

the ESSENTIAL

CHROMATOGRAPHY & SPECTROSCOPY CATALOG



The Measure of Confidence

Agilent Technologies



GENERAL CHROMATOGRAPHY

Your Essential Resource for Supplies



The Measure of Confidence

Agilent Technologies

GENERAL CHROMATOGRAPHY SUPPLIES



Minimize contamination and ensure accurate, reproducible results



As the world's premier measurement company, Agilent is uniquely positioned to offer you the widest selection of parts and supplies. All are engineered or selected by our experienced design teams, manufactured to our demanding specifications, and tested under the strictest conditions.

- **Vials, caps and septa** are designed to work flawlessly with your autosampler's gripping and injection mechanisms – eliminating breakage and leaks that can cause unnecessary downtime, expensive repairs, and sample loss. We have also expanded our portfolio to include MS analyzed kits, Agilent Certified Vials, and NEW Agilent CrossLab Vials for non-Agilent autosamplers.
- **Manual and autosampler syringes** boost performance along every step of your sampling process. Designed for accuracy, reliability and ease of use, Agilent syringes ensure exact measurement, transport, and delivery of liquids necessary for sample preparation and injection.



- **Renewable gas purification system** extends column life and reduces baseline noise by removing oxygen, water, and hydrocarbons from carrier gasses. One renewable cartridge can support up to four GC systems, while delivering the same filtration capacity as multiple competitive cartridges.
- **Gas Clean filter system** prevents dirty gas from jeopardizing your analysis. Oxygen, hydrocarbons, and moisture can decrease GC sensitivity; they can also activate glass wool in liners and accelerate septa degradation, causing high background noise and ghost peaks. Inserting a gas clean filter immediately before your GC inlet greatly reduces the level of impurities, improving trace analysis.
- **Fittings and tools** make life in the lab easier by keeping your instruments running in top form.



- **Electrochemistry meters** are designed by chromatographers for chromatographers to give you rugged simplicity and fast, reliable data. Features such as user-friendly controls, waterproof connectors, and multi-parameter measurement capabilities make Agilent pH, DO, ISE, conductivity and multi-parameter meters your first choice for a broad range of applications.



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PUT MORE THAN 40 YEARS OF RELENTLESS INNOVATION BEHIND YOUR EVERY RESULT

By continually raising the standards for technologies that support your routine analyses, Agilent's R&D efforts have led to breakthroughs such as:

- **New GC columns** that help you achieve higher levels of inertness and column-to-column reproducibility
- **LC column choices** that deliver the sensitivity and reliability you need for demanding applications
- **Cutting-edge sample preparation products** that promote reliable extraction and concentration
- **Fresh atomic and molecular spectroscopy ideas** for identifying and confirming targets and unknowns

Longtime Agilent customers have experienced our commitment firsthand. And now, we look forward to demonstrating how Agilent's approach to relentless innovation can work to your advantage, too.

CHEMICAL ANALYSIS SOLUTIONS



Food

From high-volume screening of vegetables for large numbers of pesticides to rapid identification of pathogens, Agilent understands the analytical needs of food producers, shippers, and regulators. When a new toxin appears, we deploy substantial resources to quickly help customers develop robust and reliable methods. Agilent's leading separations, mass spectrometry, and spectroscopy solutions are emerging as valuable food testing techniques.



Environmental

Agilent offers more than 40 years of environmental testing and regulatory expertise. We help government and private labs with the full range of assays, from routine testing of soils for heavy metals to detection of pharmaceuticals in groundwater, in concentrations down to parts per trillion.



Energy and Fuels

Agilent collaborates closely with process industry customers to offer analytical systems that meet their needs for separation, detection, throughput, and support. We'll even preconfigure custom or standard analyzers so they arrive at the lab ready-to-go. Agilent's expertise in both chemical analysis and life science is a powerful combination for researching and producing biofuels, including a wide range of analytical techniques for fatty acid methyl esters (FAMEs). Our newly-expanded portfolio also offers powerful tools for developing and producing photovoltaic films and solar panels.



Forensics

Because the careers of world class athletes and many other individuals hinge on drug testing, it's critical that those doing the testing have the highest level of confidence in the results. Forensics analysts worldwide have grown to depend on Agilent tools for accuracy, reliability, and speed in this high stakes, high-throughput field. Our best selling GC, GC/MS and popular LC and LC/MS are workhorses in forensics labs.



Traditional Lab Informatics

The ways labs generate and store data profoundly affect their efficiency. Agilent offers a rich, integrated suite of software products built on a set of customer-driven architectural values with the Agilent OpenLAB Laboratory Software Suite. OpenLAB delivers superior performance, open systems integration and investment protection. Our commitment is to deliver more value across each step in the life cycle of scientific data – from data collection and analysis to interpretation and management.



Materials Science

Agilent offers a newly expanded portfolio of instruments used for the research, manufacturing and testing of advanced materials, from precision optics to pulp, paper and polymers. Tools for chromatography, atomic absorption spectroscopy, molecular spectroscopy, X-ray crystallography, and nuclear magnetic resonance all support continuous progress in materials science.

LIFE SCIENCE SOLUTIONS



Biopharmaceutical

As "multi-omics" studies gain momentum in the search for new therapeutics, Agilent is uniquely positioned to provide the instruments, reagents, and powerful software needed for performing experiments in multiple disciplines and combining the massive amounts of data into biological insight.



Pharmaceutical

Drug manufacturing requires the accuracy, sensitivity and high throughput of other analytical applications, along with the demands of regulatory record-keeping and validation requirements. Agilent provides a potent combination of rugged, high-throughput tools and unmatched compliance services. Agilent now offers the market-leading family of dissolution apparatus and sampling systems that pair perfectly with our HPLC and UV systems.



Proteomics

Research into how large sets of proteins affect the health of an organism requires special sets of analytical tools. Agilent has built a formidable arsenal of liquid chromatograph/mass spectrometers, bioinformatics systems, multiple affinity protein removal columns, and OFFGEL electrophoresis for protein identification and protein biomarker discovery. Accurate-Mass mass spectrometry and the microfluidic HPLC-Chip/MS are two Agilent innovations speeding the work of proteomics researchers around the globe.



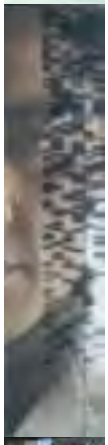
Metabolomics

Collections of small molecules are increasingly being seen as rich sources of biomarkers, but studying metabolites presents many challenges. The need for speed, accuracy, and powerful interpretation capabilities in looking at chemical profile snapshots is underscored because molecules are constantly entering, leaving or changing within the metabolome. Agilent's GC, LC, NMR and MS portfolios, along with our excellent bioinformatics offerings, user-customizable METLIN metabolite database for LC/MS, and the industry's first commercial GC/MS retention time locked metabolite library align well with needs of metabolomics researchers.



Genomics

Agilent is a global leader in microarrays, scanners, and reagents used in a wide variety of genomic-based disease research experiments. Our SureSelect Target Enrichment System dominates the category, streamlining next generation sequencing studies worldwide. Agilent offers a wide range of catalog microarrays and a highly-developed capability to produce custom arrays featuring ink jet-based SurePrint fabrication and the eArray on-line design tool. All Agilent microarrays feature highly sensitive, selective 60-mer probes. With as many as eight arrays printed on a standard 1 x 3 in. slide, the cost per experiment becomes very affordable.



Life Science Informatics

Mirroring its extensive instrument portfolio, Agilent offers the industry's most extensive suite of bioinformatics software, helping users derive knowledge from complex genomic, proteomic, metabolomic and other biological data. This includes DNA Analytics for analyzing CGH, ChIP and methylation microarray data. The GeneSpring suite includes informatics software for microarray-based gene expression data, genotyping data, and GeneSpring MS, which are useful for analyzing mass spec data from proteomics and metabolomics experiments and comparing complex datasets to explore biological questions from multiple perspectives.



Lab Automation

To meet the skyrocketing demand for more throughput and automation, Agilent has substantially expanded its lab automation offerings. The Agilent line of liquid handlers and microplate processors are designed to streamline high-volume life science workflows. Agilent is also continually upgrading its advanced autosamplers for LC, GC, LC/MS and GC/MS, adding functionality and speed to reflect the performance of its advanced instruments.



Vacuum Technology

Agilent works with customers to solve vacuum challenges from experiments in high-energy physics to developing systems for producing flat panel displays. Agilent manufactures vacuum systems used in its own mass spectrometry instruments as well as those of other manufacturers. Agilent's vacuum technology has been proven by the most powerful physics experiment ever built, CERN's Large Hadron Collider machine, which was used in the discovery of the Higgs boson particle.



Get the Agilent Service Guarantee

Should your instrument require service while covered by an Agilent service agreement, we guarantee repair or we will replace your instrument for free.

No other company offers this level of commitment to keep your lab up and running at peak efficiency.



Laboratory decision makers and users ranked Agilent as their first choice for general laboratory compliance services.

Agilent Service and Support for Instrument Systems

Focus on what you do best

For over 40 years, Agilent has been building and maintaining the instruments you count on to stay competitive and successful. Trust us to protect your investment with a broad portfolio of services, backed by a global network of experienced service professionals dedicated to the productivity of your lab.

Agilent Advantage Service Plans

The best service available for your Agilent instruments

Agilent offers a flexible range of service plans so that you can choose the level of coverage that is best for your lab.

- **Agilent Advantage Gold** – Priority-one coverage for ultimate uptime and productivity
- **Agilent Advantage Silver** – Comprehensive coverage for dependable laboratory operations
- **Agilent Advantage Bronze** – Total repair coverage at a fixed annual price
- **Agilent Repair Service** – Basic coverage for reliable instrument repair

Agilent Advantage service plans include Agilent Remote Advisor for real-time remote monitoring and diagnostics. Through secure internet connections, you can interact with Agilent service professionals, receive detailed asset reports, and configure text or email alerts to notify you before problems occur – helping you to maximize instrument uptime and optimize laboratory workflows.

Agilent Compliance Services

Equipment qualification that meets the most stringent requirements

Enterprise Edition Compliance was developed to streamline compliance across your entire lab. Used globally in regulated labs, including standards organizations and regulatory agencies, Enterprise Edition enables you to:

- Improve qualification efficiency by automating protocols across platforms to ensure greater efficiency and minimize regulatory risk
- Standardize your entire compliance operation with robust test designs that work with all your instruments
- Add, remove or reconfigure tests based upon your unique user requirements
- Significantly reduce staff review time with consistently formatted, computer generated, tamper-proof reports

Agilent Education and Consulting Services



Our best minds, working for you

Make the most of your instrument with training and consulting from the same experts who designed the instruments, software and processes you use every day.

- Classroom and on-site training in instrument operation, troubleshooting and maintenance
- Customized consulting services to meet your lab's unique needs

The Agilent Value Promise – 10 Years of Guaranteed Value

In addition to continually evolving products, we offer something else unique to the industry – our 10-year value guarantee. The Agilent Value Promise guarantees you at least 10 years of instrument use from your date of purchase, or we will credit you with the residual value of the system toward an upgraded model. Not only does Agilent ensure a reliable purchase now, but we also ensure that your investment is just as valuable in the future.

For more detailed information,
please go to **www.agilent.com/chem/services**
or contact your local Agilent Services and Support representative.

Technical Support at work for you



Have a hardware, software, application, instrument repair or troubleshooting question? Agilent's technical experts are available to answer your questions. With years of laboratory experience, our technical support specialists can provide in-depth knowledge and experience.

For questions pertaining to supplies found in this catalog, contact your local Agilent office or Authorized Agilent Distributor or visit **www.agilent.com/chem/techsupport**

Need more information?

Visit **www.agilent.com/chem/contactus** to:

- Locate your nearest Agilent office or distributor for expert technical support.
- Get fast sales and product assistance by phone. Simply use the scroll-down menu to select your country.
- Receive email assistance using our convenient online forms.



Agilent Gas Clean Filters

The Agilent Gas Clean Filter System provides enhanced gas quality for maximum productivity. Clean gases reduce the risk of column damage, sensitivity loss, and instrument downtime. Oxygen, hydrocarbons and moisture can cause loss of sensitivity and accuracy of the GC, and damage your column and consumables. Inserting a Gas Clean Filter System in the gas line immediately before the instrument inlet greatly reduces the level of impurities and helps you detect any problems before they occur.

Turn to pages 96-99.

Agilent Ultra Inert Solutions

Agilent is leading the way in flow path inertness with their industry-leading Agilent J&W Ultra Inert GC Column family and the Agilent Ultra Inert Liner. Whether you are analyzing difficult, active food and environmental samples or screening for drugs of abuse, our Ultra Inert solutions help ensure an inert GC flow path for higher sensitivity, accuracy, and reproducibility…especially at trace levels. For more information, visit **www.agilent.com/chem/ultrainert**





Agilent Electronic Crimper and Decapper

The Agilent Electronic Crimper and Decapper is much easier to use than a manual crimper, and is more likely to give you a secure seal every time. The crimper also increases lab productivity because you don't waste time refixing poor seals and cleaning up broken glass and spilled samples. You can also be confident that you do not risk losing potentially valuable samples.

Turn to page 34.

Agilent Syringes

Whether you need an autosampler or manual syringe, there are two key features consider when choosing the right syringe – identifying your sample type and establishing the smallest volume to be dispensed or injected. Agilent offers syringes for all sample types in all the dimensions you are ever likely to need, for accurate and effective sampling.

Turn to page 60.



Agilent CrossLab

Agilent CrossLab Supplies

Agilent CrossLab is a growing portfolio of GC and LC supplies critical to instrument performance and productivity. They are manufactured to perform seamlessly with a variety of analytical instruments in your lab, regardless of make or model. When you choose Agilent CrossLab, you know you'll get:

- Over 40 years of chromatography expertise and on-going innovation
- The same commitment to quality inherent in all Agilent products
- Optimal performance for routine and challenging applications
- Convenience of consolidated purchasing

All with our risk-free, 90-day, money-back guarantee.



Agilent CrossLab HPLC supports instruments from Waters, Shimadzu, Dionex (now part of Thermo Scientific), CTC Analytics, and more. The comprehensive range includes detector lamps, autosampler vials and closures, well plates and sealing mats, autosampler syringes, pump and valve supplies, capillaries, tubing, and fittings, and performance maintenance kits. Put Agilent CrossLab HPLC quality supplies to work across your lab.



Agilent CrossLab GC works with instruments from Bruker (formerly Varian), CTC Analytics, PerkinElmer, and Shimadzu, with more on the way. The family comprises autosampler syringes to autosampler vials, Agilent Ultra Inert inlet liners to non-stick liner O-rings, capillary column ferrules to column nuts, vials, caps, septa, and more. Experience the same Agilent quality solutions you know and trust, now for your non-Agilent GCs.

All Agilent Crosslab high quality supplies are backed by Agilent's worldwide technical support and dependable availability and delivery.

For information on Agilent CrossLab Vials, turn to page 36
For information on Agilent CrossLab Syringes, turn to page 77-78



Agilent Vials and Closures

Common questions about Agilent vials and caps

Why is it important to use Agilent Certified vials on my Agilent autosampler?

Agilent Certified vials are the only vials in the industry designed and tested for full compatibility with our autosamplers. The same attention and precision that go into designing our instruments, columns, and parts also go into designing these vials. Many Agilent autosamplers use a robotic arm to grip vials by the neck. Therefore, it is critical that the vial neck and shoulder are the proper height to prevent dropped vials and lost samples. Only Agilent Certified vials are designed for use on Agilent autosamplers; competitor products simply do not meet our exact specifications, which can lead to costly instrument downtime and potential loss of your precious samples.

Is the same true for Agilent Certified caps and inserts?

To avoid leakage and sample loss due to evaporation, inserts must sit neatly in the vial – and the entire assembly must be tightly sealed when capped. You should also consider the depth of your autosampler needle when using an insert to prevent needle damage and ensure proper sample uptake.

The threads on the Agilent Certified screw vials are designed precisely to match the threads on Agilent Certified caps. Using a non-Agilent Certified cap on these vials will not create a secure, tight seal and will lead to sample loss. In addition, Certified crimp vials and caps are tested over 100,000 times on our Agilent autosamplers to confirm a proper fit and secure seal.

Do I need to be concerned about the compatibility of my sample with my vials?

For highly sensitive samples such as pesticides or semivolatiles, as well as samples that are prone to sudden shifts in pH, deactivated vials are best, because their surface is more hydrophobic and inert. For more exacting, demanding applications, such as mass spectrometry, deactivated vials are recommended to prevent sample interactions prior to analysis.

Polypropylene vials are an excellent choice for biological applications and for applications involving samples with high metal content, such as ion chromatography, AA, or ICP-MS. Agilent thoroughly tested and evaluated a variety of polypropylene materials prior to selecting the grade used in our polypropylene vials. Our polypropylene vials have the lowest levels of extractables to ensure integrity of your sample.

Can I count on consistency from one vial to the next?

Autosampler vials can vary from their stated size and wall weight if tolerances are not tightly controlled. This can affect the volume of sample in the vial, which is especially problematic when working with small amounts of sample. Our tight control of tolerances extends through the entire manufacturing process, from the initial design to the final opto-electronic screening process, which inspects every single vial and cap for accuracy.

Agilent Certified vials conform to the industry's tightest tolerances to ensure consistency from lot to lot, as well as from one vial to the next.

Why should I buy my vials from Agilent?

Vial integrity, cleanliness, and consistency are critical for today's demanding applications. That is why Agilent vials and caps are designed using the same engineering expertise that is built into Agilent instruments. All Agilent Certified vials are manufactured in ISO 9001 clean environments, must pass a 33-point visual inspection, and are uniquely packaged to stay clean and secure during shipment.

Why It Is Critical to Use Agilent Certified Vials and Closures on Agilent Autosamplers

Common Problems	Effects	Benefits of Agilent Certified Vials and Caps
Inconsistency with vial bottom thickness	• Sample draw inconsistency • Damaged needle	Consistent and valid relative standard deviation (RSD) values
Autosampler sequence interruption	• Mishandled or dropped vials • Loss of precious sample	Confidence in unattended operation
Undetected improper seal	• Sample loss/evaporation • Possible sample contamination	Proper sealing for accurate results
Dislodged or misaligned septa	• Sample loss • Sample contamination	Accurate results
Ghost peaks	• Contamination by cap septa	Chromatographic purity test that eliminates outliers and analysis errors

TIPS & TOOLS

Agilent has made vial, cap and septum selection easy with its new Interactive Vial Selection Tool, available online in both desktop and mobile versions. The tool identifies the right vial and closures for your particular application, and provides the rationale for the choices offered.
Visit **www.agilent.com/chem/SelectVials**

Protect sample integrity by choosing the right septa for your application

Proper septa selection is critical to preventing contamination and avoiding damage to the needle and instrument. Here are some questions you should ask:

Are the septa chemically compatible with your samples and solvents?

The chart below summarizes chemical compatibility and incompatibility. Agilent provides this septa compatibilty as a guide and a starting reference point. We realize that chemical compatibility can vary depending on the concentration of the solvent, the temperature, the molecular weight of the solvent, and other factors. Therefore it is always recommended you try a variety of septa to determine the best one for your analysis.

Septa Chemical Compatibility

	PTFE	PTFE/Silicone	PTFE/Silicone/PTFE*	PTFE/Red Rubber	Viton	PTFE/Butyl
Acetonitrile	✓	✓	✓	✓		✓
Hydrocarbons (hexane, heptane, methane)	✓		✓	✓	✓	
Methanol	✓	✓	✓	✓		✓
Benzene	✓		✓		✓	
THF	✓		✓			
Toluene	✓		✓			
DMF	✓	✓	✓			✓
DMSO	✓	✓	✓			✓
Ether	✓	✓	✓			
Chlorinated Solvents (methylene chloride)	✓		✓		✓	
Alcohols (ethanol)	✓	✓	✓	✓	✓	✓
Acetic Acid	✓	✓	✓			✓
Acetone	✓	✓	✓			
Phenol	✓	✓	✓		✓	✓
Cyclohexane	✓		✓	✓	✓	

*PTFE/silicone/PTFE has the same chemical compatibility of PTFE ONLY UNTIL PUNCTURED

Will my application require repeat injections from the same vial or storage of the sample?

Resealability is an important factor to consider when selecting septa. PTFE/red rubber septa are not recommended for multiple injections or for samples that need to be stored for further analysis. When applications require a longer time between injections or any type of standard additions, PTFE/silicone/PTFE septa are always best.

What force is required to penetrate the septa?

Generally, silicone septa are more easily pierced than red rubber or butyl septa. For thicker, hard-to-pierce septa, a small gauge (23 gauge) needle may be required. Or an S-needle as they are stronger.

Pre-slit septa are the best option for the easiest penetration and will reduce the likelihood of coring.

All Agilent Certified septa are designed for optimal use with Agilent autosamplers and for proper fit in the caps.

Cap and Septa Compatibility

	High Performance Septa	Thin PTFE	PTFE/Silicone*	PTFE/ Silicone/ PTFE*	PTFE/ Red Rubber	Viton	Butyl
Temperature range	40 °C to 300 °C**	Up to 260 °C	-40 °C to 200 °C	-40 °C to 200 °C	-40 °C to 90 °C	-40 °C to 260 °C	-50 °C to 150 °C
Use for multiple injections	No	No	Yes	Yes	No	No	No
Price	More expensive	Very economical	Economical	Most expensive	Very economical	Economical	Economical
Resistance to coring	Excellent	None	Excellent	Excellent	None	None	None
Recommended for storage	No	No	Yes	Yes	No	No	No
Best for	High temperature headspace applications	Superior chemical inertness, short cycle times, and single injections	Most common HPLC and GC analyses, not as resistant to coring as P/S/P	Superior performance for ultra trace analysis, repeat injections, internal standards	Chlorosilanes, more economical option for single injections	Chlorinated solvents, higher temperatures	Organic solvents, acetic acids; impermeable to gases

*Agilent silicone is platinum cured (versus peroxide cured), making it more inert and less likely to interact with samples

**For up to one hour

TIPS & TOOLS

Agilent has made vial, cap and septum selection easy with its new Interactive Vial Selection Tool, available online in both desktop and mobile versions. The tool identifies the right vial and closures for your particular application, and provides the rationale for the choices offered.
Visit **www.agilent.com/chem/SelectVials**

What temperature range does my application require?

Septa can degrade at higher temperatures, causing contamination of your samples. Red rubber septa are only stable up to 90 °C and therefore are not a good option for higher temperature applications. Generally, PTFE-lined silicone septa provide the best compatibility with a wide range of temperatures.

For newer headspace applications that require temperatures up to 300 °C, Agilent offers the new High Performance Septa, made of special proprietary materials that minimize degradation at extreme temperatures.

How do I avoid common issues caused by septa?

Coring

Coring occurs when the needle diameter is too large for the septa or when the septa material is not durable enough to withstand repeat injections. When this happens, septa material can flake off into the vial and contaminate the sample. Here is how to prevent coring:

- Choose a PTFE-lined septum to prevent septa material from entering the sample
- Make sure the needle is not damaged, and consider a side-entry needle instead of a conical needle
- Use pre-slit septa, which will virtually eliminate coring

Vacuum Generation

Sometimes withdrawing volume from a sealed vial can create a vacuum. A few simple steps can prevent this from happening:

- Use pre-slit septa to help equalize the pressure on both sides of the cap
- Do not overfill vials
- Do not take more than 50 µL (from a 2 mL vial) in one injection

TIPS & TOOLS

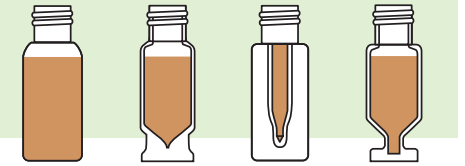
For highly sensitive samples, we recommend PTFE-lined ("sandwiched") septa, because the PTFE layers act as a chemically resistant barrier.

TIPS & TOOLS

Septa that are too thick can prevent the cap from fitting properly on the vial. Agilent Certified septa are designed for use in our Certified caps.

Agilent Vial Identification Chart and Actual Fill Volumes

Wide Opening Screw Top Vials (9 mm)



Dimensions:	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm
Recommended Fill:	1.5 mL	1.2 mL	250 µL	1.3 mL
Part Number:	5182-0714	5183-2030	5188-6591	5184-3550
Recommended Cap:	5182-0717	5182-0717	5182-0717	5182-0717

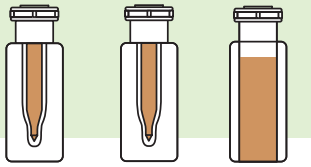
Narrow Opening Screw Top Vials (8 mm)



Dimensions:	32 mm x 12 mm
Recommended Fill:	1.5 mL
Part Number:	5183-4428
Recommended Cap:	5183-4442

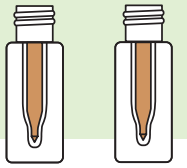
Polypropylene Vials

Crimp/Snap Top



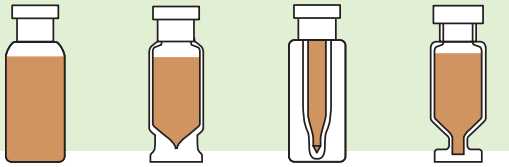
Dimensions:	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm
Recommended Fill:	250 µL	250 µL	0.7 mL
Part Number:	5188-2788	9301-0977	5182-0567
Recommended Cap:	5182-0552 (crimp) 5182-3458 (snap)	5182-0552 (crimp) 5182-3458 (snap) Glass Insert	5182-0552 (crimp) 5182-3458 (snap)

Screw Top



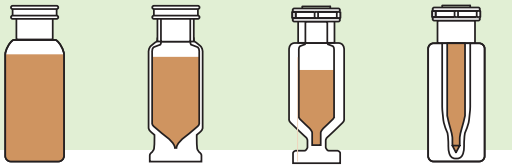
Dimensions:	32 mm x 12 mm	32 mm x 12 mm
Recommended Fill:	250 µL	250 µL
Part Number:	5190-2242	5188-5390
Recommended Cap:	5182-0717	5182-0717 Glass Insert

Wide Opening Crimp Top Vials (11 mm)



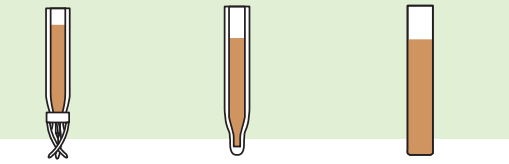
Dimensions:	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm
Recommended Fill:	1.5 mL	1.2 mL	250 µL	1.3 mL
Part Number:	5181-3375	5182-3454	9301-1388	5184-3551
Recommended Cap:	5182-0552	5182-0552	5182-0552	5182-0552

Wide Opening Snap Top Vials



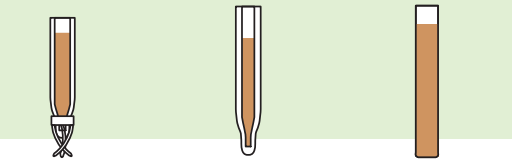
Dimensions:	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm
Recommended Fill:	1.7 mL	1.4 mL	0.7 mL	0.3 mL
Part Number:	5182-0544	5183-4510	5184-3552	5188-6593
Recommended Cap:	5182-3458	5182-3458	5182-3458	5182-3458

Inserts for Wide Opening Vials (11 mm & 9 mm)



Dimensions:	30 mm x 5.6 mm	31 mm x 5.6 mm	31 mm x 5.6 mm
Recommended Fill:	250 µL	250 µL	400 µL
Part Number:	5181-1270	5183-2085	5181-3377
Recommended Cap:			

Inserts for Narrow Opening Vials (8 mm)



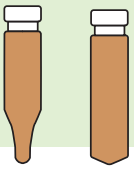
Dimensions:	28 mm x 4.8 mm	31 mm x 4.8 mm	31 mm x 4.8 mm
Recommended Fill:	150 µL	150 µL	200 µL
Part Number:	5183-2088	5183-2089	5183-2090
Recommended Cap:			

Headspace Vials



Dimensions:	75 mm x 22 mm	45 mm x 22 mm	75 mm x 22 mm	45 mm x 22 mm
Recommended Fill:	20 mL	10 mL	20 mL	10 mL
Part Number:	5182-0837	5182-0838	5183-4474	5183-4475
Recommended Cap:	5183-4477	5183-4477	5183-4477	5183-4477

Mini Vials



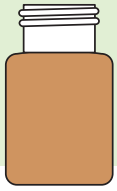
Dimensions:	–	–
Recommended Fill:	500 µL	700 µL
Part Number:	5180-0806	5180-0805
Recommended Cap:	5180-0842	5180-0842

Specialty Vials



Dimensions:	37 mm x 22 mm	45 mm x 15 mm
Recommended Fill:	6 mL	4 mL
Part Number:	9301-1419	5183-4448
Recommended Cap:	9301-1425	5183-4464

Large Volume Vials



Dimensions:	37 mm x 22 mm
Recommended Fill:	6 mL
Part Number:	9301-1377
Recommended Cap:	9301-1379



MS Analyzed Vial Kits

Agilent MS Analyzed Vial Kits end the need to pre-test or to re-run samples due to unexpected peaks. All MS Analyzed Vial Kits include a Certificate of Analysis that contains accurate, lot-specific, and fully traceable LC/MS and GC/MS signal traces, as well as critical physical dimensions. Agilent's new MS Analyzed Vial Kits provide lot-specific test results for greater confidence in your results.

- All vials are lot-tested by both GC/MS and LC/MS using Agilent systems
- Manufactured for full-warranted compatibility with Agilent GC and LC autosamplers
- Packaged in a unique box designed to reduce vial breakage
- Packed in a clean environment using clean packaging to reduce contamination
- Available in both crimp top and screw top closures
- Larger write-on spots for easier labeling and identification
- Conveniently packaged in a combination pack with 100 vials and 100 caps/septa



Screw top MS analyzed vial kit, 5190-2277



Screw top MS analyzed vial kit, 5190-2280



Crimp top MS analyzed vial kit, 5190-2282

MS Analyzed Vial Kits

Vial Type	Septa Type	Cap Color	100/pk
Screw Top MS Analyzed Vial Kits			
Clear	PTFE/red silicone septa	Blue	5190-2277
Clear with write-on spot	PTFE/red silicone septa	Blue	5190-2278
Amber	PTFE/red silicone septa	Blue	5190-2279
Amber with write-on spot	PTFE/red silicone septa	Blue	5190-2280
Crimp Top MS Analyzed Vial Kits			
Clear	PTFE/white silicone septa	Silver aluminum	5190-2281
Clear with write-on spot	PTFE/white silicone septa	Silver aluminum	5190-2282
Amber	PTFE/white silicone septa	Silver aluminum	5190-2283



Certificate of Analysis
signed by Agilent's Quality Manager

Certified Screw Top Vials and Closures



Combine the excellent autosampler handling of a crimp cap profile with the ease of a screw cap. The screw caps and precision fit septa give a secure seal with microvolume inserts.

- Certified for full warranted compatibility with Agilent autosamplers
- 2 mL, 12 x 32 mm, 9 mm diameter
- Packaged in a unique box designed to reduce vial breakage
- 40% larger opening than standard narrow opening vials
- Unique thread design for consistently secure seal
- Precision-formed neck for optimal robotic arm handling
- Rigorous quality assurance for dimensional consistency from lot-to-lot
- Optional ceramic write-on spot with fill marks

2 mL Wide Opening Screw Top Glass Vials

Description	100/pk	1000/cs*
Clear	5182-0714	5183-2067
Clear, write-on spot	5182-0715	5183-2068
Amber	5188-6535	5188-6536
Amber, write-on spot	5182-0716	5183-2069
Deactivated Vials		
Clear	5183-2070	
Clear, write-on spot	5183-2071	
Amber, write-on spot	5183-2072	

*Case includes 10 packs of 100 vials

LC Vials and Closures

Description	Unit	Part No.
6 mL Screw Top Vials and Closures		
Clear, flat bottom	100/pk	9301-1377
Screw caps, 16 mm	100/pk	9301-1379
PTFE/silicone septa	100/pk	9301-1378
PTFE/silicone septa, pre-slit	100/pk	5188-2758
5 mL Screw Top Vials		
Clear, high recovery	30/pk	5188-5369



PTFE-lined solid top screw caps for 2 mL vials, 5183-2075



Polypropylene caps with bonded septa, 5185-5823



Screw caps with septa

Screw Caps for 2 mL Vials

Color	Septa Type	Certified	100/pk	500/pk	1000/pk
Blue	PTFE/red silicone septa	✓	5182-0717	5185-5820	5190-1599
	PTFE/white silicone septa	✓	5182-0720	5185-5863	
	PTFE/silicone/PTFE septa	✓	5182-0723	5185-5862	
	Pre-slit PTFE/silicone septa	✓	5183-2076	5185-5865	
	PTFE-lined solid top	✓	5183-2075		
	Open top, no septa	✓	5182-0728		
	Bonded PTFE/silicone septa		5185-5823		
	Bonded pre-slit PTFE/silicone septa		5185-5824	5040-4649	
Green	PTFE/red silicone septa	✓	5182-0718	5185-5829	
	PTFE/white silicone septa	✓	5182-0721	5185-5864	
	PTFE/silicone/PTFE septa	✓	5182-0724	5185-5861	
	Pre-slit PTFE/silicone septa	✓	5183-2077		
	Open top, no septa	✓	5182-0727		
Red	PTFE/red silicone septa	✓	5182-0719		
	PTFE/white silicone septa	✓	5182-0722		
	PTFE/silicone/PTFE septa	✓	5182-0725		
	Pre-slit PTFE/silicone septa	✓	5183-2078		
	Open top, no septa	✓	5182-0726		
Black	PTFE/red silicone septa	✓	5185-5838		
Purple	PTFE/silicone septa	✓	5040-4681		
Light turquoise	PTFE/silicone septa	✓	5040-4683		

Certified Septa for Wide Opening (9 mm) Screw Caps

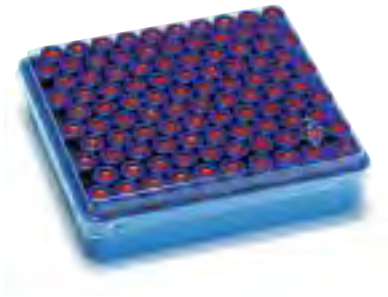
Septa Type	Color	100/pk
PTFE/red silicone	Ivory	5182-0731
PTFE/white silicone/red PTFE	Red	5182-0729
Pre-slit PTFE/white silicone	Blue	5183-2074
PTFE/white silicone	Red	5182-0730

Screw Cap Pack for 7696 Sample Prep Workbench

Description	Septa Type	Part No.
Multicolor screw cap pack Includes 50/pk of each color: blue, green, red, light turquoise, purple	PTFE/silicone septa	5040-4682

Certified 2 mL Screw Top Vial Packs

Pre-assembled packs come ready-to-use with the cap and septum of your choice attached to the vial. A time- and labor-saving product for use with your Agilent autosampler or any rotating tray automatic sampler.



Pre-assembled vial pack

Certified 2 mL Screw Top Vial Packs

Vial Type	Septa Type	Cap Color	100/pk
Clear	PTFE/red silicone septa	Blue	5182-0553
Clear with write-on spot	PTFE/red silicone septa	Blue	5182-0864
Amber with write-on spot	PTFE/red silicone septa	Green	5182-0554
Clear	PTFE/silicone/PTFE septa	Blue	5182-0555
Clear with write-on spot	PTFE/silicone/PTFE septa	Blue	5182-0866
Amber with write-on spot	PTFE/silicone/PTFE septa	Green	5182-0556
Clear	PTFE/silicone septa	Blue	5182-0557
Clear with write-on spot	PTFE/silicone septa	Blue	5182-0865
Amber with write-on spot	PTFE/silicone septa	Green	5182-0558
Clear	Pre-slit PTFE/silicone septa	Blue	5183-2082
Clear with write-on spot	Pre-slit PTFE/silicone septa	Blue	5183-2083



Screw top vial convenience kit

Certified Screw Top Vial Convenience Packs

Convenience packs are an easy way to get 500 of each component using one part number. Packed in our six-drawer, reusable blue plastic cabinet, 500 vials and caps with septa installed are kept handy and dust-free.

Certified Screw Top Vial Convenience Packs

Vial Type	Septa Type	Cap Color	500/pk
Clear	PTFE/red silicone septa	Blue	5182-0732
Clear with write-on spot	PTFE/red silicone septa	Blue	5182-0867
Amber with write-on spot	PTFE/red silicone septa	Green	5182-0733
Clear	PTFE/silicone/PTFE septa	Blue	5182-0736
Clear with write-on spot	PTFE/silicone/PTFE septa	Blue	5182-0869
Amber with write-on spot	PTFE/silicone/PTFE septa	Green	5182-0737
Clear	PTFE/silicone septa	Blue	5182-0734
Clear with write-on spot	PTFE/silicone septa	Blue	5182-0868
Amber with write-on spot	PTFE/silicone septa	Green	5182-0735
Clear	Pre-slit PTFE/silicone septa	Blue	5183-2079
Clear with write-on spot	Pre-slit PTFE/silicone septa	Blue	5183-2080
Amber with write-on spot	Pre-slit PTFE/silicone septa	Green	5183-2081
Clear	Bonded, pre-slit PTFE/silicone septa	Blue	5067-0205

Crimp Top Vials and Closures

The wide opening crimp cap provides a larger target area for improved autosampler needle accuracy. Select from five cap colors and a variety of septa. Whatever your crimp top vial needs, Agilent has what you are looking for.

- Certified for full warranted compatibility with Agilent autosamplers
- 2 mL, 12 x 32 mm
- Available in unique packaging designed to reduce vial breakage
- Tightly controlled crown for improved crimping
- Precision-formed neck for improved autosampler handling
- Rigorous quality assurance provides dimensional consistency from lot-to-lot
- Optional ceramic write-on spot with fill marks





Clear crimp top vials, 5181-3375

2 mL Wide Opening Crimp Top Vials

Description	Certified	100/pk	1000/cs*
Clear	✓	5181-3375	5183-4491
Clear, write-on spot	✓	5182-0543	5183-4492
Amber, write-on spot	✓	5181-3376	5183-4493
Deactivated Vials			
Clear	✓	5183-4494	
Clear, write-on spot	✓	5183-4495	
Amber, write-on spot	✓	5183-4496	
Crimp Top Vials with Fixed Inserts			
Amber, 300 µL recommended useable volume		5188-6572	
Clear, 300 µL recommended useable volume		9301-1388	

*Case includes 10 packs of 100 vials

LC Vials and Closures

Description	Unit	Part No.
6 mL Crimp Top Vials and Closures		
Clear, flat bottom	100/pk	9301-1419
Crimp caps, 20 mm, PTFE/silicone septa	100/pk	9301-1425



Magnetic crimp caps, 5188-5386

Crimp Caps with 11 mm Septa

Agilent recommends using Certified crimp caps with PTFE/silicone septa to ensure seamless operation with your Agilent autosampler. Agilent Certified crimp caps are guaranteed to work with your instrument to reduce autosampler malfunctioning and contamination.

Crimp Caps with 11 mm Septa

Cap Color	Septa Type	Certified	25/pk	100/pk	500/pk	1000/pk
Silver aluminum	PTFE/silicone/ PTFE septa	✓		5181-1211		5183-4499
	PTFE/silicone septa	✓		5182-0552		5183-4500
	Black Viton septa	✓		5181-1212		
	Thin PTFE septa	✓		5182-0871		
	Thin-membrane rubber septa		5062-3582			
	PTFE/red rubber septa			5181-1210	5061-3370	5183-4498
Blue aluminum	PTFE/red rubber septa			5181-1215		
Green aluminum	PTFE/red rubber septa			5181-1216		
Red aluminum	PTFE/red rubber septa			5181-1217		
Gold aluminum	Magnetic			5188-5386		

Crimp Top Vial Convenience Packs

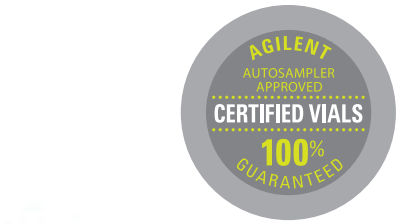
Vial Type	Septa Type	Cap Color	500/pk
Clear	PTFE/red rubber septa	Silver aluminum	5181-3400
Clear with write-on spot	PTFE/red rubber septa	Silver aluminum	5190-2241
Amber with write-on spot	PTFE/red rubber septa	Silver aluminum	5181-8801

TIPS & TOOLS

Red rubber septa have a tendency to cause needle sticking during sampling. Agilent recommends a 23/26 gauge needle when using red rubber septa. Agilent Certified crimp caps are compatible with all needle types.

Certified Microvolume Inserts for Wide Opening Vials

To meet your microsampling needs, Agilent has a variety of microvolume inserts with capacities and designs that can transform our vials from full-capacity to limited volume with one simple step. Microvolume inserts are certified to work with all Certified vials for excellent fit with Agilent autosamplers.





Certified Microvolume Inserts for Wide Opening Vials

Description	Maximum Fill Volume	Recommended Fill Volume	Unit	Part No.
Conical Inserts with Polymer Feet				
Glass inserts with polymer feet and mandrel interior	320 µL	250 µL	100/pk	5181-1270*
Deactivated glass inserts with polymer feet and mandrel interior	350 µL	250 µL	100/pk	5181-8872
Conical Glass Inserts				
Pulled-point glass inserts	350 µL	250 µL	100/pk	5183-2085
Pulled-point glass inserts	180 µL	100 µL	500/pk	9301-1387
Flat Bottom Inserts				
Glass flat bottom inserts	440 µL	400 µL	500/pk	5181-3377
Deactivated glass flat bottom inserts	440 µL	400 µL	500/pk	5183-2086

*For vortexing or mixing small volume samples, Agilent recommends using 5181-1270 because it provides a secure seal with the cap and septum



250 µL pulled-point glass inserts, 5183-2085



400 µL glass flat bottom inserts, 5181-3377

Polypropylene Vials

Wide opening 12 x 32 mm vials are manufactured from virgin polypropylene, meeting the requirements of 21 CFR 177.1520. Polypropylene is chemically resistant and the material of choice for sodium or heavy metals analysis. Polypropylene vials are translucent and can be used with crimp caps.

Agilent's polypropylene vials use the purest, cleanest grade of polypropylene available, to guarantee the lowest levels of extractables. In addition, the walls of these vials have been thickened to withstand the force of Agilent LC and CE autosamplers. Competitor vials are not comparable.



Crimp/Snap top polypropylene vial, 250 µL, 5188-2788



Polypropylene vial with glass insert, 9301-0977

When should I use a Polypropylene Vial?

The information provided below will help you to determine if polypropylene vials or silanized glass vials are the best option for your application. As always, this information serves only as a guideline, and we always recommend testing options before deciding on the proper vial and cap.

Polypropylene

- Traditionally the material of choice for LC or LC/MS and CE
- Polypropylene can oxidize some biologicals
- Not recommended for light sensitive compounds
- Not compatible with a number of organic solvents
- Max temperature of ~ 175 °C

Available Sizes/Formats	
Polypropylene Vials	
250 µL	Crimp & Screw
Deactivated/Silanized Vials	
2 mL	Crimp, Snap & Screw
250 µL, 400 µL	Microvolume Inserts

TIPS & TOOLS

The Agilent headspace autosamplers G1888A, and 7694A, B and E are compatible with the flat bottom headspace vials only. Only Agilent vials are designed to properly fit in the Agilent autosampler incubator.

Deactivated/Silanized Vials

- Deactivation process renders surface inert
- Will not interact with metals, biologicals or proteins and will not cause shifts in pH of sample
- Compatible with a wide variety of solvents
- Available in amber for light sensitive samples
- More expensive than polypropylene
- Can withstand temperatures up to 500 °C

Agilent Polypropylene Vial Compatibility

Contact Time	Extraction (<5 min)	< 1 hr	1 - 4 hr	4 - 8 hr	24 hr
Hexane	Good	Fair	Not recommended	Not recommended	Not recommended
THF	Good	Fair	Not recommended	Not recommended	Not recommended
$MeCl_2$	Good	Fair	Not recommended	Not recommended	Not recommended
Toluene	Good	Fair	Not recommended	Not recommended	Not recommended
Isooctane	Good	Good	Fair	Fair	Not recommended
Acetone	Good	Good	Good	Fair	Not recommended
Ethyl acetate	Good	Good	Good	Fair	Fair
IPA	Good	Good	Good	Good	Good
Ethanol	Good	Good	Good	Good	Good
Methanol	Good	Good	Good	Good	Good
DMSO	Good	Good	Good	Good	Good
Acetonitrile	Good	Good	Good	Good	Good

Polypropylene Vials

Vial Type	Volume	Certified	100/pk	1000/pk
Polypropylene, crimp/snap top	250 µL	✓	5188-2788	9301-0978
Polypropylene, screw top	250 µL	✓	5190-2242	5190-2243
Polypropylene, crimp/snap top	250 µL			5190-3155
Polypropylene, crimp/snap top	1 mL		5182-0567	
Polypropylene with glass insert, crimp/snap top	250 µL		9301-0977	
Polypropylene with glass insert, screw top	250 µL		5188-5390	



Headspace Vials and Closures

Beveled-neck headspace vials are available in both 10 mL and 20 mL capacities, flat or rounded bottom. The 20 mm crimp caps provide a consistently secure seal. Agilent also offers cost-saving convenience packs with vials, caps and septa packaged together.

- Certified for full warranted compatibility with Agilent autosamplers
- Choice of crimp or screw top vials
- Beveled top for maximum secure seal
- Two neck lengths available
- Choice of a pressure safety release cap at 45 psi
- Available in flat or rounded bottom designs





Clear headspace crimp top vials with graduation marks and write-on spot, 5190-2285



Amber headspace crimp top vials with graduation marks and write-on spot, 5190-2288

Certified Headspace Crimp Top Glass Vials

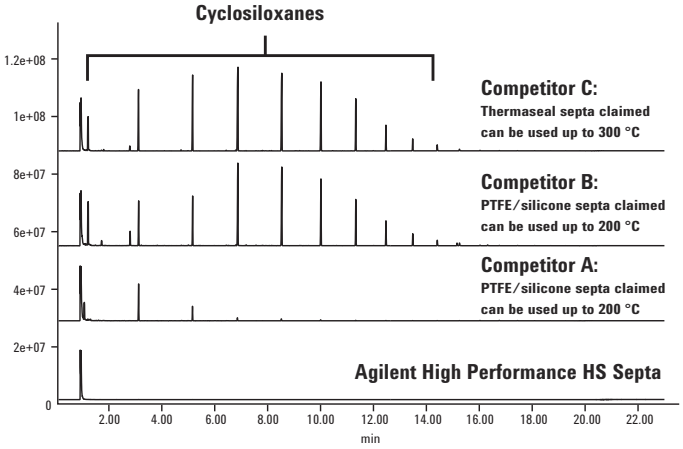
Description	Unit	Flat Bottom	Rounded Bottom
10 mL, 23 x 46 mm			
Clear	100/pk	5182-0838	5183-4475
Amber	100/pk	5067-0227	5190-2238
Clear, graduation marks and write-on spot	100/pk	5190-2285	
Amber, graduation marks and write-on spot	100/pk	5190-2287	
20 mL, 23 x 75 mm			
Clear	100/pk	5182-0837	5183-4474
Amber	100/pk	5067-0226	5190-2239
Clear, graduation marks and write-on spot	100/pk	5190-2286	
Amber, graduation marks and write-on spot	100/pk	5190-2288	

High Performance Septa

Agilent introduces the first septa that can withstand extreme temperatures and conditions for today's demanding headspace applications.

- Proven to withstand temperatures up to 300 °C with no degradation
- Leakproof
- Available in your choice of crimp or screw

Headspace screw top vial blank chromatogram comparison at 300 °C with different septa

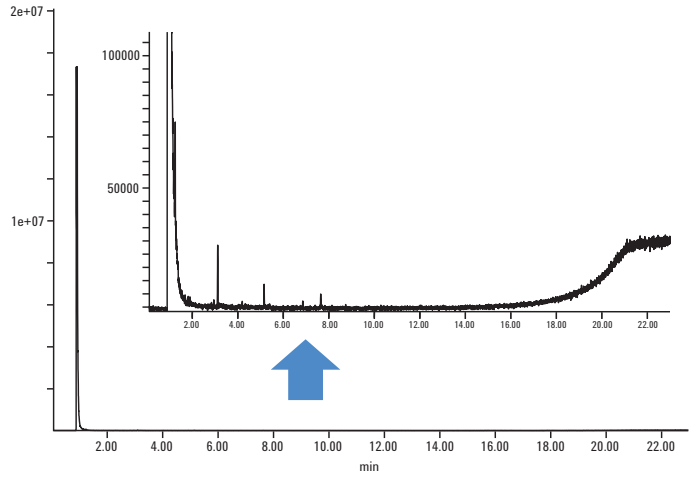


GC/MS conditions

Inlet:	Split mode w/ 10:1 ratio, 250 °C
Column:	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm, Constant flow: 2.5 mL/min
Oven:	40 °C hold 1.5 min, then 15 °C/min to 325 °C and hold for 2.5 min, 23 min total run time
Thermal Aux/MS source/ MS guard:	250 °C/230 °C/150 °C
MSD:	Scan mode 25 - 550 m/z

Vial blank sample chromatogram at 300 °C with Agilent High Performance HS Septa

Agilent High Performance Septa provide significant cleaner blank background at high temperature HS testing. Even with small abundance scale, the 300 °C vial blank chromatogram with High Performance Septa only shows few siloxane peaks with very small abundance.



Headspace conditions

Septa Type:	Agilent High Performance Septa, 5190-3986
Temperature:	Oven/loop & valve/transfer line: 300 °C/300 °C/300 °C
Times:	GC cycle time: 32 min, Vial equib time: 30 min
Vial:	Fill pressure: 15 psi, Fill flow: 50 mL/min, Loop fill ramp rate: 20 psi/min, Loop final pressure: 10 psi, Vial Size: 20 mL, Shaking: 1
Carrier:	GC controlled

TIPS & TOOLS

For information on CrossLab High Performance Septa, turn to page 41-42.

High Performance Septa

Description	Unit	Agilent Certified Part No.	Compatible With
18 mm steel screw cap with High Performance Septa	100/pk	5190-3986	5188-2753, 5188-6537, 5188-5392, 5188-6538
20 mm steel crimp cap with High Performance Septa	100/pk	5190-3987	5182-0837, 5183-4474, 5067-0226, 5190-2239, 5182-0838, 5183-4475, 5067-0227, 5190-2238

20 mm Headspace Crimp Caps and Septa

Cap Color	Septa Type	Specifications	Certified	100/pk	10,000/pk
Silver aluminum	PTFE/silicone septa	-60 °C to 180 °C	✓	5183-4477	5190-2257
Silver aluminum with safety feature	PTFE/silicone septa	-60 °C to 180 °C	✓	5183-4478	
Silver aluminum	Molded PTFE/ butyl septa	-40 °C to 125 °C	✓	5183-4479	5190-2258
Silver aluminum with safety feature	Molded PTFE/ butyl septa	-40 °C to 125 °C		5183-4480	
Silver aluminum	No septa			9301-0721	
Silver aluminum with safety feature	No septa			9301-0718	
Septa only	Gray PTFE/ black butyl molded	-40 °C to 125 °C		9301-0976	
Septa only	Tan PTFE/ white silicone	-60 °C to 180 °C		9301-0719	5067-0234



Aluminum crimp caps, 5183-4477



Headspace vial convenience kit

Certified Headspace Vial Convenience Packs

Septa Type	Vial Type	Cap Color	Specifications	Unit	Part No.
Molded PTFE/ black butyl septa	Flat bottom	Silver aluminum with safety feature	< 125 °C	100/pk	5182-0839
PTFE/silicone septa	Flat bottom	Silver aluminum with safety feature	< 180 °C	100/pk	5182-0840

TIPS & TOOLS

For information on CrossLab Headspace Vial Convenience Packs, turn to pages 40-42.

CombiPAL Headspace Vials and Closures

Screw top vials and caps are recommended for the tightest seal and the most reproducible headspace results. CombiPAL headspace vials and caps are precision-threaded, making them an excellent choice for dependability and ease-of-use. They are ideal for applications in the environmental, food and beverage, industrial hygiene, drug analysis, and clinical chemistry industries.



CombiPAL Headspace Screw Top Vials

Description	100/pk
10 mL, 23 x 46 mm	
Clear	5188-5392
Amber	5188-6538
20 mL, 23 x 75 mm	
Clear	5188-2753
Amber	5188-6537

CombiPAL 18 mm Screw Top Caps with Septa

Cap Color	Septa Type	100/pk
Silver aluminum, magnetic	PTFE/silicone septa (top white, bottom blue)	5188-2759





Snap Top Vials and Closures

Snap top vials and caps are the simple, efficient way to a secure seal without crimping. It's as easy as push-on, pull-off. Crimp caps can also be used with wide opening snap top vials. **Note:** Snap cap vials cannot be pressurized.

- 2 mL, 12 x 32 mm
- Use with any 11 mm snap or crimp cap
- Available in unique packaging designed to reduce vial breakage
- Provides a total seal around the entire circumference of the vial crown
- Precision-formed neck improves autosampler handling
- Optional ceramic write-on spot
- Uniformly flat bottom ensures compatibility with inserts



Snap top vials with fixed inserts

2 mL (11 mm) Snap Top Glass Vials

Description	100/pk	1000/cs*
Clear	5182-0544	5183-4504
Clear, write-on spot	5182-0546	5183-4505
Amber, write-on spot	5182-0545	5183-4506
Deactivated Vials		
Clear	5183-4507	
Clear, write-on spot	5183-4508	
Amber, write-on spot	5183-4509	
Snap Top Vials with Fixed Inserts		
Clear, 300 µL useable volume	5188-6593	
Amber, 300 µL useable volume	5188-6594	

*Case includes 10 packs of 100 vials

Polyethylene Snap Caps with 11 mm Septa

Cap Color	Septa Type	100/pk	500/pk
Clear	Clear PTFE/red silicone septa	5182-0550	5182-0564
Blue	Clear PTFE/red silicone septa	5182-3458	
Green	Clear PTFE/red silicone septa	5182-3457	
Red	Clear PTFE/red silicone septa	5182-3459	
Clear	PTFE/silicone/PTFE septa	5182-0566	
Blue	PTFE/silicone septa	5182-0541	
Clear	Pre-slit PTFE/silicone septa	5183-4511	
Clear	Solid polyethylene membrane septa	5182-0542	
Clear	PTFE septa	5182-0540	



Snap caps with septa

Snap Top Vial Convenience Packs

Vial Type	Septa Type	Cap Color	500/pk
Clear	PTFE/red rubber septa	Clear polypropylene	5182-0547
Clear with write-on spot	PTFE/red rubber septa	Clear polypropylene	5190-2240
Amber	PTFE/red rubber septa	Clear polypropylene	5182-0548



Crimp top vial, high recovery, 5182-3454

Specialty Vials and Closures

High Recovery Glass Vials

Wide opening, 1.5 mL vials with 30 µL reservoir are for sample concentration and injection without transferring to microvolume inserts.

1.5 mL Wide Opening High Recovery Glass Vials

Vial Type	Unit	Screw Top	Crimp Top	Snap Top
Clear	100/pk	5183-2030	5182-3454	5183-4510
Clear, silanized	100/pk		5183-4497	
Amber	100/pk	5183-2073		



Micro-V Vial, snap top, 5184-3552

Micro-V Vials

- Wide opening, 1.5 mL vials with low residual volume
- Made from first hydrolytical glass Type 1
- Standard 12 x 32 mm dimension
- Compatible with 11 mm crimp closures
- Lower cost alternative to high recovery vials

Micro-V Vials

Description	Unit	Screw Top	Crimp Top	Snap Top
Clear	100/pk	5184-3550	5184-3551	5184-3552
Amber	100/pk	5184-3554	5184-3555	5184-3556

Standard Opening Screw Top Vials, Closures and Inserts



Screw top vials, closures and inserts

The original, smaller opening vials with an 8-425 thread-size screw cap are available with black caps and a variety of septa to meet the needs of your application.

- 2 mL, 12 x 32 mm, 8 mm diameter
- 8-425 thread design
- Original, standard neck size

2 mL Standard Opening (8 mm) Screw Top Glass Vials

Description	Unit	Part No.
Clear	100/pk	5183-4428
Amber	100/pk	5183-4429
Clear, PTFE-lined storage cap	100/pk	5183-4518
Deactivated Vials		
Clear	100/pk	5183-4432
Amber	100/pk	5183-4433

Screw Caps and Septa for Standard Opening (8 mm) Vials

Cap Color	Septa Type	Unit	Part No.
Black	Red PTFE/white silicone	100/pk	5183-4442
Black	No septa	100/pk	5183-4438
Septa only	Red PTFE/white silicone/red PTFE, 8 mm	100/pk	5183-4436
Septa only	Red PTFE/white silicone, 8 mm	100/pk	5183-4437
Septa only	PTFE-coated butyl rubber	500/pk	9301-1130



8-425 screw top vials

Microvolume Inserts for Standard Opening (8 mm) Vials

Description	Unit	Part No.
Conical Inserts with Polymer Feet		
150 µL glass inserts with polymer feet	100/pk	5183-2088
Conical Glass Inserts		
150 µL pulled-point interior glass inserts	100/pk	5183-2089
Flat Bottom Inserts		
200 µL glass flat bottom inserts	100/pk	5183-2090



4 mL screw top vials

4 mL (13 mm) Screw Top Vials and Closures

- 4 mL, 15 x 45 mm
- Precision-formed screw threads (13 x 425) for consistently secure seal
- Can be used as wash, waste, or storage vials

4 mL (13 mm) Screw Top Glass Vials

Description	Unit	Part No.
Clear	100/pk	5183-4448
Clear with write-on spot	100/pk	5067-0246
Amber	100/pk	5183-4450
Amber with write-on spot	100/pk	5067-0247



Caps and Septa for 4 mL (13 mm) Vials

Caps and Septa for 4 mL (13 mm) Vials

Description	Unit	Part No.
Black 13 x 425 caps, PTFE/silicone septa	100/pk	5183-4464
Black 13 x 425 open top screw caps	100/pk	5183-4461
Diffusion inserts used with black open top screw caps	12/pk	07673-40180
PTFE/natural rubber septa	144/pk	9301-1031
Red PTFE/white silicone septa	100/pk	5183-4460
White virgin PTFE septa	1000/pk	5183-4459

4 mL (13 mm) Screw Top Convenience Packs

Description	Unit	Part No.
Clear vials with caps (no septa)	144/pk	9301-0723
4 mL wash vials with fill markings and caps	25/pk	5182-0551

General Purpose Sample Storage Vial and Caps

Agilent caps and vials are ideal for sampling and storage. Caps are lined with PTFE/silicone for excellent sealability and chemical resistance. All caps include bonded septa that will prevent liner fallout during shipping and sampling. Caps are manufactured of high quality materials to eliminate sample contamination.



Sample vial pack

General Purpose Sample Storage Vial Kits

Vial Size	Cap Size	Vial Type	Unit	Closed Top	Open Top
4 mL, 15 x 45	13-425	Clear	100/pk	5183-4311	5183-4331
		Amber	100/pk	5183-4321	
12 mL, 19 x 65	15-425	Clear	100/pk	5183-4312	5183-4332
		Amber	100/pk	5183-4322	
22 mL, 23 x 85	20-400	Clear	100/pk	5183-4313	5183-4333
		Amber	100/pk	5183-4323	
40 mL, 28 x 95	24-414	Clear	100/pk	5183-4314	5183-4334
		Amber	100/pk	5183-4324	



Sample storage vial kit, 5183-4324

Bonded Caps

Cap Size	Cap Color	Cap Type	Septa Type	Unit	Closed Top	Open Top
13-425	White	Polypropylene	PTFE/silicone liner	100/pk	5183-4301	5183-4305
15-425	White	Polypropylene	PTFE/silicone liner	100/pk	5183-4302	5183-4306
20-400	White	Polypropylene	PTFE/silicone liner	100/pk	5183-4303	5183-4307
24-414	White	Polypropylene	PTFE/silicone liner	100/pk	5183-4304	5183-4308

Crimping and Decapping Tools

Electronic Crimpers and Decappers

Designed to replace awkward and bulky manual crimping pliers, the Agilent electronic handheld crimpers give tight, reproducible seals every time. Adjustable, slim steel jaws fit around closely spaced vials, enabling you to crimp vials directly in crowded autosampler trays. Using the same handheld design as the crimpers, Agilent's electronic decappers remove caps instantly and are designed for laboratories that recycle or reuse vials.



11 mm electronic crimper, 5190-3188

- More vials crimped per battery charge – new lithium ion battery lasts three times longer
- Increased crimping speed – new model is 50% more powerful (6.4 volt battery)
- Less hand strain – lighter weight means less effort
- Improved power signal – clearly shows when battery needs recharging
- Easily used in right or left hand – display on top for easier viewing
- More efficient charging – no overheating during recharging
- Extended productivity – significantly longer motor life



20 mm electronic crimper, 5190-3189

Electronic Crimpers and Decappers

Description	Part No.
11 mm electronic crimper with lithium battery	5190-3188
20 mm electronic crimper with lithium battery	5190-3189
11 mm electronic decapper with lithium battery	5190-3190
20 mm electronic decapper with lithium battery	5190-3191
Replacement lithium battery for crimper and decapper	5190-3192
High Power Electronic Crimping Tool with Power Supply	5190-4061
11 mm Crimper Jaw Set for HP Electronic Crimper	5190-4062
11 mm Decapper Jaw Set for HP Electronic Crimp tool	5190-4063
20 mm Crimper Jaw Set	5190-4064
20 mm Decapper Jaw Set	5190-4065
Base for Electronic Crimping Tool	5190-4066
20 mm HP Crimping Tool and Jaw Sets Bundle	5190-4067



11 mm electronic decapper, 5190-3190



20 mm electronic decapper, 5190-3191

Manual Crimpers and Decappers

Agilent's ergonomic manual crimpers and decappers remove the pain and discomfort of wrist strain with a lightweight, tailored design. Weighing 25-30% less than predecessors and eliminating sore, pinched hands, the new design dramatically improves your experience. Extensively tested with Agilent vials for optimal fit, and color-coded for ease-of-use, this tool is a necessity for every lab. The new crimpers are built for lasting performance: the 11 mm crimper will cap at least 100,000 caps and the 20 mm at least 60,000 before wear starts to impact performance.

- Comfortable, lightweight, ergonomically designed handles fit smoothly in the hand and eliminate pinching
- Top-mounted adjustment knob shows directionality for tightening/loosening
- Adjustment knob doubles as an indicator that the crimp (or decap) is complete
- Crimpers are color-coded with blue knobs and labels, decappers with orange
- Narrow jaws provide better vertical clearance over vials
- Bottom handle motion allows for better control and enhanced stability of crimping jaw
- Sturdy construction of rugged, fiber-reinforced resin with steel reinforcement in the handles





Ergonomic manual crimper, 5040-4667

Manual Crimpers and Decappers

Description	Part No.
Ergonomic manual crimper for 11 mm caps	5040-4667
Ergonomic manual decapper for 11 mm caps	5040-4668
Ergonomic manual crimper for 20 mm caps	5040-4669
Ergonomic manual decapper for 20 mm caps	5040-4671

CrossLab Vials and Closures

Agilent CrossLab vials and closures are thoroughly tested to ensure the highest level of quality. Additionally, CrossLab vials are designed for use in a wide range of non-Agilent GCs and LCs, including those from Bruker (formerly Varian), Dionex (now Thermo Scientific), PerkinElmer, Shimadzu, and Thermo Scientific. They are:

- Manufactured in an ISO 9001 certified facility
- Made from First Hydrolytic Type 1 Class A or Class B borosilicate glass, which conforms to US FDA, USP, and EU Pharmacopeia standards
- Protected by proprietary packaging with a crush barrier to reduce vial breakage
- Packaged in material that has been tested and selected for cleanliness
- Subjected to rigorous end-of-line sampling and quality control procedures to ensure all vials remain within specifications
- Compatible with a wide variety of autosamplers regardless of make and model



CrossLab Vials and Closures

The table below illustrates that the Agilent CrossLab vial portfolio is compatible with a wide range of HPLC and GC autosamplers.

CrossLab Vial Compatibility

Manufacturer	Autosampler	8 mm Screw Top	9 mm Screw Top	15 x 45 mm, 4 mL	11 mm Crimp Top	Headspace
Waters	717 Plus				✓	
	Acquity	✓	✓		✓	
	Alliance 2690	✓	✓			
	CapLC	✓	✓		✓	
	WISP			✓		
Shimadzu	AOC14/1400	✓	✓		✓	
	AOC-20		✓	✓	✓	
	AOC 88/9	✓	✓		✓	
	AOC-5000	✓	✓		✓	Magnetic
	HSS-2B/4B					✓
	LC 2010	✓	✓		✓	
	SIL-6A/6B/9A	With flange				
	SIL-10A, SIL-10Ai, SIL-10AxL	✓	✓			
	SIL-HT/10ADVP	✓	✓		✓	
Thermo Scientific	A-200S/AS 150/800/8000	✓	✓		✓	
	AS 3000/TRACE GC		✓		✓	
	ASI-100	✓	✓		✓	
	SURVEYOR LC	✓	✓		✓	
	TriPlus		✓		✓	
	WPS-3000RS	✓	✓		✓	
	WPS-3000SL	✓	✓		✓	
Bruker, Varian*	8034/8035/8100/8200	✓	✓		✓	
	9095/9100	✓	✓		✓	
	CP-8410		✓	✓	✓	
	Genesis					✓
PerkinElmer	Autosystem GC/XL/AS-2000	✓	✓	✓	✓	
	Clarus 500/600		✓		✓	
	HS16/40					✓
	Integral 4000	✓	✓		✓	
	ISS-100/200	✓	✓		✓	
	LC 600 42 vial tray		✓			
	LC Plus	✓	✓	✓		
	TurboMatrix 40/110					✓
CTC Analytics	CombiPal		✓	✓	✓	Magnetic

*Formerly Varian systems, now Bruker products

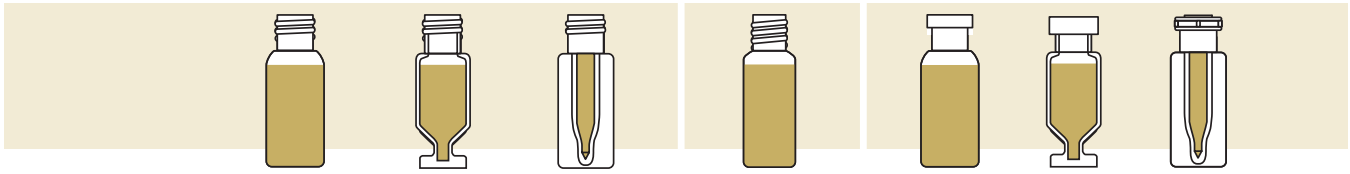
Agilent CrossLab Vial Identification Chart with Recommended Fill Volumes

The Agilent CrossLab vial identification chart below provides a quick reference on vial dimensions, fill volumes, and Agilent CrossLab part numbers for a variety of vials, along with the recommended closures, for both HPLC and GC autosamplers.

Wide Opening Screw Top Vials (9 mm)

Narrow Opening Screw Top Vials (8 mm)

Wide Opening Crimp Top Vials (11 mm)



Dimensions:	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	
Recommended Fill:	1.7 mL	1.3 mL	0.3 mL	1.5 mL	1.7 mL	1.3 mL	0.3 mL	
Part Number:	8010-0014	8010-0018	8010-0008	8010-0010	8010-0001	8010-0004	8010-0006	
Recommended Cap*:	8010-0086	8010-0086	8010-0086	8010-0061	8010-0050	8010-0050	8010-0050	

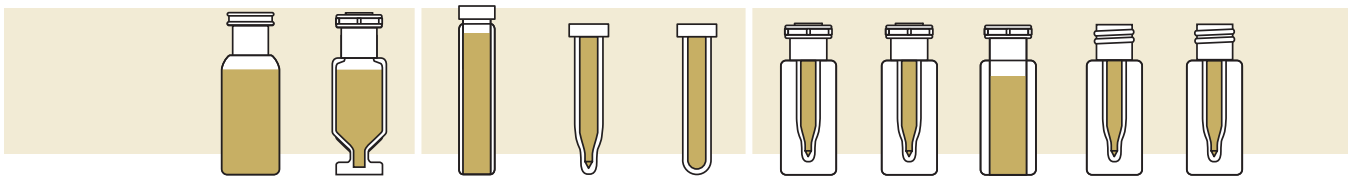
Wide Opening Snap Top Vials

Micro Vials

Polypropylene Vials

Crimp/Snap Top

Screw Top



Dimensions:	32 mm x 12 mm	32 mm x 12 mm	40 mm x 7 mm	32 mm x 5.5 mm	32 mm x 5.5 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm	32 mm x 12 mm
Recommended Fill:	1.5 mL	1.3 mL	0.8 mL	0.1 mL	250 µL	250 µL	250 µL	0.7 mL	250 µL	250 µL
Part Number:	8010-0023	8010-0028	8010-0153	8010-0154	8010-0155	8010-0158	8010-0160	8010-0159	8010-0161	8010-0162
Recommended Cap*:	8010-0108	8010-0108	8010-0516	8010-0516	8010-0516	8010-0050	8010-0050 Glass Insert	8010-0050	8010-0086	8010-0086 Glass Insert

Headspace Vials

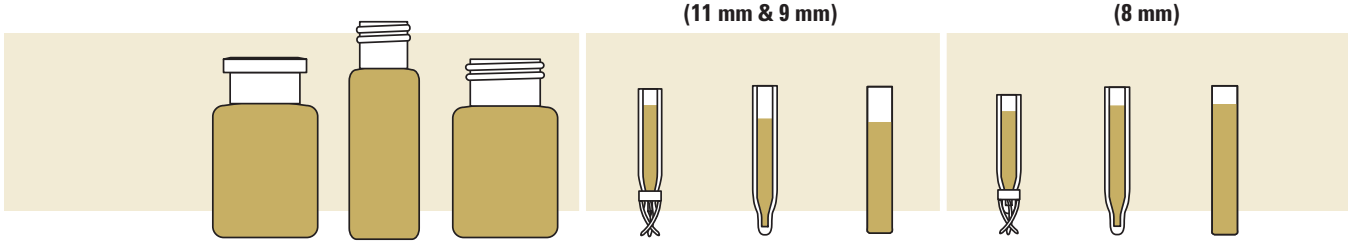


Dimensions:	45 mm x 22 mm	45 mm x 22 mm	75 mm x 22 mm	75 mm x 22 mm	75 mm x 22 mm	45 mm x 22 mm	75 mm x 22 mm
Recommended Fill:	10 mL	10 mL	20 mL	20 mL	20 mL	10 mL	20 mL
Part Number:	8010-0029	8010-0030	8010-0033	8010-0034	8010-0152	8010-0038	8010-0042
Recommended Cap*:	8010-0116	8010-0116	8010-0116	8010-0116	8010-0116	8010-0139	8010-0139

Specialty Vials

Inserts for Wide Opening Vials (11 mm & 9 mm)

Inserts for Narrow Opening Vials (8 mm)



Dimensions:	37 mm x 22 mm	45 mm x 15 mm	37 mm x 22 mm	30 mm x 5.6 mm	31 mm x 5.6 mm	31 mm x 5.6 mm	28 mm x 4.8 mm	31 mm x 4.8 mm	31 mm x 4.8 mm
Recommended Fill:	6 mL	4 mL	6 mL	250 µL	250 µL	400 µL	150 µL	150 µL	200 µL
Part Number:	8010-0151	8010-0020	8010-0022	8010-0131	8010-0132	8010-0136	8010-0124	8010-0125	8010-0126
Recommended Cap*:	8010-0116	8010-0095	8010-0101						

*Caps are available in a variety of colors

Vial Septum Chemical Compatibility Chart

	PTFE	PTFE/Silicone	PTFE/ Silicone/ PTFE*	PTFE/ Red Rubber	Viton	PTFE/Butyl
Acetonitrile	✓	✓	✓	✓		✓
Hydrocarbons (hexane, heptane, methane)	✓		✓	✓	✓	
Methanol	✓	✓	✓	✓		✓
Benzene	✓		✓		✓	
THF	✓		✓			
Toluene	✓		✓			
DMF	✓	✓	✓			✓
DMSO	✓	✓	✓			✓
Ether	✓	✓	✓			
Chlorinated Solvents (methylene chloride)	✓		✓		✓	
Alcohols (ethanol)	✓	✓	✓	✓	✓	✓
Acetic Acid	✓	✓	✓			✓
Acetone	✓	✓	✓			
Phenol	✓	✓	✓		✓	✓
Cyclohexane	✓		✓	✓	✓	

*PTFE/silicone/PTFE has the same chemical compatibility of PTFE ONLY UNTIL PUNCTURED

Agilent provides this septa compatibility information as a guide and starting reference point. We realize that chemical compatibility can vary depending on the concentration of the solvent, temperature, molecular weight of the solvent, and other factors. Therefore, it is always recommended that you try a variety of septa to determine the best one for your analysis.

Vial Cap and Septum Compatibility

	Thin PTFE	PTFE/ Silicone*	PTFE/ Silicone/ PTFE*	PTFE/ Red Rubber	Viton	Butyl	High Performance Septa
Temperature range	Up to 260 °C	-40 °C to 200 °C	-40 °C to 200 °C	-40 °C to 90 °C	-40 °C to 260 °C	-50 °C to 150 °C	Up to 300 °C for up to 1 hour
Use for multiple injections	No	Yes	Yes	No	No	No	Yes
Price	Very economical	Economical	Most expensive	Very economical	Economical	Economical	More expensive
Resistance to coring	None	Excellent	Excellent	None	None	None	Excellent
Recommended for storage	No	Yes	Yes	No	No	No	No
Best for	Superior chemical inertness, short cycle times, and single injections	Most common HPLC and GC analyses, not as resistant to coring as P/S/P	Superior performance for ultra trace analysis, repeat injections, internal standards	Chlorosilanes, more economical option for single injections	Chlorinated solvents, higher temperatures	Organic solvents, acetic acids; impermeable to gases	High temperature headspace applications

*Agilent CrossLab silicone is platinum cured (versus peroxide cured), making it more inert and less likely to interact with samples

To obtain an optimal fit and seal of any vial and closure, we strongly recommend buying an entire CrossLab vial assembly (including a vial, cap, and septum, as well as a vial insert if needed). Please avoid mixing and matching any CrossLab vials with any other brand of closures, or any CrossLab closures with any other brand of vials.



Headspace crimp top vials, 8010-0029

CrossLab Headspace Vials and Closures

- Choice of crimp or screw top vials
- Bevelled top for maximum secure seal
- Choice of a pressure safety release cap at 45 psi
- Available in flat or rounded bottom designs
- New high performance septa designed for temperatures up to 300 °C



Headspace crimp top glass vials, 8010-0033

Headspace Crimp Top Glass Vials

Description	Unit	Flat Bottom CrossLab Part No.	Rounded Bottom CrossLab Part No.
10 mL Headspace Crimp Top Glass Vials			
Clear	100/pk	8010-0029	8010-0030
	1000/cs	8010-0179	
Amber, flat bottom	100/pk	8010-0031	8010-0032
20 mL Headspace Crimp Top Glass Vials			
Clear, flat bottom	100/pk	8010-0033	8010-0034
	1000/cs	8010-0180	
Amber, flat bottom	100/pk	8010-0035	8010-0036

Headspace Screw Top Glass Vials

Description	Unit	Rounded Bottom CrossLab Part No.
10 mL Headspace Screw Top Glass Vials		
Clear, flat bottom	100/pk	8010-0038
Amber, flat bottom	100/pk	8010-0040
20 mL Headspace Screw Top Glass Vials		
Clear, flat bottom	100/pk	8010-0042
Amber, flat bottom	100/pk	8010-0044

To obtain an optimal fit and seal of any vial and closure, we strongly recommend buying an entire CrossLab vial assembly (including a vial, cap, and septum, as well as a vial insert if needed). Please avoid mixing and matching any CrossLab vials with any other brand of closures, or any CrossLab closures with any other brand of vials.

22 mL Headspace Crimp Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0152

Use 20 mm crimp caps with 6 mL and 22 mL headspace vials

6 mL Headspace Crimp Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0151

Use 20 mm crimp caps with 6 mL headspace vials

TIPS & TOOLS

Many Agilent CrossLab vials are printed with graduation marks and write-on spots. Barcoding labels are also available for regular temperature and high temperature headspace applications.

NEW! High Performance Septa

The first septa that can withstand extreme temperatures and conditions for today's demanding headspace applications.

- Proven to withstand temperatures up to 300 °C for one hour with minimal degradation
- Leak proof
- Available in your choice of crimp or screw
- Compatible with all common headspace solvents including DMSO, DMF, Tolulene, and Water
- Fits PerkinElmer and other headspace autosamplers



Headspace aluminum crimp caps with PTFE/silicone septa, 8010-0144

Headspace Caps and Septa

Cap Color	Septa Type	Unit	Agilent CrossLab Part No.
20 mm Headspace Crimp Caps and Septa			
Silver aluminum	Tan PTFE/silicone	100/pk	8010-0116
	Tan PTFE/silicone	1000/pk	8010-0191
	Gray PTFE/butyl	100/pk	8010-0117
	No septa	100/pk	8010-0120
Silver aluminum with safety feature	PTFE/butyl	100/pk	8010-0143
	PTFE/silicone	100/pk	8010-0144
Silver, magnetic	Tan PTFE/silicone	100/pk	8010-0165
Bimetal, magnetic	PTFE/silicone	100/pk	8010-0420
Steel	High performance	100/pk	8010-0429*
Steel, magnetic	PTFE/silicone	100/pk	8010-0424**
Septa only	Gray PTFE/butyl	100/pk	8010-0121
	Tan PTFE/silicone	100/pk	8010-0122
	PTFE/white silicone	1000/pk	8010-0192
18 mm Headspace Screw Caps and Septa			
Silver, magnetic	Tan PTFE/silicone	100/pk	8010-0119
	PTFE/silicone	100/pk	8010-0139***
	PTFE/butyl	100/pk	8010-0140
Steel	High performance	100/pk	8010-0428*
Septa only	Blue PTFE/silicone	1000/pk	8010-0418

*Recommended for high temperature applications up to 300 °C for up to one hour

**5.0 mm opening, suitable for SPME applications

***This cap is suitable for use in SPME applications

Headspace Vial Convenience Packs

Vial Type	Septa Type	Cap Color	Unit	Agilent CrossLab Part No.
10 mL, crimp top, clear, flat bottom	PTFE/silicone	Silver, aluminum	100/pk	8010-0412
20 mL, crimp top, clear, flat bottom	PTFE/silicone	Silver, aluminum	100/pk	8010-0413
20 mL, screw top, clear, rounded bottom	PTFE/silicone	Silver, magnetic	100/pk	8010-0417

TIPS & TOOLS

For further information on High Performance Septa, turn to pages 25-26.

CrossLab Screw Top Vials and Closures

Combine the excellent autosampler handling of a crimp cap profile with the ease of a screw cap. CrossLab screw caps and precision-fit septa give a secure seal with microvolume inserts.



2 mL Wide Opening (9 mm) Screw Top Vials and Closures

- 2 mL, 12 x 32 mm, 9 mm diameter
- Available in unique packaging designed to reduce vial breakage
- Wider opening prevents syringe problems
- Unique thread design for consistently secure seal
- Precision-formed neck for optimal robotic arm handling
- Optional ceramic write-on spot with fill marks

2 mL Wide Opening (9 mm) Screw Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0015
Clear, write-on spot	100/pk	8010-0014
	1000/cs	8010-0175
Amber	100/pk	8010-0017
Amber, write-on spot	100/pk	8010-0016
	1000/cs	8010-0176
Screw Top Vials with Fixed Inserts		
Clear, 300 µL insert volume	100/pk	8010-0008
Amber, 300 µL insert volume	100/pk	8010-0009



Clear, 2 mL wide opening (9 mm) screw top glass vials, 8010-0015



Wide opening screw top vials with write-on spot, 8010-0014

Screw Caps for Wide Opening (9 mm) Vials

Color	Septa Type	Unit	Agilent CrossLab Part No.
Blue	PTFE/silicone	100/pk	8010-0086
	PTFE/silicone/PTFE	100/pk	8010-0087
	Pre-slit PTFE/silicone	100/pk	8010-0078
	Bonded PTFE/silicone	100/pk	8010-0077
	PTFE lined	100/pk	8010-0080
	Open top, no septa	100/pk	8010-0079
Red	PTFE/silicone	100/pk	8010-0088
	PTFE/silicone/PTFE	100/pk	8010-0089
	Pre-slit PTFE/silicone	100/pk	8010-0082
	Bonded PTFE/silicone	100/pk	8010-0081
	Open top, no septa	100/pk	8010-0083
Orange	PTFE/silicone	100/pk	8010-0084
		1000/cs	8010-0186
	PTFE/silicone/PTFE	100/pk	8010-0085
		1000/cs	8010-0187
	Pre-slit PTFE/silicone	100/pk	8010-0075
	Bonded PTFE/silicone	100/pk	8010-0074
	Open top, no septa	100/pk	8010-0076



Orange screw caps with PTFE/silicone septa for wide opening (9 mm) vials, 8010-0084

Septa for Wide Opening (9 mm) Screw Caps

Septa Type	Color	Unit	Agilent CrossLab Part No.
PTFE/red silicone	Ivory	100/pk	8010-0093
PTFE/white silicone/red PTFE	Red	100/pk	8010-0091
		1000/cs	8010-0188
Pre-slit PTFE/white silicone	Blue	100/pk	8010-0094
PTFE/white silicone	Red	100/pk	8010-0092



Septa for wide opening screw caps, 8010-0094

2 mL Wide Opening (9 mm) Screw Top Vial Convenience Packs, 100/pk

Vial Type	Septa Type	Cap Color	Agilent CrossLab Part No.
Clear	Pre-slit PTFE/silicone	Red	8010-0425
Clear, write-on spot	PTFE/silicone	Orange	8010-0198
Clear, write-on spot	Pre-slit PTFE/silicone	Orange	8010-0542
Clear, write-on spot, 300 µL insert volume	PTFE/silicone	Orange	8010-0545
Clear, write-on spot, 300 µL insert volume	Pre-slit PTFE/silicone	Orange	8010-0547
Amber, write-on spot	PTFE/silicone	Orange	8010-0199
Amber, write-on spot	Pre-slit PTFE/silicone	Orange	8010-0543
Amber, write-on spot, 300 µL insert volume	PTFE/silicone	Orange	8010-0546
Amber, write-on spot, 300 µL insert volume	Pre-slit PTFE/silicone	Orange	8010-0548

2 mL Standard Opening (8 mm) Screw Top Vials and Closures

- 2 mL, 12 x 32 mm, 8 mm diameter
- 8-425 thread design
- Optional ceramic write-on spot with fill marks

2 mL Standard Opening (8 mm) Screw Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0011
Clear, write-on spot	100/pk	8010-0010
Amber	100/pk	8010-0013
Amber, write-on spot	100/pk	8010-0012



Clear 2 mL wide opening (8 mm) screw top glass vials, 8010-0011

2 mL Standard Opening (8 mm) Screw Top Glass Vial Convenience Packs

Vial Type	Septa Type	Cap Color	Unit	Agilent CrossLab Part No.
Clear	PTFE/silicone	Black	100/pk	8010-0414
Clear	PTFE/butyl	Black	100/pk	8010-0426
Clear, 100 µL insert volume	PTFE/butyl	Black	100/pk	8010-0427
Amber	PTFE/silicone	Black	100/pk	8010-0415



Screw caps for standard opening vials, 8010-0056

Screw Caps for Standard Opening (8 mm) Vials

Color	Septa Type	Unit	Agilent CrossLab Part No.
Blue	PTFE/silicone	100/pk	8010-0061
	Pre-slit PTFE/silicone	100/pk	8010-0062
	PTFE/silicone/PTFE	100/pk	8010-0063
	PTFE/butyl	100/pk	8010-0064
	Open top, no septa	100/pk	8010-0065
Red	PTFE/silicone	100/pk	8010-0066
	Pre-slit PTFE/silicone	100/pk	8010-0067
	PTFE/silicone/PTFE	100/pk	8010-0068
	PTFE/butyl	100/pk	8010-0069
	Open top, no septa	100/pk	8010-0070
Orange	PTFE/silicone	100/pk	8010-0056
	Pre-slit PTFE/silicone	100/pk	8010-0057
	PTFE/silicone/PTFE	100/pk	8010-0058
	PTFE/butyl	100/pk	8010-0059
	Open top, no septa	100/pk	8010-0060
Black	PTFE/silicone	100/pk	8010-0054
	Open top, no septa	100/pk	8010-0055
Flanged Caps (Compatible with Shimadzu Autosamplers)			
Orange	Flanged, PTFE/silicone	100/pk	8010-0141
	Flanged, pre-slit PTFE/silicone	100/pk	8010-0142
	Flanged, no septa	100/pk	8010-0166

Septa for Standard Opening (8 mm) Vials

Septa Type	Unit	Agilent CrossLab Part No.
Red PTFE/white silicone/red PTFE	100/pk	8010-0071
Red PTFE/white silicone	100/pk	8010-0072
PTFE/butyl	500/pk	8010-0073

4 mL (13 mm) Screw Top Vials and Closures

- 4 mL, 15 x 45 mm
- Compatible with WISP 48 style autosamplers
- Precision-formed screw threads (13 x 425) for consistently secure seal
- Can be used as wash, waste, or storage vials



Black screw caps with red PTFE/silicone septa for 4 mL (13 mm) vials, 8010-0095

4 mL (13 mm) Screw Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0020
Amber	100/pk	8010-0021

Screw Caps for 4 mL (13 mm) Vials

Color	Septa Type	Unit	Agilent CrossLab Part No.
Black	Red PTFE/silicone	100/pk	8010-0095
	Open top, no septa	100/pk	8010-0096

Septa for 4 mL (13 mm) Vials

Septa Type	Unit	Agilent CrossLab Part No.
Red PTFE/white silicone	100/pk	8010-0098
White PTFE	100/pk	8010-0099
Pre-slit PTFE/silicone	100/pk	8010-0557

4 mL (13 mm) Screw Top Vial Convenience Packs, 100/pk

Vial Type	Septa Type	Cap Color	Agilent CrossLab Part No.
Clear	PTFE/silicone	Black	8010-0553
Clear	Pre-slit PTFE/silicone	Black	8010-0555
Clear, 250 µL insert volume	PTFE/silicone	Black	8010-0559
Clear, 250 µL insert volume	Pre-slit PTFE/silicone	Black	8010-0561
Amber	PTFE/silicone	Black	8010-0554
Amber	Pre-slit PTFE/silicone	Black	8010-0556
Amber, 250 µL insert volume	PTFE/silicone	Black	8010-0560
Amber, 250 µL insert volume	Pre-slit PTFE/silicone	Black	8010-0562



Screw caps for 6 mL (16 mm) vials

6 mL (16 mm) Screw Top Vials and Closures

6 mL (16 mm) Screw Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0022

Screw Caps for 6 mL (16 mm) Vials

Septa Type	Unit	Agilent CrossLab Part No.
PTFE/silicone	100/pk	8010-0101
Pre-slit PTFE/silicone	100/pk	8010-0102
Open top, no septa	100/pk	8010-0100

10 mL (22 mm) Screw Top Vials and Closures

10 mL (22 mm) Screw Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0563

Screw Caps for 10 mL (22 mm) Vials

Septa Type	Color	Unit	Agilent CrossLab Part No.
No septa	Black	100/pk	8010-0565

Septa for 10 mL (22 mm) Vials

Septa Type	Unit	Agilent CrossLab Part No.
PTFE/silicone	100/pk	8010-0564

CrossLab Crimp Top Vials and Closures

The wide opening crimp cap provides a larger target area for improved autosampler needle accuracy. Select from a variety of cap colors and septa. Whatever your crimp top vial needs, Agilent has what you are looking for.



Crimp top glass vials with write-on spot, 8010-0001

2 mL (11 mm) Crimp Top Vials and Closures

- 2 mL, 12 x 32 mm
- Available in unique packaging designed to reduce vial breakage
- Tightly controlled crown for improved crimping
- Precision-formed neck for improved autosampler handling
- Rigorous quality assurance provides dimensional accuracy from lot to lot
- Optional ceramic write-on spot with fill marks

2 mL (11 mm) Crimp Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0002
Clear, write-on spot	100/pk	8010-0001
	1000/cs	8010-0170
Amber, write-on spot	100/pk	8010-0003
	1000/cs	8010-0172
Crimp Top Vials with Fixed Inserts		
Clear, 300 µL insert volume	100/pk	8010-0006
Amber, 300 µL insert volume	100/pk	8010-0007

TIPS & TOOLS

Agilent offers ergonomic manual crimpers and decappers, designed to significantly reduce hand strain. Electronic versions are also available, featuring a longer life battery designed for quick, powerful use. For more information, please visit **www.agilent.com/chem/crimper**





Magnetic crimp caps, 8010-0052

Crimp Caps with 11 mm Septa

Cap Color	Septa Type	Unit	Agilent CrossLab Part No.
Silver aluminum	PTFE/silicone/PTFE	100/pk	8010-0049
		1000/cs	8010-0182
	PTFE/silicone	100/pk	8010-0050
		1000/cs	8010-0183
	Pre-slit PTFE/Silicone	100/pk	8010-0582
	PTFE/butyl	100/pk	8010-0051
	Thin membrane rubber	25/pk	8010-0053
	PTFE/red rubber	100/pk	8010-0045
		1000/cs	8010-0181
Blue aluminum	PTFE/red rubber	100/pk	8010-0046
Green aluminum	PTFE/red rubber	100/pk	8010-0047
Red aluminum	PTFE/red rubber	100/pk	8010-0048
Gold aluminum	Magnetic	100/pk	8010-0052

2 mL (11 mm) Crimp Top Vial Convenience Packs, 100/pk

Vial Type	Septa Type	Cap Color	Agilent CrossLab Part No.
Clear, write-on spot	PTFE/silicone	Silver aluminum	8010-0195
Clear, write-on spot, 300 µL insert volume, conical with feet	PTFE/silicone	Silver aluminum	8010-0566
Clear, write-on spot, 300 µL insert volume, conical with feet	Pre-slit PTFE/silicone	Silver aluminum	8010-0568
Amber, write-on spot	PTFE/silicone	Silver aluminum	8010-0196
Amber, write-on spot, 300 µL insert volume, conical with feet	PTFE/silicone	Silver aluminum	8010-0567
Amber, write-on spot, 300 µL insert volume, conical with feet	Pre-slit PTFE/silicone	Silver aluminum	8010-0569

TIPS & TOOLS

Red rubber septa have a tendency to cause needle sticking during sampling and are more likely to core. Agilent recommends using silicone septa as a higher quality alternative to prevent contamination and issues related to septa coring.

Crimp Top Micro Vials

Agilent CrossLab offers a selection of crimp top micro vials designed for a variety of autosamplers, including HTS and HTC PAL systems, to cope with today's high-throughput LC/MS demands. Additionally, Agilent CrossLab crimp top micro vials work seamlessly with CombiPAL and GC PAL magnetic needle guides and barcode readers.



Amber, flat bottom crimp top micro vials, 8010-0153

Crimp Top Micro Vials

Description	Volume	Unit	Agilent CrossLab Part No.
Amber, flat bottom	0.8 mL	1000/pk	8010-0153
Clear, tapered bottom	0.1 mL	500/pk	8010-0154
Clear, round bottom	0.3 mL	500/pk	8010-0155

CrossLab Snap Top Vials and Closures

Snap top vials and caps are the simple, efficient way to a secure seal without crimping. It's as easy as push-on, pull-off. Crimp caps can also be used with wide opening snap top vials.
Note: Snap cap vials cannot be pressurized.

2 mL (11 mm) Snap Top Vials and Closures

- 2 mL, 12 x 32 mm
- Use with any 11 mm snap or crimp cap
- Available in unique packaging designed to reduce vial breakage
- Precision-formed neck improves autosampler handling
- Optional ceramic write-on spot



Snap top vials with write-on spot, 8010-0025

2 mL (11 mm) Snap Top Glass Vials

Description	Unit	Agilent CrossLab Part No.
Clear	100/pk	8010-0024
Clear, write-on spot	100/pk	8010-0023
	1000/cs	8010-0177
Amber	100/pk	8010-0026
Amber, write-on spot	100/pk	8010-0025
	1000/cs	8010-0178



Snap caps with 11 mm red silicone septa, 8010-0103

Snap Caps with 11 mm Septa

Cap Color	Septa Type	Unit	Agilent CrossLab Part No.
Clear	PTFE/red silicone	100/pk	8010-0104
	PTFE/silicone/PTFE	100/pk	8010-0105
	Pre-slit PTFE/white silicone	100/pk	8010-0106
	Clear polyethylene membrane	100/pk	8010-0107
Blue	PTFE/red silicone	100/pk	8010-0108
	PTFE/white silicone	100/pk	8010-0112
Green	PTFE/red silicone	100/pk	8010-0109
Orange	PTFE/red silicone	100/pk	8010-0103
	PTFE/red silicone	1000/cs	8010-0189
	PTFE/white silicone	100/pk	8010-0111
	Pre-slit PTFE/white silicone	1000/cs	8010-0190
	Pre-slit PTFE/white silicone	100/pk	8010-0113
Red	PTFE/red silicone	100/pk	8010-0110
Polyurethane		100/pk	8010-0115

2 mL (11 mm) Snap Top Vial Convenience Packs

Vial Type	Septa Type	Cap Color	Unit	Agilent CrossLab Part No.
Clear, write-on spot	PTFE/silicone	Orange	100/pk	8010-0200
Amber, write-on spot	PTFE/silicone	Orange	100/pk	8010-0411

Snap Top Solvent Vial Convenience Packs

Snap Top Solvent Vial Convenience Packs

Vial Type	Septa Type	Cap Color	Unit	Agilent CrossLab Part No.
5 mL Snap Top Solvent Vial Convenience Pack				
Clear	PTFE/silicone	Clear	100/pk	8010-0416
10 mL Snap Top Solvent Vial Convenience Pack				
Clear	Red PTFE/white silicone	Clear	100/pk	8010-0422

Snap Cap for 5 mL and 10 mL Solvent Vials

Cap Color	Septa Type	Unit	Agilent CrossLab Part No.
Clear	PTFE/silicone	50/pk	8010-0423

19 mm Septa for 5 mL and 10 mL Snap Caps

Septa Type	Unit	Agilent CrossLab Part No.
Red rubber	100/pk	8010-0430



CrossLab polypropylene vial, crimp/snap top, 8010-0158

CrossLab Polypropylene Vials

Wide opening 12 x 32 mm vials are manufactured from virgin polypropylene, meeting the requirements of 21 CFR 177.1520. Polypropylene vials are translucent and can be used with crimp or snap caps.



Polypropylene vial with glass insert, 8010-0160

Polypropylene Vials

Description	Recommended Fill Volume	Max Fill Volume	Unit	Agilent CrossLab Part No.
Polypropylene, crimp/snap top	250 µL	440 µL	100/pk	8010-0158
Polypropylene, crimp/snap top	250 µL	440 µL	1000/cs	8010-0193
Polypropylene, crimp/snap top	0.7 mL	1 mL	100/pk	8010-0159
Polypropylene, screw top	250 µL	440 µL	100/pk	8010-0161
Polypropylene, screw top	250 µL	440 µL	1000/cs	8010-0194
Polypropylene with glass insert, crimp/snap top	250 µL	350 µL	100/pk	8010-0160
Polypropylene with glass insert, screw top	250 µL	350 µL	100/pk	8010-0162



Clear, crimp top Micro-V vial, 8010-0004

CrossLab Micro-V Vials

- Wide opening, 1.5 mL vials with low residual volume
- Made from first hydrolytic glass Type 1
- Standard 12 x 32 mm dimension
- Compatible with 11 mm crimp closures

Micro-V Vials

Description	Unit	Screw Top	Crimp Top	Snap Top
Clear, screw top	100/pk	8010-0018	8010-0004	8010-0027
Amber	100/pk	8010-0019	8010-0005	8010-0028

TIPS & TOOLS

For economical and effective microsampling, choose the polypropylene vial with molded glass flanged insert. Its polypropylene body has a glass flanged insert molded to the inside, so the sample comes in contact only with the high quality glass insert and the septum.

CrossLab Microvolume Inserts

To meet your microsampling needs, Agilent offers a variety of microvolume inserts with capacities and designs that can transform your vials from full-capacity to limited volume with one simple step.



Microvolume inserts

Microvolume Inserts for 8 mm Screw Top Vials

Description	Max Fill Volume	Recommended Fill Volume	Unit	Agilent CrossLab Part No.
Glass conical insert with polymer feet	200 µL	150 µL	100/pk	8010-0124
Glass pulled-point insert	200 µL	150 µL	100/pk	8010-0125
Flat bottom insert	250 µL	200 µL	100/pk	8010-0126



250 µL conical insert with polymer feet, 8010-0131

Microvolume Inserts for 11 mm Crimp Top or 9 mm Screw Top Vials

Description	Max Fill Volume	Recommended Fill Volume	Unit	Agilent CrossLab Part No.
Conical insert with polymer feet	350 µL	250 µL	100/pk	8010-0131
Pulled-point insert	350 µL	250 µL	100/pk	8010-0132
Flat bottom insert	440 µL	400 µL	500/pk	8010-0136



250 µL pulled-point glass insert, 8010-0132

Microvolume Inserts for 4 mL (13 mm) Screw Top Vials

Description	Max Fill Volume	Recommended Fill Volume	Unit	Agilent CrossLab Part No.
Pulled-point insert with flange	350 µL	250 µL	100/pk	8010-0558



400 µL flat bottom glass insert, 8010-0136

CrossLab Well Plates and Sealing Mats

Choose the cleanest well plates and sealing mats for your autosamplers

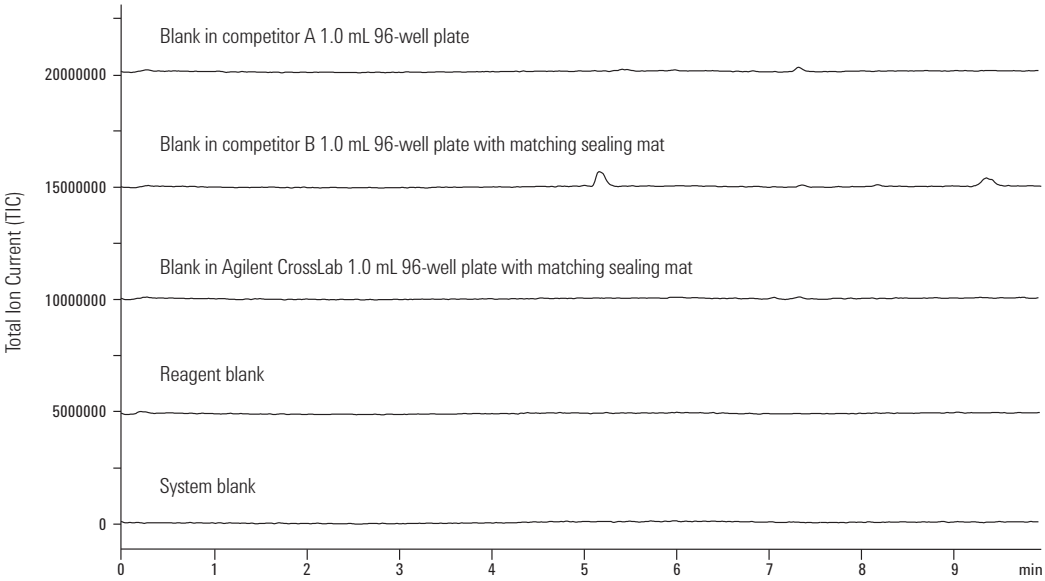
Advantages of Agilent CrossLab well plates:

- Made from polypropylene
- Free from RNase, DNase, Endotoxins, and human DNA
- Chemically resistant to common solvents
- Autoclavable (121 °C/20 min)
- Alpha-numeric grid
- Compatible with pipetting workstations and multi-channel pipettes
- Raised rims are available with 0.5 mL and 1.0 mL deep well plates for efficient sealing and a reduced risk of cross-contamination during rigorous vortexing
- Available in 96- or 384-well plate format
- 96-well plates range from 0.2 mL to 2 mL
- 384-well plates available in 0.1 mL and 0.25 mL
- Stackable

Advantages of Agilent CrossLab sealing mats:

- Protect well contents during storage
- Free from RNase, DNase, Endotoxins, and human DNA
- Highly flexible for a tight seal and exact fit
- Insets in every well eliminate the need for glue during connection
- Pierceable with pipette tips (0.5 mL and 1.0 mL sealing mats)
- Prevent solvent evaporation
- Made from thermoplastic elastomer (TPE) or ethylene-vinyl acetate (EVA)
- Compatible with common solvents

Cleanliness of well plates and sealing mats: Agilent CrossLab vs. the competition



The chemical extraction experiments demonstrate the superior cleanliness of the Agilent CrossLab well plates and sealing mats compared to the competition, making them ideal for LC/MS applications.

LC/MS ESI positive chromatogram comparison. Reagent blank: 1:1 Acetonitrile/H_2O with 0.1% formic acid

CrossLab Well Plates and Sealing Mats

Agilent CrossLab offers a range of polypropylene 96-well or 384-well plates with a variety of sealing options for collection of samples, storage, and use in autosamplers.

Well Plates

Description	Well Volume (mL)	Material	Plate Height (mm)	Well Depth (mm)	Well Shape	Bottom Shape	Unit	Agilent CrossLab Part No.
96-well plate	0.2	Polypropylene	20.9	20.9	Round	Conical	50/pk	8010-0532
96-well plate	0.5	Polypropylene	26.5	21.6	Round	Round	56/pk	8010-0533
96-well plate	1.0	Polypropylene	39.1	37.1	Round	Round	32/pk	8010-0534
96-well plate	2.0	Polypropylene	44	41.85	Round	Round	32/pk	8010-0536
384-well plate	0.1	Polypropylene	14.4	11.7	Square	Round	120/pk	8010-0538
384-well plate	0.25	Polypropylene	22	19.5	Square	Round	60/pk	8010-0539

Sealing Mats and Accessories

Description	Unit	Agilent CrossLab Part No.
Sealing mat for 0.2 mL 96-well plates, Thermoplastic Elastomers (TPE)	5/pk	8010-0577
Sealing mat for 0.5 mL and 1.0 mL 96-well plates, Thermoplastic Elastomers (TPE)	50/pk	8010-0535
Sealing mat for 2 mL 96-well plate, Ethylene Vinyl Acetate (EVA)	50/pk	8010-0537
Sealing tape for 384-well plate, polyethylene	100/pk	8010-0540
Sealing foil, self adhesive, high transparency, for all plates, Polyethylene terepthalate (PET)	100/pk	8010-0541
Sealing foil, self adhesive, for all plates, Polypropylene	100/pk	8010-0578



96-well plate, 8010-0534



96-well plate with removable sealing mat, 8010-0534



Sealing mat for 2 mL 96-well plate, (EVA), 8010-0537

CrossLab Vials Cross Reference List

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatibile with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.

CrossLab Vials for Bruker/Varian

Similar to Bruker/Varian Part No.	Agilent CrossLab Part No.
392611525	8010-0195
392611530	8010-0414
392611549	8010-0198
392611550	8010-0199
392611593	8010-0125
190010204 392611594 392620538	8010-0131
392611596 392611636	8010-0132
392611607	8010-0143
392611607	8010-0413
392611613	8010-0142
392611613	8010-0412
392611631	8010-0050
392611632	8010-0051
390886500 392611634	8010-0002
392611639 392620550 CP10271	8010-0011
392611640	8010-0013
392611641	8010-0056
392611641	8010-0061
392611645	8010-0064
392611641	8010-0066
392611645	8010-0059
392611645	8010-0069
392611646 392611653	8010-0015
392611654	8010-0017

(Continued)

CrossLab Vials for Bruker/Varian

Similar to Bruker/Varian Part No.	Agilent CrossLab Part No.
392611659	8010-0084
392611659	8010-0086
392611659	8010-0088
392611667	8010-0159
392611675 392612021 MLA202100	8010-0034
392611857	8010-0151
392610003 392611858 ROK7382420	8010-0116
392611859	8010-0121
392611871	8010-0108
392611970 392611974 392611975 392611980 392611981 392611982	8010-0416
392620104	8010-0040
392620202	8010-0042
392620204	8010-0044
392620302 392620304	8010-0139
392620306	8010-0140
392620401 392620403	8010-0417
392620500 CPLC40111B CPLC40111R	8010-0175
190010209 392620510	8010-0092

(Continued)

CrossLab Vials for Bruker/Varian

Similar to Bruker/Varian Part No.	Agilent CrossLab Part No.
190010209 392620510	8010-0093
392620514	8010-0008
392620517	8010-0170
392620526	8010-0032
392620528	8010-0036
1600069800	8010-0070
390614901 6900016900 R005486RT1	8010-0072
CP10204	8010-0029
CP10205	8010-0033
CP10277	8010-0020
CP741315 CP913323	8010-0038
CP912446 CP913077	8010-0418
CP959464	8010-0420
CP959485	8010-0155
39260500 CPLC40111B CPLC40111R	8010-0014
CPLCL07CPVA	8010-0172
CPLCL11ACBST144	8010-0183
MLA110040M	8010-0152
392611860 392612017 MLA2000051ML	8010-0165
MLA21000	8010-0030
R000548SCY	8010-0160

CrossLab Vials for PerkinElmer

Similar to PerkinElmer Part No.	Agilent CrossLab Part No.
B0104239	8010-0143
B0104241	8010-0144
B4000022	8010-0122
B4000025	8010-0121
N6356478	8010-0030
N6356479	8010-0038
N9300500	8010-0195
N9300700	8010-0198
N9301385	8010-0002
N9302680	8010-0003
N9302684	8010-0047
N9302685	8010-0048
N9302686	8010-0046
N9303416	8010-0106
N9303416	8010-0113
N9303417	8010-0105
N9303417	8010-0112
N9303418	8010-0024
N9303419	8010-0104
N9303419	8010-0111
N9303441	8010-0055
N9303442	8010-0073
N9303992	8010-0413
N9306015	8010-0051
N9306052	8010-0054
N9306075	8010-0042
N9306077	8010-0119
N9306079	8010-0034
N9306201	8010-0015
N9306202	8010-0086
N9306207	8010-0023
N9306208	8010-0025
N9306220	8010-0017
N9306228	8010-0050
N9306229	8010-0049
N9306240	8010-0152
N9306247	8010-0020

CrossLab Vials for Shimadzu

Similar to Shimadzu Part No.	Agilent CrossLab Part No.
038-00165-06	8010-0011
220-90384-00	8010-0055
220-90393-00	8010-0020
220-90394-00	8010-0096
220-91521-14	8010-0095
220-94562-00	8010-0412
220-94563-00	8010-0413
220-94796-01	8010-0042
220-94796-02	8010-0119
220-94796-07	8010-0038
221-34271-92	8010-0054
221-34271-92	8010-0056
221-34271-92	8010-0072
228-21290-91	8010-0098
228-45450-91	8010-0198
228-45452-91	8010-0199

CrossLab Vials for Thermo Scientific

Similar to Thermo Scientific Part No.	Agilent CrossLab Part No.
60180-507	8010-0008
10-800-247	8010-0038
14-824-365	8010-0042
60180-502 C4011-1W 2-CV 11 09 0476	8010-0001
60180-504 10-800-246	8010-0030
60180-505 14-824-360	8010-0032
60180-506	8010-0034
60180-507	8010-0008
60180-508	8010-0010
60180-509 C4000-1W 2SVW 11 09 0519	8010-0014

(Continued)

CrossLab Vials for Thermo Scientific

Similar to Thermo Scientific Part No.	Agilent CrossLab Part No.
60180-510 C4015-1 4-SV 13 09 0222	8010-0020
60180-511	8010-0116
60180-513	8010-0117
60180-514	8010-0055
60180-514	8010-0060
60180-514	8010-0065
60180-514	8010-0070
60180-515	8010-0061
60180-516	8010-0086
60180-521 60180-522	8010-0122
60180-526	8010-0046
60180-560	8010-0012
60180-561 C4000-2W 2SVW(A) 11 09 0520	8010-0016
60180-562	8010-0066
60180-597	8010-0195
60180-599	8010-0198
60180-713	8010-0112
C4013-98Y	8010-0166

CrossLab Vials for Waters

Similar to Waters Part No.	Agilent CrossLab Part No.
186000842	8010-0557
186001420	8010-0563
186001421	8010-0565
186001422	8010-0564
186000307C	8010-0542
186000838C	8010-0553
186000839C	8010-0555
186000847C	8010-0543
186001133C	8010-0554
186001134C	8010-0556
WAT025053C	8010-0575
WAT025054C	8010-0574

Agilent Syringes

With a broad selection of syringes for manual and auto injectors, Agilent has what you need for accurate and effective sampling.

Whether you need an autosampler or manual syringe, there are two keys to choosing the right syringe – identifying your sample type and establishing the smallest volume to be dispensed or injected. Agilent offers two varieties of syringes.

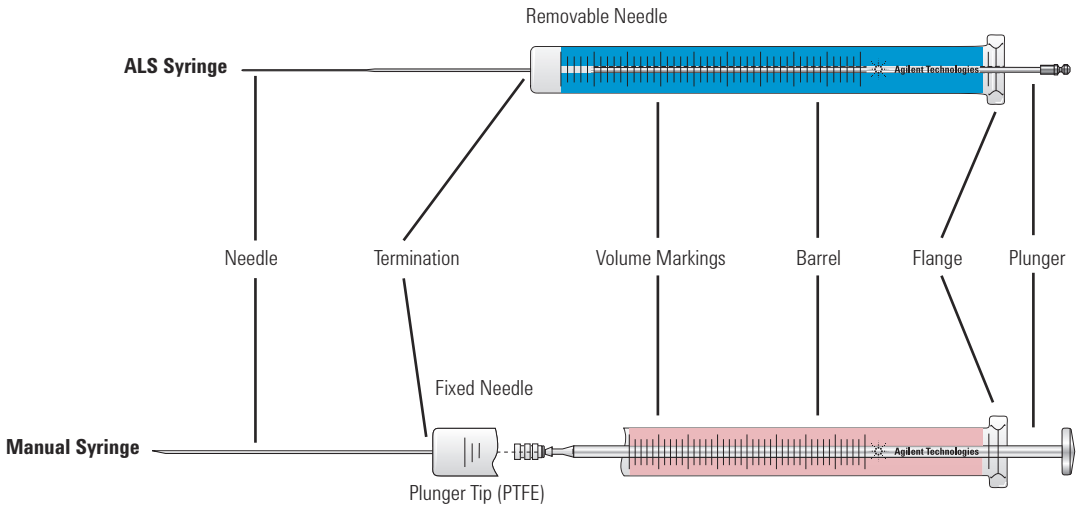
PTFE-Tipped Syringes for Gases and Liquids

PTFE-tipped syringes have a precision-machined plunger tip that forms a tight seal and enables the tip to wipe the barrel's interior free of sample during operation. This feature is particularly useful for viscous or heterogeneous samples, because it reduces deposits that can cause the plunger to freeze. Replacement plunger assemblies are available for most PTFE-tipped syringes.

Fitted Plunger Syringes for Liquids

Fitted plunger syringes feature a stainless steel plunger that is meticulously hand-fitted to its matching glass barrel, creating a liquid-tight seal. These syringes are ideal for homogenous samples that are not prone to precipitation or bonding with glass. **Note:** plungers cannot be interchanged or replaced if damaged.

Syringe Features



Reference drawing (not to scale)

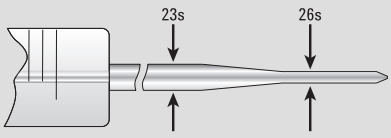
Needle Gauge



Needle gauge is the thickness of the needle. The gauge depends on the injector. When selecting a needle gauge, it is important to keep in mind the volume of the syringe and the dead volume of the needle. Refer to the chart below to choose a needle gauge with an appropriate dimension before selecting a needle.

Typical Needle Gauge Dimensions

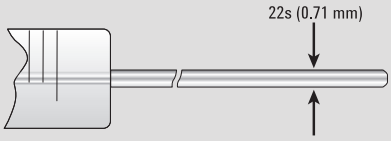
	OD		ID	
Gauge	**mm**	**inches**	**mm**	**inches**
22	0.71	0.028	0.41	0.016
23s	0.635	0.025	0.11	0.0045
25	0.50	0.020	0.20	0.008
26s	0.47	0.0184	0.11	0.0045



Tapered Dual Gauge 23-26 or 23s-26s (0.64-0.47 mm)

Durability of a 23-gauge

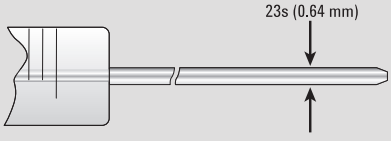
Versatility of a 26-gauge for split/splitless and on-column injection



Single Gauge 22 (0.71 mm)

HPLC valves

Pipetting liquids

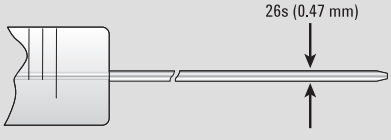


Single Gauge 23 or 23s (0.64 mm)

Merlin Microseal septa

Packed column injector ports

Split/splitless injector ports



Single Gauge 26 or 26s (0.47 mm)

Packed column injector ports

Split/splitless injector ports

Note: Needles with an 'S' following the gauge are more durable, with a thicker needle wall and smaller id bore.

Needle Termination

Needle terminations are available in fixed or removable, with various tip styles:

- **Fixed (cemented)** – Economical, reproducible injections for autosamplers
- **Removable needle** – One syringe fixed – many methods, simplicity of fixed needle, but needle can be replaced if damaged or clogged
- **Luer tip** – Easy, fast needle replacement, syringe filter or pump priming, Luer tip is ground glass suitable for mounting chromatographic or PTFE needles, syringes can be autoclaved (without plunger or needle)
- **Luer Lok** – Security of a locked needle, syringe filter or pump priming, PTFE, male Luer taper with nickel-plated brass locking hub for use with KEL-F or metal hub needles and universal connectors

Needle Tip Design



HP Tip (also referred to as Cone or Point Style AS)

Proprietary design required for Agilent autosamplers for optimal performance and reliability by reducing septum coring.



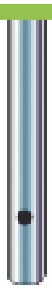
Bevel Tip (Point Style 2, BV)

General purpose; excellent choice for transferring liquids from ampoules or vials. For manual GC injections, a beveled tip is preferred for optimum septum penetration and to prevent septum coring.



LC Tip (Point Style 3)

For HPLC injections and sample pipetting, the blunt tip style 3 is preferred. The blunt tip has chamfered and polished edges that eliminate damage to the valve's rotor seal and stator face. This style can also be used for pipetting liquids.



Side Hole (Point Style 5)

Recommended for thin gauged septa or large volume injections.

Autosampler Syringes

Premium autosampler syringes optimize system productivity and ensure precise sample handling

Agilent Blue Line Autosampler Syringes for 7693A ALS

Agilent blue line autosampler syringes are specifically designed to support the higher productivity features of the 7693A ALS, while increasing plunger life and reducing costly downtime. Backed by over 40 years of chromatography experience, these meticulously crafted syringes offer:

- Wider range of volumes including exclusive 250 and 500 µL syringes for sample enhancement with the new 7693A
- Precise match with your autosampler's stroking mechanism, resulting in more accurate volume delivered
- Smooth needle that reduces septum coring and keeps your system working at its full potential
- Choice of PTFE-tipped or metal fitted plunger to meet application needs
- Easy-open, environmentally friendly packaging
- Certified compliance with strict Agilent specifications



Blue line autosampler syringe shown in 7693A ALS, G4513-80204

TIPS & TOOLS

Order your free GC troubleshooting and GC column installation posters at **www.agilent.com/chem/GCposteroffer**





Blue line autosampler syringe, G4513-80205



Blue line autosampler syringe, G4513-80204

Blue Line Autosampler Syringes with Fitted Plungers

Fitted plunger syringes are recommended for homogeneous liquid samples. Each fitted syringe is individually matched with the plunger for precision injection. Plungers are not interchangeable or replaceable.

Blue Line Autosampler Syringes with Fitted Plungers

Volume (µL)	Description	Unit	Needle Gauge/ Length (mm)/Tip	Part No.
1	Plunger in needle, fixed		23/42/cone tipped	G4513-80229
	Replacement needle/plunger			G4513-80240
2	Plunger in needle, fixed		23/42/cone tipped	G4513-80215
	Replacement needle/plunger			G4513-80239
5	Straight, fixed		23/42/HP	G4513-80213
	Straight, fixed	6/pk	23/42/HP	G4513-80205
	Straight, fixed		26s/42/HP	G4513-80226
	Straight, fixed	6/pk	26s/42/HP	G4513-80212
	Tapered, fixed		23-26s/42/HP	G4513-80206
	Tapered, fixed	6/pk	23-26s/42/HP	G4513-80201
	Straight, removable		23/42/HP	G4513-80234
	Replacement needle	3/pk	23/42/HP	G4513-80236
	Tapered, removable		23-26s/42/HP	G4513-80224
	Replacement needle	3/pk	23-26/42/HP	G4513-80225
10	Straight, fixed		23/42/HP	G4513-80209
	Straight, fixed	6/pk	23/42/HP	G4513-80202
	Straight, fixed		26s/42/HP	G4513-80216
	Straight, fixed	6/pk	26s/42/HP	G4513-80211
	Tapered, fixed		23-26s/42/HP	G4513-80204
	Tapered, fixed	6/pk	23-26s/42/HP	G4513-80200
	Straight, removable		23/42/HP	G4513-80235
	Replacement needle	3/pk	23/42/HP	G4513-80236
	Removable		23-26s/42/HP	G4513-80218
	Replacement needle	3/pk	23-26/42/HP	G4513-80225
25	Tapered, fixed		23-26/42/HP	G4513-80242
50	Tapered, fixed		23-26/42/HP	G4513-80244
100	Tapered, fixed		23-26/42/HP	G4513-80243

Blue Line Autosampler Syringes with PTFE-Tipped Plungers

Suitable for gas and liquid samples, the PTFE tip of the plunger creates a tight seal between the plunger and glass, helping to reduce carry-over and increase syringe lifetime. Replacement plungers are available.

Blue Line Autosampler Syringes with PTFE-Tipped Plungers

Volume (µL)	Description	Unit	Needle Gauge/ Length (mm)/Tip	Part No.
10	Straight, fixed		23/42/HP	G4513-80220
	Straight, fixed	6/pk	23/42/HP	G4513-80210
	Tapered, fixed		23-26/42/HP	G4513-80203*
	Replacement plunger for fixed needle			G4513-80227
	Tapered, fixed	6/pk	23-26s/42/HP	G4513-80208
	Straight, removable		23/42/HP	G4513-80219
	Replacement needle	3/pk	23/42/HP	G4513-80236
	Tapered, removable		23-26/42/HP	G4513-80233
	Replacement needle	3/pk	23-26/42/HP	G4513-80225
25	Straight, fixed		23/42/HP	G4513-80228
	Tapered, fixed		23-26/42/HP	G4513-80241
50	Straight, fixed		23/42/HP	G4513-80221
	Tapered, fixed		23-26/42/HP	G4513-80223
100	Tapered, Fixed		23-26s/42/HP	G4513-80222

*Included in 7693A shipments



Needles, replacement, G4513-80236

Advanced Sample Enhancement Autosampler Syringes with PTFE-Tipped Plungers

Used with the 7693A optional Enhanced Sample Handling Syringe Carriage, these syringes can eliminate analyst-to-analyst variability and reduce re-work in sample preparation, such as dilution and internal standard addition.

Advanced Sample Enhancement Autosampler Syringes with PTFE-Tipped Plungers

Volume (µL)	Description	Needle Gauge/ Length (mm)/Tip	Part No.
250	Fixed, advanced sample enhancement	23/42/HP	G4513-60560
500	Fixed, advanced sample enhancement	23/42/HP	G4513-60561



Blue line autosampler syringe, G4513-60560

Gold Standard Autosampler Syringes

Use one needle and get the benefits of two. The upper portion of the tapered needle offers the strength of a 23-gauge needle, while the lower portion at 26s-gauge allows use with split/splitless or on-column injections with 0.53 mm id columns. All standard plungers are stainless steel.

Tapered Needle, 23-26s Gauge Autosampler Syringes

Volume (µL)	Description	Unit	Needle Gauge/Length (mm)/Tip	Part No.
5	Tapered, fixed		23-26s/42/HP	5181-1273
	Tapered, fixed	6/pk	23-26s/42/HP	5181-8810
	Tapered, removable		23-26s/42/HP	5182-0835
	Replacement needle for 5 µL syringe	3/pk		5182-0832
10	Tapered, fixed		23-26s/42/HP	5181-1267
	Tapered, fixed	6/pk	23-26s/42/HP	5181-3360
	Tapered, removable		23-26s/42/HP	5181-3321
	Replacement needle for 10 µL syringe	3/pk		5181-3319
	Tapered, fixed, PTFE-tipped plunger		23-26s/42/HP	5181-3354
	Tapered, fixed, PTFE-tipped plunger	6/pk	23-26s/42/HP	5181-3361
	Replacement plunger with PTFE tip for fixed needle 10 µL syringe			5181-3365
	Tapered, removable		23-26s/42/HP	5181-3356
	Replacement plunger with PTFE tip for removable needle 10 µL syringe			5181-3358
50	Tapered, fixed, PTFE-tipped plunger		23-26s/42/HP	5183-0314
100	Tapered, fixed, PTFE-tipped plunger		23-26s/42/HP	5183-2042



Straight Needle, 23 and 26s Gauge Autosampler Syringes

Volume (µL)	Description	Unit	Needle Gauge/ Length (mm)/Tip	Part No.
1	Cone-tipped		23/42/HP	5188-5246
1	Replacement needle/plunger for 1.0 µL syringe		23/42/HP	5188-5370
0.5	Replacement needle/plunger for 0.5 µL syringe		23-26/42/HP	5190-3193
2	Cone-tipped		23/42/HP	5188-5247
	Replacement needle/plunger for 2.0 µL syringe		23/42/HP	5188-5371
5	Straight, fixed		26s/42/HP	9301-0891
	Straight, fixed	6/pk	26s/42/HP	5183-4728
	Straight, fixed		23/42/HP	9301-0892
	Straight, fixed	6/pk	23/42/HP	5182-0875
	Straight, removable		23/42/HP	5182-0834
	Replacement needle for 5 µL syringe	3/pk		5182-0830
10	Straight, fixed		26s/42/HP	9301-0714
	Straight, fixed	6/pk	26s/42/HP	5183-4729
	Straight, fixed		23/42/HP	9301-0713
	Straight, fixed	6/pk	23/42/HP	9301-0725
	Straight, fixed, PTFE-tipped plunger		23/42/HP	5181-8809
	Straight, fixed, PTFE-tipped plunger	6/pk	23/42/HP	5183-4730
	Replacement plunger for 10 µL fixed needle syringe			5181-8808
	Straight, removable		23/42/HP	5181-8806
	Straight, removable, PTFE-tipped plunger		23/42/HP	5181-8813
	Replacement needle for 10 µL syringe	3/pk		5181-8811
	Replacement plunger with PTFE tip for removable needle 10 µL syringe			5181-3358
25	Straight, fixed, PTFE-tipped plunger		23/42/HP	5183-0316
50	Straight, fixed, PTFE-tipped plunger		23/42/HP	5183-0318
100	Straight, fixed, PTFE-tipped plunger		23/42/HP	5183-2058



Autosampler Syringes



7673/7683 On-Column Autosampler Syringes

Agilent 7673/7683 on-column syringes with needle diameter for columns ranging from 0.25 mm to 0.53 mm are specifically designed for the 7673/7683 Autosampler.

7673/7683 On-Column Autosampler Syringes

Volume (µL)	Description	Unit	Part No.
5	Removable needle, syringe only		5182-0836
	Stainless steel needle for 0.53 mm column	3/pk	5182-0832
	Stainless steel needle for 0.32 mm column	3/pk	5182-0831
	Stainless steel needle for 0.25 mm column	3/pk	5182-0833
	Plunger button	10/pk	5181-8866



Autosampler syringe, 10 µL, straight, RN, 5182-9626

HP 7670/71/72 Autosampler Syringes

This syringe has a long needle and regular plunger button for compatibility with HP 7670/71/72 autosamplers. Available with a fixed or removable needle.

HP 7670/71/72 Autosampler Syringes

Volume (µL)	Description	Needle	Part No.
1	Straight, removable	23/56/2	5182-9622
10	Straight, fixed	23/50/HP	5182-9734
	Straight, removable	23/50/HP	5182-9626
	Straight, fixed, PTFE-tipped plunger	23/50/HP	5182-9799

Manual Syringes

Agilent color-coded manual syringes allow you to determine syringe volume with one quick glance, so you can more efficiently perform manual dilution, extraction, and sample prep. They also give you the advantages of:

- Improved scale readability with a new vertical syringe scale orientation for more intuitive use
- A wide selection of volumes, making Agilent your "one-stop" resource for all of your sample manipulation needs
- Accuracy within ±1% of nominal volume, and precision within 1%, measured at 80% of total scale volume
- Earth-friendly cardboard and plastic packaging that could be recycled to help reduce landfill waste
- A Certificate of Conformance to ensure the highest quality construction and performance, available for viewing and printing anytime
- Lot-traceable for accurate identification

Of course, all Agilent syringes are backed by over 40 years of chromatography expertise, industry-leading technical support, and a 90-day warranty from the date of shipment.

Manual Syringes Color Code Chart



0.5 µL	1.0 µL	2.0 µL	5.0 µL	10 µL 1.0 mL	25 µL 2.5 mL	50 µL 5.0 mL	100 µL 10.0 mL	250 µL 25.0 mL	500 µL 50.0 mL



Manual syringe, 1.0 µL,
RN cone tip, 5190-1463

Manual Syringes with Fitted Plunger, Fixed and Removable Needle, 0.5 to 5 µL

Volume (µL)	Description	Unit	Needle	Part No.
0.5	Plunger in needle, removable		23/70 mm/cone tip	5190-0464
	Replacement needle and plunger kit for 0.5 µL syringe			5190-1461
	Plunger in needle, removable		23/70 mm/bevel tip	5190-1460
	Replacement needle and plunger kit for 0.5 µL syringe			5190-1462
1.0	Plunger in needle, removable		26/70 mm/cone tip	5190-1463
	Replacement needle and plunger kit for 1.0 µL syringe			5190-1467
	Plunger in needle, removable		26/70 mm/bevel tip	5190-1466
	Replacement needle and plunger kit for 1.0 µL syringe			5190-1470
	Plunger in needle, removable		23/70 mm/cone tip	5190-1464
	Replacement needle and plunger kit for 1.0 µL syringe			5190-1468
	Plunger in needle, removable		23/70 mm/bevel tip	5190-1465
	Replacement needle and plunger kit for 1.0 µL syringe			5190-1469
2.0	Plunger in needle, removable		23/70 mm/cone tip	5190-1471
	Replacement needle and plunger kit for 2.0 µL syringe			5190-1473
	Plunger in needle, removable		26/70 mm/bevel tip	5190-1472
	Replacement needle and plunger kit for 2.0 µL syringe			5190-1474
5.0	Plunger in needle, removable		23/70 mm/cone tip	5190-1475
	Replacement needle and plunger kit for 5.0 µL syringe			5190-1477
	Plunger in needle, removable		23/70 mm/bevel tip	5190-1476
	Replacement needle and plunger kit for 5.0 µL syringe			5190-1478
	Straight, fixed		26/50 mm/bevel tip	5190-1479
	Removable, with flexible plunger		26/50 mm/bevel tip	5190-1481
	Replacement needle for 5.0 µL syringe	3/pk		5190-1482

Manual Syringes with Fitted Plunger, Fixed and Removable Needle, 10 to 500 µL

Volume (µL)	Description	Unit	Needle	Part No.
10	Fixed		26/50 mm/bevel tip	5190-1483
	Fixed	10/pk	26/50 mm/bevel tip	5190-1487
	Fixed, with flexible plunger		26/50 mm/bevel tip	5190-1488
	Fixed, with flexible plunger	6/pk	26/50 mm/bevel tip	5190-1489
25	Fixed		25/50 mm/bevel tip	5190-1493
	Removable		25/50 mm/bevel tip	5190-1495
	Replacement needle	3/pk		5190-1496
50	Fixed		25/50 mm/bevel tip	5190-1500
	Removable		25/50 mm/bevel tip	5190-1502
	Replacement needle	3/pk		5190-1496
100	Fixed		25/50 mm/bevel tip	5190-1507
	Removable		25/50 mm/bevel tip	5190-1509
	Replacement needle	3/pk		5190-1496
250	Fixed		25/50 mm/bevel tip	5190-1514
	Removable		25/50 mm/bevel tip	5190-1516
	Replacement needle	3/pk		5190-1496
500	Fixed		25/50 mm/bevel tip	5190-1521
	Removable		25/50 mm/bevel tip	5190-1524
	Replacement needle	3/pk		5190-1496



Manual syringe, 50 µL, FN bevel tip, 5190-1500



Manual Syringes with PTFE-Tipped Plunger, Removable Needle, 10 to 500 µL

Volume (µL)	Description	Unit	Needle	Part No.
10	Removable		25/50 mm/bevel tip	5190-1491
	Replacement needle	3/pk		5190-1496
	Replacement plunger with PTFE tip for 10 µL syringe			5190-1559
25	Removable		25/50 mm/bevel tip	5190-1498
	Replacement needle	3/pk		5190-1496
	Replacement plunger with PTFE tip for 25 µL syringe			5190-1560
50	Removable		25/50 mm/bevel tip	5190-1504
	Replacement needle	3/pk		5190-1496
	Replacement plunger with PTFE tip for 50 µL syringe			5190-1561
100	Removable		25/50 mm/bevel tip	5190-1511
	Replacement needle	3/pk		5190-1496
	Replacement plunger with PTFE tip for 100 µL syringe			5190-1562
250	Removable		25/50 mm/bevel tip	5190-1518
	Replacement needle	3/pk		5190-1496
	Replacement plunger with PTFE tip for 250 µL syringe			5190-1563
500	Removable		25/50 mm/bevel tip	5190-1525
	Replacement needle	3/pk		5190-1496
	Replacement plunger with PTFE tip for 500 µL syringe			5190-1564



Manual Syringes with PTFE-Tipped Plunger, Fixed Needle, 10 to 500 µL

Volume (µL)	Description	Needle	Part No.
10	Fixed	26/50 mm/bevel tip	5190-1490
	Replacement plunger with PTFE tip for 10 µL syringe		5190-1558
25	Fixed	25/50 mm/bevel tip	5190-1497
	Replacement plunger with PTFE tip for 25 µL syringe		5190-1560
50	Fixed	25/50 mm/bevel tip	5190-1503
	Replacement plunger with PTFE tip for 50 µL syringe		5190-1561
100	Fixed	25/50 mm/bevel tip	5190-1510
	Replacement plunger with PTFE tip for 100 µL syringe		5190-1562
250	Fixed	25/50 mm/bevel tip	5190-1517
	Replacement plunger with PTFE tip for 250 µL syringe		5190-1563
500	Fixed	25/50 mm/bevel tip	5190-1523
	Replacement plunger with PTFE tip for 500 µL syringe		5190-1564

Manual Syringes with PTFE-Tipped Plunger, Removable Needle, 1 mL to 10 mL

Volume (mL)	Description	Unit	Needle	Part No.
1.0	Removable		23/50 mm/bevel tip	5190-1529
	Replacement needle	3/pk		5190-1581
	Replacement plunger with PTFE tip for 1 mL syringes			5190-1565
2.5	Removable		23/50 mm/bevel tip	5190-1533
	Replacement needle	3/pk		5190-1581
	Replacement plunger with PTFE tip for 2.5 mL syringes			5190-1572
5.0	Removable		23/50 mm/bevel tip	5190-1537
	Replacement needle	3/pk		5190-1538
	Replacement plunger with PTFE tip for 5 mL syringes			5190-1573
10	Removable		23/50 mm/bevel tip	5190-1542
	Replacement needle	3/pk		5190-1538
	Replacement plunger with PTFE tip for 10 mL syringes			5190-1574



Manual syringe, 500 µL, FN bevel tip, 5190-1523



Manual syringe, 1 mL, FN bevel tip, 5180-1528

Manual Syringes with PTFE-Tipped Plunger, Fixed Needle, 1 mL to 10 mL

Volume (mL)	Description	Needle	Part No.
1.0	Fixed	22/50 mm/bevel tip	5190-1528
	Replacement plunger with PTFE tip for 1 mL syringes		5190-1565
2.5	Fixed	22/50 mm/bevel tip	5190-1532
	Replacement plunger with PTFE tip for 2.5 mL syringes		5190-1572
5.0	Fixed	22/50 mm/bevel tip	5190-1536
	Replacement plunger with PTFE tip for 5 mL syringes		5190-1573
10	Fixed	22/50 mm/bevel tip	5190-1541
	Replacement plunger with PTFE tip for 10 mL syringes		5190-1574

Manual Syringe with PTFE-Tipped Plunger and Luer Lok, 50 to 500 µL

Volume (µL)	Description	Needle	Part No.
50	Luer Lok	Luer Lok/50 mm or 2 in	5190-1506
	Replacement plunger with PTFE tip for 50 µL syringe		5190-1561
100	Luer Lok	Luer Lok/50 mm or 2 in	5190-1513
	Replacement plunger with PTFE tip for 100 µL syringe		5190-1562
250	Luer Lok	Luer Lok/50 mm or 2 in	5190-1519
	Replacement plunger with PTFE tip for 250 µL syringe		5190-1563
500	Luer Lok	Luer Lok/50 mm or 2 in	5190-1527
	Replacement plunger with PTFE tip for 500 µL syringe		5190-1564



Manual Syringe with PTFE-Tipped Plunger and Luer Lok, 1 to 50 mL

Volume (mL)	Description	Needle	Part No.
1.0	Luer Lok	Luer Lok/50 mm or 2 in	5190-1530
	Luer Lok valve	Luer Lok valve/50 mm or 2 in	5190-1531
	Replacement plunger with PTFE tip for 1 mL syringes		5190-1565
2.5	Luer Lok	Luer Lok/50 mm or 2 in	5190-1534
	Luer Lok valve	Luer Lok valve/50 mm or 2 in	5190-1535
	Replacement plunger with PTFE tip for 2.5 mL syringes		5190-1572
5.0	Luer Lok	Luer Lok/50 mm or 2 in	5190-1539
	Luer Lok valve	Luer Lok valve/50 mm or 2 in	5190-1540
	Replacement plunger with PTFE tip for 5 mL syringes		5190-1573
10	Luer Lok	Luer Lok/50 mm or 2 in	5190-1457
	Luer Lok valve	Luer Lok valve/50 mm or 2 in	5190-1543
	Replacement plunger with PTFE tip for 10 mL syringes		5190-1574
25	Luer Lok	Luer Lok/50 mm or 2 in	5190-1544
	Replacement plunger with PTFE tip for 25 mL syringe		5190-1575
	Luer Lok valve	Luer Lok valve/50 mm or 2 in	5190-1545
	Replacement plunger with PTFE tip for 25 mL syringe		5190-1576
50	Luer Lok	Luer Lok/50 mm or 2 in	5190-1546
	Luer Lok valve	Luer Lok valve/50 mm or 2 in	5190-1547
	Replacement plunger with PTFE tip for 50 mL syringes		5190-1577



Luer Lok valve, 5190-1531



Luer Lok, 5190-1534



Luer Lok valve, 5190-1543

Luer Lok and Luer Lok Valve Needles

Description	Unit	Needle	Part No.
Luer Lok needle	3/pk	23/50/bevel tip	5190-1548
Luer Lok needle	3/pk	23/50/sidehole tip	5190-1549
Luer Lok needle	3/pk	22/51/LC tip	5190-1550



Syringe, 100 µL FN LC tip, 5190-1508

LC Manual Syringes with Fitted Plungers

Volume (µL)	Description	Unit	Needle	Part No.
5	Fixed		22 gauge/2 in/LC tip	5190-1480
10	Fixed		22 gauge/2 in/LC tip	5190-1484
	Removable		22 gauge/2 in/LC tip	5190-1485
	Replacement needle for 10 µL syringe	3/pk		5190-1486
25	Fixed		22 gauge/2 in/LC tip	5190-1494
50	Fixed		22 gauge/2 in/LC tip	5190-1501
100	Fixed		22 gauge/2 in/LC tip	5190-1508
250	Fixed		22 gauge/2 in/LC tip	5190-1515
500	Fixed		22 gauge/2 in/LC tip	5190-1522

LC Manual Syringes with PTFE-Tipped Plungers

Volume (µL)	Description	Unit	Needle	Part No.
10	Removable		22 gauge/2 in/LC tip	5190-1492
	Replacement needle for 10 µL syringe	3/pk		5190-1486
	Replacement plunger with PTFE tip for 10 µL syringe			5190-1558
25	Removable		22 gauge/2 in/LC tip	5190-1499
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 25 µL syringe			5190-1560
50	Removable		22 gauge/2 in/LC tip	5190-1505
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 50 µL syringe			5190-1561
100	Removable		22 gauge/2 in/LC tip	5190-1512
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 100 µL syringe			5190-1562
250	Removable		22 gauge/2 in/LC tip	5190-1520
	Replacement needle	3/pk		5190-1571
500	Removable		22 gauge/2 in/LC tip	5190-1526
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 500 µL syringe			5190-1564

Agilent CrossLab Syringes

CrossLab GC Autosampler Syringes

With a broad selection of syringes for auto injection, CrossLab autosampler syringes provide what you need for accurate and effective sampling. CrossLab syringes meet all fit, form, and function criteria for specific autosampler models. Agilent delivers more value in every autosampler syringe:

- Lot number printed directly on the barrel with a corresponding Certificate of Conformance
- Illuminating backing strip, for effortless viewing of the volume scale
- Environmentally friendly packaging and improved design that reduces waste
- Individually packaged for contaminant-free use right out of the box

Typical Needle Gauge Dimensions

	OD		ID	
Gauge	**mm**	**inches**	**mm**	**inches**
23	0.64	0.0248	0.11	0.0043
25	0.50	0.0197	0.20	0.0079
26	0.47	0.0184	0.11	0.0043



Autosampler syringe, 10 µL fixed needle, 8010-0351



Autosampler syringe, 5 µL, fixed needle, 8003-0001

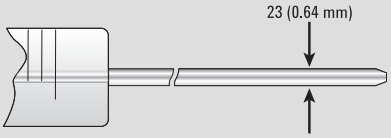


Autosampler syringe, 5 µL, gas tight, fixed needle, 8003-0002

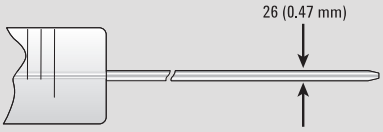
TIPS & TOOLS

Replace syringe if dirt is noticeable, syringe cannot be cleaned or plunger doesn't slide easily. Replace needle if septa wear is abnormal or needle is clogged.

Needle Gauge



Single Gauge 23 (0.64 mm)
Packed column injector ports
Split/splitless injector ports



Single Gauge 26 (0.47 mm)
Packed column injector ports
Split/splitless injector ports

Needle Termination

Needle terminations are available in fixed or removable, with various tip styles.

Fixed (cemented)

- Economical, reproducible injections for autosamplers
- Preferred for applications requiring trace level samples
- Recommended for use where probability of needle bending is minimal
- Can be heated up to 70 °C

Removable needle

- Versatile option for injections
- Needle can be replaced if damaged or clogged
- Allows needle to be changed for different applications
- Can be heated up to 120 °C

TIPS & TOOLS

Follow manufacturer's recommendation for syringe cleaning and regularly inspect syringe barrel for sample build-up and needle tip for wear.



Autosampler Syringes for Bruker/Varian GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Agilent CrossLab Syringe Part No.	Similar to Bruker/Varian Syringe Part No.	Agilent CrossLab Replacement Needle Part No.	Agilent CrossLab Replacement Plunger Part No.
CP8400 CP8410 CP9010 CP9050 AS200 AS2000 AS3000 AS800 TriPlus	10	Fixed needle	23/50/cone tip	8010-0351	SG002981		
CP8400 CP8410 CP9010 CP9050	10	Fixed needle	26/50/bevel tip	8004-0001			
CP8400 CP8410 CP9010 CP9050	10	Removable needle	26/50/cone tip	8004-0003	SG002982	8004-0004, 2/pk	
8035 8100 8200	10	Fixed needle, gas tight	26/53/side hole tip	8004-0002			8004-0007
	10	Removable needle, gas tight	25/53/side hole tip	8004-0005		8004-0006, 2/pk	8004-0007
CP8400 CP8410 CP9010 CP9050	10	Replacement needle		8004-0004			
8035 8100 8200	10	Replacement needle		8004-0006			
8035 8100 8200	10	Replacement plunger		8004-0007			

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Autosampler Syringes for PerkinElmer GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Agilent CrossLab Syringe Part No.	Similar to PerkinElmer Syringe Part No.	Agilent CrossLab Replacement Needle and Plunger Repair Kit Part No.	Similar to PerkinElmer Replacement Needle and Plunger Repair Kit Part No.
Autosystem Autosystem XL Clarus	0.5	Removable needle	23/70/cone tip	8003-0005	N6101252	8003-0006	N6101469
		Removable needle	26/70/bevelled cone tip	8003-0007		8003-0008	
	5	Fixed needle	23/70/cone tip	8003-0001	N6101251		
		Fixed needle, gas tight	23/70/cone tip	8003-0002	N6101390		
		Fixed needle	26/70/cone tip	8003-0003	N6101380		
	50	Fixed needle	23/70/cone tip	8003-0004	N6101760		
		Replacement needle and plunger repair kit		8003-0006	N6101469		
		Replacement needle and plunger repair kit		8003-0008			

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.

Autosampler Syringes for Shimadzu GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Agilent CrossLab Syringe Part No.	Similar to Shimadzu Syringe Part No.	Agilent CrossLab Replacement Needle Part No.	Similar to Shimadzu Replacement Needle Part No.
AOC-14 AOC-17 AOC-20	5	Fixed needle	23/42/cone tip	8001-0001			
	10	Removable needle	23/42/cone tip	8001-0004	220-90282-20	8001-0005, 2/pk	220-90281-20
		Removable needle	26/42/cone tip	8001-0006	220-90282-21	8001-0007, 2/pk	220-90281-21
	50	Fixed needle	23/42/cone tip	8001-0002	221-45243-00		
	250	Fixed needle, gas tight	23/42/cone tip	8001-0003	221-45244-00		

Autosampler Syringes for Shimadzu HPLC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Agilent CrossLab Syringe Part No.	Similar to Shimadzu Syringe Part No.	Agilent CrossLab Replacement Needle Part No.	Similar to Shimadzu Replacement Needle Part No.
SIL-10A SIL-10Ai	500	Chem (1/4-28 UNF screw threads), gas tight		8001-0401	228-25237-04		
	2.5	Chem (1/4-28 UNF screw threads), gas tight		8001-0402	228-25237-06		
	2.5	1/4-28 screw threads, gas tight with bracket		8001-0404	228-28128-91		

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Autosampler Syringes for Thermo GC Systems, 1/pk

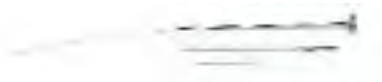
Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Agilent CrossLab Syringe Part No.	Similar to Thermo Scientific Syringe Part No.	Agilent CrossLab Replacement Needle or Plunger Part No.	Similar to Thermo Scientific Replacement Needle or Plunger Part No.
AS3000 TriPlus	0.5	Plunger-in-needle	23/50/cone tip	8010-0355	36504045	8010-0367*	
TriPlus	5	Fixed needle	26/50/cone tip	8010-0353	36504047		
CP8400 CP8410 CP9010 CP9050 AS200 AS2000 AS3000 AS800 TriPlus	10	Fixed needle	23/50/cone tip	8010-0351	36520060		
AOC-14 AOC-17 AOC-20	10	Fixed needle	26/50/cone tip	8010-0352	365D3711		
AS200 AS2000 AS3000 AS800 TriPlus	10	Fixed needle	25/50/cone tip	8002-0003	36500525		
AS2000 TriPlus	10	Fixed needle	23/80/cone tip	8002-0002	36520061		
AS2000 TriPlus	10	Fixed needle	26/80/cone tip	8002-0001	36502019		
AS200 AS2000 AS800 TriPlus	100	Fixed needle, gas tight	23/50/cone tip	8010-0354		8010-0368**	
AS2000 TriPlus	100	Removable needle, gas tight	23/50/side hole tip	8002-0004	36520050	8002-0005***	36540040

*Needle and plunger repair kit

**Replacement plunger

***Replacement needle

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Needle and plunger repair kit, 8010-0367



Replacement plunger, 8010-0368

CrossLab Supplies for CTC Analytics GC Autosamplers



Agilent's CrossLab portfolio includes a variety of syringes compatible with CTC Analytics GC PAL and CombiPAL systems.

- Syringe capacities from 0.5 µL to 2.5 mL
- Fixed and removable needles
- Several needle tip styles to suit your application requirements
- High temperature syringes for headspace application with temperatures up to 150 °C
- PTFE plunger seal option for smooth, leak-free operation
- Syringe specifications are matched to CTC holders to ensure proper fit and reliable functioning

Autosampler Syringes for CTC CombiPAL and GC PAL, 1/pk

Volume (µL)	Description	Needle Gauge/Length (mm)/Tip	Agilent CrossLab Syringe Part No.	Agilent CrossLab Replacement Needle or Plunger Part No.
0.5	Plunger-in-needle	23/50/cone tip	8010-0355	8010-0367*
5	Fixed needle	23/50/cone tip	8010-0356	
	Fixed needle	26/50/cone tip	8010-0353	
10	Fixed needle	23/50/cone tip	8010-0351	
	Fixed needle	25/50/cone tip	8002-0003	
	Fixed needle	26/50/cone tip	8010-0352	
	Fixed needle, gas tight	26/50/cone tip	8010-0357	8010-0359**
	Fixed needle	26/50/bevel tip	8010-0358	
25	Fixed needle	26/50/cone tip	8010-0360	
100	Fixed needle, gas tight	23/50/cone tip	8010-0354	
	Removable needle, gas tight	23/50/side hole tip	8002-0004	8002-0005***
	Fixed needle	26/50/cone tip	8010-0361	
250	Fixed needle, gas tight	26/50/cone tip	8010-0362	

Volume (mL)	Description	Needle Gauge/Length (mm)/Tip	Agilent CrossLab Syringe Part No.	Agilent CrossLab Replacement Plunger Part No.
1	Fixed needle, gas tight, headspace	23/56/side hole tip	8010-0363	8010-0365
2.5	Fixed needle, gas tight, headspace	23/56/side hole tip	8010-0364	8010-0366

*Needle and plunger repair kit

**Replacement plunger

***Replacement needle

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Autosampler syringe, 10 µL fixed needle, 8010-0351

Autosampler Syringes for Dionex LC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Similar to Dionex Syringe Part No.	Agilent CrossLab Syringe	Agilent CrossLab Replacement Needle	Agilent CrossLab Replacement Plunger
WPS-3000SL	25	Chem (1/4-28 UNF screw threads), gas tight		6822.0001	8002-0405		
	250	Chem (1/4-28 UNF screw threads), gas tight		6822.0003	8002-0407		
ASI-100	100	Removable needle, gas tight	22/51/3	5805.2920	8002-0401*	8002-0413, 6/pk	8002-0402
			22s/51/3			8002-0412, 6/pk	
	1,000	Removable needle, gas tight	22/51/3	5805.2940	8002-0403*	8002-0414, 6/pk	8002-0406
			22s/51/3			8002-0415, 6/pk	
	2,500	Removable needle, gas tight	22/51/3	5805.2950	8002-0404*	8002-0414, 6/pk	8002-0408
			22s/51/3			8002-0415, 6/pk	

*Needles are sold separately

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Chem (1/4-28 UNF screw threads), gas tight, 8002-0405



Removable needle, gas tight, 8002-0401

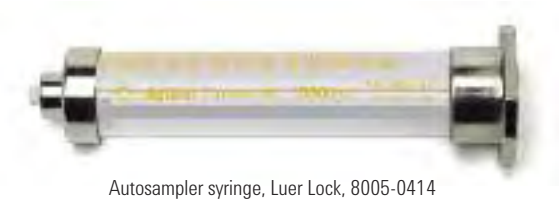
Autosampler Syringes for Waters LC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Agilent CrossLab Syringe Part No.	Similar to Waters Syringe Part No.	Agilent CrossLab Replacement Needle or Plunger Part No.
2777 Compact Sample Manager 2777 Sample Manager	1	Fixed needle, gas tight	22/51/3	8010-0443	430000867	8010-0455
	2.5	Fixed needle, gas tight	22/51/3	8010-0444	430000868	8010-0448
	10	Fixed needle	22s/51/3	8010-0445	430000859	
	25	Fixed needle, gas tight	22s/51/3	8010-0441	430000861	
	100	Fixed needle, gas tight	22s/51/3	8010-0442*	430000864	
		Fixed needle, gas tight	22/51/3	8010-0446*	430000863	
	250	Fixed needle, gas tight	22/51/3	8010-0467	430000865	
	500	Fixed needle, gas tight	22/51/3	8010-0468	430000866	8010-0460, 10/pk**
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System CapLC System CapLC XE System	10000	Luer Lock	No needle	8005-0414	WAT025559	
600 MultiSolvent Delivery System Rheodyne Injector	25	Removable needle, gas tight	22s/51/3	8005-0416	WAT033381	
Rheodyne Injector	100	Removable needle, gas tight	22s/51/3	8005-0417	WAT033383	8005-0418, 6/pk
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module LC Module 1 717/717plus Autosampler	25	Chem (1/4-28 UNF screw threads), gas tight	No needle	8005-0420	WAT077343	
	250	Chem (1/4-28 screw threads UNF), gas tight	No needle	8005-0419	WAT073109	

*Barrel od is 6.7 mm. All other 10, 25, and, 100 µL syringes have 7.9 mm od.

**Replacement plunger

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Autosampler syringe, Luer Lock, 8005-0414



Autosampler syringe, gas tight, 8005-0417



CTC Autosampler Supplies

To better serve Agilent instrument users who choose CTC Analytics autosamplers for high-throughput and flexible sample introduction, Agilent has partnered with CTC to provide a fully integrated system, including CTC approved consumables.

Agilent's portfolio includes a variety of vials, caps, syringes, and well plates compatible with the CTC Analytics HTC PAL, GC PAL, and CombiPAL systems.



CTC syringes



Fixed needle, G6500-80120

CombiPAL and GC PAL Liquid Injection Syringes

A key feature of CTC's GC PAL and CombiPAL is the ability to inject a wide range of sample volumes, up to 500 µL for LVI applications. The following fixed needle syringes are recommended by CTC to sustain high reproducibility and accuracy.

CombiPAL and GC PAL Liquid Injection Syringes

Volume (µL)	Description	Unit	Needle	Part No.
1.2	Fixed needle		26/51/AS	G6500-80113
5	Fixed needle		26/51/AS	G6500-80114
	Removable needle for Cool On-Column (COC)		26/51/AS	5190-3984
	Replacement removable needle for Cool On-Column (COC)	3/pk		5190-3985
10	Fixed needle		26/51/2	G6500-80115
			26s/51/AS	G6500-80116
	Fixed needle, Merlin & PTV		23s/51/AS	5188-6596
25	Fixed needle		26/51/AS	G6500-80117
	Replacement plunger	10/pk		G4200-80104
100	Fixed needle		26/51/AS	G6500-80118
	Replacement plunger	10/pk		G4200-80105
250	Fixed needle		26/51/AS	G6500-80119
	Replacement plunger	10/pk		G4200-80102
500	Fixed needle		26/51/AS	G6500-80120
	Replacement plunger			G4200-80106

TIPS & TOOLS

For vials and caps that work seamlessly with your CTC Analytics PAL Autosamplers, see our complete Vials and Closures section, turn to page 27.

CombiPAL Headspace Supplies

Our fixed needle headspace syringes feature a sideport needle for gas flushing, in conformance with strict CTC standards. Use with Agilent's Merlin Microseal to minimize instrument downtime and to prevent lost or compromised data caused by septum leaks and liner contamination.



Headspace Vials

CombiPAL Headspace Syringes

Volume (mL)	Description	Gauge	Part No.
1	Fixed needle	23	G6500-80107
	Replacement plunger		G4200-80101
2.5	Fixed needle	23	G6500-80109
	Replacement plunger		G4200-80107
5	Fixed needle	23	G6500-80111
	Replacement plunger		G4200-80108

CombiPAL Headspace Supplies

Description	Part No.
Liner, inlet for SPME, deactivated	5188-6471
Liner, Ultra Inert for SPME, straight	5190-4048



Fixed needle, G6500-80109

HTS and HTC PAL Liquid Injection Crimp Top Micro Vials and Caps

HTS and HTC PAL high-throughput LC injection systems are configured to cope with today's high-throughput LC/MS demands. Agilent offers a selection of crimp top micro vials designed specifically for HTS and HTC PAL systems.

HTS and HTC PAL Liquid Injection Crimp Top Micro Vials and Caps

Description	Unit	Part No.
0.8 mL, amber glass, flat bottom	1000/pk	5183-4487
0.1 mL, clear glass, tapered bottom	500/pk	5180-0844
0.3 mL, clear glass, round bottom	500/pk	5180-0841
0.7 mL, amber glass, round bottom	500/pk	5180-0805
0.5 mL, amber glass, conical bottom	500/pk	5180-0806
Micro Caps		
Crimp caps with PTFE/silicone septa	500/pk	5180-0842

HTS and HTC PAL Liquid Injection Syringes

Designed specifically for CTC autosamplers, these X-type syringes feature zero carryover and a long-lasting plunger for applications that demand precision and productivity. They are strongly recommended for high-throughput applications.

Agilent offers a wide selection of fixed needle, 22-gauge, pointstyle 3 syringes to accommodate a variety of applications.



X-type fixed needle, G4200-80118



Replacement plunger, G4200-80111

HTS and HTC PAL Liquid Injection Syringes

Volume (µL)	Description	Unit	Needle	Part No.
25	X-type fixed needle		22s/51/3	G4200-80117
	Replacement plunger for X-type syringe	3/pk		G4200-80112
50	X-type fixed needle		22/51/3	5188-6485
	Replacement plunger for X-type syringe	3/pk		5188-5395
100	X-type fixed needle, fast aspiration and eject		22/51/3	G4200-80118
	X-type fixed needle, low dead volume		22s/51/3	G4200-80119
	Replacement plunger for X-type syringe	3/pk		G4200-80111
10	Fixed needle		22s/51/3	G4200-80113
	Replacement plunger	10/pk		G4200-80103
25	Fixed needle		22s/51/3	G4200-80114
	Replacement plunger	10/pk		G4200-80104
100	Fixed needle		22/51/3	G4200-80115
	Fixed needle		22s/51/3	G4200-80116
	Replacement plunger	10/pk		G4200-80105
250	Fixed needle		22/51/3	G6500-80102
	Replacement plunger	10/pk		G4200-80102
500	Fixed needle		22/51/3	G6500-80103
	Replacement plunger			G4200-80106
1000	Fixed needle		22/51/3	G6500-80104
	Replacement plunger			G4200-80101
2500	Fixed needle		22/51/3	G6500-80105
	Replacement plunger			G4200-80107
5000	Fixed needle		22/51/3	G6500-80106
	Replacement plunger			G4200-80108

HTS and HTC PAL Liquid Injection Valve Supplies

Whether your HTS or HTC PAL autosampler uses the Agilent proprietary Rheodyne high-pressure 600 bar injection valve or Valco Cheminert injection valves, Agilent can help you find a sample loop to meet your most challenging applications – including:

- Rheodyne 600 bar injection valve loops, which include high-pressure Swagelok fittings
- Cheminert metal loops, which feature two 1/16 in stainless steel nuts and two stainless steel ferrules
- Cheminert PEEK loops, which include two PEEK nuts and two PEEK ferrules

HTS and HTC PAL Liquid Injection Valve Loops and Needle Seals

Description	Part No.
Rheodyne 600 bar Valve Supplies	
Stainless Steel Loops: Supplied with Swagelok fittings required for high pressure	
5 µL	5188-6486
10 µL	5188-6487
20 µL	5188-6488
50 µL	5188-6489
100 µL	5188-6490
Stator, Rheodyne 600 bar	5188-6491
RheBuild Kit, 600 bar, includes Rotor Seal and 3/32 in hex wrench	5188-6492
Needle Seals, Rheodyne valve, 600 bar, 10/pk	5188-6478
Cheminert Valve Supplies	
PEEK Loops: Include two PEEK nuts and two PEEK ferrules	
2 µL	5188-6469
5 µL	5188-6470
10 µL	5188-6467
20 µL	5188-6468
Metal Loops: Include two 1/16 in stainless steel nuts and two stainless steel ferrules	
2 µL	5188-6457
10 µL	5188-6458
50 µL	5188-6460
100 µL	5188-6461
250 µL	5188-6462
500 µL	5188-6463
1000 µL	5188-6464
2000 µL	5188-6465
5000 µL	5188-6466
PEEK Needle Seal, Valco, 22-gauge, 10/pk	5188-6476
PTFE Needle Seal, Valco, 22-gauge, 10/pk	5188-6477



Stainless steel loop, 5188-6486


2 µL PEEK loop, 5188-6469


10 µL PEEK loop, 5188-6467

CTC Autosampler General Supplies

For your convenience, Agilent offers a selection of replacement sampling trays, well plates and sampling accessories for CTC autosamplers.



Sample tray, G6500-80101



Collection plate, showing
96-position closing mat, 5042-1389



Well plate foil cutter, 5188-6479

Description	Part No.
Sample tray, 200 vials, 0.7 or 1 mL	G6500-80100
Sample tray, 98 2 mL or 78 1 mL vials	G6500-80101
Sample tray, 32 10 or 20 mL vials	G6500-80121
Sample tray, 54 2 mL vials, for PAL deep-well stack	G6500-80122
96-well plates, 0.5 mL, polypropylene, 10/pk	5042-1386
96-deep well plates, 1 mL, polypropylene, 50/pk	5042-6454
384-well plates, 90 µL, polypropylene, 30/pk	5042-1388
Closing mats for 96-well plates, silicone, pre-slit, fits 96-well plates P/N 5042-1385 and 5042-1386 only, 50/pk	5042-1389
Well plate foil cutter, max 22-gauge needle	5188-6479

Gas Management

Gas Purification

Impure gases can cause installation delays, premature instrument failure, and flawed results. Purification is one of the most important steps you can take to optimize your system performance.

Agilent brings the highest performance of gas purifiers to gas chromatographers. We manufacture purifiers in a variety of sizes and configurations to remove oxygen, moisture, and hydrocarbons. We recommend that each gas chromatograph use a gas purification system with removable cartridges such as Gas Clean or Renewable. These systems ensure the highest quality gas and contain indicators to allow for timely replacement before other consumables, like columns and liners, are damaged and sensitivity decreases. Agilent Gas Purifiers are a cost effective safety and preventive measure to assure the supply of the highest purity gas to your GC and GC/MS instrumentation with considerable savings in laboratory gas costs. We also carry a line of in-line purifiers to provide high capacity or economy solutions for customers. Please refer to the Gas Purifier Selection Guide to determine which gas purifiers you should use, see page 95.



Gas Clean Filters

Carrier Gas Purification

The Carrier Gas Purification illustration on the next page shows the most common gas purification configurations used in gas chromatography.

Regardless of which purification system is employed, proper installation and maintenance are required to achieve optimal performance. A purifier that is not maintained will eventually expire and become ineffective, or worse, a source of contamination.

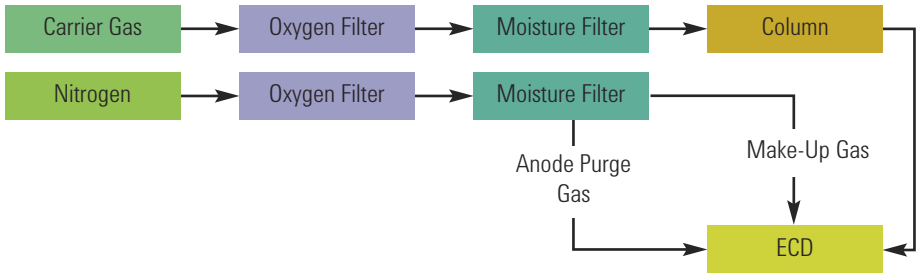
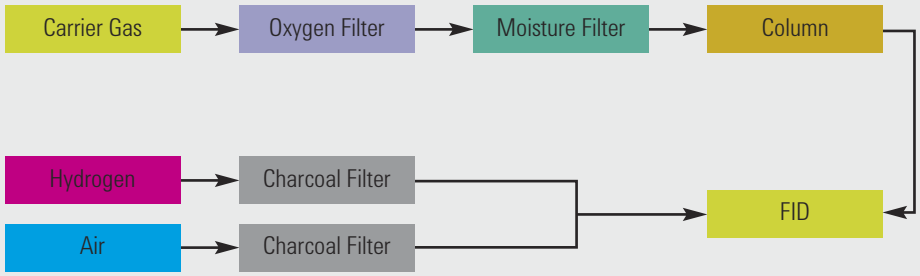
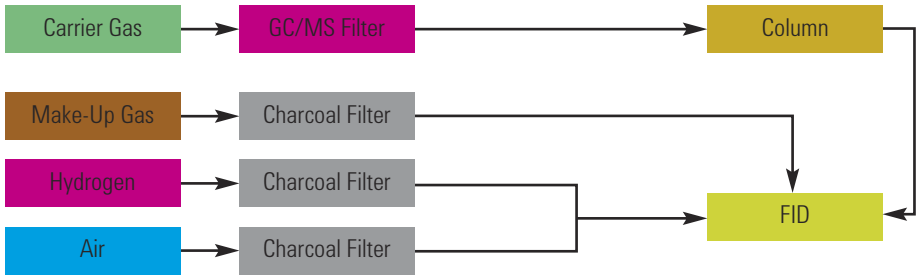
Helpful Hints for Purification Success

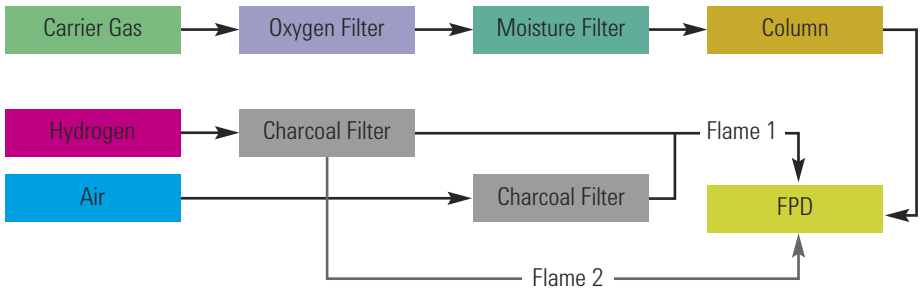
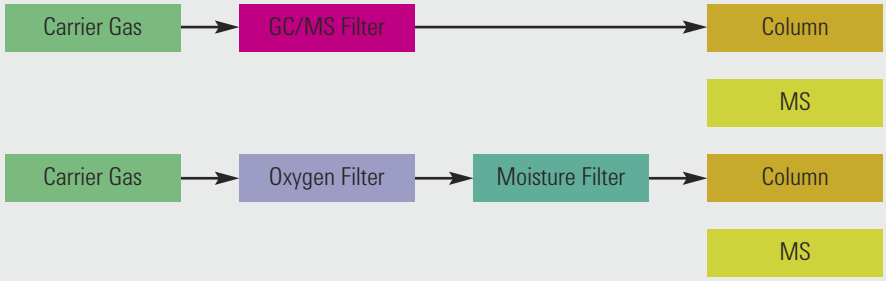
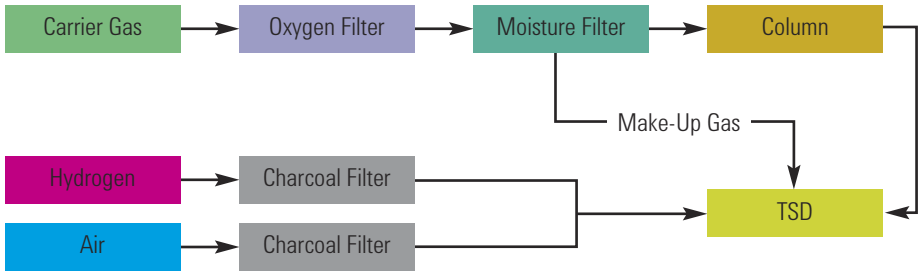
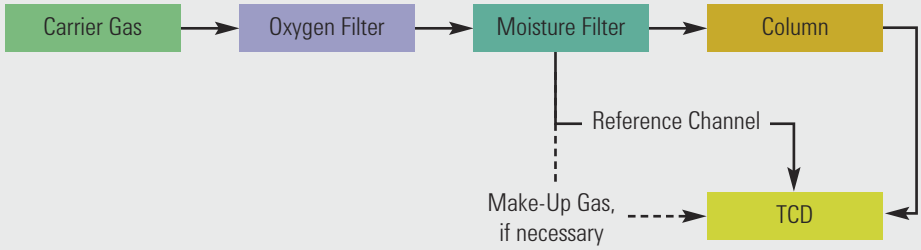
- Keep number of fittings in gas line to a minimum
- Install purifiers in a convenient location close to the GC
- Use purifier log books to determine maintenance and cartridge replacement schedules
- Use indicating traps closest to the GC so you can determine when to change the traps that are upstream

TIPS & TOOLS

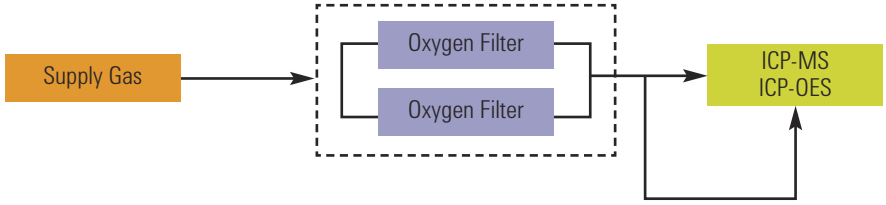
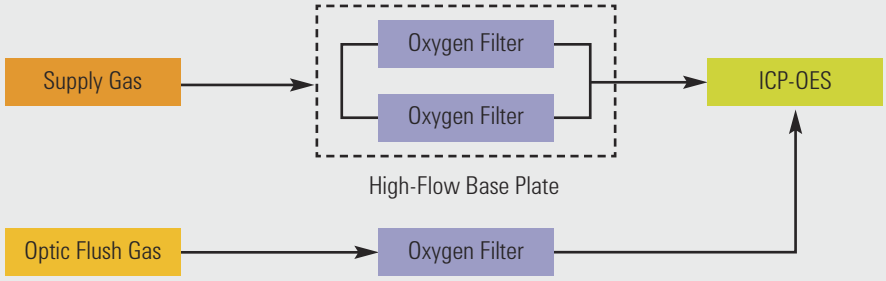
View the latest Agilent J&W GC column focused applications, products and educational resources at **www.agilent.com/chem/mygccolumns**

Connection Diagrams for Common Detectors

Detector	Connection Diagrams
ECD Electron Capture Detector	
FID Flame Ionization Detector (Carrier Gas = Make-Up Gas)	
FID Flame Ionization Detector (Carrier Gas differs from Make-Up Gas)	

Detector	Connection Diagrams
FPD Flame Photometric Detector **PFPD** Pulsed Flame Photometric Detector	
MS (ITD, MSD) Ion Trap Detector, Mass Selective Detector Two Possibilities (see diagrams to the right)	
NPD, PND Nitrogen-Phosphorus Detector **TID, TSD** Thermionic Detector (Carrier Gas = Make-Up Gas)	
TCD Thermal Conductivity Detector	

Connection Diagrams Analyzers and Generators

Detector	Connection Diagrams
ICP-OES/ICP-MS Inductively Coupled Plasma-Optical Emission Spectrometry/Mass Spectrometry (Plasma Gas = Nebulizer Gas)	
ICP-OES Inductively Coupled Plasma-Optical Emission (Different Optic Flush Gas)	
Total Organic Carbon (TOC) Analyzer	
Zero-Air Generator	

Key:
GC/MS Filter: A triple filter that removes oxygen, moisture, and hydrocarbons
Oxygen Filter: A filter that removes oxygen
Moisture Filter: A filter that removes water
Charcoal Filter: A filter that removes hydrocarbons
CO_2 Filter: A filter that removes carbon dioxide

Gas Purifier Selection Guide

Contaminant	Description	Series	Unique Features	Page No.
Purification Systems				
Hydrocarbon Moisture Oxygen Triple Filter (GC/MS) Carbon Dioxide Renewable Types: Triple Filter	Gas Clean Filters*		Ships standard with GC/MS Systems, highly sensitive indicators with fast, leak-free filter replacement	96
	Renewable Gas Purification System	G3440	Recyclable high-capacity system filters moisture, oxygen and hydrocarbons in a small, single-cartridge unit, featuring quick changes and easy-to-read dual indicators	100
In-Line Purifiers				
Moisture (H_2O)	Indicating Moisture Traps		Glass construction with plastic safety shield	104
	Big Moisture Traps	BMT	Ultra-high capacity for moisture	103
Oxygen (O_2)	Indicating Oxygen Traps		Glass construction with plastic safety shield	105
	Oxygen Traps	OT1	Economical non-indicating oxygen trap	106
	Big Oxygen Traps	BOT	Ultra-high capacity for oxygen	103
Hydrocarbons (HCs)	Hydrocarbon Traps	HT	Economical trap for hydrocarbons	106
	Big Hydrocarbon Traps	BHT	Ultra-high capacity for hydrocarbons	103
Combination Traps	Oxygen/Moisture Trap	OT3	Economical bi-functional trap	108
	Hydrocarbon/Moisture Trap	HMT	Economical bi-functional trap	109
	Big Universal Trap	RMS	Gas-specific (for purifying He, N_2, or H_2), ultra-high capacity, removes H_2O, O_2, HCs, CO, and CO_2, recommended for GC and GC/MS gas supplies	101
Other Purifiers				
Organics	Split Vent Trap	RDT	Cartridge design with durable cartridge holder and replacement cartridges	109

*Agilent Recommended



The unique connection design allows fast, leak-free replacement of the Gas Clean Filter

Gas Purification Systems

Agilent Gas Clean Filters

- Deliver clean gases for accurate analyses
- Fast, leak-free filter replacement reduces downtime
- Economical, with immediate payback
- Highly sensitive filter indicators provide maximum instrument protection

The Agilent Gas Clean Filter System delivers clean gases, reducing the risks of column damage, sensitivity loss, and instrument downtime. Inserting a Gas Clean Filter System in the gas line immediately before the instrument inlet greatly reduces the level of impurities, thus improving trace analysis. Contaminants entering your GC column will also be reduced, which is critical for high temperature analysis and essential for longer column lifetime.

Replacing the filters when they have reached absorption capacity ensures maximum protection of your GC columns and analytical hardware. The sensitive indicators change color, alerting you that the filter needs to be replaced.

A Gas Clean Filter System allows you to use 99.996% (4.6) pure helium instead of the more expensive 99.999% (5.0) or 99.9999% (6.0) grade, while still yielding high quality analytical results. The expected cost savings are 30%.

TIPS & TOOLS

Learn best practices for GC troubleshooting with the Agilent GC Troubleshooting video series – view at **www.agilent.com/chem/GCtroubleshooting**



Benefits of Using Gas Clean Filters

Technique	Filters	Benefit
GC/MS	GC/MS filter	Higher data accuracy and less maintenance
GC column	Moisture filter and oxygen filter or a GC/MS filter	Longer lifetime
ECD detector	GC/MS Filter	Greater sensitivity
TCD detector	Moisture filter and oxygen filter or a GC/MS filter	Greater sensitivity and less maintenance
Process GC	Process moisture filter	Long term stability
FID detector	Two charcoal filters (for air and hydrogen)	Greater sensitivity
PID detector	Oxygen filter and charcoal filter	Greater sensitivity
PFPD or FDP detector	Charcoal filter, CO_2 filter and moisture filter	Greater sensitivity
TSD or NPD detector	Charcoal filter, CO_2 filter and moisture filter	Greater sensitivity
Total organic carbon	CO_2 filter and moisture filter	Greater sensitivity
Zero-air generator	CO_2 filter and moisture filter	Cleaner gas
ICP-OES, ICP-MS	High flow connection unit with two oxygen filters	Greater sensitivity

Gas Clean Filters Technical Specifications

Description	Function	Indicator Color Change	Capacity	Outlet Concentration (at operating flow of 1-10 L/min)
Oxygen Filter	Removes oxygen as well as traces of sulfur and chlorine compounds from carrier gas	From green to gray	150 mL oxygen	< 50 µg/L
Moisture Filter/Process Moisture Filter	Removes water, oil, and other foreign material from the carrier gas	From green to pale brown	7.2 g water	< 0.1 mg/L
Charcoal Filter	Removes organic compounds from gas streams	No indicator	Approximately 7 g, depending on impurities	< 0.1 mg/L
GC/MS Filter	Single combination filter, removes water, oxygen, and organic compounds	Oxygen, from green to gray; Moisture, from green to pale brown	100 mL oxygen, 1 g water, organics depending on impurities	Oxygen < 50 µg/L Moisture < 0.1 mg/L Organics < 0.1 mg/L
CO_2 Filter	Removes CO_2 from the gas stream; use with moisture filter	From white to violet	9 g CO_2	< 1 mg/L



Gas Clean Filters



1-position connecting unit, 1/8 in, CP7988



4-position connecting unit, 1/8 in, CP736520



High flow connecting unit 1/8 in, CP17985

Agilent Gas Clean Filter Starter Kits

Description	Part No.
Agilent Gas Clean FID Filter kit Includes a 4-position 1/8 in connecting unit and two Charcoal filters, one Oxygen filter, and one Moisture filter	CP7995*
Agilent Gas Clean Filter Kit, 1/8 in Includes a 4-position 1/8 in connecting unit and two Charcoal filters, one Oxygen filter, and one Moisture filter	CP736530
Agilent Gas Clean GC/MS Filter kit Includes a 1-position connecting unit 1/8 in and two GC/MS filters	CP17976
Agilent Gas Clean GC/MS Filter kit Includes a 1-position connecting unit 1/4 in and two GC/MS filters	CP17977
Agilent Gas Clean GC/MS Filter Installation kit Includes 1 m copper tubing (P/N CP17976), two nuts and two ferrules, 1/8 in	CP17978
Agilent Gas Clean CO_2 kit Includes 2-position 1/4 in connecting unit and CO_2 and moisture filters	CP17982
Agilent Gas Clean CO_2 kit Includes 2-position 1/8 in connecting unit and CO_2 and moisture filters	CP17983
Agilent TCD Filter Kit Includes a 2-position 1/8 in connecting unit, one Oxygen filter, and one Moisture filter	CP738408
Agilent GC Installation Kit Includes CP736530 and many useful fittings and accessories.	19199N

*For 1/8 in tube, use reducer 1/8 in x 1/4 in, P/N CP4392

Connecting Units

Description	Part No.
1-position connecting unit, 1/4 in	CP7980
1-position connecting unit, 1/8 in	CP7988
2-position connecting unit, 1/4 in	CP738406
2-position connecting unit, 1/8 in	CP738407
4-position connecting unit, 1/4 in	CP7989
4-position connecting unit, 1/8 in	CP736520
High flow connecting unit, 2-position, 1/4 in	CP17984
High flow connecting unit, 2-position, 1/8 in	CP17985
1-position, stainless steel, 1/4 in tube	CP7980P4
1-position, stainless steel, 1/8 in tube	CP7988P8
1-position, stainless steel, 3 mm tube	CP7988P3
1-position, stainless steel, 6 mm tube	CP7980P6

Replacement Gas Clean Filters

Description	Part No.
Agilent Gas Clean CO_2 filter	CP17969
Agilent Gas Clean Oxygen filter	CP17970
Agilent Gas Clean Moisture filter	CP17971
Agilent Gas Clean Process Moisture filter	CP17971P
Agilent Gas Clean Charcoal filter	CP17972
Agilent Gas Clean GC/MS filter*	CP17973

*GC/MS filter removes Hydrocarbons, Moisture, and Oxygen, and can be used to purify any GC carrier gas. It is the best filter for protecting your inert consumables.



Agilent Gas Clean GC/MS filter, CP17973

Accessories and Fittings

Description	Part No.
Wall mounting bracket for connecting unit For CP7980 and CP7988	CP7981
Upper part filter connecting unit	CP7978
Flush head for connecting unit	CP7987
Male connector, 1/4 in with dust filter	CP7986
Male connector, 1/8 in with dust filter	CP82117
Viton O-rings, two sets	CP7983
Male connector, stainless steel, 1/4 in with dust filter	CP7986SS
Male connector, stainless steel, 1/8 in with dust filter	CP82117SS
Male connector, stainless steel, 3 mm with dust filter	CP82117SS3
Male connector, stainless steel, 6 mm with dust filter	CP7986SS6



Wall mounting bracket for connecting unit, for CP7980 and CP7988, CP7981



Flush head for connecting unit, CP7987

TIPS & TOOLS

GC/MS filter removes Hydrocarbons, Moisture, and Oxygen and can be used to purify any GC carrier gas. It is the best filter for protecting your inert consumables.



Renewable gas purification system (left) and recycled cartridge (right)

Renewable Gas Purification System

The Renewable Gas Purification System from Agilent not only traps large quantities of contaminants and lasts a long time, but it is also recyclable. With average use, you'll only need to purchase a replacement cartridge once per year or after approximately 20 cylinders' worth of purification. When you need a replacement, you have the option to purchase a new or recycled cartridge. Recycled cartridges are refilled and certified to the full specifications of the new cartridges.

- Agilent's highest capacity and most economical purification system
- All cartridges are environmentally friendly and reduce waste
- High capacity – 850 cc or more oxygen filtration, 12 g H_2O, and approximately 8 g hydrocarbon filtration per cartridge – in a compact footprint
- Improves 99.995% gas purity to 99.9995% purity
- Dual indicators make it easy to see the purification results
- Labeling displays indicator color and shape for accurate reading
- Simple twist on/off knob and guide rod make cartridge changes quick and easy
- One renewable gas purifier system can support up to four GC systems
- Designed with efficiency, safety, and environmental responsibility in mind
- All replacement cartridges include return packaging and instructions



Renewable gas purifier cartridge, new, G3440-60003

Renewable Gas Purification System

Description	Part No.
Renewable gas purifier system startup kit Includes one G3440-80007 base, one G3440-60003 renewable gas purifier cartridge, wall or bench mount hardware, and instruction manual	G3440-60004
Renewable gas purifier cartridge, new	G3440-60003
Renewable gas purifier cartridge, recycled	G3440-69003
Renewable gas purifier system, base only	G3440-80007
Return packaging set For return of G3440-60003 or G3440-69003 renewable gas purification cartridge when original packaging is lost or damaged	5190-1414

TIPS & TOOLS

For more information about the Renewable Gas Purification System, visit **www.agilent.com/chem/renewable**

In-Line Gas Traps

The purpose of gas traps is to remove detrimental impurities from carrier and detector gases. Combination traps are available which remove moisture, oxygen, and/or organics with a single trap. The effectiveness of the traps depends on the initial quality of the gas.

Constant exposure of capillary columns to oxygen and moisture, especially at high temperatures, results in rapid and severe column damage. The use of oxygen and moisture traps for the carrier gas may extend column life and protect the instrument. Any moisture or oxygen introduced into the gas stream due to a leak will be removed by the trap until it expires.

Big Universal Traps

Big Universal Traps utilize a layered, multi-adsorbent bed packing of the most effective, highest capacity adsorbent materials available today for the removal of oxygen, moisture, hydrocarbons, carbon dioxide, and carbon monoxide from helium gas streams. The volume of the various adsorbent materials in the Big Universal Trap was developed through rigorous testing and evaluation in order to ensure that breakthrough of the five major contaminant groups occurs as simultaneously as possible as each material achieves complete saturation.



Big universal trap

One Big Universal Trap unit will easily purify the contents of thirteen "K" size cylinders of 99.997% purity helium to a cumulative level of 100 µg/L of O_2, H_2O, CO_2, CO, and hydrocarbons at a flow rate of up to 8 L/min. All tube fittings are Swagelok stainless steel, fitted with 40 µm stainless steel frits for particulate control. Maximum pressure is 250 psi.

Big Universal Traps are more economical than other purifiers, offering nearly three times the capacity.

Big Universal Traps are ideal for any GC or GC/MS application where helium is employed and assurance of purity is essential. Combining the contents of three individual in-line traps into a single unit reduces the number of potential leaks and the possibility of aspirating contaminants into the gas stream. A single purifier also simplifies installation and replacement.

TIPS & TOOLS

Big universal traps have nearly three times the capacity of other purifiers.

Capacity Data		
High Purity Helium-99.997%		**Removal Capacity**
O_2	< 5 mg/L	1.07 L
THC*	< 1 mg/L	20 g
H_2O	< 5 mg/L	46 g

*Total Hydrocarbons, analysis limited to three contaminant groups

Effluent Concentration			
Research Grade Helium-99.9999%			
Impurities	< 1 mg/L	H_2O	< 0.2 mg/L
N_2	< 0.5 mg/L	H_2	< 0.2 mg/L
O_2	< 0.5 mg/L	Ar	< 0.1 mg/L
THC*	< 0.1 mg/L	Ne	< 0.5 mg/L
$CO+CO_2$	< 0.1 mg/L		

*Total Hydrocarbons, analysis limited to three contaminant groups

Big Universal Traps (RMS Series)

Description	1/8 in Part No.	1/4 in Part No.
Hydrogen	RMSHY-2	RMSHY-4
Helium (Ar/Me)	RMSH-2	RMSH-4
Nitrogen	RMSN-2	RMSN-4
Trap Mounting Clips		
Big Mounting Clip, 2/pk	UMC-5-2	UMC-5-2

Big Traps

- Pressure: Up to 250 psig
- 750 cm^3 gas purifiers
- Ideal for bulk purification applications or where several instruments are plumbed from a single gas source
- One piece of heavy-walled aluminum tube eliminates potential leaks
- Equipped with sintered stainless steel frits to prevent particulate contamination



Big moisture trap

Big Moisture Traps (BMT Series)

Description	Capacity	Efficiency	1/8 in Part No.	1/4 in Part No.
Big Moisture Trap	130 g H_2O	Reduction of H_2O to less than 5 µg/L	BMT-2	BMT-4
Mounting Clips				
Big Mounting Clip, 2/pk			UMC-5-2	UMC-5-2

Big Oxygen Traps (BOT Series)

Description	Capacity	Efficiency	1/8 in Part No.	1/4 in Part No.
Big Oxygen Trap	3 L O_2 or 3.2 g	Reduction of O_2 to less than 1 µg/L	BOT-2	BOT-4
Trap Mounting Clips				
Big Mounting Clip, 2/pk			UMC-5-2	UMC-5-2

Big Hydrocarbon Traps (BHT Series)

Description	Capacity	Efficiency	1/8 in Part No.	1/4 in Part No.
Big Hydrocarbon Trap	80 g of medium to heavy molecular weight hydrocarbons	Reduction of C4 hydrocarbons to less than 15 µg/L	BHT-2	BHT-4
Mounting Clips				
Big Mounting Clip, 2/pk			UMC-5-2	UMC-5-2

Indicating Moisture Traps

This is an advanced-design gas filter for applications requiring high-efficiency moisture removal with the benefit of a depletion indicator. The adsorbing materials are Molecular Sieve 5Å and cobalt-free indicator, held in a sturdy glass tube. The gas to be purified contacts only glass, metal and the absorbent.

The indicator changes color from greenish-yellow to blue at about 5% relative humidity to signal leaks in the system; the molecular sieve removes moisture to trace levels. The glass tube is sealed with a special dual sealing system for extra protection from leaks. An internal frit at each end prevents particulate contamination. The inner glass tube in the Moisture Trap is enclosed in a plastic outer tube for safety. Dimensions: 3.5 cm x 26 cm, maximum pressure 6.8 bar (100 psig).

Dual Seal Design: In this design the glass inner tube is protected by a sealed outer plastic tube. Even if the glass tube fails, the gas system is fully protected against leaks.

Description	1/8 in Part No.	1/4 in Part No.
Glass Indicating Moisture Trap	5182-9211	5182-9411



Glass Indicating Moisture Trap

Indicating Oxygen Traps

This is an improved, compact indicating filter for high-efficiency oxygen removal, suitable for use with chromatography carrier gas streams. It removes oxygen to low-ppb levels, with an indicator that changes color from green to gray when adsorption capacity is depleted. The adsorbent forms copper oxide in the presence of oxygen; no gas is generated.

The Glass Indicating Oxygen Trap is recommended as a downstream indicator for high-capacity traps. It can be used with non-oxidizing gases such as He, Ar, N_2, H_2 or CH_4, with maximum recommended flow rate of 150 cc/min. The absorbents are held in a heavy-walled inner glass tube, shielded by an outer clear plastic tube for increased safety. Maximum pressure is 6.8 bar (100 psig). Approximate dimensions are 3.5 cm x 26 cm including fittings.

Dual Seal Design: In this design the glass inner tube is protected by a sealed outer plastic tube. Even if the glass tube fails, the gas system is fully protected against leaks.

Description	1/8 in Part No.	1/4 in Part No.
Glass Indicating Oxygen Trap	5182-9201	5182-9401
Glass Indicating Oxygen Trap, Stainless Steel Fitting	5182-9202	5182-9402



Glass Indicating Oxygen Trap

Oxygen Traps

- Reduces oxygen to less than 1 µg/L
- Environmentally safe

This trap removes the oxygen rather than converting it to another form of contamination.



Economy non-indicating oxygen trap

Description	Size (cc)	1/8 in Part No.	1/4 in Part No.
Economy Non-Indicating Oxygen Traps (OT1 Series)			
Oxygen Trap	70	OT1-2	OT1-4
Trap Mounting Clips			
Mounting clip for OT1 traps		MC-1	MC-1

Hydrocarbon Traps



Hydrocarbon trap, HT200-2

Hydrocarbon Traps

Description	Size (cc)	1/8 in Part No.	1/4 in Part No.
Hydrocarbon Trap	200	HT200-2	HT200-4
Capillary Grade Hydrocarbon Trap	100	HT3-2	HT3-4
Mounting Clips			
Mounting clip for HT200 Series		MC-1	MC-1

Ability of Activated Carbon to Remove Substances from Gases Using Hydrocarbon Traps

Compound	Efficiency	Compound	Efficiency
acetone	excellent	dissolved oils	excellent
hypochlorous acid	excellent	nitrobenzenes	excellent
alcohol	excellent	nitrotoluene	excellent
amines	very good	ethyl acetate	excellent
inorganic acids	none	ethyl alcohol	excellent
ammonia	poor	organic acids	excellent
iodine	excellent	ethyl chloride	excellent
amyl acetate	excellent	oxalic acid	excellent
isopropyl acetate	excellent	ethyl ether	excellent
amyl alcohol	excellent	ozone	excellent
isopropyl alcohol	excellent	fluoride	poor
benzene	excellent	phenol	excellent
ketones	excellent	formaldehyde	poor
butyl acetate	excellent	potassium permanganate	excellent
butyl alcohol	excellent	propyl acetate	excellent
lactic acids	excellent	glycol	excellent
by-products-organic	very good	propyl alcohol	excellent
lysol	excellent	propyl chloride	excellent
calcium hypochlorite	excellent	hydrogen bromide	satisfactory
mercaptans	excellent	hydrogen chloride	poor
carbon dioxide	none	sodium hypochlorite	excellent
methyl acetate	excellent	hydrogen fluoride	none
chlorobenzene	excellent	solvents	excellent
methyl alcohol	excellent	hydrogen iodide	satisfactory
chlorine	excellent	sulfuric acid	satisfactory
methyl bromide	excellent	hydrogen selenide	satisfactory
chlorophenol	excellent	hydrogen sulfide	satisfactory
methyl chloride	excellent	toluene	excellent
chlorophyl	excellent	trichloroethylene	excellent
methyl ethyl ketone	excellent	xylene	excellent
cresol	excellent		

Combination Traps

Oxygen/Moisture Traps

Oxygen/moisture adsorbents team up to give you two functionalities in the same trap. Unlike some oxygen/moisture traps, these traps are disposable.

Consider the safety, performance, and cost advantages of Agilent capillary-grade oxygen/moisture traps (OT3) compared to heated, catalytic traps.

- Optimized for maximum surface area and capacity
- Leak-free, one-piece design (tested to 2000 psi)
- Bed material treated with ultra-high purity helium
- Filter design: prevents channeling, promotes efficient scrubbing

In addition to inert gases (nitrogen, helium, argon, and krypton), the Agilent OT3 Trap treats streams of hydrogen, alkanes, alkenes, aliphatic hydrocarbon gases, low boiling aromatics, carbon dioxide, carbon monoxide, and argon-methane.



Agilent OT3 trap

Oxygen/Moisture Traps (OT3 Series)

Description	Capacity	Efficiency	Size (cc)	1/8 in Part No.	1/4 in Part No.
OT3 Trap	500 mL O_2 2 g H_2O	< 15 µg/L	100	OT3-2	OT3-4
Trap Mounting Clips					
Mounting clip				MC-1	MC-1

HOW DOES IT WORK?

The Agilent OT3 Trap contains a highly active, metal-containing, scrubbing material in an inert, aluminum body.

Hydrocarbon/Moisture Traps

- Replace most mixed bed traps supplied by GC manufacturers
- Mounting panel



Hydrocarbon/Moisture trap

Hydrocarbon/Moisture Traps (HMT Series)

Description	Size (cc)	1/8 in Part No.	1/4 in Part No.
Hydrocarbon/Moisture Trap	200	HMT200-2	HMT200-4
Mounting Clips			
Mounting clip		MC-1	MC-1

Combination Traps for Chemical Ionization MS

Description	Fitting (in)	Part No.
Chemical Ionization for MS*	1/8	G1999-80410

*Isobutane or methane applications only

Universal/External Split Vent Trap

- Protects lab from contaminants released by split injection systems
- Stops environmental pollution by trapping and eliminating a broad range of contaminants
- Easy to change
- Comes with three packs of replacement cartridges



Split vent trap and cartridges, RDT-1020

Universal/External Split Vent Trap

Description	Part No.
Universal/external split vent trap with 3 cartridges, 1/8 in Swagelok fitting	RDT-1020
Replacement cartridges, 3/pk	RDT-1023

TIPS & TOOLS

Remember to replace split vent cartridge every six months.

ADM Flow Meters

ADM flow meters allow most gas measurements with the touch of only one button – turn it on, and the instrument provides continuous, hands-free flow readings. Measure column, detector, and carrier gas flows without making any adjustments. ADM flow meters are ideal for measuring gas streams with a changing gas composition. For example, if gas flow is measured from a digestion system, concentration changes in methane, carbon dioxide, and oxygen will not affect accuracy.

All ADM flow meters are battery powered and field-portable. Agilent calibrates each instrument to 5-point, NIST-traceable standards to ensure the highest available accuracy. The ADM family measures flow volumetrically, so you don't have to make adjustments when changing from one gas to another.



ADM 1000

ADM 1000

- Accuracy ± 3%
- Operating temperature range – 0 to 45 °C for the instrument, -70 to 135 °C for the tubing
- Calibration – traceable to NIST primary standards
- Real-time, split ratio measurement
- CE mark certified
- Measures flow rates from 0.5 to 1000 mL/min
- Split ratios – compare the ratio from one gas measurement to another (i.e., injection port split ratios)



ADM 2000

ADM 2000

In addition to the features of the ADM 1000, the ADM 2000 includes:

- Mass flow measurements – measure flow rate, independent of atmospheric pressure and temperature (calculated)
- Data output through RS-232 port
- 9 V battery and AC power adapter (120 or 220 VAC)

ADM Flow Meters

Description	Flow Rate (mL/min) Low	Flow Rate (mL/min) High	Gases Measured*	Accuracy (%)	Power Supply	RS-232 Data Output	Part No.
ADM 1000**	0.5	1000	All	± 3	9 V Battery	None	220-1170
ADM 2000**	0.5	1000	All	± 3	Battery or 120 VAC	Yes	220-1171-U
ADM 2000E**	0.5	1000	All	± 3	AC Adapter, 220 V	Yes	220-1171-E
Carrying Case for ADM							907-0056

*± 3% or ± 0.2 mL/min, whichever is greater with a flow rate of 0.5-1,000 mL/min

**Non-corrosive gases only

Flow Meters

Precision Gas Flow Meter



Precision gas flow meter, 5067-0223

Agilent's Precision Gas Flow Meter is the ultimate gas flow meter for chromatography applications. This handheld flow meter is highly accurate, reliable and incorporates industry leading performance. The inherent stability of the rugged, solid state components allows Agilent to provide the longest calibration interval on the market, all traceable to NIST standards.

- Highly accurate and reliable measurement of common carrier and fuel gases used in GC, including nitrogen, air, carbon dioxide, hydrogen, helium, and argon/methane
- Two year guaranteed calibration period traceable to NIST standards
- Measures flow based on gas viscosity properties with an accuracy of ± 0.8% of reading + 0.2% of full scale
- Flow rate range from 5 to 500 mL/min
- Displays mass flow, volumetric flow, temperature, and pressure readings simultaneously
- Can be plumbed inline

Precision Gas Flow Meter

Description	Part No.
Precision gas flow meter	5067-0223

TIPS & TOOLS

Ensure you are maximizing the inertness of your GC flow path with the Agilent Ultra Inert Poster – **www.agilent.com/chem/Ulorder**



Gas leak detector, G3388B

Gas Leak Detector

Gas leaks can cause detector noise and baseline instability, shorten column life and waste expensive carrier gas. Liquid leak detectors, although inexpensive, can contaminate your system. Agilent's G3388B Electronic Gas Leak Detector is an easy way to quickly identify leaks in your system and prevent system downtime.

- Detects thermal conductivity differences
- Audible and visual alerts
- Minimum detection limit – 0.0005 mL/min hydrogen and helium
- Lightweight – only 105 g
- Small – roughly 50 (w) x 19.5 (d) x 111 (h) mm
- Rechargeable Lithium Ion Battery with over 5 hours of life
- Includes a USB cable for battery charging
- One year warranty from Agilent

Gas Leak Detector

Description	Part No.
Handheld electronic gas leak detector	G3388B

G3388A Replacement Parts

Description	Part No.
Replacement filter tip	5067-0218
Replacement battery	5067-0219
Replacement power supply	5067-0220

TIPS & TOOLS

For more information about the Gas Leak Detector, visit **www.agilent.com/chem/leakdetector**

Gas Cylinder Regulators, U.S. Only

To plumb your system properly, select one of Agilent's economical brass regulators and the proper gas purification devices from our newly expanded product offering. These regulators and our broad spectrum of in-line filters, combination traps, and gas purification systems are an excellent combination to plumb your systems. Our new gas purification selection guide and diagrams will help you determine which products can be used with the regulators below.



Brass body regulator

Brass Body, Dual Stainless Steel Diaphragms

Specifications	
Max inlet pressure	3000 psig
Operating temperature range	-40 °F to 165 °F
Inlet-outlet port	1/4 in, MNPT
Outlet valve	1/4 in, MNPT 2 1/2 in dual-scale gauges CGA-346, 350, 340, 580, 590 Internal self-reseating relief valve
Delivery pressures	1 to 125 psig
Weight	5.6 lb

Materials of Construction





Connector (Swagelok-style to female NPT), 0100-0118



Connector (Swagelok-style to female NPT), 0100-0119



Cylinder wall bracket, 5183-1941

Brass Body, Two-Stage Stainless Steel Diaphragms, 1/8 in, U.S. Only*

Description	Part No.
CGA 346, 125 psig max (8.6 bar), Breathing Air	5183-4641
CGA 350, 125 psig max (8.6 bar), H_2, Ar/Me	5183-4642
CGA 540, 125 psig max (8.6 bar), O_2	5183-4643
CGA 580 Regulator, 125 psig max (8.6 bar), He, Ar, N_2	5183-4644
CGA 590, 125 psig max (8.6 bar), Industrial Air	5183-4645

*For 1/4 in tubing, purchase a 1/4 in adapter, U.S. only

Connectors (Swagelok to Female NPT)

Description	Unit	Part No.
1/8 in (A) x 1/4 in (B) connector, brass (included with brass regulators)	1/ea	0100-0118
1/4 in (A) x 1/4 in (B) connector, brass*	1/ea	0100-0119
PTFE tape, industrial roll		0460-1266

*Required for plumbing 1/4 in tubing to regulators

Cylinder Wall Bracket

Description	Part No.
Cylinder wall bracket with strap & chain (cylinder size up to 14 in, 35 cm)	5183-1941

Kits, Fittings, Tools and Accessories

GC Installation Kits

Agilent Installation Kits for GC are designed to provide you with the essential items necessary for a successful installation while providing a substantial cost saving over individual purchases.

GC Installation Kit with Gas Purifiers

Description	Unit	Part No.
GC Installation Kit with Gas Purifiers		19199N
Gas Clean Filter Kit, 1/8 in		CP736530
Snoop, 8 oz (236 mL) bottle		9300-0311
1/8 in brass nut and ferrule set	20/pk	5080-8750
Copper tubing, 1/8 in, 50 ft		5180-4196
1/8 in tee, brass	2/pk	5180-4160
1/8 in cap, brass	6/pk	5180-4121
Universal/external split vent trap with 3 cartridges		RDT-1020
Tubing Cutter		8710-1709



Gas Clean Filters



Low dead volume tee, 5180-4160



1/8 in brass cap, 5180-4121



GC Installation Kit with Tools (no gas purifiers), 19199M

GC Installation Kit with Tools (no gas purifiers)

Description	Unit	Part No.
GC Installation Kit with Tools (no gas purifiers)		19199M
Snoop, 8 oz (236 mL) bottle		9300-0311
1/8 in brass nut and ferrule set	20/pk	5080-8750
Copper tubing, 1/8 in, 50 ft, precleaned		5180-4196
1/8 in tee, brass	2/pk	5180-4160
Tubing cutter, 1/8 to 5/8 in od tubing		8710-1709
1/8 in cap, brass	6/pk	5180-4121
Nut driver, 7 mm		8710-1217
Screwdriver, Torx T10		5182-3466
Screwdriver, Torx T20		5182-3465
Open end wrench, 1/4 and 5/16 in		8710-0510
Open end wrench, 7/16 and 9/16 in		8710-0803
Open end wrench, 7/16 and 3/8 in		8710-0972
Wrench, 1/2 and 7/16 in		8710-0806

GC Basic Installation Kit

Description	Part No.
GC Basic Installation Kit Includes copper tubing, column nuts, a gas trap for the carrier gas, and five wrenches	5182-3453

Tubing

Description	OD (in)	ID (mm)	Length	Part No.
Precleaned Copper tubing	1/8	2.1	50 ft	5180-4196
Precleaned Copper tubing	1/4	4.83		3700014600
Precleaned Copper tubing	1/8	2.1	12 ft	5021-7107
Copper tubing	1/16	3.25	50 ft	AL30509
Pretreated 316 stainless steel tubing	1/8	2.1	25 m	CP4026
Pretreated 316 stainless steel tubing			20 ft	7157-0210
Pretreated 316 stainless steel tubing			10 m	CP4025
Pretreated 316 stainless steel tubing			5 m	CP4024
Pretreated 316 stainless steel tubing	1/4	4.3	25 m	CP4032
Pretreated 316 stainless steel tubing			5 m	CP4030
Pretreated 316 stainless steel tubing			1 m	CP4013
PFA tubing	1/16	0.76	25 ft	AL45734

Fittings

Nuts, Front and Back Ferrule Sets

Description	Unit	Brass	Stainless Steel
1/16 in	10/pk		5180-4149
1/8 in	20/pk	5080-8750	5080-8751
1/4 in	20/pk	5080-8752	5080-8753

Nuts

Description	Unit	Brass	Stainless Steel
1/16 in, male nut	10/pk	SWB1021	5180-4102
1/16 in	1/ea		0100-0053
1/8 in	10/pk	5180-4103	5180-4104
1/8 in	1/ea	0100-0058	0100-0057
1/4 in	10/pk	5180-4105	5180-4106

Front Ferrules

Description	Unit	Brass	Stainless Steel
1/16 in	10/pk		5180-4108
1/4 in	1/ea	2869463500	
1/16 in, Valco one piece	10/pk		5181-1292
1/8 in	10/pk	5180-4109	5180-4110
1/4 in	10/pk	5180-4111	SWSS4031



Brass nut and ferrule set, 5080-8750



Stainless steel front ferrules, 5180-4108



Front ferrules, stainless steel, 5181-1292



Front ferrules, 5180-4109



Front ferrules, 5180-4111



Back ferrules, 5180-4115



Back ferrules, 5180-4117



1/8 in brass cap, 5180-4121



1/4 in brass cap, 5180-4120



1/8 in plug, 5180-4124



1/4 in plug, 5180-4125

Back Ferrules

Description	Unit	Brass	Stainless Steel
1/16 in	10/pk	5180-4113	5180-4114
1/8 in	10/pk	5180-4115	5180-4116
1/4 in	10/pk	5180-4117	SWSS4041

Caps

Description	Unit	Brass
1/8 in	6/pk	5180-4121
1/4 in	6/pk	5180-4120

Plugs

Description	Unit	Brass
1/8 in	6/pk	5180-4124
1/8 in	1/ea	0100-0071
1/6 in	1/ea	0100-1315
1/4 in	6/pk	5180-4125

Blanking Nut

Description	Unit	Stainless Steel
1/16 in	1/ea	01080-83202



Stainless steel blanking nut, 01080-83202

Adapter

Description	Unit	Brass
1/8 in x 1/8 in	1/ea	0100-0420



Brass adapter, 0100-0420

Hose Connector

Description	Unit	Brass
1/16 in	10/pk	5180-4148

Tees

Description	Unit	Brass	Stainless Steel
1/16 in	1/ea	0100-0680	0100-0782
1/8 in	1/ea	0100-0090	0100-0542
	2/pk	5180-4160	
1/8 in, for O_2 gas mix	1/ea		0100-0542
1/4 in	1/ea	0100-0088	0100-0089
	2/pk	5180-4129	
1/6 in, low dead volume	1/ea		0100-0969



Low dead volume tee, 0100-0782



Stainless steel tee, 0100-0542



Low dead volume tee, 5180-4160



Brass cross, 0100-0161



Brass cross, 0100-0985



Brass union, 0100-1316



Stainless steel union, 0100-0124



1/8 in brass union, 5180-4127



1/4 in brass union, 5180-4128



ZDV union with fittings, 0100-0900

Crosses

Description	Unit	Brass
1/8 in	1/ea	0100-0161
1/8 in	1/ea	0100-0996
1/4 in	1/ea	0100-0985

Elbows

Description	Unit	Brass
1/8 in	1/ea	0100-0091
1/8 in	1/ea	0100-0092

Unions

Description	Unit	Brass	Stainless Steel
1/16 in	1/ea	0100-1316	0100-0124
1/8 in	2/pk	5180-4127	
	1/ea		0100-0126
1/4 in	2/pk	5180-4128	
	1/ea		0100-0128

Zero Dead Volume Unions

Description	Unit	Stainless Steel
1/16 in	1/ea	0100-0900

Bulkhead Unions

Description	Unit	Brass	Stainless Steel
1/8 in	1/ea	0100-0132	0100-0133

Connectors (Swagelok to Male NPT)

Description	Unit	Brass	Stainless Steel
1/16 in (A) x 1/4 in (B)	1/ea		CP741648
1/8 in (A) x 1/4 in (B)	2/pk	5180-4143	
1/8 in (A) x 1/8 in (B)	1/ea	0100-0110	0100-0111
1/4 in (A) x 1/4 in (B)	1/ea	0100-0208	0100-1189
	2/pk	5180-4145	

Connectors (Swagelok to Female NPT)

Description	Unit	Brass	Stainless Steel
1/8 in (A) x 1/4 in (B)	1/ea	0100-0118	SWSS20074
1/4 in (A) x 1/4 in (B)*	1/ea	0100-0119	

*Required for plumbing 1/4 in tubing to regulators

Reducing Unions

Description	Unit	Brass	Stainless Steel
1/16 in x 1/8 in	2/pk	5180-4130	
	1/ea		0100-0241
1/8 in x 1/4 in	2/pk	5180-4131	
	1/ea		0100-0121



Connector (Swagelok-style to male NPT), 5180-4143



Connector (Swagelok-style to male NPT), 5180-4145



Connector (Swagelok-style to female NPT), 0100-0118



Connector (Swagelok-style to female NPT), 0100-0119



Reducing union, 5180-4130



Reducing union, 5180-4131



Reducing union, 0100-0241



Reducing union, 0100-0121


Reducer, 5180-4135


Reducer, 5180-4134


Front ferrules, 5180-4109


Front ferrules, 5180-4111


Back ferrules, 5180-4115


1/4 in brass cap, 5180-4120


1/8 in brass cap, 5180-4121


1/8 in plug, 5180-4124


1/8 in brass union, 5180-4127


1/4 in brass union, 5180-4128


Low dead volume tee, 5180-4160

Reducers

Description	Unit	Brass	Stainless Steel
1/8 in (A) x 1/4 in (B)	2/pk	5180-4135	
1/6 in (A) x 1/8 in (B)	1/ea		0100-0073
1/4 in (A) x 1/8 in (B)	2/pk	5180-4134	

Fittings Kit

Description	Unit	Part No.
Fittings Kit: Includes items below		5180-4161
1/8 in nut, brass	10/pk	5180-4103
1/4 in nut, brass	10/pk	5180-4105
1/8 in front ferrule, brass	10/pk	5180-4109
1/4 in front ferrule, brass	10/pk	5180-4111
1/8 in back ferrule, brass	10/pk	5180-4115
1/4 in back ferrule, brass	10/pk	5180-4117
1/4 in cap, brass	6/pk	5180-4120
1/8 in cap, brass	6/pk	5180-4121
1/8 in plug, brass	6/pk	5180-4124
1/4 in plug, brass	6/pk	5180-4125
1/8 in union, brass	2/pk	5180-4127
1/4 in union, brass	2/pk	5180-4128
1/8 in tee, brass	2/pk	5180-4160
1/4 in tee, brass	2/pk	5180-4129
1/8 x 1/4 in reducing union, brass	2/pk	5180-4131
1/4 in (A) x 1/8 in (B) reducer, brass	2/pk	5180-4134
1/8 in (A) x 1/4 in (B) reducer, brass	2/pk	5180-4135

Tools

General Laboratory Tool Kit

The general laboratory tool kit includes the following items:

- Toolbox
- Flashlight
- 8 in bastard file
- 6 in adjustable wrench
- 12 in adjustable wrench for use with regulator
- No. 1 pt, 3 in Pozidriv shaft, fits no. 2-4 screws
- No. 2 pt, 4 in Pozidriv shaft, fits no. 5-10 screws
- Flathead screwdriver, 2 in steel shaft, 1/8 in blade
- Flathead screwdriver, 4 in steel shaft, 1/4 in blade
- Hex key set, 1.5, 2, 2.5, 3, 4, 5, and 6 mm keys
- 6 in long jaw needle nose pliers with side cutters
- Three open-end wrenches (1/4 x 5/16 in, 1/2 x 9/16 in, 7/16 x 3/8 in)
- Snoop-liquid leak detector
- PTFE tape

Description	Part No.
General laboratory tool kit	5180-4162



General laboratory tool kit, 5180-4162

Wrenches

Description	Part No.
Open end wrench, 1/4 and 5/16 in	8710-0510
Wrench, 1/2 and 7/16 in	8710-0806
Open end wrench, 7/16 and 9/16 in	8710-0803
Open end wrench, 7/16 and 3/8 in	8710-0972
Adjustable wrench, 12 in, for use with regulators	8710-1712
Open end wrench, 9/16 and 5/8 in	8720-0010
Open end wrench, 1/2 and 9/16 in	8720-0025
Open end wrench, 14 mm	8710-1924
Open end wrench, 12 mm, 116 mm long	8710-1841
Open end wrench, 4 mm	8710-1534

LC Tool Kits

Description	Part No.
HPLC system tool kit	G4203-68708
Compact tool kit	G4296-68715



HPLC system tool kit, G4203-68708

Screwdrivers

Description	Part No.
Screwdriver, 3 in Pozidriv shaft No. 1 pt	8710-0899
Screwdriver, 4 in Pozidriv shaft No. 2 pt	8710-0900
Screwdriver, Torx T10	5182-3466
Screwdriver, Torx T20	5182-3465

Pliers and Tweezers

Description	Part No.
Needle nose pliers, pointed serrated jaws	8710-0004
Tweezers, 4-3/4 in long	8710-0007
Truarc pliers	8710-0018

Tube Cutters and Replacement Blades



Plastic tubing cutter, 8710-1930

Description	Unit	Part No.
Precision tubing cutter for 1/16 in stainless steel tubing		5190-1442
Hi-duty tubing cutter, 1/8 to 1-1/8 in od tubing		8710-1707
Hi-duty tubing cutter blades	5/pk	8710-1708
Tubing cutter, 1/8 to 5/8 in od tubing		8710-1709
Plastic tubing cutter		8710-1930
Blades for plastic cutter, 5/pk	5/pk	8710-1931

Hex Keys



Hex keys, Rheotool, 5064-8211

Description	Part No.
Hex key set: 1.5, 2, 2.5, 3, 4, and 5 mm keys, 1090A (5880/90A)	8710-0641
Hex key, 4 mm, 15 cm long, T-handle	8710-2392
Hex key, 3 mm, 12 cm long, straight handle	8710-2411
Hex key, 2.5 mm, 15 cm long, straight handle	8710-2412
Hex key, 1.5 mm, 10 cm long, straight handle	8710-2393
Hex key, 9/64 in, 15 cm long, T-handle	8710-2394
Hex key, 4.0 mm, 10 cm long, straight handle	5965-0027
Hex key, 2.5 mm, 10 cm long, straight handle	5965-0028
Tool kit hex keys, Rheotool*	5064-8211
Includes 3 hex keys, 4 mm, 1.5 mm, and 9/64 in, with straight or T-handle plus Rheotool	

*These tools are recommended for easier repair and maintenance of LC modules.

GC Column Accessories

Capillary Column Installation Kit

The Capillary Column Installation Kit contains:

- Diamond-tipped pencil
- 20x magnifier
- Ferrule removal tool
- Septum removal tool
- Refillable 2 oz bottle of Snoop

Description	Part No.
Capillary Column Installation Kit with diamond-tipped cutting pencil	430-2000



Column installation kit, 430-2000

Capillary Column Rinse Kit

This kit makes solvent rinsing easy! Solvent rinsing removes many contaminants that accumulate in columns. The contaminants are removed by passing solvents through the column. Only bonded and cross-linked phase columns should be rinsed, or permanent damage to the column will result.

Description	Part No.
Capillary Column Rinse Kit	430-3000



Column rinse kit, 430-3000

TIPS & TOOLS

View the latest Agilent J&W GC column focused applications, products and educational resources at **www.agilent.com/chem/mygccolumns**





Fused silica tubing cutters

Fused Silica Tubing Cutters

We offer a conveniently designed, pencil-shaped tool and a ceramic wafer that allow you to make clean and easy cuts in fused silica, glass and aluminum-clad capillary columns.

Description	Part No.
Diamond-tipped column cutting pencil	420-1000
Ceramic wafer column cutter, 4/pk	5181-8836
Column cutter with rotating diamond blade	5183-4620
Replacement diamond blade (for 5183-4620)	5183-4621



Column cutting tool, 5183-4620

Column Baskets and Hangers

Description	Part No.
13 cm, 5 in basket for 6850 capillary columns	19091-80060
Column hanger for 5 in basket	G2630-80800
Column hanger clip kit for 7 in basket	G1530-61580
Column hanger for 6890, 5890, 5880A	1460-1914

Miscellaneous Tools

Ferrule Tools

Remove ferrules stuck inside fittings. Screw the stainless steel ferrule tool into the ferrule and pull it out. Use the smaller capillary ferrule tool for capillary column ferrules (0.32 mm id column and smaller). The megabore ferrule tool is used for megabore ferrules. The liner tool can be used to remove polyimide and tubing from inside a megabore liner. The column ferrule installation tool positions a ferrule onto a capillary column for proper installation.



Capillary and megabore ferrule tool

Description	Part No.
Capillary ferrule tool	RFT-2500
Megabore ferrule tool	RFT-5300
Column ferrule installation tool	19251-80680
MS interface column installation tool	G1099-20030

20x Magnifier

Examine column ends for proper cuts. Jagged, rough, or non-perpendicular cuts negatively affect chromatographic performance.

Description	Part No.
20x Magnifier	430-1020

Microprobes

Hardened stainless steel probes remove septum and ferrule pieces stuck in fittings. Five different styles give you all of the angles necessary for getting into those hard-to-reach places.

Description	Part No.
Microprobes	RMP-5005



Magnifier, mirror, microprobes

Mirror

Inspect injection ports, the inside of fittings, and other hard-to-reach places.

Description	Part No.
Mirror	707-0027



Snoop

Snoop

Leak test most pressurized gas systems. We recommend that leak detecting solutions be used with care where there is any possibility of the fluid being aspirated into gas flow streams supplying the column or detector. This squeezable bottle comes with a "Snooper Tube" extendable up to 12 in (30 cm). Electronic leak detectors are preferred. In their absence, a volatile nonreactive solvent like isopropanol may be used. Use caution to avoid aspiration of materials such as Snoop into the column.

Description	Part No.
Snoop, 8 oz (236 mL) bottle	9300-0311
Snoop, 1 gallon bottle	460-1002



Injection port cleaning kit, 480-0003

Injection Port Cleaning Kit

If changing the liner and trimming the column does not remove contamination from your injection port, you probably need to clean and flush your injection port. Three stainless steel brushes and a scraper are the ideal tools for removing sample residue and septum particles. The stainless steel brushes have diameters of 5 mm, 1/4 in, and 3/8 in.

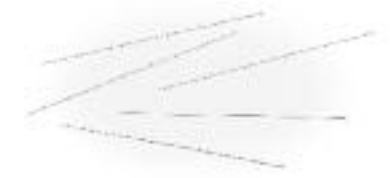
Description	Part No.
Injection Port Cleaning Kit	480-0003



Septum tool with knurled handle, 450-1000

Miscellaneous Injection Port Tools

Description	Part No.
Septum tool, knurled handle	450-1000
Ferrule removal tool	440-1000
Capillary inlet cleaning wires, 5/pk	5180-4153
Cotton swabs, 100/pk	5080-5400



Capillary inlet cleaning wires, 5180-4153

FID Cleaning Kit

This easy-to-use maintenance kit improves sensitivity, reduces noise, and decreases detector spiking.

Description	Part No.
FID cleaning kit	9301-0985



FID cleaning kit, 9301-0985

12-Piece File Set

This 12-piece file set scores glass, removes burrs from metal tubing, and cleans threads. The files are 5-1/2 in long.

Description	Part No.
12-Piece File Set	RSF-1200



3200P standard pH meter, G4383A

User-friendly control panel simplifies your measurements and ensures accurate results, regardless of technical knowledge or skill level.

Every Agilent Meter is backed by our 3-year replacement guarantee.



3200P standard pH meter, G4383A

Electrochemistry Meters, Electrodes, and Solutions

Analyst-friendly features optimize your measurements and ensure accuracy

Your rapidly changing work environment demands speed and productivity without jeopardizing results. That is why all Agilent meters and electrodes are designed for easy operation, even by non-technical users, while still producing the most reliable readings.

- Unique electrode reference system, backed by our qualified material and manufacturing process, delivers fast, reliable response during meter operation
- Rugged design stands up to the toughest indoor and outdoor conditions
- High-endurance protective glass and multi-layer composite electrodes prevent breakage caused by frequent use, even in demanding environments

3200P pH Meter

3200P pH Meter Specifications*

Specifications		3200P
Range	pH	-2.000-20.000 pH
	mV	-1999.9-1999.9 mV
	Temperature	-5.0-110.0 °C
Resolution	pH	0.1/0.01/0.001 pH
	mV	0.1 mV
	Temperature	0.1 °C
Accuracy	pH	±0.002 pH
	mV	±0.03% FS
	Temperature	±0.1 °C
Temperature compensation		Manual/Auto -5.0-110.0 °C
Power		Universal AC power adapter 100 V-240 V, 50/60 Hz**
Dimension (L×D×H) [mm]		190×190×105
Weight (kg)		1

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters

**Shipped with meter

3200M Multi-parameter Meter

Simultaneously measure pH/pX, ion concentration, ion electrode potential (mV), conductivity (TDS, salinity), DO (concentration and saturation), temperature, and more.



3200M multi-parameter meter, G4387A

3200M Multi-parameter Analyzer Specifications*

Specifications		3200M
Range	pH	-2.000-20.000 pH
	pX	0.000-14.000 pX
	mV	-1999.9-1999.9 mV
	Conductivity	0.000 µS/cm-2000 mS/cm
	Resistivity	5.00 Ω.cm-100.0 MΩ.cm
	TDS	0.000 mg/L-1000 g/L
	Salinity	0.00%-8.00% (Chinese version) 0.0-80.0 g/L (English version)
	DO	0-45.00 mg/L
	DO saturation	0.0-300.0%
	Ion concentration	0-19990
		-5.0-110.0 °C
	Temperature	-5.0-110.0 °C
Resolution	pH/pX	0.1/0.01/0.001 pH/pX
	mV	0.1 mV
	Ion concentration	Four effective digits (Scientific notation)
	DO	0.01 mg/L
	DO saturation	0.1%
	Temperature	0.1 °C

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters

(Continued)



3200M Multi-parameter Analyzer Specifications*

Specifications		3200M
Accuracy	pH/pX	±0.002 pH/pX:pXII:± 0.005 pX
	mV	±0.03% FS
	Ion concentration	±0.3%
	Conductivity	±0.5% FS
	Resistivity	±0.5% FS
	TDS	±0.5% FS
	Salinity	±0.1%
	DO	±0.10 mg/L
	DO saturation	±2.0%
	Temperature	±0.1 °C
Power		Universal AC power adapter 100 V-240 V, 50/60 Hz**
Dimensions (LxDxH) [mm]		190×190×105
Weight (kg)	1	1

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters

**Shipped with meter

Cell Constant and Correspondent Measuring Range

Cell constant (K) (cm^{-1})	0.001	0.01	0.1	1.0	10.0	100
Measuring range for solutions	0.000 µS/cm-1.999 µS/cm	0.000 µS/cm-19.99 µS/cm	0.200 µS/cm-199.9 µS/cm	2.00 µS/cm-19.99 mS/cm	20.0 µS/cm-199.9 mS/cm	200 mS/cm-2000 mS/cm

3200I Ion Meter

When matched with an ion-selective electrode and reference electrode, ion meters can measure corresponding electrode potential (mv), pX, and ion concentration.



3200I ion meter, G4386A

3200I Ion Meter Specifications*

Specifications		3200I
Range	pH	-2.000-20.000 pH
	pX	0.000-14.000 pX
	mV	-1999.9-1999.9 mV
	Ion concentration	0-19990
	Concentration unit	mol/L, mmol/L, g/L, mg/L, µg/L (Chinese version) mol/L, mg/L, %, mg/L, µg/L (English version)
	Temperature	-5.0-110.0 °C
Resolution	pX	0.1/0.01/0.001 pH/pX
	mV	0.1 mV
	Ion concentration	Four effective digit (Scientific notation)
	Temperature	0.1 °C
Accuracy	pX	±0.002 pH/pX:pXII: ±0.005 pX
	mV	±0.03% FS
	Ion concentration	±0.3%
	Temperature	±0.1 °C
Power		Universal AC power adapter 100 V-240 V, 50/60 Hz**
Dimension (L×D×H) [mm]		190x190x105
Weight (kg)		1

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters

**Shipped with meter



3200C conductivity meter, G4384A

3200C Conductivity Meter

Measure conductivity, resistivity, total dissolved solid (TDS), salinity, and present solution temperature.

3200C Conductivity Meter Specifications*

Specifications		3200C
Range	Conductivity	0.000 µS/cm-2000 mS/cm
	Resistivity	5.00 Ω.cm-100.0 MΩ.cm
	TDS	0.000 mg/L-1000 g/L
	Salinity	0.00%-8.00% (Chinese version) 0.0-80.0 g/L (English version)
	Temperature	-5.0-110.0 °C
Resolution	Conductivity	Four effective digital, and the lowest level is 0.001 µS/cm
	Temperature	0.1 °C
Accuracy	Conductivity	±0.5% FS
	Resistivity	±0.5% FS
	TDS	±0.5% FS
	Salinity	±0.1%
	Temperature	±0.1 °C
Cell constant		0.001, 0.01, 0.1, 1.0, 10, 100 cm^{-1}
Compensation range of cell constant		±20% of Standard constant value
Temperature compensation range		0-50.0 °C
Conductivity and TDS standard temperature		25.0 °C
Salinity standard temperature		18.0 °C
Power		Universal AC power adapter 100 V-240 V, 50/60 Hz**
Dimension (L×D×H) [mm]		190×190×105
Weight (kg)		1

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters

**Shipped with meter

3200D Dissolved Oxygen Meter

Membrane electrode measures DO concentration and saturation of water solutions.



3200D dissolved oxygen meter, G4385A

3200D Dissolved Oxygen Meter Specifications*		
Specifications		**3200D**
Range	DO	0-45.00 mg/L
	DO saturation	0.0-300.0%
	Temperature	-5.0-110.0 °C
Resolution	DO	0.01 mg/L
	DO saturation	0.1%
	Temperature	0.1 °C
Accuracy	DO	±0.10 mg/L
	DO saturation	±2.0%
	Temperature	±0.1 °C
Temperature compensation		Automatic: 0.0-45.0 °C
Standard temperature		20±1 °C
Salinity calibration		0.0-50.0 g/L
Barometric pressure calibration		60.0-110.0 kPa
Power		Universal AC power adapter 100 V-240 V, 50/60 Hz**
Dimension (L×D×H) [mm]		190×190×105
Weight (kg)		1

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters

**Shipped with meter

Agilent Electrochemistry Meters: rigorously evaluated for durability and safety

Our environmental test specifications ensure that Agilent Electrochemistry Meters will be rugged performers in your lab, just like Agilent columns and instruments.



Environmental Test Specifications	
Operating ambient temperature	0-50 °C
Operating relative humidity	5-95%, no condensation
Storage temperature	Meter: -40-70 °C; Electrode: -15-55 °C
Vibration and shock	Instrument test and package test

Module Specifications

Type/Model	Key Industries/Applications	Measurements	Details
Standard pH Meter (3200P)	• Pharmaceutical • Food safety • Biological agriculture • Environmental • Water quality	• Acid and alkali levels • Electrode potential (mV) values of relevant ions	• G4383A for 3200P meter only • G4391A for basic package with electrode, electrode holder and buffer • G4392A for kit with triode combination electrode, electrode holder and buffer
Conductivity Meter (3200C)	• Environmental • Petrochemical • Food safety • Biological	• Conductivity • Resistivity • Total Dissolved Solids (TDS) • Salinity • Present solution temperature value	• G4384A for 3200C meter only • G4393A for package with 3200C meter, electrode and electrode holder
Dissolved Oxygen (DO) Meter (3200D)	• Environmental • Sewage disposal • Tap water source monitoring • Food safety • Aquaculture • Beverage production • Biological agriculture • Scientific research	• Dissolved oxygen concentration • Saturation of water solution	• G4385A for 3200D meter only • G4395A for package with 3200D meter, electrode and electrode holder
Ion Meter (3200I)	• Food safety • Biological agriculture • Petrochemical • Environmental protection • Scientific research • Disease control	• Electrode potential (mV) values • pX value and ion concentration	• G4396A for 3200I meter only • G4396A for package with 3200I meter, pH electrode, electrode holder and buffer • G4397A for fluoride ion package with 3200I meter, fluoride ion electrode and electrode holder and buffer
Multi-Parameter Meter (3200M)	• Water quality • Disease control • Environmental protection • Biological agriculture • Scientific research	• Simultaneously measures pH/pX, ion concentration, ion electrode potential (mV), conductivity, Total Dissolved Solids (TDS), salinity, dissolved oxygen, and temperature	• G4378A for 3200M meter • G4398A for 3200M meter, electrode, electrode holder and buffer

Module specifications

Agilent provides modules to fit your most challenging applications.

Module	Specifications	Benefits
3200P 3200C 3200D 3200I 3200M	Temperature: -5.0-110.0 °C	Compatible with a wide temperature range
	Measuring mode: continuous/timed reading/auto-lock	Lets you perform a variety of measurements with one meter
	Dot-matrix LCD	Fast interpretation of results Easy for novices to use
	Numeric operating keys	Simplified operation for all skill levels
3200P 3200I 3200M	Automatic identification for buffers	Choice of NIST and GB buffers
	Impedance: $3x10^{12}$ Ω	Choose from a wider range of electrodes for your sample
	Accuracy of DO: ±0.10 mg/L	Precise measurements and excellent temperature compensation provide outstanding DO accuracy
3200I 3200M	Provides Ion measurement modes for H+, Ag+, Na+, K+ NH_4+, Cl-, F-, NO_3-, BF_4-, CN-, Cu^2+, Pb^2+ and Ca^2+	Easily exchanged electrodes (or ISEs) allow flexible multi-ion analysis
	Different units can be switched freely	Automatic functions optimize measurements and ensure accurate results
	Measuring mode in ion concentration: direct reading, "Standard" addition, sample addition, GRAN plot addition	Convenience



3200EA electrode holder, G4389A

Wide range of Agilent electrodes help meet the needs of any application

Unlike single-layer breathable membrane electrodes, Agilent electrodes are made from multi-layered composite materials for extra durability. They also feature a specific barrier to protect the glass bubble against breakage.

What's more, the unique reference system on every Agilent electrode is backed by our uncompromising materials quality and manufacturing process – giving you fast response and high accuracy.

The electrodes shown here use universal connections, so you can use them interchangeably on Orion 3 star, 4 star meter, Hanna HI2221, and Mettler FE20pH.



P3211 pH combination electrode, 5190-3988



P3212 pH combination electrode, 5190-3989



P3214 pH combination electrode, 5190-3993



P3213 pH combination electrode, 5190-3992



P3311 pH triode combination electrode, 5190-3990



P3111 pH electrode, 5190-3991

pH P3211	pH P3212	pH P3214	pH P3213	pH P3311	pH P3111
• Combination electrode with glass body • Refillable • BNC connector • Glass bulb measuring tip	• Combination electrode with PC body • Not refillable • BNC connector • Glass bulb measuring tip	• Combination electrode with ABS body • Not refillable • BNC connector • Spear-tipped measuring tip	• Combination electrode with PC body • Refillable • BNC connector • Flat measuring tip	• Combination electrode with glass body • Refillable • BNC and miniDIN4 connector • Glass bulb measuring tip	• Electrode with glass body • Not refillable • BNC connector • Glass bulb measuring tip

Recommended uses*

Industry	Sample	pH P3211	pH P3212	pH P3214	pH P3213	pH P3311	pH P3111
Drinks and dairy products	Milk	✓	✓			✓	✓
	Soy Sauce	✓	✓			✓	✓
	Beer	✓	✓			✓	✓
	Soft drinks (ice black tea)	✓	✓			✓	✓
Food and agricultural products	Compound fertilizer		✓				
	Jam						✓
	Meat			✓			
	Vegetables	✓	✓			✓	✓
	Waste	✓				✓	
Chemical reagents and electrolytes	Electroplate liquid	✓				✓	✓
Coatings, dyes, and latex	Suspended solid (soil)		✓				
Water	Tap water	✓	✓			✓	
	Drinking water (barreled water)						✓ (Static)
	Distilled water						✓ (Sealed)
Drug or biological samples	Protein sample/protein powder	✓	✓			✓	
Surface measurement	Droplet size of the sample				✓		
	Textiles				✓		
Cosmetics and viscous samples	Shampoo	✓				✓	✓
	Cosmetic paste	✓				✓	✓

*Laboratory test; for reference only



ORP8211 ORP electrode, 5190-3999

Recommended uses*	
ORP8211	Oxygen Reduction Potential (ORP) measurement of: • Conventional water • Wastewater • Electroplate liquid • Biological samples
I9111	• Fluoride water samples • Surface water • Drinking water • Industrial effluent
I9121	• Ammonium/ammonia-containing water samples • River and lake water • Tap water • Environmental protection/sewage
I9131	• Conventional sodium water samples • Water treatment • Power plant • Industrial process control

*Laboratory test; for reference only

pH Electrode Specifications

Model	P3211	P3212	P3214	P3213	P3311	P3111
Measurement range	0-14 pH	0-14 pH	0-14 pH	0-14 pH	0-14 pH	0-14 pH
PTS	≥ 97%	≥ 97%	≥ 97%	≥ 97%	≥ 97%	≥ 98.5%
Response time	30s	30s	60s	60s	30s	60s
Temperature accuracy	–	–	–	–	± 0.5 °C	–
Electrode impedance	≤ 300 MΩ	≤ 300 MΩ	≤ 500 MΩ	≤ 500 MΩ	≤ 300 MΩ	≤250 MΩ
Reference type	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl	Ag/AgCl	–
Liquid junction material	Ceramic	Porous polymer	Fiber	Fiber	Ceramic	–



ORP8211 ORP electrode,
5190-3999



I9111 Fluoride combination ISE,
5190-4002



I9121 Ammonia combination ISE,
5190-4004



I9131 Sodium combination ISE,
5190-4005

ORP8211 Oxidation Reduction Potential	I9111 Fluoride Combination ISE	I9121 Ammonia Combination ISE	I9131 Sodium Combination ISE
Combination electrode with glass body Refillable BNC connector	Combination electrode with PC body Refillable BNC connector	Combination electrode with PMMA body Refillable BNC connector	Combination electrode with glass body Refillable BNC connector

Ion Selective Electrode Specifications	I9111 Fluoride Combination ISE	I9121 Ammonia Combination ISE	I9131 Sodium Combination ISE
Concentration range	Saturation: -10^{-6} mol/L Saturation: -0.02 mg/L	(10^{-1}- 10^{-6}) mol/L	Saturation: -10^{-6} mol/L
Slope (25 °C)	≥ 56 (10^{-5}-10^{-1}) mol/L	≥ 55 (10^{-5}-10^{-2}) mol/L	≥ 56 (10^{-5}-10^{-1}) mol/L
Response time	30s	180s	180s
Internal impedance	≤ 1 MΩ	≤ 1500 MΩ	≤ 250 MΩ
Reference type	Ag/AgCl	Ag/AgCl	Ag/AgCl

ORP8211 Oxidation Reduction Potential Electrode Specifications	
Measurement range	± 1999 mV
Potential accuracy	263 ± 10 mV
Reference type	Ag/AgCl
Liquid junction material	Ceramic

R8111 Reference Electrode Specifications	
Potential accuracy	± 4 mV
Internal impedance	≤ 1 kΩ
Reference type	Ag/AgCl
Liquid junction material	Ceramic
Reference filling solution	AgCl, 3 mol/L KCl

T7111 Automatic Temperature Compensation Probe Specifications	
Measuring range	0-100 °C
Accuracy	± 0.3 °C 0-60 °C ± 1.0 °C 60-100 °C

D6111 Dissolved Oxygen Probe Specifications	
Measuring range	0-20 mg/L
Zero oxygen current	1% FS (5 min)
Response time (90%)	30 s
Temperature accuracy	± 0.5 °C

Conductivity Probe Specifications	C5111	C5112	C5113
Cell constant	1.0 ± 0.2	1.0 ± 0.2	0.1 ± 0.02
Measuring range	2-19990 µS/cm	2-3000 µS/cm	0.2-199.9 µS/cm
Accuracy	± 0.6%	± 0.6%	± 0.6%

All-in-one Packages

Description	Recommended Use	Part No.
Agilent 3200P Benchtop pH Meter Basic Package Includes:	Stable, accurate measurement of organic solution samples in fields such as scientific research, education, and chemical analysis	**G4391A**
Agilent 3200P benchtop pH meter		G4383A
Agilent 3200EA electrode holder		G4389A
P3211 pH combination electrode, includes 30 mL reference solution		5190-3988
T7111 ATC probe		5190-3998
pH buffer solutions, 4.01, 7.00, 10.01, NIST traceable, 250 mL, 3/pk		5190-0533*
pH buffer solutions, 4.00, 6.86, 9.18, GB traceable, 250 mL, 3/pk		5190-0534**
Agilent 3200P Benchtop pH Meter Package with 3-in-1 Electrode Includes:	Ordinary physical and chemical analysis in fields such as conventional water quality, education, and chemical analysis	**G4392A**
Agilent 3200P benchtop pH meter		G4383A
Agilent 3200EA electrode holder		G4389A
P3311 pH triode combination electrode, includes 30 mL reference solution		5190-3990
pH buffer solutions, 4.01, 7.00, 10.01, NIST traceable, 250 mL, 3/pk		5190-0533*
pH buffer solutions, 4.00, 6.86, 9.18, GB traceable, 250 mL, 3/pk		5190-0534**
Agilent 3200C Benchtop Conductivity Meter Basic Package Includes:	Best for applications such as conventional surface water, drinking water, environmental water testing, and process analysis	**G4393A**
Agilent 3200C benchtop conductivity meter		G4384A
Agilent 3200EA electrode holder		G4389A
C5111 conductivity probe		5190-3994
T7111 ATC probe		5190-3998
Agilent 3200C Benchtop Conductivity Meter Package for Pure Water Analysis Includes:	Low-conductivity sample measurement of distilled water, boiler water, and pure water in fields such as energy, pharmacy, biology, and food safety	**G4394A**
Agilent 3200C benchtop conductivity meter		G4384A
Agilent 3200EA electrode holder		G4389A
C5113 conductivity probe		5190-3996
T7111 ATC probe		5190-3998

*Default, if not specified otherwise

**For China customers only

(Continued)

All-in-one Packages

Description	Recommended Use	Part No.
Agilent 3200D Benchtop Dissolved Oxygen Meter Package Includes:	DO measurement of conventional water in applications such as environmental, monitoring, aquaculture, sewage treatment, drinking water and research	**G4395A**
Agilent 3200D benchtop dissolved oxygen meter		G4385A
Agilent 3200EA electrode holder		G4389A
D6111 DO probe, 30 mL bottle of DO filling solution		5190-3997
Agilent 3200I Benchtop Ion Meter Basic Package Includes:	pH measurement and ion analysis in fields such as scientific research, process analysis, biochemistry, and pharmacy (different ion, different electrode)	**G4396A**
Agilent 3200I benchtop ion meter		G4386A
Agilent 3200EA electrode holder		G4389A
T7111 ATC probe		5190-3998
pH buffer solutions, 4.01, 7.00, 10.01, NIST traceable, 250 mL, 3/pk		5190-0533*
pH buffer solutions, 4.00, 6.86, 9.18, GB traceable, 250 mL, 3/pk		5190-0534**
P3211 pH combination electrode, includes 30 mL reference solution		5190-3988
Agilent 3200I Benchtop Fluoride Ion Meter Package Includes:	Measurement of samples such as fluoride water, surface water, drinking water, and industrial effluent	**G4397A**
Agilent 3200I benchtop ion meter		G4386A
Agilent 3200EA electrode holder		G4389A
T7111 ATC probe		5190-3998
I9111 fluoride combination ISE, includes 30 mL reference solution		5190-4002
Agilent 3200M Benchtop Multi-Parameter Analyzer Package Includes:	pH, conductivity, and DO measurement; ion analysis in a wide range of fields (different ion, different electrode)	**G4398A**
Agilent 3200M benchtop multi-parameter analyzer		G4387A
Agilent 3200EA electrode holder		G4389A
P3211 pH combination electrode, includes 30 mL reference solution		5190-3988
T7111 ATC probe		5190-3998
pH buffer solutions, 4.01, 7.00, 10.01, NIST traceable, 250 mL, 3/pk		5190-0533*
pH buffer solutions, 4.00, 6.86, 9.18, GB traceable, 250 mL, 3/pk		5190-0534**
D6111 DO probe, 30 mL bottle of DO filling solution		5190-3997
C5111 conductivity probe		5190-3994

*Default, if not specified otherwise

**For China customers only

Electrochemistry Meters*

Description	Part No.
Agilent 3200P benchtop pH meter	G4383A
Agilent 3200C benchtop conductivity meter	G4384A
Agilent 3200D benchtop dissolved oxygen meter	G4385A
Agilent 3200I benchtop ion meter	G4386A
Agilent 3200M benchtop multi-parameter analyzer	G4387A
Accessories	
Agilent 3200SA stirrer	G4388A
Agilent 3200EA electrode holder	G4389A

*EC Print software for easy and direct printing and EC Firmware software are available for free download at www.agilent.com/chem/phmeters



3200SA stirrer, G4388A



P3211 pH combination electrode, 5190-3988



P3212 pH combination electrode, 5190-3989



P3311 pH triode combination electrode, 5190-3990



P3111 pH electrode, 5190-3991



P3213 pH combination electrode, 5190-3992



P3214 pH combination electrode, 5190-3993



C5111 Conductivity probe, 5190-3994



C5112 Conductivity probe, 5190-3995



C5113 Conductivity probe, 5190-3996



D6111 DO probe, 5190-3997



7T111 ATC probe, 5190-3998



ORP8211 ORP electrode, 5190-3999



R8111 Reference electrode, 5190-4003



I9111 Fluoride combination ISE, 5190-4002



I9121 Ammonia combination ISE, 5190-4004



I9131 Sodium combination ISE, 5190-4005

Electrodes*

Description	Kit Contents	Part No.
P3211 pH combination electrode	Includes 30 mL reference solution	5190-3988
P3212 pH combination electrode		5190-3989
P3311 pH triode combination electrode	Includes 30 mL reference solution	5190-3990
P3111 pH electrode		5190-3991
P3213 pH combination electrode	Includes 30 mL reference solution	5190-3992
P3214 pH combination electrode		5190-3993
C5111 conductivity probe		5190-3994
C5112 conductivity probe		5190-3995
C5113 conductivity probe		5190-3996
D6111 DO probe	Includes 30 mL DO Filling Solution	5190-3997
T7111 ATC probe		5190-3998
ORP8211 ORP electrode	Includes 30 mL reference solution	5190-3999
R8111 reference electrode	Includes 30 mL reference solution	5190-4003
I9111 fluoride combination ISE	Includes 30 mL reference solution	5190-4002
I9121 ammonia combination ISE	Includes 30 mL reference solution	5190-4004
I9131 sodium combination ISE	Includes 30 mL reference solution	5190-4005

*All electrodes ship with a certificate of conformance and the certificate is also available online in the literature library

Chemicals*

Description	Amount	Part No.
pH buffer solutions, 4.01, 7.00, 10.01, NIST traceable	3 x 250 mL	5190-0533
pH buffer solutions, 4.00, 6.86, 9.18, GB traceable	3 x 250 mL	5190-0534
pH buffer, 4.01	3 x 250 mL	5190-0535
pH buffer, 10.01	3 x 250 mL	5190-0536
pH buffer, 7.00	3 x 250 mL	5190-0537
pH buffer, 4.00	3 x 250 mL	5190-0538
pH buffer, 6.86	3 x 250 mL	5190-0539
pH buffer, 9.18	3 x 250 mL	5190-0540
Ammonia electrode membrane, 5 pieces		5190-0543
Ammonia Reference Solution	3 x 30 mL	5190-0544
Reference solution, pH	3 x 250 mL	5190-0545
Sodium ISE Reference Solution	3 x 30 mL	5190-0546
DO filling solution	3 x 30 mL	5190-0547
DO membrane sleeve, 3 pieces	3 x 30 mL	5190-0548
Accessories		
Power adapter, E15WCP1-090100SPA		5185-8389
B620 stirring bar		G4388-27000
BNC-50J short circuit plug		G4383-40000
ATC temperature diagnostic tool		5185-8390
Conductivity diagnostic tool		5185-8391

*Certificates of analysis ship with this product and are also available online in the literature library.



Agilent reference and filling solutions



Ammonia electrode membrane, 5190-0543



Power adapter, 5185-8389



B620 stirring bar, G4388-27000



BNC-50J short circuit plug, G4383-40000



ATC temperature diagnostic tool, 5185-8390



Conductivity diagnostic tool, 5185-8391



Integrators, Integrator Supplies and Cables

Information generation and presentation have never been more important. Agilent understands that data handling supplies are essential. We provide a convenient way to purchase ink cartridges and integrator supplies at the same time as other laboratory supplies so you never run out at a crucial moment.



Ink cartridge, 5181-1220

Integrator Cartridges and Printheads

Description	Part No.
Ink cartridge, Agilent 3397A, 3396 Series III, 3396A and B, 3395, 3394	5181-1220
Printhead for 3388A and 5880A	19350-60540

Integrator Paper and Supplies

Paper and Supplies for Agilent 3397A, 3396 Series II, and 3396A/B/95/94

Description	Unit	Part No.
Z-fold paper, sequentially numbered, 8.5 x 11 in, 500 sheets/pk, Inkjet	5/pk	5062-3561
Perforated paper, 8.5 x 11 in rolls, Inkjet	4/pk	5181-1219
Perforated paper, sequentially numbered, 8.5 x 11 in rolls, Inkjet	4/pk	5183-2009
Perforated paper, A4 size rolls, Inkjet	4/pk	5181-1255
Replacement paper roll rod		03394-20500
Replacement paper roll brackets	2/pk	03396-40050

Thermal Paper for Agilent 3390/92/93

Description	Unit	Part No.
Thermal printing paper, blue print, 4.209 in (106.9806 mm) wide x 400 ft	4 rolls/pk	5080-8800

Thermal Paper for Agilent 338X/5830/3370

Description	Unit	Part No.
Z-fold paper, black print, 8.5 in wide	8 pk/box	9270-0658

Cables

3396 Series III Cable Sets

Description	Part No.
Series III Integrator General Purpose cables, signal/remote cable pair includes 35900-60630 and 03396-61031	G2108A
INET interface for integrators, provides INET communications and dual-channel output, includes 1 INET cable	G1553A

Cables to Connect 3397A or 3396/95 Series III Integrator

	Cable Type		
Instrument	**Analog**	**Remote**	**Sample**
6890 Series GC (non-INET)	G1530-60570	03396-61010	
5890 GC (non-INET)	35900-60610		
1100/1200 Series LC	35900-60750	03396-61010	03396-60560
General Purpose	35900-60630	03394-60540	

Cables to Connect 3394/95A and 3396A/B Integrator

	Cable Type	
Instrument	**Analog**	**Remote**
6890 Series GC	G1530-60570	
	03396-61020	03396-61010
5890 GC	35900-60610	
General Purpose	35900-60630	
	35900-60900	35900-60920

HPIB and GPIB Cables

Description	Part No.
PCI GPIB Card for Win95/98/NT (82350A/B)	G1680-63715
HPIB Cable 2 m (10833B)	10833B-2310
General Purpose Cable GPIO, open end	G1103-61611
HPIB Cable, 8 m (10833G)	10833G-2310
Cable, 6890 to PC 9F/9F RS232	G1530-60600
Crossover Ethertwist Cable, 10 ft	5183-4649
Adapter, extends GPIB connector (10834A)	10834A-2310

Instrument Interface Cables

Description	Part No.
Signal cable, general purpose analog output cable assembly, spade lugs/6 pins	G1530-60560
External event control, cable, 8 pins/spade lugs	G1530-60590
Remote start cable for general use with lug	35900-60670
6890 to PC via RS 232-C, 9 female/25 male user card cable	G1530-60610
General purpose binary-coded decimals cable with spade lugs	G1530-60630
Automatic liquid sampler; remote start/stop cable, 2 m 9 male/9 female	G1530-60930
HPIL cable, 5 m	82167-60003
Remote Y Cable, G1512/5890A to 3396C	G1512-60530
Remote Cable to 5890	35900-60700

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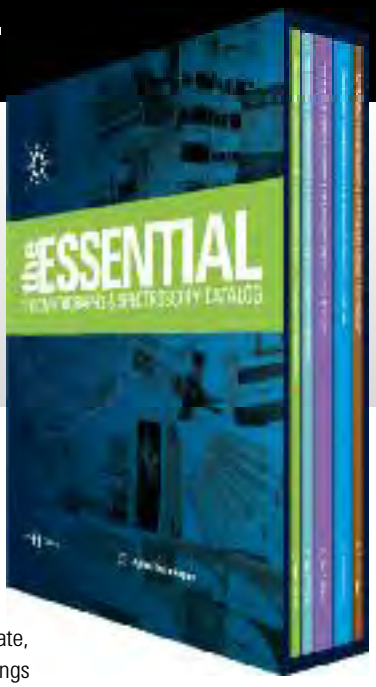
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- **LC column choices** that deliver the sensitivity and reliability you need for demanding applications
- **Cutting-edge sample preparation products** that promote reliable extraction and concentration
- **Fresh atomic and molecular spectroscopy ideas** for identifying and confirming targets and unknowns

Longtime Agilent customers have experienced our commitment firsthand. And now, we look forward to demonstrating how Agilent's approach to relentless innovation can work to your advantage, too.

CHEMICAL ANALYSIS SOLUTIONS



Food

From high-volume screening of vegetables for large numbers of pesticides to rapid identification of pathogens, Agilent understands the analytical needs of food producers, shippers, and regulators. When a new toxin appears, we deploy substantial resources to quickly help customers develop robust and reliable methods. Agilent's leading separations, mass spectrometry, and spectroscopy solutions are emerging as valuable food testing techniques.



Environmental

Agilent offers more than 40 years of environmental testing and regulatory expertise. We help government and private labs with the full range of assays, from routine testing of soils for heavy metals to detection of pharmaceuticals in groundwater, in concentrations down to parts per trillion.



Energy and Fuels

Agilent collaborates closely with process industry customers to offer analytical systems that meet their needs for separation, detection, throughput, and support. We'll even preconfigure custom or standard analyzers so they arrive at the lab ready-to-go. Agilent's expertise in both chemical analysis and life science is a powerful combination for researching and producing biofuels, including a wide range of analytical techniques for fatty acid methyl esters (FAMEs). Our newly-expanded portfolio also offers powerful tools for developing and producing photovoltaic films and solar panels.



Forensics

Because the careers of world class athletes and many other individuals hinge on drug testing, it's critical that those doing the testing have the highest level of confidence in the results. Forensics analysts worldwide have grown to depend on Agilent tools for accuracy, reliability, and speed in this high stakes, high-throughput field. Our best selling GC, GC/MS and popular LC and LC/MS are workhorses in forensics labs.



Traditional Lab Informatics

The ways labs generate and store data profoundly affect their efficiency. Agilent offers a rich, integrated suite of software products built on a set of customer-driven architectural values with the Agilent OpenLAB Laboratory Software Suite. OpenLAB delivers superior performance, open systems integration and investment protection. Our commitment is to deliver more value across each step in the life cycle of scientific data – from data collection and analysis to interpretation and management.



Materials Science

Agilent offers a newly expanded portfolio of instruments used for the research, manufacturing and testing of advanced materials, from precision optics to pulp, paper and polymers. Tools for chromatography, atomic absorption spectroscopy, molecular spectroscopy, X-ray crystallography, and nuclear magnetic resonance all support continuous progress in materials science.

LIFE SCIENCE SOLUTIONS



Biopharmaceutical

As "multi-omics" studies gain momentum in the search for new therapeutics, Agilent is uniquely positioned to provide the instruments, reagents, and powerful software needed for performing experiments in multiple disciplines and combining the massive amounts of data into biological insight.



Pharmaceutical

Drug manufacturing requires the accuracy, sensitivity and high throughput of other analytical applications, along with the demands of regulatory record-keeping and validation requirements. Agilent provides a potent combination of rugged, high-throughput tools and unmatched compliance services. Agilent now offers the market-leading family of dissolution apparatus and sampling systems that pair perfectly with our HPLC and UV systems.



Proteomics

Research into how large sets of proteins affect the health of an organism requires special sets of analytical tools. Agilent has built a formidable arsenal of liquid chromatograph/mass spectrometers, bioinformatics systems, multiple affinity protein removal columns, and OFFGEL electrophoresis for protein identification and protein biomarker discovery. Accurate-Mass mass spectrometry and the microfluidic HPLC-Chip/MS are two Agilent innovations speeding the work of proteomics researchers around the globe.



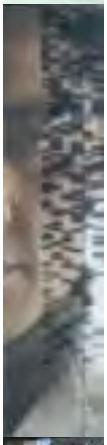
Metabolomics

Collections of small molecules are increasingly being seen as rich sources of biomarkers, but studying metabolites presents many challenges. The need for speed, accuracy, and powerful interpretation capabilities in looking at chemical profile snapshots is underscored because molecules are constantly entering, leaving or changing within the metabolome. Agilent's GC, LC, NMR and MS portfolios, along with our excellent bioinformatics offerings, user-customizable METLIN metabolite database for LC/MS, and the industry's first commercial GC/MS retention time locked metabolite library align well with needs of metabolomics researchers.



Genomics

Agilent is a global leader in microarrays, scanners, and reagents used in a wide variety of genomic-based disease research experiments. Our SureSelect Target Enrichment System dominates the category, streamlining next generation sequencing studies worldwide. Agilent offers a wide range of catalog microarrays and a highly-developed capability to produce custom arrays featuring ink jet-based SurePrint fabrication and the eArray on-line design tool. All Agilent microarrays feature highly sensitive, selective 60-mer probes. With as many as eight arrays printed on a standard 1 x 3 in. slide, the cost per experiment becomes very affordable.



Life Science Informatics

Mirroring its extensive instrument portfolio, Agilent offers the industry's most extensive suite of bioinformatics software, helping users derive knowledge from complex genomic, proteomic, metabolomic and other biological data. This includes DNA Analytics for analyzing CGH, ChIP and methylation microarray data. The GeneSpring suite includes informatics software for microarray-based gene expression data, genotyping data, and GeneSpring MS, which are useful for analyzing mass spec data from proteomics and metabolomics experiments and comparing complex datasets to explore biological questions from multiple perspectives.



Lab Automation

To meet the skyrocketing demand for more throughput and automation, Agilent has substantially expanded its lab automation offerings. The Agilent line of liquid handlers and microplate processors are designed to streamline high-volume life science workflows. Agilent is also continually upgrading its advanced autosamplers for LC, GC, LC/MS and GC/MS, adding functionality and speed to reflect the performance of its advanced instruments.



Vacuum Technology

Agilent works with customers to solve vacuum challenges from experiments in high-energy physics to developing systems for producing flat panel displays. Agilent manufactures vacuum systems used in its own mass spectrometry instruments as well as those of other manufacturers. Agilent's vacuum technology has been proven by the most powerful physics experiment ever built, CERN's Large Hadron Collider machine, which was used in the discovery of the Higgs boson particle.



Get the Agilent Service Guarantee

Should your instrument require service while covered by an Agilent service agreement, we guarantee repair or we will replace your instrument for free.

No other company offers this level of commitment to keep your lab up and running at peak efficiency.



Laboratory decision makers and users ranked Agilent as their first choice for general laboratory compliance services.

Agilent Service and Support for Instrument Systems

Focus on what you do best

For over 40 years, Agilent has been building and maintaining the instruments you count on to stay competitive and successful. Trust us to protect your investment with a broad portfolio of services, backed by a global network of experienced service professionals dedicated to the productivity of your lab.

Agilent Advantage Service Plans

The best service available for your Agilent instruments

Agilent offers a flexible range of service plans so that you can choose the level of coverage that is best for your lab.

- **Agilent Advantage Gold** – Priority-one coverage for ultimate uptime and productivity
- **Agilent Advantage Silver** – Comprehensive coverage for dependable laboratory operations
- **Agilent Advantage Bronze** – Total repair coverage at a fixed annual price
- **Agilent Repair Service** – Basic coverage for reliable instrument repair

Agilent Advantage service plans include Agilent Remote Advisor for real-time remote monitoring and diagnostics. Through secure internet connections, you can interact with Agilent service professionals, receive detailed asset reports, and configure text or email alerts to notify you before problems occur – helping you to maximize instrument uptime and optimize laboratory workflows.

Agilent Compliance Services

Equipment qualification that meets the most stringent requirements

Enterprise Edition Compliance was developed to streamline compliance across your entire lab. Used globally in regulated labs, including standards organizations and regulatory agencies, Enterprise Edition enables you to:

- Improve qualification efficiency by automating protocols across platforms to ensure greater efficiency and minimize regulatory risk
- Standardize your entire compliance operation with robust test designs that work with all your instruments
- Add, remove or reconfigure tests based upon your unique user requirements
- Significantly reduce staff review time with consistently formatted, computer generated, tamper-proof reports

Agilent Education and Consulting Services



Our best minds, working for you

Make the most of your instrument with training and consulting from the same experts who designed the instruments, software and processes you use every day.

- Classroom and on-site training in instrument operation, troubleshooting and maintenance
- Customized consulting services to meet your lab's unique needs

The Agilent Value Promise – 10 Years of Guaranteed Value

In addition to continually evolving products, we offer something else unique to the industry – our 10-year value guarantee. The Agilent Value Promise guarantees you at least 10 years of instrument use from your date of purchase, or we will credit you with the residual value of the system toward an upgraded model. Not only does Agilent ensure a reliable purchase now, but we also ensure that your investment is just as valuable in the future.

For more detailed information,
please go to **www.agilent.com/chem/services**
or contact your local Agilent Services and Support representative.

Technical Support at work for you



Have a hardware, software, application, instrument repair or troubleshooting question? Agilent's technical experts are available to answer your questions. With years of laboratory experience, our technical support specialists can provide in-depth knowledge and experience.

For questions pertaining to supplies found in this catalog, contact your local Agilent office or Authorized Agilent Distributor or visit **www.agilent.com/chem/techsupport**

Need more information?

Visit **www.agilent.com/chem/contactus** to:

- Locate your nearest Agilent office or distributor for expert technical support.
- Get fast sales and product assistance by phone. Simply use the scroll-down menu to select your country.
- Receive email assistance using our convenient online forms.

Bond Elut Plexa

Bond Elut Plexa is the next generation of polymeric SPE products. A unique polymeric functionality and optimized methodologies deliver high recoveries with excellent cleanliness, reduced ion suppression and ease-of-use in any SPE workflow.

Turn to page 21.





Agilent Bond Elut QuEChERS Kits

With Agilent Bond Elut QuEChERS disposable pre-weighed extraction and dispersive kits, you can extract and prepare complex matrices for multi-class, multi-residue pesticide analysis in minutes rather than hours.

Turn to pages 90-99.

Captiva Filtration

Faster than centrifugation and easily automated, Captiva's unique dual-depth filtration media provide complete removal of precipitated proteins and outstanding resistance to sample clogging.

Turn to page 100.



Option 1 – Interference Guide: Select your Sample Preparation technique based on the type of interferences(s) you need to remove

	More Selective			*Instrument Separation and Detection Selectivity*			More Selective	
	Less Selective			*Sample Preparation Selectivity*			Less Selective	
Sample Prep Technique / Interference Removed	**Dilute & Shoot**	**Filtration**	**Dried Matrix Spotting**	**Supported Liquid Extraction (SLE)**	**Precipitation**	**QuEChERS**	**Lipid Removal 'Hybrid' Filtration**	**Solid Phase Extraction**
Lipids	No	No	No	No	No	Yes	Yes	Yes
Oligomeric Surfactants	No	No	No	No	No	No	Yes	Yes
Particulates	No	Yes	No	Some	Yes	Yes	Yes	Yes
Pigments	No	No	No	Some	No	Yes	No	Yes
Polar Organic Acids	No	No	No	Yes	No	Yes	No	Yes
Proteins	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Salts	No	No	No	Yes	No	Yes	No	Yes
Suggested Agilent Products	**Agilent Autosampler Vials**	**Captiva**	**Bond Elut DMS***	**Chem Elut Hydromatrix**	**Captiva Non-Drip (ND)**	**Bond Elut QuEChERS**	**Captiva ND^{LIPIDS}**	**Bond Elut Silica and Polymeric SPE**

*Bond Elut DMS cards are for sample collection/transport and are not for sample cleanup



TIPS & TOOLS

Agilent suggests adding filtration to any sample preparation process to extend the system uptime and maximize your application's performance.

Option 2 - Application Guide: Select the Sample Preparation product best suited for your analysis needs



Application Guide				
Industry	**Application**	**Technique**	**Product**	**Page No.**
Biotechnology	Protein/Peptide Purification	Lysate Filtration	Captiva	100
		Micro-volume SPE	OMIX	80
Clinical Research and Forensics	Bioanalysis	Solid Phase Extraction	Bond Elut	21
			Bond Elut Plexa	21
			Bond Elut Plexa PCX	28
		Micro-volume SPE	OMIX	80
		Supported Liquid Extraction (SLE)	Chem Elut	118
		Protein Precipitation Filtration	Captiva ND	101
			Captiva ND^{Lipids}	102
			Captiva	100
Environmental Monitoring	Semi-volatiles	Solid Phase Extraction	Bond Elut	25
			SPEC	83
	Oils and Grease	Solid Phase Extraction	Bond Elut	25
			SPEC	83
		Water Removal	Bond Elut	25
			Na_2SO_4	25
	Emerging Contaminants	Solid Phase Extraction	Bond Elut	25
		Supported Liquid Extraction (SLE)	Chem Elut	118
	Textile analysis	Supported Liquid Extraction (SLE)	Chem Elut	118

(Continued)

TIPS & TOOLS

Simplify your operations with Agilent J&W DB-CLP1 and DB-CLP2 GC columns – the most flexible universal column pair for nine EPA dual-ECD pesticide methods. Together, these fast, reliable columns deliver excellent resolving power with exceptionally low bleed while eliminating the need for time-consuming column switching. Learn more at **www.agilent.com/chem/CLP**

Application Guide continued

Application Guide				
Industry	**Application**	**Technique**	**Product**	**Page No.**
Food and Beverage	Pesticides and Herbicides	Filtration	Captiva ND	101
			Captiva ND^{Lipids}	102
			Captiva	100
		Solid Phase Extraction	Bondesil	88
			QuEChERS	90
		Supported Liquid Extraction (SLE)	Chem Elut	118
Pharmaceutical	Bioanalysis	Solid Phase Extraction	Bond Elut Plexa	25
			Bond Elut Plexa PCX	28
			Bond Elut Plexa PAX	30
			Bond Elut	21
			SPEC	83
		Micro-volume SPE	OMIX	80
		Protein Precipitation Filtration	Captiva ND	101
			Captiva ND^{Lipids}	102
			Captiva	100
		Supported Liquid Extraction (SLE)	Chem Elut	118
	Veterinary Drugs	Solid Phase Extraction	QuEChERS	90



Option 3 - Sample Preparation Reference Guide: Select the Sample Preparation product best suited for your matrix and compound types

Sample Preparation Reference Guide

Typical Matrices	Compound Types	Primary Extraction Mechanism	Product	Page No.
Various food matrices	Pesticide and industrial chemical residues	Buffered or unbuffered extraction, dSPE*	Bond Elut QuEChERS	90
Various food matrices	Veterinary drugs	Unbuffered extraction, dSPE*	Bond Elut QuEChERS	90
Various food matrices	Acrylamide	Unbuffered extraction, dSPE*	Bond Elut QuEChERS	90
Aqueous samples, biological fluids	Small molecules	Tip-based SPE: ion exchange, reversed phase	Bond Elut OMIX	80
Aqueous samples, biological fluids, beverages and food	Small molecules	Filtration	Captiva	100
			Captiva ND^{LIPIDS}	102
Aqueous samples, biological fluids, beverages and food	Small molecules	Filtration and lipid depletion	Captiva ND	101
Urine, plasma and biological fluids, beverages and food	Catecholamines, acrylamide in liquids and food	Strong cation and anion exchange	Bond Elut AccuCAT	59
Non-polar organics	Polar cleanup	Polar	Bond Elut Alumina	64
Urine, plasma, biological fluids	Strongly non-polar compounds	Non-polar, polar (as a normal phase extraction)	Bond Elut C1	44
Aqueous samples, biological fluids	Non-polar compounds	Non-polar	Bond Elut C18	35
Aqueous samples, biological fluids	Non-polar compounds, desalting	Non-polar	Bond Elut C18 OH	39
Aqueous samples, biological fluids, non-polar extracts	Extra wide pore for larger, macro molecules up to 15 kDa	Non-polar hydrogen bonding	Bond Elut C18 EWP	38

*Dispersive Solid Phase Extraction

(Continued)

Sample Preparation Reference Guide continued

Sample Preparation Reference Guide				
Typical Matrices	**Compound Types**	**Primary Extraction Mechanism**	**Product**	**Page No.**
Aqueous samples, biological fluids	Vitamin D, fat soluble compounds, steroids/hormones	Non-polar	Bond Elut C2	45
Aqueous samples, biological fluids	Strongly non-polar compounds	Non-polar	Bond Elut C8	40
Aqueous samples, biological fluids	Non-polar compounds	Weak anion exchange	Bond Elut CBA	57
Aqueous and non-polar organics	Strong and weak bases	Polar (Hydroxyl)	Bond Elut Cellulose	71
Aqueous samples, biological fluids	Polar impurities/compounds	Non-polar	Bond Elut CH (cyclohexyl)	43
Aqueous samples, biological fluids	Non-polar compounds	Non-polar, dipole	Bond Elut CN-E	47
Organic plant and tissue extracts	Mid-range polarity compounds	Wide range non-polar retention	Bond Elut Carbon	68
Urine, plasma, saliva, blood, biological fluids	Acid, basic and neutral drugs	Non-polar and strong cation exchange	Bond Elut Certify	60
Urine, plasma, saliva, blood, biological fluids	Acidic drugs	Non-polar and strong anion exchange	Bond Elut Certify II	62
Water, biological fluids, non-polar extracts	Strong acidic compounds	Weak anion exchange	Bond Elut DEA	58
Aqueous samples, biological fluids, non-polar organics	Polar, weakly non-polar	Polar and non-polar	Bond Elut Diol (2OH)	48
Water sources	Polar organic molecules, explosive residues	Non-polar	Bond Elut ENV	32

(Continued)

Sample Preparation Reference Guide continued

Sample Preparation Reference Guide				
Typical Matrices	**Compound Types**	**Primary Extraction Mechanism**	**Product**	**Page No.**
Non-polar organics	Organic extracts, non-polar environmental extracts	Polar	Bond Elut Florisil	63
Urine, plasma, biological fluids	Non-polar compounds	Non-polar	Bond Elut LMS	33
Aqueous samples and polar organic grain extracts	Mycotoxins (trichothecenes and zearalenones)	Ionic cleanup	Bond Elut Mycotoxin	72
Horse urine, urine, biological fluids	Acidic, basic and neutral drugs, quaternary drugs, endocrine disruptors	Non-polar	Bond Elut NEXUS and Bond Elut NEXUS WCX	34
Aqueous, biological fluids, buffered organics	Polar and non-polar strong anions, polar structural isomers	Weak anion exchange	Bond Elut NH2	49
Plasma, urine, aqueous and biological fluids	cis-diol-containing compounds, catecholamines, ribonucleotides, amino alcohols, diketo and triketo compounds	Covalent bonding	Bond Elut PBA	74
Water sources	PCBs	Polar	Bond Elut PCB	71
Aqueous samples and biological fluids	Strongly non-polar compounds, aromatics	Non-polar	Bond Elut PH	42
Water sources, biological fluids	Non-polar compounds, phenols	Non-polar, electrostatic	Bond Elut PPL	31
Aqueous samples, biological fluids, buffered organics	Basic compounds (amine + pyridinium containing)	Strong cation exchange	Bond Elut PRS	55

(Continued)

Sample Preparation Reference Guide continued

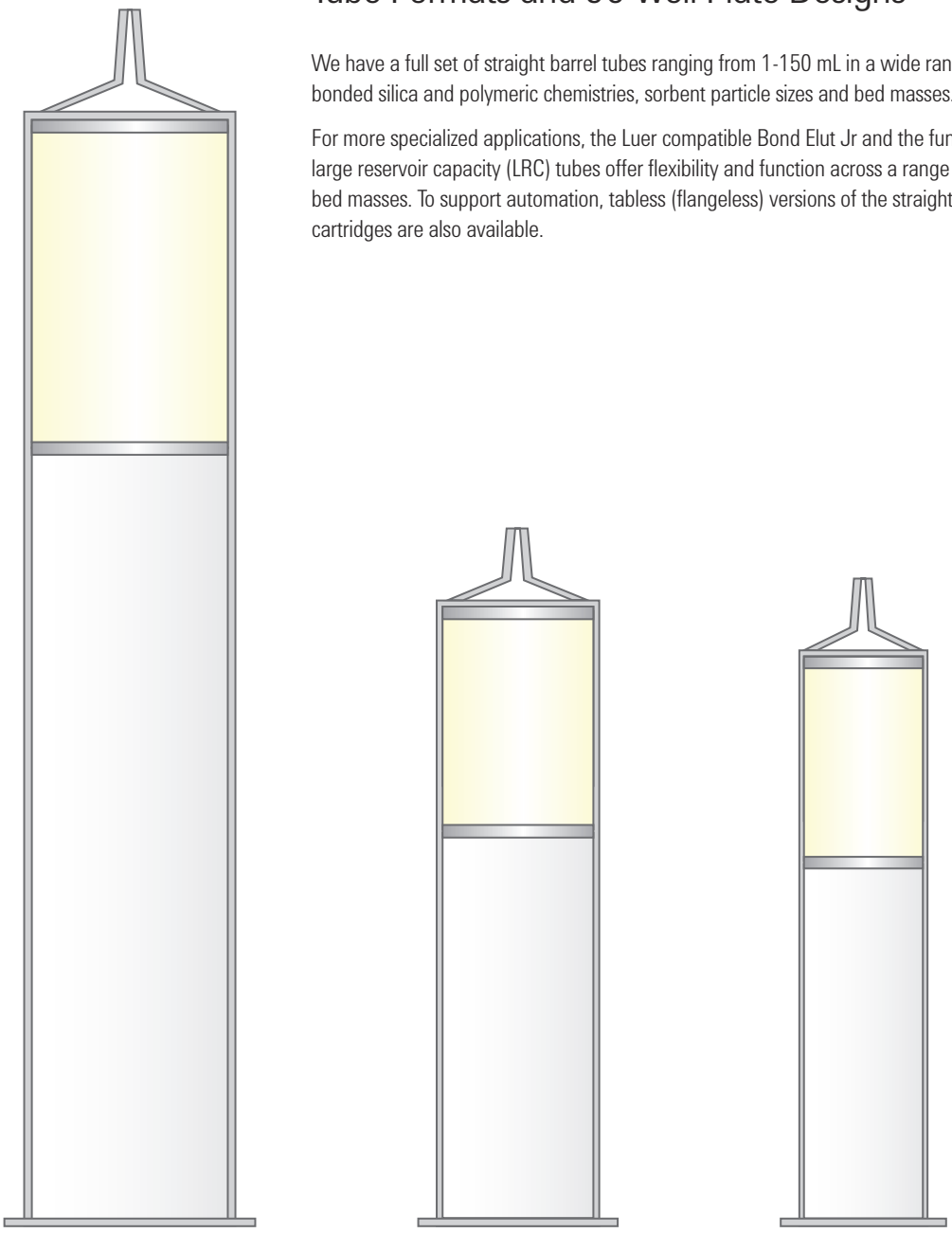
Sample Preparation Reference Guide				
Typical Matrices	**Compound Types**	**Primary Extraction Mechanism**	**Product**	**Page No.**
Aqueous samples, biological fluids, buffered organics	Acidic compounds (fruit acid removal for QuEChERS)	Weak anion exchange	Bond Elut PSA	56
Plasma, urine, aqeuous samples and biological fluids	Non-polar compounds with acidic/neutral fractionation PAH's from water	Non-polar	Bond Elut Plexa	21
Plasma, urine, aqeuous samples and biological fluids	Acidic compounds, carboxylic acid metabolites of drugs, peptides and amino acids	Mixed mode: non-polar and strong anion exchange	Bond Elut Plexa PAX	30
Plasma, urine, aqeuous samples and biological fluids	Basic drugs	Mixed mode: non-polar strong cation exchange	Bond Elut Plexa PCX	28
Aqueous samples, bioloigcal fluids	Weak acidic compounds	Strong anion exchange	Bond Elut SAX	51
Aqueous samples, biological fluids, buffered organics	Weak basic compounds	Strong cation exchange	Bond Elut SCX	53
Non-polar organics, oils, lipids	Cleanup of polar impurities	Polar	Bond Elut SI	46
Water sources, extracted soil samples	Pesticide and industrial chemical residue	Non-polar	EnvirElut	75
Aqueous biological fluids, organic reaction mixures (scavenging)	Nitrosamines, pesticides, herbicides	Solid supported LLE	Chem Elut	118
Aqueous biological fluids, organic reaction mixures (scavenging)	Nitrosamines, pesticides, herbicides	Solid supported LLE	Hydromatrix	118

Option 4 - Format Guide: Select the Sample Preparation product best suited for your analysis requirements

Agilent Offers a Broad Range of Tube Formats and 96-well Plate Designs

We have a full set of straight barrel tubes ranging from 1-150 mL in a wide range of bonded silica and polymeric chemistries, sorbent particle sizes and bed masses.

For more specialized applications, the Luer compatible Bond Elut Jr and the funnel-shaped large reservoir capacity (LRC) tubes offer flexibility and function across a range of sorbent bed masses. To support automation, tabless (flangeless) versions of the straight-barrel cartridges are also available.



Diagrams are to scale

60 mL 20 mL 12 mL

Bond Elut 96-well Plates

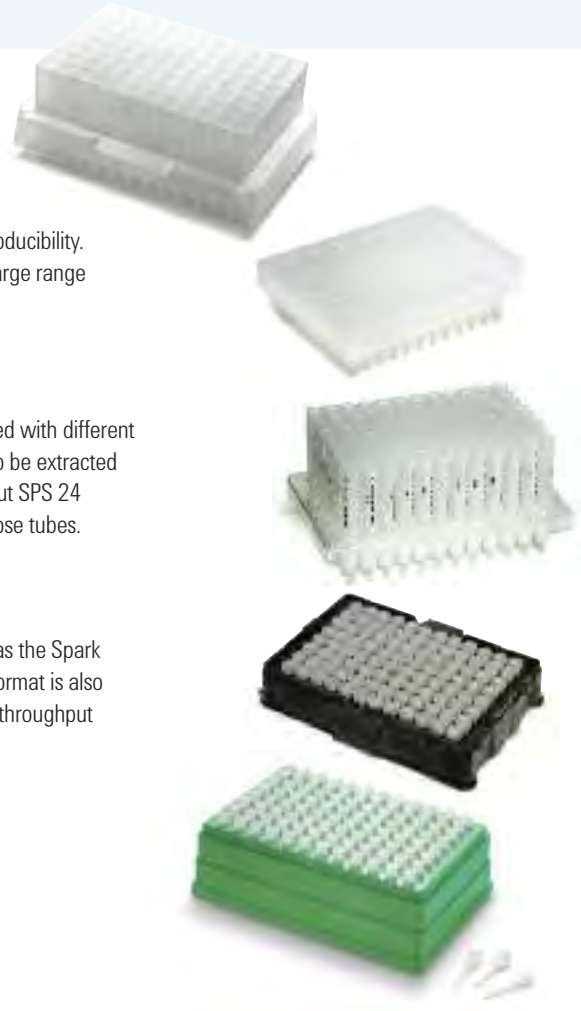
Bond Elut 96-well plate formats are best in class for flow performance and well-to-well reproducibility. These specially designed plates are available with well volumes of 1 mL and 2 mL and in a large range of different sorbent chemistries.

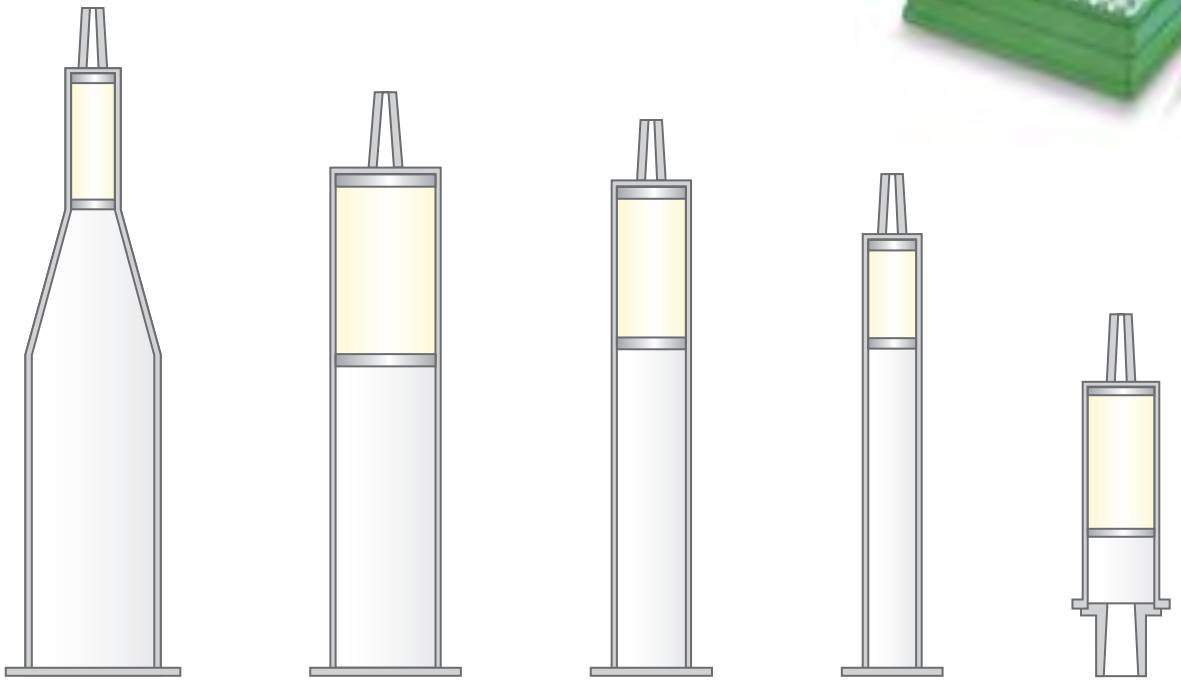
VersaPlate

VersaPlate is an innovative, versatile design that lets you customize plates. Insert tubes packed with different phases for sorbent screening, or insert only enough tubes to match the number of samples to be extracted for minimal waste. Luer tip of Versaplate tubes can also fit VacElut 12, VacElut 20, and VacElut SPS 24 vacuum manifolds. VersaPlate can be purchased in a pre-packed 96 position format or as loose tubes.

Packed Formats for Automation

Bond Elut sorbents are also available in packed bed formats for automation platforms, such as the Spark Holland Symbiosis, Gilson ASPEC and Gerstel MPS systems. Agilent's unique OMIX pipette format is also used with a wide range of liquid handling devices, ranging from hand-held pipettors to high-throughput automated systems.







Solid Phase Extraction (SPE)

Agilent Bond Elut:
Accuracy Starts Here

For over 30 years, Bond Elut has been the most trusted name in solid phase extraction. After years of use, demanding chemists at top companies worldwide have thoroughly documented its many applications and proven its performance.

Bond Elut is manufactured using state-of-the-art automation to guarantee quality and consistency. Optical scanners installed throughout our automated assembly process inspect each Bond Elut tube at multiple points. And during manufacture, 25 different tests are conducted to ensure reproducibility. If an imperfection is spotted, the tube is removed from the assembly line. The result is consistently reliable Bond Elut cartridges, time and time again.

Over 40 different sorbent functionalities are available in a variety of cartridge formats including straight barrel, large reservoir capacity (LRC) and Bond Elut Junior (Jr). 96-well plate configurations support automated workflows, with flexibility for method development and scale-up. Bulk packaging of popular products provides a cost-effective solution for high throughput. Trust integrated solutions from Agilent to connect your sample preparation, analysis and reporting needs to deliver the quality and reliability your lab needs.



The Bond Elut Difference

- Heritage of Reliability: With years of use in some of the most demanding analytical laboratories in the world, Bond Elut products have a proven track record resulting in a strong publication pedigree
- Options for Your Needs: Offering extraction solutions for the widest range of analytes and matrices, bonded silica phases for high specificity methods and polymeric phases for rapid method development, Bond Elut has the largest choice of formats and sorbents in the market today
- Innovative Products Designed for Lab Efficiency: Whether it be fast flow polymeric particles or our patented 96-well plate design, all Bond Elut products are created for ease-of-use, reliability and flexibility to meet both manual and automated requirements
- Technical Support at Every Step: For your specific applications, or to help solve occasional technical issues, a global team of analytical scientists is on hand to assist
- World Class Manufacturing and Quality: Unrivaled manufacturing control, plus exacting ISO 9001: 2000 compliant inspections guarantee the consistent quality of Bond Elut

Cross Reference of Comparable Phases by Manufacturer

Different chemistries and manufacturing processes create sorbents that exhibit differences in selectivity, so there is no universal equalivent for every application. However, the performance of products can be similar in many applications. This table provides suggestions for using Agilent Bond Elut products in comparison to products from other manufacturers.

If you are an Agilent SampliQ user, please contact our Technical Support for Bond Elut options for your sample prep needs.

Polymers

If you are using...				Try this...	Page No.
Phenomenex Strata	**Waters Oasis**	**Supelco Supelclean/Discovery**	**UCT**	**Agilent Bond Elut**	
Strata-X	HLB			Plexa	21
SDB-L		ENVI-ChromP	Styre Screen	ENV or LMS	32
Strata-X-C	MCX			Plexa PCX	28
	MAX			Plexa PAX	30

Silica-Based and Other Sorbents

If you are using...				Try this...	
Phenomenex Strata	**Waters Sep-Pak**	**Supelco Supelclean/Discovery**	**UCT**	**Agilent Bond Elut**	
C18-E	tC18	ENVI-18, DSC-C18, LC-18	C18-E	C18	35
C18-U	C18		C18-U	C18 OH	39
C8	C8	DSC-8, Envi-8, LC-8	C8	C8	40
	tC2			C2	45
Phenyl (PH)		DSC-Ph, LC-Ph	Phenyl	PH	42
Screen-C			Clean Screen	Certify	60
Si-1	Silica	DSC-Si, LC-SI	Silica	SI	46
FL-PR	Florisil	LC and ENVI Florisil	Florisil PR	FL	63
NH2	Amino Propyl	DSC-NH2, LC-NH	Amino Propyl	NH2	49
		DSC-Diol, LC-Diol	Diol	2OH	48
CN	Cyano Propyl	DSC-CN, LC-CN	Cyano Propyl	CN-E	47
	Alumina A, B, N	LC-Alumina A, B, N	Alumina A, B, N	Alumina A, B, N	64
SAX	AccellPlus QMA	DSC-SAX, LC-SAX, Quat amine with Cl	Quat amine with Cl	SAX	51
SCX	AccellPlus CM	DSC-SCX, LC-SCX	Benzenesulfonic acid	SCX	53
		ENVI-Carb	Carbon	Carbon	68
		ENVICarb-II/NH2		Carbon/NH2	68
		ENVICarb-II/PSA		Carbon/PSA	68

TIPS & TOOLS

For additional details on Agilent polymeric SPE products, see the *Agilent Bond Elut Plexa and Polymeric SPE Selection Guide*, publication number 5990-8589EN.
For details on Agilent Silica-Based SPE products, see the *Agilent Bond Elut Silica-Based SPE Selection Guide*, publication number 5990-8591EN.

Sorbent Specifications

Sorbent Phase	Category	Bonded Functional Group/ Base Material	Endcapped	Format	Typical Carbon Loading (%)	Surface Area (m^2/g)	Particle Size (µm) and Shape	Mean Pore Size (Å)	Page No.
AccuCAT	Mixed Mode	Sulfonic acid (SCX) and quaternary amine (SAX) silica based	No	Packed bed	7.0	500	40 and 120, irregular	60	59
Alumina (AL-A)	Polar	Aluminium oxide – acidic		Packed bed	0.0		25		64
Alumina (AL-B)	Polar	Aluminium oxide – basic		Packed bed	0.0		25		64
Alumina (AL-N)	Polar	Aluminium oxide – neutral		Packed bed	0.0		25		65
Aminopropyl (NH2)	Polar/Anion Exchanger	Aminopropyl/silica based	No	Packed bed	6.7	500	40 and 120, irregular	60	49
SPEC Aminopropyl (NH2)	Polar/Anion Exchanger	Aminopropyl/silica based	No	Monolithic disk		220		70	86
C1	Non-polar	Methyl/silica based	Yes	Packed bed	4.1	500	40, irregular	60	44
C2	Non-polar	Ethyl/silica based	Yes	Packed bed	5.6	500	40 and 120, irregular	60	45
SPEC C2	Non-polar	Dimethyl/silica based	No	Monolithic disk	2.7	220		70	86
C8	Non-polar	Octyl/silica based	Yes	Packed bed	12.2	500	40 and 120, irregular	60	40
SPEC C8	Non-polar	Octyl/silica based	Yes	Monolithic disk	5.0	220			86
Carbon	Strongly Non-polar	Graphitized carbon	No	Packed bed					68
C18	Non-polar	Trifunctional octadecyl/silica based	Yes	Packed bed	17.4	500	40 and 120, irregular	60	35
SPEC C18	Non-polar	Monofunctional octadecyl/silica based	No	Monolithic disk	8.0	220		70	86
SPEC C18 AR	Non-polar	Trifunctional octadecyl/silica based	Yes	Monolithic disk	9.0	220		70	86
C18 EWP	Non-polar	Trifunctional octadecyl/silica based	Yes	Packed bed	6.0	80	40, irregular	500	38
C18 OH	Non-polar	Monofunctional octadecyl/silica based	No	Packed bed	14.9	300	40 and 120, irregular	150	39
CBA	Cation Exchanger	Carboxylic acid/silica based	Yes	Packed bed	7.4	500	40 and 120, irregular	60	57
Certify	Mixed Mode	Octyl and benzenesulfonic acid (SCX)/silica based	No	Packed bed	9.0	500	40 and 120, irregular	60	60

(Continued)

Sorbent Specifications

Sorbent Phase	Category	Bonded Functional Group/ Base Material	Endcapped	Format	Typical Carbon Loading (%)	Surface Area (m^2/g)	Particle Size (µm) and Shape	Mean Pore Size (Å)	Page No.
Certify II	Mixed Mode	Octyl and quaternary amine (SAX)/ silica based	No	Packed bed	8.6	500	40 and 120, irregular	60	62
CH	Non-polar	Cyclohexyl/silica based	Yes	Packed bed	9.6	500	40 and 120, irregular	60	43
Cyano (CN-E)	Non-polar	Cyanopropyl/ silica based	Yes	Packed bed	8.1	500	40 and 120, irregular	60	47
SPEC Cyano	Polar	Cyanopropyl/ silica based	No	Monolithic disk		220		70	86
SPEC DAU	Application specific	Silica based		Monolithic disk		220		70	86
DEA	Anion Exchanger	Diethylaminopropyl/ silica based	No	Packed bed	8.5	500	40 and 120, irregular	60	58
Diol (2OH)	Polar	Diol/silica based	No	Packed bed	6.8	500	40, irregular	60	48
ENV	Non-polar	Styrene divinylbenzene		Packed bed			125, spherical	450	32
EnvirElut 1664	Application specific	Trifunctional octadecyl/silica based	No	Packed bed	18.0	500	40 and 120, irregular	60	75
FL	Polar	Florisil		Packed bed			200		63
LMS	Non-polar	Styrene divinylbenzene		Packed bed			75, spherical	300	33
SPEC MP1	Mixed Mode	Non-polar and benzenesulfonic acid (SCX)/silica based		Monolithic disk	6.0	220		70	86
SPEC MP3	Mixed Mode	Slightly polar and benzenesulfonic acid (SCX)/silica based		Monolithic disk		220		70	86
NEXUS	Mixed Mode	Mixed mode copolymer		Packed bed		575	70, spherical	100/450 Bimodal	34
PBA	Covalent	Phenylboronic acid/silica based	No	Packed bed	7.9	500	40, irregular	60	74
PCB	Application specific	Layered phase		Packed bed		500			57
PH	Non-polar	Phenyl/silica based	Yes	Packed bed	10.7	500	40 and 120, irregular	60	42
Plexa	Polar enhanced	Hydrophilic styrene divinylbenzene		Packed bed		550	45, spherical monodisperse	100	42
Plexa PCX	Cation Mixed Mode	SCX functionalized hydrophilic styrene divinylbenzene		Packed bed		550	45, spherical monodisperse	100	28
Plexa PAX	Anion Mixed Mode	SAX functionalized hydrophilic styrene divinylbenzene		Packed bed		550	45, spherical monodisperse	100	30

(Continued)

Sorbent Specifications

Sorbent Phase	Category	Bonded Functional Group/ Base Material	Endcapped	Format	Typical Carbon Loading (%)	Surface Area (m^2/g)	Particle Size (µm) and Shape	Mean Pore Size (Å)	Page No.
PPL	Non-polar	Functionalized styrene divinylbenzene		Packed bed		600	125, spherical	150	31
PRS	Cation Exchanger	Propylsulfonic acid/ silica based	No	Packed bed	1.7	500	40, irregular	60	55
PSA	Anion Exchanger	Ethylenediamine-N-propyl/silica based	No	Packed bed	7.5	500	40 and 120, irregular	60	56
SPEC PSA	Anion Exchanger	Ethylenediamine-N-propyl/silica based	No	SPEC disk		220		70	86
SPEC PH	Non-polar	Phenyl/silica based	Yes	Monolithic disk		220		70	86
SAX	Anion Exchanger	Trimethylaminopropyl/ silica based	No	Packed bed	7.5	500	40 and 120, irregular	60	51
SPEC SAX	Anion Exchanger	Trimethylaminopropyl/ silica based	No	Monolithic disk		220		70	86
SCX	Cation Exchanger	Benzenesulfonic acid/silica based	No	Packed bed	10.9	500	40 and 120, irregular	60	53
SPEC SCX	Cation Exchanger	Benzenesulfonic acid/silica based	No	Monolithic disk		220		70	86
SI	Polar	Silica	No	Packed bed		600	40 and 120, irregular	60	46
SPEC SI	Polar	Silica	No	Monolithic disk		220		70	86

Particle Size Specifications

You will note that our most common silica-based Bond Elut packings are described as 40 µm materials, yet if you look at the actual lot analyses, you will see that the actual mean is around 55 µm. We have been making silica-based Bond Elut packings since 1979, using the same diameter silicas; in that time, the models used to estimate irregular particle "diameters" and the testing equipment have changed. We have retained the term "40 µm" however, because there are so many official methods that specify a 40 µm Bond Elut sorbent. As other suppliers attempted to copy the successful Bond Elut product specifications, the term has become an industry standard. You can be assured that the actual average particle in our regular silica Bond Elut is the same now as it was 30 years ago when we first pioneered SPE as a sample prep technology.

TIPS & TOOLS

If you don't see exactly what you're looking for, Agilent offers custom configurations for many of our sorbents and formats. Requests for custom products can be requested at www.agilent.com/chem/sampleprep or contact technical support at **SPP-Support@agilent.com**

Bond Elut Plexa Polymeric SPE



The Bond Elut Plexa Family is a new generation of polymeric SPE products, designed for simplicity, improved analytical performance and ease-of-use. Its uniqueness lies in the novel hydroxylated exterior, hydrophobic interior and advanced polymeric architecture.

Bond Elut Plexa

Bond Elut Plexa is a non-polar divinylbenzene-based neutral polymeric sorbent. This sorbent is the best choice for non-ionic extraction of a wide range of acidic, neutral and basic analytes from different matrices.

Bond Elut Plexa PCX

Bond Elut Plexa PCX is a cation exchanger with mixed mode sorbent characteristics and is therefore suitable for the extraction and cleanup of weak bases from biofluids. Bond Elut Plexa PCX demonstrates the same excellent particle size distribution and integrity as Bond Elut Plexa. A highly controlled sulfonation process results in zero fines for Bond Elut Plexa PCX.

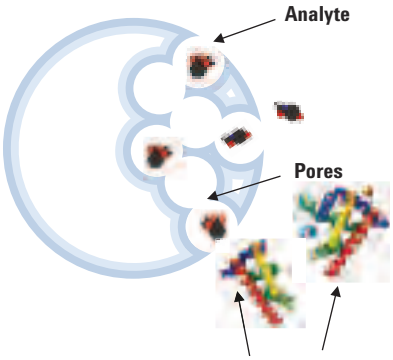
Bond Elut Plexa PAX

Bond Elut Plexa PAX is an anion exchange based on the same innovative base polymer particle technology as the other members of the Plexa SPE family. This advanced material offers excellent flow characteristics due to its monodisperse particle size distribution, affording superior ease-of-use, with minimal clogging of the packed bed. The amide-free particle technology does not provide binding sites for endogenous interferences such as proteins and lipids.

Advanced Polymer Architecture Improves Extraction Performance

LOAD:

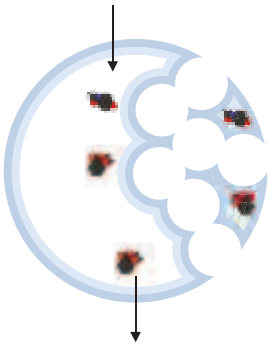
Water-rich, hydrophilic surface allows excellent phase transfer of analytes into the polymer core.



Large endogenous proteins do not bind to the surface of the polymer and cannot access pore structure.

WASH:

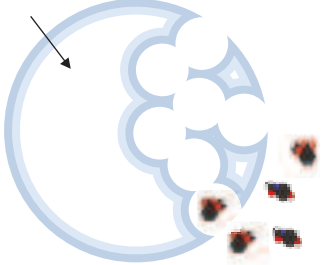
Analytes that have crossed the hydrophilic layers will remain tightly bound in the hydrophobic core.



Interferences wash away without leaching the analytes of interest.

ELUTE:

Specially engineered pore structure allows excellent mass transfer out of the polymer.



Clean extract with high recovery.



General Protocol for Trouble-Free SPE Applications with Bond Elut Plexa Polymeric SPE

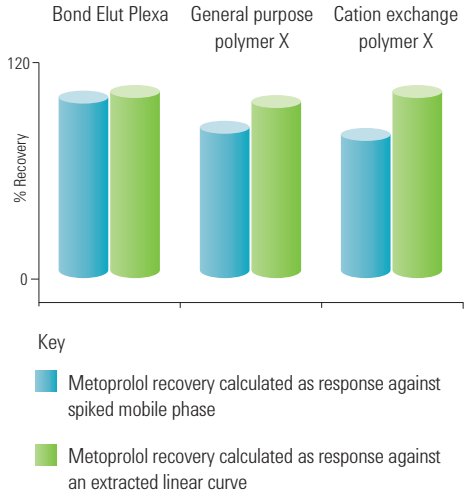
Regardless of your application or sample type, you will appreciate the difference the Bond Elut Plexa range makes. Plexa delivers simple methods and superior flow characteristics that effectively eliminate common matrix background that can cause interference and ion suppression, resulting in improved analytical sensitivity and data quality.

	Acids	Neutrals		Bases
Analyte	**Log P > 1.0 pKa < 5**	**Log P > 1.5 pKa 3-6**	**pKa 6-10**	**Log P > 0.8 pKa 6-10**
	Plexa PAX	**Plexa Acid Load Method**	**Plexa Base Load Method**	**Plexa PCX**
Sample Treatment	2% NH_4OH	1% HCO_2H	2% NH_4OH	2% H_3PO_4
Sorbent Condition	100% MeOH	100% MeOH		100% MeOH
Equilibrate	100% H_2O	100% H_2O		100% H_2O
Load	Apply pre-treated sample			
Wash	100% H_2O	5% MeOH in H_2O		2% HCO_2H in H_2O
Elution 1	100% MeOH **Neutrals**	100% MeOH **Neutrals**		1:1 MeOH/ACN **Acids, Neutrals**
Elution 2	5% HCO_2H in MeOH **Acids**			5% NH_3 in 1:1 MeOH/ACN **Bases**
Analysis	Prepare extracts for instrumental analysis			

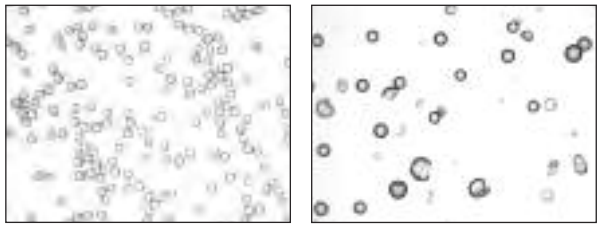
Improved Sensitivity

Matrix background can result in significantly decreased analytical sensitivity due to interference, co-elution or ion suppression. Bond Elut Plexa gives you higher recoveries in cleaner extracts, which translates into better sensitivity. Plexa delivers high recoveries regardless of whether absolute or relative calculations are used. This indicates that interference is minimized and maximum sensitivity is achieved. Relative recovery calculations (green bars) are routinely used, but these may mask the effects of interference or ion suppression, which are normalized.

Plexa improves sensitivity by minimizing interference or ion suppression effects and maximizing recovery



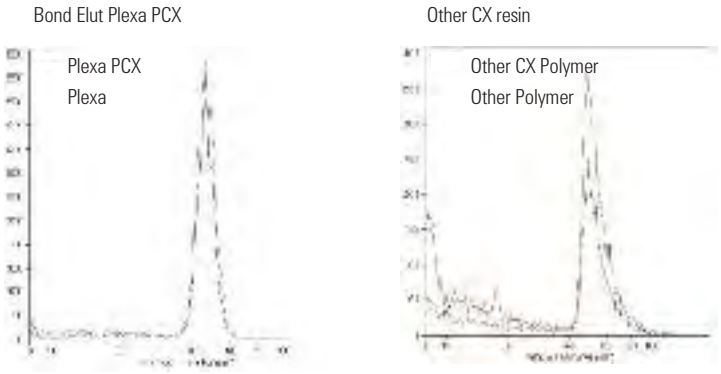
Comparison of particle sizes of non-polar SPE polymers by imaging analysis



Bond Elut Plexa PCX

Alternative Cation Exchange Polymer

Comparison of particle size distributions of non-polar SPE sorbents



The narrow particle size distribution offers reproducible, superior flow characteristics with minimal clogging

Bond Elut Plexa

- Fast flow, reproducible performance and ease-of-use
- Improved extract cleanliness minimizes sample matrix interferences
- Non-polar retention mechanism

Bond Elut Plexa polymeric SPE offers simple, easy-to-use methods that simplify sample preparation processes. The water-wettable, hydroxylated exterior allows excellent flow, even with biological fluids. A gradient of polarity on the polymer surface shunts small analytes to the more hydrophobic center of the polymer bead, where they are retained prior to the washing and elution steps. Plexa provides these performance enhancements due to a unique polymeric architecture with a non-retentive, hydroxylated, amide-free surface and a non-polar PS/DVB core for retaining small molecules. Binding of proteins and lipids on the polymer surface is minimized, resulting in cleaner samples and reduced matrix interference. Plexa is ideal for high-throughput tests requiring validated performance with minimal method development. The standard non-polar retention mechanism is applicable to almost any analyte type. The performance features operate at the sample loading step, making them largely method independent.



Typical Matrices

Plasma, urine, biological fluids and aqueous samples

Primary Extraction Mechanism

Non-polar

TIPS & TOOLS

Tabless (flangeless) cartridges are suitable for use with many automated SPE systems. Tabless products are typically designated with a "T" in the part number. If you need a tabless cartridge and do not see a part number listed, please contact **SPP-Support@agilent.com** to discuss custom options.

Bond Elut Plexa

Description	Unit	Part No.
Straight Barrel Cartridges		
30 mg, 1 mL	100/pk	12109301
30 mg, 1 mL, Tabless	100/pk	12109301T
30 mg, 3 mL	50/pk	12109303
60 mg, 1 mL	100/pk	12109601
60 mg, 3 mL	50/pk	12109603
200 mg, 3 mL	50/pk	12109610
200 mg, 6 mL	30/pk	12109206
500 mg, 3 mL	30/pk	12109703
500 mg, 6 mL	30/pk	12259506
Bond Elut Jr		
200 mg	50/pk	12169610B
Mega Bond Elut Plexa		
500 mg, 12 mL	20/pk	327832
Other Formats		
Bond Elut Plexa Prospekt cartridge, 2 mm	96/pk	12221305
Bond Elut Plexa 800 Series cartridge	96/pk	12281305
60 mg, 3 mL, Gerstel format	50/pk	167816G
200 mg, 3 mL, Gerstel format	50/pk	167822G

Bond Elut Plexa 96-well Plates

Description	10 mg	30 mg
1 mL round-well plates	A4969010	A4969030
2 mL square-well plates	A3969010	A3969030

Bond Elut Plexa Method for Polyaromatic Hydrocarbons

Twenty-four PAHs in drinking water by automated SPE with fast HPLC-FLD/UV detection **(Pub No. 5990-7686EN)**

Method

800 mL water sample + 5% isopropanol + internal standard (benzo[a]pyrene-d^{12})

Condition with 4 mL ethyl acetate + 4 mL dichloromethane + 4 mL methanol + 4 mL water

Load sample

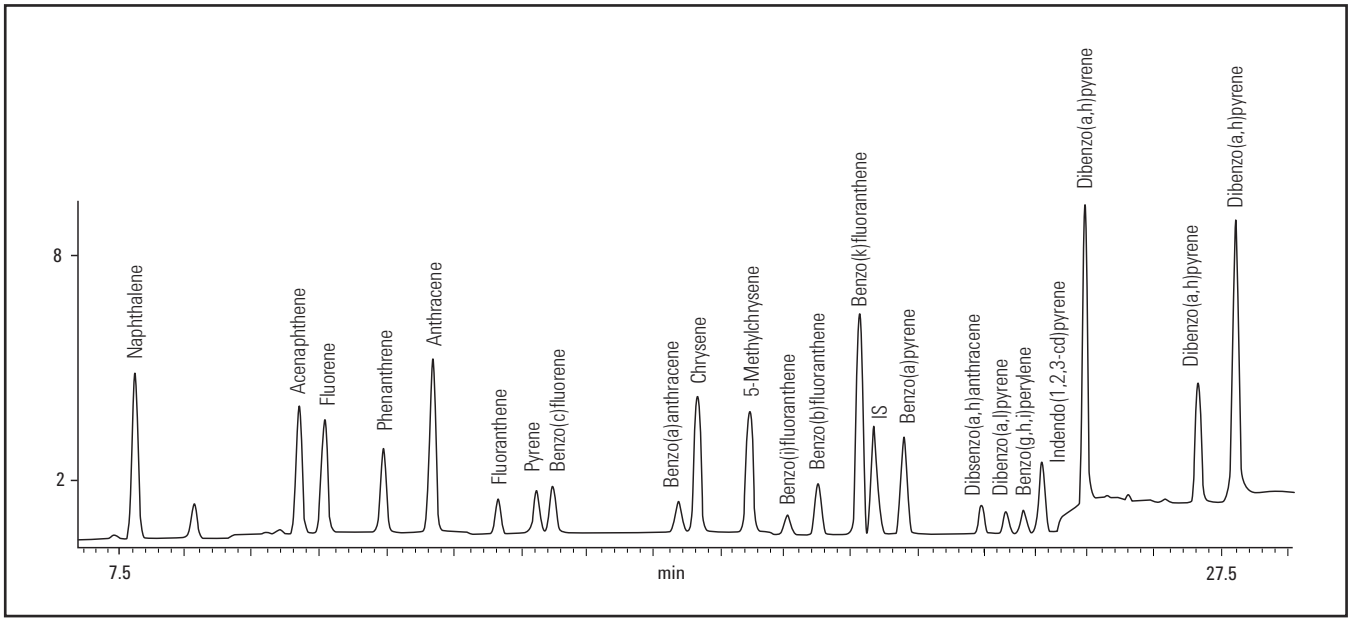
Dry for 30 min

Elute with 4 mL ethyl acetate + 4 mL dichloromethane

Make up to 10 mL with ethyl acetate:dichloromethane (1:1)

Evaporate off 4 mL

Add 0.5 mL acetonitrile



HPLC/FLD chromatogram of a 5 µL injection of the 20 ppt PAH standard solution on the Agilent Pursuit 3 PAH column



Pursuit HPLC Columns



Bond Elut Plexa PCX

- Faster flow rates improve productivity
- Extraction cleanliness and reduced interference improve precision
- Simplified, single method for ease-of-use

Bond Elut Plexa PCX is another milestone in the development of simple and robust SPE methods. Plexa PCX uses a polymeric cation exchange resin that combines the outstanding properties of Bond Elut Plexa – superior flow characteristics and improved analytical performance – with strong cation exchange functionalities. This mixed-mode SPE sorbent removes neutral and acidic interferences from the matrix, concentrates basic analytes and therefore improves sensitivity in the determination of basic compounds.

The Plexa PCX particles are near mono-dispersed, resulting in homogenous packing. Reproducible results are the norm, with very good tube-to-tube and well-to-well performance. Ion suppression is reduced because the highly polar, hydroxylated polymer surface is entirely amide-free and does not provide binding sites for endogenous species such as proteins and lipids.

Plexa PCX comes with a simple, single method approach for basic drugs that offers improved recoveries, cleaner extracts and reduced method development time and cost. Flow rate is improved because Plexa PCX particles have much narrower particle size distribution with no fines to cause blockages.

Typical Matrices

Plasma, urine, biological fluids and aqueous samples

Primary Extraction Mechanism

Mixed mode: non-polar and cation exchange

Bond Elut Plexa PCX

Description	Unit	Part No.
Straight Barrel Cartridges		
30 mg, 1 mL	100/pk	12108301
60 mg, 1 mL	100/pk	12108601
30 mg, 3 mL	50/pk	12108303
60 mg, 3 mL	50/pk	12108603
60 mg, 3 mL, Tabless	50/pk	12108603T
200 mg, 6 mL	30/pk	12108206
500 mg, 6 mL	30/pk	12258506
Other Formats		
Bond Elut Plexa PCX Prospekt Cartridge, 2 mm	96/pk	12221306
Bond Elut Plexa PCX 800 Series Cartridge, 2 mm	96/pk	12281306
Gerstel format	50/pk	168016G

Bond Elut Plexa PCX 96-well Plates

Description	10 mg	30 mg
1 mL round-well plates	A4968010	A4968030
2 mL square-well plates	A3968010	A3968030

Typical Method for Bond Elut Plexa PCX

Sample:

100 µL plasma

Pretreatment:

Dilute 1:3 with 2% H_3PO_4

Conditioning:

1. 500 µL MeOH
2. 500 µL H_2O

Washes:

Acidic wash: 500 µL aqueous 2% formic acid

Neutral wash: 500 µL CH_3OH/CH_3CN (1:1, v/v)

Elution:

500 µL CH_3OH/CH_3CN + 5% NH_3 (28-30%)

Volumes stated are for Bond Elut 96 30 mg, 1 mL, P/N A4968030.

Bond Elut Plexa PAX

Typical Matrices

Plasma, urine, biological fluids and aqueous samples

Primary Extraction Mechanism

Mixed mode: non-polar and anion exchange

- Mixed mode, non-polar polymeric anion exchanger offers high level of analyte selectivity
- Exclusion of endogenous interferences offers superior cleanliness and minimizes ion suppression
- Simple, single method for ease-of-use, reduces method development time

Bond Elut Plexa PAX is a polymeric anion exchange product (PAX) that sets the performance standard in analyte cleanup and reproducibility for polar and non-polar acidic analytes. Existing polymeric anion exchange sorbents can exhibit a broad range of ion exchange capacity from batch to batch, leading to method irreproducibility and compromised data. Plexa PAX particles are functionalized using a proprietary process which allows anion exchange loadings to be controlled with a very high degree of reproducibility, giving more robust performance across the lifetime of your compound study or method.

This Plexa PAX polymeric mixed-mode SPE product comes with a simple, single method for non-polar acidic and polar acidic analytes that offers excellent clean up, even in complex matrices such as plasma. The optimized anion exchange methodology offers clean extracts, high recoveries and low RSDs, reducing method development time, sample repeats and overall cost per sample in the process.

Typical Method for Bond Elut Plexa PAX

Sample:

100 µL human plasma

Pretreatment:

Dilute 1:3 with 2% NH_4OH

Conditioning:

1. 500 µL MeOH
2. 500 µL H_2O

Washes:

1. 500 µL H_2O
2. 500 µL MeOH

Elution:

500 µL 5% formic acid:MeOH

Volumes stated are for Bond Elut 96 1 mL Well Plate, P/N A4967010.

Bond Elut Plexa PAX

Description	Unit	Part No.
Straight Barrel Cartridges		
30 mg, 1 mL	100/pk	12107301
60 mg, 1 mL	100/pk	12107601
30 mg, 3 mL	50/pk	12107303
60 mg, 3 mL	50/pk	12107603
200 mg, 6 mL	30/pk	12107206
500 mg, 6 mL	30/pk	12257506

Bond Elut Plexa PAX 96-well Plates

Description	10 mg	30 mg
1 mL round-well plates	A4967010	A4967030
2 mL square-well plates	A3967010	A3967030

TIPS & TOOLS

View the core concepts of SPE and demonstrations of sample preparation, please visit **www.agilent.com/chem/spevideo**



Agilent Polymeric SPE

Reversed Phase Polymeric SPE



Bond Elut PPL

- Modified styrene-divinylbenzene polymer
- Large particle size allows fast extraction speeds
- High surface area and capacity for polar analytes

Bond Elut PPL is a styrene-divinylbenzene (SDVB) polymer that is modified with a proprietary non-polar surface. PPL will retain even the most polar classes of analytes, including phenols. The large particle size allows ease of flow for viscous or particulate-rich water samples, while the high surface area and strong hydrophobicity ensure reproducible extractions with high recoveries upon elution.

Bond Elut PPL is suitable for methods such as the US EPA Method 528, 'Determination of Phenols in Drinking Water by SPE and Capillary GC/MS.'

Typical Matrices
Water sources, biological fluids
Primary Extraction Mechanism
Non-polar, electrostatic

Bond Elut PPL

Description	Unit	Part No.
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12105002
100 mg, 1 mL	100/pk	12105003
100 mg, 3 mL	50/pk	12105004
200 mg, 3 mL	50/pk	12105005
500 mg, 3 mL	50/pk	12105006
500 mg, 6 mL	30/pk	12255001
1 g, 3 mL	50/pk	12102148
1 g, 6 mL	30/pk	12255002
5 g, 60 mL	16/pk	12256087

Bond Elut ENV

Typical Matrices

Water sources

Primary Extraction Mechanism

Non-polar

- Modified styrene-divinylbenzene polymer
- Large particle size allows fast extraction speeds
- High surface area and capacity for polar analytes

Bond Elut ENV, a PS/DVB polymer, is designed for the extraction of polar organic residues. It contains 125 µm spherical particles, advantageous for high volume, fast flow-through applications.

Bond Elut ENV

Description	Unit	Part No.
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12105012
100 mg, 1 mL	100/pk	12105013
100 mg, 3 mL	50/pk	12105014
200 mg, 3 mL	50/pk	12105015
200 mg, 6 mL	30/pk	12255014
500 mg, 3 mL	50/pk	12105016
500 mg, 6 mL	30/pk	12255011
1 g, 6 mL	30/pk	12255012



Bond Elut LMS

- Ultra clean styrene-divinylbenzene polymer
- Optimized 75 µm particle size for reproducible flow
- High capacity and surface area for efficient extraction

Bond Elut LMS polymeric sorbent lets you elute without having to add amine modifiers, buffers, or acids. The elimination of secondary interactions means that elution of analytes can be achieved with pure organic solvents or solvent mixtures of low ionic strength compatible with the HPLC mobile phase. These characteristics allow easy compatibility with LC/MS or other delicate analytical techniques.

Typical Matrices

Urine, plasma, biological fluids

Primary Extraction Mechanism

Non-polar

Bond Elut LMS

Description	Unit	Part No.
Straight Barrel Cartridges		
25 mg, 1 mL	100/pk	12105021
100 mg, 1 mL	100/pk	12105023
100 mg, 3 mL	50/pk	12105024
200 mg, 3 mL	50/pk	12105025
500 mg, 3 mL	50/pk	12105026
500 mg, 6 mL	30/pk	12255021
1 g, 6 mL	30/pk	12255022

Bond Elut LMS 96-well Plates

Description	10 mg	25 mg
1 mL round-well plates	A4961010	
2 mL square-well plates	A3961010	A3961025

Mixed Mode Polymeric SPE

Bond Elut NEXUS and Bond Elut NEXUS WCX

Typical Matrices

Horse urine, urine, biological fluids

Primary Extraction Mechanism

Non-polar

- Large particle size allows excellent flow for viscous samples
- Non-conditioning method saves time and improves throughput
- WCX offers enhanced selectivity for certain analytes such as quaternary amine drugs

Bond Elut NEXUS is an ultra-clean polymeric sorbent which has bi-modal porosity and a high surface area. NEXUS offers a non-polar retention mechanism with no pre-conditioning required. The large particle size makes NEXUS ideal for extractions from highly viscous samples such as horse urine.

Based on the same base polymer technology, Bond Elut NEXUS WCX is a weak cation exchange sorbent that offers extra selectivity for analytes such as quaternary ammonium drugs and anabolic steroids.

Bond Elut NEXUS and Bond Elut NEXUS WCX

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
30 mg, 10 mL	50/pk	12113100
60 mg, 10 mL	50/pk	12113101
Straight Barrel Cartridges		
30 mg, 1 mL	100/pk	12103100
60 mg, 3 mL	100/pk	12103101
60 mg, 3 mL, NEXUS WCX	100/pk	12102157
200 mg, 6 mL	30/pk	12103102
200 mg, 12 mL	20/pk	12253101
500 mg, 12 mL	20/pk	12253102
500 mg, 20 mL	20/pk	12253103

Bond Elut NEXUS 96-well Plates

Description	30 mg	60 mg
1 mL round-well plates	A4962030	
2 mL square-well plates		A3962060

References

Wynne, PM, Barry, DC, Vine, JH & Simpson, NKJ (2004) Approaches to the solid phase extraction of equine urine. Chromatography, 59, S51-S60.

Wynne, PM, Barry, DC, Vine, JH & Simpson, NKJ (2000) An improved method for the extraction of anabolic steroids from equine urine. In: RB Williams, E Houghton & J Wade (eds) Proc. 13th Int. Conf. Racing Analysts and Veterinarians. R & W Publications, Newmarket, UK.

Silica-Based SPE

Reversed Phase (Non-Polar) Silica SPE

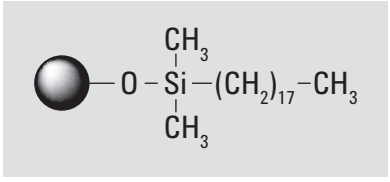


Reversed phase sorbents are non-polar and are used to retain (extract) non-polar analytes from polar matrices. For reversed phase sorbents, retention decreases as the eluting solvent becomes more non-polar.

Bond Elut C18

- The most hydrophobic, bonded silica sorbent
- Extremely retentive for non-polar compounds
- Effective for desalting aqueous mixtures

Bond Elut C18 is the most hydrophobic, bonded silica sorbent in the Bond Elut range. It is the most popular SPE sorbent because of its extremely retentive nature for non-polar compounds. C18 is generally regarded as having the broadest spectrum of retention among bonded silica sorbents, since it retains most organic analytes from aqueous matrices. When analyzing small to intermediate molecules, Bond Elut C18 can be used for desalting aqueous matrices prior to ion exchange, as salts pass through the sorbent unretained.



Typical Matrices
Aqueous samples, biological fluids
Primary Extraction Mechanism
Non-polar

TIPS & TOOLS

Tabless (flangeless) cartridges are suitable for use with many automated SPE systems. Tabless products are typically designated with a "T" in the part number. If you need a tabless cartridge and do not see a part number listed, please contact SPP-Support@agilent.com to discuss custom options.



Bond Elut C18 Flash cartridges, 12256060

Bond Elut C18

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113001	14113001
200 mg, 10 mL	50/pk	12113024	14113024
500 mg, 10 mL	50/pk	12113027	14113027
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102058	14102058
50 mg, 30 mL	500/pk	12102058B	
50 mg, 3 mL	50/pk	12105027	
100 mg, 1 mL	100/pk	12102001	14102001
100 mg, 3 mL	50/pk	12102099	
200 mg, 1 mL	100/pk	12102096	
200 mg, 3 mL	50/pk	12102025	14102025
200 mg, 3 mL tabless	50/pk	12102025T	12102025T
500 mg, 3 mL	50/pk	12102028	14102028
500 mg, 6 mL	30/pk	12102052	14102052
1 g, 3 mL	50/pk	12102118	
500 mg, 6 mL tabless	30/pk	12102052T	
1 g, 6 mL	30/pk	12256001	14256001
1 g, 60 mL	16/pk	12256060	
2 g, 12 mL	20/pk	12256001	14256015
5 g, 20 mL	20/pk	12256023	14256023
10 g, 60 mL	16/pk	12256031	14256031

(Continued)

Bond Elut C18

Description	Unit	40 µm Particle Size	120 µm Particle Size
Bond Elut Jr			
500 mg	100/pk	12162028B	
1 g	100/pk	12166001B	
Other Formats			
Prospekt cartridge, 800 Series, 2 mm	96/pk	12281001	
Prospekt cartridge, 800 Series, 1 mm	96/pk	12281024	
100 mg, 3 mL, Gerstel format	50/pk	161818G	
200 mg, 3 mL, Gerstel format	50/pk	161822G	
500 mg, 3 mL, Gerstel format	50/pk	161832G	

Bond Elut C18 VersaPlate Formats

Description	Particle Size (µm)	25 mg	50 mg	100 mg
Preassembled 96-well plate	40	75401025	75401050	7540101C
VersaPlate tubes, 96/pk*	40	75501025	75501050	7550101C
	120		75502050	

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000



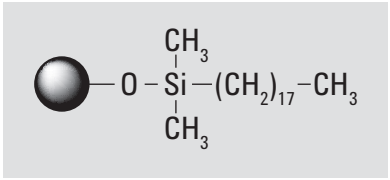
Preassembled 96-well plate, 75401050

Bond Elut C18 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960125	A4960150	A496011C
2 mL square-well plates	A3960125	A3960150	A396011C



VersaPlate tubes, 75501050



Typical Matrices

Aqueous samples, biological fluids

Primary Extraction Mechanism

Non-polar

Bond Elut C18 EWP

- No exclusion of large molecules
- Good for desalting proteins
- Successful separation of proteins, peptides or nucleotides

Bond Elut C18 EWP is based on standard particle size silica but with 500Å pores to allow more efficient extraction of large molecules (>15,000 MW), which are typically excluded from standard porosity silica phases.

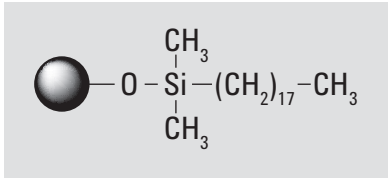
Bond Elut C18 EWP

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
50 mg, 10 mL	50/pk	12113068
500 mg, 10 mL	50/pk	12113071
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102136
100 mg, 1 mL	100/pk	12102137
500 mg, 3 mL	50/pk	12102139
1 g, 6 mL	30/pk	12256130

Bond Elut C18 OH

- Silanol activity permits metabolite fractionation
- Tight QC tolerances deliver batch-to-batch reproducibility
- 150Å pore size expands utility to higher molecular weight compounds

Bond Elut C18 OH is a non-endcapped version of the octadecyl bonded phases that enables the silanols on the silica surface to be more active. This low-load C18 has well-controlled silanol activity that permits the fractionation of metabolites and enhances retention of basic compounds compared to an endcapped C18.



Typical Matrices

Aqueous samples, biological fluids, non-polar extracts

Primary Extraction Mechanism

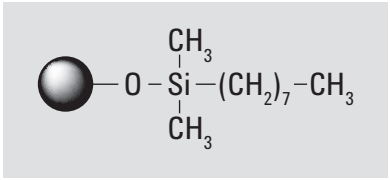
Non-polar, hydrogen bonding

Bond Elut C18 OH

Description	Unit	Part No.
Straight Barrel Cartridges		
100 mg, 1 mL	100/pk	12102020
500 mg, 3 mL	50/pk	12102046
1 g, 6 mL	30/pk	12256040

Bond Elut C18 OH 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates			A496291C
2 mL square-well plates	A3962925	A3962950	A396291C



Typical Matrices

Aqueous samples, biological fluids

Primary Extraction Mechanism

Non-polar

Bond Elut C8

- Excellent for strongly-retained analytes
- Polar interactions not significant
- Less retentive than C18

Bond Elut C8 is very similar in properties to C18, but is not as retentive for non-polar compounds, due to its shorter hydrocarbon chain, and therefore reduced carbon loading. C8 is an excellent replacement for C18 when analytes are too strongly retained for effective elution. The potential for polar interactions is somewhat higher than for C18 because there is less coverage of the silica surface. These polar interactions are not, however, a significant property of C8.

Bond Elut C8

Description	Unit	Part No.
Bond Elut Jr		
500 mg	100/pk	12162029B
1 g	100/pk	12166002B
Large Reservoir Capacity (LRC) Cartridges		
100 mg, 10 mL	50/pk	12113075
200 mg, 10 mL	50/pk	12113025
500 mg, 10 mL	50/pk	12113028
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102059
50 mg, 3 mL	50/pk	12105028
100 mg, 1 mL	100/pk	12102002
100 mg, 1 mL	500/pk	52102002
100 mg, 3 mL	50/pk	12102100
200 mg, 3 mL	50/pk	12102026
200 mg, 3 mL	500/pk	52102026
500 mg, 3 mL	50/pk	12102029
500 mg, 6 mL	30/pk	12102053
1 g, 6 mL	30/pk	12256002
5 g, 20 mL	20/pk	12256024
10 g, 60 mL	16/pk	12256032
Other Formats		
Prospekt cartridge, 800 Series, 2 mm	96/pk	12281002
100 mg, 3 mL, Gerstel format	50/pk	161618G
200 mg, 3 mL, Gerstel format	50/pk	161622G
500 mg, 3 mL, Gerstel format	50/pk	161632G

Bond Elut C8 VersaPlate Formats

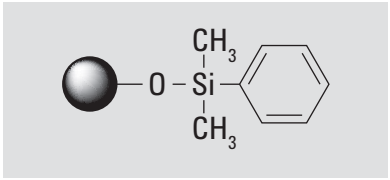
Description	25 mg	50 mg	100 mg	200 mg
Preassembled 96-well plate	75403025	75403050	7540301C	7540302C
VersaPlate tubes, 96/pk*		75503050	7550301C	

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000



Bond Elut C8 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960325	A4960350	A496031C
2 mL square-well plates	A3960325	A3960350	A396031C



Typical Matrices

Aqueous and biological fluids

Primary Extraction Mechanism

Non-polar

Bond Elut PH

- Added selectivity compared to other non-polar sorbents
- Enhanced retention of planar, conjugated organic molecules
- Similar polarity to C8

Bond Elut PH is a non-polar bonded silica material which exhibits a different selectivity to alkyl or aliphatic functionalized phases such as C8 or cyclohexyl. The electron density present in the aromatic ring enhances retention of conjugated or aromatic ring-containing analytes due to desirable pi-pi interactions.

Bond Elut PH

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113005	14113005
500 mg, 10 mL	50/pk	12113031	14113031
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102062	14102062
100 mg, 1 mL	100/pk	12102005	14102005
500 mg, 3 mL	50/pk	12102032	14102032
1 g, 6 mL	30/pk	12256004	14256004

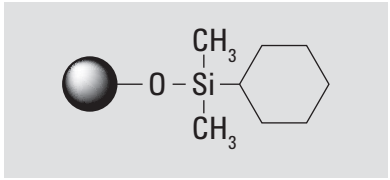
Bond Elut PH 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates			A496151C
2 mL square-well plates	A3961525	A3961550	A396151C

Bond Elut CH (cyclohexyl)

- Non-polar CH with polarity similar to C2
- Retains polar analytes from aqueous matrices
- Good choice when common non-polar sorbents do not provide the required selectivity

Bond Elut CH is a mid-polarity sorbent that exhibits unique selectivities for certain analytes. When employed as a non-polar sorbent, CH has the approximate polarity of a C2 sorbent. Bond Elut CH is often a good choice when non-polar sorbents such as C18, C8, or C2 do not provide the desired selectivity.



Typical Matrices

Aqueous samples, biological fluids

Primary Extraction Mechanism

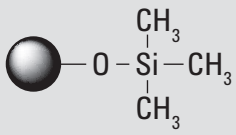
Non-polar

Bond Elut CH (cyclohexyl)

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
500 mg, 10 mL	50/pk	12113032
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102063
100 mg, 1 mL	100/pk	12102006
500 mg, 3 mL	50/pk	12102033
1 g, 6 mL	30/pk	12256005
2 g, 12 mL	20/pk	12256039

Bond Elut CH 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4962225	A4962250	A496221C



Typical Matrices

Urine, plasma, biological fluids

Primary Extraction Mechanism

Non-polar, polar
(as a normal phase extraction)

Bond Elut C1

- Least retentive of all alkyl group bonded phases
- Easy retention and release of polar compounds
- Easy retention and release of multi-functional compounds

Due to the methyl group and subsequent low carbon load, Bond Elut C1 is the least retentive of all alkyl group bonded phases for non-polar compounds. However, due to the extensive endcapping of this sorbent to mask polar silanol activity, retention and elution of polar and multi-functional analytes can still be achieved.

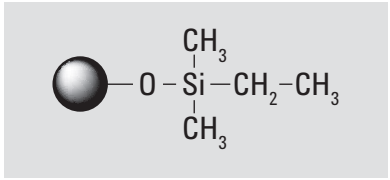
Bond Elut C1

Description	Unit	Part No.
Straight Barrel Cartridges		
100 mg, 1 mL	100/pk	12102004
100 mg, 3 mL	50/pk	12102090
500 mg, 3 mL	50/pk	12102031

Bond Elut C2

- Low carbon load sorbent
- Can be used alongside CN and C8 phases
- Popular for drug extraction from plasma and for flat baselines

Bond Elut C2 is a fairly non-polar sorbent because of the short chain length of the functional group. C2 is often used during the process of method development if analytes are retained too strongly on a C8 or C18 phase. The polarity of C2 is slightly lower than a cyano phase for polar interactions.



Typical Matrices

Aqueous samples, biological fluids

Primary Extraction Mechanism

Non-polar

Bond Elut C2

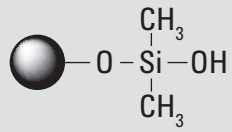
Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
100 mg, 10 mL	50/pk	12113003
500 mg, 10 mL	50/pk	12113029
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102060
50 mg, 3 mL	50/pk	12105029
100 mg, 1 mL	100/pk	12102003
100 mg, 3 mL	50/pk	12102117
200 mg, 3 mL	50/pk	12102027
500 mg, 3 mL	50/pk	12102030
500 mg, 6 mL	30/pk	12102115
1 g, 6 mL	30/pk	12256003

Bond Elut C2 96-well Plates

Description	50 mg	100 mg
1 mL round-well plates	A4961150	A496111C

Normal Phase (Polar) Silica SPE

Normal phase sorbents are polar and used to retain (extract) polar analytes. For normal phase sorbents, retention decreases as the eluting solvent becomes more polar.



Typical Matrices

Non-polar organics, oils, lipids

Primary Extraction Mechanism

Polar

Bond Elut SI

- Highly polar phase retains polar molecules from non-polar matrices
- High purity silica
- Separate compounds with very similar structures

Native silica is generally regarded as the most polar SPE sorbent available. Bond Elut SI is particularly effective at separating compounds with a very similar structure. Applying the analytes in a non-polar solvent, then increasing the solvent polarity by increasing the concentration of a polar modifier, such as THF or ethyl acetate, delivers effective separations.

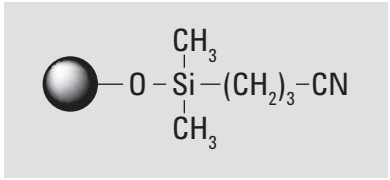
Bond Elut SI

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113010	14113010
500 mg, 10 mL	50/pk	12113036	14113036
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102068	14102068
100 mg, 1 mL	100/pk	12102010	14102010
500 mg, 3 mL	50/pk	12102037	14102037
1 g, 6 mL	30/pk	12256008	14256008
1.5 g, 3 mL	50/pk	12102119	
2 g, 6 mL	20/pk	12256018	14256018
5 g, 20 mL	20/pk	12256026	14256026
10 g, 60 mL	16/pk	12256034	14256034
Bond Elut Jr			
500 mg	100/pk	12162037B	
1 g	100/pk	12166008B	
Other Formats			
500 mg, 3 mL, Gerstel format	50/pk	167232G	

Bond Elut CN-E

- Ideal for extracting aqueous analytes
- Retention in aqueous and organic matrices
- Useful for many applications

A medium polarity sorbent with many uses, Bond Elut CN-E is ideal for applications in which extremely non-polar compounds would be irreversibly retained on high carbon load sorbents such as C8 and C18. This endcapped version of the cyano sorbent is best utilized when extracting analytes from an aqueous matrix.



Typical Matrices

Aqueous samples, biological fluids

Primary Extraction Mechanism

Non-polar, dipole

Bond Elut CN-E

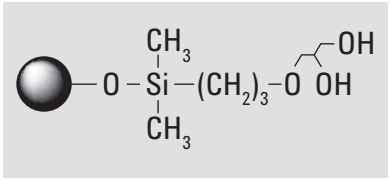
Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
500 mg, 10 mL	50/pk	12113033
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102064
100 mg, 1 mL	100/pk	12102007
500 mg, 3 mL	50/pk	12102034

Bond Elut CN-E 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960425	A4960450	A496041C

References

Pucci, V, Bugamelli, F, Mandrioli, R, Bartoletti, C, Rossi, N & Raggi, MA (2003) Liquid chromatographic analysis of the cis(Z)- and trans(E)-isomers of clopenthixol in human plasma using a novel solid phase extraction procedure. J. Chromatogr. B., 792, 313-321.



Bond Elut Diol (2OH)

- Provides polar and non-polar modes
- Strong hydrogen bonding with analytes
- Resembles un-bonded silica in its capabilities

Bond Elut Diol resembles un-bonded silica in its tendency for strong hydrogen bonding with analytes. 2OH can also be employed in the non-polar mode because the hydrocarbon spacer on its functional group provides enough non-polar character for retention of hydrophobic analytes. Bond Elut Diol is a listed SPE device for the DIN 14333-1 method on benzimidazole fungicides.

Typical Matrices

Aqueous, biological fluids, non-polar organics

Primary Extraction Mechanism

Polar and non-polar

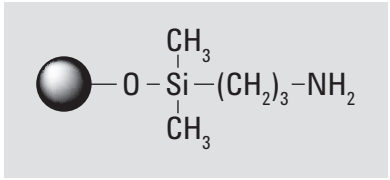
Bond Elut Diol (2OH)

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
100 mg, 10 mL	50/pk	12113009
500 mg, 10 mL	50/pk	12113035
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102067
100 mg, 1 mL	100/pk	12102009
500 mg, 3 mL	50/pk	12102036
1 g, 6 mL	30/pk	12256007

Bond Elut NH2

- Normal phase or anion exchange sorbent
- Weaker anion exchange than SAX
- Amenable to separating structural isomers

Bond Elut NH2 is a weaker anion exchanger than sorbents such as SAX (a quaternary amine sorbent that is always charged) and is therefore a better choice for retention of very strong anions, such as sulfonic acids, which may retain irreversibly on a SAX sorbent. Similar to Diol and SI sorbents, Bond Elut NH2 is excellent for the separation of structural isomers.



Typical Matrices

Aqueous samples, biological fluids, buffered organics

Primary Extraction Mechanism

Weak anion exchange

Bond Elut NH2

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113014	
200 mg, 10 mL	50/pk	12113067	
500 mg, 10 mL	50/pk	12113040	14113040
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102076	14102076
100 mg, 1 mL	100/pk	12102014	
200 mg, 3 mL	50/pk	12102089	
200 mg, 6 mL	30/pk	12102106	
300 mg, 3 mL	50/pk	12102108	
500 mg, 3 mL	50/pk	12102041	14102041
500 mg, 6 mL	30/pk	12256045	
1 g, 3 mL	50/pk	12102107	
1 g, 6 mL	30/pk	12256012	14256012
2 g, 12 mL	20/pk	12256020	14256020
Bond Elut Jr			
500 mg	100/pk	12162041B	
1 g	100/pk	12166012B	
Other Formats			
200 mg, 3 mL, Gerstel format	50/pk	165022G	
500 mg, 3 mL, Gerstel format	50/pk	165032G	

Bond Elut NH2 VersaPlate Formats

Description	Particle Size (µm)	50 mg	100 mg
Preassembled 96-well plate	40	75405050	7540501C

References

Schenck, F, Lehotay, S, & Vega, V (2002) Comparison of solid phase extraction sorbents for cleanup of pesticide residue analysis in fresh fruit and vegetables. J. Sep. Sci., 25, 883-890.



Bond Elut NH2 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960525	A4960550	A496051C
2 mL square-well plates	A3960525	A3960550	A396051C

The isolation of lipids from serum and tissue

Extraction Method

Matrix:
Chloroform extract of serum or adipose tissue

Sorbent Conditioning:
Hexane

Apply Sample:
Through Bond Elut NH2 cartridge

Elution 1:

(Neutral lipids)
(All except fatty acids and phospholipids) – 2:1 chloroform: 2-propanol

(Fatty acids)
2% acetic acid in diethyl ether

(Phospholipids)
Methanol

The neutral lipid fraction is then dried down, reconstituted in hexane, and passed through a second NH2 tube conditioned with hexane.

Elution 2:

(Cholesterol esters)
Hexane

Another Bond Elut NH2 sorbent column is attached below the existing one to trap cholesterol that breaks through the first during triglyceride elution.

Elution 3:

(Triglycerides)
Hexane containing 1% diethyl ether and 10% methylene chloride

The Bond Elut NH2 tubes are separated, cholesterol is eluted from both, and finally the di- and monoglycerides are eluted from the upper NH2 tube.

Elution 4:

(Cholesterol)
5% ethyl acetate in hexane

(Diglycerides)
15% ethyl acetate in hexane

(Monoglycerides)
2:1 chloroform:methanol

Simpson, N & Van Horne, C (eds) (1993) The Handbook of Sorbent Extraction Technology. Varian, Inc., Walnut Creek CA, USA.

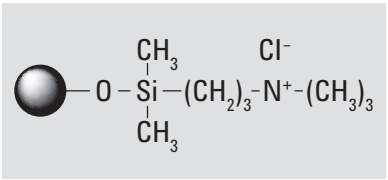
Ion Exchange Silica SPE

Ion exchange phases are more dependent on pH, ionic strength, and counter-ion strength than on solvent strength. These phases depend on ionic interactions as the primary retention mechanism.

Bond Elut SAX

- Retains compounds that elute from weak anion exchange sorbents
- Selectivity can be user-modified for increased flexibility
- Minimal non-polar interactions

Bond Elut SAX is a strong anion exchange sorbent ideally suited for the extraction of compounds such as carboxylic acids, which may not retain effectively on weak anion exchange sorbents.



Typical Matrices

Aqueous samples, biological fluids, buffered organics

Primary Extraction Mechanism

Anion exchange

Bond Elut SAX

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113017	
500 mg, 10 mL	50/pk	12113043	14113043
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102079	14102079
100 mg, 1 mL	100/pk	12102017	14102017
100 mg, 1 mL	500/pk	52102017	
100 mg, 3 mL	50/pk	12102125	
100 mg, 3 mL tabless	100/pk	12102017T	
100 mg, 3 mL tabless	500/pk	12102017TB	
500 mg, 3 mL	50/pk	12102044	14102044
500 mg, 3 mL tabless	50/pk	12102044T	
500 mg, 6 mL	30/pk	12102144	
1 g, 3 mL	50/pk	12102087	
1 g, 6 mL	30/pk	12256013	14256013
2 g, 6 mL	30/pk	12256051	
2 g, 12 mL	20/pk	12256021	14256021
5 g, 20 mL	20/pk	12256029	14256029
10 g, 60 mL	16/pk	12256037	14256037
Bond Elut Jr			
500 mg	100/pk	12162044B	
1 g	100/pk	12166013B	



Bond Elut SAX 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4963025	A4963050	A496301C
2 mL square-well plates	A3960825	A3960850	A396081C

Bond Elut SAX VersaPlate Formats

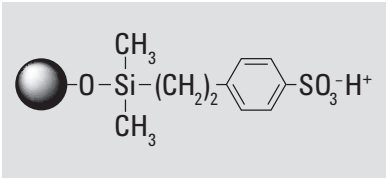
Description	Particle Size (µm)	50 mg
Preassembled 96-well plate	40	75408050
VersaPlate tubes, 96/pk*	40	75508050

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000

Bond Elut SCX

- Useful for compounds with both cationic and non-polar characteristics
- Superior cleanup from a single sorbent
- Very low pKa ligand elicits strong analyte interaction

Bond Elut SCX is a strong cation exchanger with a very low pKa. Although the pKa is similar to Bond Elut PRS, the presence of the benzene ring in the functional group increases the potential for non-polar interactions. This non-polar characteristic becomes particularly important when conducting ion exchange from aqueous systems, where selectivity towards compounds exhibiting cationic and non-polar character is seen.



Typical Matrices

Aqueous samples, biological fluids, buffered organics

Primary Extraction Mechanism

Cation exchange

Bond Elut SCX

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113013	14113013
500 mg, 10 mL	50/pk	12113039	14113039
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102075	14102075
100 mg, 1 mL	100/pk	12102013	14102013
100 mg, 3 mL	50/pk	12102098	
500 mg, 3 mL	50/pk	12102040	14102040
1 g, 6 mL	30/pk	12256011	14256011
2 g, 6 mL	30/pk	12256053	14256019
3 g, 6 mL	30/pk	12256054	
5 g, 20 mL	20/pk		14256027
10 g, 60 mL	16/pk		14256035
Bond Elut Jr			
500 mg	100/pk	12162040B	
1 g	100/pk	12166011B	
Other Formats			
200 mg, 3 mL, Gerstel format	50/pk	167022G	

Bond Elut SCX VersaPlate Formats

Description	Particle Size (µm)	50 mg	100 mg
Preassembled 96-well plate	40		7540701C
VersaPlate tubes, 96/pk*	40	75507050	7550701C

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000

Bond Elut SCX 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960725	A4960750	A496071C
2 mL square-well plates	A3960725	A3960750	A396071C

References

Codony, R, Compañó, R, Granados, M, Garcia-Regueiro, JA & Dolors Prat, M (2002) Residue analysis of macrolides in poultry muscle by liquid chromatography-electrospray mass spectrometry. J. Chromatogr. A, 959, 131-141.

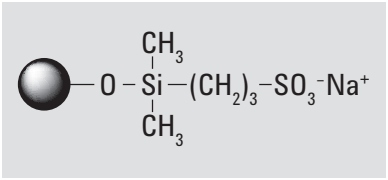
Horie, M, Saito, K, Ishii, R, Yoshida, T, Haramaki, Y & Nakazawa, H (1998) Simultaneous determination of five macrolide antibiotics in meat by high performance liquid chromatography. J. Chromatogr. A, 812, 295-302.

Stubbings, G, Tarbin, J, Cooper, A, Shaman, M. Bigwood, T & Robb, P (2005) A multi-residue cation-exchange clean up procedure for basic drugs in produce of animal origin. Analyt. Chim. Acta, 547, 262-268.

Bond Elut PRS

- Strong cation exchange sorbent, also capable of polar and hydrogen bonding interactions
- No appreciable non-polar interactions
- Unique selectivity properties

Bond Elut PRS is a strong cation exchange sorbent that is also relatively high in polarity. With no appreciable degree of hydrophobicity in non-polar solvents, PRS is capable of polar and hydrogen bonding interactions. Due to the very low pKa of PRS, it is recommended for weaker cationic species such as pyridinium compounds.



Typical Matrices

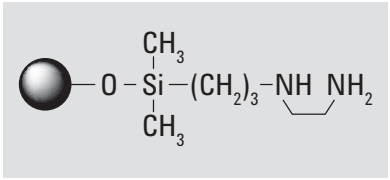
Aqueous, biological fluids, buffered organics

Primary Extraction Mechanism

Cation exchange

Bond Elut PRS

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
100 mg, 10 mL	50/pk	12113012
500 mg, 10 mL	50/pk	12113038
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102074
100 mg, 1 mL	100/pk	12102012
200 mg, 3 mL	50/pk	12102094
500 mg, 3 mL	50/pk	12102039
1 g, 6 mL	30/pk	12256010



Bond Elut PSA

- Alternative choice to Bond Elut NH2 for polar compounds
- Higher ionic capacity than NH2

Bond Elut PSA is an alkylated amine sorbent that contains two different amino functionalities – one secondary and one primary. This gives a slightly higher pKa and ionic capacity compared to Bond Elut NH2. PSA has a significantly higher carbon load than most amino functional sorbents, thus is a better choice for polar compounds, which retain too strongly on Bond Elut NH2.

Typical Matrices

Aqueous samples, biological fluids, buffered organics

Primary Extraction Mechanism

Weak anion exchange

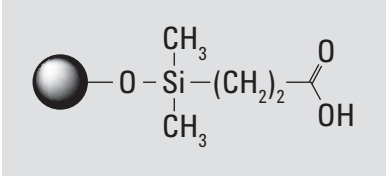
Bond Elut PSA

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
500 mg, 10 mL	50/pk	12113041
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102077
100 mg, 1 mL	100/pk	12102015
500 mg, 3 mL	50/pk	12102042
1 g, 6 mL	30/pk	12256140
2 g, 12 mL	20/pk	12256055
Bond Elut Jr		
500 mg	100/pk	12162042B
1 g	100/pk	12166050B

Bond Elut CBA

- Cation exchange with no need for extreme basic conditions
- Wider selectivity range provides more eluent options
- Polar or non-polar depending on matrix or solvent

CBA is a mid-polarity sorbent and weak cation exchanger (pKa 4.8). It can be used with a wider range of counter-ions than lower pKa sorbents like SCX, and will demonstrate easier elution of quaternary amine functionalized analytes.



Typical Matrices

Aqueous samples, biological fluids

Primary Extraction Mechanism

Weak cation exchange

Bond Elut CBA

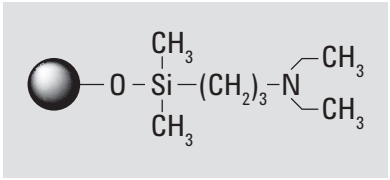
Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
100 mg, 10 mL	50/pk	12113011
500 mg, 10 mL	50/pk	12113037
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102073
100 mg, 1 mL	100/pk	12102011
100 mg, 3 mL	50/pk	12102097
200 mg, 3 mL	50/pk	12102124
500 mg, 3 mL	50/pk	12102038
1 g, 6 mL	30/pk	12256009
2 g, 12 mL	20/pk	12256058

Bond Elut CBA 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960625	A4960650	A496061C
2 mL square-well plates	A3960625	A3960650	A396061C

References

Murayama, N. & Sudo, K (1997) High performance liquid chromatographic method for determination of DX-9065a, a novel anticoagulant, in human urine and feces using cation-exchange solid-phase extraction. J. Chromatogr. Biomed. Appl., 692, 389-396.



Typical Matrices

Water, biological fluids, non-polar extracts

Primary Extraction Mechanism

Weak anion exchange

Bond Elut DEA

- Weak anion exchanger
- More polar than C8 but less polar than C2 or CN
- Alkyl side chains confer moderately non-polar characteristics

Bond Elut DEA bears some resemblance to Bond Elut NH2 in its properties but with a slightly lower capacity as an anion exchange sorbent. DEA has a moderately non-polar character due to the alkyl side chains on the amino functionality. These groups still afford a medium level of polarity, higher than C8 but less polar than C2 or CN-E.

Bond Elut DEA

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113016	
500 mg, 10 mL	50/pk	12113042	14113042
Straight Barrel Cartridges			
50 mg, 1 mL	100/pk	12102078	14102078
100 mg, 1 mL	100/pk	12102016	14102016
500 mg, 3 mL	50/pk	12102043	14102043
Bond Elut Jr			
1000 mg	100/pk	12166046B	

Bond Elut DEA VersaPlate Formats

Description	Particle Size (µm)	50 mg	100 mg
VersaPlate tubes, 96/pk*	40	7551701C	7551701C

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000

References

Kline, W., Matuszewski, B & Bayne, W (1990) Determination of 4-amino-1-hydroxybutane-1,1-bisphosphonic acid in urine by automated pre-column derivatization with 2,3-naphthalene dicarboxyaldehyde and high performance liquid chromatography with fluorescence detection. J. Chromatogr. Biomed.l Appl., 534, 139-149.

Mixed Mode Silica SPE

Bond Elut AccuCAT

- SCX and SAX functionalities offer broad analyte extraction potential
- Ultra clean, mixed sorbent bed delivers reproducible extractions
- Compatible with many biological fluids for easy method transfer

Bond Elut AccuCAT cartridges are mixed bed SPE cartridges consisting of a strong cation exchange (SCX) and a strong anion exchange (SAX) sorbent packed into one bed. AccuCAT is effective for the extraction of acidic, basic and neutral analytes from urine and other biological samples. AccuCAT is particularly effective for catecholamine extraction from bio-fluids.

Typical Matrices

Urine, plasma and biological fluids, beverages and food

Primary Extraction Mechanism

Strong cation and anion exchange

Bond Elut AccuCAT

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
200 mg, 10 mL	60/pk	12282005
600 mg, 10 mL	60/pk	12282001
Straight Barrel Cartridges		
200 mg, 3 mL	60/pk	12282003
200 mg, 6 mL	30/pk	12282004
400 mg, 6 mL	30/pk	12282006
600 mg, 3 mL	60/pk	12282002

References

Andrzejewski, D, Roach, JAG, Gay, ML and Musser, SM (2004) Analysis of coffee for the presence of acrylamide by LC-MS/MS. J. Agric. Food Chem., 52, 1996-2002.

Lenders, JW, Eisenhofer, G, Armando, I, Keiser, HR, Goldstein, DS and Kopin, IJ (1993) Determination of metanephrines in plasma by liquid chromatography with electrochemical detection. Clin. Chem., 39, 97-103.



Bond Elut Certify VersaPlate cartridges

Bond Elut Certify

- Special mixed-mode sorbent bed
- Broad application range for aqueous extraction
- Bimodal, non-polar and strong cation exchange

The Bond Elut Certify extraction cartridge is a mixed mode sorbent containing non-polar and C8 strong cation exchanger functionalities. Certify is most commonly used to extract basic (cationic) drugs from urine and blood, but it is also very effective for the extraction of a wide range of compounds from a diverse range of aqueous matrices. Rely on the Certify products for consistent performance and availability in a range of formats to support automation and high sample throughput.

Typical Matrices

Urine, plasma, saliva, blood, biological fluids

Primary Extraction Mechanism

Non-polar and strong cation exchange

Bond Elut Certify

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
130 mg, 10 mL	50/pk	12113050	14113050
130 mg, 10 mL	500/pk	52113050	14113055
200 mg, 10 mL	500/pk	52113051	
200 mg, 10 mL	50/pk	12113054	14113054
300 mg, 10 mL	50/pk	12113052	14113052
Straight Barrel Cartridges			
50 mg, 3 mL	50/pk	12105030	
130 mg, 1 mL	100/pk	12102083	14102083
130 mg, 3 mL	50/pk	12102051	14102051
130 mg 3 mL	500/pk	52102051	
130 mg, 3 mL tabless	50/pk	12102051T	
130 mg, 6 mL	30/pk	12256146	
130 mg, 6 mL tabless	500/pk	12256146TJ	
200 mg, 3 mL	50/pk	12102145	
200 mg, 6 mL	30/pk	12256145	
300 mg, 3 mL	50/pk	12102081	
300 mg, 3 mL	500/pk	52102081	
300 mg, 3 mL tabless	50/pk	12102081T	14102081T
300 mg, 6 mL	30/pk	12102082	
500 mg, 6 mL	30/pk	12102093	14102093
1 g, 6 mL	30/pk	12102085	14102085
Other Formats			
Prospekt cartridge, 800 Series	96/pk	12281101	

Bond Elut Certify VersaPlate Formats

Description	Particle Size (µm)	25 mg	50 mg	100 mg
Preassembled 96-well plate	40		75409050	7540901C
VersaPlate tubes*	40	75509025	75509050	7550901C

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000

Bond Elut Certify 96-well Plates

Description	25 mg	50 mg	100 mg
1 mL round-well plates	A4960925	A4960950	A496091C
2 mL square-well plates	A3960925	A3960950	A396091C

Bond Elut Certify II

Typical Matrices

Urine, plasma, saliva, blood, biological fluids

Primary Extraction Mechanism

Non-polar and strong anion exchange

- Ideal for non-polar and anionic compounds
- Optimized for acidic drug analysis
- Bimodal, non-polar and strong anion exchange

Bond Elut Certify II is designed for the rapid and effective extraction of acidic drugs and metabolites from urine and other biological matrices for forensic use. Certify II is a mixed-mode cartridge with non-polar C8 and strong anion exchange (SAX) functionalities. It has been optimized for acidic drugs such as 11-nor-delta-9-tetrahydrocannibinol-carboxylic acid, salicylic acid, ibuprofen, acetaminophen and other compounds that possess both non-polar and anionic characteristics.

Bond Elut Certify II

Description	Unit	40 µm Particle Size	120 µm Particle Size
Large Reservoir Capacity (LRC) Cartridges			
100 mg, 10 mL	50/pk	12113063	
200 mg, 10 mL	50/pk	12113051	14113051
Straight Barrel Cartridges			
50 mg, 3 mL	50/pk	12105031	
100 mg, 1 mL	100/pk	102818C	
200 mg, 3 mL	50/pk	12102080	14102080
500 mg, 6 mL	30/pk	12102084	14102084
1 g, 6 mL	30/pk	12102088	14102088
Other Formats			
Prospekt cartridge, 800 Series	96/pk	12281102	

Inorganic SPE

The following SPE phases have varying degrees of polarity and surface acidity or basicity. They are primarily used to retain polar analytes. For these phases, solvent retention generally decreases as the solvent becomes more polar.

Bond Elut Florisil

- Pesticide Residue (PR) grade
- For cleanup of polar interferences from non-polar samples
- Economical
- Fast flow, ideal for viscous samples

Florisil is a magnesia-loaded silica gel. Like silica, it is extremely polar in nature and ideal for the isolation of polar compounds from non-polar matrices. The larger particle size of the sorbent enables fast flow for large sample volumes and is therefore an attractive alternative to silica if the sample matrix is particularly viscous.

Typical Matrices

Non-polar organics

Primary Extraction Mechanism

Polar compounds

Bond Elut Florisil

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
500 mg, 10 mL	50/pk	12113049
Straight Barrel Cartridges		
100 mg, 1 mL	100/pk	12102024
200 mg, 3 mL	50/pk	12102129
500 mg, 6 mL	30/PK	12102159
500 mg, 3 mL	50/pk	12102050
1 g, 3 mL	50/pk	12102109
1 g, 6 mL	30/pk	12256014
1 g, 6 mL	250/pk	52256014
1 g, 20 mL	20/pk	12256047
2 g, 12 mL	20/pk	12256022
2 g, 20 mL	20/pk	12256046
5 g, 20 mL	20/pk	12256030
10 g, 60 mL	16/pk	12256038
Bond Elut Jr		
500 mg	100/pk	12162050B
1 g	100/pk	12166014B
Other Formats		
500 mg, 3 mL, Gerstel format	50/pk	164632G

Bond Elut Alumina

Typical Matrices

Non-polar organics

Primary Extraction Mechanism

Polar

- Available in acidic (A), basic (B) and neutral (N) formats
- High extraction efficiency
- Better high pH stability than unfunctionalized silica

Alumina, like silica, is an extremely polar sorbent. The alumina surface tends to be slightly more stable under high pH conditions than unfunctionalized silica. The small particle size of the Bond Elut Alumina range ensures high extraction efficiency even when small bed masses are used.

Bond Elut Alumina A

Description	Unit	Part No.
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102069
500 mg, 3 mL	50/pk	12102047
1 g, 6 mL	30/pk	12256043
Bond Elut Jr		
1 g	100/pk	12166043B

Bond Elut Alumina B

Description	Unit	Part No.
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102070
500 mg, 3 mL	50/pk	12102048
1 g, 6 mL	30/pk	12256044
Bond Elut Jr		
500 mg	100/pk	12162048B
1 g	100/pk	12166044B

Bond Elut Alumina N

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
500 mg	50/pk	12113048
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	12102071
100 mg, 1 mL	100/pk	12102023
500 mg, 3 mL	50/pk	12102049
500 mg, 6 mL	1000/pk	221032B
1 g, 6 mL	30/pk	12256086
20 g, 60 mL	16/pk	12256059
Bond Elut Jr		
500 mg	100/pk	12162049B
1 g	100/pk	12166045B

Bond Elut Sodium Sulfate Drying Cartridges

- Highly effective pre-packed dessicant
- Clean ACS grade, anhydrous sodium sulfate
- Pre-packed for convenience

Simplify sodium sulfate mediated drying steps by using cartridges pre-packed with ACS grade, granular anhydrous sodium sulfate. Available in three formats (LRC, Bond Elut Jr and straight barrels).

Bond Elut Jr cartridges have top and bottom luer fittings, allowing for easy sample processing when used in conjunction with standard SPE cartridges. Bond Elut LRC cartridges have a large reservoir above the sorbent bed and are suitable for use on any standard SPE vacuum manifold.

Bond Elut Sodium Sulfate Drying Cartridges

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
1 g, 10 mL	100/pk	12131033
Straight Barrel Cartridges		
15 g, 60 mL	100/pk	12132004
Bond Elut Jr		
1.4 g	100/pk	12162052B
2.2 g	100/pk	12162054B
3 g	100/pk	12162051B

TIPS & TOOLS

Agilent offers Bond Elut Adapters compatible with these tube formats. Turn to page 127.

Mega Bond Elut Flash



Bond Elut C18 Flash cartridges, 12256060

- Convenient disposable cartridges eliminate the need for packing glass columns
- Flexible "open" tube design for either liquid or solid samples
- Reliable, consistent flow characteristics deliver high-resolution performance

Mega Bond Elut Flash cartridges offer excellent levels of performance and productivity for the purification of organic compounds, and also for scale-up, solid phase extraction. Pre-packed, disposable cartridges offer greater convenience than glass columns that require washing, drying and re-packing after every sample.

Mega Bond Elut Flash

Description	Sorbent Mass (g)	Volume (mL)	Unit	40 µm Particle Size
C18	1	60	16/pk	12256060
	2	12	20/pk	12256015
	5	20	20/pk	12256023
	10	60	16/pk	12256031
	20	60	16/pk	12256078
	25	150	8/pk	12256079
	50	150	8/pk	12256080
	70	150	8/pk	12256081
NH2	2	12	20/pk	12256020
	5	20	16/pk	12256028
	10	60	16/pk	12256036
	20	60	16/pk	12256074
	25	150	8/pk	12256075
	50	150	8/pk	12256076
	70	150	8/pk	12256077
SCX	20	60	16/pk	12256066
	25	150	8/pk	12256070
	50	150	8/pk	12256072
	70	150	8/pk	12256073
SI	2	12	20/pk	12256018
	5	20	20/pk	12256026
	10	60	16/pk	12256034
	15	60	16/pk	12256068
	20	150	16/pk	12256042
	25	150	8/pk	12256069
	50	150	8/pk	12256067
	70	150	8/pk	12256071

Specialty SPE

Bond Elut Carbon

Typical Matrices

Organic plant and tissue extracts

Primary Extraction Mechanism

Wide range non-polar retention

- Excellent retention for small organics, including those that are too polar to retain on C18 or polymeric SPE
- Removal of chlorophyll and other pigments leads to fewer chromatographic or mass interferences
- Broader retention and easier elution of analytes across the polarity range, for improved multi-residue analysis

Bond Elut Carbon cartridges are packed with ultra-pure graphitized carbon particles that have been optimized for the absorption of pigments in food, fruits and vegetables, and small organic residues in waste water. The powerful retention mechanisms of these products are appropriate for a broad range of analytes. In addition, careful manufacturing techniques result in lower carbon fines on the wall of the device.

Bond Elut Carbon

Description	Unit	Part No.
Straight Barrel Cartridges		
50 mg, 1 mL	100/pk	126414
100 mg, 1 mL	100/pk	126418
250 mg, 6 mL	30/pk	12102201
500 mg, 6 mL	30/pk	12252201
Bond Elut Jr		
250 mg	100/pk	446424
400 mg	100/pk	466430

GLOBAL TIP

The Japanese Positive List System for Agriculture Residues in Food can be found at **http://www.ffcr.or.jp**

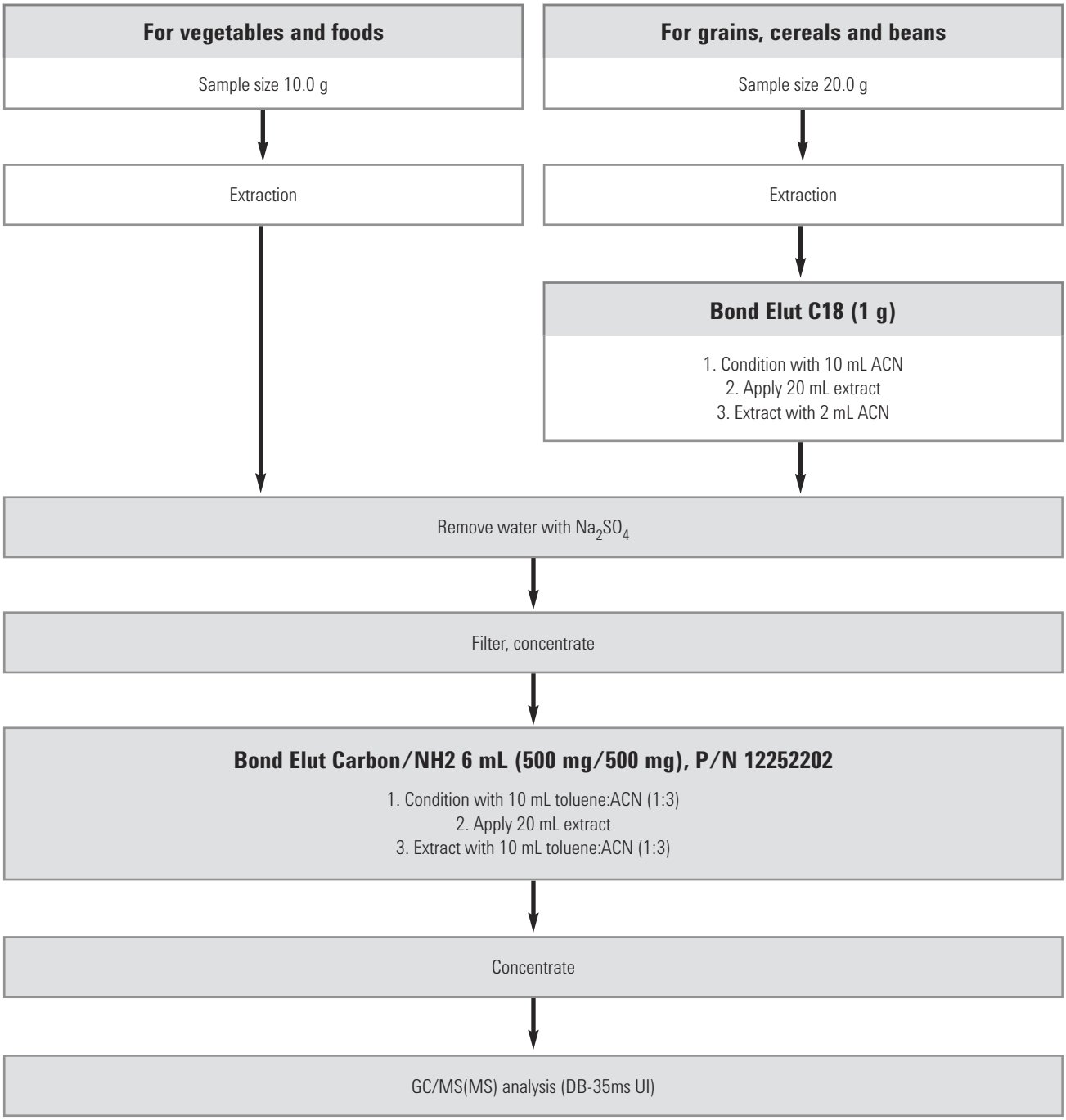
Bond Elut Carbon/NH2

Description	Unit	Part No.
Straight Barrel Cartridges		
300/500 mg, 6 mL	30/pk	2264265032
500/500 mg, 6 mL	30/pk	12252202
500/500 mg, 20 mL	20/pk	3664325032

Bond Elut Carbon/PSA

Description	Unit	Part No.
Straight Barrel Cartridges		
250/250 mg, 3 mL	50/pk	12102042C250
500/500 mg, 6 mL	30/pk	12102042C500

Method for the simultaneous monitoring of pesticide residues in agricultural products – extraction, refining (cleanup) and quantitative analysis



Bond Elut Cellulose

- High purity micro-granular cellulose with high α-cellulose content
- Stable across a broad pH range
- Extremely low metal content (Fe, Cu <5 ppm)

Bond Elut Cellulose columns use a pure micro-granular cellulose powder that is packed between two 20 µm polypropylene frits. The cellulose phase is very stable over a wide pH range with extremely low metal content. The combination of surface area and polymeric structure results in a sorbent with excellent capacity. The cellulose media contains numerous hydroxyl groups; because of it polar nature, it is able to accept high loading of many polar substances from aqueous and organic phases.

Typical Matrices

Aqueous samples and non-polar organics

Primary Extraction Mechanism

Polar (Hydroxyl)

Bond Elut Cellulose

Description	Unit	Part No.
Straight Barrel Cartridges		
300 g, 3 mL	500/pk	12102095

Bond Elut PCB

- Optimized bed mass affords excellent extraction reproducibility
- Special dual-phase enhances PCB selectivity
- All extractions can be completed with one solvent to simplify procedures

Bond Elut PCB is a specially designed sorbent which allows for the easy extraction of polychlorinated biphenyl (PCB) compounds from a variety of matrices. Desired analytes can be loaded and eluted using a simple, single solvent method prior to analysis by GC/ECD.

Typical Matrices

Water sources

Primary Extraction Mechanism

Polar

Bond Elut PCB

Description	Unit	Part No.
Straight Barrel Cartridges		
1 g, 3 mL	50/pk	12105032

Bond Elut Mycotoxin

Typical Matrices

Aqueous samples and polar organic grain extracts (beer, wine, sake), grains, and other foods

Primary Extraction Mechanism

Ionic cleanup

- Simple methodology saves time and increases throughput
- Use with a broad range of food matrices
- Economic and time-saving alternative to immunoaffinity techniques

Bond Elut Mycotoxin is a novel sorbent which cleans up food extracts for improved trichothecene and zearalenone analysis by LC/MS/MS. Results are comparable or superior to competing methods, including immunoaffinity columns (IAC) and charcoal/alumina columns. The sorbent is a proprietary silica-based ion exchange material.

The Bond Elut Mycotoxin method for extraction and cleanup is successful with a variety of food and grain sample types, including wheat, corn, durum, oats, bread, muesli and infant food.

Bond Elut Mycotoxin is easy to use and acts in a selective non-retention way – the toxin analytes pass through the cartridge while the food matrix components are retained.

Bond Elut Mycotoxin

Description	Unit	Part No.
Straight Barrel Cartridges		
500 mg, 3 mL	50/pk	12102167
Bond Elut Jr		
500 mg	100/pk	12165001B

References

Kiötzel, M, Lauber, U & Humpf, H-U (2006) A new solid phase extraction clean-up method for the determination of 12 type A and B trichothecenes in cereals and cereal-based food by LC-MS/MS. Mol. Nutr. Food Res, 50, 261-269.

Bretz, M, Beyer, M, Cramer, B & Humpf, H-U (2006) Stable isotope dilution analysis of the fusarium mycotoxins deoxynivalenol and 3-acetyldeoxynivalenol. Mol. Nutr. Food Res., 50, 251-260.

General Mycotoxin Methods

For Solids

1. Finely grind 25 g sample and extract with a solution of 100 mL acetonitrile/water (80:20) by blending at high speed for 3 min. For simultaneous determination of zearalenone, spike extract at a level of 50 ng/g sample with zearalanone (ZAN) solution in acetonitrile internal standard. Filter.
2. Pass 4 mL of the filtrate through a Bond Elut Mycotoxin column.
3. Evaporate 2 mL of eluate to dryness at 50 °C under a gentle stream of nitrogen.
4. Reconstitute in 0.5 mL ACN/H_2O (1:4; v/v).
5. Inject 10 µL into LC for analysis.

For Beverages

1. Sonicate the beverage sample for 30 min. Filter.
2. Pass 4 mL of the filtrated sample extract through a Bond Elut Mycotoxin cartridge.
3. Evaporate 2 mL of the eluate to dryness at 50 °C under a gentle stream of nitrogen.
4. Reconstitute in 0.5 mL ACN/H_2O (20/80; v/v).
5. Inject into LC/MS QQQ.

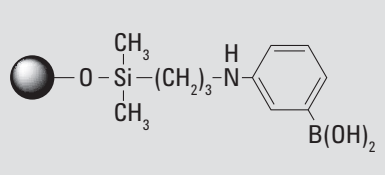
Wheat beer

	% Recovery	% RSD	% Recovery	% RSD
Mycotoxin	**35 ng/g**		**350 ng/g**	
DON	92.0	2.6	95.5	1.5
ZEA	116.0	6.1	101.9	1.3
T-2	61.3	12.6	60.1	1.1
HT-2	81.8	5.6	76.1	1.4

Sake wine

	% Recovery	% RSD	% Recovery	% RSD
Mycotoxin	**35 ng/g**		**350 ng/g**	
DON	94.3	7.4	96.8	0.5
ZEA	99.3	1.3	99.8	0.8
T-2	101.3	1.3	66.0	0.9
HT-2	113.9	8.3	111.0	1.0

This application shows the optimized extraction and cleanup of type A- and B-trichothecenes [deoxynivalenol [DON], HT-2 toxin [HT-2], T-2 toxin [T-2] and zearalenone (ZEA).



Bond Elut PBA

- Unique phenylboronic acid sorbent
- High specificity for cis-diol compounds
- Amenable to a broad range of bio-molecule applications

Bond Elut PBA is a unique silica SPE sorbent containing a phenylboronic acid functionality that can retain analytes via a reversible covalent bond. This very strong covalent retention mechanism enables high specificity and cleanliness. The boronate group has a strong affinity for cis-diol containing compounds such as catechols, nucleic acids, some proteins, carbohydrates and PEG compounds. Aminoalcohols, alpha-hydroxy amides, keto compounds, and others can also be retained.

Typical Matrices

Plasma, urine, aqueous samples and biological fluids

Primary Extraction Mechanism

Covalent bonding

Bond Elut PBA

Description	Unit	Part No.
Large Reservoir Capacity (LRC) Cartridges		
100 mg, 10 mL	50/pk	12113018
Straight Barrel Cartridges		
100 mg, 1 mL	20/pk	12102018
100 mg, 1 mL	100/pk	12102019
100 mg, 3 mL	50/pk	12102127
500 mg, 6 mL	30/pk	12102105

Bond Elut PBA 96-well Plates

Description	100 mg
1 mL round-well plates	A496121C
2 mL square-well plates	A396121C

Generic Method

Condition:

1. 70:30 H_2O:ACN with 1% TFA
2. 50 mM phosphate buffer (pH 10)

Sample Addition:

Sample should be buffered to pH 8.5 with 50 mM phosphate buffer

Interference Wash:

10 mM phosphate buffer (pH 8.5) with 5% ACN

Analyte Elution:

70:30 H_2O:ACN with 1% TFA (pH <5.0)

Compound Class	Examples
Polyhydroxy	Mannitol, fructose-6-phosphate, CDP-ethanol-amine, glycoproteins
Aromatic O-dihydroxy	Catechols, tannins, epinephrine
α-Hydroxy acids	Lactate, 6-phospho-gluconate
Aromatic O-hydroxy acids and amines	Salicylate, salicylamide
1,3-Dihydroxy	Tris, pyridoxine
Diketo & triketo	Dehydroascorbic acid, benzil, alloxan
Other dihydroxys	Steroids, prostaglandins

EnvirElut

- Extreme purity offers cleanliness in extract
- High capacity allows for the processing of large sample volumes
- Broad compound specificity

EnvirElut sorbents are specially designed for the extraction of a wide range of compounds from aqueous matrices. EnvirElut PAH and Pesticides are available in standard SPE straight barrel cartridges, which can be used on conventional vacuum manifolds such as the Vac Elut SPS 24.

Typical Matrices

Water sources, extracted soil samples

Primary Extraction Mechanism

Non-polar

EnvirElut

Description	Unit	Part No.
Straight Barrel Cartridges		
1 g, 3 mL (PAH)	50/pk	12272007
1 g, 6 mL (PAH)	30/pk	12272005
500 mg, 6 mL (Pesticide)	30/pk	12272004
5 g, 20 mL (Oil + Grease)	20/pk	12272001
US EPA 1664, 20 mL	20/pk	12272020
NH2/EnvirElut (100 mg/500 mg), 3 mL	50/pk	12102158
5 g, 20 mL (Phenols)	20/pk	12272002

Solid Phase Microextraction

Solid phase microextraction (SPME) is a technique for extracting analytes from solid, liquid or gaseous samples by adsorbing them onto the SPME fiber and then desorbing them into an inlet, either on a gas chromatograph (GC) or an HPLC system. SPME is amenable to automation using an autosampler or it can be performed manually as well. Agilent offers SPME fibers in a range of chemistries, formats, and for use with autosamplers or manual injections. Kits are also available to support method development, offering a variety of fiber types and configurations within a single kit.

Solid Phase Microextraction Fibers

When ordering SPME fibers, note that the fiber kits contain only the fibers. For a first-time order, you will also need to order the appropriate fiber holder for your needs. SPME fibers can be used multiple times depending on the application and when treated with the proper care and caution. Each fiber has a color-coded or notched hub indicating the type of coating on the fiber.

Solid Phase Microextraction Fibers

Inlet	Usage	Description	Fiber Coating (df) – µm	Fiber Length (cm)	Gauge	Fused Silica or Metal Alloy Part No.	StableFlex Part No.
Septum	Autosampler	Carbowax/Polyethylene Glycol (PEG) – A/S (Metal Alloy). Also for Merlin Microseal use	60	1	23	SU57354U	
		Carboxen/PDMS – A/S	85	1	24		SU57335U
			75	1	24	391896316	
		DVB/Carboxen/PDMS – A/S	50/30	1	24		SU57329U
		PDMS – A/S	7	1	24	391896303	
			100	1	24	391896302	
		PDMS/DVB – A/S	65	1	24	391896314	SU57327U
		Polyacrylate (PA) – A/S	85	1	24	391896306	
	Manual	Carbowax/Polyethylene Glycol (PEG) – Manual (Metal Alloy)	60	1	23	SU57355U	
		DVB/Carboxen/PDMS – Manual	50/30	1	24		SU57328U
			50/30	1	24		SU57348U
		Carboxen/PDMS – Manual	75	1	24	391896315	
		PDMS – Manual	7	1	24	391896304	
			30	1	24	391896309	
			100	1	24	391896301	
		PDMS/DVB – Manual	65	1	24	391896313	SU57326U

(Continued)

Solid Phase Microextraction Fibers

Inlet	Usage	Description	Fiber Coating (df) – µm	Fiber Length (cm)	Gauge	Fused Silica or Metal Alloy Part No.	StableFlex Part No.
Merlin Microseal	Autosampler	Carbowax/Polyethylene Glycol (PEG) – A/S (Metal Alloy). Also for Merlin Microseal use	60	1	23	SU57354U	
		Carboxen/PDMS – A/S (For Merlin Microseal Use)	75	1	23	SU57343U	
		PDMS – A/S (For Merlin Microseal Use)	100	1	23	SU57341U	
		PDMS/DVB – A/S (For Merlin Microseal Use)	65	1	23	SU57345U	
	Manual	Carbowax/Polyethylene Glycol (PEG) – Manual (Metal Alloy). Also for Merlin Microseal use.	60	1	23	SU57355U	
		Carboxen/PDMS – Manual (For Merlin Microseal Use)	75	1	23	SU57344U	
		PDMS – Manual (For Merlin Microseal Use)	100	1	23	SU57342U	
		PDMS/DVB – Manual (For Merlin Microseal Use)	65	1	23	SU57346U	

TIPS & TOOLS

The Merlin Microseal system can reduce septum coring and help eliminate septum bleed. Only use the Merlin Microseal with a 23 gauge SPME fiber assembly. To replace your GC septum nut with a Merlin microseal, you can find Merlin Microseal kits in the GC and GC/MS Columns & Supplies Catalog, publication number 5991-1058EN

Solid Phase Microextraction Kits

SPME Fiber kits contain three fibers. Note that the fiber coating thickness (df) is expressed in µm, and when multiple phase types are included in a kit, the fiber coatings are listed in the respective order that the phases are listed in the description.

Solid Phase Microextraction Kits

Inlet	Usage	Description	Fiber Coating (df) – µm	Fiber Length (cm)	Gauge	Quantity	Part No.
Septum	Autosampler	Kit 1: Polyacrylate, PDMS, PDMS; F or Volatiles and Semivolatiles – A/S	85, 100, 7	1	24	3	391896308
		Kit 2: Carboxen/PDMS, PDMS/DVB, and polyacrylate; For Volatiles or Polar Organics – A/S	75, 65, 85	1	24	3	SU57321U
		Kit 3: PDMS/DVB, polyacrylate, PDMS; For HPLC – A/S	60, 85, 100	1	24	3	SU57323U
		Kit 4: PDMS, PDMS/DVB and Carboxen/PDMS; For Flavors and Odors – A/S	100, 65, 75	1	24	3	SU57325U
		StableFlex Fiber Kit: PDMS/DVB, DVB/Carboxen/PDMS, Carboxen/PDMS and Polyacrylate – A/S	65, 50/30, 85, 85	1 & 2	24	4	SU57551U
	Manual	Kit 1: Polyacrylate, PDMS, PDMS; For Volatiles and Semivolatiles – Manual	85, 100, 7	1	24	3	391896307
		Kit 2: Carboxen/PDMS, PDMS/DVB, and polyacrylate; For Volatiles or Polar Organics – Manual	75, 65, 85	1	24	3	SU57320U
		Kit 4: PDMS, PDMS/DVB and Carboxen/PDMS; For Flavors and Odors – Manual	100, 65, 75	1	24	3	SU57324U
		StableFlex Fiber Kit: PDMS/DVB, DVB/Carboxen/PDMS, Carboxen/PDMS and Polyacrylate – A/S	65, 50/30, 85, 85	1 & 2	24	4	SU57550U

TIPS & TOOLS

Agilent offers inlet liners designed to work with SPME applications for best performance.
These liners can be found in the GC and GC/MS Columns & Supplies Catalog, publication number 5991-1058EN

Solid Phase Microextraction Accessories

The following accessories are helpful with SPME sample preparation. Select the appropriate accessories for your application needs.

Solid Phase Microextraction Accessories

Description	Part No.
Merlin Microseal SPME replacement seal, 23 gauge, 1/pk	392609902
SPME 15 mL Stand	SU57357U
SPME Fiber Holder for CTC Autosampler	SU57347U
SPME Fiber Holder for Manual Sampling	391896401
SPME Inlet Guide for Manual Injection - fits most Agilent injection ports	SU57356U
SPME Link Septa, 11 mm	392548402





Omix tips tray, A57009MB

Micro-volume SPE

OMIX Tips

- Fast, uniform flow maximizes productivity and reproducibility
- Minimal peptide losses lead to higher recoveries
- Available in three phases and sizes to deliver better sequence coverage

OMIX tips with monolithic sorbent tip technology offer dependable purification and superior results in proteomics research. Agilent OMIX pipette tips reliably purify and enrich femtomole and picomole levels of peptides and proteins prior to MALDI-TOF or LC/MS/MS. The unique monolithic sorbent technology used in OMIX consistently outperforms other tips by delivering uniform flow and strong analyte-to-surface interactions. The high binding capacity of OMIX delivers high productivity – the 10 µL tips bind up to 8 µg of peptide – twice as much as tips from other suppliers. OMIX's superior flow and exceptional binding capacity ensure reliable recovery of your peptides, minimizing peptide loss during multi-aliquot, multi-tip and evaporation steps.

OMIX Tips

Description	Elution Volume	Unit	C4 Part No.	C18 Part No.	SCX Part No.
10 µL Mini-Bed	0.5 - 2 µL	1 x 96 tips	A57009MB	A57003MB	A57004MB
		6 x 96 tips	A57009MBK	A57003MBK	
10 µL	2 - 10 µL	1 x 96 tips	A5700910	A5700310	A5700410
		6 x 96 tips	A5700910K	A5700310K	
100 µL	10 - 100 µL	1 x 96 tips	A57009100	A57003100	A57004100
		6 x 96 tips	A57009100K	A57003100K	

OMIX Tips and Plates for Robotic Automation

- Fast, uniform flow maximizes productivity and reproducibility
- Small monolithic tip delivers low elution volumes, increasing sensitivity and reducing solvent usage
- Vacuum-free processing improves reproducibility and shortens processing times

OMIX 96-well VersaPlate

OMIX automation-friendly 96-well monolithic SPE plates are specially designed to process small samples. They offer small extraction beds with almost no dead volume. Elution is achieved with microliter solvent volumes, allowing direct injection and improving assay speed and sample throughput. OMIX tips are highly amenable to ADME/DMPK bioanalysis applications.

OMIX 96-well VersaPlate Formats

Description	Part No.
OMIX 96-well VersaPlate, C4 with tubes	A57109
OMIX C4 tubes only, 96/pk*	A57109A
OMIX 96-well VersaPlate, C18 with tubes	A57103
OMIX C18 tubes only, 96/pk*	A57103A
OMIX 96-well VersaPlate, MP1 with tubes	A57111
OMIX MP1 tubes only, 96/pk*	A57111A

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000

OMIX Tips for Tomtec Quadra

Tomtec-compatible tips contain a slice of monolithic SPE material, allowing for vacuum-free processing and walk-away automation. With hands-free SPE, the process becomes much more streamlined and reproducible.

OMIX Tips for Tomtec Quadra

Description	Unit	Part No.
OMIX C18	5 racks x 96 tips	A57303
OMIX MP1	5 racks x 96 tips	A57311



OMIX C18 for Tomtec Quadra, A57303



Close-up of OMIX tips for Tomtec Quadra



OMIX C18 for Hamilton 300 µL, A57403



Close-up of OMIX tips for Hamilton

OMIX Tips for Hamilton Microlab STAR Line

Offering excellent versatility and end-user productivity enhancements, these tips have an operating volume of 300 µL, allowing flexibility in sample size. Processing 96 samples can be reduced to just a few minutes in certain applications.

OMIX Tips for Hamilton Microlab STAR Line, 300 µL

Description	Unit	Part No.
OMIX C18	5 x 96 tips	A57403
OMIX MP1	5 x 96 tips	A57411

OMIX Tips for Hamilton STAR, MP1, 5 mg

Sample Pretreatment
Add 200 µL 2% H_3PO_4 to 100 µL of human plasma

Conditioning
Aspirate 300 µL of methanol, dispense into waste tray
Aspirate 300 µL of water, dispense into waste tray

Washing
Add 5 mL 0.1M HCl, 2 mL methanol
Vacuum extract for 1 min

Conditioning
Pre-mix 300 µL sample 3 times
Aspirate 300 µL and dispense into waste tray

Washing
Aspirate 300 µL of deionized water, dispense into waste tray
Aspirate 300 µL of methanol, dispense into waste tray

Aspirate and dispense parameters

Flow rate:	50 µL/s
Setting time:	3 s
Total extraction time:	< 5 min

Albuterol Relative Recoveries

Amount (ng/mL)	% Recovery
48.0	96
46.0	92
49.7	99
46.6	93
49.1	98
47.4	95

Mean recovery 96%, RSD 3%

Disk SPE Formats

Bond Elut SPEC SPE

- No loose sorbent means no channeling of sample
- Uniform flow and extraction properties offer robust performance
- Low elution volume affords excellent concentration of analyte, improving sensitivity

Using an advanced disk design, Bond Elut SPEC delivers superior flow characteristics and trouble-free automation. Due to the low volume of the extraction bed, very low elution volumes can be used. This means that, in some applications, evaporation and reconstitution steps can be eliminated, resulting in accelerated sample processing times. The combination of low bed masses, ultra-clean base materials and a broad toolbox of selectivities delivers higher recoveries free of the matrix interferences that can cause ion suppression.

SPEC provides high recoveries at low elution volumes – as low as 100 µL. This is due to the very high surface area yet small physical volume of the monolithic disk. Overall, extraction efficiency is very high for this format of sample preparation product, and the range of functionalities allows fast method development. SPEC extraction methods are typically shorter and require less reagent and solvent than other SPE methods, for lower costs and greener operation.

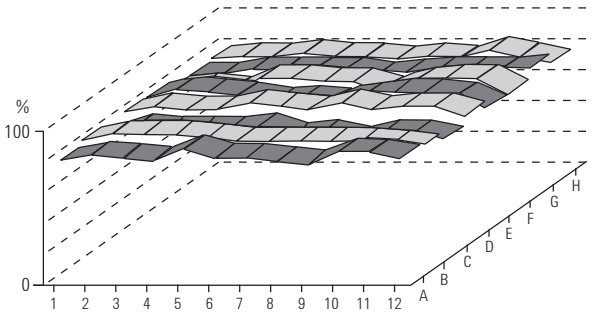


SPEC 47 mm disks and SPEC SPE cartridges, A74702

Unique phases available in SPEC 96-well and SPE tube formats

Uniform recovery and reproducibility between wells from the same well plate

- **DAU** – This functionalized SPEC disk is specifically designed for the forensic analysis of drugs in urine. Its unique sorbent chemistry results in excellent sample cleanup and concentration of samples prior to GC/MS and LC/MS.
- **MP1** – SPEC MP1 is a mixed-mode, non-polar/SCX monolithic disk ideal for analytes with polar functional groups in plasma. The dual retention mechanism results in cleaner extracts. The SCX functionality strongly binds polar basic analytes allowing rigorous washing steps to be employed. Bond Elut Certify offers similar selectivity to SPEC MP1.
- **MP3** – SPEC MP3 is slightly more polar than MP1, making it ideal for hydrophobic analytes that would bind too strongly to MP1. MP3 chemistry is particularly suited to the extraction of opiate alkaloids from biological fluids.



Note the high recovery (y axis) with an average deviation across the 96 wells of just 3.2% (well positions are shown on the x and z axes). SPEC provides the predictable flow characteristics analysts require for true walk-away automated processing. With SPEC you need not worry about clogging, and as an added benefit, the typically low vacuum pressure requirement prevents cross-talk (e.g. spraying of fast running eluates between wells in the collection plate).

SPEC 96-well Plates

When used on an automated platform, SPEC 96-well plates offer outstanding flow characteristics. Flow across all 96-well plates is uniform and highly reproducible, meaning your recoveries are too.



SPEC 96-well plate

SPEC 96-well Plates, 15 mg

Sorbent Phase	Part No.
Silica-based Sorbents	
C18	A59603
C18AR	A59619
C18AR, 30 mg	A5960330
C2	A59601
C8	A59602
CN	A59606
DAU	A596DAU
NH2	A59607
Phenyl	A59610
Ion Exchange Sorbents	
SAX	A59605
SCX	A59604
Mixed Mode Sorbents	
MP1	A59611
MP3	A59620
Method Development Plate	
C2, C8, C18, C18AR, CN, MP1, MP3, PH	A59630



SPEC SPE C18 cartridges, A5320320

SPEC SPE Cartridges

SPEC functionalities are also available in a standard straight barrel tube format, offering flexibility in sample size. Use on any standard vacuum manifold such as the Vac Elut 20 or SPS 24.

SPEC SPE Cartridges, 100/pk

Sorbent Phase	Description	Part No.
C18	15 mg, 3 mL	A5320320
	30 mg, 3 mL	A5320330
C18AR	15 mg, 3 mL	A5321920
	30 mg, 3 mL	A5321930
	35 mg, 10 mL	A5021935
C18AR/MP3	70 mg, 10 mL	A5022570
C2	30 mg, 3 mL	A5320130
C8	15 mg, 3 mL	A5320220
	30 mg, 3 mL	A5320230
DAS	15 mg, 3 mL	A532DAS
DAU	15 mg, 3 mL	A532DAU
MP1	15 mg, 3 mL	A5321120
	30 mg, 3 mL	A5321130
	35 mg, 10 mL	A5021135
	70 mg, 10 mL	A5021170
MP3	15 mg, 3 mL	A5322020
	30 mg, 3 mL	A5322030
	35 mg, 10 mL	A5020735
NH2	15 mg, 3 mL	A5320720
	70 mg, 10 mL	A5020770
Phenyl	15 mg, 3 mL	A5321020
	30 mg, 3 mL	A5321030
SAX	15 mg, 3 mL	A5320520
	30 mg, 3 mL	A5320530
	35 mg, 10 mL	A5020535



SPEC 47 mm disks and SPEC SPE cartridges, A74702

SPEC Disks and Accessories

Description	Part No.
SPEC disks, C18AR, 47 mm, 20/pk	A74819
SPEC disks, C18AR, 90 mm, 12/pk	A79019
SPEC disks, C8, 47 mm, 24/pk	A74702
SPEC environmental disk holder, 47 mm	A713
SPEC flask, 1 L, male 40/35 ground glass fitting	A714

Empore Disk SPE

- Good flow of large sample volumes
- Range of versatile sorbent chemistries
- Available in two disk diameters for better performance

Empore extraction disks provide a high flow rate solution for large volume sample preparation, and are available in a variety of bonded phases and two diameters, 47 and 90 mm. Increasing the diameter of the disk gives better solvent flow rates through the disk.

Empore Disk SPE

Description	Unit	Part No.
Anion extraction disks, 47 mm	20/pk	12145012
Chelating extraction disks, 47 mm	20/pk	12145029
SDB-XC extraction disks, 47 mm	20/pk	12145010
C8 extraction disks, 47 mm	20/pk	12145002
C18 extraction disks, 47 mm	20/pk	12145004
C18 extraction disks, 90 mm	10/pk	12145007



Anion extraction disks, 47 mm, 12145012

TIPS & TOOLS

Maximum Binding Capacity of SPEC discs or Empore Disks is 10% of the sorbent bed mass.



Bondesil Alumina-N bulk sorbent, 12213073

Bulk SPE

Bondesil Bulk Sorbents

- Ideal for dispersive cleanup techniques
- Advanced bonding offers reproducible batch-to-batch performance
- Multi-kilo quantities available upon request

Bondesil Bulk Sorbents

Description	Particle Size (µm)	Unit	Part No.
Alumina-N	25	1000 g	12213073
C18	40	10 g	12213011
	40	100 g	12213012
	40	1000 g	12213013
	120	100 g	14213012
	120	1000 g	14213013
C18 OH	40	100 g	12213049
C2	40	100 g	12213006
C8	40	100 g	12213009
CBA	40	100 g	12213033
CN-E	40	100 g	12213061
CN-U	40	100 g	12213027
DEA	40	100 g	12213047
ENV (polymeric)	125	100 g	12216061
EnvirElut	40	100 g	12214016
	40	1000 g	12214019
Florisil	200	100 g	12214013
	200	1000 g	12214015

(Continued)

Bondesil Bulk Sorbents

Description	Particle Size (µm)	Unit	Part No.
NH2	40	10 g	12213020
	40	100 g	12213021
	120	100 g	14213021
PBA	40	10 g	12213044
PH	40	100 g	12213015
Plexa (polymeric)	45	100 g	12219001
PRS	40	1000 g	12213037
PSA	40	10 g	12213023
	40	100 g	12213024
	40	1000 g	12213025
SAX	40	10 g	12213041
	40	100 g	12213042
SCX	40	100 g	12213039
	40	1000 g	12213040
	120	100 g	14213039
SI	40	500 g	12213001



QuEChERS

Agilent Bond Elut QuEChERS Kits make sample prep as easy as 1- 2- 3. Pre-packaged Agilent Bond Elut QuEChERS Kits are an easy way to capture the time-saving benefits of QuEChERS sample preparation.

- Extraction kits with pre-weighed anhydrous salts in sealed packets allow you to add salts after you add organic solvent to your sample – minimizing an exothermic reaction that can compromise analyte recovery
- Dispersive kits with sorbents and salts supplied in 2 mL or 15 mL centrifuge tubes accommodate the aliquot volumes specified by current AOAC and EN methodologies
- Universal dispersive kits provide excellent recoveries and reproducibility for all types of fruits and vegetables
- Ceramic homogenizers break up salt agglomerates, promoting consistent sample extraction and increasing product recovery during extraction and dispersion; shaking time reduced from 60 to 20 seconds

TIPS & TOOLS

For more information on QuEChERS, please view our webinar "QuEChERS 101: The Basics and Beyond" at **www.agilent.com/chem/quecherswebinar**



Agilent Recommended Standard Operating Procedure for QuEChERS

In just 3 easy steps, you can prepare any fruit or vegetable sample for multi-class, multi-residue pesticide analysis.

Comminuted Sample: 10 g or 15 g

Add Acetonitrile

Select Extraction Kit

Original Method 10 g samples	**Original Method** 15 g samples	**Buffered** **AOAC 2007.1 Method** 15 g samples	**Buffered** **EN 15662 Method** 10 g samples

Check pH and adjust to 5 - 5.5
Add internal standard
Shake and centrifuge

Aliquot: 1 mL, 6 mL or 8 mL*

Select Dispersive SPE Kit

General Fruits & Vegetables 2 mL and 15 mL kits	**Fatty/Waxy Fruits & Vegetables** 2 mL and 15 mL kits	**General Fruits & Vegetables** 2 mL and 15 mL kits	**Fatty/Waxy Fruits & Vegetables** 2 mL and 15 mL kits
Pigmented Fruits & Vegetables 2 mL and 15 mL kits	**High Pigment Fruits & Vegetables** 2 mL and 15 mL kits	**Pigmented Fruits & Vegetables** 2 mL and 15 mL kits	**Fruits & Vegetables with Fats, Pigments** 2 mL and 15 mL kits
AOAC Method		**EN Method**	

Shake and centrifuge

Analysis

*Aliquot size is specified by the method, and kits are created for these specific amounts. For pesticides with acidic groups (phenoxyalcanoic acids), analyze directly by LC/MS/MS at this point (skip the dispersive SPE stage). These acidic groups interact with the PSA that is part of the dispersive SPE step.



Selection criteria

- QuEChERS method
- Compounds for screening

Use buffered kits if base-sensitive pesticides are present. Agilent recommends using buffered kits as a first choice.

Selection criteria

- QuEChERS method
- Food type to be analyzed
- Aliquot volume



QuEChERS AOAC 2007.01 extraction kit, 5982-5755



Ceramic homogenizer for 50 mL tubes, 5982-9313

QuEChERS Extraction Kits

- Available with or without 50 mL centrifuge tubes and caps
- Include $MgSO_4$, NaCl, or other salts for buffering; pre-weighed in anhydrous packet

Step 1: Extraction

Choose the extraction salt packet based on your method of analysis, AOAC or EN. The buffered extraction salts are amenable for more labile pesticides. Adding solvent and then salts to a comminuted fruit or vegetable sample (10 g or 15 g) enables you to extract the pesticides of interest into the organic layer. Agilent pre-packages its QuEChERS salts and buffers in anhydrous packages. This allows you to add them after adding your solvent to the sample, as specified in QuEChERS methodologies.

In the table below, the "CH" products contain the appropriately sized CH for those particular kits. For more information on Ceramic Homogenizers see page 99.

QuEChERS Extraction Kits

Method	Buffered	Contents	Ceramic Homogenizers	With 50 mL Tubes 50/pk	Packets Only 50/pk	Packets Only 200/pk
AOAC 2007.01	Yes	6 g $MgSO_4$; 1.5 g NaAcetate	Yes	5982-5755CH		
			No	5982-5755	5982-6755	5982-7755
Original (10 g samples)	No	4 g $MgSO_4$; 1 g NaCl	Yes	5982-5550CH		
			No	5982-5550	5982-6550	5982-7550
Original (15 g samples)	No	6 g $MgSO_4$; 1.5 g NaCl	Yes	5982-5555CH		
			No	5982-5555	5982-6555	5982-7555
EN 15662	Yes	4 g $MgSO_4$; 1 g NaCl; 1 g NaCitrate; 0.5 g disodium citrate sesquihydrate	Yes	5982-5650CH		
			No	5982-5650	5982-6650	5982-7650
Acrylamides*	No	4 g $MgSO_4$; 0.5 g NaCl	No	5982-5850		
Veterinary Drugs**	No	4g Na2SO4, 1 g NaCl	No	5982-0032		

*Katerina Mastovaka and Steven J. Lehotay have done work to extend the scope of QuEChERS beyond fruits and vegetables(1), using it to extract acrylamides in potato chips and other fried foods.

**See Application Note publication number 5991-0013EN: Screening 36 Veterinary Drugs in Animal Origin Food by LC/MS/MS Combined with Modified QuEChERS Method.

1: "Rapid Sample Preparation Method for LC-MS/MS or GC-MS Analysis of Acrylamides in Various Food Matrices", J. Agric. Food Chem, 2006, 54, 7001-7008.

QuEChERS Dispersive Kits



QuEChERS dispersive kit, 5982-5022



QuEChERS dispersive kit, 5982-5022CH

Step 2: Dispersive SPE Cleanup

Select the Dispersive SPE kit suited to the type of food being analyzed and the method you are following. In this step, an aliquot of the sample extract from Step One is added to a 2 mL or 15 mL centrifuge tube containing a small amount of SPE sorbent and $MgSO_4$. The sorbent will pull out interfering matrix materials from the sample, while the $MgSO_4$ helps remove excess water and improve analyte partitioning. Select kits are now available with ceramic homogenizers (2 per tube). Their part numbers are designated by a CH.

QuEChERS Dispersive Kits, Fruits and Vegetables

			AOAC 2007.01 Method	European Method EN 15662
Kit	**Size**	**Unit**	**Kit Contents Part No.**	**Kit Contents Part No.**
General fruits and vegetables: Removes polar organic acids, some sugars and lipids	2 mL	100/pk	50 mg PSA 150 mg $MgSO_4$ 5982-5022 5982-5022CH	25 mg PSA 150 mg $MgSO_4$ 5982-5021 5982-5021CH
	15 mL	50/pk	400 mg PSA 1200 mg $MgSO_4$ 5982-5058 5982-5058CH	150 mg PSA 900 mg $MgSO_4$ 5982-5056 5982-5056CH
Fruits and vegetables with fats and waxes: Removes polar organic acids, some sugars, more lipids and sterols	2 mL	100/pk	50 mg PSA 50 mg C18EC 150 mg $MgSO_4$ 5982-5122 5982-5122CH	25 mg PSA 25 mg C18EC 150 mg $MgSO_4$ 5982-5121 5982-5121CH
	15 mL	50/pk	400 mg PSA 400 mg C18EC 1200 mg $MgSO_4$ 5982-5158 5982-5158CH	150 mg PSA 150 mg C18EC 900 mg $MgSO_4$ 5982-5156 5982-5156CH

Part numbers ending in CH indicate tubes containing ceramic homogenizers.

(Continued)





QuEChERS Dispersive Kits, Fruits and Vegetables







Kit	Size	Unit	AOAC 2007.01 Method Kit Contents Part No.	European Method EN 15662 Kit Contents Part No.
Pigmented fruits and vegetables: Removes polar organic acids, some sugars and lipids, and carotenoids and chlorophyll; not for use with planar pesticides	2 mL	100/pk	50 mg PSA 50 mg GCB 150 mg $MgSO_4$ 5982-5222 5982-5222CH	25 mg PSA 2.5 mg GCB 150 mg $MgSO_4$ 5982-5221 5982-5221CH
	15 mL	50/pk	400 mg PSA 400 mg GCB 1200 mg $MgSO_4$ 5982-5258 5982-5258CH	150 mg PSA 15 mg GCB 885 mg $MgSO_4$ 5982-5256 5982-5256CH
Highly pigmented fruits and vegetables: Removes polar organic acids, some sugars and lipids, plus high levels of carotenoids and chlorophyll; not for use with planar pesticides	2 mL	100/pk		25 mg PSA 7.5 mg GCB 150 mg $MgSO_4$ 5982-5321 5982-5321CH
	15 mL	50/pk		150 mg PSA 45 mg GCB 855 mg $MgSO_4$ 5982-5356 5982-5356CH
Fruits and vegetables with pigments and fats: Removes polar organic acids, some sugars and lipids, plus carotenoids and chlorophyll; not for use with planar pesticides	2 mL	100/pk	50 mg PSA 50 mg GCB 150 mg $MgSO_4$ 50 mg C18EC 5982-5421 5982-5421CH	
	15 mL	50/pk	400 mg PSA 400 mg GCB 1200 mg $MgSO_4$ 400 mg C18EC 5982-5456 5982-5456CH	

Part numbers ending in CH indicate tubes containing ceramic homogenizers.

QuEChERS Dispersive Kits: Other Food Methods

Kit	Size	Unit	AOAC 2007.01 Method Kit Contents Part No.	European Method EN 15662 Kit Contents Part No.
Other Food Methods Removes biological matrix interferences, including hydrophobic substances (fats, lipids) and proteins	2 mL	100/pk	25 mg C18 150 mg $MgSO_4$ 5982-4921 5982-4921CH	
	15 mL	50/pk	150 mg C18 900 mg $MgSO_4$ 5982-4956 5982-4956CH	
All Food Types Removes all matrix interfering materials including polar organic acids, lipids, sugars, proteins, carotenoids and chlorophyll	2 mL	100/pk	50 mg PSA 50 mg C18 7.5 mg GCB 150 mg $MgSO_4$ 5982-0028 5982-0028CH	
	15 mL	50/pk	400mg PSA 400 mg C18 45 mg GCB 1200 $MgSO_4$ 5982-0029 5982-0029CH	
Animal Origin Food Removes matrix interferences such as polar organic salts, sugars, lipids and proteins	15 mL	50/pk	50 mg PSA 150 mg C18EC 900 mg Na_2SO_4 5982-4950	

Part numbers ending in CH indicate tubes containing ceramic homogenizers.



TIPS & TOOLS

View the core concepts surrounding the QuEChERS method at **www.agilent.com/chem/QuEChERSvideo**



Suggested Bond Elut QuEChERS Dispersive Kit by Food Type and Method

Commodity Group	Commodity	General Fruits and Vegetables EN or AOAC	Fruits and Vegetables w/Fats and Waxes; EN or AOAC	Pigmented Fruits and Vegetables EN or AOAC	Highly Pigmented Fruits and Vegetables; EN	Fruits and Vegetables w/Pigment and Fats; AOAC only
Use With		Lightly colored samples	Samples containing > 1% Fat/Lipids	Colored samples (chloryphyl, carotinoids), no planar pesticides	Highly colored samples (chloryphyl, carotinoids), no planar pesticides	Colored samples that also contain fats or waxes
Fruits						
 Citrus Fruits	citrus juices					
	grapefruit					
	lemon/lime					
	orange					
	orange peel					
	nectarine					
	tangerine					
 Pome Fruits	apple					
	apple, dried					
	apple sauce					
	apple juice					
	pear					
	quince					
 Stone Fruits	apricot					
	apricot, dried					
	apricot nectar					
	cherry					
	mirabelle					
	nectarine					
	peach					
	peach, dried					
	plum					
	plum, dried					
 Soft and Small Fruits	blackberry					
	blueberry					
	currant					
	elderberry					
	gooseberry, red					
	grapes, red					
	grapes, green					
	raspberry					
	raisin					
	cranberry					
	strawberry					
 Other Fruits	pineapple					
	banana					
	avocado					
	olives					
	fig, dried					
	melon					
	kiwi					
	mango					
	papaya					

(Continued)

Suggested Bond Elut QuEChERS Dispersive Kit by Food Type and Method

Commodity Group	Commodity	General Fruits and Vegetables EN or AOAC	Fruits and Vegetables w/Fats and Waxes; EN or AOAC	Pigmented Fruits and Vegetables EN or AOAC	Highly Pigmented Fruits and Vegetables; EN	Fruits and Vegetables w/Pigment and Fats; AOAC only
Use With		Lightly colored samples	Samples containing > 1% Fat/Lipids	Colored samples (chloryphyl, carotinoids), no planar pesticides	Highly colored samples (chloryphyl, carotinoids), no planar pesticides	Colored samples that also contain fats or waxes
Vegetables						
 Root and Tuber Vegetables	beets	■				
	carrot	■				
	celeriac	■				
	horseradish	■				
	parsley root	■				
	radish	■				
	black salsify	■				
	potato	■				
 Leek Plants	garlic	■	■			
	onion	■	■			
	scallion	■		■	■	
	leek	■				
	shallot	■				
	chive			■	■	
 Fruiting Vegetables	eggplant/aubergine	■				
	cucumber	■				
	pepper, sweet green			■	■	
	pepper, sweet, red			■	■	
	pumpkin			■		
	tomato	■				
	zucchini (courgette)	■				
 Broccoli	broccoli	■		■		
	brussels sprouts	■				
	cauliflower	■				
	chinese cabbage	■				
	kale			■	■	
	kohlrabi	■				
	red cabbage			■		
	savoy cabbage	■				
	white cabbage	■				
 Leafy Vegetables and Herbs	lettuce varieties	■		■	■	
	endive			■	■	
	cress			■	■	
	lamb's lettuce			■	■	
	cilantro			■	■	
	basil			■	■	
	parsley			■	■	
	rucola, arugula			■	■	
	spinach			■	■	
 Stem Vegetables	asparagus	■				
	celery	■				
	leek	■				
	rhubarb	■		■		
	artichokes	■				
 Legumes	beans, peas, lentils, (fresh)	■		■	■	
	beans, peas, lentils, (dried)	■				

(Continued)

Suggested Bond Elut QuEChERS Dispersive Kit by Food Type and Method

Commodity Group	Commodity	General Fruits and Vegetables EN or AOAC	Fruits and Vegetables w/Fats and Waxes; EN or AOAC	Pigmented Fruits and Vegetables EN or AOAC	Highly Pigmented Fruits and Vegetables; EN	Fruits and Vegetables w/Pigment and Fats; AOAC only
Use With		Lightly colored samples	Samples containing > 1% Fat/Lipids	Colored samples (chloryphyl, carotinoids), no planar pesticides	Highly colored samples (chloryphyl, carotinoids), no planar pesticides	Colored samples that also contain fats or waxes
Animal-Sourced Foods						
Meats	beef, pork, veal, chicken					
	liver, kidney					
Seafood	finfish					
	bivalve, shellfish					
Dairy	dairy					
Other Foods						
Cereals	wheat, corn, rice					
	grain, flour, etc.					
Tea/Coffee	coffee beans					
	tea leaves					
Dried Spices	peppercorn seeds					
	peppers, curry					
	leek plants					
Oils	olive, canola					
	citrus					
Baby Food	baby food					
Other						
Agricultural Products	tobacco					
	cotton, hemp					
	cocoa solids					
Soil	soil					
Whole Blood	whole blood					

TIPS & TOOLS

Acccess the complete QuEChERS applications library at **www.agilent.com/chem/QuEChERS**

QuEChERS Ceramic Homogenizers

Ceramic homogenizers increase your overall lab productivity and give you greater confidence in your results. They make analyte extraction easier by:

- Cutting the required extraction time from 60 seconds to as little as 20 seconds – a time savings of 70% per sample
- Maintaining high, reproducible extractions in a third of the time
- Minimizing variance between technicians
- Breaking up salt agglomerates and maintaining a consistent grinding of homogenizing material

The same great ceramic homogenizers available in our QuEChERS Kits are also available for bulk purchase, providing excellent grinding capabilities of the samples.

QuEChERS Ceramic Homogenizers

Description	Unit	Part No.
Ceramic homogenizer for 50 mL tubes	100/pk	5982-9313
Ceramic homogenizer for 15 mL tubes	100/pk	5982-9312
Ceramic homogenizer for 2 mL tubes	200/pk	5982-9311



Ceramic homogenizer for 50 mL tubes, 5982-9313

Standards for QuEChERS Products

In addition to our industry-leading QuEChERS Kits, Agilent makes your analysis easier by providing standards for the most commonly used regulatory methods, including AOAC and EN.

- Save time and avoid inconvenience of making standards
- Available for both GC and LC instruments
- Ready to use for QuEChERS extractions – no dilutions required

Standards for QuEChERS Products

Description	Concentration	Kit Contents	Part No.
HPLC & GC Internal Standard, AOAC Method	1000 µg/mL	Parathion-d10 (diethyl-d10), Alpha-BHC-d6 (alpha-HCH-d6)	5190-0502
QC Solution, AOAC Method	500 µg/mL	Triphenyl phosphate	5190-0503
HPLC Internal Standard, EN Method	100 µg/mL	Tris (1,3-dichloroisopropyl) phosphate, Nicarbazin	5190-0500
GC Internal Standard, EN Method	5000 µg/mL	(2,2'5,5'-tetrachlorobiphenyl), Triphenylmethane, Tris (1,3-dichloroisopropyl) phosphate	5190-0501
QC Surrogate for GC Standard, EN Method	500 µg/mL 1000 µg/mL	(2,2',3,4,4',5'-hexachlorobiphenyl) Anthracene-d10	5190-0499



Capitiva ND 96-well plate, A5969045

Captiva Filtration

Captiva's unique dual-depth filtration media provides complete removal of precipitated proteins and outstanding resistance to sample clogging, with no loss of analytes. All Captiva components are ultra clean, and rigorously tested to ensure against non-specific binding. With Captiva, your plasma samples are processed quickly and reliably. Captiva is easily automated for enhanced productivity and excellent for sample storage.

Time-consuming sample transfer steps required with conventional precipitation are now a thing of the past. With Captiva, clean, clear filtrates are ready for injection in minutes – this user-friendly filtration device is simple and streamlined with an easy-to-follow 3-step process. And because Captiva samples are pellet-free, you can sample directly from the collection plate.

The Captiva range includes:

- Captiva ND non-drip filtration plates for organic-based protein precipitation
- Captiva ND^{Lipids} non-drip filtration plates for lipid and protein depletion
- Captiva 96-well filter plates for general sample filtration
- Captiva filter cartridges, all the usual Captiva benefits in a standard SPE cartridge format
- Captiva Syringe Filters available in a wide range of sizes,formats, and membranes to cover every matrix and sample

Captiva ND

A simple-to-use filtration device designed for high-throughput, automated, in-well protein precipitation. Built with a unique non-drip (ND) membrane, Captiva ND plates allow for solvent-first protein precipitation using methanol or acetonitrile. Captiva's unique dual filter design offers fast uniform flow while avoiding sample loss and filter plugging.

Captiva ND^{Lipids}

Specifically designed for LC/MS bioanalysis of plasma, Captiva ND^{Lipids} combine the ease of use and superior flow properties of Captiva ND with a unique chemical filter. The plate efficiently removes ion-suppressing phospholipids, proteins, and surfactant interferences from precipitated plasma samples.



Premium syringe filter, glass microfiber, 5190-5122

Captiva Syringe Filters

Captiva Syringe Filters reliably filter from 1mL up to 150mL sample volume for HPLC, UHPLC, CE, ICP-MS and LC/MS with superior flow rates and maximum loading capacity to ensure maximum productivity.

All products are supplied with an HPLC or LC/MS Certificate guaranteeing extremely low levels of extractables. Packages are color coded by membrane for easy and fast identification.

Captiva ND

- Easy automation – non-drip design resists organic solvent flow until vacuum is applied
- Exceptional flow – dual depth filter avoids plugged membranes and lost samples
- Efficient protein removal – MS-suitable samples in as little as one-fifth the time
- Multiple pore sizes available for greater flexibility with solvent use

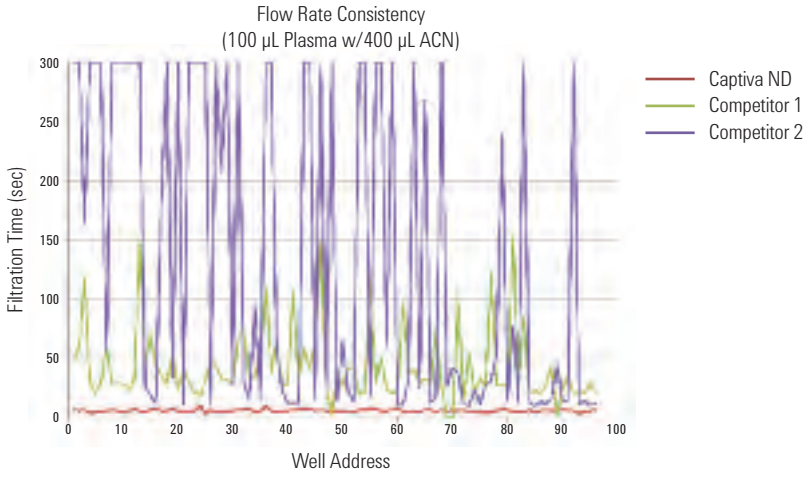
Captiva ND's unique non-drip design simplifies your workflow, ends the need to use messy tip or well seals, and reduces the number of liquid transfer steps needed to process samples. Best of all, Captiva ND's dual-depth filter construction delivers a fast reproducible flow, so you get uniform sample treatment and reliable filtrate recovery in a fraction of the time of other protein precipitation plates.

Captiva ND 96-well filter plates

Description	Unit	Part No.
Capitiva ND plate, 0.2 µm, polypropylene Recommended for both methanol and acetonitrile	5/pk	A5969002
Capitiva ND plate, 0.45 µm, polypropylene Suitable for acetonitrile only	5/pk	A5969045

Get fast, reproducible flow with Agilent Captiva ND

Agilent Captiva ND plates process samples quickly and uniformly without the need for positive pressure manifolds. Plus, its uniform flow facilitates vacuum processing making it more automation friendly.



TIPS & TOOLS

For more information on Agilent Captiva ND Plates, please visit **www.agilent.com/chem/captiva**



Captiva ND^{Lipids} 96-well filtration starter kit, A59640002SK

Captiva ND^{Lipids}

- More precise and reproducible quantitation with removal of phospholipids and proteins
- Increased productivity due to extended column lifetimes and cleaner MS ion sources
- Simple 3-step procedure
- Available with 0.2 µm pore size only, to optimize lipid removal; Methanol recommended

Capitiva ND^{Lipids} is as simple and easy-to-use as a standard protein precipitation plate. The non-drip 96-well filtration plate is specially designed to effectively remove phospholipids from biofluids. Captiva ND^{Lipids} removes lipids, proteins, surfactants and other matrix interferences from plasma extracts. Ion suppression is significantly reduced for enhanced sensitivity and precision during trace analysis. The depletion of lipid compounds also gives you better peak shapes and reproducible retention times so that standard operating procedures are easily validated. In addition, the fast, in-well precipitation technology of Captiva ND^{Lipids} ensures high sample throughput and helps reduce instrument downtime, with virtually no need for method development on a wide range of analytes.

TIPS & TOOLS

Using Captiva ND^{Lipids} with methanol is an excellent replacement for acetonitrile as the precipitation solvent. Methods with methanol show better removal of lipids than with acetonitrile. Converting to methanol is advantageous when the supply or cost of acetonitrile is restrictive. Methanol can now be your solvent of choice for lipid removal.

For more information about solvents, reference Application Note *"Agilent Captiva ND Lipids Sample Prep Choice of Precipitation Solvent: Acetonitrile versus Methanol"* publication number 5991-0445EN.

Captiva ND^{Lipids} 96-well filter plates

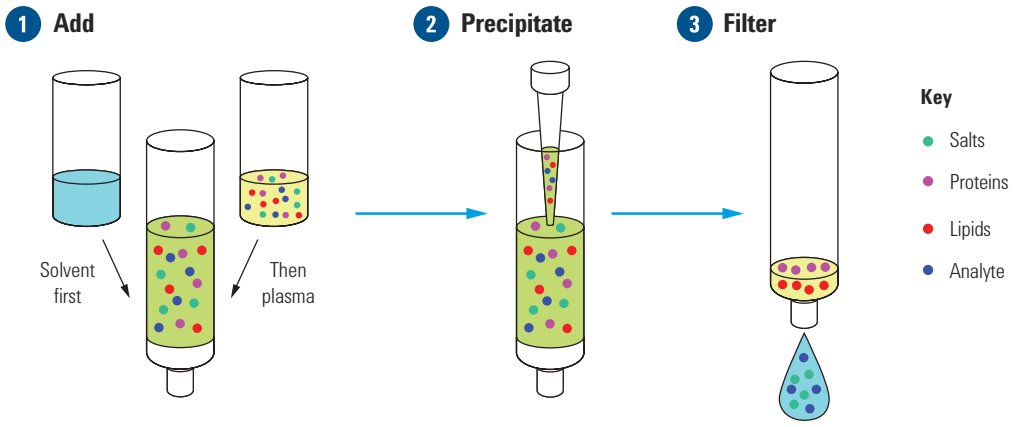
Description	Part No.
Captiva ND^{Lipids} 96-well filtration starter kit Includes 1 CaptiVac vacuum collar, 2 Captiva ND^{Lipids} filter plates, 2 Captiva 96 deep-well 1 mL collection plates and 2 Captiva collection plate pierceable covers	A59640002SK
Captiva ND^{Lipids} 96-well filtration replacement kit Includes 2 Captiva ND^{Lipids} filter plates, 2 Captiva 96 deep-well 1 mL collection plates and 2 Captiva collection plate pierceable covers	A59640002RK
Captiva ND^{Lipids} 96-well filtration plate, 100/pk	A59640002B
Captiva ND^{Lipids} 96-well filter plate, 1 mL well, 1/pk	A59640002I
Captiva ND^{Lipids} 96-well filter plates, 1 mL well, 5/pk	A59640002V
DuoSeal 96 96-well plate seals, 10/pk	A8961008

TIPS & TOOLS

Agilent provides you with the tools you need to make bioanalysis quick and reliable. Here, in this video, we demonstrate an opiate panel analysis, from sample prep using Captiva ND^{Lipids} through HPLC separation using Poroshell 120 columns and the Agilent 6490 QQQ MS/MS with iFunnel. For part one of this video, please visit **www.agilent.com/chem/bioanalysis1** – for part two of this video, please visit **www.agilent.com/chem/bioanalysis2**

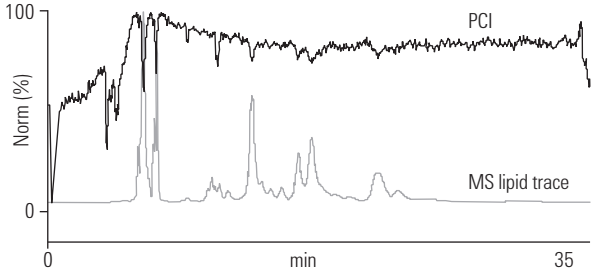


Operating Instructions and Tips for Captiva ND^{Lipids} 96-well Plates

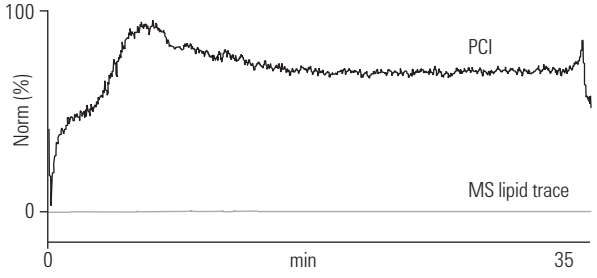


Post-Column Infusion (PCI) of Albuterol Before Treatment With Captiva ND^{Lipids}

Note that the ion-suppression features (top trace) correlate with the elution of phospholipids (bottom trace).



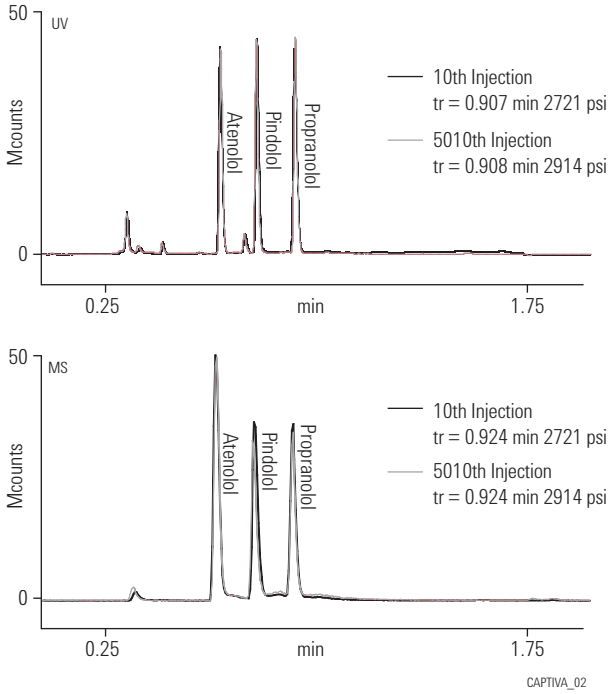
Same Experiment After Protein and Lipid Depletion With Captiva ND^{Lipids}



CAPTIVA_01

Ion suppression is dramatically reduced and the lipids are almost non-detectable.

Longevity Study Illustrating Prolonged Column Lifetime When Using Captiva ND^{Lipids}



CAPTIVA_02

No significant changes in back pressure, retention time, and peak shape with Captiva ND^{Lipids} after 10 and 5010 injections for LC/MS or LC/MS/MS bioanalysis (top = UV detection; bottom = MS detection).



Captiva 96-well filter kit

Captiva 96-well Filter Kits

- The industry standard for centrifugation-free sample filtration
- Fast and reliable processing improves productivity
- Starter kits contain everything you need

Faster than centrifugation and easily automated, Captiva's unique dual-depth filtration media provides outstanding resistance to sample clogging. With Captiva, your samples are processed quickly and reliably, and you can avoid fibrinogen clogging forever. The plates are also excellent for sample storage. All Captiva components are ultra clean, and rigorously tested to ensure against non-specific binding. Starter kits contain everything you need to get up and running with minimum fuss. Replacement kits include everything you need to replenish your Captiva system.

Captiva 96-well Filter Kits

Pore Size (µm)	Filter Material	Part No.
Starter Kits		
0.2	Polypropylene	A5960002SK
0.45	Polypropylene	A5960045SK
Includes 1 CaptiVac vacuum collar, 5 Captiva filter plates, 10 DuoSeal 96 96-well plate seals, 5 Captiva 96 deep-well 1 mL collection plates, 5 Captiva collection plate pierceable covers		
Replacement Kits		
0.2	Polypropylene	A5960002K
0.45	Polyvinyldifluoride and polypropylene	A5967045K
	Polypropylene	A5960045K
Includes 5 Captiva filter plates, 10 DuoSeal 96 96-well plate seals, 5 Captiva 96 deep-well 1 mL collection plates, 5 Captiva collection plate pierceable covers		

Captiva 96-well Filter Plates



Captiva 96-well filter plates, A5960045

- Protect HPLC columns from clogging to reduce instrument downtime
- Clean and clear filtrates offer improved sensitivity
- High analyte recovery with simple robust methods allows faster method development

Filtration is simple, versatile, and necessary to prevent clogging of valuable HPLC columns. Captiva 0.2 µm and 0.45 µm depth filter plates are ideal for filtering samples prior to LC/MS injection. Captiva 10 µm and 20 µm glass fiber filter plates are designed for clarifying highly particle-laden samples, such as freshly thawed plasma and hepatocyte filtration, preventing sample transfer problems from pipette tip clogging. They are perfect for automated systems and for use with DuoSeal 96 96-well seals.

Captiva 96-well Filter Plates

Pore Size (µm)	Filter Material	Quantity	Part No.
0.2	Polypropylene	5/pk	A5960002
	Polypropylene	100/pk	A5960002B
0.45	Polyvinyldifluoride and polypropylene	5/pk	A5967045
	Polypropylene	5/pk	A5960045
	Polypropylene	100/pk	A5960045B
10	Glass fiber	5/pk	A596401000
20	Polypropylene	5/pk	A596002000
	Polypropylene Bulk Pack	100/pk	A596002000B



Captiva 96-well collection plate, A696001000

Captiva 96-well Collection Plates and Cover

- Designed for Captiva filtration, SPEC and Bond Elut 96 applications
- Standard 1 mL format offers compatibility with further automation or liquid handling
- Silicone cover preserves sample integrity

Captiva 96-well collection plates are specially designed for use with Captiva filtration plates, SPEC SPE 96-well plates and Bond Elut 96-well plates. The 1 mL capacity provides the volume needed to collect all of your filtrate or eluate. Captiva pierceable 96-well silicone covers are easily applied to completely seal the plates, ensuring no sample loss due to spillage or evaporation and no sample contamination. The silicone is specially designed for 96-well auto injectors, providing easy piercing and removal.

Captiva 96-well Collection Plates and Cover

Description	Unit	Part No.
Captiva 96-deep well collection plate, 1 mL	10/pk	A696001000
Captiva 96-deep well collection plate, 1 mL	100/pk	A696001000B
Captiva pierceable 96 deep-well collection plate cover, 1 mL	10/pk	A8961007
DuoSeal 96-well plate seal	10/pk	A8961008

Captiva Filter Cartridges

- Standard SPE format
- Ideal for LC/MS samples
- Avoid sample transfer problems
- Non-Drip (ND) 3 mL cartridges resist flow until vacuum is applied
- Effectively remove phospholipids from biological samples with Captiva ND^{Lipids}

Captiva filter cartridges bring all of the benefits of Captiva filtration to the standard SPE cartridge format. The 0.2 µm and 0.45 µm filter cartridges are ideal for preparing precipitated protein samples for LC/MS analysis. The Captiva 10 µm glass fiber filter cartridge is designed for clarifying highly particle-laden samples, such as freshly thawed plasma, preventing sample transfer problems due to pipette tip clogging.



Captiva filter cartridges, glass fiber, A500401000

Captiva Filter Cartridges

Pore Size (µm)	Filter Material	Volume (mL)	Unit	Part No.
0.2	Polyvinyldifluoride and polypropylene	3	100/pk	A5300002
0.45	Polyvinyldifluoride and polypropylene	3	100/pk	A5307045
		6	100/pk	A5060045
10	Glass fiber	10	100/pk	A500401000

Captiva Non-Drip Filter Cartridges

Pore Size (µm)	Filter Material	Volume (mL)	Unit	Part No.
Non-Drip				
.22	Polypropylene	3	100/pk	A5300063
Non-Drip Lipids				
.22	Polypropylene	3	100/pk	A5300635

TIPS & TOOLS

Using Captiva ND^{Lipids} with methanol is an excellent replacement for acetonitrile as the precipitation solvent. Methods with methanol show better removal of lipids than with acetonitrile. Converting to methanol is advantageous when the supply or cost of acetonitrile is restrictive. Methanol can now be your solvent of choice for lipid removal.

For more information about solvents, reference Application Note *"Agilent Captiva ND^{Lipids} Sample Prep Choice of Precipitation Solvent: Acetonitrile versus Methanol"* publication number 5991-0445EN.

CaptiVac Vacuum Collar

- Pre-aligned for trouble-free operation
- Vacuum sealed for maximum efficiency
- Simple, cost effective solution

For use with Captiva Filtration and SPEC 96-well Plates, this patented vacuum collar is a completely transparent device that joins Captiva or SPEC plates directly onto our collection plate. The unique design of the Captiva collar forms a pre-set, pre-aligned vacuum seal between the filtration and collection plate, which positions the outlet tips at a specified distance inside each well, so as to prevent cross contamination of samples.



CaptiVac vacuum collar, A796

CaptiVac Vacuum Collar

Description	Part No.
CaptiVac vacuum collar	A796
CaptiVac gasket kit, 5/pk	A796G

Premium Syringe Filters



- More choices. Captiva syringe filters are available in a wide range of sizes, formats, and membranes to cover every matrix and sample.
- Certified. All products are supplied with an HPLC or LC/MS Certificate, guaranteeing extremely low levels of observed extractables.
- Exceptional Flow Rate. Captiva syringe filters have excellent flow rates and maximum sample loading capacity.
- Highest Quality. Agilent Captiva syringe filters are constructed with the highest-grade virgin polypropylene housing, and are securely welded to prevent bursting and ensure sample integrity.

Sample filtration prior to HPLC, LC/MS, UHPLC, CE and ICP-MS analysis is critical to achieving optimal system performance, and Agilent Captiva Premium Syringe Filters make the process faster than ever with the industry's highest flow rates and loading capacities. Manufactured with the highest-grade virgin polypropylene, and all are HPLC or LC/MS certified to guarantee low levels of observed extractables. PES (part numbers 5190-5094, 5190-5095,5190-5096 and 5190-5098) and Glass Fiber (5190-5120) premium syringe filters are LC/MS certified to be free of extractables Choose from a variety of membranes to suit your needs.

Premium Filters, 100/pk

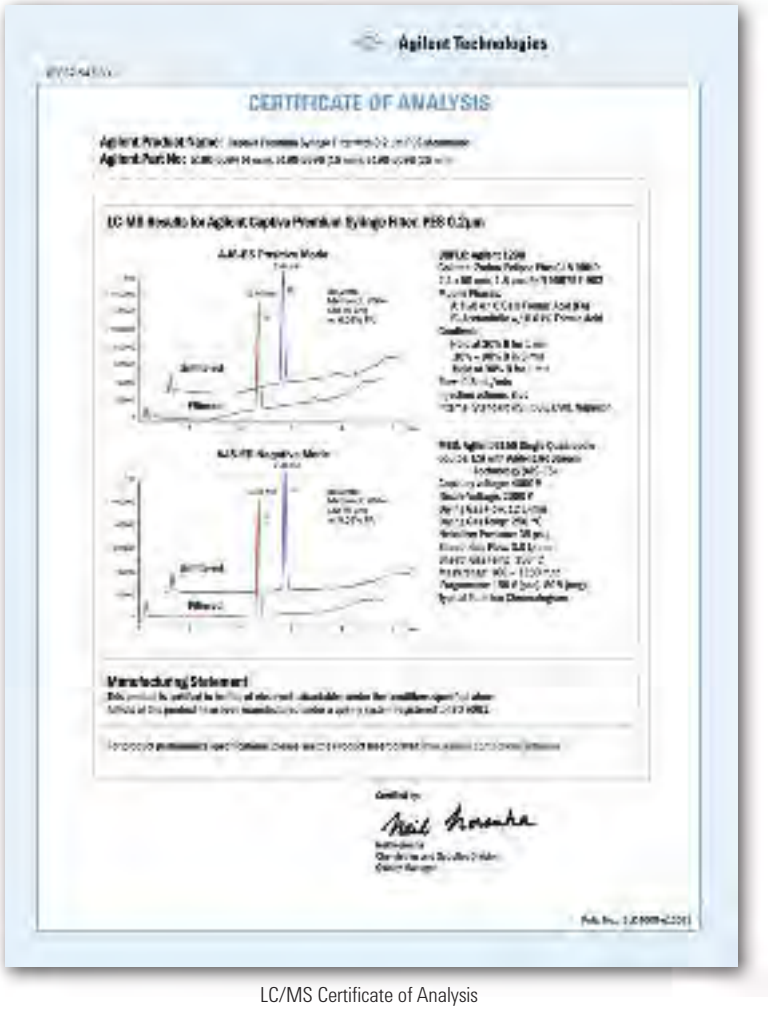
Description	Diameter (mm)	Pore Size (µm)	Certification	Housing	Part No.
PTFE	4	0.2	LC	Polypropylene	5190-5082
	4	0.45	LC	Polypropylene	5190-5083
	15	0.2	LC	Polypropylene	5190-5084
	15	0.45	LC	Polypropylene	5190-5085
	25	0.2	LC	Polypropylene	5190-5086
	25	0.45	LC	Polypropylene	5190-5087
Nylon	15	0.2	LC	Polypropylene	5190-5088
	15	0.45	LC	Polypropylene	5190-5091
	25	0.2	LC	Polypropylene	5190-5092
	25	0.45	LC	Polypropylene	5190-5093

(Continued)



Premium Filters, 100/pk

Description	Diameter (mm)	Pore Size (µm)	Certification	Housing	Part No.
PES	15	0.2	LC/MS	Polypropylene	5190-5096
	4	0.45	LC/MS	polypropylene	5190-5095
	4	0.2	LC/MS	Polypropylene	5190-5094
	15	0.45	LC	Polypropylene	5190-5097
	25	0.2	LC/MS	Polypropylene	5190-5098
	25	0.45	LC	Polypropylene	5190-5099
Regenerated cellulose	4	0.2	LC	Polypropylene	5190-5106
	4	0.45	LC	Polypropylene	5190-5107
	15	0.2	LC	Polypropylene	5190-5108
	15	0.45	LC	Polypropylene	5190-5109
	25	0.2	LC	Polypropylene	5190-5110
	25	0.45	LC	Polypropylene	5190-5111
Cellulose acetate	28	0.2	LC	MBS	5190-5116
	28	0.45	LC	MBS	5190-5117
Glass microfiber	15		LC/MS	Polypropylene	5190-5120
	28		LC	MBS	5190-5122



LC/MS Certificate of Analysis

Layered Filters with Pre-Filter

Layered Filters, 100/pk

Description	Diameter (mm)	Pore Size (µm)	Certification	Housing	Part No.
Glass Microfiber/PTFE	15	0.2	LC	Polypropylene	5190-5126
	15	0.45	LC	Polypropylene	5190-5127
	25	0.2	LC	Polypropylene	5190-5128
	25	0.45	LC	Polypropylene	5190-5129
Glass Microfiber/Nylon	15	0.2	LC	Polypropylene	5190-5132
	15	0.45	LC	Polypropylene	5190-5133
	25	0.2	LC	Polypropylene	5190-5134
	25	0.45	LC	Polypropylene	5190-5135

Captiva Disposable Syringes, 100/pk

Volume (mL)	Part No.
5	9301-6476
10	9301-6474
20	5062-8534



Captiva disposable syringe, 5 mL, 9301-6476



Captiva disposable syringe, 10 mL, 9301-6474



Captiva disposable syringe, 20 mL, 5062-8534



Econofilters

High quality Econofilters are shipped in large packs and are ideal for busy labs that need fast, efficient filtration at a reasonable price.



Econofilters, PES, 5190-5272

Econofilters, 1000/pk

Description	Diameter (mm)	Pore Size (µm)	Housing	Part No.
PVDF	13	0.2	Polypropylene	5190-5261
	13	0.45	Polypropylene	5190-5262
	25	0.2	Polypropylene	5190-5263
	25	0.45	Polypropylene	5190-5264
PTFE	13	0.2	Polypropylene	5190-5265
	13	0.45	Polypropylene	5190-5266
	25	0.2	Polypropylene	5190-5267
	25	0.45	Polypropylene	5190-5268
Nylon	13	0.2	Polypropylene	5190-5269
	13	0.45	Polypropylene	5190-5270
	25	0.2	Polypropylene	5190-5271
	25	0.45	Polypropylene	5190-5272
PES	13	0.2	Polypropylene	5190-5273
	13	0.45	Polypropylene	5190-5274
	25	0.2	Polypropylene	5190-5275
	25	0.45	Polypropylene	5190-5276
Polypropylene	13	0.2	Polypropylene	5190-5277
	13	0.45	Polypropylene	5190-5278
	25	0.2	Polypropylene	5190-5279
	25	0.45	Polypropylene	5190-5280
Regenerated cellulose	13	0.2	Polypropylene	5190-5281
	13	0.2	Polypropylene	5190-5282
	25	0.2	Polypropylene	5190-5283
	25	0.45	Polypropylene	5190-5284

Agilent Captiva Syringe Filter Selection Guide

STEP 1

Sample Composition

Aqueous

All aqueous solutions

- tissue culture/ protein applications/ large molecules
- small molecules applications/ general aqueous

Solvents

- Hydrophilic aqueous/ solvent mixtures/ solvents
- Hydrophilic solvent-mixtures/ solvents
- Hydrophobic solvents/gases/ acids/bases

PES Polyethersulfone
pH Range 3-12

CA Cellulose Acetate
pH Range 4-8

RC Regenerated Cellulose
pH Range 3-12

NY Nylon
pH Range 3-14

PTFE Polytetra-fluorethylene
pH Range 1-14

STEP 2

Sample Volume

4 mm for **up to 1 mL**



0.1-1 mL

15 mm for **up to 15 mL**



15 mL

25-28 mm for **up to 150 mL**



10-150 mL

STEP 3

What is the Particle Size of Your LC Column?

Columns packed < 2 µm particles	Columns packed > 2 µm particles
0.2 µm UHPLC	**0.2 µm or 0.45** µm HPLC

Applications

Type of Filtration	Recommended	Alternatives
HPLC • UHPLC • LC/MS • GC	RC	PTFE or Nylon
ICP-MS	PTFE	Glass Fiber/PTFE (High Particle Samples)
CE	RC	Nylon
Undiluted Organic Solvents	PTFE	Nylon
Protein Analysis • Samples with Biomolecules – Buffers	PES	RC or CA
Tissue Culture Media	PES	RC or CA
High Particle-Load Samples – Organic Solvents	Glass Fiber/PTFE	
High Particle-Load Samples – Aqueous Solutions	Glass Fiber/Nylon	

Proof of Performance: Filtration Efficiency

Testing Method

Sample preparation

The surfactant solution, 0.1% Triton X-100, was used to prepare 0.01% Latex Beads (0.3 µm and 0.5 µm) solution. The 0.1% Triton X-100 was used to maintain the homogeneity of Latex Beads solutions.

Filtration

The challenging solution was passed through each individual syringe filter and a 1 mL filtrate was collected in a 2 mL vial for HPLC run.

Ten different filters from each kind filter were tested.

Filtrate measuring on HPLC/UV

The maximum absorbance of the latex beads solutions was observed at 272 nm, which was used to correlate latex beads concentration with absorbance.

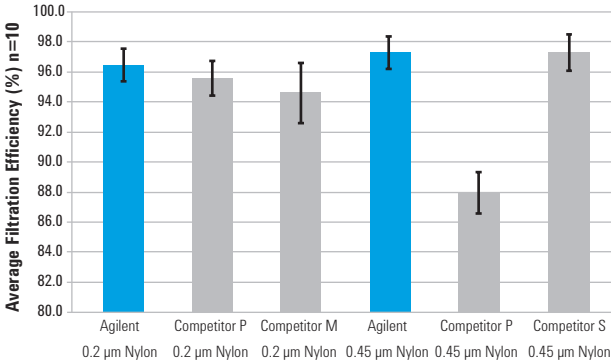
A simple HPLC method was used for automatic testing under UV 272 nm. No column was used. The mobile phase was water, and the flow rate of 1.0 mL/min was used.

The eluted peak are at 272 nm was used for filtration efficiency calculation.

Blank 0.1% Triton X-100 was run to correct contributions from surfactant absorbance at 272 nm.

Agilent Captiva Syringe Filters provide equivalent or better filtration efficiency than competitors equivalent products on particulates removal

Average Filtration Efficiency of Agilent Captiva Syringe Filters vs. Competitors



Filtration efficiency (%) calculation

$$Filtration\ EFF\,(\%) = \frac{\left(PeakArea_{Unfiltered\ LBsolution} - PeakArea_{Unfiltered\ Blank}\right) - \left(PeakArea_{Filtered\ LBsolution} - PeakArea_{Filtered\ Blank}\right)}{\left(PeakArea_{Unfiltered\ LBsolution} - PeakArea_{Unfiltered\ Blank}\right)} \times 100\%$$

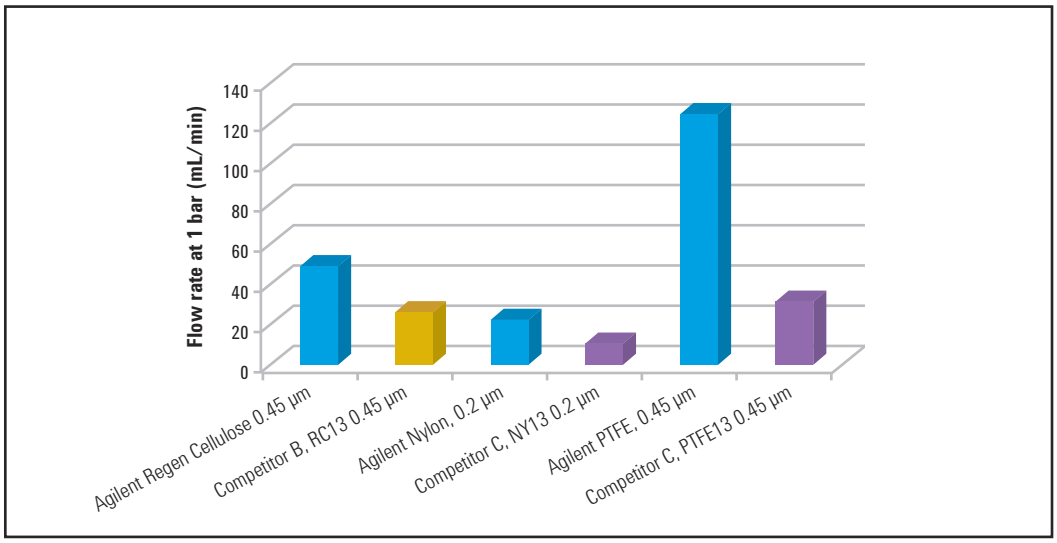
Agilent Captiva Syringe Filters provide consistent and higher than 90% filtration efficiency on particulate removal

	Agilent premium 0.2 µm syringe filters						Agilent premium 0.45 µm syringe filters					
	Nylon	**PTFE**	**RC**	**PES**	**GF/NY**	**GF/PTFE**	**Nylon**	**PTFE**	**PES**	**CA**	**GF/NY**	**GF/PTFE**
1	96.0	92.3	89.8	92.1	99	99.4	95.2	97	93.6	92.4	96.8	98.4
2	95.9	91.4	90.6	91.4	99	98.9	93.2	96.5	93.6	95.0	97.1	98.8
3	94.5	93.3	90.3	89.5	99.2	99.0	95.5	97.5	93.5	96.3	96.4	97.7
4	96.6	92.3	91.7	99.0	99.6	98.6	95.4	96.6	88.5	97.2	99.3	98.8
5	95.4	91.2	92.4	96.3	98.8	98.8	94.9	96.0	88.2	96	99.0	99.7
6	95.6	91.1	90.8	99.9	99.3	98.5	95.3	95.7	92.3	95.6	100	96.8
7	99.9	91.1	98.2	99.0	99.4	99.4	99.5	95.2	94.9	96.7	98.2	97.6
8	99.8	91.2	99.0	97.8	95.0	99.0	98.0	97.8	89.4	93.8	98.9	98.5
9	99.7	90.9	96.4	95.2	95.9	99.9	97.7	94.9	87.3	92.5	100.2	98.0
10	99.2	91.3	95.7	96.1	94.7	99.6	99.7	94.8	87.5	92.8	100.5	101.3
Average Eff (%)	**97.3**	**91.6**	**93.5**	**95.6**	**98.0**	**99.1**	**96.4**	**96.2**	**90.9**	**94.8**	**98.6**	**98.6**
RSD (%)	2.2	0.8	3.7	3.7	2.0	0.5	2.2	1.1	3.3	1.9	1.5	1.3

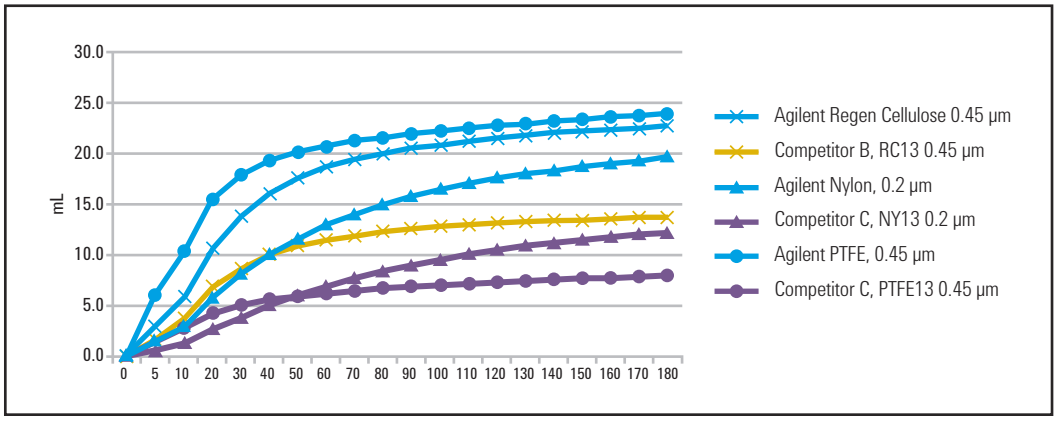
Proof of Performance: Flow Rate & Volume Capacity

Agilent Captiva Premium Syringe Filters provide incomparable loading capacity with the fastest flow rates in the market today to allow for maximum efficiency.

Flow rate for 15 mm Premium Syringe Filters



Capacity (volume) of 15 mm syringe filters over time (with Particulate-Laden Samples)



Filtration Impact on LC Column Life

Importance of Filtration

Column plugging is the most frequent cause of column failure encountered by analytical chemists. Injection of samples containing even small amounts of particulate will clog the column inlet, cause high column backpressure, retention time shift and loss of resolution, and subsequently shorten the normal column lifetime. This impact can be more significant for sub-2 µm columns. These smaller particle size columns are usually used under high pressure, thus are more sensitive to pressure increase caused by the accumulated particulates on column.

It is the intent of this work to demonstrate that sample filtration will lengthen the life of a column, not only the traditional LC columns by 0.45 µm filters, but also the sub-2 micron LC columns by 0.2 µm filters. In order to correlate the column life extend to the actual application, the plasma extracts by PPT treatment were tested also for the comparison of samples without filtration, samples with centrifugation and samples with filtration.



Testing Method

Sample preparation

A.) The surfactant solution, 0.002% Triton X-100, was used to prepare 0.05% Latex Beads (0.3 µm and 0.5 µm) solution.

B.) Latex Beads solution (0.3 µm) was used for sub-2 micron column life test. Unfiltered and filtered (by 0.2 µm filters) samples were used for comparison of impact on sub-2 micron column life.

C.) Human plasma extract was used for sub-2 micron column life actual application test. Unfiltered, centrifuged and filtered (by 0.2 µm filters) samples were used for comparison of impact on sub-2 micron column life. The sample was prepared following the below steps.

1. 2 mL of Human plasma was aliquoted in to a test tube.
2. 10 mL of Acetonitrile with 1% Acetic Acid was added.
3. Sample was vortexed vigorously and then centrifuged at 4000 rpm for 5 min.
4. The supernant was transferred into a clean test tube.
5. The supernant was blown dry with N2 flow at 37 °C.
6. The died sample was reconstituted in 10:90 MeOH/H2O. Vortex and sonicate.

Filtration

The challenging solution was passed through each individual syringe filter and a 1 mL filtrate was collected in a 2 mL vial for HPLC run.

UHPLC instrumentation
(for sub-2 column life test)

Column: Agilent Zorbax Eclipse Plus C18 RRHD column, 2.1 x 50 mm, 1.8 µm, P/N 959757-902
Column was disconnected from the detector and allowed to run to drain.

Mobile phase: Acetonitrile: Water (35:65, v/v)

Flow rate: 0.4 mL/min, isocratic

Injections: 10 µL per injection, 1 injection per minute

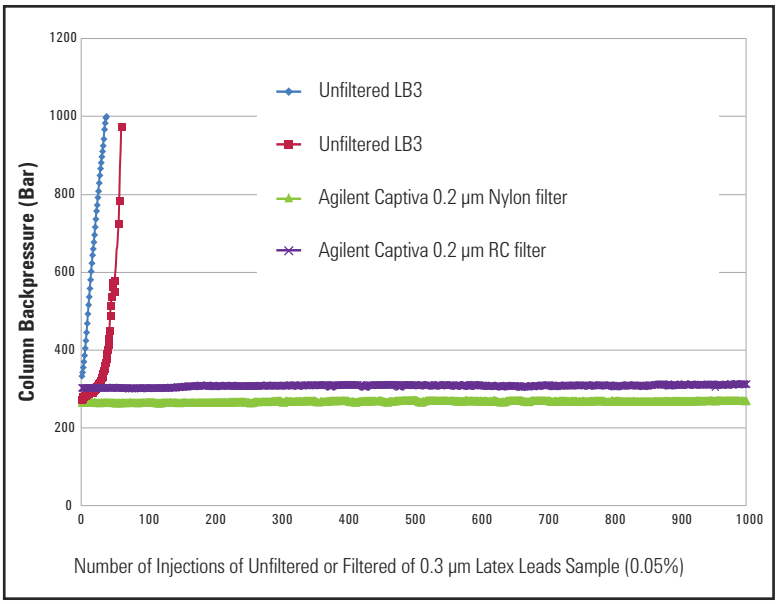
Monitoring: Column backpressure was recorded with the number of injections.

Column failure: When column back pressure exceed 1000 bar.

Sequence: A 1000 injections sequence was usually used, unless column failed in the middle due to high pressure. A new column was used for each individual sequence

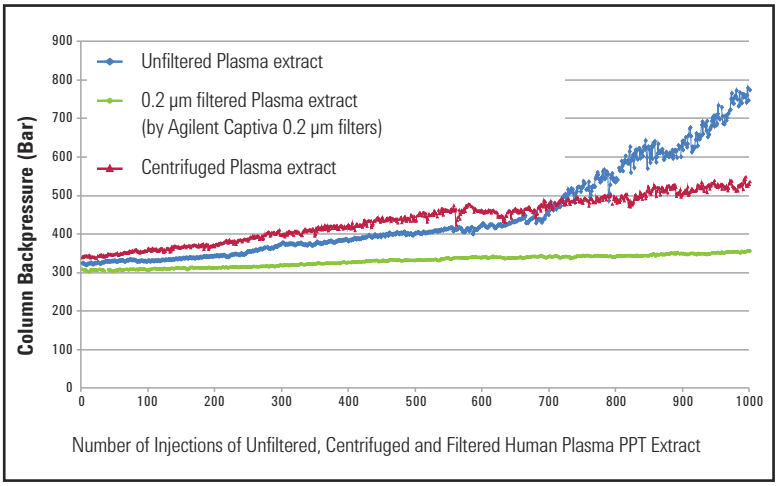
Results – Filtration impact on sub-2 micron column A by Latex Bead 0.3 µm solution

Effects on Filtration on sub-2 micron Column Life



Results – Filtration impact on sub-2 micron column B by Human Plasma PPT Extract

Effects of filtration on sub-2 column life time



Conclusion

Sample filtration prior to their introduction into an HPLC system was demonstrated to make significant improvement on the column usage life time.

Diatomaceous Earth Sorbents

Typical Matrices

Aqueous, biological fluids, organic reaction mixtures (scavenging)

Primary Extraction Mechanism

Solid supported LLE

Compound Types

Nitrosamines, pesticides, herbicides



Chem Elut cartridges, 12198006

Chem Elut and Hydromatrix

- High purity sorbent supported liquid extraction (SLE) applications
- Available in pre-packed cartridges or bulk
- Packing method delivers excellent tube-to-tube reproducibility
- Tox Elut cartridges are effective for forensic analysis of drugs in urine

Chem Elut is an economical broad performance sorbent for rapid, general sample preparation of biological samples such as plasma, serum, whole blood and urine. Chem Elut products are available in buffered and unbuffered formats. The buffered devices can be used for simple scrubbing operations on organic reactions. The base-treated cartridge can remove residual acid compounds from a variety of matrices.

Hydromatrix is a high purity, inert diatomaceous earth sorbent available in 96-well plates (Combilute and Chem Elut SLE Plates, which are designed for sample volumes of less than 80 µL) and as bulk material, offering end user flexibility and an excellent diversity of applications.

Chem Elut Cartridges*

Buffered pH	Volume (mL)	Unit	Part No.
4.5	3	100/pk	12198004
9.0	3	100/pk	12198005
Unbuffered	0.3	100/pk	12198001
	1	100/pk	12198002
	3	100/pk	12198003
	5	100/pk	12198006
	10	100/pk	12198007
	20	100/pk	12198008
	50	50/pk	12198009
	100	25/pk	12198010
	300	15/pk	12198011

*For Chem Elut and Tox Elut cartridge, select the product which fits the total volume of the sample. Volumes stated here are not the actual cartridge size, but rather the volume available for sample.

Tox Elut Cartridges*

Buffered pH	Volume (mL)	Unit	Part No.
9.0	10	100/pk	12198014
9.0	20	100/pk	12198017
Unbuffered	10	100/pk	12198012
	10	100/pk	12198015

*For Chem Elut and Tox Elut cartridge, select the product which fits the total volume of the sample. Volumes stated here are not the actual cartridge size, but rather the volume available for sample.

Hydromatrix

Description	Part No.
Hydromatrix bulk material, 1 kg	198003
Hydromatrix bulk material, 4 kg	198004

Other Formats*

Description	Part No.
Combilute 96-well plate, 200 mg	65401507
Chem Elut SLE Plate, 50 mg	A4964050
Chem Elut SLE Plate, 150 mg	A4964150
Preassembled 96-well plate (VersaPlate tubes and base plate) 260 mg	75430260
VersaPlate tubes, 96/pk, tubes only, 260 mg	75530260

*Tubes need to be inserted into a VersaPlate base plate, P/N 75400000



Combilute plate, 200 mg, 65401507

References

Plum, J & Daldrup, T (1986) Detection of digoxin, digitoxin, their cardioactive metabolites and derivatives by high performance liquid chromatography and high performance liquid chromatography-radioimmunoassay. J. Chromatogr. A, 377, 221-231.

Biondi, PA, Guidotti, L, Montana, M, Manca, F, Brambilla, G & Lucarelli, C (1991) A derivatization procedure suitable for HPLC analysis of clenbuterol. J. Chromatogr. Sci., 29(5), 190-193.

Raou, S, Gremaud, E, Biaudet, J & Turesky, R (1997) Rapid solid-phase extraction method for the detection of volatile nitrosamines in food. J. Agricultural and Food Chem., 45, 4706-4713.

The prohibition on the use of certain azo dyes is laid down in Annex XVII to the EU Regulation (EC) 1907/2006 on the registration, evaluation and authorization of chemicals (REACH), which is directly applicable in all EU Member States. CEN Leather - Chemical tests - Determination of certain azo colourants in dyed leathers. Reference: CEN ISO/TS 17234:2003



DMS card, 50/pk, A400150

Dried Matrix Spotting

Bond Elut Dried Matrix Spotting (DMS)

Dried blood spotting techniques for DMPK/ADME applications have gained significant exposure in the past few years. The practical advantages of sample collection, shipping and storage offer significant resource benefits to large pharmaceutical and CRO laboratories. Bond Elut DMS resets the bar in performance for dried blood spotting applications. The innovative non-cellulose spotting material offers key sensitivity and workflow advantages, mitigating key pains with existing cellulose blood spotting cards.

- Non-cellulose 'paper' reduces non-specific binding, improving MS analyte response, increasing signal to noise ratios
- Easy product selection – one single, untreated card for fast method development for a variety of biological matrices
- Spot size, homogeneity and recovery are highly reproducible across a range of hematocrit levels: allowing confidence in assay development for a variety of biological matrices
- Non-hygroscopic material does not absorb moisture, even in aggressively humid environments, reduces potential risk of analyte stability during transportation/storage
- Card requires five times less punching force than a cellulose based DBS card, enabling easier workflow and amenability to automation

Bond Elut Dried Matrix Spotting (DMS)

Description	Unit	Part No.
DMS card	50/pk	A400150
DMS card	500/pk	A400150K
DMS accessory pack Includes 5 x 3 mm punching tools and 5 punching mats		A42001
DMS starter kit Includes 1 accessory pack (P/N A42001) with 5 x 3 mm punching tools and 5 punching mats and Bond Elut DMS card, 50/pk (P/N A400150)		A400150SK

TIPS & TOOLS

Visit **www.agilent.com/chem/sampleprep** for Dried Matix Spotting Application Notes, including: *"Homogeneity of Dried Matrix Spots,"* publication # 5990-8035EN.



Dried Blood Spotting Workflow and Method Guide



1. SPOTTING

- Use existing sample collection workflow and preferred blood volume (typically 15 µL, but better MS responses can be achieved using 30 µL)
- Hold the pipette tip or capillary just above the paper in the center of the dotted circle (DO NOT ALLOW THE TIP TO TOUCH THE CARD SURFACE)
- Dispense, allowing the blood drop to touch the spotting surface on the card
- The blood spot will quickly soak into the surface of the card leaving a circular spot

2. DRYING

- Drying times for Bond Elut DMS cards are comparable to cellulose based cards
- It is recommended that the sample is given a minimum of 2 hours drying time prior to punching

3. PUNCHING

The Agilent DMS card is compatible with handheld punch tools and can easily be configured for automated punching systems compatible with a 4 spot card format.

- Cut a suitable sized punch from the center of the blood spot (typically 3 mm)
- Transfer the punched blood disk to a suitable vial or 96-well

4. EXTRACTION

- Add 300 µL of 0.1% formic acid* in 80% methanol to the punched disk
- Add a suitable internal standard to the sample and vortex
- Centrifuge for 15 minutes or filter if required
- Evaporate sample to dryness and reconstitute in 100 µL of mobile phase
- Inject into LC/MS/MS

*The use of 0.1% formic acid can assist the elution of more hydrophobic analytes

OTHER PRACTICAL CONSIDERATIONS

Blood Sample: Fresh, untreated blood can be used provided it shows no sign of clotting. In most cases it is common to use blood that contains an anticoagulant (EDTA or heparin). Frozen blood samples are not recommended due to the occurrence of cellular damage upon thawing.

Oval Spots: Oval spots can be caused by sudden hand movement during the spotting process. This does not create any experimental issues, as the subsequent punch from the center of the spot will normalize the assay volume.

Hematocrit Levels: Bond Elut DMS displays improved spot homogeneity and recovery compared to cellulose devices, across a wide range of hematocrit levels.

Punching Force: Bond Elut DMS cards require 4 times less punching force than a cellulose based card. There is no need to twist the cutting tool while punching the blood spot.

Cross Contamination: Provided that the blood spots have had sufficient time to dry, then cross contamination should not be an issue.

Effect of Humidity: Bond Elut DMS cards are non-hygroscopic and do not absorb water, even in high humidity environments.

Untreated Card: Bond Elut DMS contains no chemical impregnation.

Other Matrices: Bond Elut DMS is amenable to a broad range of biological matrices including plasma.

TIPS & TOOLS

To view Agilent application note "Improving Sensitivity of Basic Drugs in Dried Blood Spotting through Optimal Desorption" please visit **www.agilent.com/chem/driedbloodspotting**



ITLC SG paper, SGI0001

Chromatography Papers

Chromatography Paper is used in thin layer chromatography applications such as evaluating radioisotope purity. The porous paper is made of glass microfibers impregnated with silica gel. Agilent offers two kinds of paper: SA (contains sodium salt) and SG (contains potassium salt).

- More convenient with faster developing times than traditional TLC; no interference from organic binders
- Ideal for evaluating radioisotope QC testing
- Separates lipids and other non-polar compounds
- Can easily be cut to convenient testing sizes, and can be imprinted

Chromatography Papers

Description	Part No.
Chromatography paper (SA), 4.5 x 12 in, 50/pk	A120B12
ITLC SG paper, 4.5 x 12 in, 50/pk	SGI0001

Bond Elut Accessories

Bond Elut 96-well Accessories

Bond Elut 96-well Accessories

Description	Unit	Part No.
96-well manifold, acrylic	1/pk	5133000
96-well manifold, shimset	1/pk	12236104
Square-well collection plates, 2 mL	50/pk	5133009
Square-well collection plates, 1 mL	50/pk	5133008
Square-well collection plates, 350 µL	50/pk	5133007
Sealing tape pad	10/pk	12143105
Square 96-well sealing caps, EVA, pierceable	50/pk	5133005
VersaPlate sealing strips, each covers one column	240/pk	12236108



Bond Elut 96-well manifold, acrylic, 5133000



96-well manifold, shimset, 12236104



Bond Elut 96 square-well plate, 5133009



Bond Elut 96 square-well plate, 5133008



Bond Elut 96 square-well plate, 5133007



Sealing tape pad, 12143105



Empty SPE cartridges, 1 mL, 12131007



Empty SPE cartridges, 12 mL, 12131010



Empty SPE cartridges, 20 mL, 12131011



Empty SPE cartridges, 60 mL, 12131012

Bond Elut Empty SPE Cartridges

- Made with high purity polypropylene for cleaner extracts
- Uniform batch-to-batch size for consistent performance
- Economical for everyday use

A variety of empty reservoirs is available for packing custom SPE cartridges with bulk Bondesil or other desired sorbents. Cartridges are available from 1 to 60 mL. Order frits separately, or see the table for reservoirs with pre-installed frits.

Bond Elut Empty SPE Cartridges

Volume (mL)	Unit	Part No.
1	100/pk	12131007
3	100/pk	12131008
6	100/pk	12131009
12	100/pk	12131010
20	100/pk	12131011
60	100/pk	12131012

Bond Elut Empty SPE Cartridges with Two Frits

- Pre-installed frits for ease-of-use
- Broad range of filtration operations for maximum flexibility
- Customizable packing for specific applications

These clean polypropylene reservoirs contain two 20 µm polylethylene frits pre-inserted, an ideal configuration for simple filtration. For custom sorbent packing, additional frits can be purchased separately. Available from 1 to 60 mL.

Bond Elut Empty SPE Cartridges with Two Pre-Installed Frits

Volume (mL)	Unit	Part No.
1	100/pk	12131013
3	100/pk	12131014
12	100/pk	12131016
20	100/pk	12131017
60	100/pk	12131018
Bond Elut Empty SPE Cartridges with One Thick Frit		
6	100/pk	12131015



Empty SPE cartridges with two frits (pre-inserted), 1 mL, 12131013



Empty SPE cartridges with two frits (pre-inserted), 20 mL, 12131017



Empty SPE cartridges with two frits (pre-inserted), 60 mL, 12131018



Polyethylene Frits, 12131021

20 µm Polyethylene Frits for SPE Cartridges

- Made with high-grade, clean polyethylene for clean extracts
- Pre-cut to correct size for accuracy
- Use with reservoirs or custom packing

These frits are pre-cut to fit into Bond Elut reservoirs for use in filtration applications or for custom SPE sorbent packing.

20 µm Polyethylene Frits for SPE Cartridges

Diameter (mm)	To Fit Tube Size (mL)	Unit	Part No.
6.4	1	100/pk	12131019
9.5	3	100/pk	12131020
12.7	6	100/pk	12131021
15.9	12	100/pk	12131022
20.6	20	100/pk	12131023
27.0	60	100/pk	12131024

Bond Elut Adapters

- Connect SPE cartridges in series for large samples
- Expand cartridge volume for even more applications
- Transfer large-volume samples to any SPE cartridge

Bond Elut Adapters

Description	Unit	Part No.
Adapter cap for 1, 3 and 6 mL Bond Elut cartridges	15/pk	12131001
Adapter cap for LRC 12, and 20 mL Bond Elut cartridges	10/pk	12131003
Adapter cap for 60 mL Bond Elut cartridges	10/pk	12131004

Bond Elut adapters fit on top of any Bond Elut cartridge and contain a female Luer fitting that accommodates the tip of another cartridge, allowing the following configurations:

Bond Elut Adapter Configurations

Configuration 1: Stack two cartridges to perform multi-sorbent methods

Configuration 2 + 3: Increase any cartridge's volume by stacking an empty reservoir on top of the device.

Configuration 4: Standard Luer-tipped syringes will fit into any Bond Elut adapter. Gentle pressure can then be used to apply conditioning solvents, samples, rinsing solvents and eluents. This configuration is particularly useful for single sample processing, where a vacuum manifold is not required.

Configuration 5: For excessively large sample volumes, 1/8 in od tubing can be connected to the end of an adapter and the sample can be drawn directly from the sample container via high vacuum.



Luer Stopcocks

- Control flow rates during SPE vacuum extraction
- Improve method reproducibility
- Instant isolation from vacuum reduces accidental tube drying

Luer stopcocks are used to provide independent flow control of each individual Bond Elut cartridge when used with vacuum manifolds. They are made from solvent resistant high-grade polypropylene, are reusable and can be readily cleaned using organic solvents such as methanol or acetone.



Luer stopcocks, 12131005

Luer Stopcocks

Description	Unit	Part No.
Luer stopcocks	15/pk	12131005

Adapter Caps for Gilson ASPEC SPE Systems

- Enhance the high-throughput compatibility of Bond Elut cartridges
- Converts 1, 3 and 6 mL cartridges for use in Gilson SPE systems
- Specially engineered for leak-free operation

Gilson-engineered caps produce a positive pressure seal with the needle in Gilson ASPEC, ASPEC XL and ASPEC XL4 solid phase extraction systems.



Gilson adapter cap, 12131034

Adapter Caps for Gilson ASPEC SPE Systems

Description	Unit	Part No.
Gilson adapter cap, 1 mL	1000/pk	12131034
Gilson adapter cap, 3 mL	1000/pk	12131035
Gilson adapter cap, 6 mL	1000/pk	12131036

Vac Elut Vacuum Extraction Manifolds

- Increased productivity/sample throughput
- Disposable needles eliminate cross contamination
- Rugged, reliable construction

Engineered to increase laboratory productivity, the corrosion-resistant Vac Elut vacuum extraction manifolds permit extraction of up to 12 or 20 samples at one time, for improved efficiency. The manifold's clear glass base allows careful monitoring of the entire sample collection process, and the compact design requires very little bench space.

To minimize the risk of sample carryover, low-cost, disposable, medical grade polypropylene delivery needles can be easily replaced. Polypropylene extender tips are also available as a replacement for the standard needle valves, ensuring a direct path into the collection tube. Correct sample identification is also ensured by an interlocking fit between the lid and internal test tube rack.



Vac Elut 20 manifold with collection rack, 12234105



Vac Elut 20 collection rack, 12234517

Vac Elut 20 Vacuum Extraction Manifolds

The Vac Elut 20 vacuum control valve, vacuum gauge, and quick release valve are mounted on the lid, away from the corrosive waste stream and within convenient reach. The solvent-resistant polypropylene rack is available in a variety of sizes to accommodate collection tubes commonly used in sample preparation. Manifold sets include the glass basin, lid cover, collection rack and vacuum gauge assembly.

Vac Elut 20 Manifold

Manifold Sets	Part No.
Vac Elut 20 manifold with collection rack for 10 x 75 mm test tubes	12234105
Vac Elut 20 manifold with collection rack for 13 x 75 mm test tubes	12234100
Vac Elut 20 manifold with collection rack for 13 x 100 mm test tubes	12234101
Vac Elut 20 manifold with collection rack for 16 x 75 mm test tubes	12234102
Vac Elut 20 manifold with collection rack for 16 x 100 mm test tubes	12234103
Accessories for Vac Elut 20 Manifold	
Standard glass basin	12234505
Collection rack for 10 x 75 mm test tubes	12234517
Collection rack for 13 x 75 mm test tubes	12234507
Collection rack for 16 x 100 mm test tubes	12234510
Replacement Components	
Polypropylene delivery needles, 25/pk	12234511
Replacement exit valve for glass basin	12234506
Replacement lid gasket	12234502
Vac Elut 20 lid cover	12234501
Vacuum gauge assembly	12234504

Vac Elut 20 Manifold with Tall Glass Basin

- For extractions greater than 10 mL
- Transparent glass base allows you to monitor the whole collection operation
- Simple vacuum adjustment

The Vac Elut 20 with a large glass basin and collection rack accommodates larger 16 x 150 mm test tubes. The same high quality material and features on the standard Vac Elut system are incorporated on this special unit. These collection vessels can be utilized in combinatorial chemistry applications using large boiling tubes for collection of purified synthesis mixtures, or for any SPE extraction in which an elution volume greater than 10 mL is required.



Vac Elut 20 manifold tall glass basin, 12234104

Vac Elut 20 Manifold with Tall Glass Basin

Manifold Set	Part No.
Vac Elut 20 Manifold with tall glass basin and collection rack for 16 x 150 mm test tubes, complete system	12234104



Vac Elut 12 manifold, 5982-9110

Vac Elut 12 Manifold

The Vac Elut 12 vacuum extraction manifold is a compact tool for small sample sets. The Vac Elut 12 offers the same durability of components and operation as the Vac Elut 20 manifolds, but works well when only a few samples need to be processed at a time. The Vac Elut has 12 sample positions, a clear glass basin for easy visualization of the extraction, and a gauge for precise vacuum settings.

Vac Elut 12 Manifold

Manifold Set	Part No.
Vac Elut 12 manifold with collection rack for 16 x 100 mm test tubes	5982-9110



12-port rack for 13 x 75 mm tubes, 5982-9114

Replacement Parts for Vac Elut Vacuum Manifolds

Description	Part No.
Manifold ball ring/vacuum quick release	5982-9106
Manifold exit valve replacement kit	5982-9107
Manifold vacuum gauge assembly with valve	5982-9108
White cover for 12-port manifold	5982-9111
Sealing gasket for 12-port manifold	5982-9112
Glass chamber for 12-port manifold	5982-9113
12-port rack for 13 x 75 mm tubes	5982-9114
12-port rack for 13 x 100 mm tubes	5982-9115
12-port rack for 16 x 75 mm tubes	5982-9116
12-port rack for 16 x 100 mm tubes	5982-9117

Parts and Disposables for Vac Elut Cartridge Manifolds

Description	Unit	Part No.
Disposable needle tip	20/pk	5982-9100
Stainless steel needle with polypropylene coating	20/pk	5982-9101
Short valve stopcock	20/pk	5982-9102
Long valve stopcock	20/pk	5982-9103
Male luer plugs	25/pk	5982-9104
Needle tip ejector tool		5982-9105
Cartridge stacking adapters	12/pk	5982-9109

Vac Elut SPS 24 Manifold

- Closed operation prevents cross contamination
- Stainless steel tips deliver maximum extract purity
- Range of rack sizes covers most tube configurations

The Vac Elut SPS 24 allows simultaneous processing of up to 24 SPE cartridges. Like all Vac Elut manifolds, the SPS 24 is made from durable, solvent-resistant materials and engineered to last. The glass sides allow easy viewing of the entire sample collection process.

The ultimate feature of the SPS 24 manifold is its waste diversion funnel, which enables all steps of the SPE procedure to be completed without removing the lid. Since the collection rack is placed inside the unit before extraction begins, splash back and cross contamination are eliminated, while hazardous waste and biohazard exposure are minimized. Wastes collect outside of the manifold itself, simplifying cleanup and reducing the time needed to extract and elute samples.

Complete with replacement stainless steel delivery tips for maximum extract purity, the Vac Elut SPS 24 system also includes a vacuum controller/release, collection rack, and port sealing plugs. Racks for several different collection tube configurations are available.



Vac Elut SPS 24 manifold

Vac Elut SPS 24 Manifold

Description	Part No.
Vac Elut SPS 24 manifold with collection rack for 10 x 75 mm test tubes	12234003
Vac Elut SPS 24 manifold with collection rack for 12 x 75 mm test tubes	12234041
Vac Elut SPS 24 manifold with collection rack for 13 x 100 mm test tubes	12234022
Vac Elut SPS 24 manifold with collection rack for 16 x 100 mm test tubes	12234004
Replacement Components	
Collection rack and funnel set for 12 or 15 mL conical tubes	12234027
Collection rack and funnel set for 12 x 75 mm test tubes	12234030
Collection rack and funnel set for 13 x 100 mm test tubes	12234031
Collection rack and funnel set for 16 x 100 mm test tubes	12234028
Elastic lid fasteners, 6/pk	12234034
Complete Upper Lid Assembly	12234025C
SPS 24 upper lid cover	12234025
SPS 24 waste tower repair kit Includes base exit tube, hose connector, washer, center tube, 900 connector elbow	12234005
Stainless steel delivery needles, 25/pk	12234038



SPS 24 waste tower repair kit, 12234005

96-Well Plate Vacuum Manifold Accessories

- Can handle 96-well fixed position plates or second version to handle 96-well flexible format plate
- Constructed with polypropylene base and polyethylene lid
- Small footprint
- Supplied with on/off valve, vacuum gauge, and fine vacuum control valve
- Disposable reservoir tray collects excess sample and wash solvents
- Spacer inserts can be placed into the base so that collection plates of differing heights can be processed (both deep-well and standard microtiter plates), ensuring maximum penetration of the SPE plate into the collection plate and reducing well-to-well contamination
- Resistant gasket in the manifold lid



Base O-ring, 5185-5779



96-well vacuum manifold,
base assembly only, 5185-5797



Collection plate spacer in sizes
to match the collection plate used

Vacuum Manifolds for 96-well Plates

Description	Part No.
Manifold for 96-well plates Includes base, vacuum gauge, needle valve and fixed lid	5185-5776

Parts and Disposables for 96-well Plate Manifolds

Description	Unit	Part No.
Base O-ring for 96-well plate manifold		5185-5779
Collection plate spacer for Agilent 1 mL deep-well, 12 mm		5185-5775
Collection plate spacer for microtiter plate and Agilent 0.5 mL shallow well plate, 29 mm		5185-5781
Collection plate spacer for most industry-standard deep-well plates, 2 mm		5185-5780
Disposable reservoir tray for 96-well manifold	25/pk	5185-5782
96-well vacuum manifold, base assembly only		5185-5797
Lid for 96-fixed well vacuum manifold		5185-5798
Lid gasket for 96-well plate manifold		5185-5778
Luer adapters for 96-well flexible cartridge	25/pk	5185-5789
Needle valve for 96-well manifold		5185-5783
On/off valve for 96-well manifold		5185-5785
Vacuum gauge for 96-well manifold		5185-5786
Vacuum outlet (Ni plated) for 96-well manifold		5185-5784

Sealing Mats

Sealing mats help prevent sample contamination or evaporation that can occur when plates are exposed to environmental conditions.



Collection plate, showing 96-position closing mat, 5042-1389

Sealing Mats

Description	Unit	Part No.
96-well plate sealing mats, round	50/pk	5042-1389

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Easy Ordering Terms and Conditions

Discounts and Delivery

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A shipping and handling fee will be added to your order unless the purchase is over $2000 US for orders place online or over $4000 for orders place via phone. Special shipping (i.e., overnight in the US) is available in most regions at an additional cost.

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Shipping Damages

If items are damages in transit, please follow the instructions below:

- If a shipment is visibly damaged upon arrival, do not accept it until the person making the delivery has endorsed the bill of lading with statement for the extent of the damage.
- If any damage is found after unpacking, retain all cartons and inner packaging and immediately request an inspection from the carrier.
- Notify the Agilent Customer Contact Center at **1-800-227-9770** about the damaged shipment so that we can make the appropriate sales adjustment and/or provide you with return instructions (Sales order number, product number and quantity damaged will be needed).

Easy Ways To Order

- Phone: **1-800-227-9770** (option 1, 1) in the US and Canada – Mon-Fri, 8AM to 8PM EST
- Fax: **1-302-633-8901** in the US
- Email: **cag_sales-na@agilent.com** in the US and Canada
- Online: **www.agilent.com/chem** in the US and Canada

Payment Options

- In the US, Visa, MasterCard, Discover and American Express are accepted with a minimum order of $20 (not applicable in all countries).
- Email ePay@agilent.com to make an electronic payment using the ACH/EFT (Automated Clearing House/Electronic Funds Transfer) method.
- Establish a charge account through your Agilent Customer Service Representative or Your Local Agilent sales office. An account number will be assigned to you for charging your purchases. Payment terms are net 30 days from the invoice date. All orders are subject to credit approval.

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Part Number	Description	Quantity	Price	Total Cost

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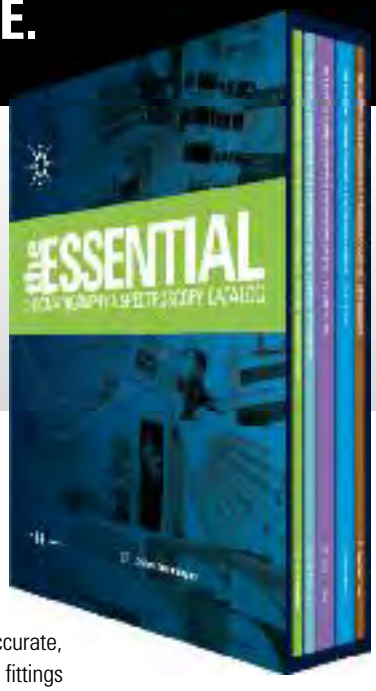
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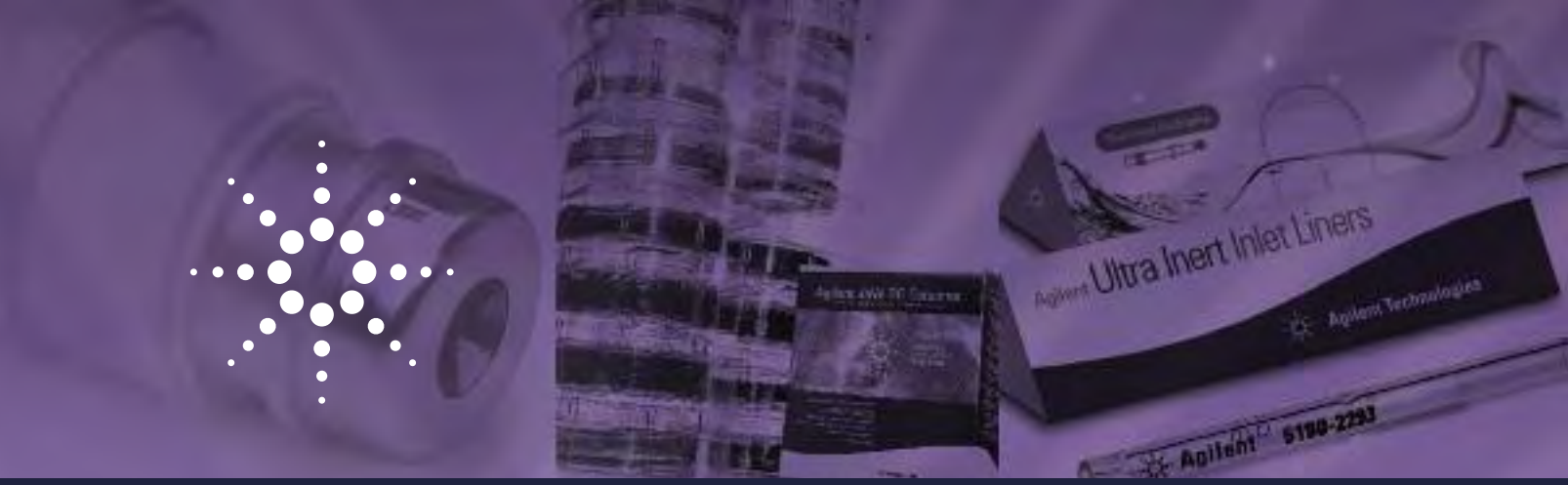
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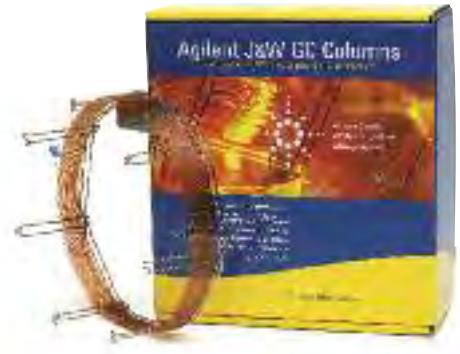
Agilent Ultra Inert solutions

provide the flow path inertness vital to analytical success. Ultra Inert split and splitless liners are manufactured and tested to our highest level of scrutiny to ensure quality and consistency. Agilent J&W Ultra Inert GC columns are tested with the industry's most demanding test probe to reduce detection limits and produce more accurate data for difficult analytes. Agilent GC and GC/MS instruments bring together all elements for trace-level analysis, dramatically improving MS resolution, spectral integrity, and detection limits.

GC and GC/MS supplies

include premium non-stick septa, plasma coated to eliminate chemical bleed and contamination, so your GC system will maintain its integrity, stay cleaner, and require less maintenance. General-purpose septa are made from an enhanced injection-molded silicone to withstand over 200 automatic injections at 350 °C. Vespel/graphite ferrules are manufactured to the ideal hardness for GC/MS applications to prevent contamination caused by flaking.





Agilent J&W GC columns

deliver the best inertness for acids, bases, and mixed functional compounds, the lowest bleed levels, and the tightest column-to-column reproducibility. Mass Spec Grade GC columns (VF-ms, DB-ms and HP-ms) give you robust performance, low column bleed, and a wide range of selectivity. LTM column modules combine a fused silica capillary GC column with heating and temperature-sensing components for efficient column heating and cooling. What's more, integrated guard columns protect your analytical columns from non-volatile compounds in the sample matrix.

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PUT MORE THAN 40 YEARS OF RELENTLESS INNOVATION BEHIND YOUR EVERY RESULT

By continually raising the standards for technologies that support your routine analyses, Agilent's R&D efforts have led to breakthroughs such as:

- **New GC columns** that help you achieve higher levels of inertness and column-to-column reproducibility
- **LC column choices** that deliver the sensitivity and reliability you need for demanding applications
- **Cutting-edge sample preparation products** that promote reliable extraction and concentration
- **Fresh atomic and molecular spectroscopy ideas** for identifying and confirming targets and unknowns

Longtime Agilent customers have experienced our commitment firsthand. And now, we look forward to demonstrating how Agilent's approach to relentless innovation can work to your advantage, too.

CHEMICAL ANALYSIS SOLUTIONS



Food

From high-volume screening of vegetables for large numbers of pesticides to rapid identification of pathogens, Agilent understands the analytical needs of food producers, shippers, and regulators. When a new toxin appears, we deploy substantial resources to quickly help customers develop robust and reliable methods. Agilent's leading separations, mass spectrometry, and spectroscopy solutions are emerging as valuable food testing techniques.



Environmental

Agilent offers more than 40 years of environmental testing and regulatory expertise. We help government and private labs with the full range of assays, from routine testing of soils for heavy metals to detection of pharmaceuticals in groundwater, in concentrations down to parts per trillion.



Energy and Fuels

Agilent collaborates closely with process industry customers to offer analytical systems that meet their needs for separation, detection, throughput, and support. We'll even preconfigure custom or standard analyzers so they arrive at the lab ready-to-go. Agilent's expertise in both chemical analysis and life science is a powerful combination for researching and producing biofuels, including a wide range of analytical techniques for fatty acid methyl esters (FAMEs). Our newly-expanded portfolio also offers powerful tools for developing and producing photovoltaic films and solar panels.



Forensics

Because the careers of world class athletes and many other individuals hinge on drug testing, it's critical that those doing the testing have the highest level of confidence in the results. Forensics analysts worldwide have grown to depend on Agilent tools for accuracy, reliability, and speed in this high stakes, high-throughput field. Our best selling GC, GC/MS and popular LC and LC/MS are workhorses in forensics labs.



Traditional Lab Informatics

The ways labs generate and store data profoundly affect their efficiency. Agilent offers a rich, integrated suite of software products built on a set of customer-driven architectural values with the Agilent OpenLAB Laboratory Software Suite. OpenLAB delivers superior performance, open systems integration and investment protection. Our commitment is to deliver more value across each step in the life cycle of scientific data – from data collection and analysis to interpretation and management.



Materials Science

Agilent offers a newly expanded portfolio of instruments used for the research, manufacturing and testing of advanced materials, from precision optics to pulp, paper and polymers. Tools for chromatography, atomic absorption spectroscopy, molecular spectroscopy, X-ray crystallography, and nuclear magnetic resonance all support continuous progress in materials science.

LIFE SCIENCE SOLUTIONS



Biopharmaceutical

As "multi-omics" studies gain momentum in the search for new therapeutics, Agilent is uniquely positioned to provide the instruments, reagents, and powerful software needed for performing experiments in multiple disciplines and combining the massive amounts of data into biological insight.



Pharmaceutical

Drug manufacturing requires the accuracy, sensitivity and high throughput of other analytical applications, along with the demands of regulatory record-keeping and validation requirements. Agilent provides a potent combination of rugged, high-throughput tools and unmatched compliance services. Agilent now offers the market-leading family of dissolution apparatus and sampling systems that pair perfectly with our HPLC and UV systems.



Proteomics

Research into how large sets of proteins affect the health of an organism requires special sets of analytical tools. Agilent has built a formidable arsenal of liquid chromatograph/mass spectrometers, bioinformatics systems, multiple affinity protein removal columns, and OFFGEL electrophoresis for protein identification and protein biomarker discovery. Accurate-Mass mass spectrometry and the microfluidic HPLC-Chip/MS are two Agilent innovations speeding the work of proteomics researchers around the globe.



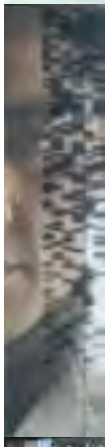
Metabolomics

Collections of small molecules are increasingly being seen as rich sources of biomarkers, but studying metabolites presents many challenges. The need for speed, accuracy, and powerful interpretation capabilities in looking at chemical profile snapshots is underscored because molecules are constantly entering, leaving or changing within the metabolome. Agilent's GC, LC, NMR and MS portfolios, along with our excellent bioinformatics offerings, user-customizable METLIN metabolite database for LC/MS, and the industry's first commercial GC/MS retention time locked metabolite library align well with needs of metabolomics researchers.



Genomics

Agilent is a global leader in microarrays, scanners, and reagents used in a wide variety of genomic-based disease research experiments. Our SureSelect Target Enrichment System dominates the category, streamlining next generation sequencing studies worldwide. Agilent offers a wide range of catalog microarrays and a highly-developed capability to produce custom arrays featuring ink jet-based SurePrint fabrication and the eArray on-line design tool. All Agilent microarrays feature highly sensitive, selective 60-mer probes. With as many as eight arrays printed on a standard 1 x 3 in. slide, the cost per experiment becomes very affordable.



Life Science Informatics

Mirroring its extensive instrument portfolio, Agilent offers the industry's most extensive suite of bioinformatics software, helping users derive knowledge from complex genomic, proteomic, metabolomic and other biological data. This includes DNA Analytics for analyzing CGH, ChIP and methylation microarray data. The GeneSpring suite includes informatics software for microarray-based gene expression data, genotyping data, and GeneSpring MS, which are useful for analyzing mass spec data from proteomics and metabolomics experiments and comparing complex datasets to explore biological questions from multiple perspectives.



Lab Automation

To meet the skyrocketing demand for more throughput and automation, Agilent has substantially expanded its lab automation offerings. The Agilent line of liquid handlers and microplate processors are designed to streamline high-volume life science workflows. Agilent is also continually upgrading its advanced autosamplers for LC, GC, LC/MS and GC/MS, adding functionality and speed to reflect the performance of its advanced instruments.



Vacuum Technology

Agilent works with customers to solve vacuum challenges from experiments in high-energy physics to developing systems for producing flat panel displays. Agilent manufactures vacuum systems used in its own mass spectrometry instruments as well as those of other manufacturers. Agilent's vacuum technology has been proven by the most powerful physics experiment ever built, CERN's Large Hadron Collider machine, which was used in the discovery of the Higgs boson particle.



Get the Agilent Service Guarantee

Should your instrument require service while covered by an Agilent service agreement, we guarantee repair or we will replace your instrument for free.

No other company offers this level of commitment to keep your lab up and running at peak efficiency.



Laboratory decision makers and users ranked Agilent as their first choice for general laboratory compliance services.

Agilent Service and Support for Instrument Systems

Focus on what you do best

For over 40 years, Agilent has been building and maintaining the instruments you count on to stay competitive and successful. Trust us to protect your investment with a broad portfolio of services, backed by a global network of experienced service professionals dedicated to the productivity of your lab.

Agilent Advantage Service Plans

The best service available for your Agilent instruments

Agilent offers a flexible range of service plans so that you can choose the level of coverage that is best for your lab.

- **Agilent Advantage Gold** – Priority-one coverage for ultimate uptime and productivity
- **Agilent Advantage Silver** – Comprehensive coverage for dependable laboratory operations
- **Agilent Advantage Bronze** – Total repair coverage at a fixed annual price
- **Agilent Repair Service** – Basic coverage for reliable instrument repair

Agilent Advantage service plans include Agilent Remote Advisor for real-time remote monitoring and diagnostics. Through secure internet connections, you can interact with Agilent service professionals, receive detailed asset reports, and configure text or email alerts to notify you before problems occur – helping you to maximize instrument uptime and optimize laboratory workflows.

Agilent Compliance Services

Equipment qualification that meets the most stringent requirements

Enterprise Edition Compliance was developed to streamline compliance across your entire lab. Used globally in regulated labs, including standards organizations and regulatory agencies, Enterprise Edition enables you to:

- Improve qualification efficiency by automating protocols across platforms to ensure greater efficiency and minimize regulatory risk
- Standardize your entire compliance operation with robust test designs that work with all your instruments
- Add, remove or reconfigure tests based upon your unique user requirements
- Significantly reduce staff review time with consistently formatted, computer generated, tamper-proof reports

Agilent Education and Consulting Services



Our best minds, working for you

Make the most of your instrument with training and consulting from the same experts who designed the instruments, software and processes you use every day.

- Classroom and on-site training in instrument operation, troubleshooting and maintenance
- Customized consulting services to meet your lab's unique needs

The Agilent Value Promise – 10 Years of Guaranteed Value

In addition to continually evolving products, we offer something else unique to the industry – our 10-year value guarantee. The Agilent Value Promise guarantees you at least 10 years of instrument use from your date of purchase, or we will credit you with the residual value of the system toward an upgraded model. Not only does Agilent ensure a reliable purchase now, but we also ensure that your investment is just as valuable in the future.

For more detailed information,
please go to **www.agilent.com/chem/services**
or contact your local Agilent Services and Support representative.

Technical Support at work for you



Have a hardware, software, application, instrument repair or troubleshooting question? Agilent's technical experts are available to answer your questions. With years of laboratory experience, our technical support specialists can provide in-depth knowledge and experience.

For questions pertaining to supplies found in this catalog, contact your local Agilent office or Authorized Agilent Distributor or visit **www.agilent.com/chem/techsupport**

Need more information?

Visit **www.agilent.com/chem/contactus** to:

- Locate your nearest Agilent office or distributor for expert technical support.
- Get fast sales and product assistance by phone. Simply use the scroll-down menu to select your country.
- Receive email assistance using our convenient online forms.

Agilent GC and GC/MS Systems

Achieve the highest level of Productivity and Performance

The industry leader in Gas Chromatography

The Agilent 7890 GC



Gives you everything you need to take your lab to the next level of performance, including advanced separation capabilities and powerful productivity tools

The Agilent 7820A GC



An affordable, high-quality solution for small- to medium-sized labs that are require with routine analyses using standard GC methods

The Agilent 6850 Series II GC



An excellent choice for any laboratory where bench space, ease of use, and independent channel flexibility are important

The information you need, wherever you need it

The Agilent 490 Micro GC and 490-PRO



The right GC solution If you want the ability to measure anywhere, and get the results you need in seconds

The customer-proven worldwide bestseller, Agilent 5975 Series GC/MSD

5975C GC/MSD



Superior performance, reliability, and productivity with industry-leading 7890 GC

5975T LTM GC/MSD



Compact, transportable GC/MS with fast, lab-quality performance

5975E GC/MSD



Affordable GC/MSD with economical 7820GC

Flexible, sensitive, and affordable EI, CI, and MS/MS, Agilent 240/220 Ion Trap GC/MS



240 Ion Trap GC/MS

The most powerful EI, CI and MS/MS analysis with unmatched full scan sensitivity



220 Ion Trap GC/MS

Compact and budget-friendly design – No.1 Ion Trap system in universities worldwide

Our most powerful trace analysis system

Agilent 7000B Triple Quadrupole GC/MS

You can rely on Agilent's 7000B Triple Quadrupole GC/MS system for extraordinary sensitivity, selectivity, and day-after-day reliability with your most complex matrices





Your choice for exceptional qualitative analysis, Agilent 7200 Q-TOF GC/MS

The world's first Q-TOF GC/MS combines the proven separation power of Agilent's 7890A GC with the high detection selectivity and accurate mass information of a TOF analyzer



Agilent Analyzers and Application Kits

Bring a new Application online can stretch your lab to the limit. Agilent solves this problem with our GC, Micro GC, GC/MS and GC/MS/MS Analyzers, which are factory preconfigured and pre-tested to get you up and running in the shortest possible time.

Agilent Gas Clean Filters



The Agilent Gas Clean Filter System provides enhanced gas quality for maximum productivity. Clean gases reduce the risk of column damage, sensitivity loss, and instrument downtime. Oxygen, hydrocarbons and moisture can cause loss of sensitivity and accuracy of the GC, and damage your column and consumables. Inserting a Gas Clean Filter System in the gas line immediately before the instrument inlet greatly reduces the level of impurities and helps you detect any problems before they occur.

Turn to pages 132-133.



Ultra Inert GC Columns

The Agilent J&W Ultra Inert GC column family pushes industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes. And, each column is tested with the most demanding Ultra Inert test probe mixture in the industry, and an individual performance summary sheet is shipped with each column.

Turn to page 237.

Ultra Inert Liners

Agilent Ultra Inert Inlet liners provide a robust, reproducible and reliable inert flow path, even when containing wool. These liners are rigorously tested and certified to ensure exceptional batch-to-batch uniformity, low bleed and superior coverage, even with highly active compounds.

Turn to pages 22-29.





Bulk GC Supplies

Ideal for high-usage laboratories, Agilent bulk gas chromatography supplies provide the high quality and consistency of Agilent chromatography supplies in convenient and economical packaging.

Turn to page 14.

Agilent CrossLab

Agilent CrossLab Supplies

Agilent CrossLab offers a growing portfolio of GC supplies manufactured for seamless performance with a variety of non-Agilent analytical instruments in your lab. Look inside this catalog to find a wide range of products for your applications.

Agilent CrossLab is more than supplies:

- Over 40 years of chromatography expertise
- The right supplies for both routine and challenging applications
- Hassle-free operations and reproducible results
- High-quality products manufactured to Agilent standards
- Technical and application support
- Dependable worldwide availability and delivery
- Convenience of consolidating purchasing
- 90-day risk free money back guarantee

All with our risk-free, 90-day, money-back guarantee.



Agilent CrossLab GC supports instruments from PerkinElmer, Shimadzu, Dionex (now part of Thermo Scientific), CTC Analytics, and more. The comprehensive range includes premium non-stick inlet septa, Ultra Inert inlet liners, liner-O-rings, column ferrules and nuts, autosampler syringes, and vials and closures.

All Agilent CrossLab high quality supplies are backed by Agilent's worldwide technical support and dependable availability and delivery.

Turn to page 139.

Agilent Parts and Supplies

GC and GC/MS Maintenance Schedule

Item	Typical Schedule	Actions/Comments
Gas Management		
Gas purifiers (carrier gas and detector gas)	Every 6 to 12 months	Replacement schedule is based on capacity and grade of gas. In general, replace non-indicating traps every 6 to 12 months or when indicating traps start to change color. Replace indicating traps when indicating material is starting to change color.
Internal split vent trap	Every 6 months*	Replace to prevent material backing up into EPC control and to avoid costly repair.
External split vent trap	Every 6 months*	Replace to prevent sample analytes from escaping into the laboratory environment.
Flow meter calibration	Every 1 to 2 years	Re-calibrate electronic flow meters – follow recommended schedule for the unit (shown on the calibration certificate).
Sample Introduction and Inlets		
Syringes and/or syringe needles	Every 3 months*	Replace syringe if dirt is noticeable in the syringe, if it cannot be cleaned, if the plunger doesn't slide easily, or if clogged. Replace needle if septa wear is abnormal or the needle becomes clogged.
Inlet liner	Weekly*	Check often. Replace when dirt is visible in the liner or if chromatography is degraded.
Liner O-rings	Monthly*	Replace with every liner change.
Inlet septum	Daily*	Check often. Replace when signs of deterioration are visible (gaping holes, fragments in inlet liner, poor chromatography, low column pressure, etc.)
Inlet hardware	Every 6 months Every year	Check for leaks and clean. Check parts and replace when parts are worn, scratched, or broken.
Inlet gold or stainless steel seal	Monthly*	For highest level of reproducibility, change inlet seal with every liner change, but minimally replace monthly or when scratched, corroded, or if there is build-up of non-volatile sample components.

*Schedule is an approximation of average usage requirements. Frequency may vary widely based upon application and sample type.

(Continued)



GC and GC/MS Maintenance Schedule

Item	Typical Schedule	Actions/Comments
Columns		
Front-end maintenance	Weekly-monthly*	Remove 1/2 to 1 m from the front of the column when experiencing chromatographic problems (peak tailing, decreased sensitivity, retention time changes, etc.). Replace inlet liner and septum, and clean inlet as necessary. Guard column may be useful for increasing column lifetime.
Solvent rinse	As needed	Perform when chromatography degradation is due to column contamination. Only for bonded and cross-linked phases.
Replacement	As needed	Replace when trimming and/or solvent rinsing no longer restore chromatographic performance.
Ferrules	As needed	Replace when changing columns and inlet/detector parts.
Detectors		
FID/NPD jets and collector	As needed	Clean when deposits are present. Replace when they become scratched, bent, or damaged, or when having difficulty lighting FID or keeping flame lit.
NPD bead	As needed	Replace when signal drifts or there is a dramatic change in sensitivity.
FID	Every 6 months	Measure hydrogen, air, and makeup gas flows.
TCD	As needed	Thermally clean by "baking-out" when a wandering baseline, increased noise, or a change in response is present. Replace when thermal cleaning does not resolve the problem.
ECD	Every 6 months or as needed	Wipe test. Thermally clean by "baking-out" when baseline is noise, or the output value is abnormally high. Replace when thermal cleaning does not resolve the problem.
FPD	Every 6 months or as needed	Measure hydrogen, air, and makeup gas flows. Clean/replace FPD windows and seals when detector sensitivity is reduced.
NCD and SCD	Every 3 months*	Change pump oil, oil coalescing filter and chemical trap.
Mass Selective Detectors		
Tune MSD	As needed	Keep plenty of PFTBS (P/N 05971-60571) on hand.
Check the calibration vial	Every 6 months	Vial can be refilled without venting the system.
Replace the foreline pump oil	Every 6 months	Check the fluid weekly. Change when the fluid becomes discolored or every 6 months.
Replace the diffusion pump fluid	Every year or as needed	Check the fluid weekly. Too little fluid will cause the pump to run at a higher temperature, resulting in degradation and loss of high vacuum. Change when the fluid is discolored or contains particulates.
Clean the ion source	As needed	Clean when performance deteriorates to remove contamination and to restore the electrostatic properties of the ion lens system. Replace scratched parts to maintain optimal performance.

*Schedule is an approximation of average usage requirements. Frequency may vary widely based upon application and sample type.

Bulk GC Supplies



Single taper splitless liner, no wool, 5190-2270



Certified gold plated seal kit, 5190-2209



Liner O-rings, 5190-2269



Non-stick BTO septa, 5190-3157

Ideal for high usage laboratories, our bulk supplies provide the quality and consistency of Agilent chromatography supplies in convenient and economical packaging. We currently offer Agilent inlet liners, septa, gold inlet seals, and liner O-rings in bulk packaging.

- Economical and convenient packaging
- Overall cost of ownership reduced
- Same great quality Agilent products

Bulk GC Supplies

Description	Unit	Part No.
Ultra Inert Liners		
Ultra Inert Liner, low pressure drop, glass wool	100/pk	5190-3173
Ultra Inert Liner splitless liner, single taper, no wool	100/pk	5190-3170
Ultra Inert splitless liner, single taper, glass wool	100/pk	5190-3171
Ultra Inert split liner, straight, glass wool	100/pk	5190-3172
Liners		
Single taper split liner, low pressure drop	100/pk	5190-2275
Single taper splitless liner, no wool	100/pk	5190-2270
Single taper splitless liner, glass wool	100/pk	5190-2271
Double taper splitless liner, no wool	100/pk	5190-2272
Seals		
Certified gold plated seal kit, includes washer	10/pk	5190-2209
O-Rings		
Non-stick fluorocarbon O-ring for Flip Top	100/pk	5190-2268
Certified non-stick fluorocarbon O-ring	100/pk	5190-2269
Septa		
Non-stick BTO septa, 11 mm	400/pk	5190-3157
Non-stick Advanced Green septa, 11 mm	400/pk	5190-3158
Siltite Ferrule Bulk packs		
Ferrules, Siltite,0.1 to 0.25 mm column	100/pk	5190-4022
Ferrules, Siltite, 0.32 mm column	100/pk	5190-4023
Ferrules, Siltite, 0.53 mm column	100/pk	5190-4024

Inlet Septa



Septa are available for a variety of different applications and have different upper temperature limits. Lower temperature septa are usually softer, seal better, and can withstand more punctures (injections) than their high-temperature counterparts. If septa are used above their recommended temperatures, they can leak or decompose, causing sample loss, lower column flow, decreased column life and ghosting. To minimize problems:

- Use within the recommended temperature range
- Change regularly
- Install the retainer nut "finger-tight"
- Use septum purge when available
- Use autoinjectors
- Use sharp syringe needles

Premium Non-Stick Septa

Agilent premium non-stick inlet septa are designed and manufactured to provide a reliable non-contaminating seal. Our tri-fold blister pack ensures that each septum remains clean and ready to use.

- Proprietary plasma treatment prevents sticking and unnecessary inlet cleaning
- Innovative blister packaging keeps each septum clean and ready for use
- Center point guides the needle for easy penetration, less coring and longer life
- Precision molding assures accurate fit in the inlet
- Each batch is tested for bleed on Agilent 7890 GC-FID
- Premium formulations selected for sealing and chromatographic cleanliness
- No need to bake septa before using



Inlet Septa

Summary of Premium Inlet Septum Characteristics

Septum Type	Bleed	Lifetime	Temperature Limits
Non-Stick BTO (Bleed and Temperature Optimized)	✓✓✓	✓	to 400 °C injection port temp
Non-Stick Advanced Green	✓✓	✓✓	to 350 °C
Non-Stick Long-Life	✓	✓✓✓	to 350 °C

✓✓✓ = best ✓✓ = very good ✓ = good

TIPS & TOOLS

Need inlet septa for your non-Agilent instruments? Check the Agilent CrossLab septa starting on page 147



Inlet Septa

Non-Stick Bleed and Temperature Optimized (BTO) Septa

- Extended temperature range, lowest bleed
- Maximum injection port temperature 400 °C
- Plasma treatment eliminates sticking in the injection port
- Pre-conditioned; ready to use
- Blister packaging for cleanliness and convenience
- Ideal for use with low-bleed, "Mass Spec" capillary columns

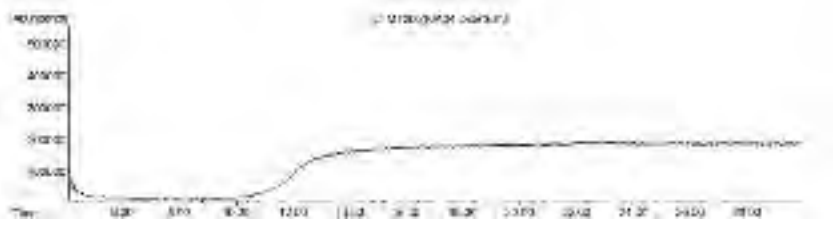


BTO septa, 5183-4757

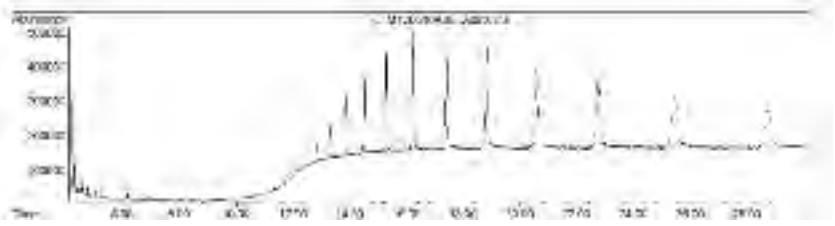
Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Unit	Part No.
11 mm septa	50/pk	5183-4757
11 mm septa	100/pk	5183-4757-100
11 mm septa	400/pk	5190-3157
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4758

Comparison of septum purity: TIC profile of iso-octane extractions



Agilent BTO Septa with CenterGuide



Competitor's High-Temperature Septa without CenterGuide

Non-Stick Advanced Green Septa

- True long-life, high temperature green septa
- More injections per septum
- Plasma treatment eliminates sticking in the injection port
- Maximum injection port temperature 350 °C
- High-performance alternative to competitors' "green" septa
- Blister packaging for cleanliness and convenience



Advanced green septa, 5183-4759

Non-Stick Advanced Green Septa

Description	Unit	Part No.
11 mm septa	50/pk	5183-4759
11 mm septa	100/pk	5183-4759-100
11 mm septa	400/pk	5190-3158
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4760

Non-Stick Long-Life Septa

- The preferred septa for autosamplers
- Pre-pierced for extended life and reduced coring
- Ideal for overnight runs
- Up to 400 injections per septum
- Plasma treatment eliminates sticking
- Maximum injection port temperature 350 °C
- Soft, 45 durometer, easy on autosampler needles
- Blister packaging for cleanliness and convenience



Long-life septa, 5183-4761

Non-Stick Long-Life Septa

Description	Unit	Part No.
11 mm septa	50/pk	5183-4761
11 mm septa	100/pk	5183-4761-100
5 mm septa through-hole for on-column, in glass jar	50/pk	5183-4762

Septa Troubleshooting

Symptom	Possible Causes	Remedy
Extra Peaks/Humps 	Septum bleed	Turn off injector heater. If extra peaks disappear, use septum specified for higher temperature or analyze at lower inlet temperature.
Baseline Change After Large Peak 	Large leak at septum during injection and for a short time thereafter (common with large diameter needles)	Replace septum and use smaller diameter needles.
Retention Times Prolonged 	Carrier gas leaks at septum or column connection	Check for leaks. Replace septum or tighten connections if necessary.



General Purpose Septa

Agilent's general purpose septa are made from an enhanced injection-molded silicone rubber. The septa material, gray in color, is specified to withstand over 200 automatic injections at an injection port temperature of 350 °C.



General purpose gray septa

General Purpose Septa

Description	Unit	Part No.
11 mm septa	50/pk	5080-8896-50
11 mm septa	100/pk	5080-8894-100
9.5 mm (3/8 in) septa*	50/pk	5080-8728-50
9.5 mm (3/8 in) septa*	100/pk	5080-8728-100
5 mm through hole septa for on-column inlets, automatic or manual injections**	25/pk	5181-1260
5 mm septa for high column backpressure, on-column inlets**	25/pk	5181-1261

*For 5700 series and 5830/40 GCs

**5 mm septa are packaged in glass jars



Merlin Microseal

- Low bleed, longer life alternative to standard septa for split/splitless injection and SPME
- Requires 23 gauge syringe needle
- Has a lifetime of more than 2000 injections, depending on samples and operating conditions
- Greatly reduced instrument downtime for septa changes and injection port liner changes due to septa particulates
- Two distinct sealing mechanisms: double O-ring type seal around the syringe needle and spring assisted duckbill to seal the injection port
- Temperature range 50-400 °C

Merlin Microseal

Description	Part No.
General Purpose Merlin Microseal (3-100 psi)	
General purpose Merlin Microseal starter kit Includes Microseal septum and nut	5182-3442
Merlin Microseal general purpose replacement septum 3 to 100 psi	5182-3444
Merlin Microseal high pressure nut	5182-3445
High sample volume septum kit Contains general purpose Merlin Microseal, six 23-gauge syringes, 500 vials and caps	5181-8839
Low Pressure Merlin Microseal (1-45 psi)	
Merlin Microseal kit, low pressure Includes nut and septum	5181-8816
Merlin Microseal kit, low pressure Includes nut and 2 septa	5181-8833
Merlin Microseal low pressure replacement septum	5181-8815
Microseal PTFE nut liners, 2/pk	5182-0853

(Continued)

Merlin Microseal

Description	Part No.
For Bruker/Varian GCs*	
Merlin microseal SPME kit, 1079 23 gauge, 1/p	392609901
Merlin Microseal adapter kit for 1177 inlets Contains adapter, nut and general purpose Merlin Microseal septum	392609903
Merlin microseal SPME replacement seal, 23GA, 1/pk	392609902
Syringes for Merlin Microseal	
Autosampler syringe Gold Standard, 5 µL, 23 gauge	9301-0892
Autosampler syringe, Gold Standard plunger, 10 µL, 23 gauge	9301-0713
Autosampler syringe, Blue Line, 5 µL, 23 gauge	G4513-80213
Autosampler syringe, Blue Line, 10 µL, 23 gauge	G4513-80209
Manual syringe, 5 µL, 23 gauge	5182-3438
Manual syringe, 10 µL, 23 gauge	5182-3439

*Varian GC systems are now Bruker products

TIPS & TOOLS

Agilent Blue Line autosampler syringes are specifically designed to support the higher productivity features of the 7693A ALS, while increasing plunger life and reducing costly downtime. Learn more at **www.agilent.com/chem/BlueLineSyringes**



Inlet Liners

Injection port liners have a variety of features to help vaporize the sample so that a true representation of the sample enters the column. Additionally, Agilent liners are individually packaged to maintain cleanliness until used. The part number and lot are silk screened on the liner for quality control and user convenience, and lot tracking is available for quality assurance.

Liner Dimensions Driven by Inlet Operation

Well-controlled glass dimensions promote better liner-to-liner consistency, ensuring GC system accuracy and reproducibility. That is why Agilent liners are made to the following precise tolerances:

Outer Diameter (OD)

- Larger od liners fit tightly to improve analyte recovery and limit sample migration onto the inlet's metal surface. Ideal for splitless injection.
- Smaller od liners are less resistant to carrier and split flow inside the inlet. Best for split injection.

Internal Diameter (ID)

- Ensures that the sample vapor is small enough to fit within the volume of the liner.
- Prevents backflash, sample loss into the septum purge, and split lines – all of which can lower reproducibility and sensitivity.

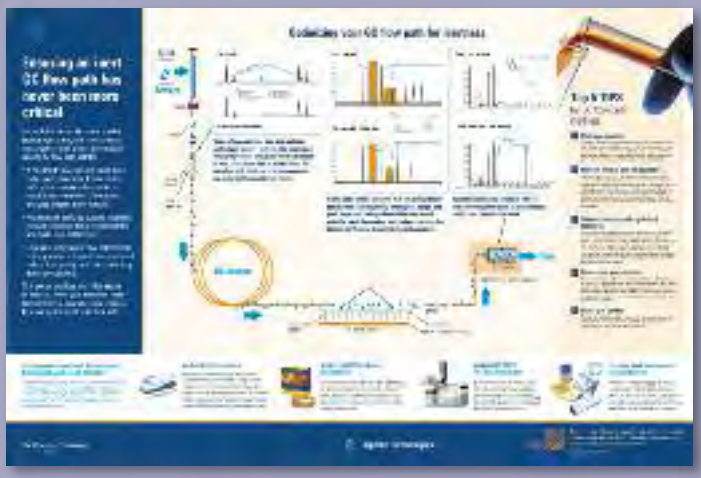
TIPS & TOOLS

Clearly Better Inertness

Confidently quantify active analytes with industry leading Ultra Inert GC solutions

- Agilent industry leading GC/MS instruments
- Ultra Inert columns
- Ultra Inert liners

To learn more and order your free poster, visit **www.agilent.com/chem/ultrainert**



Length

- Regulates internal volume and ensures proper sealing between the septum and the inlet seal.
- Precise glass bumps on the bottom of the liner allow you to repeatably position the liner relative to the inlet bottom. This is especially critical if you install liners by measuring the distance from the O-ring to the top of the liner.

Tapers

None	Bottom Tapers	Dual Tapers
• Straight tubes used in split injection with autosamplers	• Directs sample onto head of column and limits analyte exposure to bottom of inlet • Minimizes decomposition and discrimination	• Contain sample within glass liner limiting contact with metal inlet surface • Thought to limit loss through septum purge

Glass Wool

- Less molecular weight discrimination
- Provides additional surface area for sample vaporization, increasing reproducibility
- Serves as a trap for non-volatiles

For split liners, Agilent specifies the placement of glass wool in the liner so that the syringe penetrates the glass wool, wiping the syringe, to provide the most repeatable results with Agilent autosampler and split/splitless inlet design thermal profile.

Agilent Ultra Inert deactivated liners are recommended for samples with active analytes – such as phenols, amines, organic acids, pesticides and drugs of abuse – that could be irreversibly adsorbed on active surfaces in the inlet.

Deactivation

Developed for your high sensitivity analyses, Ultra Inert deactivation provides extreme surface inertness – even for liners containing glass wool. Agilent Original deactivation is recommended for your everyday analyses With use, even deactivated liners become active. Replace the liner regularly.

TIPS & TOOLS

Tight control of liner dimensions is critical to reproducibility of GC results.





Single taper, Ultra Inert Liner with glass wool, 5190-2293



Agilent Ultra Inert Liners

Agilent Ultra Inert Liners



Agilent Ultra Inert Liners are the perfect companion to Agilent J&W Ultra Inert GC columns. They provide reproducible inertness liner after liner, maintained through a sequence of samples, and for a range of analytes. Agilent's Ultra Inert Liners were developed – and are manufactured and certified – using a suite of tests specifically designed to ensure batch-to-batch uniformity.

- Exceptional batch-to-batch liner uniformity
- Low to no bleed or background contamination
- Superior coverage, allowing use of glass wool even with highly active compounds

Only Ultra Inert Liners are delivered in Agilent's exclusive touchless packaging with a pre-cleaned, conditioned and non-stick plasma treated O-ring pre-installed. Touchless packaging aids in removal of the old liner, and easy installation of the new, clean, preconditioned liner – without risk of contamination from touching.

Agilent Ultra Inert Liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	100/pk*
Split Inlet Liners						
Low pressure drop, Ultra Inert Liner with glass wool	870	4	5190-2295	5190-3165	5190-3169	5190-3173
Straight, Ultra Inert Liner with glass wool	990	4	5190-2294	5190-3164	5190-3168	5190-3172
Splitless Inlet Liners						
Single taper, Ultra Inert Liner	900	4	5190-2292	5190-3162	5190-3166	5190-3170
Single taper, Ultra Inert Liner with glass wool	900	4	5190-2293	5190-3163	5190-3167	5190-3171
Splitless, double taper Ultra Inert Liner, no wool	800	4	5190-3983	5190-4007		
Dimpled, splitless, Ultra Inert Liner	200	2	5190-2297	5190-4006		
Straight, Ultra Inert Liner		1	5190-4047			
Straight Ultra Inert Liner for SPME		.75	5190-4048			

*The 100/pk is not in the Touchless packaging. O-rings must be purchased separately.

TIPS & TOOLS

Remove the risk of contamination with touchless packaging.

Ultra Inert Inlet Liners are delivered in exclusive Agilent touchless packaging with a pre-cleaned, conditioned, and non-stick plasma treated O-ring pre-installed. Now you can quickly and easily install the new, clean liner – without searching for the O-ring pack or risking contamination from touching.

View a demonstration of the touchless packaging at **www.agilent.com/chem/touchless**

Agilent Original Deactivation Split Liners

Agilent single taper split liners are made to strict dimension specifications for optimal inlet performance and feature the tightest tolerances for od, id, taper, and glass wool placement. For ease-of-use and reproducibility, some liners have a positioning bead, a restriction to secure the position of the glass wool, and a feature to consistently self-position to the recommended height. The liners also feature Agilent's Original proprietary deactivation.

TIPS & TOOLS

Agilent recommends part number 5190-2295 as the top split liner and for splitless injection UI part number 5190-2293

Agilent Original Deactivation Split Liners

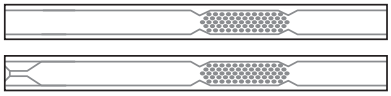
Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	100/pk
Single Taper Split Liners						
Single taper, glass wool, deactivated, low pressure drop	870	4	5183-4647	5183-4701	5183-4702	5190-2275
Single taper, glass wool, deactivated	870	4	5183-4711	5183-4712	5183-4713	
Straight Split Liners						
Straight, glass wool, non-deactivated	990	4	19251-60540	5183-4691	5183-4692	
Focus Liners						
Deactivated with glass wool	935	4		210-4004-5		
Tapered, deactivated with glass wool	880	4		210-4022-5		



Single taper split liner, 5183-4647, 5183-4711



Straight split liner, 19251-60540



Focus liners, 210-4004-5, 210-4022-5

TIPS & TOOLS

To learn more about our comprehensive portfolio of Agilent CrossLab GC supplies – including our Agilent CrossLab original deactivation liners – go to **www.agilent.com/chem/CrossLab**

Agilent Original Deactivation Splitless Liners



Single taper splitless liner, 5181-3316, 5181-3316i



Single taper, glass wool splitless liner, 5062-3587



Double taper splitless liner, 5181-3315



Straight, non-deactivated, quartz splitless liner, 18740-80220, 5181-8818



Straight, non-deactivated splitless liner, 210-3003



Direct inject liner, 18740-80200

Agilent Splitless Liners

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk	100/pk
Single Taper Splitless Liners						
Single taper, deactivated	900	4	5181-3316	5183-4695	5183-4696	5190-2270
Single taper, inert	900	4	5181-3316i			
Single taper, glass wool, deactivated	900	4	5062-3587	5183-4693	5183-4694	5190-2271
Double Taper Splitless Liners						
Double taper, deactivated	800	4	5181-3315	5183-4705	5183-4706	5190-2272
Straight Splitless Liners						
Straight, deactivated, quartz	250	2	5181-8818	5183-4703	5183-4704	
Straight, non-deactivated, quartz	250	2	18740-80220	5183-4707	5183-4708	
Straight, non-deactivated	990	4	210-3003	210-3003-5		
Direct Inlet Liners						
Straight, non-deactivated (for gas samples, headspace, or purge & trap)	140	1.5	18740-80200	5183-4709	5183-4710	

TIPS & TOOLS

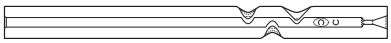
Need inlet liners and O-rings for your non-Agilent instruments? Check out the Agilent CrossLab inlet liners. See pages 140-141.

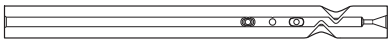


Agilent Specialty Injection Liners

MultiMode Inlet Heavy Matrix

Description	Volume (µL)	ID (mm)	1/pk	5/pk	25/pk
Dimpled					
Dimpled splitless single taper, deactivated	200	2	5190-2296		
Ultra Inert Deactivated Dimpled liners					
Dimpled, splitless, Ultra Inert Liner	200	2	5190-2297	5190-4006	
Manual Injection					
Straight, with cup (for manual injections)	800	4	18740-80190	5183-4699	5183-4700
Straight split liner with cup, glass wool, and packing, 18740-60840	800	4	18740-60840	5183-4697	5183-4698
	800	4			
	800	4			
Straight, with cup (for manual injections)	800	4			
SPME					
SPME, deactivated	70	0.75	5188-6471		
SPME, Ultra Inert deactivation	70	0.75	5190-4048		
Volatiles					
Volatiles Organic Analysis liner	1		5190-4047		





Single taper dimpled splitless liner, 5190-2296, 5190-2297

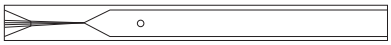


Straight split liner with cup, glass wool, and packing, 18740-60840

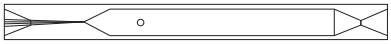
Programmed Temperature Vaporization (PTV) Liners

Description	Volume (µL)	ID (mm)	Part No.
PTV Liners			
PTV liner, single baffle, glass wool, deactivated	180	2	5183-2038
PTV liner, single baffle, deactivated	200	2	5183-2036
PTV liner, multi baffled, deactivated	150	1.8	5183-2037
PTV liner, sintered glass, deactivated	112	1.5	5190-1426
Liners for High Temperature PTV Inlet, G3506A			
PTV liner, high temperature, quartz	713	3.4	5188-5313
PTV liner, high temperature, borosilicate	668	3.4	5188-5356

Direct Connect



Single taper direct connect liner, G1544-80730



Dual taper direct connect liner, G1544-80700

Description	ID (mm)	Part No.
Direct Connect		
Direct column connect	4	G1544-80730
Dual taper direct connect liner, splitless, Agilent proprietary deactivation	4	G1544-80700
Single taper direct connect liner, splitless, deactivated, inert	4	G1544-80731

Liner O-Rings



Liner O-rings, 5190-2269

- Liners are sealed in the inlet with O-rings or graphite seals
- Graphite seals are used when inlet temperatures exceed 350 °C
- Fluorocarbon O-ring seals are easier to replace than graphite that deforms and flakes apart

Only Agilent Fluorocarbon Liner O-rings are:

- Pre-cleaned, then conditioned to eliminate out-gassing of contaminants, which is especially important for trace, ECD and MSD analyses
- Plasma treated for a non-stick, contaminant-free surface that won't stick to the inlet metal surface
- Packaged for convenience and cleanliness in a novel dial package that delivers 1 clean O-ring at a time

Liner O-Rings

Description	Unit	Part No.
Certified non-stick fluorocarbon O-ring	10/pk	5188-5365
	100/pk	5190-2269
Graphite O-ring for splitless liner	10/pk	5180-4173
Graphite O-ring for split liner	10/pk	5180-4168
Non-stick fluorocarbon liner O-ring for Flip Top	10/pk	5188-5366
	100/pk	5190-2268
High temperature PTV inlet liner fluorocarbon O-ring	10/pk	5188-5311

TIPS & TOOLS

Agilent's Ultra Inert GC liners are delivered in Touchless packaging with a certified, non-stick O-ring pre-installed. See page 24.



Capillary Column Ferrules and Nuts

Using the wrong ferrule or a worn-out ferrule to seal your column connection can result in inconsistent and unreliable chromatography. An improper ferrule can cause leaks, which allow air and other contaminants to enter the instrument through the column seal, causing major interference with column and detector performance.

For optimum performance, ferrules should be replaced every time the column is replaced and when performing column maintenance.

To minimize problems, follow these general techniques for ferrule installation:

- Don't overtighten – finger tighten the column nut, then use wrench to tighten
- Maintain cleanliness
- Bake out ferrules prior to use (Vespel and Vespel/Graphite only)
- Avoid contamination, such as fingerprint oils
- Inspect used ferrules with magnifier for cracks, chips, or other damage before reusing them
- Change ferrules when new columns or injector/detector parts are installed



Vespel/Graphite ferrules, 5181-3323

Caution: Agilent capillary column ferrules are manufactured to tolerances specific for Agilent J&W HP and DB brand columns. Fused silica tubing used for Agilent J&W VF columns has slightly different tolerances for the outer diameter. Turn to pages 32-33.

Ferrule Selection Recommendations

Ferrule Type	Upper Temp. Limit	Usages	Advantages	Limitations
Graphite (100%)	450 °C	• General purpose for capillary columns • Suitable for FID and NPD • Recommended for high temperature and cool on-column applications	• Easy-to-use stable seal • Higher temperature limit • Can be removed easily	• Not for MS or oxygen-sensitive detectors • Soft, easily deformed or destroyed • Possible system contamination
Vespel/Graphite (85%/15%)	350 °C	• General purpose for capillary columns • Recommended for MS and oxygen-sensitive detectors • Most reliable leak-free connection	• Mechanically robust • Long lifetime	• Not reusable • Flows at elevated temperature • Must re-tighten frequently
Vespel (100%)	280 °C	• Isothermal operation • Can be reused or removed easily • Excellent sealing material when making metal or glass connections	• Mechanically robust • Long lifetime • Can be reused or removed easily	• Leaks after temperature cycle • Flows at elevated temperature • Must re-tighten frequently

TIPS & TOOLS

Look for the following signals that indicate ferrule damage:

- Background noise from oxygen diffusing into the system
- Column bleed catalyzed by oxygen
- Sample degradation
- Sample loss
- Increase in detector signal/noise
- Poor retention time reproducibility

Short and Long Ferrules

Short Ferrules (height 3 mm)



Vespel/Graphite ferrules, 5181-3323



Universal column nut, 5181-8830

Standard fitting for Agilent GC inlet and detectors (FID, NPD, ECD) column connections use short ferrules and the Universal nut

Long Ferrules (height 3.6 mm)



Pre-conditioned long ferrule for MSD connection, 5062-3508



MS interface column nut, 05988-20066

Pre-conditioned graphite/vespel ferrules are recommened with MSD Interface nut



Column nut for long or long two-hole ferrules, 05921-21170

Alternative nut for Agilent standard inlet or detector fittings used with long graphite/vespel ferrules

TIPS & TOOLS

100% Vespel ferrules should only be used for isothermal applications.

Capillary Column Ferrules – for use with the most brands of column, including DB and HP columns

Column ID (mm)	Ferrule Nom ID	Graphite Ferrule Short Part No.	Vespel Short Ferrule Part No.	85% Vespel/15% Graphite Short Ferrule Part No.	Pre-Conditioned Long Ferrule 85% Graphite/15% Vespel for MSD connection
0.1-0.25	0.4	500-2114	5181-3322	5181-3323	5062-3508
0.32	0.5	5080-8853	5062-3513	5062-3514	5062-3506
0.45	0.8	500-2118	5062-3511	5062-3512	5062-3538
0.53	0.8	500-2118	5062-3511	5062-3512	5062-3538
No hole				5190-4054	5181-3308

Capillary Column Ferrules – for use with CP, VF and Select columns

Column ID (mm)	Factor 4, Select and CP Column Brands	Ferrule Nom ID	Graphite Ferrule Short Part No.	Vespel Ferrule Short Part No.	85% Vespel/ 15% Graphite Short Ferrule	Pre-Conditioned Long Ferrule 85% Graphite/15% Vespel for MSD*
0.025-0.05	CP, VF, Select	0.4	500-2114	5062-3515	5062-3516	5062-3507
0.075	CP, VF, Select	0.4	500-2114	5062-3515	5062-3516	5062-3507
0.1-0.25	CP, VF, Select	0.5	5080-8853	5062-3513	5062-3514	5062-3508
0.32	CP, VF, Select	0.5	5080-8853	5062-3513	5062-3514	5062-3508
	CP-silica PLOT	0.8	500-2118	5062-3511	5062-3512	5062-3538
0.53	CP, VF, Select	0.8	500-2118	5062-3511	5062-3512	5062-3538
No hole					5190-4054	5181-3308

*These ferrules are recommended for GC/MS

For additional capillary column ferrule selection, please refer to our CrossLab portfolio.Turn to page 143.



Vespel ferrule, 5181-3322



Graphite ferrules, 5080-8853



Vespel/Graphite ferrule, 5062-3514



Universal column nut, 5181-8830



MS interface column nut, 05988-20066

Column Nuts

Description	Part No.
Short Nuts	
Universal column nut, 1/16 in hex, 2/pk	5181-8830
Finger tight column nut for 530 µm columns*	5020-8293
Finger tight column nut for 320 µm columns and smaller*	5020-8292
Blanking plug, finger tight style	5020-8294
6850 column nut, 2/pk	5183-4732
Extended column nut, VI inlet	G3504-20504
High Temperature SimDis PTV inlet, 4 mm hex	5188-5312
Long Nuts	
MS interface column nut, female	05988-20066
Column nut for long or long two-hole ferrules	05921-21170
Accessories	
Open end wrench, 1/4 and 5/16 in	8710-0510

*For use with graphite ferrules only

Specialty Ferrules, 85% Vespel/15% Graphite

Ferrule ID (mm)	Column ID (mm)	Unit	Part No.
Two Hole			
0.5	0.1	10/pk	5181-3388
0.5	0.10.20.25	10/pk	5062-3580
0.5	0.32	10/pk	5062-3581
No Hole			
Capillary column long ferrule		10/pk	5181-3308
Capillary column short ferrule		10/pk	5190-4054
High Temperature PTV Inlet SS/Graphite			
0.4	0.32	10/pk	5188-5315
0.4	0.53	10/pk	5188-5314

Straight Ferrules

Description	Unit	Part No.
1/4 in PTFE	10/pk	0100-1378
1/4 in Graphite	10/pk	0100-1324
1/8 in PTFE	10/pk	0100-1365
1/8 in Graphite	10/pk	0100-1325
1/8 in 85% Vespel/15% Graphite	10/pk	0100-1332
1/16 in PTFE	10/pk	0100-1375
1/16 in Graphite	10/pk	0100-1326
1/16 in VG-2 Vespel, 40% Graphite	10/pk	0100-1379
6.4 mm Vespel		0100-1104
1/4 in 85% Vespel/15% Graphite	10/pk	0100-1331



1/8 in 85% Vespel/15% Graphite, 0100-1332

Reducing Ferrules

Description	Unit	Part No.
1/8 to 1/16 in Vespel	10/pk	0100-1342
1/8 to 1/16 in VG-1 Vespel, 15% Graphite	10/pk	0100-1344
1/16 in to 0.4 mm VG-2 Vespel, 40% Graphite	10/pk	0100-1381

Ferrules for LTM Rapid Heating/Cooling System

Description	Original Design (5/pk)	2010+ Siltite/ Ultimate Union (10/pk)
For use with 0.25-0.4 mm id LTM columns	5190-1437	5188-5361
For use with 0.4-0.5 mm id LTM columns	5190-1438	5188-5362
For use with 0.5-0.8 mm id LTM columns	5190-1439	5188-5363

Ferrules and Nuts for NCD and SCD

Description	Part No.
Spare column nut and ferrule kit	G6600-80018

Capillary Flow Technology Supplies

Agilent offers a family of GC accessories based on our proprietary Capillary Flow Technology. These accessories increase system productivity and performance:

- Deans Switch device simplifies the analysis of complex samples
- Purged Effluent Splitter for inert, leak-free column effluent splitting



Ultimate Union

Ultimate Union

The Ultimate Union is part of Agilent's Capillary Flow Technology family, providing extremely low dead volume column connections. Like the QuickSwap, Deans Switch and Purged Effluent Splitter, the Ultimate Union uses special fittings and SilTite ferrules to create an inert, leak-free and robust seal that doesn't need re-tightening after temperature cycles.

Each Agilent Ultimate Union kit contains:

- 1 Union (your choice of deactivated or non-deactivated)
- 2 Internal nuts
- 1 Swaging nut
- 1 Oven wall clip

Ultimate Union Kits, Fittings and Ferrules

Description	Part No.
Ultimate union kit, deactivated	G3182-61580
Ultimate union kit, non-deactivated	G3182-61581

Fittings, Ferrules and Supplies

For leak-free, low dead volume and inert column connections with capillary flow accessories, such as the Deans Switch or QuickSwap MS Interface, use SilTite ferrules and specified nuts. For Capillary Flow devices, use deactivated fused silica tubing. Do not use tubing that has been coated with stationary phase.

Fittings, Ferrules and Supplies

Description	Unit	Part No.
Internal nut		G2855-20530
Swaging nut		G2855-20555
Tee, inert		G3184-60065
Column storage fitting		G2855-20590
SilTite metal ferrules, 0.10-0.25 mm id capillary columns	10/pk	5188-5361
SilTite metal ferrules, 0.32 mm id capillary columns	10/pk	5188-5362
SilTite metal ferrules, 0.53 mm id capillary columns	10/pk	5188-5363
Ferrule pre-swaging tool		G2855-60200



Internal nut, G2855-20530



Tee, inert, G3184-60065

Column/Retention Gap Installation Supplies

Description	Part No.
250 µm retention gap, one 5 m piece	160-2255-5
320 µm retention gap, one 5 m piece	160-2325-5
530 µm retention gap, 5 m length	160-2535-5
Fused silica, deactivated, 0.15 mm x 1 m	160-2625-1
Fused silica, deactivated, 0.15 mm x 5 m	160-2625-5
Fused silica, deactivated, 0.15 mm x 10 m	160-2625-10



Glass press-fit connections

Press-fit Capillary Column Connectors

In the past it was necessary to use press-fit connectors with specific dimensions to connect columns of those dimensions. Modern press-fit connectors are "laser-milled" to provide highly reproducible taper angles throughout the length of the press-fit, ensuring an excellent seal. Now the only choice you have to make is between a glass union for standard applications, and fused silica unions or deactivated quartz unions for applications demanding maximum inertness.

Glass and Fused Silica Press-fit Connectors

Description	Unit	Part No.
Glass union, universal, 2-way	25/pk	705-0825
Fused silica union, universal, 2-way	5/pk	705-0905
Fused silica union, universal, 2-way	25/pk	705-0925
Fused silica union, universal, 3-way		705-0903
Polymide sealing resin, 5 g		500-1200



Quartz splitter

Quartz Press-fit Connectors/Splitters

Description	Unit	Part No.
Quartz column connector, 0.1 to 0.53 mm	5/pk	5181-3395
Deactivated quartz column connector	5/pk	5181-3396
Quartz splitter		5181-3397
Quartz deactivated splitter		5181-3398

Graphpak Capillary Column Connectors (2.5 mm)*

Column ID (mm)	Connector ID (mm)	Part No.
Capillary Detector Port Connector		
0.32/0.25	0.4	5021-7166
0.53	0.7	5021-7164
Capillary Divider for Simultaneous Sampling		
0.32/0.25	0.53	5021-7148
0.53	0.7	5021-7146
Capillary Injection Port Connector		
0.2	0.3	5021-7169
0.32/0.25	0.4	5021-7170
0.53	0.7	5021-7168

*The 2.5 mm Graphpak is not compatible with the Graphpak 2M used for the PTV.



Graphpak connector for Agilent capillary detectors



Graphpak divider for simultaneous sampling

Note: Order ferrules in addition to the connector to fit your column. Ferrules must be ordered separately.

Ferrules for Connectors

Column ID (mm)	ID (mm)	Unit	Part No.
0.2	0.3	10/pk	5021-7136
0.32/0.25	0.4	10/pk	5021-7137
0.53	0.7	10/pk	5021-7134
Graphpak plug ferrule		10/pk	5021-7133
Replacement Graphpak column nut		5/pk	5062-3525



Capillary injection port connector, 5021-7170

Valves and Loops



General purpose gas sampling valves

Gas Sampling General Purpose Valves

Description	Part No.
6-port replacement valve WE series, 400 psi, 225 °C	5062-9508
6-port replacement valve WE series, Hastelloy C, 400 psi, 225 °C	5062-9509
10-port replacement valve WE series, 400 psi, 225 °C	5062-9510
10-port replacement valve WE series, Hastelloy C, 400 psi, 225 °C	5062-9511
6-port replacement valve WT series, 300 psi, 350 °C	0101-0584
10-port replacement valve WT series, 300 psi, 350 °C	0101-0585



General purpose liquid sampling valves

Liquid Sampling General Purpose Valves

Description	Part No.
0.2 µL replacement valve UWP series, 1,000 psi, 175 °C	0101-0636
0.5 µL replacement valve UWP series, 1,000 psi, 175 °C	0101-0637
1.0 µL replacement valve UWP series, 1,000 psi, 175 °C	0101-0638
0.5 µL replacement valve UWP series, 5,000 psi, 75 °C	0101-0639

Replacement Rotors for Gas Sampling Valves

Description	Part No.
6-port replacement rotor WE series, 400 psi, 225 °C	5181-7459
10-port replacement rotor WE series, 400 psi, 225 °C	5181-7460
6-port valve, replacement rotor, WT series, 300 psi, 350 °C	1535-4952
10-port replacement rotor WT series, 300 psi, 350 °C	1535-4954

Valve Supplies

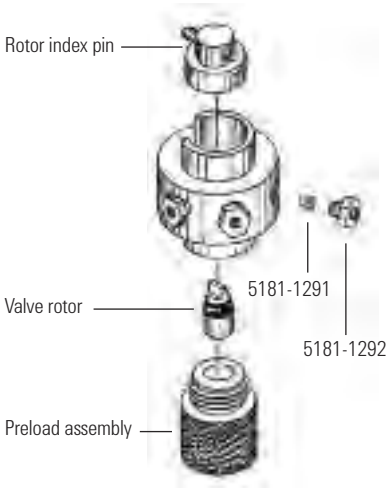
Description	Part No.
1/16 in stainless steel nut	5181-1291
1/16 in front ferrule, stainless steel	5181-1292
Straight metering valve, 1/16 in, stainless steel, for LSVs as a sample-out restrictor or as a flow-balancer for 10-100 mL/min	0101-0355
Micrometering valve, for flow balancing gas flows of 2-50 mL/min	0101-0633
Air actuator	19325-60660
Angle metering valve, 1/16 in, stainless steel	0101-0403
7 µm gas line filter	0101-0532



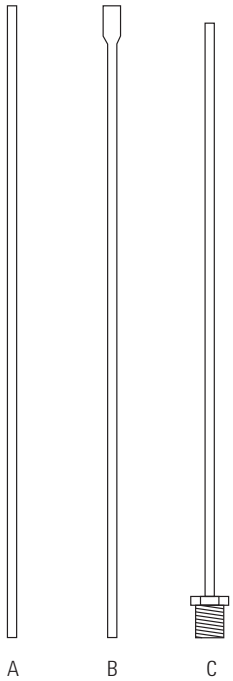
Front ferrules, stainless steel, 5181-1292

Valve Column Connections

Description	Part No.
1/16 in Tube Assembly, inert (50 cm, 0.010 in id)	G1580-60060
1/16 in Tube Assembly, non-inert (50 cm, 0.010 in id)	G1580-80060
1/16 in Tube Assembly, inert (50 cm, 0.020 in id)	G1580-60062
1/16 in Tube Assembly, non-inert (50 cm, 0.020 in id)	G1580-80062
Swaging nut	G2855-20555
Internal nut	G2855-20530
Hex nut, 5/16 in-20	2950-0232
Nut Plate Assembly	05890-80660
Ferrule pre-swaging tool	G2855-60200
SilTite metal ferrules, 0.10-0.25 mm id capillary columns	5188-5361
SilTite metal ferrules, 0.32 mm id capillary columns	5188-5362
SilTite metal ferrules, 0.53 mm id capillary columns	5188-5363



Valve body, disassembled



Valve Loops for GC
(Includes loop, nut and ferrule, 1/16 in)

Description	Part No.
Sample loop, 0.25 cc	0101-0303
Sample loop, 0.50 cc	0101-0282
Sample loop, 1.00 cc	0101-0299
Sample loop, 2.00 cc	0101-0300
Sample loop, 5.00 cc	0101-0301
Sample loop, 10.00 cc	0101-0302

Valve Supplies for GC

Description	Part No.
A. Tube, 1/16 in stainless steel, 280 mm long	18900-20250
Tube, 1/16 in stainless steel, 400 mm long	18900-20280
Tube, 1/16 in stainless steel, 375 mm long	18900-20281
Tube, 1/16 in stainless steel, 560 mm long	18900-20300
B. Tube, 1/16 in with 1/8 in flare, stainless steel, 360 mm long	1530-2163
Tube, 1/16 in with 1/8 in flare, stainless steel, 520 mm long	1530-2167
C. Tube, 1/16 in with 1/8 in bulkhead fitting, 520 mm long	07675-80050
Tube, 1/16 in with 1/8 in bulkhead fitting, nickel, 460 mm long	18900-80255

Sample Introduction Systems

7693A Automatic Liquid Sampler Replacement Parts and Supplies

To support the higher productivity, performance, and flexibility offered by the 7693A ALS, Agilent has expanded its supplies offering. Agilent Blue Line autosampler syringes are specifically designed to support the 7693A, while increasing plunger life and reducing costly downtime. For cost-conscious laboratories, economical shell vials and caps provide quality at an attractive price. Additional accessories, such as color-coded sample trays and vial caps, add to system ease-of-use.



7693A Automatic Liquid Sampler

7693A Replacement Parts and Supplies

Description	Unit	Part No.
Gripper finger caps	16/pk	G4514-60710
Injector mounting post		G4513-20561
Dual parking post for autosampler		05890-61525
Needle support insert, standard		G4513-40525
Needle support insert, on-column		G4513-40529
Vial rack, set of 3, Includes 3 white label tags		G4514-67505
Vial rack label kit		G4525-60701
Vial rack label kit, red	3/pk	G4525-60702
Vial rack label kit, yellow	3/pk	G4525-60703
Vial rack label kit, green	3/pk	G4525-60704

Wash Vials (also for standards, diluents)

Description	Unit	Part No.
4 mL wash vials with fill markings and caps	25/pk	5182-0551
Diffusion caps for 4 mL vials	12/pk	07673-40180
Septa for 4 mL vials*	144/pk	9301-1031
4 mL wash vial with screw caps	144/pk	9301-0723

*Septa for 4 mL vials should only be used for sample storage

Automatic Liquid Sampler Supplies

Automatic Liquid Sampler Supplies

Description	Part No.
Screw for mounting syringe	07673-20570
Quadrant tray (4 tray sections)	18596-40015
7673 Basic Supply Kit Contains 10 µL syringes (6/ea), 23/26 gauge needles, 4 mL vials with diffusion caps (144/pk), 2 mL automatic sampler vials with screw caps (1,000/pk), GC septa (25/pk), vial racks (5/pk)	07673-60840

Bar Code Reader Labels

Description	Part No.
Labels numbered (1,000/roll)	
1 to 1,000	5958-9450
1,001 to 2,000	5958-9441
2,001 to 3,000	5958-9442
3,001 to 4,000	5958-9443
4,001 to 5,000	5958-9444
5,001 to 6,000	5958-9445



7697A Headspace Sampler Supplies

The new 7697A Headspace Sampler from Agilent utilizes advanced designs based on our industry-leading gas chromatography architecture. The headspace sampling technique allows introduction of volatile compounds to the GC or GC/MS from virtually any sample matrix, while leaving unwanted components in a disposable sample vial. With up to 111 sample vial positions and removable vial racks, the 7697A supports nearly continuous operation to satisfy even the busiest laboratory.

- Built-in legendary Agilent pneumatics for superior control and easier setup
- Proven valve and loop sampling technology
- Fully-automatic sample vial leak checking and available bar code reader help ensure greater confidence in results method compatibility
- Instrument control software that is fully integrated in Agilent data systems
- Resource conserving programmable instrument scheduler



7697A Headspace Sampler

7697A Headspace Replacement Parts and Supplies

Description	Part No.
Tray vial racks	G4556-60019
Vial rack label	G4556-90500
Universal/external split vent trap with 3 cartridges, 1/8 in Swagelok fitting	RDT-1020
Leak test kit Includes instruction sheet, no-hole ferrule, 1/8 in nylon tube fitting plug, headspace leak test vial, 1/16 in stainless steel ZDV plug, 11 mm low bleed septa (5/pk)	G4556-67010
Sample probe, deactivated SN 1030	G4556-60690
Sample probe, deactivated SN 2000	G4556-60125
6-port valve, replacement rotor, WT series, 300 psi, 350 °C	1535-4952

TIPS & TOOLS

The transfer line heater assembly is 1 m in length and accommodates the following tubing types:

- Fused silica capillary of 0.25 mm, 0.32 mm, and 0.53 mm id with maximum od of 0.67 mm
- Metal capillary of 0.53 mm id, such as Agilent UltiMetal or ProSteel, with maximum od of 0.67 mm

For one transfer line, a piece of fused silica or ProSteel approximately 1 m in length is required in addition to one ferrule and one nut and reducing union. Order a ProSteel sleeve to protect the transfer line when operating above 200 °C. ProSteel operated above 200 °C in the transfer line without the sleeve can permanently bind to the heated conduit tube.



7697A Headspace Sampler

7697A Headspace Replacement Parts and Supplies

Description	Part No.
Tray vial racks	G4556-60019
Vial rack label	G4556-90500
Universal/external split vent trap with 3 cartridges, 1/8 in Swagelok fitting	RDT-1020
Leak test kit Includes instruction sheet, no-hole ferrule, 1/8 in nylon tube fitting plug, headspace leak test vial, 1/16 in stainless steel ZDV plug, 11 mm low bleed septa (5/pk)	G4556-67010
Sample probe, deactivated SN 1030	G4556-60690
Sample probe, deactivated SN 2000	G4556-60125
6-port valve, replacement rotor, WT series, 300 psi, 350 °C	1535-4952
Transfer Line Components	
Deactivated fused silica, 5 m length	
0.25 mm	160-2255-5
0.32 mm	160-2325-5
0.45 mm	160-2455-5
0.53 mm	160-2535-5
ProSteel deactivated stainless steel, 5 m length	
0.53 mm	160-4535-5
Polyimide sleeve for ProSteel	4177-0607
Polyimide, Valcon ferrule, 5/pk	
Ferrule, low thermal mass, column id 320 µm, 0.5 mm id, 5/pk	5190-1438
Ferrule, low thermal mass, column id up to 250 µm, 0.4 mm id, 5/pk	5190-1437
Nut and reducing union for 6 port valve and transfer line connection	0100-2594
Septum nut, transfer line, split/splitless and multimode inlets	G3452-60835

G3520A XLSI Accessory Supplies

Description	Part No.
G3520A XLSI Accessory kit	G3520-67001
Ceramic wafer column cutter	5181-8836
Transfer line nut fitting	G3520-20210
Column storage fitting	G2855-20590
Magnifier, 3x, 6x, paddle, plastic	G2855-40001
Plug for microfluidic manifold or unions	G2855-60570
Ferrule pre-swaging tool	G2855-60200

Sampling Loops

Description	Part No.
Sampling Loops, SN 2000	
Sample loop, 0.025 mL	G4556-80101
Sample loop, 0.05 mL	G4556-80102
Sample loop, 0.10 mL	G4556-80103
Sample loop, 0.50 mL	G4556-80105
Sample loop, 1.00 mL	G4556-80106
Sample loop, 5.00 mL	G4556-80109
Sample loop, 3.00 mL	G4556-80108
Certified Sample Loops*	
Certified sample loop, 1.00 mL	G4556-80126
Certified sample loop, 3.00 mL	G4556-80128
Sampling Loops, SN 1030	
Sample loop, 0.025 mL	G4556-80111
Sample loop, 0.05 mL	G4556-80112
Sample loop, 0.10 mL	G4556-80113
Sample loop, 0.50 mL	G4556-80115
Sample loop, 1.00 mL	G4556-80116
Sample loop, 3.00 mL	G4556-80118
Sample loop, 5.00 mL	G4556-80119

*Certified sample loops are validated by Micro Precision Calibration, Inc and come with a calibration certificate. Loops can be recertified yearly by contacting Micro Precision directly at +1 (530) 268 1860.

Vials and Caps for 7697A

Description	Unit	Part No.
Vial kit 20 mL Headspace crimp top, flat bottom vials, silver aluminum one-piece crimp caps with safety feature, PTFE/white silicone septa	100/pk	5182-0840
Headspace crimp top, flat bottom vials, 10 mL	100/pk	5182-0838
Headspace crimp top, flat bottom vials, 20 mL	100/pk	5182-0837
Silver aluminum crimp caps with 20 mm, PTFE/silicone septa	100/pk	5183-4477
20 mm electronic crimper		5062-0208
Ergonomic manual crimper for 20 mm caps		5040-4669



Certified headspace crimp top vials, 5182-0837



Aluminum crimp caps, 5183-4477



Manual crimper and decapper, 5040-4669



G1888A Network Headspace Sampler Supplies

Description	Part No.
Stainless Steel Sample Loops	
Certified sample loop, 1 mL, deactivated	5190-2265
Certified sample loop, 3 mL, deactivated	5190-2266
Sample loop, 1 mL, deactivated	2321700003
Sample loop, 3 mL, deactivated	2321700004
Probes and Unions	
Sample probe, deactivated	2322700011
M6 union, brass	2302533140
Union, zero dead volume, deactivated	2307230001
Union	2307232901
Transfer Line Needles and Unions	
Needle only, headspace transfer line, deactivated 0.5 mm od	2322590004
Needle only, headspace transfer line, deactivated 0.7 mm od	2322590005
Strain relief septum nut	6410090050
Tubing	
Tubing, solenoids to 6-port valve, deactivated	0410105017
Tubing, probe to 6-port valve, deactivated	1300502506
Standards	
OQ/PV Headspace Sample Contains 0.2-0.3% t-butyl disulfide, 1,2-dichlorobenzene, and nitrobenzene in ethanol	5182-9733
PM Kits	
G1888A PM kit with 1 mL loop	G1888-60702
G1888A PM kit with 3 mL loop	G1888-60703
G1888A enhanced PM kit	G1888-60704



G1888A Headspace unit

G1883A Network Headspace Supplies

Description	Part No.
Needles	
Needle only, headspace transfer line, deactivated 0.5 mm od	2322590004
Needle for transfer line, 0.25 mm id, 0.5 mm od, nickel	301-016-HSP
Needle only, headspace transfer line, deactivated 0.7 mm od	2322590005
Needle for transfer line, 0.4 mm id, 0.8 mm od, nickel	301-015-HSP
Needle assembly vial probe, deactivated	232-2790012-EHS
Needle assembly vial probe, nickel	232-2790010-EHS
Fittings	
Union elbow M5	998-0000053-EHS
Transfer line nut	19258-20830
Transfer line ferrule	19258-20870
Union FF 6MB, 5-piece set	325-062-HSP
Union T6 MB, 5-piece set, brass	325-132-HSP
Union T5 MA	325-185-HSP
Valves	
Restrictor, stainless steel	321-002-HSP
Valve, solenoid vent Kalrez	3600500001
Valve, solenoid vial pressurization	3600500002
Tubing and Transfer Lines	
Sample loop, 1 mL, deactivated	2321700003
Sample loop, 1 mL, nickel	321-055-HSP
Sample loop, 3 mL, deactivated	2321700004
Sample loop, 3 mL, nickel	321-056-HSP
Oven adaptor for 10 mL vials	301-017-HSP
Tube, needle, 6-port valve, deactivated	301-212-HSP
Tube, needle, 6-port valve, nickel	301-169-HSP
Tube, vent-valve stainless steel	301-170-HSP
Sensor tube, 125 mm PTFE	321-057-HSP
Transfer line, deactivated, 1 m	301-211-HSP
Transfer line, 1 m, nickel	301-152-HSP
Transfer line, 80 cm, nickel	301-011-HSP
Repair, Leak Test, and OQ/PV Supplies	
Strain relief septum nut	301-205-HSP
Headspace leak test kit	G1888-60701
OQ/PV Headspace Sample	5182-9733

Teledyne Tekmar Purge and Trap Supplies



Stratum PTC Sample Concentrator

Glassware for Teledyne Tekmar Purge and Trap Concentrators, 1/2 in Mount

Description	Part No.
5 mL frit sparger (glassware only)	5182-0852
5 mL frit sparger kit with fittings	5182-0846
25 mL frit sparger (glassware only)	5182-0851
25 mL frit sparger kit with fittings	5182-0845
5 mL fritless sparger (glassware only)	5182-0850
5 mL fritless sparger kit with fittings	5182-0844
25 mL fritless sparger (glassware only)	5182-0849
25 mL fritless sparger kit with fittings	5182-0796
5 mL needle sparger (glassware only)	5182-0848
5 mL needle sparger kit	5182-0795
25 mL needle sparger (glassware only)	5182-0847
25 mL needle sparger kit	5182-0794

Traps for Teledyne Tekmar Stratum and Atomx Purge and Trap Concentrator

Description	Part No.
Trap, BTEX + MTBE	5188-8813
Trap #5, OV-1/Tenax/Silica Gel/Charcoal	5188-8814
Trap #8, Carbopak B/Carbosieve S-III	5188-8815
Trap #9, Proprietary	5188-8816
Trap, Tenax/Silica Gel/Carbosieve S-III	5188-8817
Strat-Trap, Tenax/Silica Gel, #2	5188-8818
Strat-Trap, Tenax/Silica Gel/Charcoal, #3	5188-8819
Strat-Trap, OV-1/Tenax, #7	5190-1445
Strat-Trap, Tenax, #1	5190-1446
Trap, VOCARB 3000	5188-8820
Trap, VOCARB 4000	5188-8821
Trap, BTEX	5188-8822
Trap, Tenax	5188-1447
Trap, VPH	5188-1448

Stratum and Atomx traps are U-shaped



Trap, BTEX + MTBE, 5188-8813

Atomx VOC Autosampler Supplies

Description	Part No.
Antifoam agent, Antifoam 1520, 10 mL	5190-2235
Syringe with side port, 27 mL	5190-2234
Vessel, amber IS, 15 mL	5190-2233
Frit sparge glassware kit, 25 mL	5190-2232
Fritless sparge glassware kit, 25 mL	5190-2231



Atomx Purge and Trap Concentrator

Traps for Teledyne Tekmar Velocity Purge and Trap Concentrator

Description	Part No.
Trap, Vocarb 3000 (K Trap)	5182-0775
Trap, Vocarb 4000 (I Trap)	5182-0774
Trap, Tenax (A Trap)	5182-0783
Trap, Tenax/Silica Gel/Charcoal (C Trap)	5182-0781
Trap, BTEX	5182-0773
DryFlow moisture trap	14-8911-003

Velocity traps are straight

TIPS & TOOLS

Compared to a frit sparger, the fritless sparger may be the better choice when a water sample has a tendency to foam. This sparger is not appropriate for soil samples, which tend to clog the capillary tube.



Agilent ARCHON Purge and Trap Autosampler



Agilent ARCHON Purge and Trap Autosampler with removable tray



ARCHON removable 51 position sample tray

Archon Purge and Trap Supplies

Description	Part No.
Vial kit, 40 mL, precleaned vials, caps, and septa, 72/pk	5183-4741
Bottle without cap, 80 oz.	DY50390600
22 mm septa, PTFE/silicone, 72/pk	5190-3978
22 mm septa, EPA lowbleed, 60/pk	5190-3976
Syringe mount O-ring	DY50549500
Water probe replacement kit, for S/N above 995	DY50573990
Sparge probe replacement kit, for S/N above 13160	DY70007791
Sparge probe replacement kit, for S/N 995-13160	DY50574190
Sparge probe replacement kit, for S/N below 995	DY50549290
Standard reservoir	DY50548400
Water transfer line	DY50551400
I.S. pickup/waste lines	DY70001990
Soil transfer line	DY50574500
75-micron screen for water probe	DY50559800
Water probe, cleaned, for S/N 695-995	DY50549100
Sparge probe cleaned, for S/N above 13160	DY70007701
10-micron soil probe frit	DY50559900
Valco rotor loop, 1 µL	DY50572600
Flangeless nuts and ferrules, 8/pk	DY70008101
PTFE stir bar for 40 mL vials	DY50295500
Spin bar for soil vial	DY50402400
Stir magnet	DY50546100
Valco valve and actuator	DY50540700
Glass barrel with decal, 26 mL	DY50296800
Kit, chiller option, field	DY70008590

Markes Thermal Desorption

Agilent now offers a comprehensive line of supplies for Markes Thermal Desorption (TD) instrumentation. Thermal desorption allows the introduction of volatile and semivolatile compounds from a wide range of sample matrices, directly into a GC or GC/MS.



Markes Thermal Desorption system



Sampling tube, MKI-UTD-5105



Silcosteel Difflok cap, MKI-MTD-1204

Markes Thermal Desorption Supplies

Description	Unit	Part No.
O-rings, Markes 7 mm cold trap seals	10/pk	MKI-U-COV07
O-rings, Markes 6 mm cold trap seals	10/pk	MKI-U-COV06
PTFE filter disks, 5.1 mm Markes TD	10/pk	MKI-U-DISK1
PTFE filter disks, 6.3 mm Markes TD	10/pk	MKI-U-DISK3
Spare general purpose carbon cold trap		MKI-U-T11GPC
Sampling tube, Tenax TA, Markes Unity		MKI-UTD-5105
Quick fit connectors, Markes Unity	10/pk	MKI-C-QSC10
Stainless steel Difflok cap, Markes Unity	10/pk	MKI-MTD-1169
Silcosteel Difflok cap, Markes Unity	10/pk	MKI-MTD-1204
O-ring insertion tool, Markes Unity TDI		MKI-Z-0285
O-ring extraction tool, Markes Unity TDI		MKI-Z-0351
Cold trap alignment tool, Markes Unity		MKI-UTD-5064
Cold trap, air toxics, C_2-C_{14}, Unity 2		MKI-U-T3ATX-2S
Cold trap, air toxics, C_2-C_{14}, Unity		MKI-U-T3ATX
Cold trap, materials emissions, Unity		MKI-U-T12ME
Cold trap, GP Carbon, $C_{4/5}$-$C_{30/32}$, Unity 2		MKI-U-T11GPC-2S
O-rings, 010 Markes Unity	10/pk	MKI-U-COV10
Cold trap, materials emissions, Unity 2		MKI-U-T12ME-2S
Empty stainless steel TD tubes	10/pk	C-TBE10
Tenax stainless steel tubes, preconditioned/capped	10/pk	C-TBP1TC
Empty glass TD tubes	10/pk	C-GT010
PTFE inserts	10/pk	C-PL010
Long term TD tube storage caps	10/pk	C-CF020
Cap-LOK Tool for long term storage caps		C-CPLOK
Diffusive sampling caps	10/pk	C-DF010
Bio-VOC breath samplers	10/pk	C-BIO10
Disposable card mouth piece for Bio-VOC	10/pk	C-B010M
Tenax TA 34-60 Mesh, 10 g		C-TNXTA

(Continued)



Markes Thermal Desorption system

Markes Thermal Desorption Supplies

Description	Unit	Part No.
General purpose hydrophobic tubes, stainless steel Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling n-C_5 to n-C_{20}.	10/pk	C-HY010C
Tenax/S'carb 'Sulphur' tubes Preconditioned and capped with 1/4 in brass storage caps. For odor and landfill gas analysis.	10/pk	C-102SSC
Carbograph 1 stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling C_5 to C_{14}, plus diffusion of BTX.	10/pk	C-TBP1C1C
Carb X stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped/diffusion of 1.3-butadiene & benzene.	10/pk	C-TBP1CXC
Air toxics (TO-17) stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps. For pumped sampling VOCs n-C_3 to n-C_{12}.	10/pk	C-AT010C
Universal stainless steel tubes Preconditioned and capped with 1/4 in brass storage caps	10/pk	C-UN010C
Glass tubes with 1 cm Tenax For direct liquid injection	10/pk	C-G1CM10
Glass air toxics (TO-17) tubes Pre-packed with 2 carbon-based sorbents; preconditioned and capped with 1/4 in brass storage caps	10/pk	C-GAT010C
CRS BTX Standards, 1 µg	10/pk	C-BTX1UG

Inlet Systems

Agilent Inlet Convenience Kits

Convenience kits are an easy way to get all the supplies you need using one part number. Agilent's new preventative maintenance kits include septa, liners, O-rings, gold seals and traps.

Agilent Inlet Convenience Kits

Description	Part No.
QuickPick Split Inlet PM Kit Includes 5 non-stick BTO septa, 1 split liner, 1 non-stick liner O-ring, and inlet gold seal kit	5188-6493
QuickPick Split Vent and Inlet PM Kit Includes 5 non-stick BTO septa, 1 split liner, 1 non-stick liner O-ring, inlet gold seal kit, and split vent trap with 2 O-rings	5188-6496
QuickPick Splitless Inlet PM Kit Includes 5 non-stick BTO septa, 1 splitless liner, 1 non-stick liner O-ring, and inlet gold seal kit	5188-6494
QuickPick Splitless Vent and Inlet PM Kit Includes 5 non-stick BTO septa, 1 splitless liner, 1 non-stick liner O-ring, inlet gold seal kit, and split vent trap with 2 O-rings	5188-6497
QuickPick Purged Packed Inlet PM Kit Includes 5 non-stick BTO septa, 1 O-ring, 1 ferrule, and 1 disposable glass liner	5188-6498
Internal split vent trap PM kit for split/splitless, volatiles, and PTV septumless inlet split vent line Includes 1 cartridge and 2 O-rings	5188-6495



QuickPick Splitless PM Kit, 5188-6497



QuickPick Purged Packed PM Kit, 5188-6498



Split Vent Trap PM Kit, 5188-6495

Split/Splitless Inlet Seals

To ensure that you have a consistent and inert surface to properly seal the inlet and prevent sample degradation, Agilent has revolutionized production of the gold inlet seal. Unlike traditional machined seals, the new format Agilent Gold Inlet Seal has a very reproducible smooth surface, eliminating traces of machining grooves that can be the source of minute leaks. With Agilent's proprietary metal injection molding (MIM) manufacturing process, every gold inlet seal provides a high quality, leak-free seal so critical for reproducible results.

Our new package keeps the gold seal clean and scratch-free. For your added convenience, an inlet washer is provided with each inlet seal.



Gold plated seal kit, 5188-5367



Certified gold plated seal kit, 5190-2209

Split/Splitless Inlet Seals

Description	Unit	Part No.
Certified gold plated seal kit, includes washer		5188-5367
	10/pk	5190-2209
Gold plated seal with cross*		5182-9652
Stainless steel seal		18740-20880

*Use with total flow rates above 200 mL/min

Flip Top Inlet Sealing System

Agilent's Flip Top Inlet Sealing System is the faster, smarter way to change inlet liners on Agilent 6890, 6850 and 5890 GC systems.

- Cuts liner replacement time to as little as 30 seconds
- Eliminates frustrating searches for special wrenches or tools
- Improves inlet ergonomics – no more handling of heated parts, no more burns or scrapes
- Decreases downtime and increases productivity
- Minimizes exposure to ambient air, extending column life
- Easily installed by user in 15 minutes

Available exclusively from Agilent, the Flip Top has a levered arm that attaches to any 6890/6850/5890 insert weldment and locks to the injection port using an adapter ring screwed onto the inlet. Once installed, simply lift the arm of the Flip Top which releases the insert weldment from the injection port, and allows instant access to the liner. The process is simply reversed to reseal the weldment to the port.







Flip Top Inlet Sealing System installation kit, 5188-2717

Flip Top Inlet Sealing System

Description	Unit	Part No.
Flip Top Inlet Sealing System For 6890, 6850, 5890 only; not compatible with 7890		5188-2717
Non-stick fluorocarbon liner O-ring for Flip Top	10/pk	5188-5366
	100/pk	5190-2268

Split/Splitless Inlets

The combined split/splitless inlet is the most popular inlet for capillary column gas chromatography. Because it can be used in either split or splitless mode, it provides a very effective combination that can cover most analysis requirements.

Split Inlet Troubleshooting

Split inlets are spared from most band-broadening phenomena, since the splitting process generates narrow peaks. Peak broadening or tailing is usually due to:

- Improper column installation
- Low inlet temperature
- Low split flow (<20 mL/min on 6890)
- Inlet and needle discrimination and decomposition

If your results are inaccurate or inconsistent:

- Check the column and reinstall if necessary
- Increase inlet temperature by 50 °C and compare results
- Check inlets and needles for wear and replace as necessary

Splitless Inlet Troubleshooting

Most problems encountered with a splitless injection are related to:

- Incorrect purge time
- Degradation
- Improper focusing
- Inappropriate column temperature
- Backflash

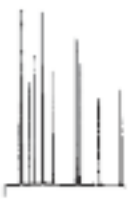
You can also improve the reproducibility and linearity of peak areas and avoid backflash by matching:

- Inlet temperature
- Liner volume
- Injection volume

Decomposition

Loss of peak area or generation of new peaks can sometimes be dramatically reduced by changing liner type or by deactivating the liner and inlet with silanizing reagents. Removing or reducing the amount of liner packing can also decrease inlet activity.

Column Troubleshooting



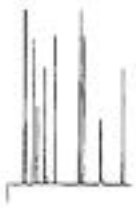
Normal Peaks

Correct column positioning in both injection port and FID



Tailing Solvent Peaks

Column positioned incorrectly in the injection port or possible ferrule particle in the carrier gas flow path



Wrong Peak Ratios

Column positioned in the inlet (either too far or not far enough; verify 4-6 mm installation distance)

For the most reproducible split injection results, try Agilent's low pressure drop split liner (part number 5183-4647), with built in positioning bead, tight dimension tolerances, glass wool placement, and proprietary deactivation.

Split Mode Variables, Practices and Rationales

Parameter	Selection/Setting	Rationale
Inlet temperature	Try 250 °C or BP of last eluting compound	Ensures flash vaporization Minimizes inlet discrimination
Inlet liner	Large volume, deactivated	Minimizes backflash Minimizes degradation
Inlet packing	Silanized glass wool	Retains non-volatiles Minimizes inlet discrimination
	Glass beads or frit	Less active than wool
	None	Least active
Injection volume	0.5-3 µL liquid	Split easily adjusted
	0.10-10 mL gas	Split adjusted accordingly
Injection technique	Fast autoinjection	Less needle discrimination
	Hot-needle fast manual injection	Reproducible discrimination
Split ratio	50:1 to 500:1	Depends on sample and injection volume, and column id
Initial column temperatures	Not critical	Narrow initial peaks
Septum purge	2-3 mL/min	Minimizes ghosting

Splitless Mode Variables, Practices and Rationales

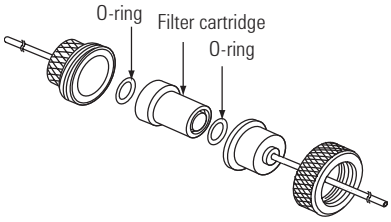
Parameter	Selection/Setting	Rationale
Inlet temperature	Just above highest boiling point of solutes (+20 °C)	Ensures flash vaporization Reduce if degradation occurs Use higher for dirty samples and higher-boiling solutes
Inlet liner	Large volume > 0.8 mL Small volume < 0.2 mL	Use with autoinjector Use only for slow manual injections and gas injections
Inlet packing	None	Use only with slow injection Decreases degradation
	Silanized glass wool	Use for fast autoinjection and dirty samples
Injection volume	0.5-2 µL liquid	Depends on solvent, liner and conditions
Injection technique	Fast autoinjection Hot-needle slow manual Hot-needle fast manual	Most reproducible Less needle discrimination Inject 1-2 µL/sec if narrow liner is used and > 1 µL injection Use for < 1 µL injections
Purge flow	20-50 mL/min	Higher if using constant flow
Purge delay time	20-80 sec	Adjust according to column flow rate/liner type and sample conditions
Oven temperature	10-25 °C below solvent BP	Necessary for solvent focusing
Column flow	> 2 mL/min when possible	Clears inlet fast Reduces backflash and decomposition
Septum purge	2-3 mL/min	Reduces ghosting
Quantification	Internal standard External standard addition	Maximizes reproducibility Use only with constant injection volume
Retention gap	1-3 m, deactivated (1-2 m per µL injected)	Reduces peak distortion Promotes solvent and stationary phase focusing

Split/Splitless Inlet Maintenance

Changing the Split Vent Trap*

1. Remove the retaining clip.
2. Remove the old filter cartridge and two O-rings.
3. Verify the new O-rings are seated properly on the new filter cartridge.
4. Install the new filter cartridge then reassemble the trap. Do not fully tighten yet.
5. Place the filter trap assembly in the mounting bracket and install the retaining clip.
6. Fully tighten the split vent front weldment onto the trap.
7. Check for leaks.

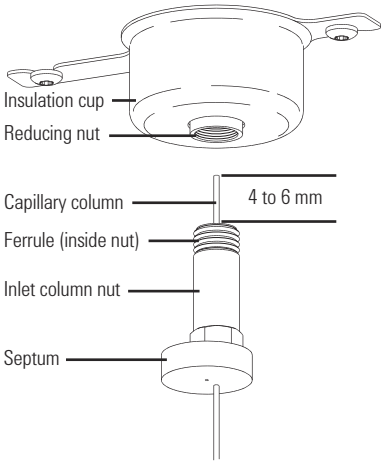
*Change every 6 months



Split vent trap, 5188-6495

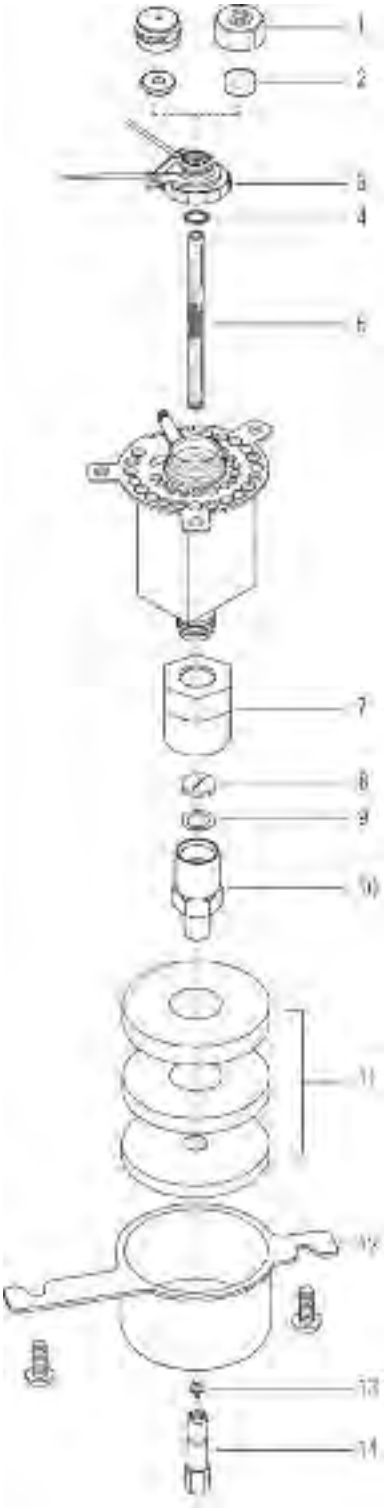
Installing a Capillary Column in a Split/Splitless Inlet

1. Prepare the column for installation.
2. Position the column so it extends 4 to 6 mm past the end of the ferrule.
3. Slide the septum to place the nut and ferrule in the correct position.
4. Insert the column in the inlet.
5. Slide the nut up the column to the inlet base and finger tighten the nut.
6. Adjust the column position so the septum is even with the bottom of the column nut.
7. Tighten the column nut an additional 1/4 to 1/2 turn. The column should not slide with a gentle tug.
8. Start carrier gas flow.
9. Verify flow by submerging the free end of the column in isopropanol. Look for bubbles.



WARNINGS & CAUTION

The split vent trap may contain residual amounts of any samples or other chemicals you have injected into the GC. Follow your company's safety procedures for handling these types of substances while replacing the trap filter cartridge.



Split/Splitless Inlet assembly

7890/6890/6850 Split/Splitless Inlet Supplies

Item	Description	Unit	Part No.
	Low pressure drop, Ultra Inert Liner with glass wool		5190-2295
	Universal, low pressure drop, Ultra Inert Liner with glass wool		5190-3169
	Single taper, Ultra Inert Liner		5190-3166
	QuickPick Split Inlet PM Kit		5188-6493
	QuickPick Split Vent and Inlet PM Kit		5188-6496
	QuickPick Splitless Inlet PM Kit		5188-6494
	QuickPick Splitless Vent and Inlet PM Kit		5188-6497
1	Headspace septum retainer nut		18740-60830
	Septum retainer nut		18740-60835
	Strain relief septum nut		301-205-HSP
2	11 mm Certified BTO septa	50/pk	5183-4757
	For complete offering of premium septa, see page 15		
3	7890 Insert Weldment		
	Top insert weldment assembly, standard		G3452-60730
	Turn top		G3430-40035
	Split ring		0510-1306
	Top insert weldment assembly, headspace		G3452-60100
	Top insert, AC gang fitting weldment		G3430-60011
	Top insert assembly, valve		G3480-67585
	6890 Insert Weldment		
	S/SL insert weldment Used with large charcoal canister type filter, for 6890/6850		G1544-60585
	S/SL insert assembly for G1540A with valved system option This insert assembly uses the large charcoal canister split vent filter, for 6890/6850		G1580-60585
	Similar to G1544-60575 except carrier lines separated for interface to valved systems of a G1540A instrument		G1580-60575
	Original standard EPC using 1/4 in split vent filter		G1544-60575
	Similar to G1544-60575 except allows insertion of 1/4 in chemical filters to clean carrier gas for ECD operation		G1544-80580
	Insert Weldment Standard manual pneumatics		19251-60575
4	Certified non-stick fluorocarbon O-ring	10/pk	5188-5365
	Graphite O-ring for split liner	10/pk	5180-4168
	Graphite O-ring for splitless liner	10/pk	5180-4173
	Non-stick fluorocarbon liner O-ring for Flip Top	10/pk	5188-5366
5	Split liner, single taper, low pressure drop, glass wool	1/pk 25/pk	5183-4647 5183-4702
	Splitless liner, single taper, without glass wool	1/pk 25/pk	5181-3316 5183-4696
	For complete offering of liners, see pages 25		

(Continued)

7890/6890/6850 Split/Splitless Inlet Supplies

Item	Description	Unit	Part No.
6	Split vent trap kit		G1544-60610
	Replacement cartridge Includes 2 cartridges and 4 O-rings		G1544-80530
	Split vent trap PM kit Includes 1 cartridge and 2 O-rings		5188-6495
7	Retaining nut		G1544-20590
8	Stainless steel seal		18740-20880
	Certified gold plated seal kit, includes washer		5188-5367
	Gold plated seal with cross		5182-9652
9	Washers, 0.375 od	12/pk	5061-5869
10	Reducing nut		18740-20800
11	Insulation kit, 3 pieces		5188-5241
12	Lower insulation cover		19243-00070
13	Ferrules		
	For complete offering of ferrules, see pages 33-34		
14	Universal column nut	2/pk	5181-8830
	6850 column nut	2/pk	5183-4732
	Split/splitless septum nut angled wrench		19251-00100
	Flip Top Inlet Sealing System For 6890, 6850, 5890 only; not compatible with 7890		5188-2717
	Capillary Inlet Evaluation Sample (Split Mode)		8500-4789
	Capillary Inlet Supplies Kit, Includes:		5181-8838
	Certified gold plated seal kit, includes washer		5188-5367
	Liner, split, straight, glass wool, non-deactivated	4 each	19251-60540
	Liner, splitless, single-taper, glass wool, deactivated	2 each	5062-3587
	Certified non-stick fluorocarbon O-ring	10/pk*	5188-5365
	Liner, direct, 2 mm id, deactivated		5181-8818
	11 mm Certified BTO septa	50/pk*	5183-4757
	Capillary inlet cleaning wires	5/pk*	5180-4153

*Quantity when part ordered individually



Item 6, split vent trap, G1544-60610

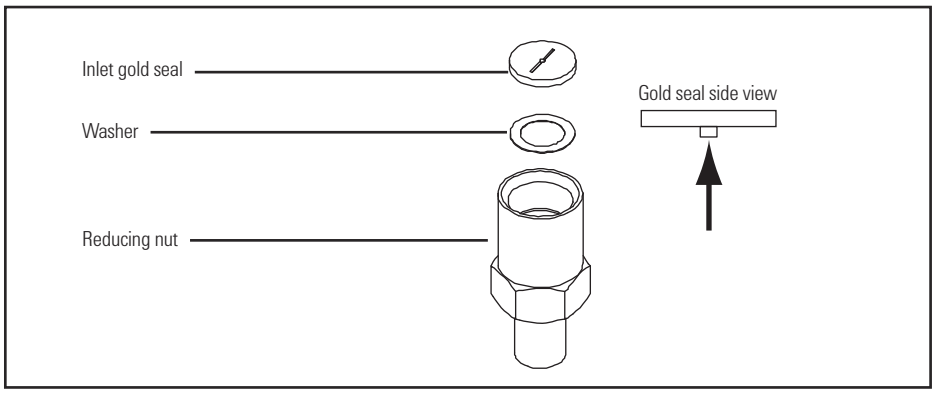


Reducing nut, 18740-20800



Gold plated seal kit, 5188-5367

Gold seal on the split/splitless inlet



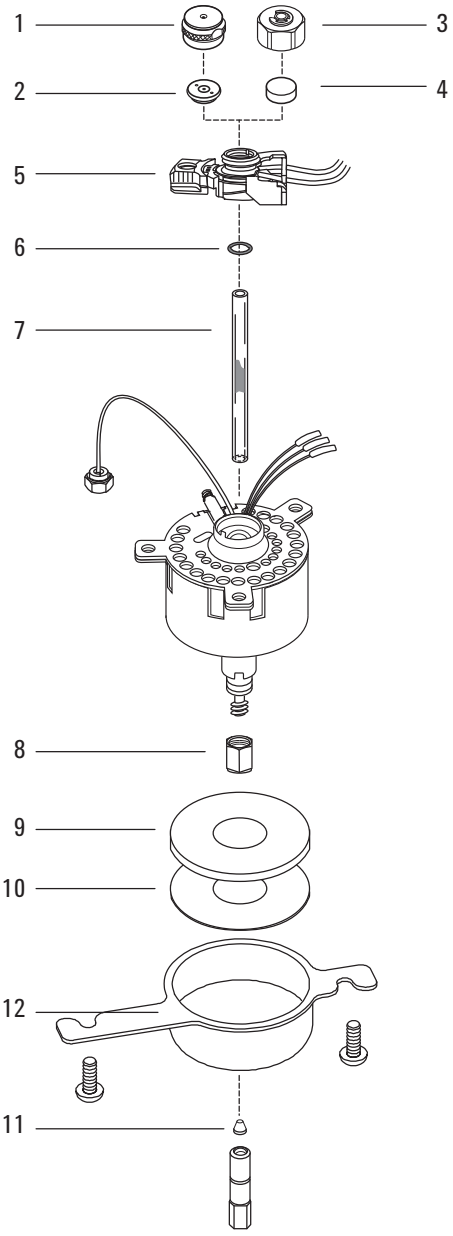
Multimode Inlet

Agilent's premium inlet – two inlets in one for maximum performance and flexibility for the 7890A

Whether you need to increase your system sensitivity with large volume injection capabilities, analyze thermally labile compounds or inject dirty samples, the Multimode Inlet delivers the performance and flexibility you need.

Multimode Inlet Body

Item	Description	Part No.
1	Merlin cap	5182-3445
2	Merlin Microseal	5182-3444
3	Septum retainer nut	18740-60835
4	11 mm Certified BTO septa 50/pk For complete offering of premium septa, turn to page 15.	5183-4757
5	Top insert assembly, standard	G3452-60730
6	Certified non-stick fluorocarbon O-ring	5188-5365
7	Dimpled splitless single taper, deactivated	5190-2296
8	Column nut adapter	G3510-20018
9	Foil (LN_2 only)	
10	Multimode Inlet insulation	19243-000681
11	Ferrule	For complete offering of ferrules, turn to pages 33-34.
12	MMI Metal Insulation Cup	G3431-00005



Exploded Parts View of the Multimode Inlet

TIPS & TOOLS

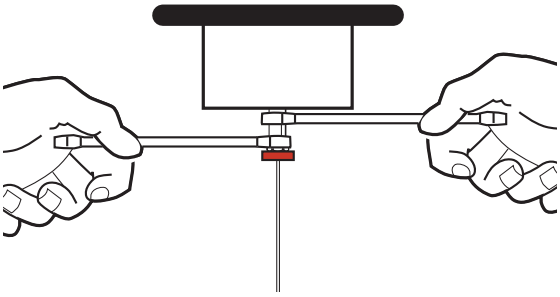
Because of the temperature programmability, graphite is preferred ferrule for the MMI. However, Graphite/Vespel ferrules can be used if they are temperature cycled and retightened. After the initial shrinkage, they do not show a detrimental leak for air.

Turn to pages 62-63.

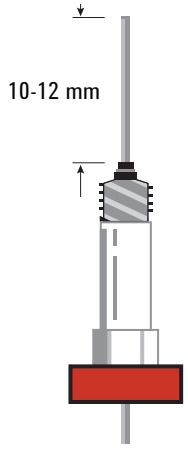
Installing a Capillary Column in a Multimode Inlet

1. Prepare the column for installation.
2. Thread the column adapter nut onto the base of the inlet and make sure it can spin freely.
3. Place a septum, capillary nut, and graphite ferrule on the column.
4. Score and snap off the end of the column.
5. Position the column so it extends 10 to 12 mm past the end of the ferrule.
6. Slide the septum to place the nut and ferrule in the correct position.
7. Insert the column in the inlet.
8. While holding the adapter with a wrench thread the column nut into the inlet (but do not tighten).
9. Adjust the column position so that the septum contacts the bottom of the column nut. Finger-tighten the column nut until it begins to grip the column.
10. While holding the inlet base with one wrench, use the second wrench to tighten the column nut an additional 1/4 to 1/2 turn so that the column cannot be pulled from the fitting with gentle pressure.

Step 2



Step 5



Cleaning the Multimode Inlet

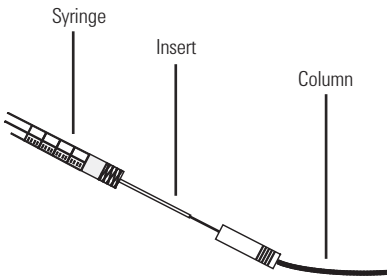
Agilent recommends using the G3510-60820 Multimode Cleaning Kit, which ships with detailed cleaning instructions.

Depending on the inlet mode used, the liner installed, and the cleanliness of the sample, the frequency of cleaning may range from weekly to monthly. When establishing your cleaning frequency, start with a visual inspection of the inlet bottom whenever a liner is changed. A small ring of material will collect at the bottom of the inlet when dirty samples such as food extracts or solid waste extracts are injected. An initial cleaning schedule of every two weeks for dirty samples and every two months for clean samples is appropriate and can be adjusted subsequently.

WARNINGS & CAUTION

The inside of the wall of the inlet is only 0.005 in thick and can be damaged with hard scrubbing.

Cool On-Column Inlets



Cool On-Column Inlet Maintenance

Installing a Capillary Column into a Cool On-Column Inlet

1. Gently insert the column into the inlet until it bottoms.
2. Insert the column nut into the inlet fitting and finger tighten.
3. Tighten the column nut an additional 1/4 turn with a wrench or until the column does not move. Use two wrenches to support inlet (5/16 in and 1/4 in).
4. If using an automatic injection system with a 0.25 mm or 0.32 mm column, verify that the column installation by manually pushing the syringe into the inlet.

Checking the Needle-to-Column Size on the Cool On-Column Inlet

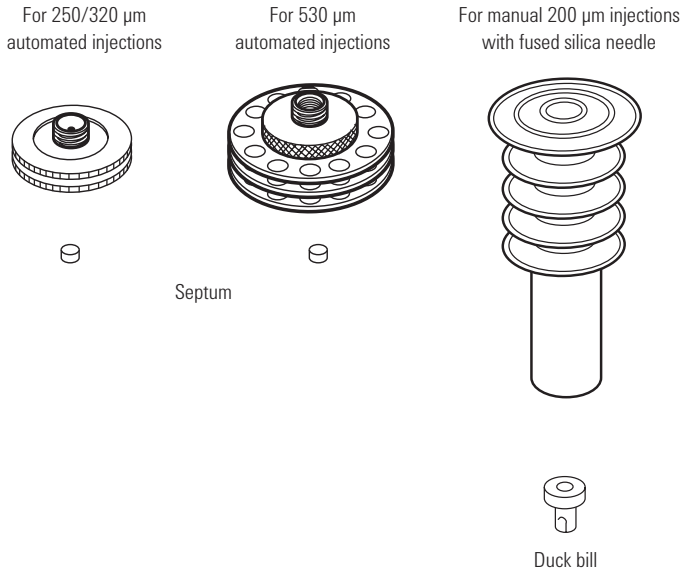
1. Check the needle-to-column size to make certain that the needle fits in the column.
2. Identify the correct insert for the column size. Use the insert that is the same size as the syringe needle to verify that the column you plan to use is the correct size.
3. Insert the column into one end of the insert.
4. Insert the syringe needle through the other end of the insert and into the column. If the needle cannot pass easily into the column, reverse the insert to try the needle and column in the other end.

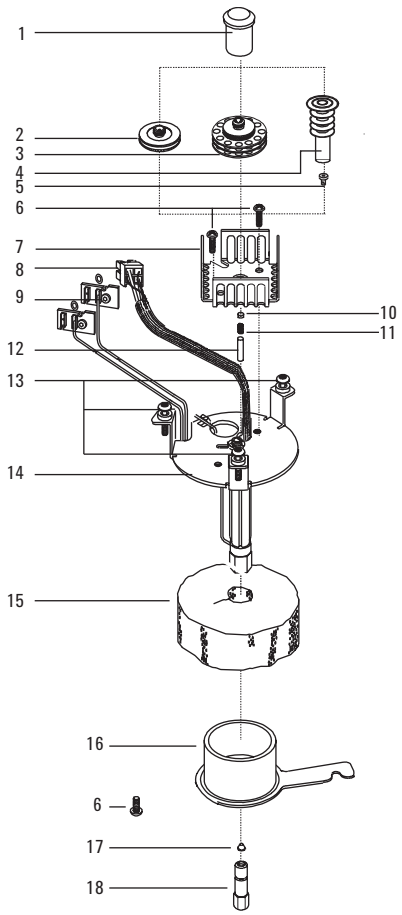
Changing the Septum on the Cool On-Column Inlet

1. Replace the septum.

   If you are using a septum nut, grasp the knurling and unscrew. Remove the old septum with tweezers. Use tweezers to install a new septum. Push the septum into the septum nut until properly seated. Firmly tighten the nut.

   If you are using a cooling tower, grasp the three rings and unscrew. The spring and duck bill septum may pop out of the inlet when you remove the cooling tower. Be careful not to lose them. If they do not pop out, use a thin wire to remove them from the inlet. Insert the replacement duck bill septum into the spring and place in the inlet. Reattach the cooling tower assembly, then finger tighten.
2. Before making an injection, check the alignment of the entire assembly using the proper size syringe.
3. Restore the analytical method.
4. Reset the septum counter.





Cool On-Column Inlet assembly

7890/6890 Cool On-Column Inlet Supplies

Item	Description	Part No.	Quantity
1	Needle guide top (optional)	19245-20670	
2	Septum nut base assembly, for 0.250/0.320-mm columns	19245-80521	1
3	Septum nut base, for 0.530 mm columns	G1545-80520	1
4	Manual cooling tower assembly (optional), for 0.200 mm columns	19320-80625	1
5	Duckbill for use with cooling tower, 10/pk	19245-40050	
6	Screw, M4 x 8, Torx T-20 chromeplate	0515-2711	3
7	Heatsink fin	G1545-00010	1
8	Heater/Sensor assembly	G1545-60520	1
9	Screw, M3 x 16 mm	1390-1022	1
10	Septa	Turn to page 15.	
11	Insert spring	19245-60760	1
12	Inserts (identify by number of rings on insert)		
13	Screw, M4 x 12 mm, T-20	0515-2496	3
14	Inlet weldment	G3454-80500	1
15	Inlet weldment insulation	G1545-20630	1
16	Cavity sleeve	19245-00060	1
17	Ferrules (identify by internal diameter)	Turn to pages 30-31.	
18	Column nut	Turn to pages 33-34.	

7673/7683 On-Column Autosampler Syringes

Volume (µL)	Description	Unit	Part No.
5	Removable needle, syringe only*		5182-0836
	Stainless steel needle for 0.53 mm column	3/pk	5182-0832
	Stainless steel needle for 0.32 mm column	3/pk	5182-0831
	Stainless steel needle for 0.25 mm column	3/pk	5182-0833
	Plunger button	10/pk	5181-8866

*Order appropriate needle

Programmable Temperature Vaporizer (PTV) Inlets



PTV inlets combine the benefits of split, splitless and on-column inlets. The sample is usually injected into a cool liner, so syringe needle discrimination does not occur. Then the inlet temperature is increased to vaporize the sample. The user programs vent times and temperature to achieve the equivalent of split or splitless transfer of sample vapors to the column. PTV injection is considered the most universal sample introduction system because of its flexibility.

Advantages

- No syringe-needle discrimination
- Minimal inlet discrimination
- Use of large injection volumes
- Removal of solvent and low boiling components
- Trapping of nonvolatile components in liner
- Split or splitless operation
- Retention time and area reproducibility approaching cool on-column injection

PTV inlets are actively cooled before and during injection by Peltier devices or by forced gases (air, liquid N_2, or liquid CO_2). Cryogenic cooling of the inlet can reduce inlet temperature enough to thermally focus gas injections from other sampling devices in the liner. This is a distinct advantage of using PTV inlets in comparison to conventional inlets for coupling auxiliary sampling devices to capillary columns.

Post-injection, PTV inlets are heated using electrical heaters or preheated compressed air. Depending on design, inlet temperature ramps are either ballistic (i.e., ramped to the maximum temperature at an uncontrolled maximum rate) or programmable.

PTV Inlet Practices and Rationales (Cold Split/Splitless Modes)

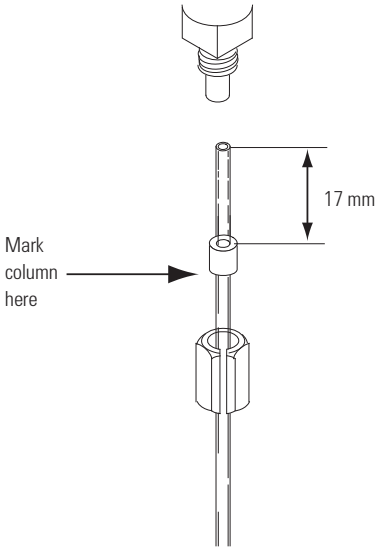
Parameter	Selection/Setting	Rationale
Injection mode	Cold split	For general use and sample screening
	Cold splitless	For trace analysis
	Cold solvent vent	LVI
Inlet temperature ramp rate	Adjustable (i.e., 2 °C/sec to 720 °C/sec max)	Use slower ramp rates for labile, complex, or large volume samples
		Use faster ramp rates for most samples
		Use faster ramp rates to shorten splitless purge delay time
	Ballistic	Simpler, less expensive instrumentation
Inlet liner	Straight with silanized wool	For general use
	Baffled	For labile samples
	Packed with an adsorbent	For focusing gaseous injections from auxiliary sampling devices
Injection volume	0.1-1.5 µL	Use lower volumes for volatile solvents and fast ramp rates
	5-50 µL for LVI	Use volumes larger than 1.5 µL only in solvent-elimination mode
Sample Injection technique	Autosampler or manual, fast or slow	Not critical for cold split and splitless modes
Oven temperature	10-25 °C below solvent BP	For proper solvent effect in splitless mode
	Sample dependent	For split mode
Column flow	30-50 cm/sec	Clears inlet faster
		Less backflash
Septum purge	1-5 mL/min	Minimizes ghosting
Quantification	Any method	Inherently reproducible
		Low discrimination in cold injection modes
Retention gap	1-3 m, deactivated	Compensates for extended flooded zone and solvent-column incompatibility



PTV Inlet Maintenance

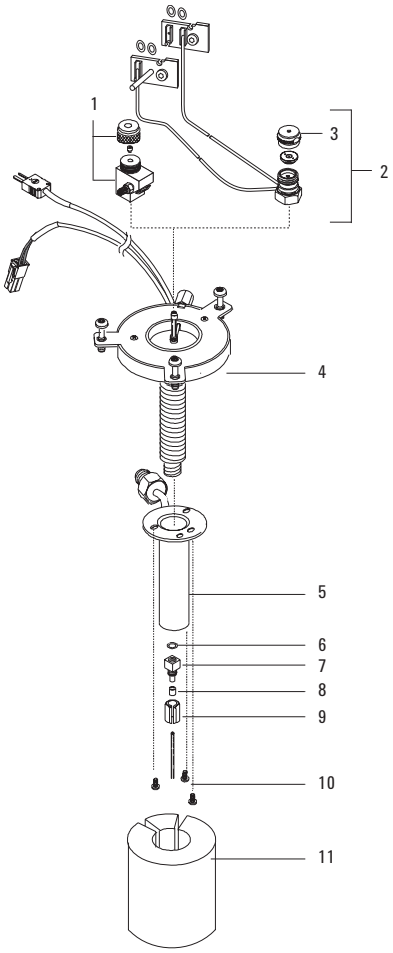
Installing a Capillary Column into the PTV Inlet

1. Position the column so it extends 17 mm above the end of the ferrule. Mark the column behind the ferrule with correction fluid or a marker. Slide the nut over the column.
2. Insert the column into the adapter and finger tighten the column nut. Looking through the slot in the nut, adjust the column until the mark is correctly positioned below the Graphpak 2M ferrule.
3. Tighten the column nut an additional 1/8 to 1/4 turn with a wrench. Do not overtighten.



7890/6890 Septumless PTV Inlet Supplies

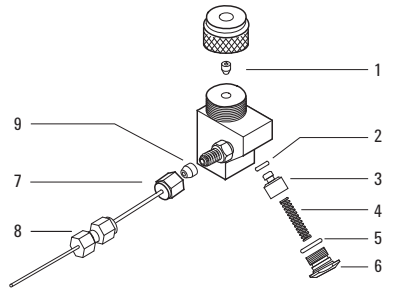
Description	Column ID (mm)	Unit	Part No.
Microseal high pressure nut			5182-3445
Merlin Microseal			5182-3444
Septumless head			G2617-60507
Septum head			G2618-80500
Septum retainer nut			18740-60835
PTV inlet assembly			G2617-60506
PTV LCO_2 cooling jacket			G2617-60508
PTV LN_2 cooling jacket			G2619-60501
Silver seal		5/pk	5182-9763
Graphpak 2M inlet adapter	0.20		5182-9754
	0.25-0.33		5182-9761
	0.53		5182-9762
Ferrules for Graphpak 2M inlet	0.20		5182-9756
	0.25		5182-9768
	0.32		5182-9769
	0.53		5182-9770
Replacement Graphpak column nut			5062-3525
PTV insulation block			G2617-20510
PTV Cryo insulator			G2617-60510
PTFE ferrule (needle seal)		10/pk	5182-9748
Kalrez seal			5182-9759
Valve body			5182-9757
Pressure spring			5182-9758
Viton seal		5/pk	5182-9775
Sealing element			5182-9760
CO_2 Cryo inline filter			3150-0602
Service kit for septumless head Contains Kalrez seal, valve body, and pressure spring			5182-9747
Graphpak 3D ferrules		5/pk	5182-9749
Assembly tool for Graphpak 3D ferrules			G2617-80540



PTV Inlet Body

Item	Description	Part No.
NS	Septumless head weldment	G3500-80000
1	Septumless head	G2617-60507
2	Septum head	G3500-80001
3	Septum nut	18740-60835
4	PTV inlet assembly	G2617-60506
5	Cooling jacket	
	PTV LCO_2 cooling jacket	G2617-60508
	PTV LN_2 cooling jacket	G2619-60501
NS	PTV inlet assembly with cooling jacket	
	PTV inlet with CO2 cooling jacket	G2617-60518
	PTV inlet with LN2 cooling jacket	G2617-60517
6	Silver seal	5182-9763
7	Graphpak inlet adapter	
8	Ferrules for Graphpak inlet	Turn to pages 30-31.
9	Replacement Graphpak column nut	5062-3525
10	Screw, M3 x 3 mm	
11	PTV insulation block	G2617-20510
NS	PTV Cryo insulator	G2617-60510

NS = not shown



PTV Septumless Head

Item	Description	Part No.
	Septumless head	G2617-60507
1	PTFE ferrule (needle seal)	5182-9748
2	Kalrez seal	5182-9759
3	Valve body	5182-9757
4	Pressure spring	5182-9758
5	Viton seal	5182-9775
6	Sealing element	5182-9760
7	PTV column adapter tube (includes 1/6-inch nut and ferrule)	G2617-80550
8	Septumless head weldment	G3500-80000
9	Straight ferrule, 1/16 in, 10/pk	0100-1375

Programmable Temperature Vaporizing (PTV) Liners

Description	ID (mm)	Volume (µL)	Part No.
Liners for Septumless PTV Inlet, G3501A, G3502A, G3503A			
PTV liner, single baffle, glass wool, deactivated	2	180	5183-2038
PTV liner, single baffle, deactivated	2	200	5183-2036
PTV liner, multi baffled, deactivated	1.8	150	5183-2037
PTV liner, sintered glass, deactivated	1.5	112	5190-1426
Liners for High Temperature PTV Inlet, G3506A			
PTV liner, high temperature, quartz	3.4	713	5188-5313
PTV liner, high temperature, borosilicate	3.4	668	5188-5356

Syringes for Septumless and High Temperature PTV Inlets

Volume (µL)	Description	Needle	Part No.
0.5	Removable	23/70/HP	5182-9651
5	Straight, fixed	23/42/HP	9301-0892
10	Straight, fixed	23/42/HP	9301-0713
50	Straight, fixed, for large volume injections	23/42/HP	5183-0318
100	Straight, fixed, for large volume injections	23/42/HP	5183-2058

Purged Packed Inlets

Packed column analysis is frequently done when high efficiency separations are not needed or when gases are analyzed by gas-solid chromatography. Purged packed inlets are simple in both design and use. Few parameters need to be set, and all carrier gas flow flushes through the inlet into the column in the standard configuration.

Purged Packed Inlet Practices and Rationales

Parameter	Selection/Setting	Rationale
Inlet temperature	BP of solvent +50 °C BP of major solute(s)	Ensures flash vaporization Use for neat samples
Insert type	1/8 in stainless steel 1/4 in stainless steel 530 µm	Use for stainless steel column only Inserts permit connection of columns up to 1/4 in od
Liner	Glass	Use to lower activity (replaceable)
Initial column temperature	Temperature programming	Sharpens peaks and reduces run time
Column type	1/8 in packed stainless 1/4 in packed glass 530 µm	Will not break Better for polar or labile compounds
Carrier gas flow	10-40 mL/min 10-60 mL/min	Use with N_2 carrier gas Use with He or H_2 carrier gas

For more information on our new expanded and refreshed Agilent packed column portfolio see pages 400-409

Purged Packed Inlet Troubleshooting

Purged packed inlets are active, have low volume and are generally flow controlled. This means that most packed column inlet problems involve sample decomposition, flashback, or leaks.

Decomposition

Diagnose inlet sample decomposition by comparing retention times for decomposition products to their standard retention times. Then try these options to improve results:

- Intracolumn direct injection
- Deactivated glass liners
- Lower inlet temperatures
- Remove column packing in the inlet zone
- Increase flow rates

Backflash

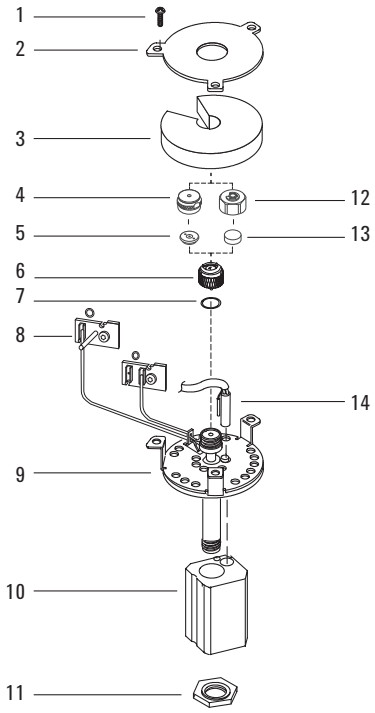
Large sample injections can exceed liner capacity and backflash into the gas supply lines and onto the septum. This can cause:

- Ghost peaks
- Sample losses
- Irreproducible peak areas
- Decomposition

Leaks

Septum and column leaks can cause column degradation and stationary phase decompositions on flow-controlled column inlets.

- Change the septum on a regular basis and check column connections to help eliminate leak holes.
- Keep the oven and inlet at room temperature when not in use or while changing the septum.

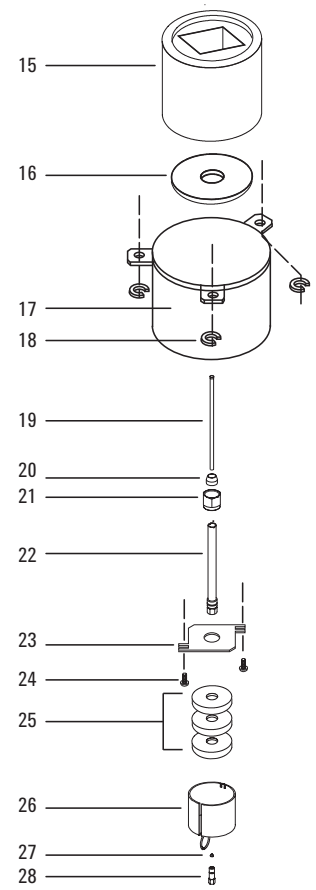


Purged Packed Inlet Upper Body

Purged Packed Inlet Upper Body

Item	Description	Part No.
1	Screw, Torx T-20, M4 x 12 mm	1390-1023
2	Top cover plate	G1543-00085
3	Top insulation	G1543-00100
4	Merlin cap	5182-3445
5	Septum, Merlin Microseal	5182-8815
6	Top insert weldment	19243-80570
7	O-ring, fluorocarbon	5080-8898
8	Screw, Torx T-10, M3 x 16 mm	G1946-20168
9	Inlet weldment	G3451-80501
10	Thermal block	G1543-20765
11	Bottom nut	G1543-20580
12	Septum retainer nut	18740-60835
13	11 mm septa	5183-4757
14	Heater/Sensor assembly	G1543-61540
NS	PTV Cryo insulator	G1543-00155

NS = not shown



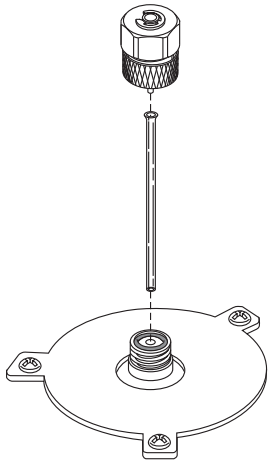
Purged Packed Inlet assembly

Purged Packed Inlet

Item	Description	Part No.
15	PP insulation	G3432-00004
16	PP bottom insulation	G3432-00003
17	PP insulation cup	G3431-00005
18	C-clip	0515-1799
19	Disposable glass liner, 170 µL internal volume	5080-8732
20	Vespel ferrule, 1/4 in	5080-8774
21	1/4 in nut, brass	5180-4105
22	530 µm column adapter for use with glass liners	19244-80540
23	Bottom plate for oven	G1543-00060
24	Screw, T-20, M4 x 12 mm	0515-2711
25	Adapter insulation	19234-60715
26	Insulating cup	19234-60700
27	Ferrules	Turn to pages 30-31.
28	Column nut (capillary, universal, 2/pk)	5180-8830

7890/6890/6850 Purged Packed Inlet Supplies

Description	Unit	Part No.
QuickPick Purged Packed Inlet PM Kit Includes 5 non-stick BTO septa, 1 O-ring, 1 ferrule, and 1 disposable glass liner		5188-6498
Merlin Microseal		5182-3444
Microseal high pressure nut		5182-3445
Septum retainer nut		18740-60835
11 mm Certified BTO septa	50/pk	5183-4757
Top insert weldment		19243-80570
O-ring, Fluorocarbon	12/pk	5080-8898
Disposable glass liner, 170 µL internal volume	25/pk	5080-8732
Disposable glass insert, deactivated, 170 µL internal volume	5/pk	5181-3382
Vespel ferrule, 1/4 in	10/pk	5080-8774
1/4 in nut, brass	10/pk	5180-4105
530 µm column adapter for use with glass liners		19244-80540
1/8 in column adapter for use with glass liners		19243-80530
1/4 in column adapter for use with glass liners		19243-80540
Insulating cup		19234-60720
Universal column nut	2/pk	5181-8830



How to install glass liner on Purged Packed Inlet

Nuts and Ferrules for 1/8 in Packed Columns

Description	Unit	Part No.
1/8 in stainless steel nut and ferrule set	20/pk	5080-8751
1/8 in brass nut and ferrule set	20/pk	5080-8750
Vespel/graphite ferrule, 1/8 in	10/pk	0100-1332



Detector Systems

Flame Ionization Detector (FID)

The FID requires routine maintenance to ensure optimum performance. Maintenance requirements are application dependent, but Agilent recommends periodically cleaning or replacing the following items:

FID Routine Maintenance

Item	Comments
FID Jet	A plugged jet results in longer retention times as the column exit/detector pressure increases. Once the jet becomes completely plugged, it is difficult to light or sustain a flame.
Ignitor Glow-Plug	Replace if corroded or burned out.
FID Collector/Insulators	Contamination can contribute to detector noise or loss of sensitivity.
Column Adapter/Seals For Adaptable FID only	Leaks at column fittings can result in difficulty lighting the FID or sustaining a flame after injection.

Typical FID Problems

Condensation

Since the FID combustion process results in water formation, the detector temperature must be kept above 300 °C to prevent condensation. At detector block temperatures below 300 °C, the castle assembly drops below 100 °C, resulting in condensation and possible rusting. Such condensation, especially when combined with chlorinated or fluorinated solvents or samples, causes corrosion, with resulting increase in detector noise and loss of sensitivity.

Flame Ignition

If the flame goes out or will not light:

- Measure the hydrogen/air and makeup flow rates – Low H_2 or makeup flows indicate a plugged jet, or a leak at the column fitting. Measure each gas flow independently.
- Confirm that the ignitor is glowing during the FID ignition sequence.
- Check for partially or completely plugged jet – Formation of silica or carbon deposits at the tip of the jet can cause plugging. Incorrect capillary column installation can also cause plugging.

It is best to replace a plugged jet, rather than try to clean it.

- Check that the capillary column is not installed all the way to the jet tip (withdraw 1-2 mm).
- Check that the correct type of jet is installed for the column you are using.
- Check for leaking column or adapter fitting at the base of the FID.
- Check the lit offset value to make sure it is not too low or too high. Adjust the value (normally set to 2.0 pA).

Injecting large volumes of aromatic solvent or water can cause the flame to go out. Switch to a non-aromatic solvent or reduce injection volume.



FID collector assembly

Increased FID Noise or Loss in Sensitivity

FID noise is affected by:

- The cleanliness of the GC gases and gas delivery system – Ensure that the carrier/H_2 and air purity is ≥ 99.9995%. Check traps and filters in the gas supply lines. The FID background signal should be ≤ 20 pA when the flame is lit and stablized.
- Dirty collector/PTFE insulators – Clean or replace.
- Dirty jet – An incorrect flame pattern can increase noise or affect sensitivity.

TIPS & TOOLS

For optimal sensitivity, use Agilent gas purifiers to ensure cleanliness of your GC gases, see pages 12-13

Installing a Capillary Column in the FID

WHAT YOU NEED:

- Column
- Ferrule(s)
- Column nut
- Column cutter
- 1/4 in open end wrench
- Septum
- Isopropanol
- Lab tissue
- Lint-free gloves
- Column ferrule installation tool (P/N 19251-80680)

WARNINGS & CAUTION

- The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.
- Wear safety glasses to protect your eyes from flying particles while handling, cutting or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.
- Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

1. Gather the required supplies and tools.
2. Load the GC maintenance method and wait for the GC to become ready.
3. If using the adaptable detector, verify that the adapter is installed.
4. Place a septum, capillary column nut, and ferrule on the column.
5. Score the column using a glass scribing tool. The score must be square to ensure a clean break.
6. Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain there are no burrs or jagged edges.
7. Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
8. Install the capillary column.

   If the column id is greater than 0.1 mm:

   a. Gently insert the column into the detector until it bottoms; do not attempt to force it further.

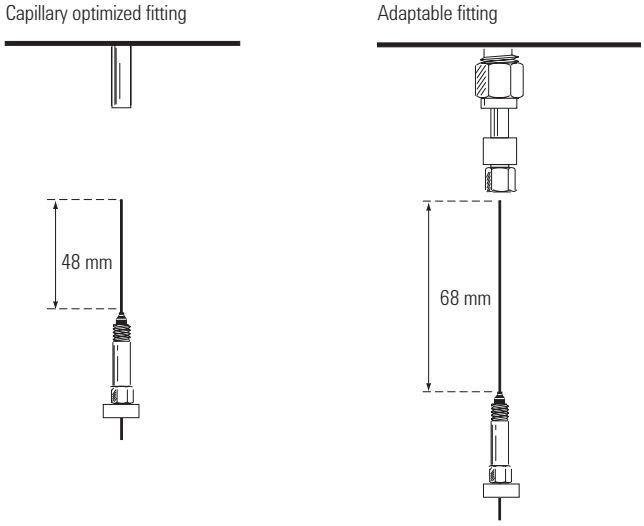
   b. Finger-tighten the column nut, then withdraw the column about 1 mm. Tighten the nut an additional 1/4 turn with a wrench.

   If the column id is 0.1 mm or less, position the column so it extends above the ferrule by 48 mm (capillary optimized fitting) or 68 mm (adaptable fitting). Slide the septum up to hold the column nut and ferrule at this fixed position.

   c. Insert the column into the detector. Slide the nut and ferrule up the column to the detector base. Finger-tighten the column nut until it grips the column.

   d. Adjust the column (not the septum) position so that the septum is even with the bottom of the column nut. Tighten the nut an additional 1/4 turn with a wrench.

Positioning the column



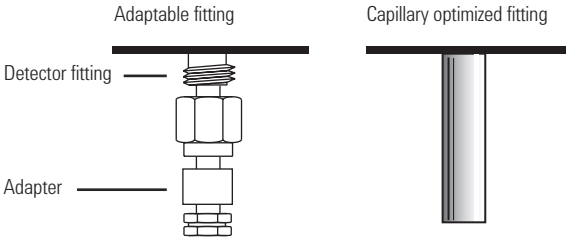
FID Jet Identification and Selection

Before ordering parts for FID maintenance, determine which type of FID is installed on your GC.
The FID is available in two versions:

- Dedicated, Capillary Optimized: for capillary columns only
- Adaptable: for packed or capillary columns

To determine the type of FID installed on your GC, open the oven door and examine the fitting at the base of the detector. Compare to the following diagram.

Hint: Adaptable jets are longer than dedicated capillary jets.



FID Jets

Description	Jet Tip ID	Length (mm)	Part No.
Jets for capillary optimized fittings			
Capillary	0.29 mm (0.011 in)	42.8	G1531-80560
Capillary Optimized for simulated distillation	0.47 mm (0.018 in)	42.8	G1531-80620
Jets for adaptable fittings			
Capillary	0.29 mm (0.011 in)	61.5	19244-80560
Capillary Optimized for simulated distillation	0.47 mm (0.018 in)	61.5	19244-80620
Packed	0.46 mm (0.018 in)	63.5	18710-20119
Packed, wide-bore Use with high-bleed applications	0.76 mm (0.030 in)	63.5	18789-80070



Plugged FID Jet, 19244-80560



Dedicated capillary, G1531-80560

Adaptable capillary, 19244-80560

Adaptable packed capillary, 18710-20119



FID cleaning kit, 9301-0985

Jet Cleaning Procedure

Use Agilent FID Cleaning Kit, part number 9301-0985

1. Run a cleaning wire through the top of the jet. Run it back and forth a few times until it runs smoothly. Be careful not to scratch the jet. (Do not force too large a wire or probe into the jet opening or the opening will become distorted. A loss of sensitivity, poor peak shape, and/or lighting difficulties may result if the opening is deformed.)
2. Fill an ultrasonic cleaning bath with aqueous detergent, and place the jet in the bath. Sonicate for five minutes.
3. Use a jet reamer to clean the inside of the jet.
4. Sonicate again for five minutes.

   Note: from this point on, handle the parts only with forceps!
5. Remove the jet from the bath and rinse it thoroughly, first with hot tap water and then with a small amount of GC-grade methanol.
6. Blow the jet dry with a burst of compressed air or nitrogen, and then place the jet on a paper towel and allow to air dry.

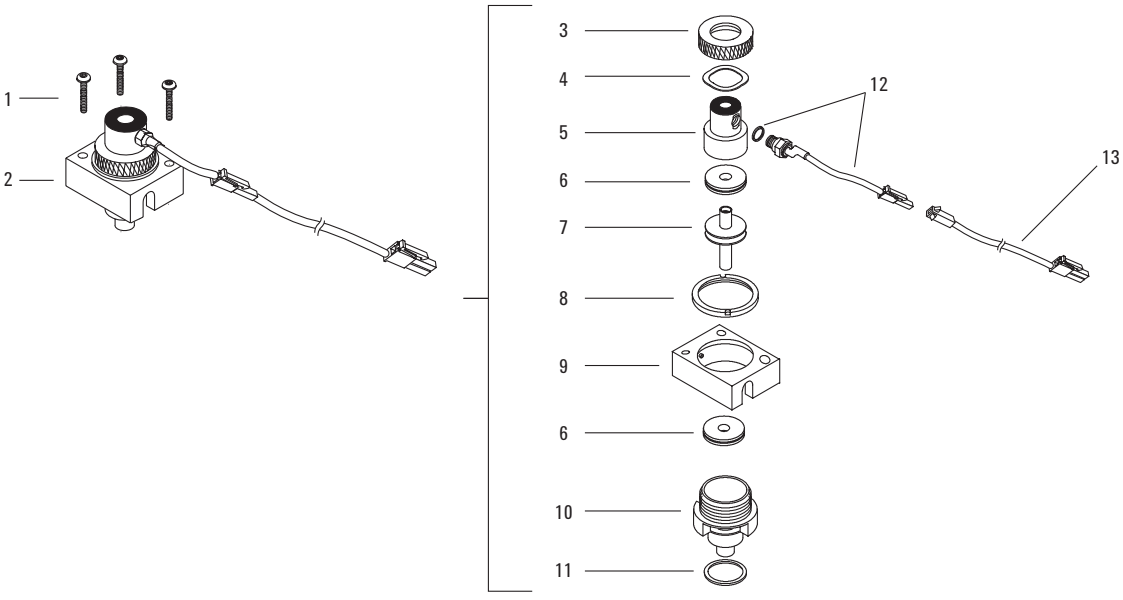
7890/6890/6850 Flame Ionization Detector (FID) Supplies

Item	Description	Unit	Part No.
	PTFE chimney (optional)		19231-21050
1	Screw, M4 x 25 mm, Torx T-20		0515-2712
2	FID collector assembly		G1531-60690
	FID collector cleaning brush	2/pk	8710-1346
	FID retainer nut wrench 5880, 5890, 6890		19301-00150
	1/4 in nut driver for FID jet, drilled shaft		8710-1561
3	Collector nut		19231-20940
4	Spring washer	10/pk	5181-3311
5	Ignitor castle		19231-20910
	Hastelloy ignitor castle (optional)		19231-21060
6	Collector insulator		G1531-20700
7	Collector body		G1531-20690
	Hastelloy collector body		G1531-21090
8	Nut, collector spanner		19231-20980
9	Collector mount		G1531-20550
10	Collector housing		G1531-20740
11	Silicone gaskets, 0.890-inch od/0.709-inch id, 12/pk		5180-4165
12	Ignitor glow plug assembly		19231-60680
13	FID ignitor cable, 7890A only		G3431-60680
	FID ignitor cable for 6890/6850 only		G1531-60680

(Continued)

7890/6890/6850 Flame Ionization Detector (FID) Supplies

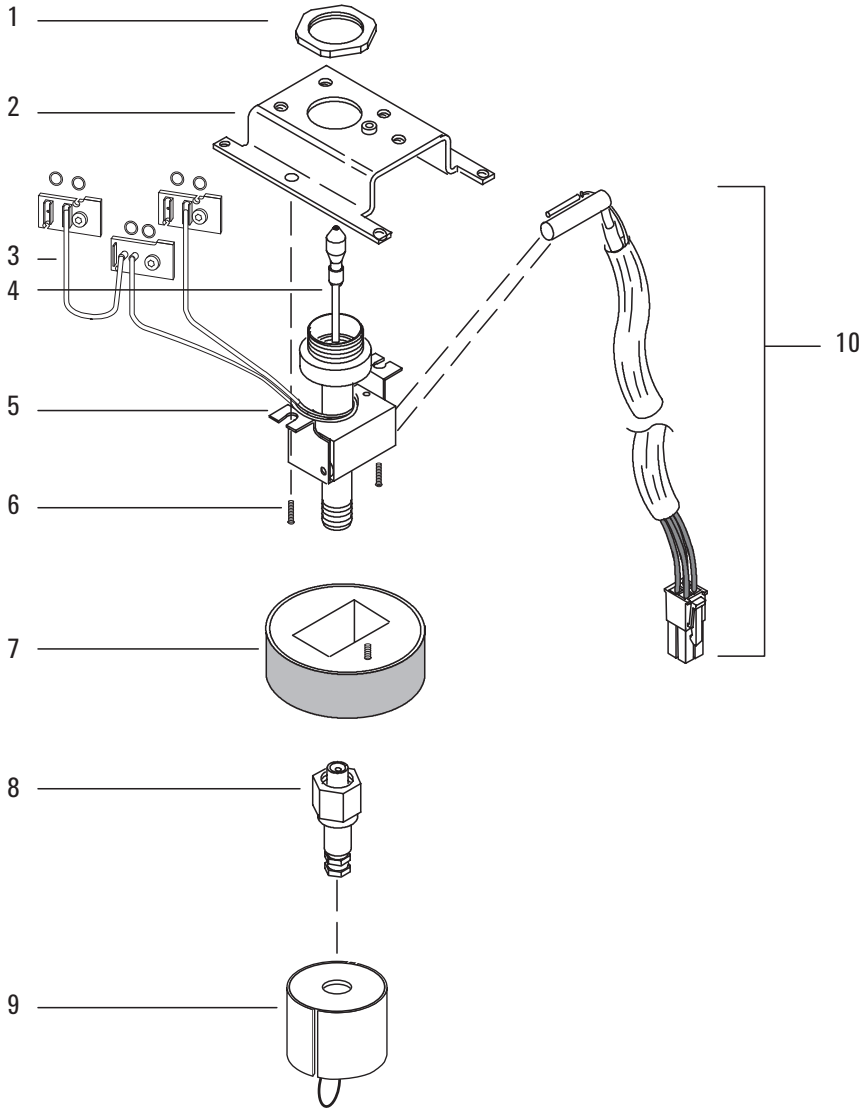
Item	Description	Unit	Part No.
	FID performance evaluation sample kit This sample is used for the HP 5880, 5890 and 6890 with a FID or TCD. Solution of 0.033% C14, C15, and C16 normal alkanes in hexane. Three 0.5 mL ampoules.		18710-60170
	FID MDL test sample for 7890 only 3 x 0.5 mL ampoules. Contains 2.36 mg/L n-Tridecane, 2.36 mg/L n-Tetradecane, 23.6 mg/mL n-Penta-decane, 23.6 mg/mL n-Hexadecane in iso-octane		5188-5372
	O-rings	12/pk	5080-4978
	FID/NPD adapter for capillary column		19244-80610
	FID/NPD 1/8 in packed column		19231-80520
	FID/NPD 1/4 in packed column		19231-80530
	1/4 in nut driver for FID jet, drilled shaft		8710-1561
	FID collector cleaning brush	2/pk	8710-1346
	FID Supplies Kit, Includes:		5182-3450
	Jet, packed standard 0.018 in id tip	3 each	18710-20119
	FID and TCD sample	2 each	18710-60170
	Ignitor glow plug assembly	2 each	19231-60680
	Jet, 0.011 in id tip, capillary adaptable	3 each	19244-80560
	FID flow measuring insert	2 each	19301-60660
	Cleaning wires for 0.03 in id jet	5/pk	5180-4150
	Cleaning wire for 0.018 in id/530 µm jet For use with 0.018 and 0.011 in id jets	5/pk	5180-4152
	Cleaning wire for 0.011 in id jet	5/pk	19301-20720
	Capillary inlet cleaning wires	5/pk	5180-4153
	FID cleaning kit		9301-0985



Flame Ionization Detector (FID) assembly

FID Base Assembly

Item	Description	Part No.
1	Base spanner nut	19231-20990
2	Thermal strap	G1531-00105
3	Screw, Torx T-10, M3 x 16 mm	G1946-20168
	Replacement O-rings	5180-4181
4	Jets	Turn to page 81.
5	Adaptable FID, base weldment with jet	G3431-80509
	Capillary column FID, base weldment with jet	G3431-80507
6	Screw, M4 x 25 mm, Torx T-20	0515-2712
7	FID block insulation	G1531-60700
8	Adaptable FID column adapters:	
	FID/NPD adapter for capillary column	19244-80610
	FID/NPD 1/8 in packed column	19231-80520
	FID/NPD 1/4 in packed column	19231-80530
9	Nut warmer insulation and cup assembly	19234-60720
10	Heater/sensor assembly	G1530-61950



FID Base Assembly



Electron Capture Detector (ECD)

The Agilent micro ECD is the most sensitive on the market, with a detection zone volume 10 times smaller than any other ECD. The replaceable liner serves as a physical stop for the column, ensuring reproducible column installation and decreasing column contamination of the cell.

Liner Selection

The only assembly that requires routine maintenance is the glass liner in the makeup gas assembly, especially for the µECD. All sample passes through the indent in the mixing liner of the µECD. The mixing liner should be replaced if there is a significant loss of sensitivity or any time the column is removed/reinstalled in the detector.

- Gigabore Liner (P/N 19233-20625): for original ECD design (5890 and 6890), brown, polyamide coating
- Mixing Liner (P/N G2397-20540): for µECD, clear glass with indent

Makeup Gas Adapter Maintenance/Installation Procedure

1. Remove the Makeup Gas Adapter from the ECD fitting with a 9/16 in wrench. Be careful not to stress the 1/16 in stainless steel gas supply tube.
2. Unscrew the end cap of the Makeup Gas Adapter and ultrasonically clean in solvent.
3. Remove the old liner.
4. Clean the Makeup Gas Adapter body with solvent in a Nalgene squeeze bottle.
5. Wipe the Makeup Gas Adapter with a clean laboratory wipe.
6. Install the replacement liner.
7. Reinstall the tip of the Makeup Gas Adapter and tighten securely.
8. Reinstall the Makeup Gas Adapter. Make sure it is fully inserted into the detector.
9. Reinstall the column.
10. Reinstall the insulation cup.

Thermal Cleaning

If your baseline is noisy or the output value is abnormally high (> 1000 Hz), and you have determined that these problems are not being caused by leaks in the GC system, you may have contamination in the detector from column bleed and sample residues. To remove contamination, you should perform a thermal cleaning (bakeout) of the detector. Bakeout the detector at 20 to 30 degrees higher than normal operating temperature (375 °C Max), with 50 to 100 mL/min of makeup gas flow.

WARNINGS & CAUTION

Detector disassembly and/or cleaning procedures other than thermal should be performed only by personnel trained and licensed appropriately to handle radioactive materials. Trace amounts of radioactive ^{63}Ni may be removed during other procedures, causing possible hazardous exposure to β and x-radiation.

Radioactivity Leak Test

Electron capture detectors must be tested for radioactive leakage at least every six months. Records of tests and results must be maintained for possible inspection by the Nuclear Regulatory Commission and/or responsible local agency. More frequent tests may be conducted when necessary.

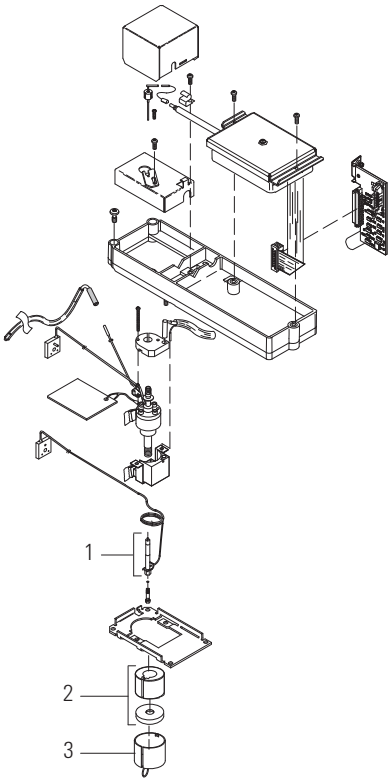
The procedure used is a "wipe test." A Wipe Test Kit is supplied with each new detector. Refer to the information card supplied in the kit for instructions on performing the test.

Gas Purity

For successful EC detection, it's important that the carrier and purge gases are very clean and dry (99.9995% minimum purity). Moisture, oxygen, or other contaminants can result in higher detector response but usually at the expense of both sensitivity and linear range. Always precondition the column before connection to the detector.

ECD Wipe Test

The Wipe Test Kit (P/N 18713-60050) included with each new ECD includes an information card with instructions for performing the test. Records of tests and results must be maintained for possible inspection by the Nuclear Regulatory Commission (NRC) and/or responsible state agency.



Electron Capture Detector (ECD) assembly

7890/6890/6850 Electron Capture Detector (ECD) Supplies

Item	Description	Part No.
1	Standard ECD makeup gas adapter*	G1533-80565
	Micro ECD makeup gas adapter	G2397-80520
	Micro ECD mixing liner, also compatible with standard ECD design	G2397-20540
	Gigabore liner for standard ECD, polyamide coating, not compatible with micro ECD	19233-20625
	ECD makeup gas adapter, 7890 only	G3433-63000
2, 3	Insulating cup	19234-60720
	ECD adapter end cap	19233-20755
	Vespel ferrule, 1/4 in	5080-8774
	1/4 in nut, brass	5180-4105
	Electron Capture Detector sample	18713-60040
	ECD test sample	5183-0379
	Micro ECD wipe test kit	18713-60050

*Includes one each of P/N 19233-20625 and 19233-20755

ECD WARNINGS

Although beta particles at this energy level have little penetrating power – the surface layer of the skin or a few sheets of paper will stop most of them – they may be hazardous if the isotope is ingested or inhaled. For this reason the cell must be handled with care. Radioactive leak tests must be performed at the required intervals, the inlet and outlet fittings must be capped when the detector is not in use, corrosive chemicals must not be introduced into the detector, and the effluent from the detector must be vented outside the laboratory environment.

Thermal Conductivity Detector (TCD)

The TCD compares the thermal conductivities of two gas flows – pure carrier gas (also called the reference gas) and carrier gas plus sample components (also called column effluent).

Filament Maintenance

The primary maintenance for a TCD involves the filament. Most procedures involve improving filament life or keeping the filament from becoming damaged or contaminated. To avoid filament damage and contamination:

- Check for leaks
- Use gas purifiers to remove oxygen
- Avoid chemically-active sample components, such as acids and halogenated compounds
- Turn off the filament when not in use

Increasing Filament Lifetime

Use the following startup process to increase filament lifetime:

Purge the detector with carrier and makeup gas for 10-15 minutes before turning on the filaments. This prevents oxidation of the filaments due to the presence of oxygen that has diffused into the cell under no flow conditions.

Cell Contamination

Cell contamination is a problem when a lower detector temperature is used to improve sensitivity. If the cell becomes contaminated, a solvent flush of the detector may help to remove the condensed material.

Solvent Flush

1. Cool the cell to room temperature and remove the column.
2. Place a septum in a nut or fitting assembly that fits onto the detector entrance (7 mm septum in a 1/8 in nut).
3. Place the nut or assembly on the detector fitting and tighten. Verify the presence of makeup gas flow.
4. Inject 20-100 µL volumes of toluene or benzene into the detector through the septum. Inject a total volume of at least 1 mL of solvent. Do not inject halogenated solvents such as methylene chloride and chloroform into the detector.
5. After the final injection, allow makeup gas to flow for 10 minutes or more. Slowly raise the temperature of the cell to 20-30 °C above the normal operating temperature.
6. After 30 minutes, decrease the temperature to the normal value and install the column as usual.

Thermal Cleaning

The TCD can become contaminated with deposits from such things as column bleed or dirty samples. A wandering baseline, increased noise level, or changes in response on a checkout chromatogram all indicate contamination. Thermal cleaning, or bakeout (heating the detector block to evaporate the contaminant), should be performed only after you have confirmed that the carrier gas and the flow system components are leak-free and contaminant-free.

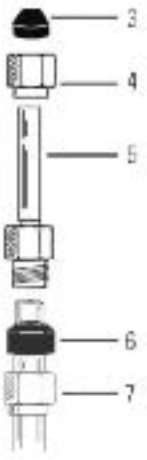
Watch out for decreased sensitivity caused by samples that react with the filament, originating from oxygen-contaminated carrier gas, leaks in plumbing, or column bleeding. Samples with active components, such as acids and halogenated compounds can chemically attack the filament as well. Also, sample condensation will contaminate the detector cell if the temperature is too low.

7890/6890/6850 Thermal Conductivity Detector (TCD) Supplies

Item	Description	Unit	Part No.
For 1/8 in SS Packed Column Installation			
1	Vespel/graphite ferrule, 1/8 in	10/pk	0100-1332
2	1/8 in nut, brass	10/pk	5180-4103
For 1/4 in SS Packed Column Installation			
3	Vespel/graphite ferrule, 1/8 in	10/pk	0100-1332
4	1/8 in nut, brass	10/pk	5180-4103
5	1/4 in packed column adapter		G1532-20710
6	Vespel ferrule, 1/4 in	10/pk	5080-8774
7	1/4 in nut, brass	10/pk	5180-4105
For Capillary Column Installation (Standard)			
	TCD capillary column adapter		G1532-80540
8	Vespel/graphite ferrule, 1/8 in	10/pk	0100-1332
9	1/8 in nut, brass	10/pk	5180-4103
	Universal column nut	2/pk	5181-8830
	6850 column nut	2/pk	5183-4732
	530 µm, 1.0 mm id graphite ferrule	10/pk	5080-8773
	320 µm, 0.5 mm id graphite ferrule	10/pk	5080-8853
	TCD sample		18711-60060
	FID and TCD sample		18710-60170



1/8 in SS packed column



1/4 in SS packed column


Standard design

Installing a Capillary Column in the TCD

WHAT YOU NEED:

- Front ferrule
- Back ferrule
- Column nut
- Column cutter
- 7/16 in wrench
- Lab tissue
- Lint-free gloves

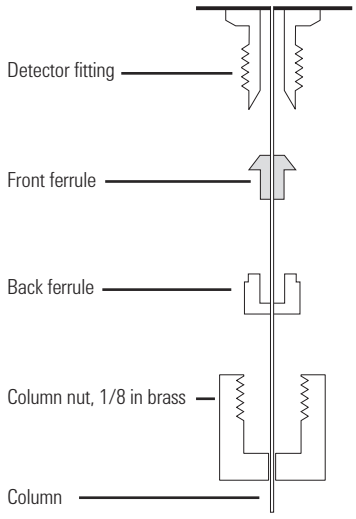
1. Gather the required supplies and tools.
2. Assemble the ferrules and 1/8 in brass Swagelok nut on the column.
3. Score the column using a glass scribing tool. The score must be square to ensure a clean break.
4. Break off the column end by supporting it against the column cutter opposite the scribe. Inspect the end with a magnifying loupe to make certain that there are no burrs or jagged edges.
5. Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
6. Insert the column into the detector until it bottoms.
7. Slide the column nut and ferrules up the column to the detector and finger tighten the nut.
8. Pull out 1 mm of column. Tighten the nut an additional 1/4 turn with a wrench or until the column does not move.

WARNINGS & CAUTION

- The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.
- Wear safety glasses to protect your eyes from flying particles while handling, cutting or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.
- Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

TCD Ferrules

Column ID (mm)	Back Ferrules	Front Ferrules, 10/pk
0.53	5182-3477	5182-9673
0.32	5182-3477	5182-9676
0.25/0.2/0.1	5182-3477	5182-9677
No hole	5182-3477	5182-9679
1/8 in nut, brass, 10/pk	5180-4103	



Determining the TCD Electronic Pressure Control (EPC)

If you have a 6890A or 6890A Plus GC, you may have an older design EPC flow manifold for the TCD. The older design requires removal of sheet metal panels to attach the TCD reference flow gas supply inside the GC. The new "Minifold" design allows TCD reference gas to be connected directly to the back of the GC. Replacement TCD filament block assemblies have different part numbers depending on the EPC design type.

Once you have determined the type of EPC module, consider ordering a passivated filament block assembly, which is recommended for fatty acid analysis or reactive/acidic samples.

TCD Filament Block Assemblies

Instrument	Passivated	Applications	Specifications	EPC Design	Part No.
7890A	Yes	Standard TCD Analysis Gases/Hydrocarbons	Complete Detector Assembly Includes detector palette and heater/sensor assembly	Original	G3432-60220
7890A	Yes	Standard TCD Analysis Gases/Hydrocarbons	Complete Detector Assembly Includes detector palette and heater/sensor assembly Third detector, side mounted	Original	G3432-60221
6890	No	Standard TCD Analysis Gases/Hydrocarbons	Filament Block Only Must reuse heater/sensor	Original	G1532-60675
6890	No	Standard TCD Analysis Gases/Hydrocarbons	Filament Block Only Must reuse heater/sensor	Minifold	G1532-60685
6890	Yes	Recommended for Fatty Acid Analysis	Filament Block Only Must reuse heater/sensor	Original	G1532-60690
6890/6850	Yes	Recommended for Fatty Acid Analysis	Filament Block Only Must reuse heater/sensor	Minifold	G1532-60695
6890/6850	No		Complete Detector Assembly Includes detector palette and heater/sensor assembly	Minifold	G2630-61230

Flame Photometric Detector (FPD)

In 2005, Agilent released an improved FPD with minimum detectable levels (MDL) of 3.6 pg/s for sulfur and 60 fg/s for phosphorus. This is more than a 5 times improvement for sulfur. The updated design is based on a one-piece, deactivated transfer line jet assembly and improved optics. Upgrade kits are available.

Operation

The FPD uses three gases: air and hydrogen to support the flame, and nitrogen makeup for capillary columns. The flow rates are critical for optimizing performance. Using nitrogen as a makeup gas is essential to obtaining low MDLs. Do not use helium for the makeup gas.

Recommended Gas Flows

Detector Gas Flows	Phosphorus Mode	Sulfur Mode
Air	100 mL/min	60 mL/min
Hydrogen	75 mL/min	50 mL/min
Nitrogen makeup	60 mL/min	60 mL/min

Maintenance

Managing gas purity; contamination from column bleed, sample residue, and corrosion; and air leaks can help keep your FPD at peak performance.



Glow plug, 0854-0141

Gas Purity

Sulfur contamination is a common problem and causes noise and/or a higher baseline offset in the FPD. To minimize sulfur contamination and achieve the lowest MDLs, use at least 99.9995% pure gases, clean tubing, and regulators with metal diagrams. To protect your FPD over its lifetime, Agilent recommends gas generators or supply gas filters designed to remove sulfur.

For more information on Gas Clean Filters, see pages 132-133

Contamination

The FPD is susceptible to build up of residue on the surfaces of the ignitor coil, jet, combustion chamber, and chamber window. The residue increases detector offset and reduces the signal-to-noise ratio. The sample or column bleed usually cause the residue. After a period of time, you may need to rebuild the detector and replace the transfer line. Do not clean the transfer line, jet, or other parts with brushes or solvents.

To increase the time between servicing, remove the column, cap off the detector, and run it at 250 °C with the flame to bake off some of the residue. Replacing the ignitor may reduce baseline output. If these tactics are not effective, rebuild the detector.

If your solvent or sample is corrosive, it can erode the aluminum vent tube. Agilent recommends using alternative stainless steel vent tubes for these applications.

Air Leaks

The original FPD design has three more internal seals than the new design. Temperature cycling of the detector causes the ferrules to shrink and leaks to occur. The most common leaks are around the fused silica transfer line. To eliminate these leaks, remove the detector from the GC and tighten the transfer line fittings.

For both the original and new FPD, leaks can develop at the column nut or capillary column adapter, the gang fitting at the EPC module, around the vent tube, or around the ignitor glow plug. If you are replacing fittings or O-rings, always use conditioned, graphitized-vespel ferrules and Agilent's low sulfur O-rings. Make sure ferrules are the correct size for your column.

Flame Ignition Problems

You can tell if your FPD is lit by checking the detector "Output" and "Flame" on the display. The detector senses that the flame is on by comparing the output with the offset. An optimized FPD normally runs with an output in the range of 30 to 80 with the offset point at 2.0. If the flame is out and the electrometer is on, the output usually displays less than 1.

Most FPD ignition problems are caused by incorrect gas flows, incorrect column installation, or a dirty or defective ignitor. To troubleshoot:

1. Make sure the FPD is at operating temperature before trying to light.
2. Remove the rubber drip tube while lighting the FPD.
3. Increase air supply pressure by 10-20 psi.
4. Check the detector gas flows to see if they match the Recommended Gas Flows table.
5. Check the detector output when you turn the flame on. The photomultiplier will see the glow of the ignitor and jump to about 68000 pA.
6. Remove the column and check the tip for residue or burnt polymide coating. If it appears damaged, cut off the damaged portion and reinstall to the proper height.
7. Remove the ignitor glow plug. If dirty or damaged, replace it.

Less common problems include leaks, quenching, and condensation:

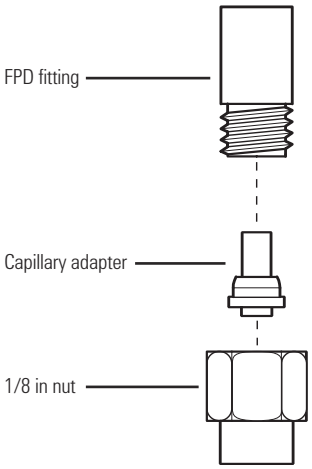
- Large air leaks at the inlet or detector can reduce the percentage of the hydrogen-air mixture at the detector and cause ignition problems.
- Large injections of certain samples can cause flameouts or quenching that cause the detector to attempt to relight, interrupting your analysis.
- Condensation is a by-product of the burning of your sample. For many analyses, the liquid is collected from the vent tube. If the liquid drips back into the detector, it will extinguish the flame. Agilent recommends that you wait to light the flame until the detector is at temperature and equilibrated.
- Light leaks at the vent tube can cause a higher baseline offset. Make sure the vent tube ferrule seals tightly against the emission block. Keep the lid closed over the detector.

TIPS & TOOLS

Helium is not a good makeup gas for the FPD. You will not be able to light or keep the detector lit in the sulfur mode with helium.

Installing a Capillary Column Adapter to the FPD

1. Gather the required supplies and tools.
2. Load the GC maintenance method and wait for the GC to become ready.
3. Insert the capillary adapter into the 1/8 inch nut as shown, then thread the nut onto the detector fitting.
4. Finger-tighten the nut, then tighten an additional 1/8 turn with a wrench.



WHAT YOU NEED:

- FPD capillary column adapter
- Column cutter
- 1/4 in and 9/16 in wrenches
- Metric ruler
- 1/8 in nut
- Lint-free gloves

WARNINGS & CAUTION

- The oven and/or inlet may be hot enough to cause burns. If either is hot, wear heat-resistant gloves to protect your hands.
- Wear safety glasses to protect your eyes from flying particles while handling, cutting or installing glass or fused silica capillary columns. Use care in handling these columns to prevent puncture wounds.
- Wear clean, lint-free gloves to prevent contamination of parts with dirt and skin oils.

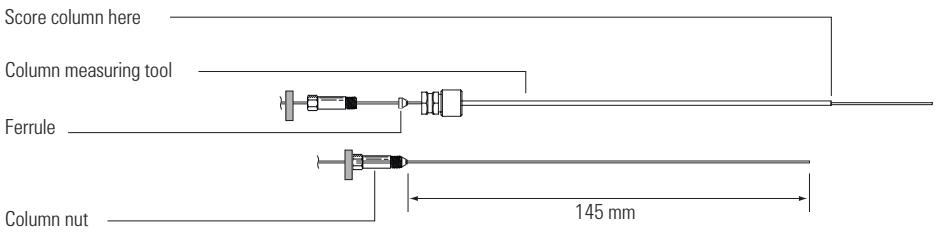
WHAT YOU NEED:

- Column measuring tool, P/N 19256-80640
- Column cutter
- 1/4 in and 7/16 in wrenches
- Column nut
- Ferrule
- Capillary column
- Lint-free gloves

Attaching a Capillary Column to the FPD

1. Gather the required supplies and tools.
2. Load the GC maintenance method and wait for the GC to become ready.
3. Assemble a septum, column nut, and ferrule on the end of the column.
4. Insert the end of the column through the column measuring tool so that the end protrudes beyond the tool.
5. Tighten the column nut until it grips the column. Tighten the nut an additional 1/8 to 1/4 turn with a pair of wrenches. Snug the septum against the base of the column nut.
6. Use a wafer cutter at 45° to score the column.
7. Snap off the column end. The column may protrude about 1 mm beyond the end of the tool. Inspect the end with a magnifying loupe to make certain that there are no burrs or jagged edges.
8. Remove the column, nut, and swaged ferrule from the tool.
9. Wipe the column walls with a tissue dampened with isopropanol to remove fingerprints and dust.
10. Verify that a capillary adapter is installed in the detector fitting.
11. Carefully thread the swaged column up into the adapter. Finger-tighten the column nut, then use a wrench to tighten an additional 1/8 turn.

If you are using a capillary column, the tip of the column must be at least 1 mm below the surface of the jet. When you install the column, measure the distance from the sealing surface of the ferrule to the tip of the column. This measurement is 153 mm for the original FPD and 145 mm for the new FPD. For the new design, Agilent recommends using the column measuring tool, part number 19256-80640.

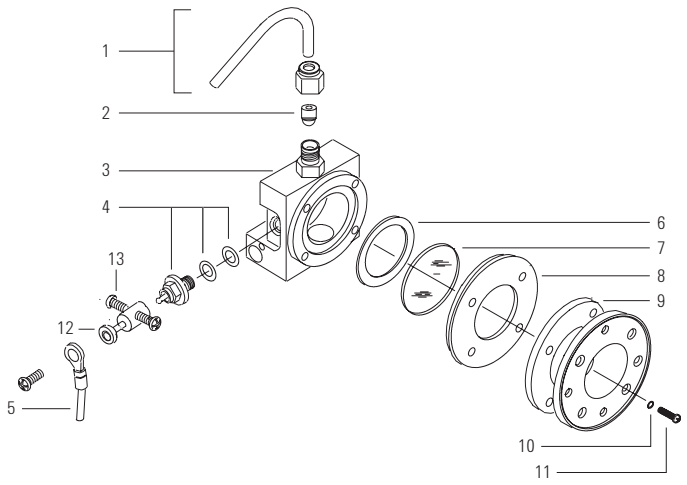


7890/6890/6850 FPD Ignitor and Heat Shield Assembly

Item	Description	Part No.
1	FPD Exit Tube Assembly	
	Aluminum	19256-60700
	Stainless steel	19256-20705
2	Vespel ferrule, 1/4 in, 10/pk	5080-8774
3	Emission chamber	
	FPD, single	19256-80560
	FPD, dual	19256-80600
4	FPD ignitor replacement kit	19256-60800
	O-ring, size 2-010	0905-1610
	Spacer, ignitor	19256-20590
	Glow plug	0854-0141
5	Ignitor cable assembly	G1535-60600
6	Heat shield gasket, white	19256-80045
7	First heat shield window	19256-80030
8	Heat shield disk	19256-20580
9	Stainless steel coupling	19256-20550
10	Lock washer (4 required)	2190-0584
11	Screw, M3 x 12 mm, T10 (4 required)	0515-1084
12	Collar	19256-20690
13	Screw, M3 x 66 mm, T10	0515-0680
	FPD check out sample	5188-5953
	FPD sample	5188-5245



Glow plug, 0854-0141



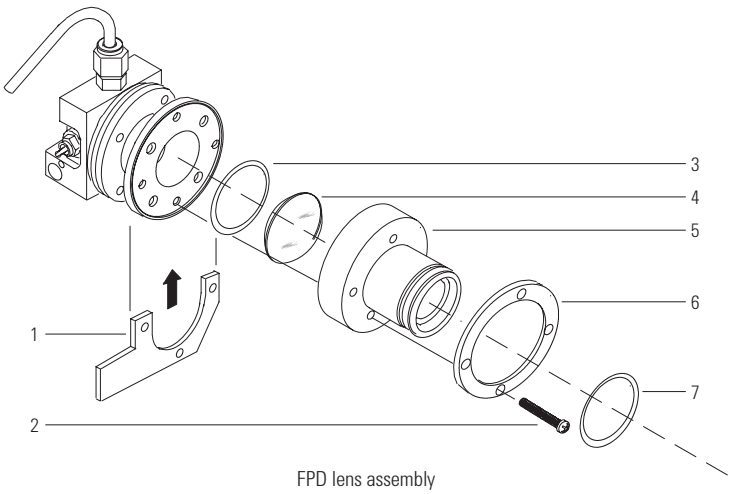
FPD ignitor and heat shield assembly

FPD Lens Assembly

Item	Description	Part No.
1	Clamp	19256-00090
2	Screw, M3 x 25 mm (4 required)	0515-0683
3	Window O-ring, inner, 0.926 in id, orange	5061-5886
4	Convex lens	1000-1438
5	Lens housing	19256-20900
6	Flange ring	19256-00200
7	Fluorocarbon Elastomer O-ring, brown, 1.239 in id	5061-5890

TIPS & TOOLS

Track detector output – when it increases by 50%, remove the column, bake it out, replace the ignitor, or rebuild the detector.



FPD lens assembly

FPD Photomultiplier Tube (PMT) and Bracket Assemblies

Description	Part No.
Chimney back cover	G1535-80520
Heator/sensor assembly	G1535-60610
Transfer line support bracket	19256-00320
Bracket/support	G1535-00010
Sulfur filter, 7890 and late model 6890*	1000-1437
Sulfur filter, blue, early model 6890*	19256-80000
Phosphorus filter, yellow	19256-80010
Filter spacer (used only with sulfur filter)	19256-20910
PMT housing assembly	19256-60510
Dual FPD chimney front	G1535-00030

*Please contact Agilent technical support for assistance in selecting the correct sulfur filter for your 6890 FPD detector.

Nitrogen Phosphorus Detector (NPD)



NPD Beads

The NPD for the 7890/6890 GC features a ceramic bead selective for nitrogen and phosphorous compounds. Agilent offers three beads:

- Blos bead
- White ceramic bead
- Black ceramic bead

Compared to the white ceramic bead, the new Blos bead provides:

- Superior bead lifetime
- Faster attainment of stable operation at initial start-up, as well as more stable operation throughout bead's lifetime
- Superior sensitivity and selectivity for phosphorous-containing compounds
- Similar sensitivity and selectivity for nitrogen-containing compounds
- Superior immunity to moisture

The white ceramic bead exhibits some tailing for phosphorous compounds. The black ceramic bead does not exhibit peak tailing and typically has a longer lifetime than the white bead; however, it is less sensitive.

All Agilent NPD beads are preconditioned, self-aligning for installation and include a proof-of-performance chromatogram.

NPD Beads

Description	Part No.
Blos NPD bead assembly	G3434-60806
NPD white ceramic bead assembly	G1534-60570
NPD black ceramic bead assembly	5183-2007



Blos NPD bead assembly, G3434-60806



NPD Gas Flow

The hydrogen, air and makeup gas flows should be measured frequently. They can drift over time or be changed unintentionally without knowledge of it occurring. Each gas flow should be measured independently to obtain the most accurate values. NPDs are very sensitive to changes in the gas flows and consistent flows are necessary to maintain performance levels.

Measuring NPD Flows

1. Set the bead voltage to 0.0 V.
2. Cool the NPD to 100 °C.
3. Remove the bead and store it carefully until re-installation.
4. Insert the NPD flow meter adapter tool into the NPD collector.
5. Attach the flow-measuring insert to the NPD flow meter adapter tool.
6. Place the flow meter tubing over the flow-measuring insert to begin measuring flows.

NPD Gas Purity

Because of its high sensitivity, the NPD requires very pure gases (99.999% or better). We strongly recommend that moisture and hydrocarbon traps be used on the carrier gas and all detector gases, including the detector hydrogen, air, and makeup gases. Dirty gases will not only give poor chromatographic performance, but will shorten the bead life as well.

TIPS & TOOLS

Agilent has a comprehensive offering of GC columns, designed and manufactured to provide excellent and reproducible performance for the benign to the most difficult types of samples. Learn more at **www.agilent.com/chem/mygccolumns**



Cleaning and Replacement

The NPD requires periodic cleaning. In most cases, this only involves the collector and the jet. Agilent provides brushes and wires that simplify the cleaning of all detector parts. The brushes are used to dislodge particulates clinging to the metal surfaces. A fine wire is used to clean the jet opening of particulates. Do not force too large a wire or probe into the jet opening or the opening will become distorted. A loss of sensitivity or poor peak shape may result if the opening is deformed. The various parts can be ultrasonicated after cleaning with a brush. Eventually the jet needs to be replaced, so it is strongly recommended to have spare jets on hand.

Over time, residue from the bead or sample can build up in the collector and cause baseline problems. You should clean the collector after you have damaged the bead two or three times.

The metal C-rings wear slightly with each assembly and disassembly. After several assemblies and disassemblies (five or more), the rings may not seal effectively, causing an erratic baseline. A ceramic insulator and seal kit is available (P/N 5182-9722). Always cool the detector to near-ambient when changing seals and insulators.

Because there is no flame in the NPD, the jet does not collect silica and soot as does the FID jet. Although you can clean the jet, it is more practical to simply replace dirty jets with new ones. If you do clean the jet, use the cleaning wire, taking care not to damage the inside of the jet. You can also use a sonicator bath to clean the jet.

Contaminants

Some chemical problems can also arise when using the NPD. Because it is a trace detector, be careful not to contaminate the analytical system.

Glassware

Glassware must be very clean. Phosphate detergents should be avoided, so acid washing of glassware followed by distilled water and solvent rinsing is recommended.

Solvents

Solvents should be checked for purity. Chlorinated solvents and silanizing reagents can decrease the useful lifetime of the alkali source; excess reagent should be removed prior to injection, if possible.

Other Contamination Sources

Phosphate-containing leak detectors, phosphoric acid-treated columns or glass wool, polyimide-coated columns, or nitrogen-containing liquid phases can add noise to the system and should be avoided.

NPD Jet Identification and Selection

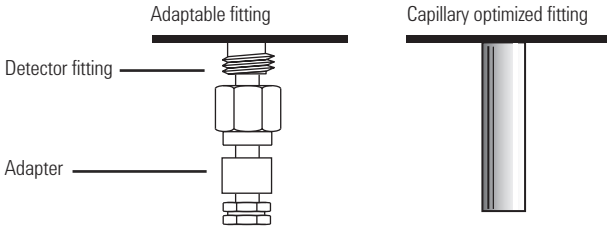
Before ordering parts for NPD maintenance, determine which type of NPD is installed on your GC. The NPD is available in two versions:

- Dedicated, Capillary Optimized: for capillary columns only
- Adaptable: for packed or capillary columns

Hint: Adaptable jets are longer than dedicated capillary jets.

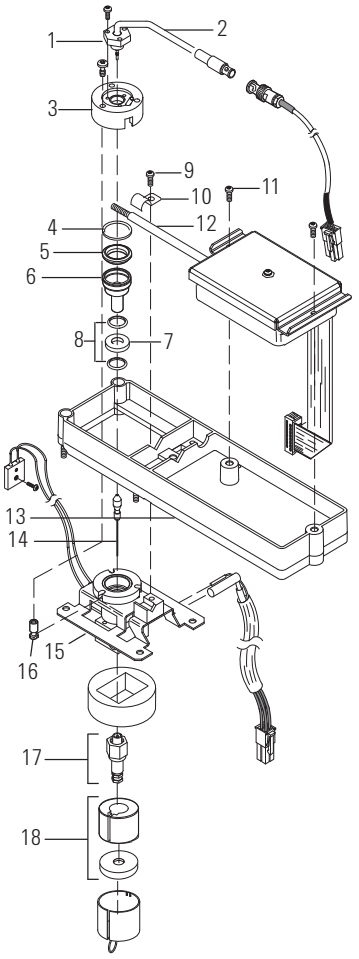
NPD Jets

Description	Jet Tip ID	Length (mm)	Part No.
Jets for capillary optimized fittings			
Capillary with extended jet (recommended)	0.29 mm (0.011 in)	51.5	G1534-80580
Capillary	0.29 mm (0.011 in)	42.8	G1531-80560
Capillary	0.47 mm (0.018 in)	42.8	G1531-80620
Jets for adaptable fittings			
Capillary with extended jet (recommended)	0.29 mm (0.011 in)	70.5	G1534-80590
Capillary	0.29 mm (0.011 in)	61.5	19244-80560
Capillary	0.47 mm (0.018 in)	61.5	19244-80620
Packed	0.46 mm (0.018 in)	63.5	18710-20119



7890/6890/6850 Nitrogen Phosphorus Detector (NPD) Supplies

Item	Description	Part No.
1	Screws, M3 x 0.5, 8 mm (Pozidriv)	0515-0655
2	NPD white ceramic bead assembly	G1534-60570
	NPD black ceramic bead assembly	5183-2007
3	Lid weldment	G1534-80510
4	Metal C-ring, top	0905-2580
5	Alumina insulator, upper	G1534-40020
6	Collector funnel	G1534-20530
7	Alumina insulator, lower	G1534-40030
8	Metal C-ring, bottom	0905-1284
9	Screw, M4 x 07, 10 mm	0515-2495
10	J-Clamp	1400-0015
11	Screw, M4 x 07, 10 mm	0515-2495
12	NPD interconnect assembly	G1534-60610
13	Mounting pallet	G1531-40020
14	Jet, 0.011 in/0.29 mm id tip, capillary dedicated	G1531-80560
	Jet, 0.011 in id tip, capillary adaptable	19244-80560
	Jet, packed standard 0.018 in id tip	18710-20119
15	Base weldment, capillary NPD for 6890/6850 only	G1534-80500
	Base weldment, packed NPD for 6890/6850 only	G1534-80540
	Base weldment, capillary NPD, 7890A	G3434-67500
	Base weldment, packed NPD, 7890A	G3434-67540
16	Lid stop	G1534-20590
	NPD ceramic insulator kit Includes items 4, 5, 7, and 8	5182-9722
17	FID/NPD adapter for capillary column	19244-80610
	FID/NPD 1/8 in packed column	19231-80520
	FID/NPD 1/4 in packed column	19231-80530
18	Insulating cup	19234-60720
	Vespel ferrule, 1/4 in, 10/pk	5080-8774
	530 µm, 1.0 mm id graphite ferrule, 10/pk	5080-8773
	320 µm, 0.5 mm id graphite ferrule, 10/pk	5080-8853
	1/4 in nut, brass, 10/pk	5180-4105
	Universal column nut, 2/pk	5181-8830
	Nitrogen Phosphorus Detector sample	18789-60060



Nitrogen Phosphorus Detector (NPD) assembly



Nitrogen Chemiluminescence Detector (NCD)

Nitrogen and Sulfur Chemiluminescence Detectors

The Agilent 355 Sulfur Chemiluminescence Detector (SCD) is the most sensitive and selective chromatographic sulfur detector available for the analysis of sulfur compounds.

The Agilent 255 Nitrogen Chemiluminescence Detector (NCD) is a nitrogen-specific detector that produces a linear and equimolar response to nitrogen compounds based on a chemiluminescent reaction of NO with ozone. Even complex sample matrices can be analyzed with little or no interference.



Dual plasma burner accessory kit, G6600-60038



Replacement oil coalescing filter, G6600-80042



Replacement oil coalescing filter for oil mist filter, G6600-80044



Replacement odor filtration element, G6600-80045

Nitrogen Chemiluminescence Detector (NCD) Supplies

Description	Part No.
Dual plasma burner accessory kit Includes ferrules, fittings and quartz tube	G6600-60038
PM Kit, DP RV5 oil pump Includes 6 chemical traps for ozone destruction, 3 oil coalescer elements and 4 (1 qt) bottles of synthetic oil	G6600-67007
PM Kit, dry piston pump Includes 4 chemical traps for ozone destruction and 2 repair kits for pump	G6600-67008
12-month maintenance kit Includes 6 qt oil, 12 chemical traps, 4 oil filter elements, 2 sets of ceramic tubes, and 2 O-rings	G6600-67009
Replacement oil coalescing filter	G6600-80042
Oil mist filter for RV5 pump	G6600-80043
Replacement oil coalescing filter for oil mist filter	G6600-80044
Replacement odor filtration element	G6600-80045
O-ring, 1.3614 in id	G6600-80050
O-ring, 1.301 in id	G6600-80051
Dual plasma quartz tube	G6600-80063
Mobil 1 synthetic oil	G6600-85001
Oil, Edwards Ultragrade for RV3 and RV5 pumps	G6600-85002
Spare column nut and ferrule kit	G6600-80018

Sulfur Chemiluminescence Detector (SCD) Supplies

Description	Part No.
PM Kit, dry piston pump Includes dry piston seal, 6 Moleculite vacuum pump traps and 1 set of ceramic tubes	G6600-67006
PM Kit, dry piston pump Includes 4 chemical traps for ozone destruction and 2 repair kits for pump	G6600-67008
Dual plasma burner accessory kit	G6600-60037
Mobil 1 synthetic oil	G6600-85001
Oil mist filter for RV5 pump	G6600-80043
Oil, Edwards Ultragrade for RV3 and RV5 pumps	G6600-85002
O-ring, 1.301 in id	G6600-80051
Ozone destruction chemical trap	G6600-85000
Replacement oil coalescing filter for oil mist filter	G6600-80044
Sulfur chemiluminescence test sample	G2933-85001
Sulfur trap For carrier H_2 and air gases; one required for each cylinder of gas (3 total)	G2933-85003
Spare column nut and ferrule kit	G6600-80018

Miscellaneous Instrument Parts and Supplies

Description	Part No.
Oven exhaust deflector for 6890	G1530-80650
Oven exhaust deflector for 6850	G2630-60710



Sulfur Chemiluminescence Detector (SCD)



PM kit, G6600-67008



Dual plasma burner accessory kit, G6600-60037



Oil mist filter, G6600-80043

GC Standards

GC Qualitative Standards

Description	Part No.
Qualitative Simulated Distallation Standards	
Boiling Point Calibration Sample No. 1	5080-8716
Low Boiling Point Calibration Sample No. 220	5080-8768
Boiling Point Calibration Sample No. 320	5080-8769
PolyWax 500, 1 g, neat	5188-5316
PolyWax 655, 1 g, neat	5188-5317
Qualitative Petrochemical Standards	
Alcohol in Gasoline Sample	18900-60640
Natural Gas Sample	5080-8756
Transformer Gas Sample	5080-8759
Refinery Gas Sample	5080-8755
Reference Gas Oil No. 1, Batch 2	5060-9086
Miscellaneous Qualitative Standards	
Nickel Catalyst Test Sample	19354-60510
Nickel Catalyst refill	5080-8761
MIDI System Calibration Standard	19298-60500
Oral Fluids Analyzer Test Sample	G1540-85010

GC/MS Parts and Supplies



Your mass spectrometer is a sensitive, specialized device that delivers a higher level of functionality than other GC detectors. To continue achieving optimal results, it is critical to maintain your system properly by performing the essential tasks within this section. Some of the benefits of maintaining your GC/MSD include:

- Less downtime for repairs
- Longer lifetime for your MSD system
- Reduction in overall operating costs

It is advisable to keep a log book of system performance, Autotune, and maintenance operations performed. This makes it easier to identify variations from normal performance and to take corrective action.

Maintenance Schedule

Task	Every week	Every 6 months	Every year	As needed
Tune the MSD				✓
Change injection port liners	✓			
Check the foreline pump oil level	✓			
Gas ballast the foreline pump	✓			
Check the calibration vial		✓		
Replace the foreline pump oil		✓		
Check the diffusion pump fluid	✓			
Replace the diffusion pump fluid			✓	
Replace the dry pump diaphragm seals (MVP55)				✓
Replace the dry pump tip seals (IDP3)			✓	
Replace the traps and filters			✓	
Clean the ion source				✓
Change the carrier gas trap(s) and purifier				✓
Replace worn out parts				✓
Lubricate seals (where appropriate)				✓
Replace column				✓

MSD Contamination

Contamination is usually identified by excessive background in the mass spectra, which can come from the GC or MSD. The source of contamination can sometimes be determined by identifying the contaminants. Some contaminants are much more likely to originate in the GC, while others are likely to originate in the MSD.

Contamination Sources in the GC

- Column or septum bleed
- Dirty injection port
- Injection port liner
- Contaminated syringe
- Poor quality carrier gas
- Dirty carrier gas tubing
- Fingerprints
- Air leaks
- Cleaning solvents and materials

Contamination Sources in the MSD

- Air leaks
- Cleaning solvents and materials
- Fingerprints inside the manifold
- Diffusion pump fluid
- Foreline pump oil

The action required to remove contamination depends on the type and level of contamination. Minor contamination by water or solvents can usually be removed by allowing the system to pump (with a flow of clean carrier gas) overnight. Serious contamination by rough pump oil, diffusion pump fluid or fingerprints is much more difficult to remove and may require extensive cleaning.

Air Leaks

Air leaks are a problem for any instrument that requires a vacuum to operate. Leaks are generally caused by vacuum seals that are damaged or not fastened correctly.

Symptoms of leaks

- Higher than normal vacuum manifold pressure or foreline pressure
- Higher than normal background
- Peaks characteristic of air (m/z 18, 28, 32, and 44 or m/z 14 and 16)
- Poor sensitivity
- Low relative abundance of m/z 502 (this varies with the tune program and MSD used)

Remedy

- Check interface nut for tightness. Replace if necessary.
- Check and leak test the GC injection port.

Leaks can occur in other places in the MSD, including the following:

- GC/MSD interface column nut
- Side/top plate O-ring (all the way around)
- Vent valve O-ring
- Calibration valve
- High vacuum gauge tube/controller fitting
- Cracked ion gauge tube (5973/5972/5971)
- Front and rear end plate O-rings
- GC/MSD interface O-ring (where the interface attaches to the vacuum manifold)
- Diffusion pump co-seal
- Baffle adapter O-ring
- Turbomolecular pump O-ring
- Vespel/Graphite ferrules, when heated



Cleaning Solvents

It is common to see cleaning solvent peaks in the mass spectra shortly after the ion source is cleaned.

Remedy

- Dry all cleaned metal parts in the GC oven before reassembling and reinstalling them. Refer to specific cleaning procedures in your MSD Hardware Manual or MSD Maintenance and Troubleshooting Manual.
- Use a temperature above the boiling point of the solvent but below the limit of the column.

Fingerprints

Fingerprints contain hydrocarbons that can appear in mass spectra. Hydrocarbon contamination is characterized by a series of mass peaks 14 m/z apart. The abundances of these peaks decrease as peak mass increases. Fingerprint contamination is usually caused by the failure to wear lint-free, nylon gloves during ion source cleaning, GC inlet maintenance, or from installing the column. Use special care to avoid recontamination of parts after you clean them. This typically occurs after some maintenance or part replacement.

Remedy

Reclean using clean, nylon gloves and proper cleaning techniques.

MSD Contamination Identification

The following table lists some of the more common contaminants, the ion characteristics of those contaminants, and the likely sources of those contaminants.

Common Contaminants

Ions (m/z)	Compound	Possible Source
13, 14, 15, 16	Methane	CI gas
18, 28, 32, 44 or 14, 16	H_20, N_2, O_2, CO_2, CO_2 or N, O	Residual air and water, air leaks, outgassing from Vespel ferrules
31, 51, 69, 100, 119, 131, 169, 181, 214, 219, 264, 376, 414, 426, 464, 502, 576, 614	PFTBA and related ions	PFTBA (tuning compound)
31	Methanol	Cleaning solvent
43, 58	Acetone	Cleaning solvent
78	Benzene	Cleaning solvent
91, 92	Toluene or Xylene	Cleaning solvent
105, 106	Xylene	Cleaning solvent
151, 153	Trichloroethane	Cleaning solvent
69	Foreline pump fluid or PFTBA	Foreline pump oil vapor or calibration valve leak
73, 147, 207, 221, 281, 295, 355, 429	Dimethylpolysiloxane	Septum bleed or methyl silicone column coating
77, 94, 115, 141, 168, 170, 262, 354, 446	Diffusion pump fluid	Diffusion pump fluid and related ions
149	Plasticizer (phthalates)	Vacuum seals (O-rings) damaged by high temperatures, use of vinyl or plastic gloves
Peaks spaced 14 amu apart	Hydrocarbons	Fingerprints, foreline pump oil

The easiest way to insure that you minimize background contamination and remove damaging oxygen from your carrier gas system is to use a carrier gas purifying trap right before the gas enters your GC system.

Column bleed generally appears as a continuous and increased rise in the baseline at higher column temperatures, especially at or near the upper temperature limit of the GC column. Septum bleed usually appears as discrete peaks, and can occur at any temperature.

A crude sign of a "leak-free" MS system is when the ion ratio of m/z 28 (nitrogen) over m/z 32 (oxygen) is approximately two or greater.

Even preconditioned ferrules can shrink slightly at very high temperatures. If leak problems persist upon a new column installation, check this fitting first.

Mass Spectrometer Symptoms

Mass spectrometer symptoms can typically be classified as either affecting system sensitivity or affecting the repeatability of a measurement. Most symptoms can be corrected by following the suggested corrective actions.

Mass Spectrometer Symptoms

Symptoms	Remedy
Sensitivity	
Wrong retention time	Check GC, method, application and carrier gas velocity.
Low signal	Check GC, tune vacuum system.
Leaking injection port	Clean the injection port. Replace the injection port liner and septa.
Air leak	Check and tighten interface nut, leak test GC injection port.
Peak widths	Do Autotune, check flow rate and temperature stability.
Interfering peaks	Check time parameters, coeluting peaks, column type.
Excessive background	Do Autotune and compare to background specifications. Check time parameters.
Incorrect mass assignment	Retune.
Abnormal spectra – excessive background contamination	Check for contamination.
Incorrect tuning	Check tune file, retune, check sample.
Repeller voltage is too low	Raise voltage to test for response.
Dirty ion source	Clean source.

(Continued)

Mass Spectrometer Symptoms

Symptoms	Remedy
Repeatability	
Dirty syringe needle	Clean or replace the syringe.
Wrong syringe needle	Replace syringe and septa.
Leaking injection port	Perform injection port maintenance. Replace the injection port liner, septa and liner O-ring.
Injection is too large	Check method and injection volume, split ratio and/or splitless purge time.
Loose column connections	Tighten column nuts on injection port or transfer line. Replace column nuts and ferrule.
Variations in pressure, column flow and temperature	Ensure the MSD is located in an environment where the temperature is stable. Keep MSD out of drafts and direct sunlight. Check that the carrier gas is steady and well regulated. Service the foreline pump and/or diffusion pump.
Dirty ion source	Clean source.
Loose connections in the analyzer	Check internal and external analyzer wiring conections, make sure all are secure.
Ground loops	Check main electrical lines.



5975 MSD

Cleaning and Maintenance Supplies

Description	Part No.
One Year Maintenance Kit (for diffusion pump systems) Includes Big Universal Trap for He (1/8 in), abrasive sheets (5/pk), lint-free cloths (15/pk), cotton swabs (100/pk), SantoVac Ultra, 18.5 mL (2 each), rough pump oil (1 L), filament assembly, octafluoronapthalene (OFN)	5183-2096
Nylon gloves, lint-free, large, 1 pair	8650-0030
Nylon gloves, lint-free, small, 1 pair	8650-0029
Lint-free industrial wipes, 100% cotton, 9 x 9 in, 300/pk	9310-4828
Ion source cleaning kit Includes lint-free cloths (15/pk), abrasive sheets (5/pk), cotton swabs (100/pk), lint-free nylon gloves, abrasive Alumina powder	5181-8863
Cloths, lint-free, 15/pk	05980-60051
Cotton swabs, 100/pk	5080-5400
Abrasive sheets, aluminum oxide green lapping paper, 600 mesh, 5/pk	5061-5896
Alumina powder, abrasive, 1 kg	8660-0791
PFTBA sample, certified, 10 g, 5.32 mL	8500-0656
Replacement glass bulb for PFTBA and PFDTD test sample	G3170-80002
Replacement glass vial for PFTBA and PFDTD test sample	05980-20018
Activated alumina, absorbent pellets for Edwards rough pump traps, non-LC/MS, 1 lb can	8500-1233
MSD Tool Kit, 5975/5973 Includes source hold tool, lint-free cloth, cotton swabs, lint-free nylon gloves, abrasive sheets, wrenches and driving tools	G1099-60566
MSD Tool Kit, 5972/5971 Includes small cleaning rod, large cleaning rod, source hold tool, cotton swabs, lint-free nylon gloves, abrasive sheets, wrenches and driving tools	05971-60561

(Continued)

Cleaning and Maintenance Supplies

Description	Part No.
MS Interface Supplies	
MS interface column nut, female	05988-20066
Column nut for long or long two-hole ferrules	05921-21170
Universal column nut, 2/pk	5181-8830
MS interface column installation tool for 5973 and 5975	G1099-20030
Column installation tool for 5975T	G3880-20030
Tools	
Screwdriver, 3 in Pozidriv shaft No. 1 pt, fits no. 2-4 screws	8710-0899
Screwdriver, 4 in Pozidriv shaft No. 2 pt, fits no. 5-10 screws	8710-0900
Open end wrench, 1/4 and 5/16 in	8710-0510
Hex nut driver, 5.5 mm	8710-1220
Screwdriver, Torx T20	8710-1615
Screwdriver, Torx T15	8710-1622
Screwdriver, Torx T10	5182-3466
Ferrules	
0.4 mm Vespel/Graphite ferrule for 200/250 µm columns, 10/pk	5062-3508
0.5 mm Vespel/Graphite ferrule for 320 µm columns, 10/pk	5062-3506
250 µm Vespel/Graphite ferrule, 10/pk	5181-3323
SilTite metal ferrules for 1/16 in od tubing, 10/pk Includes 2 column nuts	5184-3571
SilTite metal ferrules, 1/16 in x 0.4 mm id, 10/pk Includes 2 column nuts	5184-3569
SilTite metal ferrules, 1/16 in x 0.5 mm id, 10/pk Includes 2 column nuts	5184-3570
Ferrule pre-swaging tool	G2855-60200
Plug for microfluidic manifold or unions	G2855-60570



MS interface column nut, 05988-20066



Universal column nut, 5181-8830



Column installation tool, G1099-20030



Vespel/Graphite ferrules, 5181-3323



Electron Impact (EI) Ion Source

Ion Source

The ion source operates by electron ionization (EI) or chemical ionization (CI). The sample enters the ion source from the GC/MSD interface. Electrons emitted by a filament enter the ionization chamber, guided by a magnetic field. The high-energy electrons interact with the sample molecules, ionizing and fragmenting them. The positive voltage on the repeller pushes the positive ions into the lens stack, where they pass through several electrostatic lenses. These lenses concentrate the ions into a tight beam, which is directed into the mass filter.

Maintaining the Ion Source

Cleaning procedures for MSDs vary. Refer to your Troubleshooting and Maintenance Manual for specific ion source cleaning procedures.

Common Measures of Instrument Performance

- Abundance of certain ions (e.g., percentage of the 502 ion from the Autotune report)
- Shape of lens ramps and the chosen voltages, especially Repeller Ramp
- Sensitivity obtainable for a given analysis
- Ability to tune to a given reference compound (e.g., DFTPP)

Preparing to Clean

Prior to cleaning, the mass spectrometer must be vented and the ion source must be removed. Before venting the system, the following conditions must be met:

- Heated zones are less than 100 °C
- The diffusion pump is off and cool
- The turbo pump is off and not spinning
- The rough pump is off

Always allow the automatic venting routine to run its full course. Improper venting may cause diffusion pump fluid to be deposited into the analyzer (backstreaming). It can also reduce the life of the multiplier or other sensitive MS parts.

MSD Flow Rates (mL/min)

	Min	Max Diff Pump	Max Turbo Pump	Tuning Max
5975	0.1	2.0	4.0	2.0
5973	0.1	2.0	4.0	2.0
5972	0.1	2.0	N/A	2.0
5971	0.1	1.5	N/A	1.0
GCD	0.1	1.0	N/A	1.0

WARNINGS & CAUTION

Important: Do not abrasively or ultrasonically clean the insulators.

Abrasively clean the surfaces that contact the sample or ion beam. Use an abrasive slurry of alumina powder and reagent-grade methanol on a cotton swab. Use enough force to remove all discoloration. Polishing the parts is not necessary; small scratches will not harm performance. Abrasively clean discoloration where electrons from filaments enter the source body.

Take care to avoid contaminating cleaned and dried parts. Put on new, clean gloves before handling the parts. Do not put the cleaned parts on a dirty surface. Place them only on clean, lint-free cloths.

TIPS & TOOLS

It is good practice to replace scratched lenses and other ion source parts regularly. Scratched source parts lead to poor performance.

Electron Impact (EI) Ion Source

The recommended cleaning material for the EI ion source is abrasive, aluminum oxide powder.

Do not immerse filaments or lens insulators in solvent. If insulators are dirty, clean them with a cotton swab dampened with reagent-grade methanol. If that does not clean the insulators, replace them.



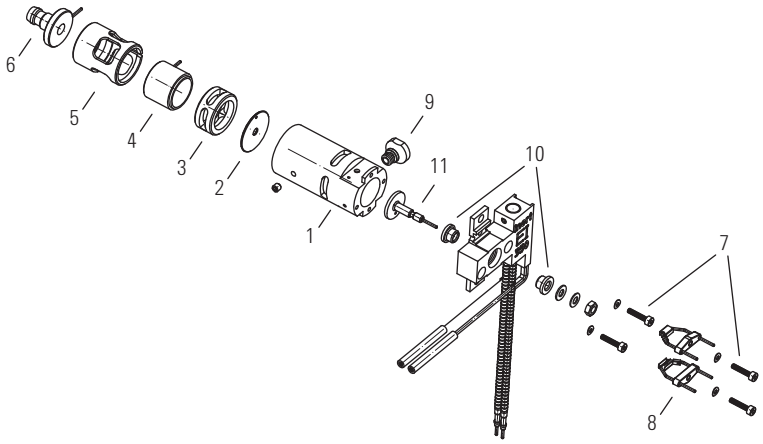
Electron Impact (EI) Ion Source



Lens insulator, G3170-20530

5975/5973 MSD Electron Impact Ion Source Parts (EI)

Item	Description	Part No.	Inert Part No.
1	Ion source body	G1099-20130	G2589-20043
2	Drawout plate, 3 mm	05971-20134	G2589-20100
	Drawout plate, 6 mm	G3163-20530	G2589-20045
3	Drawout cylinder	G1072-20008	G1072-20008
4	Ion focus lens	05971-20143	05971-20143
4	Lens insulator	G3170-20530	G3170-20530
6	Entrance lens	G3170-20126	G3170-20126
7	Cap screw, gold plated	G1999-20021	G1999-20021
8	High temperature filament	G3170-60050	G3170-60050
9	Transfer line socket	G1099-20136	G1099-20136
10	Repeller insulator	G1099-20133	G1099-20133
11	Repeller	G1099-20132	G2589-20044



5975/5973 MSD Electron Impact (EI) ion source assembly

Chemical Ionization (CI) Ion Source



Agilent 5975 Ion Source

Because the CI ion source operates at much higher pressures than the EI ion source, it will probably require more frequent cleaning than the EI ion source.

The source should be cleaned whenever there are performance anomalies that are associated with a dirty ion source. Let analytical performance be your guide.

When cleaning the CI ion source, concentrate on the CI repeller, ion source body, and drawout plate. Be sure to clean the 0.5 mm diameter holes in the ion source body and drawout plate.

Cleaning the ion source is very similar to cleaning the EI ion source. Use the same EI cleaning procedure with the following exceptions:

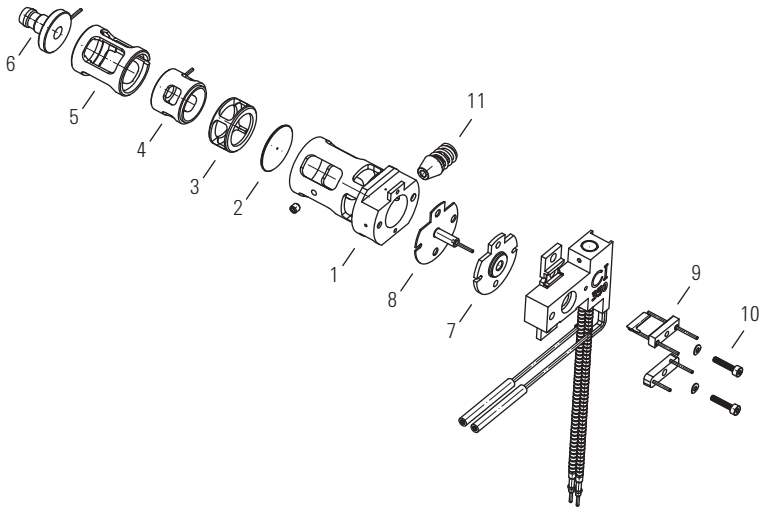
- The CI ion source may not look dirty, but deposits left by chemical ionization are very difficult to remove. Clean the CI ion source thoroughly.
- Use a round wooden toothpick to gently clean out the electron entrance hole in the source body and the ion exit hole in the drawout plate.
- Do not use halogenated solvents. Use hexane for the final rinse.

5975/5973 MSD Chemical Ionization Ion Source Parts (CI)

Item	Description	Part No.
1	Source body	G1999-20430
2	Drawout plate	G1999-20446
3	Drawout cylinder	G1999-20444
4	Ion focus lens	G1999-20443
4	Lens insulator	G3170-20540
6	Entrance lens	G3170-20126
7	Repeller insulator	G1999-20433
8	Repeller	G1999-20432
9	High temperature filament	G1099-80053
10	Cap screw, gold plated	G1999-20021
11	Interface tip seal/spring	G1999-60412

TIPS & TOOLS

Visual appearance is not an accurate guide to cleanliness of the CI ion source. The CI ion source can show little or no discoloration, yet still need cleaning.



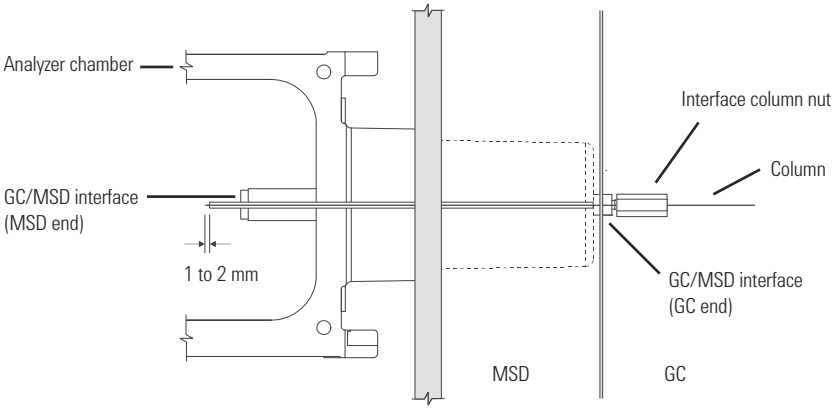
5975/5973 MSD Chemical Ionization (CI) ion source assembly

Installing a Capillary Column in the GC/MSD Interface

1. Condition the column.
2. Vent the MSD and open the analyzer chamber. Be sure you can see the end of the GC/MSD interface.
3. If the CI interface is installed, remove the spring-loaded tip seal from the MSD end of the interface.
4. Slide an interface nut and conditioned ferrule onto the free end of the GC column. The tapered end of the ferrule must point towards the nut.
4. Slide the column into the GC/MSD interface until you can pull it out through the analyzer chamber.
6. Score the column using a glass scribing tool. The score must be square to ensure a clean break.
7. Trim 1 cm off the end of the column. Do not let any column fragments fall into the analyzer chamber. They could damage the turbo pump.
8. Clean the outside of the free end of the column with a lint-free cloth moistened with methanol.
9. Adjust the column.
   - 5975 – Push the column through, and then let it pass the end of the Transferline by 1-2 mm. With the analyzer door partially open, view through the glass plate to see the column protrude.
   - 5973 – Push the column through, and then let it pass the end of the Transferline by 1-2 mm as seen with the analyzer door open from that side.
   - 5972 – Push the column in all the way and then pull it back about 1-2 mm.

   Use the flashlight and magnifying glass if necessary to see the end of the column inside the analyzer changer. Do not use your finger to feel for the column end.
10. Hand-tighten the nut. Make sure the position of the column does not change as you tighten the nut. Reinstall the spring-loaded tip seal if it was removed earlier.
11. Check the GC oven to be sure that the column does not touch the oven walls.
12. Tighten the nut 1/4 to 1/2 turn. Check the tightness after one or two heat cycles.

Installing a capillary column in the GC/MSD interface

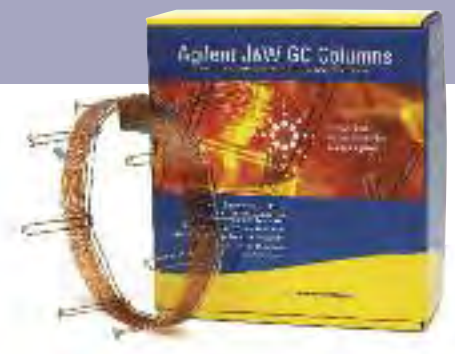


TIPS & TOOLS

The column installation procedure for 5975 MSDs is different from that for most previous MSDs. Using the procedure from another instrument may result in poor sensitivity and possible damage to the MSD.

TIPS & TOOLS

Agilent J&W GC Columns offer the lowest bleed levels, the best inertness for acids/bases/mixed functional compounds, and the tightest column-to-column reproducibility. Learn more at **www.agilent.com/chem/mygccolumns**





QuickSwap Capillary Flow Technology module

QuickSwap MS Interface Restrictors

Agilent's QuickSwap Capillary Flow Technology module and pre-swaged fused silica tubing restrictors can increase the productivity of your Agilent 5973N and 5975 Inert MSD Systems, allowing you to change columns without venting the MSD. QuickSwap not included.

These restrictors are prefabricated for convenience and ease-of-use. For applications requiring other restrictor sizes, Agilent offers a wide variety of deactivated fused silica tubing, SilTite ferrules and swaging tools.

QuickSwap MS Interface Restrictors

Description	ID (mm)	Unit	Part No.
QuickSwap restrictor	0.092	4/pk	G3185-60361
QuickSwap restrictor	0.100	4/pk	G3185-60362
QuickSwap restrictor	0.110	4/pk	G3185-60363
QuickSwap restrictor	0.120	4/pk	G3185-60364
QuickSwap restrictor variety pack, 2 each of the above id restrictors			G3185-60300



SilTite metal ferrules, 5188-5361

SilTite Metal Ferrules

Description	Unit	Part No.
For use with 0.25 mm id capillary columns	10/pk	5188-5361
For use with 0.32 mm id capillary columns	10/pk	5188-5362
For use with 1/16 in od stainless steel tubing Includes 2 column nuts	10/pk	5184-3571
For use with 0.53 mm id capillary columns	10/pk	5188-5363

MSD Filaments



Filament assembly (EI), G3170-60050

Like the filaments in an incandescent light bulb, the ion source filaments will eventually burn out. Certain practices will reduce the chance of early failure.

- When setting up data acquisition parameters, set the solvent delay so that the analyzer will not turn on while the solvent peak is eluting
- When the software prompts 'Override solvent delay at the beginning of a run' always select 'No'
- Higher emission current will reduce filament life
- If you control your MSD from the Edit Parameters screen, always select 'MS Off' before changing any of the filament parameters

MSD Filaments

Description	5975 Series	5975T Series	5973 Series	5972 Series	5971 Series
Filament assembly (EI)	G3170-60050		G3170-60050	G3170-60050	05971-60140
Filament assembly (CI)	G1099-80053		G1099-80053		
Micro ion vacuum gauge	G3170-80001				
Triode gauge tube for measuring vacuum			0960-0897		
Ion gauge controller		G3880-80010			
Ion gauge tube		G3880-80011			

TIPS & TOOLS

It is very useful to switch from one filament to the other every three months so that when a filament fails, you know the other will fail soon. This will allow you to change both filaments at the same time. Since the GC/MS system is already vented, it's a good idea to replace other supplies in the flowpath at the same time as the filaments.



Quadrupole Mass Filter

The mass filter does not require periodic maintenance. It should not be removed from the radiator or disturbed in any way.

- Never put the quadrupole in an ultrasonic cleaner.
- Never change the physical orientation of the quadrupole mass filter.
- The fused-quartz quadrupole is fragile and will break if dropped or handled roughly.
- The material in the cusps of the quadrupole is very hygroscopic. If exposed to water, the quadrupole must be dried very slowly to prevent damage.
- Cleaning techniques that are appropriate for other manufacturers' instruments are not suitable for Agilent MSDs – and may actually harm the mass filter.
- To save time and effort, use only Agilent MSD mass filters, which do not require periodic cleaning or maintenance.
- In case of extreme contamination, contact a trained Agilent service representative to perform the mass filter cleaning.

MSD Electron Multipliers and Replacement Horn



Electron multiplier replacement horn

The lifetime of an electron multiplier is directly related to the current that flows through it and the extent of contamination or condensation that it experiences. Replace the electron multiplier or replacement horn when voltage is over 2500 V. To maximize electron multiplier life:

- Maintain the best possible vacuum, especially in the analyzer manifold
- Use extreme caution and be conservative with venting, pumpdown, and all vacuum system procedures to keep pump fluid background to a minimum
- After venting, allow four hours for pumpdown and thermal equilibration before scanning
- Actively look for background contamination and leaks and repair them immediately
- Don't tune excessively – PFTBA can result in higher background over an extended period of time
- Replace the electron multiplier if vacuum is poor or voltage is over 2500 V

MSD Electron Multipliers and Replacement Horn

Description	5975 Series	5973 Series	5972/5971 Series
Electron multiplier replacement horn Use with electron multipliers with "straight" horns	05971-80103	05971-80103	05971-80103
Triple axis detector assembly*	G3170-80100		
Triple axis electron multiplier	G3170-80103		
EM signal wire, low noise detector	G3170-80008		
High energy dynode		G1099-80001	
Electron multiplier			05971-80102

*Included on 5975 triple axis detector systems

TIPS & TOOLS

The Agilent multipliers and horns listed are recommended for your MSD. Other manufacturers' products may be incompatible with Agilent instruments and can result in reduced sensitivity, lifetime, and noise problems.



Vacuum Systems and Pumps

The vacuum system creates the high vacuum (low pressure) required for the MSD to operate. Without this vacuum, the molecular mean free path is too short.

Ions cannot travel from the ion source through the mass filter to the electron multiplier (detector) without colliding with other molecules.

The main components of the vacuum system are:

- Vacuum manifold
- Foreline gauge
- Calibration valve
- Gauge controller (optional)
- Vacuum seals
- Foreline pump and/or trap
- Diffusion/turbo pump and fan
- High vacuum gauge tube

Pressure Symptoms

This section describes unusual pressure readings and their possible causes. The symptoms in this section are based on typical pressures. At typical column flow rates (0.5-2.0 mL/min), the foreline pressure will be approximately 20 to 100 m Torr. The vacuum manifold pressure will be approximately 1 x 10^{-6} to 1.4 x 10^{-4} Torr.

These pressures can vary widely from instrument to instrument, so it is important that you are familiar with the pressures that are typical for your instrument at a given carrier gas flow and oven temperature.

The foreline pressures listed can only be measured on diffusion pump-equipped systems. Turbomolecular pumps are controlled according to their speed and do not have foreline pressure gauges.

The vacuum manifold pressures can only be measured if your system is equipped with the optional gauge controller.

TIPS & TOOLS

Keeping a pan under the vacuum pump helps to detect and identify the origin of oil leaks.

Pressure Symptoms

Symptoms	Possible Causes
Foreline pressure is too high	
• Pressure is above 100 m Torr. • Pressure for a given column flow has increased over time	• Column (carrier gas) flow is too high • Wrong carrier gas • Air leak (normally at transferline interface) • Foreline pump oil level is low or oil is contaminated • Foreline hose is constricted • Foreline gauge is not working correctly • Foreline pump is not working correctly
Foreline pressure is too low	
• Pressure is below 20 m Torr.	• Column (carrier gas) flow is too low • Wrong carrier gas • Column plugged or crushed by an overtightened nut • Empty or insufficient carrier gas supply • Bent or pinched carrier gas tubing • Foreline gauge is not working correctly
Vacuum manifold pressure is too high	
• Pressure is above 1.4×10^{-4} Torr. • Pressure for a given column flow has increased over time	• Column (carrier gas) flow is too high • Wrong carrier gas • Air leak • Foreline pump is not working correctly • Diffusion pump fluid level is low or fluid is contaminated • Defective gauge controller • Faulty ion gauge tube
Vacuum manifold pressure is too low	
• Pressure is below 1.4×10^{-4} Torr.	• Column (carrier gas) flow is too low • Wrong carrier gas • Column plugged or crushed by an overtightened nut • Empty or insufficient carrier gas supply • Bent or pinched carrier gas tubing • Defective gauge controller • Faulty ion gauge tube



Diffusion Pump

It is not necessary to change the diffusion pump fluid more than once a year, unless you observe symptoms that suggest a problem with the fluid. The MSD must be vented in order to check the diffusion pump fluid (except for the 5975/5973). Therefore, the best time to check the fluid is when the instrument is already vented for other maintenance.

How to Check the Fluid Level

5972/5971 Series

1. If it is not vented already, shut down and vent the MSD according to instrument manual.
2. Unplug the MSD power cord.
3. Remove the pump and cover the top with aluminum foil.
4. After heating the pump in a GC oven at 60 °C for 15 minutes to make the fluid flow down into the reservoir at the bottom, remove the stack parts.
4. Inspect the pump fluid. If the fluid is discolored or contains particulate material, the fluid must be changed.
6. Use a metal ruler to determine the depth of the fluid. A pump that has been in operation should have a pool 9 mm +/- 1 mm deep. Fluid in freshly charged pumps will be 12 mm deep. It is normal that up to 2 mL of oil may be in the rear portion of the vacuum manifold. The recommended total fluid charge for the 5971/5972 is 18 mL (+/- 2 mL).

5975/5973 Series

- Use the sight glass to determine the depth of the fluid. The recommended total fluid charge is approximately 37 mL.

Foreline Pump

The oil in the foreline or rough pump should be replaced on average once every six months, but can vary depending upon applications. If a foreline trap is present, the molecular sieves should also be replaced after an oil change.

Avoid contact with the pump oil. The residue from some samples may be toxic. Dispense of used oil properly.



Foreline Pump

Pump Oils

Description	Part No.
Foreline pump (rotary pump) oil, Inland 45, 1 L	6040-0834
High vacuum grease, 25 g	6040-0289
Diffusion pump fluid, 18.5 mL	6040-0809*
IDP Series tip seal kit for 5975T	IDP3TS
Oil mist exhaust filter	G1099-80039

*2 required for 5975 and 5973 Series



General Instructions on How to Replace the Pump Oil

1. Vent and shut down the MSD.
2. Place a container under the drain plug on the foreline pump.
3. Remove the fill cap from the top of the pump to expose the fill hole.
4. Remove the drain plug from the pump.
5. Reconnect the MSD to its power source. Switch on for 2 or 3 seconds, and then switch it off again. This displaces old oil from the internal pump cavities. Disconnect the power cord again.
6. Reinstall the drain plug and pour pump oil into the fill hole.
7. Reinstall the fill cap.
8. Reconnect the MSD power cord.
9. Start up and pump down the MSD according to the Instrument Manual procedure.



7000A Triple Quadropole GC/MS

7000A Triple Quadropole GC/MS Parts and Supplies

Engineered from the ground up for ease-of-use and routine high performance operation, the 7000A Triple Quadrapole GC/MS delivers advanced high-speed GC/MS/MS quantitation for ultra-trace analysis of even the most complex samples. Combined with the Agilent 7890 GC, the result is an optimally robust GC/MS/MS system.

Gas Filters

Description	Part No.
Chemical Ionization Gas Purifier	G1999-80410
Gas Clean GC/MS starter kit 1/8 in	CP17974
Agilent Gas Clean GC/MS filter	CP17973
Mounting clip	UMC-2



Agilent Gas Clean GC/MS filter, CP17973

Foreline Pump Supplies

Description	Part No.
Diffusion pump fluid, 18.5 mL	6040-0809
Foreline pump oil, P3, 0.5 L	6040-0621
Rough pump inlet flange	0905-1463
Oil return kit	3162-1057
Pump oil drip pan	G1946-00034
Oil mist exhaust filter	G1099-80039
Oil mist filter for RV5 pump	G6600-80043



Oil mist filter, G6600-80043

Maintenance Supplies

Description	Part No.
Abrasive sheets	5061-5896
Alumina powder, abrasive, 1 kg	8660-0791
Cloths, lint-free	05980-60051
Lint-free industrial wipes, 100% cotton	9310-4828
Cotton swabs	5080-5400
Nylon gloves, lint-free, large	8650-0030
Nylon gloves, lint-free, small	8650-0029
High vacuum grease, 25 g	6040-0289
Electron multiplier replacement horn	05971-80103
Low noise EM horn	G3170-80103
Filament assembly, high temperature (EI)	G3170-60050
Filament assembly (CI)	G1099-80053
Micro ion vacuum gauge	G3170-80001
Replacement glass bulb for PFTBA and PFDTD test sample	G3170-80002



Low noise EM horn, G3170-80103



Filament assembly (EI), G3170-60050



240-MS Ion Trap Parts and Supplies

The Agilent 240-MS Ion Trap delivers unparalleled capabilities for both research and routine applications. Advanced ionization, including positive and negative chemical ionization, improves selectivity and limits of detection. Enhanced scanning techniques ensure compound confirmation. The MS/MS and MS^n reduce matrix influences and provide more detailed structural information. The software comes with a full complement of productivity, reporting, and regulatory compliance tools.

- Accurate identification and quantification of trace analytes
- Unsurpassed sensitivity (200 femtogram OFN full scan)
- Choice of internal or external ionization configurations
- Powerful MS/MS and CI options
- Low maintenance and high reliability
- Intuitive software for increased productivity

240-MS Ion Trap Parts and Supplies

Description	Part No.
Manifold O-ring	393010924
Transfer line inner O-ring	393010920
Transfer line outer O-ring	393010918
Internal filaments (2 filaments on one disk)	392017401
Internal transfer line tip	393171201
External filament (single filament)	393161001
Electrode, end cap, SilChrom	393164493
Electrode set kit, SilChrom, DFC (inert) tested Includes 2 end cap electrodes, 1 RF electrode, cleaning instructions	9300003590
Electrode, RF, SilChrom	393167593
Spacer, RF, Silco-quartz	393053502
Electron multiplier	393175101
Transfer line assembly upgrade field kit Contains a complete transfer line and side-mounted block for vacuum manifold	393101291
EPA volatile kit for EPA methods 524.2 & 8260B	393082491
ChromatoProbe microvials, 100/pk	392567111

TIPS & TOOLS

Need GC supplies for your non-Agilent instruments? Check out the Agilent CrossLab supplies for Bruker/Varian GC Systems.

See pages 154-168

240-MS Ion Trap Parts and Supplies

Description	Part No.
GC/MS Standards	
Evaluation standard (Internal EI & CI) 2 pg/µL OFN, 5 pg/µL	393112601
Test standard for external EI (5 pg/µL OFN)	393112702
Benzophenone CI sensitivity standard 50 pg/mL	392030500
Test standard for external NCI (1 pg /µL DFB)	393113001
Tuning calibration compound PFTBA (FC-43)	392035300
GC/MS column test mix	392027300
Vacuum Supplies	
Oil mist exhaust filter, DS42	393847701
Oil mist eliminator	2735000500
Replacement cartridge for oil exhaust filter, 2/pk	2710100200
Foreline (roughing) pump oil, 1 L	8829951700
Premium foreline (roughing) pump oil, 1 L	8829953800
IDP-3 dry scroll pump tip seal maintenance kit	2710100400
IDP-3 dry scroll replacement module	2710100500





220-MS Parts and Supplies

The 220-MS is a high sensitivity, flexible gas chromatograph/mass spectrometer that delivers outstanding qualitative and quantitative data in a range of applications. This simple and robust system is easy to operate and maintain.

- Accurately identify and quantify trace analytes
- Take advantage of powerful CI and MS/MS upgrades for advanced applications
- Spend less time on maintenance and more time on analysis

220-MS Parts and Supplies

Description	Part No.
Electron multiplier assembly	393031501
Exit end cap electrode, chrome	393050292
Exit end cap electrode, SilChrom	393050293
Filament end cap electrode, chrome	393050392
Filament end cap electrode, SilChrom	393050393
RF ring electrode, chrome	393050492
RF ring electrode, SilChrom	393050493
Complete set of SilChrom electrodes and Silco-quartz spacers	393001991
Spacer, RF, quartz	393053501
Spacer, RF, Silco-quartz	393053502
Filament disk assembly with wire connectors	393060191
Filament disk assembly User must solder on 3 wire connectors	392043700
Thermocouple vacuum gauge	2722990700
Mass spectrometer expendable supplies kit for 2x0MS Includes PFTBA calibration compound, cal-gas glass chamber, capillary injector nut, O-rings, cotton tipped applicators, end cap insulator, vacuum pump oil	393011391
GC/MS Standards	
Hexachlorobenzene EI sensitivity standard 100 pg/mL	392027500
Benzophenone CI sensitivity standard 50 pg/mL	392030500
Tuning calibration compound PFTBA (FC-43)	392035300
Hexachlorobenzene EI sensitivity standard 2 pg/mL	392047100
GC/MS column test mix	392027300

GC/MS Standards



MS standards

GC/MS Analyzer Kit Standards

Description	Part No.
GC/MS semivolatiles analyzer checkout mixture	5190-0473
GC/MS pesticide analyzer internal standard, phenanthrene-d10 at 1000 µg/mL in methylene chloride, 4 x 1 mL	5190-0472
Pesticide analyzer checkout solution, 20 pesticides at 10 µg/mL each in acetone, 3 x 1 mL	5190-0468
Pesticide checkout standard, 100 µg/L, 3 x 1 mL	5190-0494
GC/MS toxicology checkout mixture	5190-0471
Residual solvent revised method 467, class C	5190-0493
Residual solvent revised method 467, class 1	5190-0490
Butanetriol internal standard #1 for biodiesel	5982-0024
Tricaprin internal standard #2 for biodiesel	5982-0025
Pesticide retention locking standard, 3 pesticides at 10 µg/mL each in n-hexane, 3 x 1 mL	5190-1441

MS Test and Performance Samples

	Description	Part No.	5975 Series	5973 Series	5972 Series	5971 Series	GCD	7000 Series	7200 Series
Tuning Samples									
EI Tune	PFTBA sample, certified, 10 g, 5.32 mL	8500-0656	✓	✓	✓	✓	✓	✓	✓
CI Tune	PFDTD calibrant	8500-8510	✓	✓				✓	✓
Performance Verification Samples									
EI	OFN, 1 pg/µL	5188-5348	✓	✓					
	Hexachlorobenzene 10 pg/µL, 1 ng/µL	8500-5808			✓				
	Methyl stearate (in methanol), 1 ng/µL, 2 ea	05990-60075				✓			
	MSD Sampler	05970-60045					✓	✓	
Negative Mode CI	OFN, 100 fg/µL	5188-5347	✓						
Positive Mode CI	Benzophenone, 100 pg/µL	8500-5440	✓	✓	✓	✓			
	1 pg/µL OFN, 5 pg/µL BZ	393065201						✓	
Checkout Samples									
HighMass	PHFT, 100 pg/µL	5188-5357	✓						
Semivolatile	GC/MS tuning standard, DFTPP	8500-5995	✓	✓	✓	✓	✓		
Volatile	p-Bromofluorobenzene (BFB), 25 µg/mL	8500-5851	✓	✓	✓	✓	✓		
MSD sampler	Solution of dodecane, biphenyl, p-cholorodiphenyl, and methyl palmitate in isooctane. Six 1.0 mL ampoules: 4 at 10 ng/µL, 1 at 100 ng/µL, 1 at 100 pg/µL.	05970-60045	✓	✓	✓	✓	✓	✓	

TIPS & TOOLS

Each GC/MS has a specific test and performance sample. Refer to the chart above for the exact sample. All volumes are approximately 0.5-1 mL unless otherwise specified.

Agilent CrossLab

Supplies for Non-Agilent GC Systems

Agilent CrossLab is a growing portfolio of supplies critical to instrument performance and productivity. Agilent CrossLab GC supplies are designed and manufactured to perform seamlessly with a variety of non-Agilent GCs in your lab. Look inside this catalog to find a comprehensive range of GC supplies to use across your lab.

We currently support:

- Bruker, Varian*
- CTC
- PerkinElmer
- Shimadzu
- Thermo Scientific

*Formerly Varian GC systems, now Bruker products

Our growing GC Supplies portfolio includes the following products, featuring easy-to-use packaging for improved productivity:

- Premium non-stick inlet septa
- Ultra Inert inlet liners
- Liner O-rings
- Column ferrules and nuts
- Autosampler syringes
- Vials and closures
  (See the complete CrossLab Vials and Closures section of our General Chromatography catalog, publication number 5991-1056EN)





Agilent CrossLab is more than supplies:

- Offering a comprehensive portfolio of GC supplies
- Over 40 years of chromatography expertise and ongoing innovation
- Optimal performance for both routine and challenging applications
- Dependable worldwide product availability and delivery
- Convenience of consolidated purchasing

Agilent CrossLab works with BRUKER | CTC | PERKINELMER | SHIMADZU | THERMO SCIENTIFIC | AND MORE



Agilent CrossLab Inlet Liners

Liners are the centerpiece of the inlet system where sample is vaporized and mixed with the carrier gas. CrossLab GC inlet liners have the perfect mix of liner configurations and chemistries to solve your application challenges.

Choose from split, splitless, PTV, and other inlet liner designs in either the new, innovative Ultra Inert deactivation or Agilent's popular proprietary deactivation, now referred to as Agilent Original deactivation. With part number and lot number silk screened on CrossLab liners, identification and re-ordering have never been easier.

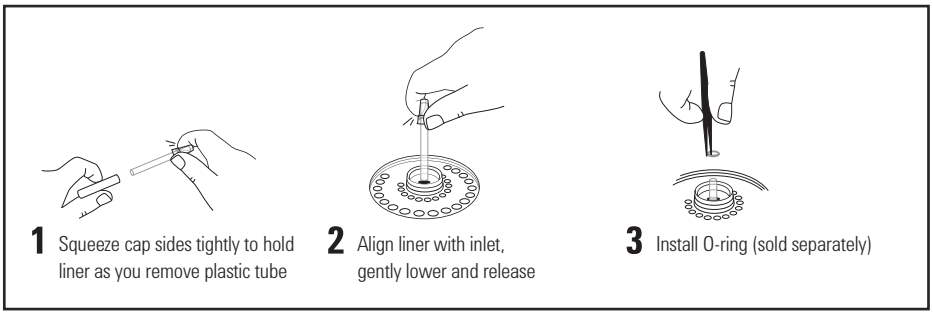
Agilent CrossLab Liners with Ultra Inert Deactivation

Developed for high sensitivity analysis, Agilent's Ultra Inert deactivation provides extreme surface inertness – even for liners containing glass wool. Ultra Inert chemistry was developed using a suite of tests specifically designed to stress then evaluate liner activity, resulting in liners featuring:

- **Reproducibility** – highest level and consistent inertness for active compounds such as acids and bases
- **Robustness** – tested with a sequence of 100 injections of Endrin/DDT with < 20% degradation, allowing use of glass wool even with highly active compounds at trace (0.5 ng on-column) levels
- **Reliability** – lot-tested for inertness to ensure consistent and efficient deactivation using both acidic and basic probes at trace level (2 ng) on-column, with low to no bleed or background contamination

Ultra Inert liners are delivered in Agilent's exclusive Touchless packaging. Touchless packaging aids in easy installation of the new, clean, preconditioned liner – without risk of contamination from touching.

To view a demonstration of the Touchless Packaging for CrossLab Ultra Inert Liners please visit **www.agilent.com/chem/CLTouchless**



CrossLab Ultra Inert Touchless liner packaging includes visual installation guide.

Consider the following to determine how often to change your liners:

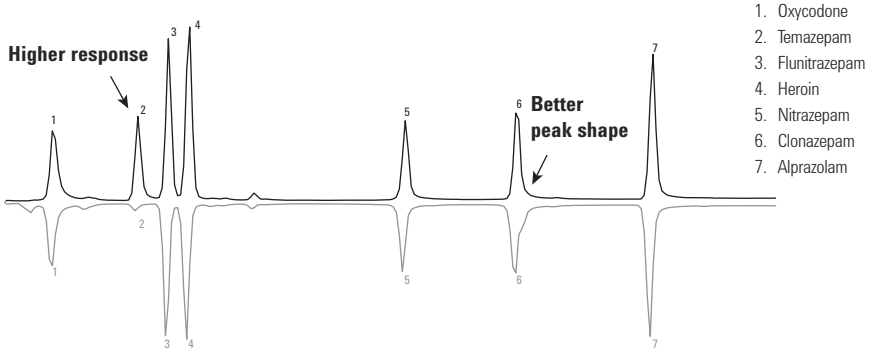
- Previous use pattern
- Sample cleanliness
- Chromatographic abnormalities, such as
  - ✓ Peak shape changes
  - ✓ Peak discrimination
  - ✓ Poor reproducibility
  - ✓ Sample pyrolysis
  - ✓ Active analyte response loss or decomposition

Get a robust, reproducible, and reliable inert flow path with Agilent CrossLab Ultra Inert Inlet Liners – even when containing glass wool

Forensic basic drugs test conditions

Column:	**DB-5ms Ultra Inert 122-5512UI 15 m x 0.25 mm, 0.25 µm**
Sample:	5 mg/L Checkout mixture for GC/MS forensic/toxicology analyzer (P/N 5190-0471)
Injection:	1 µL splitless @ 280 °C (hold 0.75 min)
Oven:	100 °C (0.5 min) to 325 °C at 20 °C/min and hold 2.5 min
Carrier:	He, 18.74 psi (adj to RT lock), constant pressure
Detector:	MSD; Source temp @ 300 °C, Quad temp @ 150 °C, Transfer line @ 300 °C; Acquisition mode, SIM/scan

Agilent CrossLab Ultra Inert single taper liner with wool



Restek Siltek deactivated gooseneck liner with deactivated wool (cat. no. 22406.213.5)

Agilent CrossLab Ultra Inert deactivated liners with wool contribute to higher response and better peak shape for very active forensic basic drug compounds than similar Restek Siltek liners.

Agilent CrossLab Liners with Agilent Original Deactivation

Developed to complement fused silica capillary column technology, Agilent's proprietary deactivation, now referred to as Agilent Original deactivation, has been successfully used for years. Proven to deliver a long-lasting surface deactivation, this proprietary chemistry and manufacturing process was previously available for Agilent gas chromatographs only, but is now available for other GC systems. Agilent Original deactivation is recommended for everyday analysis.

Agilent CrossLab Liner O-rings

- Liners are sealed in the inlet with fluoroelastomer or graphite O-rings
- Graphite O-rings are used when inlet temperatures exceed 350 °C
- Fluoroelastomer O-rings are easier to replace than graphite O-rings, which deform and flake apart more easily

Ready for chromatographic use, CrossLab fluoroelastomer O-rings feature:

- Proprietary two-step cleaning and conditioning process eliminates out-gassing of contaminants, which is especially important for trace, ECD, and MSD analyses
- Plasma-treatment for a non-stick, contaminant-free surface that won't stick to the inlet metal surface
- Novel translucent dial package that conveniently delivers one clean O-ring at a time and makes it easy to know when to reorder



Agilent CrossLab Column Ferrules

A variety of column ferrules are available to meet your application requirements, including 100% Graphite, 100% Vespel, and Vespel/Graphite ferrules.

Using the wrong ferrule or a worn-out ferrule to seal your column connection can result in inconsistent and unreliable chromatography. An improper ferrule can cause leaks, which allow air and other contaminants to enter the instrument through the column seal, causing major interference with column and detector performance.

The ideal ferrule provides a leak-free seal, accommodates various column outer diameters, seals with minimum torque, withstands temperature cycling, and does not stick to the column or fittings.

For optimum performance, ferrules should be replaced every time the column is replaced and when performing column maintenance.

To minimize problems, follow these general techniques for ferrule installation:

- Don't overtighten – finger tighten the column nut, then use wrench to tighten
- Maintain cleanliness
- Bake out ferrules prior to use (Vespel and Vespel/Graphite only)
- Avoid contamination, such as fingerprint oils
- Inspect used ferrules with magnifier for cracks, chips, or other damage before reusing them
- Change ferrules when new columns or injector/detector parts are installed

TIPS & TOOLS

Look for the following signals that indicate ferrule damage:

- Background noise from oxygen diffusing into the system
- Column bleed catalyzed by oxygen
- Sample degradation
- Sample loss
- Increase in detector signal/noise
- Poor retention time reproducibility



Ferrule Selection Recommendations

Ferrule Type	Upper Temp. Limit	Usages	Advantages	Limitations
Graphite (100%)	450 °C	• General purpose for capillary columns • Suitable for FID and NPD • Recommended for high temperature and cool on-column applications	• Easy-to-use stable seal • Higher temperature limit • Can be removed easily	• Not for MS or oxygen-sensitive detectors • Soft, easily deformed or destroyed • Possible system contamination
Vespel/Graphite (85%/15% or 60%/40%)	350 °C	• General purpose for capillary columns • Recommended for MS and oxygen-sensitive detectors • Most reliable leak-free connection	• Mechanically robust • Long lifetime	• Not reusable • Flows at elevated temperature • Must re-tighten frequently
Vespel (100%)	280 °C	• Isothermal operation • Can be reused or removed easily • Excellent sealing material when making metal or glass connections	• Mechanically robust • Long lifetime • Can be reused or removed easily	• Leaks after temperature cycle • Flows at elevated temperature • Must re-tighten frequently

TIPS & TOOLS

100% Vespel ferrules should only be used for isothermal applications.



Agilent CrossLab Autosampler Syringes

With a broad selection of syringes for auto injection, CrossLab autosampler syringes provide what you need for accurate and effective sampling. CrossLab syringes meet all fit, form, and function criteria for specific autosampler models. Agilent delivers more value in every autosampler syringe:

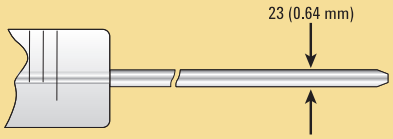
- Lot number printed directly on the barrel with a corresponding Certificate of Conformance
- Illuminating backing strip, for effortless viewing of the volume scale
- Environmentally friendly packaging and improved design that reduces waste
- Individually packaged for contaminant-free use right out of the box

Typical Needle Gauge Dimensions

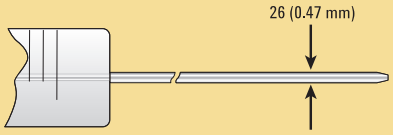
	OD		ID	
Gauge	**mm**	**inches**	**mm**	**inches**
23	0.64	0.0248	0.11	0.0043
25	0.50	0.0197	0.20	0.0079
26	0.47	0.0184	0.11	0.0043



Needle Gauge



Single Gauge 23 (0.64 mm)
Packed column injector ports
Split/splitless injector ports



Single Gauge 26 (0.47 mm)
Packed column injector ports
Split/splitless injector ports

Needle Termination

Needle terminations are available in fixed or removable, with various tip styles.

Fixed (cemented)

- Economical, reproducible injections for autosamplers
- Preferred for applications requiring trace level samples
- Recommended for use where probability of needle bending is minimal
- Can be heated up to 70 °C

Removable needle

- Versatile option for injections
- Needle can be replaced if damaged or clogged
- Allows needle to be changed for different applications
- Can be heated up to 120 °C



Agilent CrossLab Inlet Septa

Inlet septa are a key component of sample introduction. Septa maintain the leak-free seal and exclude air from the inlet. They come in many different sizes and are made from different types of materials specific to inlet type and analysis needs.

Replace septa regularly to avoid:

- Leaks
- Decomposition
- Sample loss
- Reduced column or split vent flow
- Ghost peaks
- Column degradation

Septa are available for a variety of different applications and have different upper temperature limits. Lower temperature septa are usually softer, seal better, and can withstand more punctures (injections) than their high-temperature counterparts. If septa are used above their recommended temperatures, they can leak or decompose, causing sample loss, lower column flow, decreased column life, and ghosting. To minimize problems:

- Use within the recommended temperature range
- Change regularly
- Use septum purge when available
- Use autoinjectors
- Regularly inspect needle tips for wear

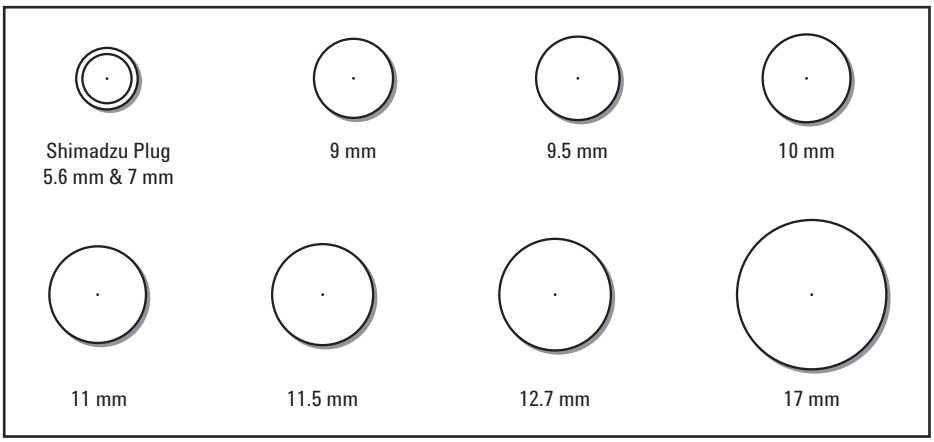


Agilent CrossLab Inlet Septa Selection Guide

GC Manufacturer	Instrument Model	Diameter (mm)	Diameter (in)
Bruker, Varian*	1177 Split/Splitless Injector	9	
	1078/1079 Programmable Temperature Vaporizing Injector	11.5	
	1093 Cold On-Column Injector	11	7/16
	1075/1077 Split/Splitless Injector	11	7/16
	1061 Packed/0.53 mm Capillary Column Flash Vaporization Injector	9.5	3/8
	1041 Packed/Wide Bore On-Column Injector	9.5	3/8
PerkinElmer	Clarus System	11	7/16
	AutoSystem	11	7/16
	AutoSystem XL	11	7/16
	8000 Series	11	7/16
	Sigma Series	11	7/16
Thermo Scientific Trace GC Ultra and Focus GC	Split/Splitless Injector	17	
	Large Volume Splitless Injector	9	
	Programmable Temperature Vaporizing Injector	12.7	1/2
	Purged Packed Column Injector	11	
	Packed Column Injector	11	
Thermo Scientific Finnigan	Trace 2000 Series	9.5	
	9001 GC	9.5	
Shimadzu	All Models	Shimadzu Plug	

*Formerly Varian GC systems, now Bruker products

Septa Diameters



Premium Non-Stick Septa



CrossLab premium non-stick inlet septa are designed and manufactured to provide a reliable noncontaminating seal. Our tri-fold blister pack ensures that each septum remains clean and ready to use.

- Proprietary plasma treatment prevents sticking and unnecessary inlet cleaning
- Innovative blister packaging keeps each septum clean and ready for use
- Center point guides the needle for easy penetration, less coring, and longer life
- Precision molding assures accurate fit in the inlet
- Each batch is tested for bleed
- Premium formulations selected for sealing and chromatographic cleanliness
- No need to bake septa before using

Summary of Premium Inlet Septum Characteristics

Septum Type	Bleed	Lifetime	Temperature Limits
Non-Stick BTO (Bleed and Temperature Optimized)	✓✓✓	✓	to 400 °C injection port temp
Non-Stick Advanced Green	✓✓	✓✓	to 350 °C
Non-Stick Long-Life	✓	✓✓✓	to 350 °C

✓✓✓ = best ✓✓ = very good ✓ = good



Agilent CrossLab Non-Stick Bleed Temperature Optimized (BTO) Inlet Septa

- Extended temperature range, lowest bleed
- Maximum injection port temperature 400 °C
- Plasma treatment eliminates sticking in the injection port
- Pre-conditioned; ready to use
- Blister packaging maintains cleanliness and convenience
- Ideal for use with low-bleed, "Mass Spec" capillary columns

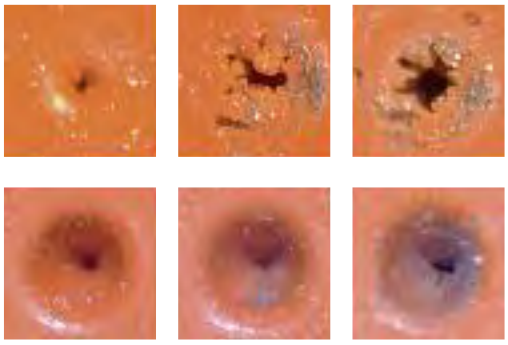


BTO septa, 8010-0223, 8010-0224

Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0217	8010-0218
9.5 mm	8010-0219	8010-0220
10 mm	8010-0221	8010-0222
11 mm, CenterGuide	8010-0223	8010-0224
11.5 mm, CenterGuide	8010-0225	8010-0226
Shimadzu plug	8010-0231	8010-0232
Description	**24/pk**	**48/pk**
12.7 mm, CenterGuide	8010-0227	8010-0228
17 mm, CenterGuide	8010-0229	8010-0230

Comparison of Coring, With and Without CenterGuide (30x magnification)



High-Temperature Septa without CenterGuide

Major coring before 100 autoinjections

CrossLab BTO Septa with CenterGuide

Very little coring, even after 700 autoinjections

Agilent CrossLab Non-Stick Advanced Green Inlet Septa

- True long-life, high-temperature green septa
- More injections per septum
- Plasma treatment eliminates sticking in the injection port
- Maximum injection port temperature 350 °C
- High-performance alternative to competitors' "green" septa
- Blister packaging for cleanliness and convenience

Non-Stick Advanced Green Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0201	8010-0202
9.5 mm	8010-0203	8010-0204
10 mm	8010-0205	8010-0206
11 mm, CenterGuide	8010-0207	8010-0208
11.5 mm, CenterGuide	8010-0209	8010-0210
Shimadzu plug	8010-0215	8010-0216
Description	**24/pk**	**48/pk**
12.7 mm, CenterGuide	8010-0211	8010-0212
17 mm, CenterGuide	8010-0213	8010-0214



Advanced green septa, 8010-0207, 8010-0208

Agilent CrossLab Non-Stick Long-Life Inlet Septa

- Preferred septa for autosamplers
- Pre-pierced for extended life and reduced coring
- Ideal for overnight runs
- Up to 400 injections per septum
- Plasma treatment eliminates sticking
- Maximum injection port temperature 350 °C
- Soft, 45 durometer, easy on autosampler needles
- Blister packaging for cleanliness and convenience



Long-life septa, 8010-0239, 8010-0240

Non-Stick Long-Life Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0233	8010-0234
11 mm, CenterGuide	8010-0239	8010-0240
11.5 mm, CenterGuide	8010-0241	8010-0242
Description	**24/pk**	**48/pk**
12.7 mm, CenterGuide	8010-0243	8010-0244
17 mm, CenterGuide	8010-0245	8010-0246



Agilent CrossLab Gray General Purpose Inlet Septa

Agilent CrossLab general purpose septa are made from an enhanced injection-molded silicone rubber and are good for routine use. The septa material, gray in color, is specified to withstand over 200 automatic injections at an injection port temperature of 350 °C.

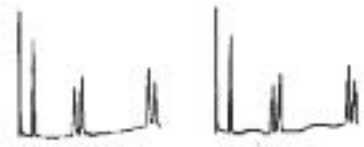
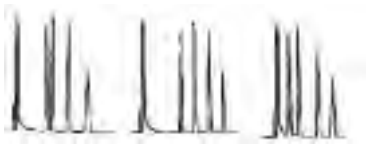


CrossLab general purpose inlet septa, 8010-0257

General Purpose Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
9 mm	8010-0249	8010-0250
9.5 mm	8010-0251	8010-0252
10 mm	8010-0253	8010-0254
11 mm	8010-0255	8010-0256
11.5 mm	8010-0257	8010-0258
12.7 mm	8010-0259	8010-0260
17 mm	8010-0261	8010-0262
Shimadzu plug	8010-0263	8010-0264

Septa Troubleshooting

Symptom	Possible Causes	Remedy
Extra Peaks/Humps 	Septum bleed	Turn off injector heater. If extra peaks disappear, use septum specified for higher temperature or analyze at lower inlet temperature.
Baseline Change After Large Peak 	Large leak at septum during injection and for a short time thereafter (common with large diameter needles)	Replace septum and use smaller diameter needles.
Retention Times Prolonged 	Carrier gas leaks at septum or column connection	Check for leaks. Replace septum or tighten connections if necessary.

Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Liners for 1177 Split/Splitless Injector Ports

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Split/Splitless Liners										
	Single taper	4.0	6.3	78.5	1000	5/pk	RT207992145 SG092017	8004-0151	SG092017	8004-0101
	Single taper, with wool	4.0	6.3	78.5	1000	5/pk	SG092019	8004-0152	SG092019	8004-0102
	Double taper	4.0	6.3	78.5	1000	5/pk	SG092018	8004-0155	SG092018	8004-0105
	Gooseneck, with wool	4.0	6.5	78.5	1000	5/pk	392611936	8004-0170	392611936	8004-0114
	Recessed gooseneck, with wool	4.0	6.3	78.5	1000	5/pk	SG092010	8004-0153	SG092010	8004-0103
	Gooseneck	2.0	6.5	78.5	250	5/pk	392611926	8004-0178	392611926	8004-0119
Splitless Liners										
	Straight, with wool	4.0	6.5	78.5	1000	5/pk	392611937	8004-0173	392611937	8004-0116
	Gooseneck	4.0	6.5	78.5	1000	5/pk	392611927	8004-0165	392611927	8004-0113
Split Liners										
	Straight-through	4.0	6.3	78.5	1000	5/pk	RT207732145 SG092007	8004-0156	SG092007	8004-0106
	Straight, with wool	4.0	6.3	78.5	1000	5/pk	SG092001 392611934	8004-0154	SG092001 392611934	8004-0104
	With frit, gooseneck	4.0	6.3	78.5	1000	5/pk	RT210462145	8004-0158		
Direct Liners										
	Straight-through	1.2	6.3	78.5	90	5/pk	SG092016	8004-0157	SG092016	8004-0107

***Formerly Varian GC systems, now Bruker products**

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Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Liners for 1078/1079 Injector Ports

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Split/Splitless Liners										
	Single taper	3.4	5.0	54	500	5/pk	RT209012145 SG092038	8004-0160	SG092038	8004-0108
	Gooseneck, with wool	2.0	5.0	54	250	5/pk			392611953	8004-0118
Splitless Liners										
	Single taper	2.0	5.0	54	170	5/pk	RT207122145 SG092039	8004-0161	SG092039	8004-0109
Split Liners										
	Gooseneck	3.4	5.0	54	500	5/pk	392611945	8004-0164	392611945	8004-0112
	With frit, gooseneck	3.4	5.0	54	500	5/pk	RT217092145	8004-0159		
	With frit, gooseneck	3.4	5.0	54	500	5/pk	392611946	8004-0171		
Other Liners										
	SPME, straight	0.8	5.0	54	30	5/pk	392611948	8004-0176		

Liners for 1093/1094 Injector Ports

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Direct Liners										
	SPI for 0.25/0.32 mm id columns	0.5	4.6	54	10	5/pk	190010906	8004-0167		
	SPI with 0.5 mm restriction for 0.53 mm id on-column	0.8	4.6	54	30	5/pk	SG092034 190010907	8004-0162	SG092034 190010907	8004-0110

***Formerly Varian GC systems, now Bruker products**

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Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Liners for 1075/1077 Injector Ports

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Split Liners										
	With wool	4.0	6.3	72	1000	5/pk	SG092021 190010901	8004-0163	SG092021 190010901	8004-0111

Liners for 1060/1061 Injector Ports

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Direct Liners										
	Double gooseneck	0.9	6.3	72	1000	5/pk	392611943	8004-0168		



Graphite O-ring, 8004-0202

Liner O-rings

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Non-stick fluoroelastomer O-ring, 1177 split/splitless, 6.3/6.5 mm od	10/pk	8850103100	8004-0201
Graphite O-ring, 1177 split/splitless, 6.5 mm od	10/pk	392611930	8004-0202
Graphite O-ring, 1177 split/splitless, 6.3 mm od	10/pk	392611935	8004-0203
Graphite liner seal, 1078/1079 injector, 5 mm id	10/pk	392534201	8004-0204

***Formerly Varian GC systems, now Bruker products**

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Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Column Ferrules

Capillary Column Ferrules

Injector	Fitting Size (in)	Ferrule ID (mm)	Column ID (mm)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
60% Vespel/40% Graphite Capillary Column Ferrules							
1177, 1079	1/16	0.3	0.18 or smaller	1	10/pk	CR213103	8004-0211
	1/16	0.4	0.25	2	10/pk	CR213124	8004-0213
	1/16	0.425	0.25	1	10/pk	CR213104	8004-0212
	1/16	0.5	0.32	1	10/pk	CR213105	8004-0214
	1/16	0.5	0.32	2	10/pk	CR213125	8004-0215
1177, 1079, 1061, 1041	1/16	0.8	0.53	1	10/pk	CR213108	8004-0216
Vespel Capillary Column Ferrules							
1177, 1079	1/16	0.3	0.18	1	10/pk	CR212103	8010-0306
	1/16	0.4	0.25	1	10/pk		8010-0307
	1/16	0.425	0.25	1	10/pk	CR212104	8004-0219
	1/16	0.5	0.32	1	10/pk	CR212105	8010-0308
	1/16	0.5	0.32	2	10/pk	CR212125	8004-0218*
1177, 1079, 1061, 1041	1/16	0.8	0.53	1	10/pk	CR212108	8010-0309
Graphite Capillary Column Ferrules							
1177, 1079	1/16	0.4	0.25	1	10/pk	CR211104	8010-0301
	1/16	0.5	0.32	1	10/pk	CR211105	8010-0302
	1/16	0.5	0.32	2	10/pk	CR211125	8010-0303
1177, 1079, 1061, 1041	1/16	0.8	0.53	1	10/pk	CR211108	8010-0304

*1177 Injector only

***Formerly Varian GC systems, now Bruker products**

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Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Packed Column Ferrules

Injector	Fitting Size (in)	Ferrule ID (in)	Column OD (in)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
60% Vespel/40% Graphite Packed Column Ferrules							
1093, 1061, 1041	1/4	1/4	1/4	1	10/pk	CR213400	8004-0217*
Graphite Packed Column Ferrules							
1093, 1061, 1041	1/4	1/4	1/4	1	10/pk	CR211400	8010-0305*

*Straight body

Column Nuts

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Column nut, brass, 1177, 1079, 1061, or 1041 injector	2/pk	394955100	8004-0311
Column nut, stainless steel, 1093 injector	2/pk	CP743117	8004-0312

Autosampler Syringes for Bruker/Varian GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/Length (mm)/Tip	Similar to OEM syringe Part No.	Agilent CrossLab Syringe Part No.	Agilent CrossLab Replacement Needle Part No.	Agilent CrossLab Replacement Plunger Part No.
Varian* CP8400, CP8410, CP9010, CP9050	10	Fixed needle	23/50/cone tip	SG002981	8010-0351		
		Fixed needle	26/50/bevel tip		8004-0001		
		Removable needle	26/50/cone tip	SG002982	8004-0003	8004-0004, 2/pk	
Varian* 8035, 8100, 8200		Fixed needle, gas tight	26/53/side hole tip		8004-0002		8004-0007
		Removable needle, gas tight	25/53/side hole tip		8004-0005	8004-0006, 2/pk	8004-0007

***Formerly Varian GC systems, now Bruker products**

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.



Autosampler syringe, 10 µL fixed needle, 8010-0351

Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Inlet Septa



Non-stick bleed and temperature optimized septa, 10 mm, 50/pk, 8010-0221

Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0217	CR298713	8010-0218
9.5 mm	8010-0219	CR298705	8010-0220
10 mm	8010-0221	CR298745	8010-0222
11 mm, CenterGuide	8010-0223	CR298717	8010-0224
11.5 mm, CenterGuide	8010-0225	CR298777	8010-0226

Non-Stick Advanced Green Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0201	CR246713	8010-0202
9.5 mm	8010-0203	CR246124	8010-0204
10 mm	8010-0205		8010-0206
11 mm, CenterGuide	8010-0207	CR246225	8010-0208
11.5 mm, CenterGuide	8010-0209	CR246725	8010-0210

***Formerly Varian GC systems, now Bruker products**

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Agilent CrossLab Supplies for Bruker, Varian* GC Systems



Long-life septa, 8010-0239, 8010-0240

Non-Stick Long-Life Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0233	CR239778	8010-0234
11 mm, CenterGuide	8010-0239	CR239287	8010-0240
11.5 mm, CenterGuide	8010-0241	CR239287	8010-0242

General Purpose Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
General Purpose Septa		
9 mm	8010-0249	8010-0250
9.5 mm	8010-0251	8010-0252
10 mm	8010-0253	8010-0254
11 mm	8010-0255	8010-0256
11.5 mm	8010-0257	8010-0258

***Formerly Varian GC systems, now Bruker products**

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TIPS & TOOLS

For a comprehensive vial compatibility chart, identification guide, septum recommendations, and ordering information, see the complete CrossLab Vials and Closures section of our General Chromatography catalog, publication number 5991-1056EN.

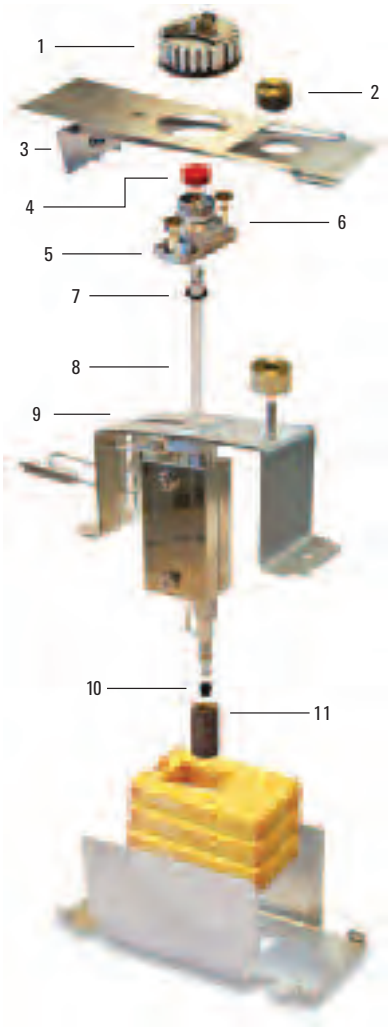
Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Injector Replacement Parts and Supplies

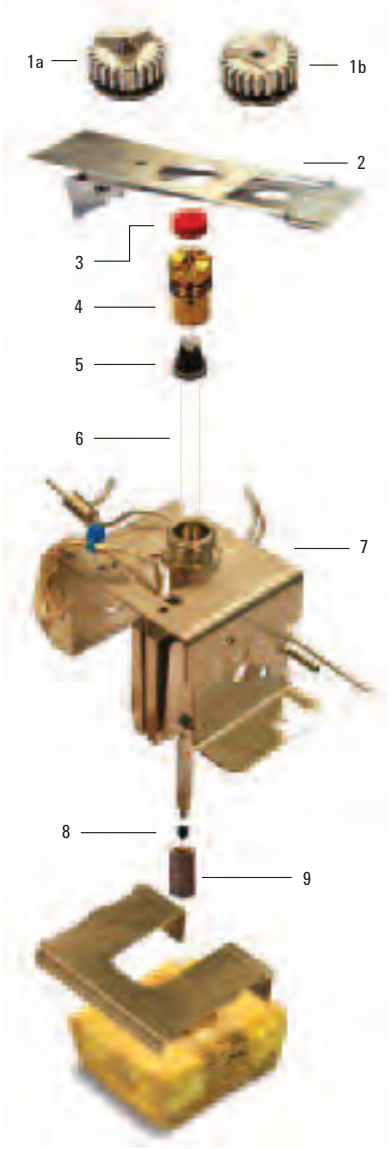
1177 Split/Splitless Injector

Item	Description	Agilent CrossLab and Agilent Part No.
1	Injector nut	392597501
	Injector nut wrench	390842300
2	Knob	392597101
3	Automatic start switch	390820601
4	Septum, 9 mm	
	BTO	8010-0217
	Long Life	8010-0233
	Advanced Green	8010-0201
	Septum pick	7200008400
5	Septum purge head	
	EFC21 (stainless steel)	392597301
	EFC21 (UltiMetal)	392597303
	EFC25 or Manual Pneumatics	392597302
6	Purge head screw	391866308
7	Graphite liner O-ring, splitless, 6.5 mm	8004-0202
	Non-stick fluoroelastomer liner O-ring, 6.3 mm	8004-0201
8	Glass liner	8004-0165
9	Injector body	
	Stainless steel	392599401
	UltiMetal	392599411
	Manual	392599501
10	For replacement ferrules, see complete CrossLab column ferrules ordering information, see page 157	
11	Bottom nut	8004-0311

***Formerly Varian GC systems, now Bruker products**



Agilent CrossLab Supplies for Bruker, Varian* GC Systems



1079 Large Volume Injector (LVI)

Item	Description	Agilent CrossLab and Agilent Part No.
1a	Injector nut	394966601
1b	Injector nut	394966601
	Injector nut wrench	390842300
2	Automatic start switch	390820601
3	Septum, 11.5 mm	
	BTO	8010-0225
	Long Life	8010-0241
	Advanced Green	8010-0209
	Septum pick	7200008400
4	Septum support	391867600
5	Graphite liner seal	8004-0204
6	Glass liner	8004-0164
7	Injector body, EFC type	
	Stainless steel	392544001
	UltiMetal	392544011
8	For replacement ferrules, see complete CrossLab column ferrules ordering information, see page 157	
9	Bottom nut	8004-0311

***Formerly Varian GC systems, now Bruker products**

TIPS & TOOLS

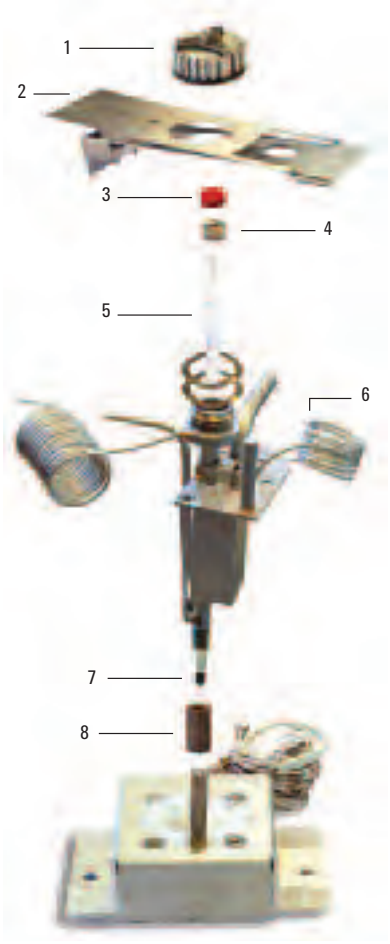
For a comprehensive vial compatibility chart, identification guide, septum recommendations, and ordering information, see the complete CrossLab Vials and Closures section of our General Chromatography catalog, publication number 5991-1056EN.

Agilent CrossLab Supplies for Bruker, Varian* GC Systems

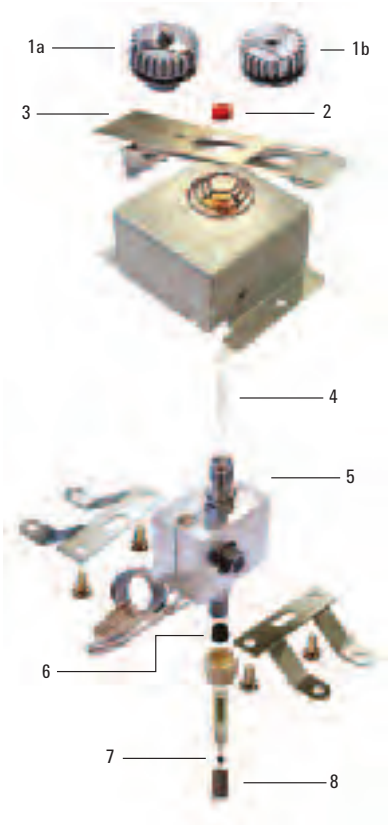
1093 Cool On-Column (COC) Injector

Item	Description	Agilent CrossLab and Agilent Part No.
1	Injector nut	394966601
	Injector nut wrench	390842300
2	Automatic start switch	390820601
3	Septum, 11.5 mm	
	BTO	8010-0225
	Long Life	8010-0241
	Advanced Green	8010-0209
	Septum pick	7200008400
4	Septum support	391821100
5	Glass liner	
	Default	8004-0162
	High performance	8004-0167
6	Screw	391866306
7	Graphite/Vespel ferrule	8004-0217
	Graphite ferrule	8010-0305
8	Bottom nut	
	Brass	8004-0311
	Stainless steel	8004-0312

***Formerly Varian GC systems, now Bruker products**



Agilent CrossLab Supplies for Bruker, Varian* GC Systems



1061 Packed/530 µm Capillary Column Injector

Item	Description	Agilent CrossLab and Agilent Part No.
1a	Injector nut	390812700
1b	Injector nut	392595501
	Injector nut wrench	390842300
2	Septum, 9.5 mm	
	BTO	8010-0219
	Advanced Green	8010-0203
	Septum pick	7200008400
3	Automatic start switch	390820601
4	Glass liner	8004-0168
5	Injector body, EFC23	392548301
6	Graphite/Vespel ferrule	8004-0217
	Graphite ferrule	8010-0305
7	For replacement ferrules, see complete CrossLab column ferrules ordering information, see page 157	
8	Bottom nut	8004-0311

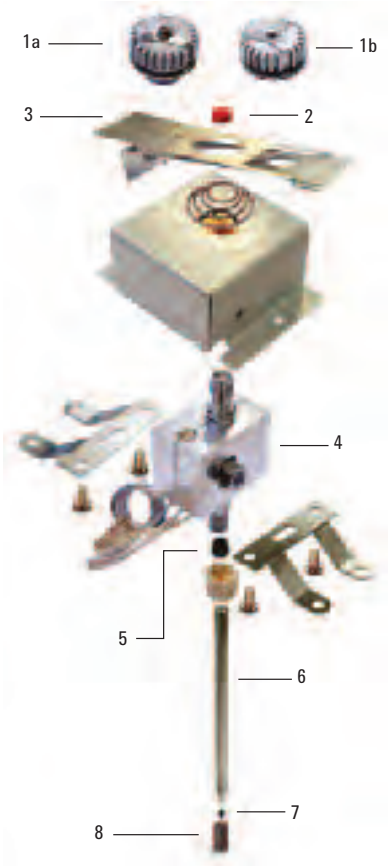
***Formerly Varian GC systems, now Bruker products**

Agilent CrossLab Supplies for Bruker, Varian* GC Systems

1041 Packed/Wide Bore On-Column (PWOC) Injector

Item	Description	Agilent CrossLab and Agilent Part No.
1a	Injector nut	390812700
1b	Injector nut	392595501
	Injector nut wrench	390842300
2	Septum, 9.5 mm	
	BTO	8010-0219
	Advanced Green	8010-0203
	Septum pick	7200008400
3	Automatic start switch	390820601
4	Injector body, EFC type	392548201
5	Graphite/Vespel ferrule	8004-0217
	Graphite ferrule	8010-0305
6	Injector insert, stainless steel	392543101
7	For replacement ferrules, see complete CrossLab column ferrules ordering information, see page 157	
8	Bottom nut	8004-0311

***Formerly Varian GC systems, now Bruker products**



Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Detector Replacement Parts and Supplies

Thermal Conductivity Detector (TCD)

Description	Agilent Part No.
Adapter TCD/DEFC capillary make-up	392585291
Adapter TCD/DEFC reference gas kit	392585292
Adapter TCD capillary make-up, MPC, 3800	392560591
TCD DEFC 14 (Non-H_2), 2 channels	392561290

Flame Ionization Detector (FID)

Description	Agilent Part No.
Tube collector	394958700
Lower FID insulator #17311	2100003200
FID flame tip jet, 0.010 in	200187500
FID flame tip jet with nut, 0.020 in	200193800
Crunch washer, 25/pk	1500334701

***Formerly Varian GC systems, now Bruker products**

Agilent CrossLab Supplies for Bruker, Varian* GC Systems

Pulsed Flame Photometric Detector (PFPD)

Description	Agilent Part No.
Photomultiplier tube (PFPD) #R647-08	392517100
O-Ring, silicone, 0.53 in id, PFPD	2740292400
PFPD light pipe	392515500
Sapphire window assembly	392514500
Sapphire window washer	392514300
Wrench, PFPD combustor support	392519200
Seal, combustor support	392513800
Combustor holder (2 mm)	392517800
Combustor Sulfur (2 mm), cleaned	392517600
Holder, combustor, 3 mm, cleaned	392517901
Combustor Phosphorus, 3 mm, cleaned	392517700

PFPD Filter Assemblies

Description	Agilent Part No.
Arsenic (As)	392515105
Manganese (Mn)	392544391
Nitrogen (N)	392511901
Sulfur and Phosphorus (S and P)	392515104
Phosphorus (P)	392515102
Sulfur (S)	392515101
Tin (Sn)	392515103

***Formerly Varian GC systems, now Bruker products**

TIPS & TOOLS

For a comprehensive vial compatibility chart, identification guide, septum recommendations, and ordering information, see the complete CrossLab Vials and Closures section of our General Chromatography catalog, publication number 5991-1056EN.

Agilent CrossLab Supplies for Bruker, Varian* GC Systems

PFPD Nitrogen Mode Maintenance

Description	Agilent Part No.
Photomultiplier tube, Nitrogen R-5070A	392512800
O-Ring, 0.987 in id	2740236100
PFPD filter assembly, Nitrogen	392511901
PFPD light pipe	392515500
Sapphire window assembly	392514500
Sapphire window washer	392514300

Thermionic Specific Detector (TSD)

Description	Agilent Part No.
TSD bead probe, unconditioned and untested	390607400
TSD bead probe, conditioned and tested	390607401
Upper TSD insulator #17310 TSD	2100003100
O-Ring, 30/pk	2740928202
TSD collector assembly	390607900
Lower FID insulator #17311	2100003200
Crunch washer, 25/pk	1500334701
FID flame tip jet with nut, 0.020 in	200193800
Flow tube assembly	200187600

***Formerly Varian GC systems, now Bruker products**

Agilent CrossLab Parts and Supplies for PerkinElmer GC Systems

Liners for AutoSystem, AutoSystem XL, Clarus Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Split/Splitless Liners										
	PSS straight	2.0	4.0	86.2		5/pk	N6502002	8003-0153		8003-0103
	PSS straight with bottom restriction	2.0	4.0	86.2	260	5/pk	N6121004	8003-0158		
	PSS on-column	2.0	4.0	86.2	250	5/pk	N6101539	8003-0165	N6101539	8003-0110
	PSS straight	1.0	4.0	86.2	65	5/pk	N6121006	8003-0157		
Split/Large Volume Splitless Liners										
	Straight with bottom restriction	4.0	6.2	92.1	1150	5/pk	N6121001	8003-0159	N6121001	8003-0105
Splitless Liners										
	Straight	2.0	6.2	92.1	300	5/pk	N6101372	8003-0162	N6101372	8003-0107
	Straight-through	2.0	6.2	92.1	300	5/pk	N6502004	8003-0152	N6502004	8003-0102
Split Liners										
	Straight-through	4.0	6.2	92.1	1150	5/pk		8003-0151		8003-0101
	Straight, wool	4.0	6.2	92.1	1100	5/pk	N6121020	8003-0160	N6121020	8003-0106
	Straight with bottom restriction	4.0	6.2	92.1	1100	5/pk	N6101052	8003-0166	N6101052	8003-0111

(Continued)

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Parts and Supplies for PerkinElmer GC Systems

Liners for AutoSystem, AutoSystem XL, Clarus Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Direct Liners										
	Gooseneck, drilled hole on top, wool	4.0	6.2	92.1		5/pk	N6121022	8003-0155		
Other Liners										
	Packed column, straight	3.0	6.2	112	800	5/pk	N6121000	8003-0163	N6121000	8003-0108
	Programmable on-column, hour glass	2.2	4.0	16		5/pk			N6101703	8003-0109*
	PTV, 0.25 mm id restriction, recessed gooseneck	1.0	2.0	88	70	5/pk		8003-0154		8003-0104

*P/N 8003-0109 is not deactivated



Graphite O-rings, 8003-0205

Liner O-rings

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Non-stick fluoroelastomer O-ring	10/pk	N9302783	8010-0401
Non-stick fluoroelastomer O-ring, PSS Injector	10/pk	N6101747	8003-0202
Silicone O-ring	10/pk	N6101374	8003-0203
Graphite O-ring, PSS Injector	10/pk	N6101751	8003-0204
Graphite O-ring	10/pk	N6101378	8003-0205

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Agilent CrossLab Parts and Supplies for PerkinElmer GC Systems

Column Ferrules

Capillary Column Ferrules

Model	Fitting Size (in)	Ferrule ID (mm)	Column ID (mm)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
85% Vespel/15% Graphite Capillary Column Ferrules							
AutoSystem, AutoSystem XL, Clarus	1/16	0.4	0.25	1	10/pk	09920104	8010-0310
	1/16	0.4	0.25	2	10/pk	04972392	8010-0312
	1/16	0.5	0.32	1	10/pk	09920105	8010-0311
	1/16	0.5	0.32	2	10/pk	N9306000	8003-0216
	1/16	0.8	0.53	1	10/pk	09920107	8010-0313
Graphite Capillary Column Ferrules							
AutoSystem, AutoSystem XL, Clarus	1/16	0.4	0.25	1	10/pk		8010-0301
	1/16	0.5	0.32	1	10/pk	09903700	8010-0302
	1/16	0.5	0.32	2	10/pk	N9306001	8010-0303
	1/16	0.8	0.53	1	10/pk	09920141	8010-0304
Vespel Capillary Column Ferrules							
AutoSystem, AutoSystem XL, Clarus	1/16	0.3	0.18 or smaller	1	10/pk		8010-0306
	1/16	0.4	0.25	1	10/pk		8010-0307
	1/16	0.5	0.32	1	10/pk		8010-0308
	1/16	0.8	0.53	1	10/pk		8010-0309

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Parts and Supplies for PerkinElmer GC Systems

Packed Column Ferrules

Model	Fitting Size (in)	Ferrule ID (in)	Column OD (in)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
85% Vespel/15% Graphite Packed Column Ferrules							
AutoSystem, AutoSystem XL, Clarus	1/4	1/4	1/4	1	10/pk	09903739	8010-0314
	1/8	1/8	1/8	1	10/pk	N9302081	8003-0219
	1/16	1/16	1/16	1	10/pk	09920127	8010-0315
Graphite Packed Column Ferrules							
AutoSystem, AutoSystem XL, Clarus	1/4	1/4	1/4	1	10/pk	09920140	8010-0305
	1/8	1/8	1/8	1	10/pk	09903915	8003-0212
	1/16	1/16	1/16	1	10/pk	02450972	8003-0211
Vespel Packed Column Ferrules							
AutoSystem, AutoSystem XL, Clarus	1/4	1/4	1/4	1	10/pk	N9301361	8003-0223
	1/8	1/8	1/8	1	10/pk	N9301360	8003-0222
	1/16	1/16	1/16	1	10/pk		8003-0221

Column Nuts

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Column nut, 1/16 in	2/pk	09903392	8003-0311

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Autosampler Syringes for PerkinElmer GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/Tip	Similar to OEM Syringe Part No.	Agilent CrossLab Syringe Part No.	Similar to OEM Replacement Needle and Plunger Repair Kit Part No.	Agilent CrossLab Replacement Needle and Plunger Repair Kit Part No.
AutoSystem, AutoSystem XL, Clarus	0.5	Removable needle	23/70/cone tip	N6101252	8003-0005	N6101469	8003-0006
AutoSystem, AutoSystem XL, Clarus		Removable needle	26/70/bevelled cone tip		8003-0007		8003-0008
AutoSystem, AutoSystem XL, Clarus	5	Fixed needle	23/70/cone tip	N6101251	8003-0001		
AutoSystem, AutoSystem XL, Clarus		Fixed needle, gas tight	23/70/cone tip	N6101390	8003-0002		
AutoSystem, AutoSystem XL, Clarus		Fixed needle	26/70/cone tip	N6101380	8003-0003		
AutoSystem, AutoSystem XL, Clarus	50	Fixed needle	23/70/cone tip	N6101760	8003-0004		

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Parts and Supplies for PerkinElmer GC Systems

Inlet Septa

Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
11 mm, CenterGuide	8010-0223	N9302972	8010-0224

Non-Stick Advanced Green Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
11 mm, CenterGuide	8010-0207	N6621028 N9306219	8010-0208



Long-life septa, 8010-0239, 8010-0240

Non-Stick Long-Life Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
11 mm, CenterGuide	8010-0239	8010-0240

General Purpose Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
11 mm	8010-0255	54019985	8010-0256

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

TIPS & TOOLS

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Agilent CrossLab Supplies for Shimadzu GC Systems

Liners for 2014 Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Splitless Liners										
	Single taper, wool	3.5	5.0	95		5/pk	221-48876-02	8001-0160		
	Double taper, drilled hole near top	3.5	5.0	95		5/pk	220-94734-01	8001-0158		
	Double taper, drilled hole near bottom	3.5	5.0	95		5/pk	220-94734-02	8001-0159		
	Straight-through	2.6	5.0	95	500	5/pk	220-94767-00	8001-0151	220-94767-00	8001-0101
Split Liners										
	Straight with middle restriction	3.5	5.0	95	800	5/pk	221-41444-01	8001-0156	221-41444-01	8001-0106
	Straight with middle restriction, wool	3.5	5.0	95	800	5/pk	220-90784-00	8001-0157		
	Straight-through	3.4	5.0	95	860	5/pk		8001-0153		8001-0103
Direct Liners										
	For 0.53 mm id column	2.6	5.0	95	450	5/pk	220-94768-00	8001-0152	220-94768-00	8001-0102

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Supplies for Shimadzu GC Systems

Liners for 2010 and 2010 Plus Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Split/Splitless Liners										
	Single taper	3.4	5.0	95		5/pk	961-01480-07 221-48335-01	8001-0154	221-48335-01	8001-0104
Splitless Liners										
	Single taper, wool	3.5	5.0	95		5/pk	221-48876-02	8001-0160		
	Double taper, drilled hole near top	3.5	5.0	95		5/pk	220-94734-01	8001-0158		
	Double taper, drilled hole near bottom	3.5	5.0	95		5/pk	220-94734-02	8001-0159		
	Straight-through	2.6	5.0	95	500	5/pk	220-94767-00	8001-0151	220-94767-00	8001-0101
Split Liners										
	Straight-through	3.4	5.0	95	860	5/pk		8001-0153		8001-0103
	Straight with middle restriction	3.5	5.0	95	800	5/pk	221-41444-01	8001-0156	221-41444-01	8001-0106
	Straight with middle restriction, wool	3.5	5.0	95	800	5/pk	220-90784-00	8001-0157		
Other Liners										
	PTV	1.25	3.5	95	100	5/pk	221-49300-00	8001-0163		
	SPME or Purge and Trap, straight	0.75	5.0	95	50	5/pk	220-94769-00	8001-0162		

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Agilent CrossLab Supplies for Shimadzu GC Systems

Liners for 17A Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Splitless Liners										
	Single taper, wool	3.5	5.0	95		5/pk	221-48876-02	8001-0160		
	Double taper, drilled hole near top	3.5	5.0	95		5/pk	220-94734-01	8001-0158		
	Double taper, drilled hole near bottom	3.5	5.0	95		5/pk	220-94734-02	8001-0159		
	Straight-through	2.6	5.0	95	500	5/pk	220-94767-00	8001-0151	220-94767-00	8001-0101
Split Liners										
	Straight with middle restriction, wool	3.5	5.0	95	800	5/pk	220-90784-00	8001-0157		
	Straight-through	3.4	5.0	95	860	5/pk		8001-0153		8001-0103
Direct Liners										
	For 0.53 mm id column	2.6	5.0	95	450	5/pk	220-94768-00	8001-0152	220-94768-00	8001-0102

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.



Agilent CrossLab Supplies for Shimadzu GC Systems

Liners for 14 Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Agilent Ultra Inert Deactivation	Agilent Original Deactivation
Split/Splitless Liners								
	2.0 mm middle gooseneck	3.4	5.0	99	850	5/pk	8001-0155	8001-0105



Graphite O-rings

Liner O-rings

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Non-stick fluoroelastomer O-ring	10/pk	036-11203-84	8001-0201
Graphite O-ring, split	10/pk	221-48393-91	8001-0202
Graphite O-ring, splitless	10/pk	221-47222-91	8001-0203

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Agilent CrossLab Supplies for Shimadzu GC Systems

Column Ferrules

Capillary Column Ferrules

Model	Fitting Size (in)	Ferrule ID (mm)	Column ID (mm)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
85% Vespel/15% Graphite Capillary Column Ferrules							
QP5000/5050 Standard MS	1/16	0.3	0.18 or smaller	1	10/pk	220-90700-01	8001-0224
	1/16	0.4	0.25	1	10/pk	220-90700-02	8001-0221
	1/16	0.5	0.32	1	10/pk	220-90700-03	8001-0222
	1/16	0.8	0.53	1	10/pk	220-90700-04	8001-0223
QP2010	1/16	0.4	0.25	1	10/pk	220-90418-14	8010-0310
	1/16	0.4	0.25	2	10/pk	225-19056-00	8010-0312
	1/16	0.5	0.32	1	10/pk	220-90418-15	8010-0311
	1/16	0.8	0.53	1	10/pk	220-90418-18	8010-0313
Graphite Capillary Column Ferrules							
2010, 2010 Plus, 2014, 17A, 14A	1/16	0.4	0.25	1	10/pk	220-90765-00	8001-0211
	1/16	0.5	0.32	1	10/pk	221-32126-05	8001-0212
	1/16	0.8	0.53	1	10/pk	221-32126-08	8001-0213

Packed Column Ferrules

Model	Fitting Size (in)	Ferrule ID (in)	Column OD (in)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
85% Vespel/15% Graphite Packed Column Ferrules							
QP5000/5050 Standard MS	1/4	1/4	1/4	1	10/pk	225-09028-00	8010-0314
QP5000/5050 Wide Bore MS	1/16	1/16	1/16	1	10/pk	220-90418-28	8010-0315
QP2010	1/16	1/16	1/16	1	10/pk		8010-0315
17A	5 mm	5 mm	5 mm od	1	10/pk	221-46403-92	8001-0214

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.



Graphite capillary column ferrules, 8001-0213

Agilent CrossLab Supplies for Shimadzu GC Systems

Column Nuts

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Column nut, slotted, 6-sided	2/pk	221-32705-00	8001-0311
Column nut, no slot, 6-sided	2/pk	221-41533-00	8001-0312

Autosampler Syringes for Shimadzu GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/ Tip	Similar to OEM Syringe Part No.	Agilent CrossLab Syringe Part No.	Similar to OEM Replacement Needle and Plunger Repair Kit Part No.	Agilent CrossLab Replacement Needle Part No.
AOC-14, AOC-17, AOC-20	5	Removable needle	23/42/cone tip		8001-0010		8001-0011
AOC-14, AOC-17, AOC-20	10	Removable needle	23/42/cone tip	220-90282-20	8001-0004	220-90281-20	8001-0005, 2/pk
AOC-14, AOC-17, AOC-20		Removable needle	26/42/cone tip	220-90282-21	8001-0006	220-90281-21	8001-0007, 2/pk
AOC-14, AOC-17, AOC-20	50	Removable needle	23/42/cone tip	221-45243-00	8001-0012		8001-0014
AOC-14, AOC-17, AOC-20	250	Removable needle, gas tight	23/42/cone tip	221-45244-00	8001-0013		8001-0014

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

TIPS & TOOLS

For a comprehensive vial compatibility chart, identification guide, septum recommendations, and ordering information, see the complete CrossLab Vials and Closures section of our General Chromatography catalog, publication number 5991-1056EN.

Agilent CrossLab Supplies for Shimadzu GC Systems

Inlet Septa

Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
Shimadzu plug	8010-0231	8010-0232

Non-Stick Advanced Green Septa

Description	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
Shimadzu plug	8010-0215	220-90547-00 220-94781-00	8010-0216

General Purpose Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
Shimadzu plug	8010-0263	8010-0264

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Supplies for Thermo Scientific GC Systems

Liners for Trace, Focus Systems

	Description	ID (mm)	OD (mm)	Length (mm)	Volume (µL)	Unit	Similar to OEM Part No.	Agilent Ultra Inert Deactivation	Similar to OEM Part No.	Agilent Original Deactivation
Splitless Liners										
	Single taper	5.0	8.0	105	1750	5/pk	45350033	8002-0153	45350033	8002-0103
	Single taper	3.0	8.0	105		5/pk	45350032	8002-0154	45350032	8002-0104
Split Liners										
	Straight	5.0	8.0	105	2000	5/pk	45350030	8002-0151	45350030	8002-0101
	Straight	3.0	8.0	105	750	5/pk	45350031	8002-0152	45350031	8002-0102
PTV Liners										
	Straight	2.0	2.75	120	375	5/pk	45322045	8002-0156*	45322045	8002-0106*
	Straight with bottom restriction	2.0	2.75	120	375	5/pk	45352057	8002-0157	45352057	8002-0107
	6 baffles	2.0	2.75	120		5/pk	453T2120	8002-0160*		
	Straight	1.75	2.75	120	300	5/pk		8002-0155		8002-0105
	Straight	1.0	2.75	120	90	5/pk	45352054	8002-0161		
	3 baffles	1.0	2.75	120		5/pk	45352062	8002-0159*		

*Use in Trace systems only

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Supplies for Thermo Scientific GC Systems

Liner O-rings

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Non-stick fluoroelastomer O-ring, sintered liner	10/pk	29031305	8002-0201
Non-stick fluoroelastomer O-ring	10/pk	29030306	8010-0401
Graphite O-ring, 8 mm od	2/pk	29033406	8002-0203
Graphite O-ring, PTV	2/pk	29013417	8002-0204

Column Ferrules

Capillary Column Ferrules

Model	Fitting Size (in)	Ferrule ID (mm)	Column ID (mm)	Hole	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
85% Vespel/15% Graphite Capillary Column Ferrules							
Injectors/Detectors	1/16	0.4	0.25	1	10/pk	290VT186	8002-0220
	1/16	0.5	0.32	1	10/pk	290VT187	8002-0221
	1/16	0.8	0.53	1	10/pk	290VT188	8002-0222
Any GC/MS Interface	1/16	0.4	0.25	1	10/pk	29033496	8010-0310
	1/16	0.5	0.32	1	10/pk	29033497	8010-0311
Graphite Capillary Column Ferrules							
Trace/Focus Injectors/Detectors (not for GC/MS Interface)	M4	0.3	0.18	1	10/pk		8002-0211
	M4	0.4	0.25	1	10/pk	29053488	8002-0212
	M4	0.5	0.32	1	10/pk	29053487	8002-0213
	M4	0.8	0.53	1	10/pk	29053486	8002-0214
Injectors/Detectors	1/16	0.4	0.25	1	10/pk		8002-0215
	1/16	0.5	0.32	1	10/pk		8002-0216
	1/16	0.8	0.53	1	10/pk		8002-0217

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Supplies for Thermo Scientific GC Systems

Column Nuts

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Column nut, stainless steel, split/splitless injector	2/pk	35032423	8002-0311
Column nut, brass	2/pk	290BT239	8002-0312

Autosampler Syringes for Thermo GC Systems, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/Tip	Similar to OEM Syringe Part No.	Agilent CrossLab Syringe Part No.	Similar to OEM Replacement Needle or Plunger Part No.	Agilent CrossLab Replacement Needle or Plunger Part No.
TriPlus, AS3000	0.5	Plunger-in-needle	23/50/cone tip	36504045	8010-0355		8010-0367*
TriPlus	5	Fixed needle	26/50/cone tip	36504047	8010-0353		
TriPlus, AS3000, AS2000, AS200, AS800	10	Fixed needle	23/50/cone tip	36520060	8010-0351		
		Fixed needle	26/50/cone tip	365D3711	8010-0352		
		Fixed needle	25/50/cone tip	36500525	8002-0003		
TriPlus, AS2000		Fixed needle	23/80/cone tip	36520061	8002-0002		
		Fixed needle	26/80/cone tip	36502019	8002-0001		
TriPlus, AS2000, AS200, AS800	100	Fixed needle, gas tight	23/50/cone tip		8010-0354		8010-0368**
TriPlus, AS2000		Removable needle, gas tight	23/50/side hole tip	36520050	8002-0004	36540040	8002-0005***

*Needle and plunger repair kit

**Replacement plunger

***Replacement needle

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts.

Agilent CrossLab Supplies for Thermo Scientific GC Systems

Inlet Septa

Non-Stick Bleed and Temperature Optimized (BTO) Septa

Description	Similar to OEM Part No.	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	31303240	8010-0217		8010-0218
9.5 mm		8010-0219		8010-0220
10 mm		8010-0221		8010-0222
11 mm, CenterGuide		8010-0223		8010-0224
11.5 mm, CenterGuide	31303230	8010-0225		8010-0226
Description		**24/pk**		**48/pk**
12.7 mm, CenterGuide		8010-0227	31303228	8010-0228
17 mm, CenterGuide		8010-0229	31303211	8010-0230

Non-Stick Advanced Green Septa

Description	Similar to OEM Part No.	Agilent CrossLab Part No. 50/pk	Similar to OEM Part No.	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	313G3240	8010-0201		8010-0202
9.5 mm		8010-0203		8010-0204
10 mm		8010-0205		8010-0206
11 mm, CenterGuide	313G3230	8010-0207		8010-0208
11.5 mm, CenterGuide		8010-0209		8010-0210
Description		**24/pk**		**48/pk**
12.7 mm, CenterGuide		8010-0211	313G3228	8010-0212
17 mm, CenterGuide		8010-0213	313G3211	8010-0214



Non-stick advanced green septum, 11 mm, CenterGuide, 8010-0207

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All Agilent CrossLab supplies are backed by Agilent's 90-day money-back warranty.

Agilent CrossLab Supplies for Thermo Scientific GC Systems



Long-life septa, 8010-0239, 8010-0240

Non-Stick Long-Life Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
9 mm, CenterGuide	8010-0233	8010-0234
11 mm, CenterGuide	8010-0239	8010-0240
11.5 mm, CenterGuide	8010-0241	8010-0242
Description	**24/pk**	**48/pk**
12.7 mm, CenterGuide	8010-0243	8010-0244
17 mm, CenterGuide	8010-0245	8010-0246

General Purpose Septa

Description	Agilent CrossLab Part No. 50/pk	Agilent CrossLab Part No. 100/pk
9 mm	8010-0249	8010-0250
9.5 mm	8010-0251	8010-0252
10 mm	8010-0253	8010-0254
11 mm	8010-0255	8010-0256
11.5 mm	8010-0257	8010-0258
12.7 mm	8010-0259	8010-0260
17 mm	8010-0261	8010-0262

TIPS & TOOLS

For a comprehensive vial compatibility chart, identification guide, septum recommendations, and ordering information, see the complete CrossLab Vials and Closures section of our General Chromatography catalog, publication number 5991-1056EN.

For more information, please visit
www.agilent.com/chem/CrossLabGC

Agilent CrossLab Supplies for CTC GC Autosamplers



Autosampler Syringes for CTC CombiPAL and GC PAL, 1/pk

Volume (µL)	Description	Needle Gauge/ Length (mm)/Tip	Agilent CrossLab Syringe Part No.	Agilent CrossLab Replacement Needle or Plunger Part No.
0.5	Plunger-in-needle	23/50/cone tip	8010-0355	8010-0367*
5	Fixed needle	23/50/cone tip	8010-0356	
	Fixed needle	26/50/cone tip	8010-0353	
10	Fixed needle	23/50/cone tip	8010-0351	
	Fixed needle	25/50/cone tip	8002-0003	
	Fixed needle	26/50/cone tip	8010-0352	
	Fixed needle, gas tight	26/50/cone tip	8010-0357	8010-0359**
	Fixed needle	26/50/bevel tip	8010-0358	
25	Fixed needle	26/50/cone tip	8010-0360	
100	Fixed needle, gas tight	23/50/cone tip	8010-0354	
	Removable needle, gas tight	23/50/side hole tip	8002-0004	8002-0005***
	Fixed needle	26/50/cone tip	8010-0361	
250	Fixed needle, gas tight	26/50/cone tip	8010-0362	

Volume (mL)	Description	Needle Gauge/ Length (mm)/Tip	Agilent CrossLab Syringe Part No.	Agilent CrossLab Replacement Needle or Plunger Part No.
1	Fixed needle, gas tight, headspace	23/56/side hole tip	8010-0363	8010-0365
2.5	Fixed needle, gas tight, headspace	23/56/side hole tip	8010-0364	8010-0366

*Needle and plunger repair kit

**Replacement plunger

***Replacement needle

Agilent J&W GC columns

The story behind Agilent J&W GC Columns

In 2000, Agilent Technologies, the inventor of fused silica GC tubing, merged with J&W Scientific, the creator of the first GC stationary phase made from cross-linked siloxane polymers. In 2010, Agilent acquired Varian adding PLOT, Select, VF, CP-Sil and packed to the existing Ultra Inert, High Efficiency, LTM, PAH, UltiMetal, and Custom GC columns. Our foundation of GC expertise, combined with these vital acquisitions, we have built Agilent J&W into the most extensive and innovative GC column offering in the world.

Put 40 years of Agilent quality and innovation behind your every separation

Agilent J&W offers the broadest portfolio of the most innovative GC columns in the world, with over 3700 part numbers. Our portfolio offers the best inertness for acids/bases/mixed functional compounds, the lowest bleed levels and the tightest column-to-column reproducibility. So when you put industry-leading Agilent J&W GC columns to work in your lab, you can have the utmost confidence in your column, and in every separation.



The most inert and lowest bleed columns for sensitivity and performance

Agilent J&W columns have the widest range of standard, GC/MS and Ultra Inert stationary phases proven to deliver consistent column inertness and exceptionally low column bleed with high upper temperature limits, ensuring accurate peak identification and quantification. Column bleed can decrease spectral integrity, reduce uptime, and shorten column life. Column activity contributes to severe peak tailing, as well as compound loss or degradation for active compounds (e.g. acids and bases), leading to inaccurate quantification.



Better precision for better results

Agilent J&W columns adhere to tight retention factor (k) specifications, promoting consistent retention and separation. They also feature narrow retention indexes and a high number of theoretical plates per meter, ensuring narrow peaks and improving the resolution of closely eluting peaks.

The industry's tightest quality control specifications

Agilent's industry-leading testing ensures the most reliable qualitative and quantitative results, and unmatched column-to-column reproducibility, for your most challenging compounds. Offering the industry's only Ultra Inert testing, we test each column for peak height ratios and tailing for acids, bases, and other chromatographically demanding compounds so you can have utmost confidence in your trace-level separations.

And, with Agilent's industry-leading instruments, services, global technical support, and quick shipping, Agilent's whole solution provides you with even more confidence in your column, and in your every separation.

To learn more about Agilent J&W GC columns please visit **www.agilent.com/chem/mygccolumns.**

Agilent J&W LTM Column Modules

Agilent J&W LTM Column Modules for 7890 and 6890 Series GC Systems

This groundbreaking column technology is designed specifically for Agilent 7890A and 6890 series gas chromatographs, and delivers:

- The capacity to run up to four column modules simultaneously – with four different temperature programs – to maximize your productivity
- Rapid temperature programming rates of up to 1800 °C/min for higher analysis speeds
- Faster cooling times – as low as one minute or less – to decrease idling and downtime
- Shorter analytical cycle times than conventional air-bath GC oven techniques
- Excellent retention time repeatability and performance – comparable to conventional GC

Most Agilent J&W Capillary GC columns – including Wall Coated Open Tubular (WCOT) and Porous Layer Open Tubular (PLOT) columns – can be used for LTM column modules.



Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

This groundbreaking column technology is designed specifically for Agilent 5975T GC/MS systems. These modules include an integrated 3 in LTM capillary column toroid assembly with heated transfer lines, cooling fan assembly and sheet metal enclosure. Replacement column toroid assemblies are also available. Benefits of the LTM column modules include:

- Rapid temperature programming rates of up to 1200 °C/min
- Faster heating and cooling times – as low as one minute or less – for more rapid analytical cycle times than standard air-bath GC oven techniques
- Excellent retention time repeatability and performance comparable to conventional GC
- Less power consumption for longer in-field operation
- Integrated module design to facilitate easy column module change in the field

Shorten analytical cycle times and boost your high speed gas chromatography capabilities

Agilent J&W LTM column modules combine a high quality fused silica capillary column with heating and temperature sensing components for a low thermal mass column assembly. The LTM column module contains a patented design which heats and cools the column very efficiently for significantly shorter analytical cycle times compared to conventional air-bath GC oven techniques, while simultaneously using less power.

Agilent offers LTM technology for our popular 7890 and 6890 Series GC systems, as well as the new 5875T GC/MS. Compatible with Agilent LTM and LTM II series GC systems and retrofit upgrades.

All LTM column modules are packaged with:

- Two 1 m guard columns (one each for the inlet and detector) made from deactivated fused silica tubing of the same id as the analytical column
- Five non-reusable ferrules that fit the dimensions of the analytical and guard columns



For more information, visit www.agilent.com/chem/LTMcol



GC Capillary Columns

More than just essential products... reliable results!

With the highest inertness, lowest bleed levels, and the tightest column-to-column reproducibility, Agilent J&W GC Capillary columns perform better than any columns on the market.

Ultra Inert Columns – allow you to perform trace level analysis – including the analysis of acids, bases, or other active compounds – with the utmost confidence. They also help ensure an inert GC flow path that is essential for sensitivity, performance, and the integrity of your analytical results.

High Efficiency Columns – are ideal for applications that require reduced analysis time, such as high throughput screening, fast process monitoring, fast QC analyses, and fast method development.

Low-bleed GC/MS Columns – are specifically designed to chromatograph a broad range of trace-level samples, and offer low bleed and high inertness even at higher temperatures.

Premium Polysiloxane Columns – are stable, robust, and versatile and are available in a wide variety of stationary phases.

Polyethylene Glycol (PEG) Columns – offer a variety of unique phase characteristics to meet the varying needs of your laboratory, thanks to Agilent's strict quality control of the cross-linking and deactivation processes.

Specialty Columns – meet Agilent's uncompromising standards for high-temperature, life science, pesticide, petroleum, semivolatile, and volatile applications.

PLOT Columns – deliver superior separation for compounds that are gases at room temperature. They are also ideal for analyzing fixed gases, low molecular weight hydrocarbon isomers, volatile polymer compounds, and reactive analytes such as gases, amines, and hydrides.

On the following pages you will find details on our complete line of innovative Agilent J&W GC columns. For more information contact your local Agilent representative or Agilent Authorized Distributor. Or you can order online at **www.agilent.com/chem/store**.

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Column Selection Principles

Narrow your choices, save time, and reduce trial and error

Selecting the right capillary column for your application can be an uncertain (and sometimes difficult) task. If possible, you should begin by consulting sample applications provided by GC manufacturers and suppliers – or described in published Application Notes.

In addition, the following pages will help you:

- Choose a stationary phase – your most critical decision – based on factors such as selectivity, polarity, and phenyl content.
- Understand how column diameter influences factors like efficiency, solute retention, head pressure, and carrier gas flow rates.
- Determine which column length will affect solute retention, column head pressure, column bleed – and cost.
- Appreciate the difference between thin-film and thick-film columns with regard to capacity, inertness, bleed, and upper temperature limit.

While there are no foolproof techniques, shortcuts, tricks or secrets to column selection, there are some guidelines and concepts that simplify the process. There are four major column parameters to consider: stationary phase, diameter, length, and film thickness.





Selecting Stationary Phases

Choosing the best stationary phase is the most important decision when selecting a capillary column. Unfortunately, it is also the most difficult and ambiguous decision. The most reliable method is to consult the large collection of example applications provided by column manufacturers, GC manufacturers and in published literature. While an exact example application may not be available, enough information can usually be obtained to simplify the decision or reduce the number of potential columns. The most difficult situation is when no previous information is available. Stationary phase selection is much easier even if only one chromatogram is available for all or most of the sample compounds. The most reliable method is to consult the large collection of example applications provided by GC column & hardware manufacturers and published in literature.

The concepts of stationary phase selectivity and polarity are very useful when selecting stationary phases. For best performance, start with the general purpose Agilent J&W Ultra Inert 1ms and 5ms columns to get the lowest column bleed and column activity for a wide range of analytes, including active compounds and trace level samples.

Synonymous use of the terms polarity and selectivity is not accurate, but it is very common. Selectivity is determined by the physicochemical interactions of the solute molecules with the stationary phase. Polarity is determined by the structure of the stationary phase. Polarity does have an effect on separation; however, it is only one of the many stationary phase properties that influence peak separation (see the next section on polarity).

Selectivity can be thought of as the ability of the stationary phase to differentiate between two solute molecules by differences in their chemical or physical properties. Separation is obtained if the interactions between the stationary phase and solutes are different. For liquid or gum stationary phase (polysiloxanes and polyethylene glycols), there are three major interactions: dispersion, dipole, and hydrogen bonding. The following is a simplified and condensed explanation of the interactions for polysiloxane and polyethylene glycol stationary phases.

Dispersion is the dominant interaction for all polysiloxane and polyethylene glycol stationary phases. Dispersion can be simplified into the concept of volatility. Simply stated, the more volatile a solute, the faster it elutes from the column (i.e., shorter retention time). However, this order can be altered by the effect of solute and stationary phase polarities, and the other interactions. Solute boiling points are sometimes used as a measure of compound volatility. That is, compounds elute in the order of their increasing boiling points. Unfortunately, boiling points cannot be universally applied to the dispersion interactions. Boiling points are fairly valid when dealing with compounds with similar structures, functional groups or homologous series (**Figure 1**). When dealing with compounds with mixed functional groups, the boiling points simplification often fails (**Figure 2**). If compound boiling points differ by more than 30 °C, they usually can be separated by most stationary phases (there are exceptions). If compound boiling points differ by less than 10 °C, the boiling point simplification becomes less certain and more likely to be in error (except for compounds in a homologous series).

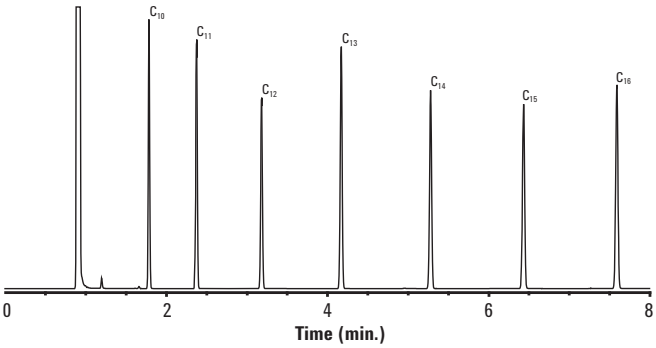
Figure 1: Boiling Point Elution Order for Homologous Series

Column: **DB-1, 15 m x 0.25 mm id, 0.25 µm**

Carrier: Helium at 30 cm/sec

Oven: 60 °C for 1 min, 60-180 °C at 20 °C/min

	Boiling Point (°C)
1. n-Decane (C_{10})	174
2. n-Undecane (C_{11})	196
3. n-Dodecane (C_{12})	216
4. n-Tridecane (C_{13})	234
5. n-Tetradecane (C_{14})	253
6. n-Pentadecane (C_{15})	268
7. n-Hexadecane (C_{16})	287

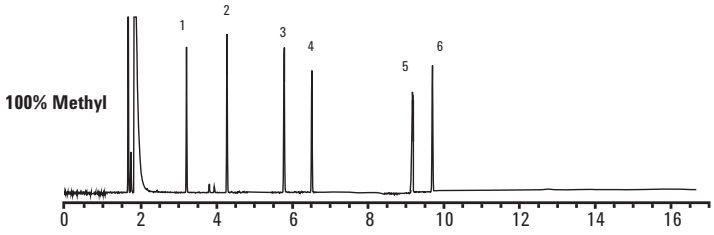


Homologous series of hydrocarbons. The solutes elute in order of their increasing boiling points; however, the peaks are not spaced in proportion to their respective boiling points.

Figure 2: Deviation from Boiling Point Order

Column: **DB-1, 30 m x 0.25 mm id, 0.25 µm**

	Boiling Point (°C)
1. Toluene	111
2. Hexanol	157
3. Phenol	182
4. Decane (C_{10})	174
5. Naphthalene	219
6. Dodecane (C_{12})	216



Solutes outside of the homologous series do not elute in the boiling point order.

If the stationary phase is capable of dipole interaction, it enhances its power to separate solutes whose dipole moments are different. Only some stationary phases are able to exploit this interaction. Polyethylene glycols, and cyanopropyl and trifluoropropyl substituted polysiloxanes readily undergo the dipole interactions; methyl or phenyl substituted groups do not undergo a dipole interaction (**Table 1**). The amount of peak separation for solutes with different dipoles often changes if a stationary phase with a different interaction is used (**Figure 3**). If the dipole difference between compounds is small, a greater amount of the appropriate group is needed (e.g., a 50% cyanopropylphenyl-methyl polysiloxane instead of a 14% cyanopropylphenyl-methyl polysiloxane). It is difficult to accurately predict the magnitude of the separation change for all of the peaks. Empirical results have shown that dipole interaction stationary phases are well suited for samples containing compounds that have base or central structures to which different groups are attached in various positions. Examples include substituted aromatics, halocarbons, pesticides and drugs.

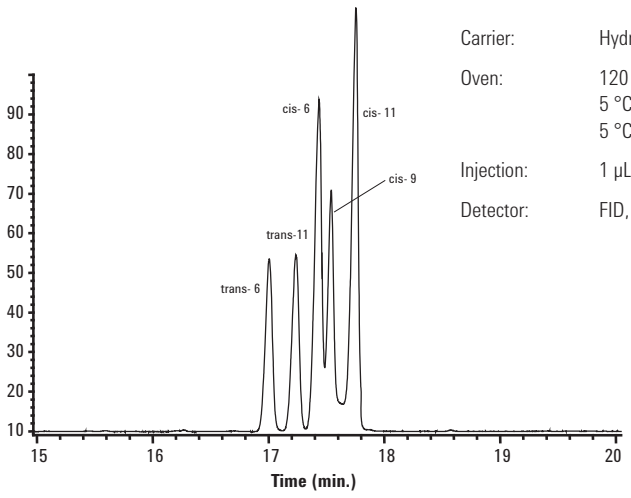
Table 1: Stationary Phase Interactions

Functional Group	Dispersion	Dipole	Hydrogen Bonding
Methyl	Strong	None	None
Phenyl	Strong	None to Weak	Weak
Cyanopropyl	Strong	Very Strong	Moderate
Trifluoropropyl	Strong	Moderate	Weak
PEG	Strong	Strong	Moderate

Figure 3: Dipole Interactions

Column: **HP-88, 30 m x 0.25 mm id, 0.25 µm**

Molecular weight and boiling points are virtually identical for these fatty acid methyl ester (FAME) isomers, with only the dipole interactions due to the hydrogen isomeric positions on the molecules being different. Only strong dipole interactions in the stationary phase can provide chromatographic separation for these types of compounds.



C-18:1 cis and trans isomers on HP-88

Carrier:	Hydrogen, 2 mL/min constant flow
Oven:	120 °C, 1 min, 10 °C/min to 175 °C, 10 min 5 °C/min to 210 °C, 5 min 5 °C/min to 230 °C, 5 min
Injection:	1 µL
Detector:	FID, 250 °C

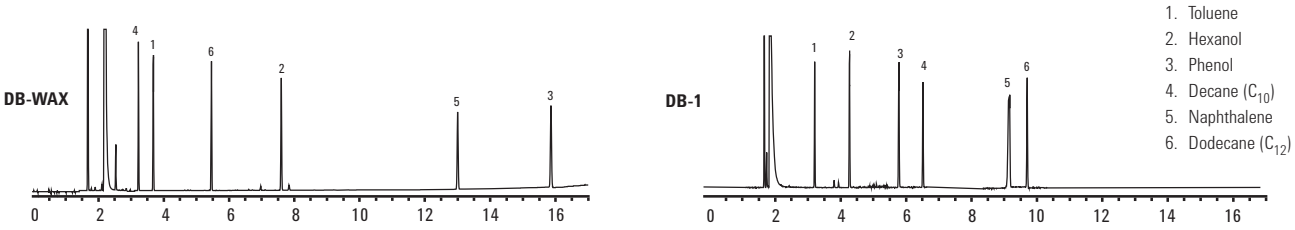
The hydrogen bonding interaction occurs if there is hydrogen bonding between the solute molecules and the stationary phase. **Table 2** lists the types of compounds that can form hydrogen bonds along with their relative bonding strengths. It is the difference in the strength of the hydrogen bonding that is critical. The same stationary phases that undergo dipole interactions also undergo hydrogen bonding interactions. The amount of peak separation for solutes whose hydrogen bonding potentials differ often changes if a stationary phase with a different amount of hydrogen bonding interaction is used (**Figure 4**). If the hydrogen bonding difference between compounds is small, a great amount of the appropriate group is needed (e.g., a polyethylene glycol instead of a 14% cyanopropylphenyl-methyl polysiloxane). It is difficult to accurately predict the magnitude of the separation change for all of the peaks. Sometimes the desired separation is obtained, but another set of peaks now co-elute with the new stationary phase.

Table 2: Relative Hydrogen Bonding Strengths

Strength	Compounds
Strong	Alcohols, carboxylic acids, amines
Moderate	Aldehydes, esters, ketones
Weak to None	Hydrocarbons, halocarbons, ethers

Figure 4: Hydrogen Bonding Interactions

Column: 15 m x 0.25 mm id, 0.25 µm

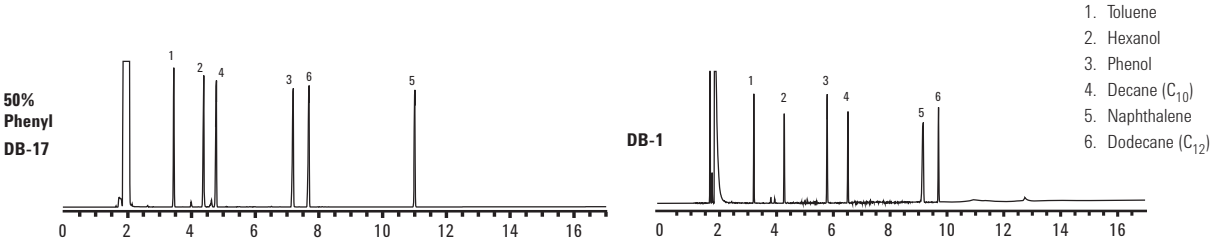


DB-1 does not undergo hydrogen bonding interactions. The change in the elution order of hexanol and phenol with DB-WAX is a combination of the dipole and hydrogen bonding interaction.

Another stationary phase characteristic that may effect retention in a predictable manner is the phenyl content. In general, the higher the phenyl content of the stationary phase, the higher the retention of aromatic solutes relative to aliphatic solutes. This does not mean that aromatic solutes are more retained (e.g., higher k) by high phenyl content stationary phases, but that aromatic solutes are more retained relative to aliphatic solutes. **Figure 5** shows an example of this retention behavior.

Figure 5: Phenyl Content Retention

Column: 15 m x 0.25 mm id, 0.25 µm



The aromatics increase in retention relative to the hydrocarbons for the DB-17 columns. DB-17 contains 50% phenyl substitution. DB-1 contains no phenyl substitution.

Polarity

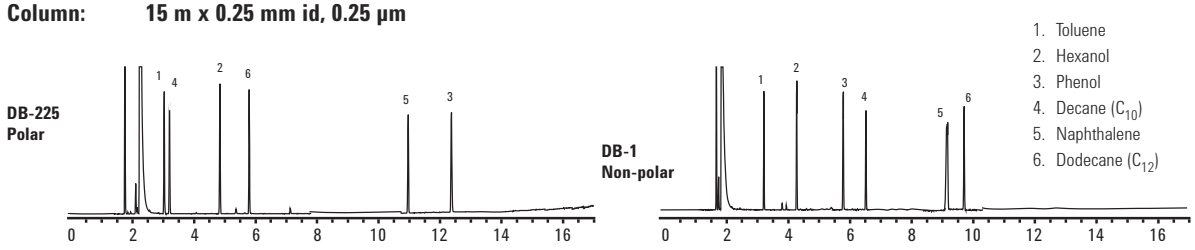
Stationary phase polarity is determined by the polarity of the substituted groups and their relative amounts. **Table 3** lists a variety of stationary phases in order of their increasing polarity. Polarity is often erroneously used to select columns or to determine separation characteristics. Stationary phase polarity is only one of many factors that affect retention and separation.

While polarity is not directly related to selectivity, it has a pronounced affect on compound retention, thus separation. For compounds of similar volatility, greater retention is obtained for solutes with polarities similar to the stationary phase. In other words, polar compounds are more strongly retained by a polar stationary phase than a less polar stationary phase, and vice versa. This effect can be seen in **Figure 6**. The changes in retention and elution order can be largely attributed to the changes in stationary phase polarity. Changes in the amount of phenyl substitution, and dipole and hydrogen bonding interactions also contribute to the changes; however, it is difficult to assess the magnitude of their individual contributions.

Separation and efficiency have to be considered together and not as separate column attributes, as each contributes to peak resolution. When the stationary phase provides adequate resolution between peaks, higher efficiency is not needed. Shorter or larger diameter columns and less than optimal GC conditions can be used in these situations. When resolution is not adequate, there is a need for higher column efficiency.

Figure 6: Polarity – Retention Relationship

Column: 15 m x 0.25 mm id, 0.25 µm



The alcohols (polar) increase in retention relative to hydrocarbon (non-polar) for the DB-225 column. DB-225 is more polar than DB-1.

In addition to retention, stationary phase polarity influences other column characteristics. There is a general trend between stationary phase polarity and column lifetime, temperature limits, bleed and efficiency. Column life, temperature limits and efficiency tend to be higher for more non-polar stationary phases. These are general trends and not absolute certainties. Low bleed stationary phases sometimes go against this trend.

Table 3: Stationary Phase Polarity

Low Polarity			Mid Polarity			High Polarity		
CP-Sil 2	DB & HP-1ms UI	DB & HP-5ms UI	DB-XLB	DB-225ms	DB-ALC1	HP-88	DB-WAX	CP-TCEP
DB-MTBE	DB & HP-1ms	DB & HP-5ms	VF-Xms	DB-225	DB-Dioxin	CP-Sil 88	DB-WAXetr	
CP-Select CB MTBE	VF-1 ms	VF-5ms	DB-35ms UI	CP-Sil 43 CB	DB-200	DB-23	HP-INNOWax	
	DB & HP-1	DB & HP-5	DB & VF-35ms	VF-1701 ms	VF-200ms	VF-23 ms	VF-WAXms	
	CP-Sil 5 CB	CP-Sil 8 CB	DB & HP-35	DB-1701	DB-210		CP-Wax 57 CB	
	Ultra 1	Ultra 2	DB & VF-17ms	CP-Sil 19 CB	DX-4		DB & HP-FFAP	
	DB-1ht	VF-DA	DB-17	HP-Blood Alcohol			DB-WAX FF	
	DB-2887	DB-5.625	HP-50+	DB-ALC2			CP-FFAP CB	
	DB-Petro/ PONA	DB & VF-5ht	DB-17ht	DX-1			CP-WAX 58 FFAP CB	
	CP-Sil PONA CB	CP-Sil PAH CB	DB-608				CP-WAX 52 CB	
	DB-HT SimDis	Select Biodiesel	DB-TPH				CP-WAX 51	
	CP-SimDis	SE-54	DB-502.2				CP-Carbowax 400	
	CP-Volamine		HP-VOC				Carbowax 20M	
	Select Mineral Oil		DB-VRX				HP-20M	
	HP-101		DB-624				CAM	
	SE-30		VF-624ms					
			CP-Select 624 CB					
			DB-1301					
			VF-1301ms					
			CP-Sil 13 CB					

Gas-Solid or PLOT Columns

PLOT (Porous Layer Open Tubular) columns are intended for the separation of very volatile solutes (primarily gases) without the need for cryogenic or sub-ambient cooling of the oven. Separations that would require column temperatures below 35 °C, even with thick film liquid stationary phase can be obtained at temperatures above 35 °C with PLOT columns.

Gas-solid or PLOT column stationary phases are physically different than polysiloxanes and polyethylene glycols. Gas-solid stationary phase are small, porous particles. The particles are stuck to the inner wall of the capillary tubing using a binder or similar means. Solutes are separated based on differences in their adsorption properties. Since the particles are porous, size and shape differentiation also occurs.

Alumina PLOT columns are well suited for the separation of C_1-C_{10} hydrocarbons and small aromatics. The KCl version of the Alumina PLOT column changes the retention order for some of the hydrocarbons. The PLOT Q column provides slightly better separation for C_1-C_3 hydrocarbons, but C_4 and higher hydrocarbons are better separated with an Alumina PLOT column. PLOT Q exhibits extremely long retention times and very broad peaks for C_6 and higher hydrocarbons and aromatics. PLOT Q separates sulfur gases from each other and from most light hydrocarbons. Molesieve PLOT columns are used to separate many noble and permanent gases. GS-GasPro columns combine many of the features of the various other PLOT columns. Light hydrocarbons, inorganic gases and solvents are some of the samples suitable for GS-GasPro.

Primary Selectivity Interactions in PLOT Phases

Dispersive

Shape/Size		**Ionic Surface**
Zeolites	⟷	Alumina/Al_2O_3 GS-OxyPLOT

Dispersive

Shape/Size		**Ionic Surface**
Molecular Sieves Bonded Graphitized Carbon	⟷ **Porous Polymers**	Bonded Silica

PLOT Column Examples

Zeolite/Molesieve:	HP-PLOT Molesieve
Graphitized Bonded Carbon:	GS-CarbonPLOT, CarboBOND
Porous Polymers:	HP-PLOT Q, HP-PLOT U
Bonded Silica:	GS-GasPro, CP-SilicaPLOT
Alumina/Al_2O_3:	GS-Alumina, GS-Alumina KCl, HP-PLOT Al_2O_3 KCl, HP-PLOT Al_2O_3 "S", HP-PLOT Al_2O_3 "M"
Proprietary Phase:	Lowox, GS-OxyPLOT

Stationary Phase Selection Summary

1. If no information or ideas about which stationary phase to use is available, start with a DB-1 or DB-5.
2. Low-bleed ("ms") columns are usually more inert and have higher temperature limits. Ultra Inert 1ms, 5ms and 35ms columns provide the lowest column bleed and highest column inertness for a wide range of analytes, including active compounds and trace level samples.
3. Use the least polar stationary phase that provides satisfactory resolution and analysis times. Non-polar stationary phases have superior lifetimes compared to polar phases.
4. Use a stationary phase with a polarity similar to that of the solutes. This approach works more times than not; however, the best stationary phase is not always found using this technique.
5. If poorly separated solutes possess different dipoles or hydrogen bonding strengths, change to a stationary phase with a different amount (not necessarily more) of the dipole or hydrogen bonding interaction. Other co-elutions may occur upon changing the stationary phase, thus the new stationary phase may not provide better overall resolution.
6. If possible, avoid using a stationary phase that contains a functionality that generates a large response with a selective detector. For example, cyanopropyl containing stationary phases exhibit a disproportionately large baseline rise (due to column bleed) with NPDs.
7. A DB-1 or DB-5, DB-1701, DB-17, and DB-WAX cover the widest range of selectivities with the smallest number of columns.
8. PLOT columns are used for the analysis of gaseous samples at above ambient column temperatures.

TIPS & TOOLS

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Table 4:
Column Efficiency vs. Diameter

Column ID Diameter (mm)	Theoretical Plates/Meter
0.10	12,500
0.18	6,600
0.20	5,940
0.25	4,750
0.32	3,710
0.45	2,640
0.53	2,240

Maximum efficiency for a solute with k=5

Column Diameter

Column diameter has an influence over five parameters of primary concern. They are efficiency, retention, pressure, carrier gas flow rate, and capacity.

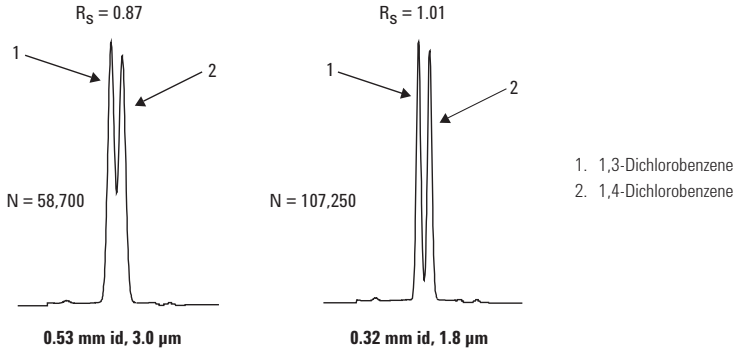
Column efficiency (N/m) is inversely proportional to column diameter. The efficiencies listed in **Table 4** show that smaller diameter columns have higher theoretical plates per meter. Resolution is a square root function of the theoretical plate number. Therefore, doubling column efficiency theoretically increases resolution only by 1.41 times (the square root of 2), but closer to 1.2-1.3 times in real practice. Smaller diameter columns are used when peak separation is small and high column efficiency (i.e., narrow peaks) is needed. **Figure 7** shows the difference in resolution for two different diameter columns.

Solute retention is inversely proportional to column diameter, for isothermal temperature conditions. For temperature program conditions, the change is 1/3-1/2 of the isothermal value. Column diameters are rarely selected based on retention. **Figure 7** shows the difference in retention for two different diameter columns.

Column head pressure is approximately an inverse squared function of the column radius. For example, a 0.25 mm id column requires about 1.7 times the head pressure of a 0.32 mm id column of the same length (also, carrier gas and temperature). Column head pressures increase or decrease dramatically with changes in column diameter. Column diameters of 0.18 mm id or larger are used for standard GC analysis due to the very high pressures needed for smaller diameter columns. Wider diameter columns, especially shorter ones (e.g., 15 m x 0.32 mm id), are impractical for use in GC/MS systems. The vacuum at the exit of the column greatly reduces the required head pressure, and it is difficult to maintain or control very low head pressures.

Figure 7: Column Diameter –
Comparison of Resolution and Retention

Column: **DB-624, 30 m**



At constant pressure, **carrier gas flow rates** increase as column diameters increase. For applications or hardware requiring high flow rates, larger diameter columns are normally used. Headspace and purge & trap systems require higher carrier gas flow rates for proper operation. 0.45 or 0.53 mm id columns are used with these systems so that the higher flow rates can be used. Special considerations must be taken if small diameter columns are used in these types of systems. This includes the use of cryogenic interfaces or ovens, or interfacing through split injectors. Added complexity and/or cost, or sample loss, are involved with these techniques. For applications or hardware requiring low carrier gas flow rates, smaller diameter columns are normally used. GC/MS is the typical system requiring low carrier gas flow rates, and therefore, 0.25 mm id and smaller id columns are used in these applications.

Column capacity increases as the column diameter increases. The actual column capacity also depends on the stationary phase, solute and film thickness. **Table 5** lists typical capacity ranges for a variety of column diameters.

Table 5: Column Capacity in ng

Film Thickness (µm)	Column Inside Diameter (mm)			
	0.18-0.20	**0.25**	**0.32**	**0.53**
0.10	20-35	25-50	35-75	50-100
0.25	35-75	50-100	75-125	100-250
0.50	75-150	100-200	125-250	250-500
1.00	150-250	200-300	250-500	500-1000
3.00		400-600	500-800	1000-2000
5.00		1000-1500	1200-2000	2000-3000

Column Diameter Selection Summary

1. Use **0.15, 0.18 or 0.25 mm id columns** when higher column efficiencies are needed. 0.15 and 0.18 mm id columns are especially well suited for GC/MS systems with low pumping capacities. Smaller diameter columns have the lowest capacities and require the highest head pressures.
2. Use **0.32 mm id columns** when higher sample capacity is needed. They often provide better resolution of earlier eluting solutes for splitless injections or large injection volumes (> 2 µL) than 0.25 mm id columns.
3. Use **0.45 mm id columns** when only a Megabore direct injector is available and higher column efficiency is desired. Well suited for high carrier gas flow rate situations, such as with purge & trap, headspace samplers, and valve injection applications.
4. Use **0.53 mm id columns** when only a Megabore direct injector is available. Well suited for high carrier gas flow rate situations, such as with purge & trap and headspace samplers. 0.53 mm id columns have the highest sample capacities at constant d_f.



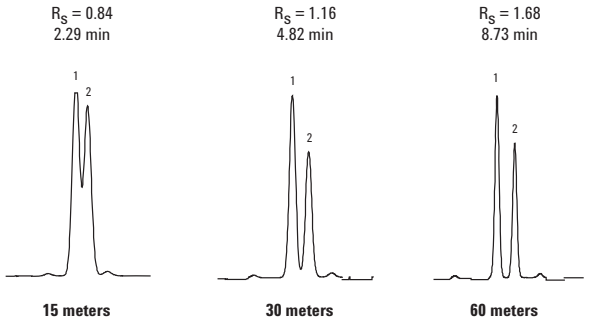
Column Length

Column length influences three parameters of major concern. They are efficiency, retention (analysis time) and carrier gas pressure.

Column efficiency (N) is proportional to column length. Resolution is a square root function of the theoretical plate number. For example, doubling column length (thus efficiency) theoretically increases resolution by only 1.41 times (closer to 1.2-1.3 times in practice). Longer columns are used when peak separation is small and high column efficiency (i.e., narrow peaks) is needed. **Figure 8** shows the difference in resolution for three different lengths.

Figure 8: Column Length – Comparison of Resolution and Retention

Column: **DB-624**
15 m x 0.53 mm id, 0.3 µm
30 m x 0.53 mm id, 0.3 µm
60 m x 0.53 mm id, 0.3 µm



1. 1,3-Dichlorobenzene
2. 1,4-Dichlorobenzene

Solute retention is proportional to column length for isothermal temperature conditions. For temperature program conditions, the change is 1/3-1/2 of the isothermal value. When efficiency is increased by lengthening the column, there is a significant increase in analysis time. Figure 8 shows the difference in retention for three different lengths.

Column head pressure is nearly proportional to column length. Pressure is usually not an issue unless the column has a very small or large diameter. Long, small diameter columns require extremely high head pressures, and short, wide diameter columns require very low head pressures. Neither situation is very practical and may be a limiting factor. Choice of carrier gas will also have an impact on column pressure.

Column bleed increases as column length increases. Longer columns have more stationary phase, thus more degradation products are produced. The increase in bleed with longer columns is not large and should not be a deterrent to using a longer column when one is necessary.

Column cost is directly related to column length. Doubling column length nearly doubles the price of the column. When efficiency is increased by lengthening the column, there is a significant increase in column cost. When considered in conjunction with the increase in analysis time, lengthening the column should be the last reasonable option for increasing efficiency.

Shorter columns cost more per meter than longer columns. Cutting longer columns into shorter lengths seems like a good method to save money, but it is not recommended. The quality of the smaller pieces cannot be guaranteed and may not be the same as the original, intact column. Theoretically, each piece should provide satisfactory and consistent results. In practice, this does not always occur. The probability of individual piece variation is higher when shorter pieces are cut from the original column. Greater variability between individual pieces is observed as column length, film thickness and stationary phase polarity increases, and column diameter decreases. Finally, there is the increased chance of tubing breakage when rewinding the shorter columns on other cages. Technically, cutting a column into shorter pieces voids the performance warranty.

Column Length Selection Summary

1. Start with **25-30 meter columns** when the best length is unknown.
2. **10-15 meter columns** are well suited for samples containing very well separated solutes or very few solutes. Shorter lengths are used for very small diameter columns to reduce head pressures.
3. **50-60 meter columns** should be used when resolution is not possible by other means (smaller diameter, different stationary phase, change in column temperature). Best suited for complex samples containing a large number of solutes. Long columns have long analysis times and higher cost.

Column Film Thickness

Column film thickness influences five major parameters: retention, resolution, bleed, inertness and capacity.

For isothermal conditions, solution retention is directly proportional to film thickness. For temperature program conditions, the change is 1/3-1/2 of the isothermal value. Thicker film columns are used to obtain higher retention for very volatile solutes. Volatile solutes normally requiring cryogenic (subambient) cooling with standard film thickness columns can be sufficiently retained at temperatures above 30 °C. Changing to a thicker film column has a net effect of providing equal or greater retention at a higher column temperature. Thicker film columns are typically used for volatile compounds like solvents and select gases. Thinner film columns are used to reduce the retention of highly retained solutes. Highly retained solutes can be eluted faster or at a lower temperature. Changing to a thinner film column has the net effect of providing equal or less retention at a lower column temperature. Thinner film columns are typically used for high boiling or molecular weight compounds. **Figure 9** shows the difference in retention for two different film thicknesses.

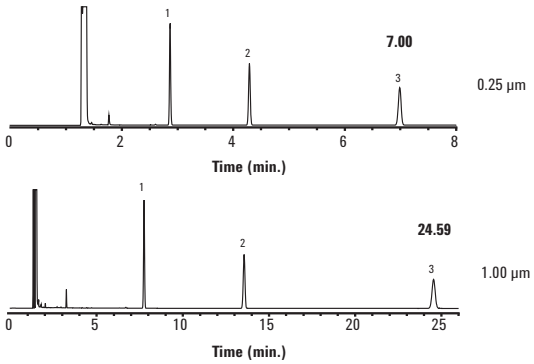
Solutes with k values less than 2 are very difficult to resolve due to insufficient retention by the column. Changing to a thicker film column results in better resolution since solute retention is increased. The resolution improvement depends on the solute k value for the original column. For solutes with k values of about 5 or less, increasing their retention results in improved resolution. For solute peaks with values of 5-10, increasing their retention provides a small to moderate increase in resolution. For peaks with k values above 10, increasing their retention often results in no resolution improvement and sometimes a loss of resolution. Increasing film thickness to improve the resolution of early eluting peaks may result in a resolution loss for later eluting peaks.

Figure 9: Column Film Thickness – Comparison of Resolution and Retention

Column: **DB-1, 30 m x 0.32 mm id**

Carrier: Helium at 38 cm/sec

Oven: 100 °C isothermal



1. n-Decane
2. n-Undecane
3. n-Dodecane

For a given stationary phase, column bleed increases as film thickness increases. Since thicker film columns are more retentive, later eluting peaks may shift into a region of much higher column bleed when increasing film thickness. The upper temperature limits of thick film columns may be lower due to their higher bleed levels.

Thicker film columns are more inert. There is more stationary phase to shield the solutes from the tubing surface. Peak tailing for active compounds can often be reduced or eliminated with a thicker film column.

Thicker film columns have higher solute capacities. When one solute is present in significantly higher amounts, the resulting broad peak may interfere or co-elute with an adjacent peak. Changing to a thicker film column may reduce peak broadening, thus co-eluting. Table 5 lists typical capacity ranges for a variety of film thickness.

Column Film Thickness Selection Summary

1. For **0.18-0.32 mm id columns**, a film thickness of 0.18-0.25 µm is average or standard (i.e., not thin or thick) and used for most analyses.
2. For **0.45-0.53 mm id columns**, a film thickness of 0.8-1.5 µm is average or standard (i.e., not thin or thick) and used for most analyses.
3. **Thick film columns** are used to retain and resolve volatile solutes (e.g., light solvents, gases). Thick columns are more inert and have higher capacities. Thick film columns exhibit higher column bleed and decreased upper temperature limits.
4. **Thin film columns** are used to minimize the retention of high boiling, high molecular weight solutes (e.g., steroids, triglycerides). Thin film columns are less inert, have lower capacities and exhibit lower column bleed.



GC Column Application and Method Guides

Application	Specific Application	Agilent Phases
Biodiesel	EN14105 Free/Total Glycerin	Biodiesel, Select Biodiesel
	ASTM D6584 Free/Total Glycerin	Biodiesel, Select Biodiesel
	EN14103 FAME Analysis	Biodiesel, Select Biodiesel
	EN14110 Residual Methanol	Biodiesel, Select Biodiesel
	EN14106 Free Glycerol	Select Biodiesel
Chiral	Chiral γ-lactones and terpenes	CycloSil-B
	Optical isomers of acids, alcohols, amino acids, aromatic hydrocarbons, diols, flavors, aromas, ketones, organic acids and phenols	Cyclodex-B
	Chiral compounds using a nitrogen selective detector	HP-Chiral β
	Optical isomers of acids, alcohols, amino acids, aromatic, diols, flavor, aromas, ketones, organic acids and phenols	CP-Chirasil-Dex CB, CP-Cyclodextrin-β-2,3,6-M-19
	Amino acids, optical isomers	CP-Chirasil-Dex CB, CP-Cyclodextrin-β-2,3,6-M-19
Foods, Flavors and Fragrances	FAME up to C_{26}, cis, trans, fast resolution FAME	Select FAME
	Best separation for cis, trans FAME analyses up to 260 °C	HP-88, CP-Sil 88 for FAME
	Volatiles	CP-Carbowax 400 for Volatiles in Alcohol
	Unsaturated triglycerides	CP-TAP CB for Triglycerides
	Flavors, aromas, free fatty acids C_1-C_{26}	DB-WAX, HP-WAX, CP-FFAP CB
	Glycols, diols, alcohols	CP-Wax 57 CB for Glycols and Alcohols, DB-WAX
Life Sciences	Blood alcohol analysis	DB-ALC1 and DB-ALC2
	Drugs of abuse confirmation	DB-5ms EVDX
	USP solvents, common solvents	DB-Select 624UI for <467>, DB-624, VF-624ms
	Drugs of abuse confirmation	DB-35ms Ultra Inert, VF-DA
Pesticides	Organochlorine pesticides and PCBs	DB-CLP1 and DB-CLP2, DB-35ms Ultra Inert, DB-17ms, DB-XLB
	Chlorinated pesticides and PCBs	DB-608
	Trace levels of pesticides in food and environmental samples	DB-35ms Ultra Inert, DB-XLB, VF-1701 Pesticides, DB-1701P
	Chlorinated, nitrogen, phosphorus pesticides	CP-Sil 8 CB for Pesticides, DB-35ms Ultra Inert, DB-5ms Ultra Inert
	Chlorinated, nitrogen, phosphorus pesticides, trace level DDT and Endrin	CP-Sil 19 CB for Pesticides, DB-35ms, DB-XLB

(Continued)

Application	Specific Application	Agilent Phases
Polycyclic Aromatic Hydrocarbons	EU regulated PAHs	DB-EUPAH
	PAHs in environmental and food samples	Select PAH
	C_5-C_{80}, PAH and polar compounds	CP-Sil PAH CB UltiMetal
	EU and EPA regulated PAHs	VF-17ms for PAH
Petroleum	Simulated distillation using ASTM Method D2887	DB-2887
	C_5-C_{120} simulated distillation	DB-HT SimDis, CP-SimDist UltiMetal
	PONA and PIANO analysis	HP-PONA, DB-Petro, CP-Sil PONA CB
	ASTM D5134	CP-Sil PONA for ASTM D5134
	C_1-C_{10} hydrocarbons	Select Al_2O_3 MAPD, Alumina PLOT family
	C_1-C_6 alcohols, aromatic C_6-C_{10}	CP-TCEP for Alcohols in Gasoline
	Sulfur impurities in propylene streams	Select Low Sulfur
	Polar and non-polar volatile compounds, especially chlorosilanes with different substituents such as alkyl groups, or groups with ether, hydroxy and nitrile bonds	Select Silanes
	C_1-C_6 amines, alcohols, NH_3, water, solvents, ethanol amines	CP-Volamine
	C_3-C_{20} amines, alkanol amines	CP-Sil 8 CB for Amines
	C_3-C_8 amines and diamines	CP-Wax for Volatile Amines and Diamines
	C_4-C_{10} amines, diamines and aromatic amines	CP-Wax 51 for Amines
	Oxygenates in C_1-C_{10} hydrocarbons	CP-Lowox, GS-OxyPLOT
	C_1-C_{10} hydrocarbons	GS-OxyPLOT
	Methanol, formaldehyde and formic acid in water	CP-Sil 5 CB for Formaldehyde
	C_1-C_{12} hydrocarbons	CP-Squalane
	Volatile oxygenates and halogenated hydrocarbons	CP-Propox
Semivolatiles	Polychlorinated dibenzodioxins (PCDDs) and dibenzofurans (PCDFs)	DB-Dioxin
	Dioxins and dibenzo furan	CP-Sil 88 for Dioxins, DB-Dioxin
	EPA Semivolatiles Methods 625, 1625, 8270 and CLP protocols	DB-UI 8270D, DB-5ms Ultra Inert, DB-5.625, HP-5ms Semivolatile
	PCB, detailed analysis	CP-Sil 5/C18 CB for PCB
	PCB	CP-Sil 8 CB for PCB, DB-XLB

(Continued)

Application	Specific Application	Agilent Phases
Volatiles	EPA Methods 502.2, 524.2 and 8260	DB-624 Ultra Inert, DB-VRX
	Volatile priority pollutants and residual solvents	DB-624 Ultra Inert, DB-624, VF-624ms
	Halogenated hydrocarbons and solvents	CP-Select 624 CB
	EPA Methods 502.2, 524.2 and 8260	HP-VOC
	EPA Method 502.2	DB-502.2
	MTBE in soil and water	DB-MTBE
	Oxygenates and solvents	CP-Select CB for MTBE
	Total petroleum hydrocarbons (TPHs), soil analysis, and LUFT	DB-TPH
	C_5-C_{40} hydrocarbons	Select Mineral Oil
Metal	High temperature analysis and process applications	UltiMetal and DB-ProSteel
Non-Bonded	Amino acid derivatives, essential oils	HP-101
	Drugs, glycols, pesticides, steroids	HP-17
	Amines, basic compounds	CAM
	Alcohols, free acids, essential oils, ethers, glycols, solvents	Carbowax 20M and HP-20M
	Generic	SE-30 and SE-54

TIPS & TOOLS

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EPA Methods

Drinking Water

EPA Methods	Application	Recommended Column	Part No.
501, 501.3	Measurement of trihalomethanes in drinking water by GC/MS and selected ion monitoring	DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
		DB-624 Ultra Inert, 30 m x 0.25 mm, 1.4 µm	122-1334UI
502.2	Volatile organic compounds in water by purge and trap capillary column GC with photoionization and electrolytic conductivity detectors in series	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
		DB-624 Ultra Inert, 60 m x 0.25 mm, 1.4 µm	122-1364UI
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
503.1	Volatile aromatic and unsaturated organic compounds in water by purge and trap gas chromatography	DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
504.1	1,2-Dibromoethane (EDB) and 1,2-dibromo-3-chloropropane (DB CP), GC, microextraction	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-624 Ultra Inert, 30 m x 0.25 mm, 1.4 µm	122-1334UI
		VF-1ms, 30 m x 0.32 mm, 1.00 µm	CP8926
		VF-1701ms, 30 m x 0.32 mm, 1.00 µm	CP9163
505	Analysis of organohalide pesticides and commercial polychlorinated biphenyl (PCB) products in water by microextraction and GC	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-XLB, 30 m x 0.25 mm, 0.50 µm	122-1236
		VF-1ms, 30 m x 0.32 mm, 1.00 µm	CP8926
		VF-17ms, 30 m x 0.32 mm, 0.50 µm	CP8991
506	Determination of phthalate and adipate esters in drinking water by liquid-liquid extraction or liquid-solid extraction and GC with photoionization detection	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-5ms, 30 m x 0.32 mm, 0.25 µm	CP8955
		VF-1ms, 30 m x 0.32 mm, 0.25 µm	CP8924
507	Determination of nitrogen and phosphorus-containing pesticides in water by GC with a nitrogen-phosphorus detector	DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070

Drinking Water

EPA Methods	Application	Recommended Column	Part No.
508	Determination of chlorinated pesticides in water by GC with an electron capture detector	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		DB-608, 30 m x 0.32 mm, 0.50 µm	123-1730
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
508.1	Determination of chlorinated pesticides, herbicides, and organohalides by liquid-solid extraction and electron capture GC	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
515	Determination of chlorinated herbicides in drinking water	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
515.3	Determination of chlorinated acids in drinking water by liquid-liquid extraction, derivatization and GC with electron capture detection	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
515.4	Determination of chlorinated acids in drinking water by liquid-liquid microextraction, derivatization, and fast GC with electron capture detection	DB-5ms Ultra Inert, 20 m x 0.18 mm, 0.18 µm	121-5522UI
		HP-5ms Ultra Inert, 20 m x 0.18 mm, 0.18 µm	19091S-577UI
		DB-1701, 20 m x 0.18 mm, 0.18 µm	121-0722
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
521	Determination of nitrosamines in drinking water by solid phase extraction and capillary column gas chromatography with large volume injection and chemical ionization tandem mass spectrometry (MS/MS)	DB-5ms Ultra Inert, 30 m x 0.25 mm, 1.00 µm	122-5533UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 1.00 µm	19091S-233UI
		VF-5ms, 30 m x 0.25 mm, 1.00 µm	CP8946

(Continued)

Drinking Water

EPA Methods	Application	Recommended Column	Part No.
524.2	Measurement of purgeable organic compounds in water by capillary GC/MS	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		DB-624 Ultra Inert, 60 m x 0.25 mm, 1.4 µm	122-1364UI
		HP-VOC, 60 m x 0.20 mm, 1.10 µm	19091R-306
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		DB-624 Ultra Inert, 60 m x 0.25 mm, 1.4 µm	122-1364UI
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
		VF-624ms, 60 m x 0.25 mm, 1.40 µm	CP9103
		VF-5ms, 30 m x 0.32 mm, 1.00 µm	CP8957
525, 525.2	Determination of organic compounds in drinking water by liquid-solid extraction and capillary column GC/MS	HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
526	Determination of selected semivolatile organic compounds in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
527	Determination of selected pesticides and flame retardants in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
528	Determination of phenols in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
529	Determination of explosives and related compounds in drinking water by solid phase extraction and capillary column GC/MS	DB-5ms Ultra Inert, 15 m x 0.25 mm, 0.25 µm	122-5512UI
		HP-5ms Ultra Inert, 15 m x 0.25 mm, 0.25 µm	19091S-431UI
		VF-5ms, 15 m x 0.25 mm, 0.25 µm	CP8939
551	Determination of chlorination disinfection byproducts and chlorinated solvents in drinking water by liquid-liquid extraction and gas chromatography with electron-capture detection	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		DB-1, 30 m x 0.25 mm, 1.00 µm	122-1033
		DB-210, 30 m x 0.25 mm, 0.50 µm	122-0233
		VF-1301ms, 30 m x 0.25 mm, 1.00 µm	CP9054
551.1	Determination of chlorination disinfection byproducts, chlorinated solvents, and halogenated pesticides/herbicides in drinking water by liquid-liquid extraction and GC with electron-capture detection	DB-5ms, 30 m x 0.25 mm, 1.00 µm	122-5533
		DB-1, 30 m x 0.25 mm, 1.00 µm	122-1033
		DB-1301, 30 m x 0.25 mm, 1.00 µm	122-1333
		VF-1ms, 30 m x 0.25 mm, 1.00 µm	CP8913
		VF-1301ms, 30 m x 0.25 mm, 1.00 µm	CP9054

(Continued)

Drinking Water

EPA Methods	Application	Recommended Column	Part No.
552	Determination of haloacetic acids in drinking water by liquid-liquid extraction, derivatization, and gas chromatography with electron-capture detection	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
552.1	Determination of haloacetic acids and dalapon in drinking water by ion-exchange liquid-solid extraction and gas chromatography with an electron-capture detector	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
552.2	Determination of haloacetic acids and dalapon in drinking water by liquid-liquid extraction, derivatization GC with electron-capture detection	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
552.3	Determination of haloacetic acids and dalapon in drinking water by liquid-liquid microextraction, derivatization, and GC with electron-capture detection	DB-CLP1, 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2, 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
556	Determination of carbonyl compounds in drinking water by pentafluorobenzylhydroxylamine derivatization and capillary GC with electron-capture detection	DB-5ms, 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-1701, 30 m x 0.25 mm, 0.25 µm	122-0732
		VF-1701ms, 30 m x 0.25 mm, 0.25 µm	CP9151
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944

Waste Water

EPA Method	Application	Column	Part No.
601	Purgeable halocarbons	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 75 m x 0.45 mm, 2.55 µm	124-1374
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		VF-624ms, 75 m x 0.53 mm, 3.00 µm	CP9108
		VF-624ms, 60 m x 0.32 mm, 1.80 µm	CP9105
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
602	Purgeable aromatics	DB-624, 75 m x 0.53 mm, 3.00 µm	125-1374
		DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		VF-624ms, 75 m x 0.53 mm, 3.00 µm	CP9108
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
603	Acrolein and acrylonitrile	DB-624, 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-VRX, 30 m x 0.25 mm, 1.40 µm	122-1534
		VF-WAXms, 30 m x 0.25 mm, 1.00 µm	CP9206
		VF-624ms, 30 m x 0.25 mm, 1.40 µm	CP9102
604	Phenols	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		VF-5ms, 60 m x 0.32 mm, 1.80 µm	CP9105
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
605	Benzidines	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
606	Phthalate esters	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
607	Nitrosamines	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		CP-Sil 8 CB for Amines, 30 m x 0.32 mm, 1.00 µm	CP7596

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TIPS & TOOLS

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Waste Water

EPA Method	Application	Column	Part No.
608	Organochlorine pesticides and PCBs	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-XLB, 30 m x 0.32 mm, 0.50 µm	123-1236
		DB-17ms, 30 m x 0.32 mm, 0.25 µm	123-4732
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-17ms, 30 m x 0.25 mm, 0.25 µm	CP8982
609	Nitroaromatics and isophorone	HP-5ms, 30 m x 0.25 mm, 0.50 µm	19091S-133
		DB-5ms, 30 m x 0.25 mm, 0.50 µm	122-5536
		DB-608, 30 m x 0.25 mm, 0.25 µm	122-6832
		VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-5ms, 30 m x 0.25 mm, 0.50 µm	CP8945
610	Polynuclear aromatic hydrocarbons	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		DB-5ms, 30 m x 0.32 mm, 0.25 µm	123-5532
		DB-17ms, 30 m x 0.25 mm, 0.25 µm	122-4732
		VF-17ms, 30 m x 0.25 mm, 0.25 µm	CP8982
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
611	Haloethers	VF-5ms, 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-5ms, 30 m x 0.25 mm, 0.50 µm	CP8945
612	Chlorinated hydrocarbons	DB-5ms, 30 m x 0.32 mm, 0.50 µm	123-5536
		HP-5ms, 30 m x 0.32 mm, 0.50 µm	19091S-113
		DB-1, 30 m x 0.32 mm, 0.50 µm	123-103E
		VF-5ms, 30 m x 0.25 mm, 0.10 µm	CP8943
		VF-35ms, 30 m x 0.25 mm, 0.25 µm	CP8877
		VF-200ms, 30 m x 0.25 mm, 1.00 µm	CP8860
613	2,3,7,8-Tetrachlorodibenzo-p-dioxin	DB-5ms Ultra Inert, 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 88 for Dioxins, 50 m x 0.25 mm, 0.20 µm	CP7588
		VF-5ms, 60 m x 0.25 mm, 0.10 µm	CP8948
614	The determination of organophosphorus pesticides in municipal and industrial wastewater	DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
615	Chlorinated herbicides	DB-35ms Ultra Inert, 30 m x 0.32 mm, 0.25 µm	123-3832UI
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074

(Continued)

Waste Water

EPA Method	Application	Column	Part No.
619	Triazine pesticides	DB-35ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-3832UI
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		VF-17ms, 30 m x 0.25 mm, 0.50 µm	CP8983
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
622	The determination of organophosphorus pesticides in municipal and industrial wastewater	DB-35ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-3832UI
		DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
624	Purgeables	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		HP-VOC, 60 m x 0.20 mm, 1.10 µm	19091R-306
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
		VF-624ms, 75 m x 0.53 mm, 3.00 µm	CP9108
		VF-624ms, 60 m x 0.32 mm, 1.80 µm	CP9105
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
625	Base/neutrals and acids	HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.50 µm	19091S-133UI
		VF-5 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-1701 Pesticides, 30 m x 0.25 mm, 0.25 µm	CP9070
		VF-200ms, 30 m x 0.25 mm, 0.25 µm	CP8858
1613	Tetra- through octa-chlorinated dioxins and furans by isotope dilution HRGC/HRMS	DB-5ms Ultra Inert, 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 88 for Dioxins, 50 m x 0.25 mm, 0.20 µm	CP7588
		VF-5ms, 60 m x 0.25 mm, 0.25 µm	CP8960
1624	Volatile organic compounds by isotope dilution GC/MS	DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
1625	Semivolatile organic compounds by isotope dilution GC/MS	DB-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	122-5532UI
		HP-5ms Ultra Inert, 30 m x 0.25 mm, 0.25 µm	19091S-433UI
		VF-5ms, 30 m x 0.25 mm, 0.25 µm	CP8944
8021	Volatile halogenated & aromatic organic compounds	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8010	Volatile halogenated organic compounds list by EPA method 8021	DB-VRX 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
8011	1,2-Dibromoethane and 1,2-dibromo-3-chloropropane by microextraction and GC	DB-624 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-624 Ultra Inert 30 m x 0.25 mm, 1.4 µm	122-1334UI
		DB-VRX 30 m x 0.25 mm, 1.40 µm	122-1534
		VF-1ms 30 m x 0.32 mm, 0.25 µm	CP8924
8015	Nonhalogenated organics by GC	DB-624 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-624 Ultra Inert 30 m x 0.25 mm, 1.4 µm	122-1334UI
		DB-VRX 30 m x 0.25 mm, 1.40 µm	122-1534
8015c	Nonhalogenated organics by GC	DB-WAX 30 m x 0.25 mm, 0.50 µm	122-7033
		DB-5 30 m x 0.25 mm, 1.00 µm	122-5033
		HP-5 30 m x 0.25 mm, 1.00 µm	19091J-233
		DB-608 30 m x 0.53 mm, 1.00 µm	CP9215
		CP-Sil 8 CB 30 m x 0.53 mm, 1.50 µm	CP8736
8020	Volatile aromatic organic compounds list by EPA method 8021	DB-624 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-624 Ultra Inert 30 m x 0.25 mm, 1.4 µm	122-1334UI
		DB-VRX 30 m x 0.25 mm, 1.40 µm	122-1534
8021, CLP Volamines	Volatile halogenated & aromatic organic compounds	DB-VRX 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8021b	Aromatic and halogenated volatiles by GC	VF-624ms 60 m x 0.53 mm, 3.00 µm	CP9107
		VF-624ms 60 m x 0.25 mm, 1.40 µm	CP9103
8031	Acrylonitrile by GC	DB-624 30 m x 0.25 mm, 1.40 µm	122-1334
		DB-624 Ultra Inert 30 m x 0.25 mm, 1.4 µm	122-1334UI
		DB-VRX 30 m x 0.25 mm, 1.40 µm	122-1534
		PoraBOND Q 25 m x 0.53 mm, 10.00 µm	CP7354
8032	Acrylamide by GC	CP-Wax 58 FFAP CB 25 m x 0.53 mm, 2.00 µm	CP7654
8033	Acetonitrile by GC with nitrogen-phosphorus detection	DB-WAX 15 m x 0.25 mm, 0.50 µm	122-7013
		HP-INNOWax 15 m x 0.25 mm, 0.50 µm	19091N-231
		VF-WAXms 15 m x 0.53 mm, 1.00 µm	CP9226
8040, 8041, 8041a	Phenols by gas chromatography	DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-XLB 30 m x 0.25 mm, 0.25 µm	122-1232
		VF-5ms 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms 30 m x 0.53 mm, 1.00 µm	CP9171
		VF-17ms 30 m x 0.53 mm, 1.00 µm	CP9001
8060	Phthalate esters	DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
8061	Phthalate esters by GC with electron capture detection (GC/ECD)	DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
		VF-1701ms 30 m x 0.53 mm, 1.00 µm	CP9171

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8070, 8070a	Nitrosamines by gas chromatography	DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		CP-Sil 8 CB for Amines 30 m x 0.53 mm, 1.00 µm	CP7597
		VF-17ms 30 m x 0.53 mm, 1.50 µm	CP9002
8081, 8081a	Organochlorine pesticides by gas chromatography	DB-CLP1 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms 30 m x 0.32 mm, 0.25 µm	123-3832
		DB-XLB 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-5ms 30 m x 0.25 mm, 1.00 µm	CP8946
		VF-35ms 30 m x 0.25 mm, 1.00 µm	CP8879
8082, CLP Pesticides, 8082a	Polychlorinated biphenyls (PCBs) by gas chromatography	DB-CLP1 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms 30 m x 0.32 mm, 0.25 µm	123-3832
		DB-XLB 30 m x 0.32 mm, 0.50 µm	123-1236
		VF-5ms 30 m x 0.25 mm, 1.00 µm	CP8946
		VF-35ms 30 m x 0.25 mm, 1.00 µm	CP8879
8090	Nitroaromatics and isophorone	DB-5ms 30 m x 0.25 mm, 1.00 µm	122-5533
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
		HP-5ms 30 m x 0.25 mm, 0.50 µm	19091S-133
8091	Nitroaromatics and cyclic ketones by GC	VF-5ms 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms 30 m x 0.53 mm, 1.00 µm	CP9171

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8095	Explosives by GC	DB-225 15 m x 0.53 mm, 1.00 µm	125-2212
		HP-5 15 m x 0.53 mm, 1.50 µm	19095J-321
		DB-5 15 m x 0.53 mm, 1.50 µm	125-5012
		VF-5ms 15 m x 0.53 mm, 1.50 µm	CP8973
		VF-1ms 15 m x 0.53 mm, 1.50 µm	CP8967
		VF-200ms 15 m x 0.53 mm, 1.00 µm	CP8866
8100	Polynuclear aromatic hydrocarbons	DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		DB-5ms 30 m x 0.32 mm, 0.25 µm	123-5532
		DB-1ms 30 m x 0.25 mm, 0.25 µm	122-0132
		DB-17ms 30 m x 0.25 mm, 0.25 µm	122-4732
		VF-5ms 30 m x 0.25 mm, 0.25 µm	CP8944
8111	Haloethers by GC	DB-5ms 30 m x 0.25 mm, 1.00 µm	122-5533
		HP-5ms 30 m x 0.25 mm, 0.50 µm	19091S-133
		DB-1701 30 m x 0.25 mm, 1.00 µm	122-0733
		VF-5ms 15 m x 0.53 mm, 1.50 µm	CP8973
		VF-1701ms 30 m x 0.53 mm, 1.00 µm	CP9171
8120	Chlorinated hydrocarbons by gas chromatography	DB-5ms 30 m x 0.32 mm, 0.50 µm	123-5536
		HP-5ms 30 m x 0.32 mm, 0.50 µm	19091S-113
		DB-1 30 m x 0.32 mm, 0.50 µm	123-103E

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8121	Chlorinated hydrocarbons by GC: capillary column technique	DB-5ms 30 m x 0.32 mm, 0.50 µm	123-5536
		HP-5ms 30 m x 0.32 mm, 0.50 µm	19091S-113
		DB-1 30 m x 0.32 mm, 0.50 µm	123-103E
		VF-200ms 30 m x 0.53 mm, 1.00 µm	CP8868
		VF-WAXms 30 m x 0.53 mm, 1.00 µm	CP9215
		VF-5ms 30 m x 0.53 mm, 1.50 µm	CP8976
		VF-1701ms 30 m x 0.53 mm, 1.00 µm	CP9171
8131	Aniline and selected derivatives by GC	DB-5ms Ultra Inert 30 m x 0.25 mm, 1.00 µm	122-5533UI
		HP-5ms Ultra Inert 30 m x 0.25 mm, 0.50 µm	19091S-133UI
		VF-5ms 30 m x 0.25 mm, 0.25 µm	CP8944
		CP-Sil 8 CB for Amines 30 m x 0.25 mm, 0.25 µm	CP7598
8140	Organophosphorus pesticides by GC-NPD	DB-35ms 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-5ms 30 m x 0.25 mm, 0.25 µm	CP8944
8141a, 8141b	Organophosphorus compounds by gas chromatography: capillary column technique	DB-35ms 30 m x 0.25 mm, 0.25 µm	122-3832
		DB-5ms 30 m x 0.25 mm, 0.25 µm	122-5532
		VF-200ms 30 m x 0.53 mm, 1.00 µm	CP8868
		VF-35ms 30 m x 0.53 mm, 1.00 µm	CP8888
		VF-5ms 30 m x 0.53 mm, 1.00 µm	CP8975
		VF-1ms 30 m x 0.53 mm, 1.00 µm	CP8969

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8150	Chlorinated herbicides	DB-35ms 30 m x 0.32 mm, 0.25 µm	123-3832
8151, 8151b	Chlorinated herbicides by GC using methylation or pentafluorobenzylation derivatization: capillary column technique	DB-CLP1 30 m x 0.32 mm, 0.25 µm	123-8232
		DB-CLP2 30 m x 0.32 mm, 0.5 µm	123-8336
		DB-35ms Ultra Inert 30 m x 0.32 mm, 0.25 µm	123-3832UI
		DB-5ms Ultra Inert 30 m x 0.32 mm, 0.25 µm	123-5532UI
		HP-5ms Ultra Inert 30 m x 0.32 mm, 0.25 µm	19091S-413UI
		VF-5 Pesticides 30 m x 0.25 mm, 0.25 µm	CP9074
		VF-5ms 30 m x 0.32 mm, 1.00 µm	CP8957
		VF-35ms 30 m x 0.25 mm, 0.25 µm	CP8877
		VF-1701 Pesticides 30 m x 0.25 mm, 0.25 µm	CP9070
8240	Volatile chlorinated and aromatic hydrocarbons	DB-VRX 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624 20 m x 0.18 mm, 1.00 µm	121-1324
		DB-624 Ultra Inert 60 m x 0.25 mm, 1.4 µm	122-1364UI
		DB-VRX 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
		HP-VOC 60 m x 0.20 mm, 1.10 µm	19091R-306
		VF-624ms 60 m x 0.25 mm, 1.40 µm	CP9103
		DB-624 Ultra Inert 60 m x 0.25 mm, 1.4 µm	122-1364UI
8260/CLP-VOCs	Volatile organic compounds by gas chromatography/mass spectroscopy (GC/MS): capillary column technique method	DB-VRX 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
		DB-VRX 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624 20 m x 0.18 mm, 1.00 µm	121-1324

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8260b	Volatile organic compounds by GC/MS	DB-VRX 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
		DB-VRX 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624 20 m x 0.18 mm, 1.00 µm	121-1324
		VF-5ms 30 m x 0.25 mm, 1.00 µm	CP8946
		VF-624ms 60 m x 0.32 mm, 1.80 µm	CP9105
		DB-624 Ultra Inert 60 m x 0.32 mm, 1.8 µm	123-1364UI
8261	Volatile organic compounds by vacuum distillation in combination with GC/MS spectrometry (VD/GC/MS)	DB-VRX 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-608 30 m x 0.53 mm, 0.50 µm	125-6837
		DB-VRX 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624 20 m x 0.18 mm, 1.00 µm	121-1324
		DB-624 Ultra Inert 20 m x 0.18 mm, 1 µm	121-1324UI
		VF-624ms 60 m x 0.25 mm, 1.40 µm	CP9103
8270, 8270d	Semivolatile organic compounds by gas chromatography/mass spectrometry (GC/MS)	DB-UI 8270D 30 m x 0.25 mm, 0.25 µm	122-9732
		DB-UI 8270D 20 m x 0.18 mm, 0.36 µm	121-9723
		HP-5ms 30 m x 0.25 mm, 0.50 µm	19091S-133
		VF-5ms 30 m x 0.25 mm, 0.25 µm	CP8944
		VF-5ms 30 m x 0.25 mm, 0.50 µm	CP8945
		VF-5ms 30 m x 0.25 mm, 1.00 µm	CP8946

(Continued)

Solid Waste

EPA Method	Application	Column	Part No.
8275a	Semivolatile organic compounds (PAHs and PCBs) in soils/sludges and solid wastes using thermal extraction/gas chromatography/mass spectrometry (TE/GC/MS)	DB-5ms 30 m x 0.25 mm, 1.00 µm	122-5533
		HP-5ms 30 m x 0.25 mm, 0.50 µm	19091S-133
		VF-5ms 30 m x 0.25 mm, 0.25 µm	CP8944
		VF-5ms 30 m x 0.25 mm, 0.50 µm	CP8945
		VF-5ms 30 m x 0.25 mm, 1.00 µm	CP8946
8280b	Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) by high resolution gas chromatography/low resolution mass spectrometry (HRGC/LRMS)	DB-5ms Ultra Inert 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 8 CB 30 m x 0.25 mm, 0.25 µm	CP8751
8290b	Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS)	DB-5ms Ultra Inert 60 m x 0.25 mm, 0.25 µm	122-5562UI
		CP-Sil 8 CB 30 m x 0.25 mm, 0.25 µm	CP8751
		CP-Sil 88 for Dioxins 50 m x 0.25 mm, 0.20 µm	CP7588
8410	Gas chromatography/Fourier transform infrared (GC/FT-IR) spectrometry for semivolatile organics: capillary column	HP-5ms 30 m x 0.32 mm, 1.00 µm	19091S-213
		DB-5ms 30 m x 0.32 mm, 1.00 µm	123-5533
		VF-5ms 30 m x 0.32 mm, 0.25 µm	CP8955
8430	Analysis of bis(2-chloroethyl) ether and hydrolysis products by direct aqueous injection (GC/FT-IR)	DB-WAX 30 m x 0.25 mm, 0.50 µm	122-7033
		HP-INNOWax 30 m x 0.25 mm, 0.50 µm	19091N-233
		VF-WAXms 30 m x 0.53 mm, 1.00 µm	CP9215

TIPS & TOOLS

The Agilent J&W DB-624UI GC columns are optimized for fast analysis of volatile compounds. Learn more at **www.agilent.com/chem/624UI**

United States Pharmacopoeia (USP) GC Phases		
USP	**Phase Composition**	**Agilent Phase Recommendation**
G1	Dimethylpolysiloxane oil	HP-1*, DB-1*, HP-1ms*, DB-1ms*, VF-1ms, CP-Sil 5 CB, CP-Sil 5 CB Low Bleed/MS
G2	Dimethylpolysiloxane gum	HP-1*, DB-1*, HP-1ms*, DB-1ms*, VF-1ms, CP-Sil 5 CB, CP-Sil 5 CB Low Bleed/MS, CP-SimDist
G3	50% Phenyl 50% methylpolysiloxane	DB-17*, HP-50+*, VF-17ms, CP-Sil 24 CB, CP-Sil 24 CB Low Bleed/MS
G5	3-cyanopropyl polysiloxane	DB-23, VF-23ms, Select for FAME, CP-Sil 88
G6	Trifluoropropylmethylpolysilicone	DB-200, DB-210, VF-200ms
G7	50% 3-cyanopropyl 50% phenylmethylsilicone	DB-225, DB-225ms, CP-Sil 43 CB
G8	80% Bis(3-cyanopropyl) 20% 3-cyanopropylphenylpolysiloxane or 90% 3-cyanopropyl 10% phenylmethylsiloxane	HP-88, VF-23ms
G14	Polyethylene glycol (average molecular weight of 950-1,050)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G15	Polyethylene glycol (average molecular weight of 3,000-3,700)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G16	Polyethylene glycol (average molecular weight of 15,000)	DB-WAX*, VF-WAXms, CP-Wax 52 CB
G17	75% Phenyl 25% methylpolysiloxane	DB-17, HP-50+, VF-17ms, CP-Sil 24 CB, CP-Sil 24 CB Low Bleed/MS
G19	25% Phenyl 25% cyanopropylmethylsilicone	DB-225*, DB-225ms, CP-Sil 43 CB
G20	Polyethylene glycol (average molecular weight of 380-420)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G25	Polyethylene glycol TPA (Carbowax 20M terephthalic acid)	DB-FFAP*, HP-FFAP*, CP-Wax 58 (FFAP) CB, CP-FFAP CB
G27	5% Phenyl 95% methylpolysiloxane	DB-5*, HP-5*, HP-5ms*, DB-5ms, VF-5ms, VF-5ht, CP-Sil 8 CB, CP-Sil 8 CB Low Bleed/MS
G28	25% Phenyl 75% methylpolysiloxane	DB-35, HP-35, DB-35ms, VF-35ms
G32	20% Phenylmethyl 80% dimethylpolysiloxane	DB-35, HP-35, DB-35ms, VF-35ms
G35	Polyethylene glycol & diepoxide esterified with nitroterepthalic acid	DB-FFAP*, HP-FFAP*, CP-Wax 58 (FFAP) CB, CP-FFAP CB
G36	1% Vinyl 5% phenylmethylpolysiloxane	DB-5, HP-5, HP-5ms, DB-5ms, VF-5ms, VF-5ht, CP-Sil 8 CB, CP-Sil 8 CB Low Bleed/MS
G38	Phase G1 plus a tailing inhibitor	DB-1, HP-1, HP-1ms, DB-1ms, VF-1ms, CP-Sil 5 CB, CP-Sil 5 CB Low Bleed/MS
G39	Polyethylene glycol (average molecular weight of 1,500)	DB-WAX, VF-WAXms, CP-Wax 52 CB
G41	Phenylmethyldimethylsilicone (10% phenyl substituted)	DB-5, HP-5, HP-5ms, DB-5ms, VF-5ms, VF-5ht, CP-Sil 8 CB, CP-Sil 8 CB Low Bleed/MS
G42	35% Phenyl 65% dimethylvinylsiloxane	DB-35*, HP-35*, DB-35ms, VF-35ms
G43	6% Cyanopropylphenyl 94% dimethylpolysiloxane	DB-624*, DB-1301, VF-624ms, VF-1301ms, CP-1301, CP-Select 624 CB
G45	Divinylbenzene-ethylene glycol-dimethacrylate	HP-PLOT U*, CP-PoraBOND U, CP-PoraPLOT U
G46	14% Cyanopropylphenyl 86% methylpolysiloxane	DB-1701*, VF-1701ms, CP-Sil 19 CB, CP-Sil 19 CB Low Bleed/MS

*Indicates an exact equivalent

TIPS & TOOLS

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 1945	Standard Test Method for the Analysis of Natural Gas by GC	HP PLOT, 15 m x 0.53 mm, 50.00 µm	19095P-MS9
		HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
		CP-Molsieve 5Å, 10 m x 0.53 mm, 50.00 µm	CP7537
		PoraPLOT Q-HT, 10 m x 0.53 mm, 20.00 µm	CP7558
D 1946	Standard Test Method for the Analysis of Reformed Gas by GC	HP PLOT, 15 m x 0.53 mm, 50.00 µm	19095P-MS9
		HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
		CP-Molsieve 5Å, 10 m x 0.53 mm, 50.00 µm	CP7537
		CP-Molsieve 5Å, 25 m x 0.25 mm, 30.00 µm	CP7533
D 1983	Standard Test Method for Fatty Acid Composition by Gas-Liquid Chromatography of Methyl Esters	DB-WAX, 30 m x 0.25 mm, 0.25 µm	122-7032
D 2163	Standard Test Method for the Analysis of Liquified Petroleum (LP) Gases and Propene Concentrates by GC	HP PLOT Al2O3 "KCl", 30 m x 0.53 mm, 15.00 µm	19095P-K23
		HP PLOT Al2O3 "S", 30 m x 0.53 mm, 15.00 µm	19095P-S23
D 2195	Standard Test Methods for Pentaerythritol	CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 2268	Standard Test Method for Analysis of High-Purity n-Heptane and Isooctane by Capillary GC	DB-1, 60 m x 0.25 mm, 0.50 µm	122-106E
D 2306	Standard Test Method for C8 Aromatic Hydrocarbons by GC	HP-INNOWax, 60 m x 0.25 mm, 0.25 µm	19091N-136
D 2360	Standard Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by GC	HP-INNOWax, 60 m x 0.32 mm, 0.25 µm	19091N-116
D 2426	Standard Test Method for Butadiene Dimer and Styrene in Butadiene Concentrates by GC	DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 2427	Standard Test Method for Determination of C_2 through C_5 Hydrocarbons in Gasoline by GC	DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
		GS-Alumina, 30 m x 0.53 mm	115-3532
		CP-Al2O3/KCl, 50 m x 0.53 mm, 10.00 µm	CP7518
D 2245	Standard Test Method for Identification of Oils and Oil Acids in Solvent-Reducible Paints	CP-Sil 88 for FAME, 50 m x 0.25 mm, 0.20 µm	CP7488
D 2504	Standard Test Method for Noncondensable Gases in C_2 and Lighter Hydrocarbon Products by GC	HP PLOT, 30 m x 0.53 mm, 50.00 µm	19095P-MS0
		CarboBOND, 25 m x 0.53 mm, 10.00 µm	CP7374
D 2505	Standard Test Method for Ethylene, Other Hydrocarbons, and Carbon Dioxide in High-Purity Ethylene by GC	GS-GasPro, 60 m x 0.32 mm	113-4362

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 2580	Standard Test Method for Phenols in Water by Gas-Liquid Chromatography	CP-Sil 8 CB, 25 m x 0.32 mm, 0.40 µm	CP5850
		CP-FFAP CB, 25 m x 0.53 mm, 1.00 µm	CP7486
D 2593	Standard Test Method for Butadiene Purity and Hydrocarbon Impurities by GC	GS-Alumina, 30 m x 0.53 mm	115-3532
		CP-Al2O3/KCl, 50 m x 0.32 mm, 5.00 µm	CP7515
		CP-Al2O3/KCl, 50 m x 0.53 mm, 10.00 µm	CP7518
D 2712	Standard Test Method for for Hydrocarbon Traces in Propylene Concentrates by GC	GS-Alumina, 50 m x 0.53 mm	115-3552
D 2743	Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography	CP-Sil 88 for FAME, 50 m x 0.25 mm, 0.20 µm	CP7488
D 2804	Standard Test Method for Purity of Methyl Ethyl Ketone by GC	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		DB-210, 15 m x 0.53 mm, 1.00 µm	125-0212
		CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by GC	DB-2887, 10 m x 0.53 mm, 3.00 µm	125-2814
		CP-SimDist UltiMetal, 5 m x 0.53 mm, 0.88 µm	CP7570
		CP-SimDist UltiMetal, 10 m x 0.53 mm, 2.65 µm	CP7582
		CP-SimDist UltiMetal, 5 m x 0.53 mm, 0.17 µm	CP7532
Extended D 2887	Standard Test Method for Boiling Range Distribution of Petroleum Fractions by GC, to C_{60}	HP-1, 10 m x 0.53 mm, 0.88 µm	19095Z-021
		HP-1, 5 m x 0.53 mm, 0.88 µm	19095Z-020
D 2908	Standard Practice for Measuring Volatile Organic Matter in Water by Aqueous-Injection GC	CP-Select 624 CB, 30 m x 0.32 mm, 1.80 µm	CP7414
		CP-Select 624 CB, 75 m x 0.53 mm, 3.00 µm	CP7417
		CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 3054	Standard Test Method for Analysis of Cyclohexane by GC	DB-1, 60 m x 0.32 mm, 0.50 µm	123-106E
D 3168	Standard Practice for Qualitative Identification of Polymers in Emulsion Paints	CP-Sil 5 CB, 30 m x 0.32 mm, 1.00 µm	CP8760
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3257	Standard Test Method for Aromatics in Mineral Spirits by GC	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
D 3271	Standard Practice for Direct Injection of Solvent-Reducible Paints into a Gas Chromatograph for Solvent Analysis	PoraPLOT Q, 25 m x 0.53 mm, 20.00 µm	CP7554
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 3328	Standard Test Methods for Comparison of Waterborne Petroleum Oils by Gas Chromatography	CP-Sil 5 CB, 30 m x 0.32 mm, 3.00 µm	CP8687
		CP-Sil 5 CB, 30 m x 0.53 mm, 3.00 µm	CP8677
D 3329	Standard Test Method for Purity of Methyl Isobutyl Ketone by GC	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		DB-624, 30 m x 0.45 mm, 2.55 µm	124-1334
		CP-WAX 52 CB, 60 m x 0.53 mm, 1.00 µm	CP8798
D 3432	Standard Test Method for Unreacted Toluene Diisocyanates in Urethane Prepolymers and Coating Solutions by GC	HP-1ms, 30 m x 0.32 mm, 1.00 µm	19091S-713
D 3447	Standard Test Method for Purity of Halogentated Organic Solvents	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
D 3452	Standard Practice for Rubber – Identification by Pyrolysis-Gas Chromatography	CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3465	Standard Test Method for Purity of Monomeric Plasticizers by Gas Chromatography	CP-Sil 5 CB, 25 m x 0.32 mm, 0.52 µm	CP8430
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3524	Standard Test Method for Diesel Fuel Diluent in Used Diesel Engine Oils by Gas Chromatography	CP-SimDist UltiMetal, 10 m x 0.53 mm, 0.53 µm	CP7592
D 3545	Standard Test Method for Alcohol Content and Purity of Acetate Esters by GC	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
D 3606	Standard Test Method for Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography	VF-1ms, 15 m x 0.25 mm, 0.10 µm	CP8906
		CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 3687	Standard Test Method for Analysis of Organic Vapors Collected by the Activated Charcoal Tube Adsorption Method	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		DB-WAX, 30 m x 0.45 mm, 0.85 µm	124-7032
		CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 3695	Standard Test Method for Volatile Alcohols in Water by Direct Aqueous-Injection GC	DB-WAX, 30 m x 0.53 mm, 1.00 µm	125-7032
		CP-SimDist UltiMetal, 10 m x 0.53 mm, 0.53 µm	CP7592
D 3710	Standard Test Method for Boiling Range Distribution of Gasoline and Gasoline Fractions by GC	DB-2887, 10 m x 0.53 mm, 3.00 µm	125-2814
D 3749	Standard Test Method for Residual Vinyl Chloride Monomer in Poly(Vinyl Chloride) Resins by Gas Chromatographic Headspace Technique	PoraBOND Q, 10 m x 0.32 mm, 5.00 µm	CP7350
		PoraBOND Q, 10 m x 0.53 mm, 10.00 µm	CP7353

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 3760	Standard Test Method for Analysis of Isopropylbenzene (Cumene) by GC	DB-WAX, 60 m x 0.32 mm, 0.25 µm	123-7062
		HP-1, 50 m x 0.32 mm, 0.52 µm	19091Z-115
		CP-Xylenes, 50 m x 0.53 mm	CP7428
D 3792	Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph	PoraBOND Q, 25 m x 0.32 mm, 5.00 µm	CP7351
		PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
D 3797	Standard Test Method for Analysis of o-Xylene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-Xylenes, 50 m x 0.53 mm	CP7428
D 3798	Standard Test Method for Analysis of p-Xylene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-Xylenes, 50 m x 0.53 mm	CP7428
D 3871	Standard Test Method for Purgeable Organic Compounds in Water Using Headspace Sampling	DB-VRX, 75 m x 0.45 mm, 2.55 µm	124-1574
D 3876	Standard Test Method for Methoxyl and Hydroxypropyl Substitution in Cellulose Ether Products by Gas Chromatography	CP-Sil 5 CB, 30 m x 0.32 mm, 1.00 µm	CP8760
		CP-Sil 5 CB, 30 m x 0.53 mm, 1.50 µm	CP8735
D 3893	Standard Test Method for Purity of Methyl Amyl Ketone and Methyl Isoamyl Ketone by GC	DB-VRX, 30 m x 0.45 mm, 2.55 µm	124-1534
D 3973	Standard Test Method for Low-Molecular Weight Halogenated Hydrocarbons in Water	DB-VRX, 30 m x 0.45 mm, 2.55 µm	124-1534
D 4059	Standard Test Method for Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography	CP-Sil 8 CB for PCB, 50 m x 0.25 mm, 0.25 µm	CP7482
D 4275	Standard Test Method for Determination of Butylated Hydroxy Toluene (BHT) in Polymers of Ethylene and Ethylene – Vinyl Acetate (EVA) Copolymers By Gas Chromatography	CP-Sil 5 CB, 30 m x 0.32 mm, 3.00 µm	CP8687
		CP-Sil 5 CB, 30 m x 0.53 mm, 3.00 µm	CP8677
D 4322	Standard Test Method for Residual Acrylonitrile Monomer Styrene-Acrylonitrile Copolymers and Nitrile Rubber by Headspace Gas Chromatography	PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
D 4367	Standard Test Method for Benzene in Hydrocarbon Solvents by Gas Chromatography	VF-1ms, 15 m x 0.25 mm, 0.10 µm	CP8906
		CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 4415	Standard Test Method for Determination of Dimer in Acrylic Acid	DB-FFAP, 30 m x 0.32 mm, 0.25 µm	123-3232
D 4424	Standard Test Method for Butylene Analysis by GC	HP PLOT Al_2O_3 S, 50 m x 0.53 mm, 15.00 µm	19095P-S25
		CP-Al2O3/Na2SO4, 25 m x 0.53 mm, 10.00 µm	CP7567
D 4443	Standard Test Method for Residual Vinyl Chloride Monomer Content in PPB Range in Vinyl Chloride Homo- and Co-Polymers by Headspace GC	DB-VRX, 30 m x 0.45 mm, 2.55 µm	124-1534

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 4492	Standard Test Method for Analysis of Benzene by Gas Chromatography	CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 4509	Standard Test Methods for Determining the 24-Hour Gas (AIR) Space Acetaldehyde Content of Freshly Blown PET Bottles	PoraBOND Q, 25 m x 0.32 mm, 5.00 µm	CP7351
		PoraBOND Q, 25 m x 0.53 mm, 10.00 µm	CP7354
D 4534	Test Method for Benzene Content of Cyclic Products by Gas Chromatography	CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
D 4735	Standard Test Method for Determination of Trace Thiophene in Refined Benzene by GC	DB-FFAP, 30 m x 0.45 mm, 0.85 µm	124-3232
		CP-Wax 58 FFAP CB, 25 m x 0.53 mm, 1.00 µm	CP7614
D 4768	Standard Test Method for Analysis of 2,6-Ditertiary-Butyl Para-Cresol and 2,6-Ditertiary- Butyl Phenol in Insulating Liquids by Gas Chromatography	CP-Wax 58 FFAP CB, 25 m x 0.53 mm, 1.00 µm	CP7614
D 4864	Standard Test Method for Determination of Traces of Methanol in Propylene Concentrates by GC	DB-WAX, 30 m x 0.45 mm, 0.85 µm	124-7032
D 4947	Standard Test Method for Chlordane and Heptachlor Residues in Indoor Air	DB-5, 30 m x 0.53 mm, 1.50 µm	125-5032
		DB-608, 30 m x 0.53 mm, 0.83 µm	125-1730
D 4961	Standard Test Method for GC Analysis of Major Organic Impurities in Phenol Produced by the Cumene Process	DB-FFAP, 30 m x 0.45 mm, 0.85 µm	124-3232
		HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
D 4983	Standard Test Method for Cyclohexylamine Morpholine and Diethylaminoethanol in Water and Condensed Steam by Direct Aqueous Injection GC	HP-5ms, 30 m x 0.32 mm, 1.00 µm	19091S-213
		CAM, 30 m x 0.53 mm, 1.00 µm	115-2132
D 5008	Standard Test Method for Ethyl Methyl Pentonal Content and Purity Value of 2-Ethylhexanol by GC	HP-1, 15 m x 0.53 mm, 5.00 µm	19095Z-621
		HP-INNOWax, 30 m x 0.32 mm, 0.25 µm	19091N-113
D 5060	Standard Test Method for Determining Impurities in High-Purity Ethylbenzene by GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-WAX 52 CB, 60 m x 0.32 mm, 0.50 µm	CP8773
D 5075	Standard Test Method for Nicotine in Indoor Air	DB-5, 30 m x 0.53 mm, 1.50 µm	125-5032
		DB-5, 30 m x 0.32 mm, 1.00 µm	123-5033
D 5134	Standard Test Method for Detailed Analysis of Petroleum Naphthas Through n-Nonane by Capillary GC	HP-PONA, 50 m x 0.20 mm, 0.50 µm	19091S-001
		CP-Sil PONA para ASTM D 5134, 50 m x 0.21 mm, 0.50 µm	CP7531
D 5135	Standard Test Method for Analysis of Styrene by Capillary GC	HP-INNOWax, 60 m x 0.32 mm, 0.50 µm	19091N-216
		CP-WAX 52 CB, 60 m x 0.32 mm, 0.50 µm	CP8773
D 5175	Standard Test Method for Organohalide Pesticides and Polychlorinated Biphenyls in Water by Microextraction and GC	DB-1, 30 m x 0.32 mm, 1.00 µm	123-1033
		DB-608, 30 m x 0.32 mm, 0.50 µm	123-1730
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232

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ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 5303	Standard Test Method for Trace Carbonyl Sulfide in Propylene by GC	GS-GasPro, 30 m x 0.32 mm	113-4332
		HP PLOT Q, 30 m x 0.53 mm, 40.00 µm	19095P-QO4
D 5307	Standard Test Method for Determination of Boiling Range Distribution of Crude Petroleum by GC	HP-1, 7.5 m x 0.53 mm, 5.00 µm	19095Z-627
D 5310	Standard Test Method for Tar Acid Composition by Capillary GC	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-225ms, 30 m x 0.25 mm, 0.25 µm	122-2932
D 5316	Standard Test Method for 1, 2-Dibromoethane and 1, 2-Dibromo-3-Chloropropane in Water by Microextraction and GC	HP-1ms, 30 m x 0.32 mm, 1.00 µm	19091S-713
		DB-624, 30 m x 0.45 mm, 2.55 µm	124-1334
D 5317	Standard Test Method for Determination of Chlorinated Organic Acid Compounds in Water by GC with Electron Capture Detector	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 µm	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
D 5320	Standard Test Method for Determination of 1, 1-Trichloroethane and Methylene Chloride in Stabilized Trichloroethylene and Tetrachloroethylene	DB-1, 30 m x 0.53 mm, 3.00 µm	125-1034
		DB-VRX, 30 m x 0.32 mm, 1.80 µm	123-1534
D 5399	Standard Test Method for Boiling Point Distribution of Hydrocarbon Solvents by GC	DB-2887, 10 m x 0.53 mm, 3.00 µm	125-2814
D 5441	Standard Test Method for Analysis of Methyl Tert-Butyl Ether (MTBD) by GC	HP-PONA, 50 m x 0.20 mm, 0.50 µm	19091S-001
		DB-Petro, 100 m x 0.25 mm, 0.50 µm	122-10A6E
D 5442	Standard Test Method for Analysis of Petroleum Waxes by GC	DB-1, 25 m x 0.32 mm, 0.25 µm	123-1022
		DB-5, 15 m x 0.25 mm, 0.25 µm	122-5012
D 5475	Standard Test Method for Nitrogen- and Phosphorus-Containing Pesticides in Water by GC with a Nitrogen Phosphorus Detector	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 µm	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832
D 5480	Standard Test Method for Engine Oil Volatility by GC	DB-PS1, 15 m x 0.53 mm, 0.15 µm	145-1011
D 5501	Standard Test Method for Determination of Ethanol Content of Denatured Fuel Ethanol by GC	HP-1, 100 m x 0.25 mm, 0.50 µm	19091Z-530
D 5504	Standard Test Method for Determination of Sulfur Compounds in Natural Gas and Gaseous Fuels by Gas Chromatography and Chemiluminescence	CP-Sil 5 CB for Sulfur, 30 m x 0.32 mm, 4.00 µm	CP7529

(Continued)

ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 5507	Standard Test Method for Determination of Trace Organic Impurities in Monomer Grade Vinyl Chloride by Capillary Column/Multi-dimensional GC	HP PLOT Q, 15 m x 0.53 mm, 40.00 µm	19095P-QO3
		HP PLOT U, 30 m x 0.53 mm, 20.00 µm	19095P-UO4
D 5508	Standard Test Method for Determination of Residual Acrylonitrile Monomer in Styrene-Acyrlonitrile Co-polymer Resins and Nitrile-Butadiene Rubber by Headspace Capillary GC	HP PLOT Q, 30 m x 0.53 mm, 40.00 µm	19095P-QO4
D 5580	Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, p/m-Xylene, C_9 and Heavier Aromatics, and Total Aromatics in Finished Gasoline by GC	DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
		CP-TCEP for Alcohols in Gasoline, 50 m x 0.25 mm, 0.40 µm	CP7525
		CP-Sil 5 CB, 30 m x 0.53 mm, 5.00 µm	CP8775
		VF-1ms, 15 m x 0.25 mm, 0.10 µm	CP8906
D 5599	Standard Test Method for Determination of Oxygenates in Gasoline by GC and Oxygen Selective Flame Ionization Detection	DB-5, 30 m x 0.25 mm, 0.25 µm	122-5032
D 5623	Standard Test Method for Sulfur Compounds in Light Petroleum Liquids by GC and Sulfur Selective Detection	HP-1, 30 m x 0.32 mm, 4.00 µm	19091Z-613
D 5713	Standard Test Method for Analysis of High Purity Benzene for Cyclohexane Feedstock by Capillary GC	DB-Petro, 50 m x 0.20 mm, 0.50 µm	128-1056
D 5739	Standard Practice for Oil Spill Source Identification by GC and Positive Ion Electron Impact Low Resolution Mass Spectrometry	DB-5, 30 m x 0.25 mm, 0.25 µm	122-5032
		DB-TPH, 30 m x 0.32 mm, 0.25 µm	123-1632
D 5769	Standard Test Method for Determination of Benzene, Toluene, and Total Aromatics in Finished Gasoline by GC/MS	HP-1, 60 m x 0.25 mm, 1.00 µm	19091Z-236
D 5790	Standard Test Method for Measurement of Purgeable Organic Compounds in Water by Capillary Column GC/MS	DB-VRX, 60 m x 0.25 mm, 1.40 µm	122-1564
		DB-VRX, 20 m x 0.18 mm, 1.00 µm	121-1524
		DB-624, 60 m x 0.25 mm, 1.40 µm	122-1364
		DB-624, 20 m x 0.18 mm, 1.00 µm	121-1324
D 5812	Standard Test Method for Determination of Organochlorine Pesticides in Water by Capillary Column GC	HP-5ms, 30 m x 0.25 mm, 0.25 µm	19091S-433
		DB-1701P, 30 m x 0.25 mm, 0.25 µm	122-7732
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
		DB-35ms, 30 m x 0.25 mm, 0.25 µm	122-3832

(Continued)

ASTM Methods

Method	Title	Recommended Agilent Column	Part No.
D 5917	Standard Test Method for Trace Impurities in Monocyclic Aromatic Hydrocarbons by GC and External Calibration	HP-INNOWax, 60 m x 0.32 mm, 0.25 µm	19091N-116
D 5974	Standard Test Method for Fatty and Rosin Acids in Tall Oil Fraction Products by Capillary GC	DB-23, 60 m x 0.25 mm, 0.25 µm	122-2362
D 5986	Standard Test Method for Determination of Oxygenates, Benzene, Toluene, C_8-C_{12} Aromatics and Total Aromatics in Finished Gasoline by GC/FTIR	HP-1, 60 m x 0.53 mm, 5.00 µm	19095Z-626
D 6144	Standard Test Method for Trace Impurities in Alpha-Methylstyrene by Capillary GC	HP-1, 60 m x 0.25 mm, 1.00 µm	19091Z-236
D 6159	Standard Test Method for Determination of Hydrocarbon Impurities in Ethylene by GC	HP PLOT Al2O3 "KCl", 50 m x 0.53 mm, 15.00 µm	19095P-K25
		GS-Alumina, 50 m x 0.53 mm	115-3552
		DB-1, 30 m x 0.53 mm, 5.00 µm	125-1035
D 6160	Standard Test Method for Determination of PCBs in Waste Materials by GC	HP-5ms, 30 m x 0.32 mm, 0.25 µm	19091S-413
		DB-XLB, 30 m x 0.25 mm, 0.25 µm	122-1232
D 6352	Standard Test Method for Boiling Range Distribution of Petroleum Distillates in Boiling Range from 174 to 700 °C by GC	DB-HT SimDis, 5 m x 0.53 mm, 0.15 µm	145-1001
D 6387	Standard Test Methods for Composition of Turpentine and Related Terpene Products by Capillary Gas Chromatography	CP-WAX 52 CB, 30 m x 0.32 mm, 0.50 µm	CP8763
		CP-WAX 52 CB, 30 m x 0.53 mm, 1.00 µm	CP8738
D 6417	Standard Test Method for Estimation of Engine Oil Volatility by Capillary GC	DB-HT SimDis, 5 m x 0.53 mm, 0.15 µm	145-1001
D 6584	Standard Test Method for Determination of Total Monoglyceride, Total Diglyceride, Total Triglyceride, and Free and Total Glycerin in B-100 Biodiesel Methyl Esters by Gas Chromatography	Select Biodiesel, 15 m x 0.32 mm, 0.10 µm	CP9078
D 6806	Standard Practice for Analysis of Halogenated Organic Solvents and Their Admixtures by Gas Chromatography	CP-Sil 5 CB, 50 m x 0.53 mm, 5.00 µm	CP7685
E 1616	Standard Test Method for Analysis of Acetic Anhydride Using GC	HP-1, 50 m x 0.32 mm, 0.52 µm	19091Z-115
E 1863	Standard Test Method for Analysis of Acrylonitrile by GC	DB-WAXetr, 60 m x 0.32 mm, 1.00 µm	123-7364
E 0202	Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols	DB-624, 30 m x 0.53 mm, 3.00 µm	125-1334
		CP-Wax 57 CB for Gycols and Alcohols, 25 m x 0.25 mm, 0.25 µm	CP7615
E 0475	Standard Test Method for Assay of Di-tert-Butyl Peroxide Using GC	HP-5, 30 m x 0.53 mm, 5.00 µm	19095J-623

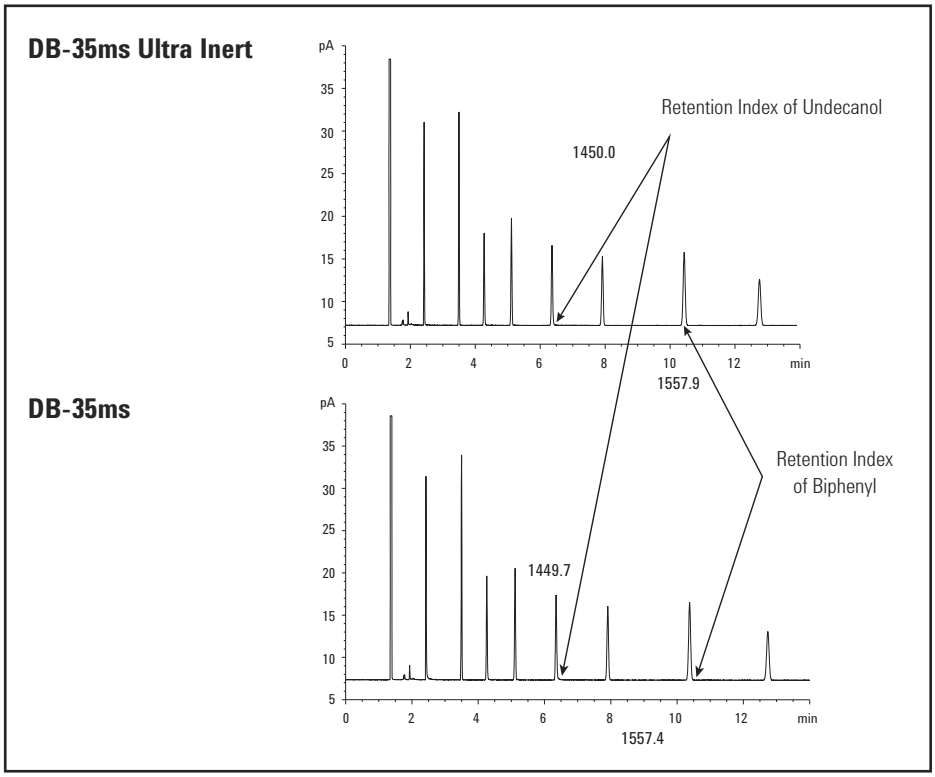
GC Capillary Columns

Agilent J&W Ultra Inert GC Columns

Perform trace-level analysis with the utmost confidence

As the GC industry's premier measurement company, Agilent is uniquely positioned to ensure the inertness of the surfaces your sample touches, so you can achieve the parts-per-billion – or parts-per-trillion – detection levels for your most demanding analyses. Agilent Ultra Inert components work together to deliver industry-leading results: the Agilent GC instrument, Ultra Inert liner and Agilent J&W Ultra Inert GC column family.

The Agilent J&W Ultra Inert GC column family pushes industry standards for consistent column inertness and exceptionally low column bleed, resulting in lower detection limits and more accurate data for difficult analytes. Each Ultra Inert column is tested with the industry's most demanding test probe mixture and we prove it with a performance summary sheet shipped with each column.



With Agilent J&W Ultra Inert GC columns, selectvity remains the same, allowing you to confidently integrate Ultra Inert columns into your current methods.

The industry's most rigorous test probe mixture ensures consistent column inertness – and results

A strong test probe mixture can highlight deficiencies in column activity, while a weak mixture can actually mask such deficiencies.

The test probes in Agilent's Ultra Inert test probe mixture have low molecular weights, low boiling points and no steric shielding of their active groups. These characteristics allow the probative portion of the test molecules to penetrate – and fully interact with – the stationary phase and column surface.

Commonly used, less demanding test probes		
1. 1-Octanol	4. 2,6-Dimethylaniline	7. 1-Decanol
2. n-Undecane	5. n-Dodecane	8. n-Tridecane
3. 2,6-Dimethylphenol	6. Napthalene	9. Methyldecanoate

TIPS & TOOLS

Clearly Better Inertness

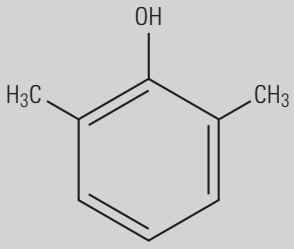
To learn more and order your free poster, visit **www.agilent.com/chem/ultrainert**



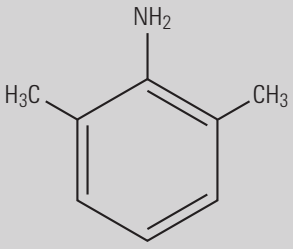
Agilent's more demanding Ultra Inert test probe mixture for 5ms, 1ms, and 35ms Ultra Inert columns

Ultra Inert 5ms Columns			Ultra Inert 1ms Columns			Ultra Inert 35ms Columns		
Elution Order	**Test Probe**	**Functional Test**	**Elution Order**	**Test Probe**	**Functional Test**	**Elution Order**	**Test Probe**	**Functional Test**
1.	1-Propionic acid	Basicity	1.	1-Propionic acid	Basicity	1.	1-Octene	Polarity
2.	1-Octene	Polarity	2.	1-Octene	Polarity	2.	1-Butyric acid	Basicity
3.	n-Octane	Hydrocarbon marker	3.	n-Octane	Hydrocarbon marker	3.	n-Nonane	Hydrocarbon marker
4.	4-Picoline	Acidity	4.	1,2-Butanediol	Silanol	4.	4-Picoline	Acidity
5.	n-Nonane	Hydrocarbon marker	5.	4-Picoline	Acidity	5.	n-Propylbenzene	Polarity
6.	Trimethyl phosphate	Acidity	6.	Trimethyl phosphate	Acidity	6.	1-Heptanol	Silanol, Polarity
7.	1,2-Pentanediol	Silanol	7.	n-Propylbenzene	Hydrocarbon marker	7.	1,2-Pentanediol	Silanol
8.	n-Propylbenzene	Hydrocarbon marker	8.	1-Heptanol	Silanol	8.	3-Octanone	Polarity
9.	1-Heptanol	Silanol	9.	3-Octanone	Polarity	9.	Trimethyl phosphate	Acidity
10.	3-Octanone	Polarity	10.	tert-Butylbenzene	Hydrocarbon marker	10.	tert-Butylbenzene	Hydrocarbon marker
11.	n-Decane	Efficiency	11.	n-Decane	Efficiency	11.	n-Undecane	Efficiency

Chemical Structures

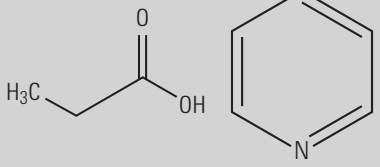


2,6-Dimethylphenol

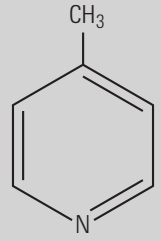


2,6-Dimethylaniline

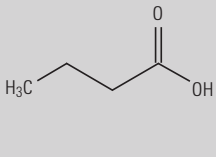
Weak probe molecules: The acidic and basic portions of these molecules are shielded by the two methyl groups on their phenyl rings, making them less probative.



1-Propionic acid



4-Picoline



1-Butyric acid

Strong probe molecules: The probes in Agilent's Ultra Inert test probe mixture are highly probative of the stationary phase and surface. Note, too, that the active end of each compound is available to interact with any active sites on the column.

DB-1ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.18	*20*	*0.18*	*-60 to 325/350*	*121-0122UI*	
0.25	15	0.25	-60 to 325/350	122-0112UI	122-0112UIE
	30	0.25	-60 to 325/350	122-0132UI	122-0132UIE
	60	0.25	-60 to 325/350	122-0162UI	
0.32	15	0.25	-60 to 325/350	123-0112UI	
	30	0.25	-60 to 325/350	123-0132UI	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-1ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-677UI*	*19091S-677UIE*
0.25	15	0.25	-60 to 325/350	19091S-931UI	19091S-931UIE
	30	0.25	-60 to 325/350	19091S-933UI	19091S-933UIE
		0.50	-60 to 325/350	19091S-633UI	
		1.00	-60 to 325/350	19091S-733UI	19091S-733UIE
0.32	15	0.25	-60 to 325/350	19091S-911UI	
	25	0.52	-60 to 325/350	19091S-612UI	
	30	0.25	-60 to 325/350	19091S-913UI	19091S-913UIE
		1.00	-60 to 325/350	19091S-713UI	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1, ZB-1ms

TIPS & TOOLS



Learn how to ensure an inert GC flow path with the Agilent Ultra Inert Solutions Brochure. Order yours at **www.agilent.com/chem/Ulorder**

DB-5ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*121-5522UI*		*121-5522UILTM*
		0.36	*-60 to 325/350*	*121-5523UI*		*121-5523UILTM*
0.25	15	0.25	-60 to 325/350	122-5512UI		122-5512UILTM
		1.00	-60 to 325/350	122-5513UI		122-5513UILTM
	25	0.25	-60 to 325/350	122-5522UI		122-5522UILTM
	30	0.25	-60 to 325/350	122-5532UI	122-5532UIE	122-5532UILTM
		0.50	-60 to 325/350	122-5536UI		122-5536UILTM
		1.00	-60 to 325/350	122-5533UI	122-5533UIE	122-5533UILTM
	50	0.25	-60 to 325/350	122-5552UI		
	60	0.25	-60 to 325/350	122-5562UI		
		1.00	-60 to 325/350	122-5563UI		
0.32	30	0.25	-60 to 325/350	123-5532UI	123-5532UIE	123-5532UILTM
		0.50	-60 to 325/350	123-5536UI		123-5536UILTM
		1.00	-60 to 325/350	123-5533UI		123-5533UILTM
	60	1.00	-60 to 325/350	123-5563UI		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, VF-5ms, PTE-5, BPX-5, AT-5ms, ZB-5ms, ZB-5MSi, SLB-5ms, Equity-5

HP-5ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
HP-5ms Ultra Inert						
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-577UI*		*19091S-577UILTM*
0.25	15	0.25	-60 to 325/350	19091S-431UI		19091S-431UILTM
	30	0.25	-60 to 325/350	19091S-433UI	19091S-433UIE	19091S-433UILTM
		0.50	-60 to 325/350	19091S-133UI		19091S-133UILTM
		1.00	-60 to 325/350	19091S-233UI	19091S-233UIE	19091S-233UILTM
	60	0.25	-60 to 325/350	19091S-436UI		
0.32	30	0.25	-60 to 325/350	19091S-413UI		19091S-413UILTM
		1.00	-60 to 325/350	19091S-213UI		19091S-213UILTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, SLB-5ms, Equity-7

DB-35ms Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*0.18*	*50 to 340/360*	*121-3822UI*
0.25	15	0.25	50 to 340/360	122-3812UI
	30	0.25	50 to 340/360	122-3832UI
0.32	15	0.25	50 to 340/360	123-3812UI
	30	0.25	50 to 340/360	123-3832UI

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

TIPS & TOOLS

Complete your ultra inert flow path with the industry leading Agilent Ultra Inert Inlet Liner, **www.agilent.com/chem/uiliner**



DB-624 Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*1*	*-20 to 260*	*121-1324UI*
0.25	30	1.4	-20 to 260	122-1334UI
	60	1.4	-20 to 260	122-1364UI
0.32	30	1.8	-20 to 260	123-1334UI
	60	1.8	-20 to 260	123-1364UI
0.53	30	3	-20 to 260	125-1334UI
	75	3	-20 to 260	125-1374UI

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-UI 8270D

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*0.36*	*-60 to 325/350*	*121-9723*
				*621-9723, 6/pk**
0.25	30	0.25	-60 to 325/350	122-9732
			-60 to 325/350	622-9732, 6/pk*
		0.50	-60 to 325/350	122-9736

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

*Only available in the U.S.

Agilent J&W High Efficiency GC Capillary Columns

High efficiency, high throughput, and high resolution without the high costs

This leading-edge column technology is ideal for applications that require faster run times, such as high-throughput screening, fast process monitoring, and fast method development. In fact, Agilent High Efficiency GC columns can reduce your sample run time by 50% or more without compromising resolution.

Unlike other manufacturers' 0.1 mm id columns, Agilent's 0.15 and 0.18 mm id High Efficiency Capillary GC columns are compatible with all standard-pressure capillary GC and GC/MS instruments – without expensive high-pressure modifications. They also give you:

- The flexibility to choose between helium and hydrogen carrier gases. You can stay with a helium carrier if you wish to simplify method development, or switch to a hydrogen carrier to further reduce your analysis time.
- The ability to separate samples using less carrier gas, which can lead to longer intervals between cylinder changes, increased uptime, and a lower cost per sample.

In addition, these flexible columns easily adapt to a wide variety of environmental, petrochemical, flavor/fragrance, clinical toxicology, and pharmaceutical sample matrices.

The Agilent J&W High Efficiency GC columns throughout this section are displayed using italicized descriptions and part numbers in the ordering tables.

Low-bleed GC/MS Columns

There is a rapidly increasing population of benchtop GC/MS instruments in analytical laboratories that analyze a widening range of trace level, higher temperature samples. These samples require increasingly inert, lower bleed, higher temperature columns. In response to this growing need, Agilent Technologies designed several "ms" columns to chromatograph a broader range of low level samples and generate lower bleed even at higher temperatures.

What makes an Agilent J&W low-bleed column exceptional? Unique polymer chemistry and proprietary surface deactivation, both of which have contributed to columns that adhere to the tightest quality control specifications in the industry for bleed, inertness, selectivity and efficiency. Agilent J&W "ms" columns utilize special surface deactivation and siloxane chemistries which enhance the chromatographic performance of siloxane polymers.

The mass spectrum of septum bleed can look very much like GC column bleed, so the two are often confused. An easy way to tell the two apart: column bleed will be indicated by a rise in the baseline, not peaks. If you see bleed peaks, these generally come from lower quality septa or septa being used beyond their operating limits. To minimize septa contributions to background bleed, use quality Agilent BTO, Long Life, or Advanced Green septa.

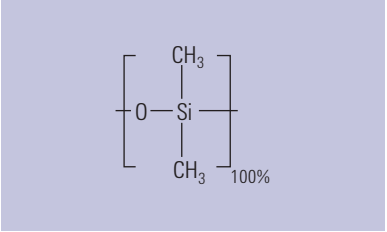
TIPS & TOOLS

Check out Agilent's complete line of sample preparation products for any type of GC and GC/MS analysis at **www.agilent.com/chem/sampleprep**



DB-1ms

- 100% Dimethylpolysiloxane
- Identical selectivity to DB-1
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Improved acid performance compared to standard 100% Dimethylpolysiloxane columns
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- 340/360 °C upper temperature limit
- Excellent general purpose column
- Bonded and cross-linked
- Solvent rinsable



Structure of DB-1ms

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1, ZB-1ms

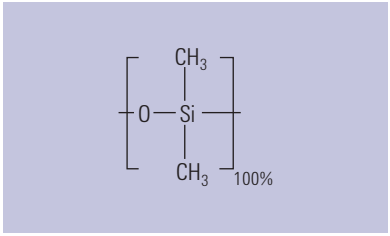
DB-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.10	10	0.10	-60 to 340/360	127-0112		127-0112LTM	
		0.40	-60 to 340/360	127-0113			
	20	0.10	-60 to 340/360	127-0122			
		0.40	-60 to 340/360	127-0123		127-0123LTM	
0.18	*20*	*0.18*	*-60 to 340/360*	*121-0122*	*121-0122E*	*121-0122LTM*	*221-0122LTM*
0.20	12	0.33	-60 to 340/350	128-0112		128-0112LTM	
	25	0.33	-60 to 340/350	128-0122	128-0122E	128-0122LTM	
0.25	15	0.25	-60 to 340/360	122-0112	122-0112E	122-0112LTM	222-0112LTM
	30	0.10	-60 to 340/360	122-0131			
		0.25	-60 to 340/360	122-0132	122-0132E		222-0132LTM
	60	0.25	-60 to 340/360	122-0162			
0.32	15	0.25	-60 to 340/360	123-0112			
	30	0.10	-60 to 340/360	123-0131			
		0.25	-60 to 340/360	123-0132		123-0132LTM	
	60	0.25	-60 to 340/360	123-0162			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

TIPS & TOOLS

Learn how the Agilent 5975T LTM GC/MSD can deliver the rapid, reliable results you need in the field or in the lab, **www.agilent.com/chem/5975T**



Structure of HP-1ms

HP-1ms

- 100% Dimethylpolysiloxane
- Identical selectivity to HP-1
- Non-polar
- Low bleed characteristics
- Excellent general purpose column
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rtx-1ms, Rxi-1ms, MDN-1, AT-1, ZB-1ms, Equity-1

HP-1ms

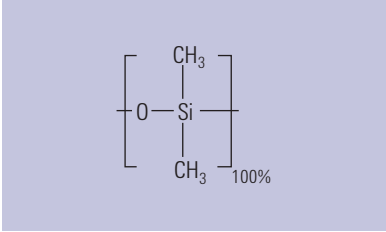
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-677*	*19091S-677E*	*19091S-677LTM*	*29091S-677LTM*
0.20	25	0.33	-60 to 325/350	19091S-602	19091S-602E	19091S-602LTM	
0.25	15	0.25	-60 to 325/350	19091S-931	19091S-931E	19091S-931LTM	29091S-931LTM
	30	0.10	-60 to 325/350	19091S-833		19091S-833LTM	29091S-833LTM
		0.25	-60 to 325/350	19091S-933	19091S-933E	19091S-933LTM	29091S-433LTM
		0.50	-60 to 325/350	19091S-633		19091S-633LTM	
		1.00	-60 to 325/350	19091S-733	19091S-733E	19091S-733LTM	
	60	0.25	-60 to 325/350	19091S-936	19091S-936E		
0.32	15	0.25	-60 to 325/350	19091S-911		19091S-911LTM	
	25	0.52	-60 to 325/350	19091S-612		19091S-612LTM	
	30	0.25	-60 to 325/350	19091S-913	19091S-913E	19091S-913LTM	
		1.00	-60 to 325/350	19091S-713		19091S-713LTM	
	60	0.25	-60 to 325/350	19091S-916			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

VF-1ms

- Highly inert, non-polar 100% dimethylpolysiloxane phase, low-bleed GC column providing increased sensitivity over a broad array of applications
- Ultra low bleed specification of 1 pA @ 325 °C (30 m, 0.25 mm, 0.25 µm) for trace analysis with MS
- QC test results for retention index, efficiency, selectivity and bleed is reported with every column
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-1ms, Rxi-1ms, MDN-1, AT-1, ZB-1ms, Equity-1



Structure of VF-1ms

VF-1ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	-60 to 325/350	CP8900	
		0.40	-60 to 325/350	CP8901	
	20	0.10	-60 to 325/350	CP8902	
		0.40	-60 to 325/350	CP8903	
0.15	*10*	*0.15*	*-60 to 325/350*	*CP9030*	
	15	*0.15*	*-60 to 325/350*	*CP5881*	
	20	*0.15*	*-60 to 325/350*	*CP9031*	
		0.60	*-60 to 325/350*	*CP9032*	*CP9032I5*
0.20	12	0.33	-60 to 325/350	CP8904	
	25	0.33	-60 to 325/350	CP8905	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)



Column shown with EZ-GRIP

VF-1ms

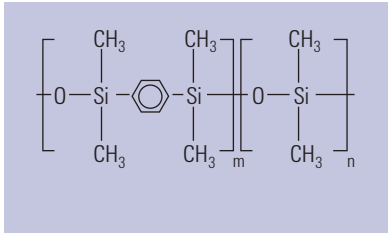
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	15	0.10	-60 to 325/350	CP8906	CP8906I5
		0.25	-60 to 325/350	CP8907	CP8907I5
		1.00	-60 to 325/350	CP8908	CP8908I5
	25	0.25	-60 to 325/350	CP8909	
		0.40	-60 to 325/350	CP8910	
	30	0.10	-60 to 325/350	CP8911	CP8911I5
		0.25	-60 to 325/350	CP8912	CP8912I5
		1.00	-60 to 325/350	CP8913	CP8913I5
	50	0.25	-60 to 325/350	CP8914	
		0.40	-60 to 325/350	CP8915	
	60	0.25	-60 to 325/350	CP8916	CP8916I5
		1.00	-60 to 325/350	CP8917	CP8917I5
0.32	15	0.10	-60 to 325/350	CP8918	CP8918I5
		0.25	-60 to 325/350	CP8919	
		1.00	-60 to 325/350	CP8920	CP8920I5
	25	0.25	-60 to 325/350	CP8921	
		0.40	-60 to 325/350	CP8922	
	30	0.10	-60 to 325/350	CP8923	
		0.25	-60 to 325/350	CP8924	
		0.50	-60 to 325/350	CP8925	
		1.00	-60 to 325/350	CP8926	
	50	0.25	-60 to 325/350	CP8927	
		0.40	-60 to 325/350	CP8928	
	60	0.25	-60 to 325/350	CP8929	
		1.00	-60 to 325/350	CP8930	
0.53	15	0.50	-60 to 325/350	CP8965	
		1.50	-60 to 325/350	CP8967	
	30	0.50	-60 to 325/350	CP8968	
		1.00	-60 to 325/350	CP8969	
		1.50	-60 to 310/335	CP8970	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-5ms

- Phenyl Arylene polymer virtually equivalent to a (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Excellent inertness for active compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-5TA
- Close equivalent to USP Phase G27
- Test mix available

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, ZB-5MSi, SLB-5ms, Equity-5



Structure of DB-5ms



TIPS & TOOLS

Learn more about the Agilent 7890A GC System at **www.agilent.com/chem/7890A**

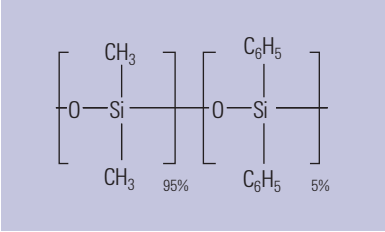
DB-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*-60 to 325/350*	*121-5522*	*121-5522E*	*121-5522LTM*	*221-5522LTM*
		0.36	*-60 to 325/350*	*121-5523*		*121-5523LTM*	
	40	*0.18*	*-60 to 325/350*	*121-5542*			
0.20	12	0.33	-60 to 325/350	128-5512		128-5512LTM	
	25	0.33	-60 to 325/350	128-5522		128-5522LTM	
	50	0.33	-60 to 325/350	128-5552			
0.25	15	0.10	-60 to 325/350	122-5511		122-5511LTM	
		0.25	-60 to 325/350	122-5512		122-5512LTM	222-5512LTM
		0.50	-60 to 325/350	122-5516		122-5516LTM	
		1.00	-60 to 325/350	122-5513		122-5513LTM	
	25	0.25	-60 to 325/350	122-5522		122-5522LTM	
		0.40	-60 to 325/350	122-552A		122-552ALTM	
	30	0.10	-60 to 325/350	122-5531		122-5531LTM	
		0.25	-60 to 325/350	122-5532	122-5532E	122-5532LTM	222-5532LTM
		0.50	-60 to 325/350	122-5536	122-5536E	122-5536LTM	
		1.00	-60 to 325/350	122-5533	122-5533E	122-5533LTM	
	50	0.25	-60 to 325/350	122-5552			
	60	0.10	-60 to 325/350	122-5561			
		0.25	-60 to 325/350	122-5562	122-5562E		
		1.00	-60 to 325/350	122-5563			
0.32	15	0.10	-60 to 325/350	123-5511		123-5511LTM	
		0.25	-60 to 325/350	123-5512		123-5512LTM	
		1.00	-60 to 325/350	123-5513	123-5513E	123-5513LTM	
	25	0.52	-60 to 325/350	123-5526		123-5526LTM	
	30	0.10	-60 to 325/350	123-5531		123-5531LTM	
		0.25	-60 to 325/350	123-5532	123-5532E	123-5532LTM	
		0.50	-60 to 325/350	123-5536		123-5536LTM	
		1.00	-60 to 325/350	123-5533		123-5533LTM	
	60	0.10	-60 to 325/350	123-5561			
		0.25	-60 to 325/350	123-5562			
		0.50	-60 to 325/350	123-5566			
		1.00	-60 to 325/350	123-5563			
0.53	15	1.50	-60 to 300/320	125-5512		125-5512LTM	
	30	0.50	-60 to 300/320	125-5537		125-5537LTM	
		1.00	-60 to 300/320	125-553J		125-553JLTM	
		1.50	-60 to 300/320	125-5532		125-5532LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-5ms

- (5%-Phenyl)-methylpolysiloxane
- Identical selectivity to HP-5
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Excellent inertness for active compounds including acidic and basic compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G27



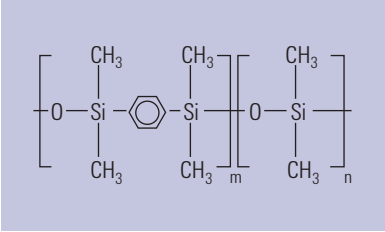
Structure of HP-5ms

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, SLB-5ms, Equity-5

HP-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*-60 to 325/350*	*19091S-577*		*19091S-577LTM*	
0.20	12	0.33	-60 to 325/350	19091S-101		19091S-101LTM	
	25	0.33	-60 to 325/350	19091S-102	19091S-102E	19091S-102LTM	
	50	0.33	-60 to 325/350	19091S-105			
0.25	15	0.10	-60 to 325/350	19091S-331		19091S-331LTM	
		0.25	-60 to 325/350	19091S-431		19091S-431LTM	
		1.00	-60 to 325/350	19091S-231		19091S-231LTM	
	30	0.10	-60 to 325/350	19091S-333		19091S-333LTM	
		0.25	-60 to 325/350	19091S-433	19091S-433E	19091S-433LTM	29091S-433LTM
		0.50	-60 to 325/350	19091S-133		19091S-133LTM	
		1.00	-60 to 325/350	19091S-233	19091S-233E	19091S-233LTM	
	60	0.10	-60 to 325/350	19091S-336			
		0.25	-60 to 325/350	19091S-436	19091S-436E		
0.32	25	0.52	-60 to 325/350	19091S-112	19091S-112E	19091S-112LTM	
	30	0.10	-60 to 325/350	19091S-313		19091S-313LTM	
		0.25	-60 to 325/350	19091S-413	19091S-413E	19091S-413LTM	
		0.50	-60 to 325/350	19091S-113		19091S-113LTM	
		1.00	-60 to 325/350	19091S-213		19091S-213LTM	
	60	0.25	-60 to 325/350	19091S-416			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-5ms

VF-5ms

- Highly inert 5% phenylmethyl column for increased sensitivity, accuracy and instrument uptime
- Minimal column bleed improves sensitivity – ultra low bleed specification of 1 pA @ 325 °C (30 m x 0.25 mm, 0.25 µm)
- Slightly higher polarity than VF-1ms, results in improved selectivity for aromatic compounds; selectivity and excellent inertness make these columns applicable for a wide range of semi-polar and even polar compounds
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- QC test results for retention index, efficiency, selectivity and bleed is reported with every column
- Supplied with EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, ZB-5MSi, SLB-5ms, Equity-5

VF-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.40	-60 to 325/350	CP8934	
	20	0.40	-60 to 325/350	CP8933	
0.15	*10*	*0.15*	*-60 to 325/350*	*CP9034*	*CP9034I5*
	15	*0.15*	*-60 to 325/350*	*CP9035*	
	20	*0.15*	*-60 to 325/350*	*CP9036*	*CP9036I5*
		0.30	*-60 to 325/350*	*CP9037*	
		0.60	*-60 to 325/350*	*CP9038*	
	40	*0.15*	*-60 to 325/350*	*CP9039*	*CP9039I5*
		0.60	*-60 to 325/350*	*CP9040*	
0.20	12	0.33	-60 to 325/350	CP8935	CP8935I5
	25	0.33	-60 to 325/350	CP8936	CP8936I5
	50	0.33	-60 to 325/350	CP8937	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

TIPS & TOOLS

As part of Agilent's ongoing commitment to be your partner in chromatography, we have created a series of GC Troubleshooting videos, featuring Daron Decker, GC Applications Specialist, and Herb Brooks, Agilent Service Engineer. To view the videos, visit **www.agilent.com/chem/gctroubleshooting**





VF-5ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	15	0.10	-60 to 325/350	CP8938	
		0.25	-60 to 325/350	CP8939	
		0.50	-60 to 325/350	CP8963	
		1.00	-60 to 325/350	CP8940	
	25	0.25	-60 to 325/350	CP8941	CP8941I5
		0.40	-60 to 325/350	CP8942	
	30	0.10	-60 to 325/350	CP8943	CP8943I5
		0.25	-60 to 325/350	CP8944	CP8944I5
		0.50	-60 to 325/350	CP8945	
		1.00	-60 to 325/350	CP8946	
	50	0.25	-60 to 325/350	CP8947	
	60	0.10	-60 to 325/350	CP8948	CP8948I5
		0.25	-60 to 325/350	CP8960	CP8960I5
		1.00	-60 to 325/350	CP8949	
0.32	15	0.10	-60 to 325/350	CP8950	
		0.25	-60 to 325/350	CP8951	
		1.00	-60 to 325/350	CP8952	
	25	0.52	-60 to 325/350	CP8953	
	30	0.10	-60 to 325/350	CP8954	CP8954I5
		0.25	-60 to 325/350	CP8955	CP8955I5
		0.50	-60 to 325/350	CP8956	
		1.00	-60 to 325/350	CP8957	CP8957I5
	50	0.25	-60 to 325/350	CP8958	
		0.40	-60 to 325/350	CP8959	
	60	0.25	-60 to 325/350	CP8961	CP8961I5
		1.00	-60 to 325/350	CP8962	
0.53	15	0.50	-60 to 325/350	CP8971	
		1.00	-60 to 325/350	CP8972	
		1.50	-60 to 325/350	CP8973	
	30	0.50	-60 to 325/350	CP8974	
		1.00	-60 to 325/350	CP8975	
		1.50	-60 to 310/335	CP8976	

DB-XLB

- Exceptionally low bleed
- Low polarity
- Extended temperature limit of 340/360 °C
- Unique selectivity
- Excellent inertness for active compounds
- Ideal for confirmational analyses
- Excellent for pesticides, herbicides, PCBs and PAHs
- Ideal for GC/MS
- Bonded and cross-linked
- Solvent rinsable

Note: "DB-XLB is designed for inhibiting column bleed at high temperatures. It also appears to have inadvertently inherited an exceptional ability for separating many PCB congeners when used with MS detection. This stellar performance was maximized after careful optimization of the column dimensions, temperature programs, and carrier gas flow conditions."

(Frame, G. Analytical Chemistry News & Features, Aug. 1, 1997, 468A-475A)

Similar Phases: Rtx-XLB, MDN-12, ZB-XLB, ZB-XLB HT

DB-XLB

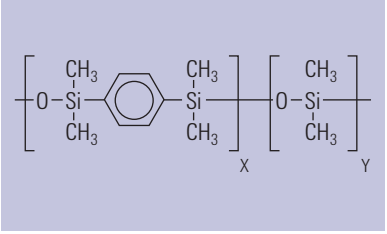
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*30 to 340/360*	*121-1222*	*121-1222E*	*121-1222LTM*
	30	*0.18*	*30 to 340/360*	*121-1232*		
0.20	12	0.33	30 to 340/360	128-1212	128-1212E	
	25	0.33	30 to 340/360	128-1222		
0.25	15	0.10	30 to 340/360	122-1211		122-1211LTM
		0.25	30 to 340/360	122-1212		
	30	0.10	30 to 340/360	122-1231		
		0.25	30 to 340/360	122-1232		122-1232LTM
		0.50	30 to 340/360	122-1236		
		1.00	30 to 340/360	122-1233		
	60	0.25	30 to 340/360	122-1262	122-1262E	
0.32	30	0.25	30 to 340/360	123-1232		
		0.50	30 to 340/360	123-1236		
	60	0.25	30 to 340/360	123-1262		
0.53	15	1.50	30 to 320/340	125-1212		125-1212LTM
	30	1.50	30 to 320/340	125-1232		125-1232LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

VF-Xms

- High arylene modified phase for accurate results
- Isothermal applications up to 340 °C for a broad application range
- Ideal for confirmational analyses – more polar alternative to 5% phenyl columns
- Ultra low bleed delivers ultimate sensitivity and signal-to-noise ratio
- Provides exceptionally high selectivity for semivolatile compounds such as pesticides and delivers high resolution with short analysis time
- Very unique selectivity for chlorinated compounds
- QC test results for retention index, efficiency, selectivity and bleed is reported with every column
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-XLB, MDN-12, ZB-XLB, ZB-XLB HT



Structure of VF-Xms

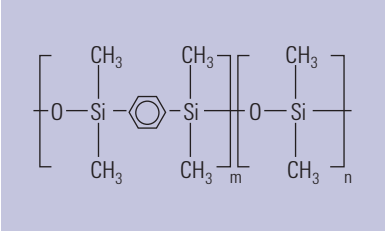


Column shown with EZ-GRIP

VF-Xms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*20*	*0.15*	*30 to 340/360*	*CP9041*	
0.20	12	0.33	30 to 340/360	CP8800	
	25	0.33	30 to 340/360	CP8801	
0.25	15	0.10	30 to 340/360	CP8802	
		0.25	30 to 340/360	CP8803	
	30	0.10	30 to 340/360	CP8805	
		0.25	30 to 340/360	CP8806	CP8806I5
		0.50	30 to 340/360	CP8807	
		1.00	30 to 340/360	CP8808	
	60	0.25	30 to 340/360	CP8809	
0.32	15	0.25	30 to 340/360	CP8810	
		1.00	30 to 340/360	CP8811	
	30	0.10	30 to 340/360	CP8812	
		0.25	30 to 340/360	CP8813	
		0.50	30 to 340/360	CP8814	
		1.00	30 to 340/360	CP8815	
	60	0.25	30 to 340/360	CP8816	
0.53	15	1.50	30 to 325/340	CP8817	
	30	1.50	30 to 325/340	CP8818	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of DB-35ms

DB-35ms

- Virtually equivalent to a (35%-Phenyl)-methylpolysiloxane
- Mid-polarity
- Very low bleed characteristics, ideal for GC/MS
- Extended temperature limit of 340/360 °C
- Excellent inertness for active compounds
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Replaces HP-35ms
- Close equivalent to USP Phase G42

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

DB-35ms

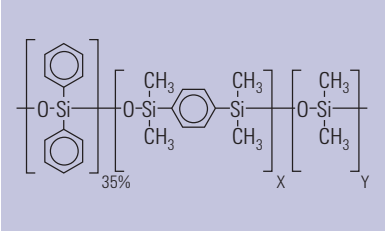
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*50 to 340/360*	*121-3822*	*121-3822E*	*121-3822LTM*	*221-3822LTM*
0.20	15	0.33	50 to 340/360	128-3812			
	25	0.33	50 to 340/360	128-3822			
0.25	15	0.25	50 to 340/360	122-3812			222-3812LTM
	30	0.15	50 to 340/360	122-3831			
	30	0.25	50 to 340/360	122-3832	122-3832E	122-3832LTM	222-3832LTM
	60	0.25	50 to 340/360	122-3862			
0.32	15	0.25	50 to 340/360	123-3812			
	30	0.25	50 to 340/360	123-3832	123-3832E		
0.53	30	0.50	50 to 320/340	125-3837		125-3837LTM	
	30	1.00	50 to 320/340	125-3832		125-3832LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

VF-35ms

- Stabilized arylene-modified equivalent of a 35% phenylmethyl phase
- Ideal for dual column confirmational analyses
- Ultra low bleed, highly stable column with a programmable maximum temperature of 360 °C
- Medium polarity column ideal for trace environmental and chemical analyses
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

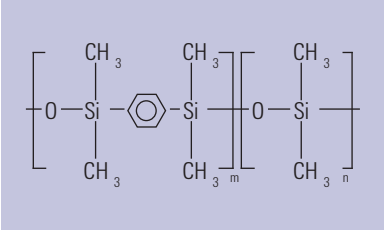


Structure of VF-35ms

VF-35ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*10*	*0.15*	*40 to 340/360*	*CP5887*	
	15	*0.15*	*40 to 340/360*	*CP5888*	
	20	*0.15*	*40 to 340/360*	*CP5889*	
0.20	15	0.33	40 to 340/360	CP8872	
	25	0.33	40 to 340/360	CP8873	
0.25	15	0.25	40 to 340/360	CP8874	
	30	0.10	40 to 340/360	CP8875	
		0.15	40 to 340/360	CP8876	
		0.25	40 to 340/360	CP8877	CP8877I5
		0.50	40 to 340/360	CP8878	CP8878I5
		1.00	40 to 340/360	CP8879	
	60	0.25	40 to 340/360	CP8880	
0.32	15	0.25	40 to 340/360	CP8881	
	30	0.25	40 to 340/360	CP8882	
		0.50	40 to 340/360	CP8883	CP8883I5
		1.00	40 to 340/360	CP8884	
	60	0.25	40 to 340/360	CP8885	
0.53	15	1.00	40 to 325/350	CP8886	
	30	0.50	40 to 325/350	CP8887	
		1.00	40 to 325/350	CP8888	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of DB-17ms

DB-17ms

- Virtually equivalent to (50%-Phenyl)-methylpolysiloxane
- 320/340 °C upper temperature limit
- Very low bleed mid-polarity column, ideal for GC/MS
- Excellent inertness for active compounds
- Enhanced mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Excellent choice for CLP pesticides

Similar Phases: Rxi-17Sil MS, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50

DB-17ms

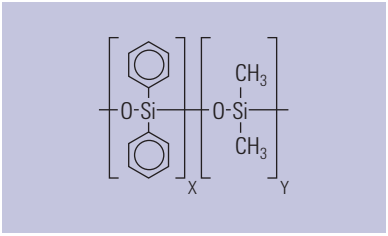
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*40 to 320/340*	*121-4722*	*121-4722E*	*121-4722LTM*	*221-4722LTM*
0.25	15	0.15	40 to 320/340	122-4711		122-4711LTM	
		0.25	40 to 320/340	122-4712		122-4712LTM	222-4712LTM
	30	0.15	40 to 320/340	122-4731		122-4731LTM	
		0.25	40 to 320/340	122-4732	122-4732E	122-4732LTM	222-4732LTM
	60	0.25	40 to 320/340	122-4762			
0.32	15	0.25	40 to 320/340	123-4712		123-4712LTM	
	30	0.25	40 to 320/340	123-4732		123-4732LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

TIPS & TOOLS

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

VF-17ms



Structure of VF-17ms

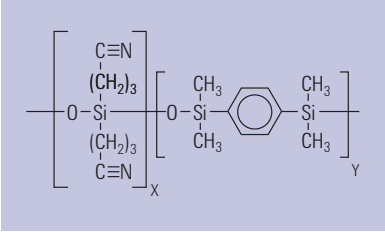
- 50% phenyl/50% dimethylpolysiloxane, medium polarity phase
- Ultra low bleed
- Proprietary deactivation technology and manufacturing process improves column stability, resulting in improved column-to-column repeatability and column lifetimes
- Ideal for environmental and clinical methods
- Ultra low bleed specification at 2 pA @ 325 °C (0.25 mm x 30 m, 0.25 µm)
- Ideal EPA confirmation column for ultimate confidence
- Bonded and cross-linked
- Solvent rinsable
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rxi-17Sil MS, Rtx-50, 007-17, SP-2250, SPB-50, BPX-50, SPB-17, AT-50

VF-17ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.20	40 to 330/360	CP8977	
0.15	*10*	*0.15*	*40 to 330/360*	*CP5882*	
	15	*0.15*	*40 to 330/360*	*CP5883*	
	20	*0.15*	*40 to 330/360*	*CP5884*	
0.25	15	0.25	40 to 330/360	CP8979	
	15	0.50	40 to 330/360	CP8980	
	30	0.15	40 to 330/360	CP8981	
		0.25	40 to 330/360	CP8982	CP8982I5
		0.50	40 to 330/360	CP8983	
	60	0.25	40 to 330/360	CP8984	
0.32	15	0.15	40 to 330/360	CP8986	
		0.25	40 to 330/360	CP8987	
	30	0.25	40 to 330/360	CP8990	CP8990I5
		0.50	40 to 330/360	CP8991	
0.53	15	0.25	40 to 330/360	CP8994	
		1.00	40 to 330/360	CP8996	
		1.50	40 to 310/340	CP8998	
	30	0.50	40 to 330/360	CP9000	
		1.00	40 to 310/340	CP9001	
		1.50	40 to 310/340	CP9002	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of VF-23ms

VF-23ms

- High polarity and highly substituted cyanopropyl low bleed phase
- Engineered for accurate analysis of very polar analytes
- 100% bonded phase permits column rinsing to enhance column lifetime
- Operating temperature up to 260 °C
- Expands application ranges to higher molecular weight compounds
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SP-2330, Rtx-2330, 007-23, AT-Silar, BPX-70, SP-2340

VF-23ms

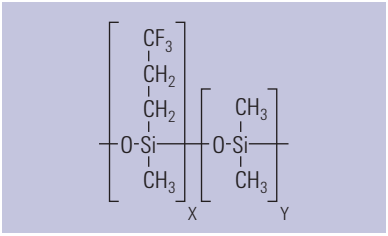
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	40 to 260/260	CP8819	
0.15	*15*	*0.15*	*40 to 260/260*	*CP5886*	
	20	*0.15*	*40 to 260/260*	*CP9042*	
	40	*0.15*	*40 to 260/260*	*CP5885*	
0.25	15	0.25	40 to 260/260	CP8820	CP8820I5
	30	0.15	40 to 260/260	CP8821	CP8821I5
		0.25	40 to 260/260	CP8822	CP8822I5
	60	0.15	40 to 260/260	CP8823	
		0.25	40 to 260/260	CP8824	CP8824I5
0.32	15	0.25	40 to 260/260	CP8825	
	30	0.15	40 to 260/260	CP8826	
		0.25	40 to 260/260	CP8827	
	60	0.15	40 to 260/260	CP8828	
		0.25	40 to 260/260	CP8829	
0.53	15	0.50	40 to 245/245	CP8830	
	30	0.50	40 to 245/245	CP8831	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

VF-200ms

- Trifluoropropyl phase has very high temperature stability and can be used routinely up to 350 °C
- Ideally suited for analyses of ketones, aldehydes, nitro- or chloro-containing compounds, PAHs, unsaturated compounds, silanes, and CFCs
- Optimized deactivation for symmetrical peak shape
- Ultra-low bleed for trace analysis
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-200



Structure of VF-200ms

VF-200ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*10*	*0.15*	*0 to 325/350*	*CP5893*	
	20	*0.15*	*0 to 325/350*	*CP5891*	
		0.60	*0 to 325/350*	*CP5892*	
0.25	15	0.25	0 to 325/350	CP8855	CP8855I5
		0.50	0 to 325/350	CP8856	
	30	0.10	0 to 325/350	CP8857	
		0.25	0 to 325/350	CP8858	
		0.50	0 to 325/350	CP8859	CP8859I5
		1.00	0 to 325/350	CP8860	CP8860I5
	60	0.25	0 to 325/350	CP8861	
0.32	15	0.25	0 to 325/350	CP8862	
	30	0.25	0 to 325/350	CP8863	
		0.50	0 to 325/350	CP8864	
		1.00	0 to 325/350	CP8865	CP8865I5
0.53	15	1.00	0 to 300/325	CP8866	
	30	0.50	0 to 300/325	CP8867	
		1.00	0 to 300/325	CP8868	CP8868I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-225ms

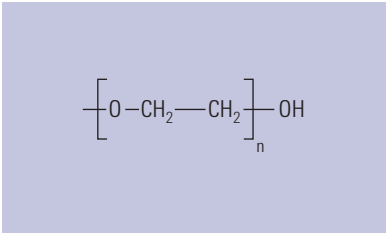
- Virtually equivalent to (50%-Cyanopropylphenyl)-methylpolysiloxane
- Mid/high polarity
- Excellent for separations of cis- and trans-fatty acid methyl esters (FAMEs)
- Low bleed
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G7

Similar Phases: SP-2330, Rtx-225, BP-225, OV-225, 007-225, AT-225

DB-225ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.25	15	0.25	40 to 240	122-2912		122-2912LTM	222-2912LTM
	30	0.25	40 to 240	122-2932	122-2932E	122-2932LTM	222-2932LTM
	60	0.25	40 to 240	122-2962			
0.32	30	0.25	40 to 240	123-2932		123-2932LTM	

VF-WAXms



Structure of VF-WAXms

- Specially designed WAX phase designed for accurate MS results with polar compounds
- Operating temperature range of 20 °C to 250 °C
- Improves signal-to-noise ratio for trace analyses
- Ideal for GC/MS food, flavor and fragrance applications, especially where trace analyses are required
- Ultra low bleed provides increased sensitivity and extended column lifetime at higher temperatures
- Improved performance with no change in the typical selectivity of PEG
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX, ZB-WAX plus

VF-WAXms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	20 to 250/260	CP9219	
		0.20	20 to 250/260	CP9218	
	20	0.10	20 to 250/260	CP9229	CP9229I5
0.15	*10*	*0.15*	*20 to 250/260*	*CP9200*	
	15	*0.15*	*20 to 250/260*	*CP9201*	
	20	*0.15*	*20 to 250/260*	*CP9220*	
	30	*0.15*	*20 to 250/260*	*CP9202*	
0.25	15	0.25	20 to 250/260	CP9203	
		0.50	20 to 250/260	CP9221	
	25	0.20	20 to 250/260	CP9204	
	30	0.25	20 to 250/260	CP9205	CP9205I5
		0.50	20 to 250/260	CP9222	
		1.00	20 to 240	CP9206	
	60	0.25	20 to 250/260	CP9207	
		0.50	20 to 240	CP9223	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

VF-WAXms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	0.25	20 to 250/260	CP9209	
		0.50	20 to 250/260	CP9224	
		1.00	20 to 250/260	CP9208	
	30	0.25	20 to 250/260	CP9212	CP9212I5
		0.50	20 to 250/260	CP9210	
		1.00	20 to 240	CP9211	
	60	0.25	20 to 250/260	CP9214	
		0.50	20 to 240	CP9225	CP9225I5
		1.00	20 to 230	CP9213	
0.53	15	1.00	20 to 250/260	CP9226	CP9226I5
		2.00	20 to 240	CP9227	
	30	1.00	20 to 240	CP9215	
		2.00	20 to 230	CP9216	
	60	1.00	20 to 230	CP9228	
		2.00	20 to 220	CP9217	

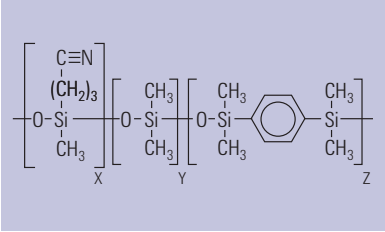
TIPS & TOOLS

As a special MS-type phase, the VF-WAXms column generates less bleed, and therefore less noise and higher signal-to-noise ratios for critical components.

VF-624ms and VF-1301ms

- VF-624ms is designed for analyzing solvents according to EPA Methods 524, 624 and 8260, as well as USP 467
- VF-1301ms ultra-low-bleed thin-film has a similar selectivity to 624 and is suitable for semivolatile organic solvents, as well as PCBs and pesticides
- Enhanced selectivity for USP 467 eliminates coelution of benzene and 1,2-dichloroethane
- Mid polarity
- Low bleed
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: AT-624, Rxi-624 Sil MS, Rtx-624, PE-624, 007-624, 007-502, ZB-624



Structure of VF-624ms and VF-1301ms

VF-624ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*15*	*0.84*	*-40 to 280/300*	*CP9101*	*CP9101I5*
	20	*0.84*	*-40 to 280/300*	*CP9100*	
	30	*0.84*	*-40 to 280/300*	*CP9109*	
	40	*0.84*	*-40 to 280/300*	*CP9110*	
0.25	30	1.40	-40 to 280/300	CP9102	CP9102I5
	60	1.40	-40 to 280/300	CP9103	CP9103I5
0.32	30	1.80	-40 to 280/300	CP9104	CP9104I5
	60	1.80	-40 to 280/300	CP9105	CP9105I5
0.53	30	3.00	-40 to 280/300	CP9106	CP9106I5
	60	3.00	-40 to 265/280	CP9107	
	75	3.00	-40 to 265/280	CP9108	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

Similar Phases: Rtx-1301, PE-1301

VF-1301ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	1.00	-40 to 280/300	CP9066	
0.15	*15*	*0.15*	*-40 to 280/300*	*CP9050*	
	20	*0.15*	*-40 to 280/300*	*CP9051*	
0.25	15	1.00	-40 to 280/300	CP9052	
	30	0.25	-40 to 280/300	CP9053	
		1.00	-40 to 280/300	CP9054	
	60	0.25	-40 to 280/300	CP9055	
		1.00	-40 to 280/300	CP9056	
0.32	15	0.25	-40 to 280/300	CP9057	
		1.00	-40 to 280/300	CP9058	
	30	0.25	-40 to 280/300	CP9059	
		1.00	-40 to 280/300	CP9060	CP9060I5
	60	1.00	-40 to 280/300	CP9061	
0.53	15	1.00	-40 to 280/300	CP9062	
	30	1.00	-40 to 280/300	CP9063	
		1.50	-40 to 280/300	CP9064	

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TIPS & TOOLS

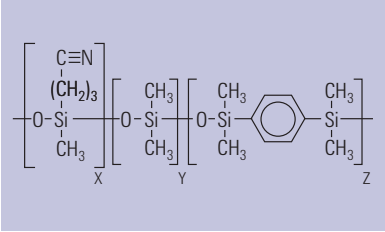
Ensure a lifetime of peak performance and maximum productivity with Agilent's comprehensive GC supplies portfolio, learn more at **www.agilent.com/chem/GCsupplies**



VF-1701ms

- Ultra-low bleed 14% cyanopropyl/phenyl/86% polydimethylsiloxane phase
- Mid polarity
- Ideal for pesticides, PCBs and semi-volatile organic compounds
- Highly inert for difficult analytes such as p,p'-DDT
- Deactivated for accurate trace analysis
- Engineered for reduced bleed, (bleed specification is 2 pA @ 280 °C for a 0.25 mm x 60 m, 0.25 µm id column)
- 0.15 mm id columns available for high efficiency GC and GC/MS analyses
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-1701, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701



Structure of VF-1701ms

VF-1701ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.20	-20 to 280/300	CP9140	
		0.40	-20 to 280/300	CP9141	
	20	0.10	-20 to 280/300	CP9142	
0.15	*15*	*0.10*	*-20 to 280/300*	*CP9175*	
		0.15	*-20 to 280/300*	*CP9143*	
		0.60	*-20 to 280/300*	*CP9144*	
	20	*0.15*	*-20 to 280/300*	*CP9145*	
		0.60	*-20 to 280/300*	*CP9146*	
0.25	15	0.15	-20 to 280/300	CP9147	
		0.25	-20 to 280/300	CP9148	
		1.00	-20 to 280/300	CP9149	CP9149I5
	30	0.15	-20 to 280/300	CP9150	
		0.25	-20 to 280/300	CP9151	CP9151I5
		1.00	-20 to 280/300	CP9152	CP9152I5
	60	0.15	-20 to 280/300	CP9153	
		0.25	-20 to 280/300	CP9154	CP9154I5
		0.50	-20 to 280/300	CP9155	CP9155I5
		1.00	-20 to 280/300	CP9156	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

VF-1701ms

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	0.15	-20 to 280/300	CP9157	
		0.25	-20 to 280/300	CP9158	
		1.00	-20 to 280/300	CP9159	
	30	0.10	-20 to 280/300	CP9160	
		0.15	-20 to 280/300	CP9161	
		0.25	-20 to 280/300	CP9162	
		1.00	-20 to 280/300	CP9163	
	60	0.15	-20 to 280/300	CP9164	
		0.25	-20 to 280/300	CP9165	
		1.00	-20 to 280/300	CP9166	CP9166I5
0.53	15	1.00	-20 to 280/300	CP9167	
	30	0.10	-20 to 280/300	CP9168	
		0.25	-20 to 280/300	CP9169	
		0.50	-20 to 280/300	CP9170	
		1.00	-20 to 280/300	CP9171	
		1.50	-20 to 280/300	CP9172	
	60	1.00	-20 to 280/300	CP9173	
		1.50	-20 to 265/280	CP9174	

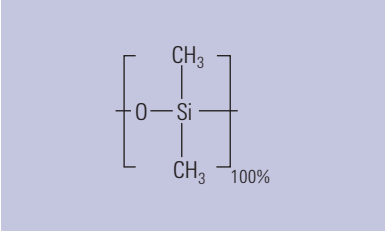
Premium Polysiloxane Columns

Polysiloxanes are the most common stationary phases. They are available in the greatest variety and are stable, robust and versatile. Standard polysiloxanes are characterized by the repeating siloxane backbone. Each silicon atom contains two functional groups. The type and percent level of substitution of the groups distinguish each stationary phase and its properties.

DB-1

- 100% Dimethylpolysiloxane
- Non-polar
- Excellent general purpose column
- Wide range of applications
- Low bleed
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G2

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1



Structure of DB-1

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.05	10	0.05	-60 to 325/350	126-1012		126-1012LTM
		0.20	-60 to 325/350	126-1013		126-1013LTM
0.10	5	0.12	-60 to 325/350	127-100A		127-100ALTM
	10	0.10	-60 to 325/350	127-1012	127-1012E	127-1012LTM
		0.40	-60 to 325/350	127-1013	127-1013E	127-1013LTM
	20	0.10	-60 to 325/350	127-1022	127-1022E	127-1022LTM
		0.40	-60 to 325/350	127-1023	127-1023E	127-1023LTM
	40	0.20	-60 to 325/350	127-1046	127-1046E	
		0.40	-60 to 325/350	127-1043		

(Continued)

DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.15	*10*	*1.20*	*-60 to 325/350*	*12A-1015*		*12A-1015LTM*
0.18	*10*	*0.18*	*-60 to 325/350*	*121-1012*	*121-1012E*	*121-1012LTM*
		0.20	*-60 to 325/350*	*121-101A*		*121-101ALTM*
		0.40	*-60 to 325/350*	*121-1013*	*121-1013E*	*121-1013LTM*
	20	*0.18*	*-60 to 325/350*	*121-1022*	*121-1022E*	*121-1022LTM*
		0.40	*-60 to 325/350*	*121-1023*		*121-1023LTM*
	40	*0.40*	*-60 to 325/350*	*121-1043*	*121-1043E*	
0.20	12	0.33	-60 to 325/350	128-1012		128-1012LTM
	25	0.33	-60 to 325/350	128-1022		128-1022LTM
	30	0.80	-60 to 325/350	128-1034		128-1034LTM
	50	0.33	-60 to 325/350	128-1052		
0.25	15	0.10	-60 to 325/350	122-1011		122-1011LTM
		0.25	-60 to 325/350	122-1012		122-1012LTM
		1.00	-60 to 325/350	122-1013		122-1013LTM
	25	0.25	-60 to 325/350	122-1022		122-1022LTM
	30	0.10	-60 to 325/350	122-1031		122-1031LTM
		0.25	-60 to 325/350	122-1032	122-1032E	122-1032LTM*
		0.50	-60 to 325/350	122-103E		122-103ELTM
		1.00	-60 to 325/350	122-1033	122-1033E	122-1033LTM
	50	0.25	-60 to 325/350	122-1052		
	60	0.10	-60 to 325/350	122-1061		
		0.25	-60 to 325/350	122-1062		
		0.50	-60 to 325/350	122-106E		
		1.00	-60 to 325/350	122-1063		
	100	0.50	-60 to 325/350	122-10AE		
	150	1.00	-60 to 325/350	122-10G3		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

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DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	10	0.50	-60 to 325/350	123-100E		123-100ELTM
	15	0.10	-60 to 325/350	123-1011		123-1011LTM
		0.25	-60 to 325/350	123-1012		123-1012LTM
		1.00	-60 to 325/350	123-1013		123-1013LTM
		3.00	-60 to 280/300	123-1014		123-1014LTM
		5.00	-60 to 280/300	123-1015		123-1015LTM
	25	0.12	-60 to 325/350	123-1027		123-1027LTM
		0.25	-60 to 325/350	123-1022		123-1022LTM
		0.52	-60 to 325/350	123-1026		123-1026LTM
		1.05	-60 to 325/350	123-102F		123-102FLTM
	30	0.10	-60 to 325/350	123-1031		123-1031LTM
		0.25	-60 to 325/350	123-1032		123-1032LTM
		0.50	-60 to 325/350	123-103E		123-103ELTM
		1.00	-60 to 325/350	123-1033	123-1033E	123-1033LTM
		1.50	-60 to 300/320	123-103B		123-103BLTM
		3.00	-60 to 280/300	123-1034		123-1034LTM
		5.00	-60 to 280/300	123-1035		123-1035LTM
	50	0.25	-60 to 325/350	123-1052		
		0.52	-60 to 325/350	123-1056		
		1.05	-60 to 325/350	123-105F		
		1.20	-60 to 325/350	123-105C		
		5.00	-60 to 280/300	123-1055		
	60	0.10	-60 to 325/350	123-1061		
		0.25	-60 to 325/350	123-1062	123-1062E	
		0.50	-60 to 325/350	123-106E		
		1.00	-60 to 325/350	123-1063	123-1063E	
		1.50	-60 to 300/320	123-106B	123-106BE	
		2.00	-60 to 280/300	123-106G		
		3.00	-60 to 280/300	123-1064	123-1064E	
		5.00	-60 to 280/300	123-1065	123-1065E	
0.45	30	1.27	-60 to 325/350	124-1032		124-1032LTM
		2.55	-60 to 260/280	124-1034		124-1034LTM

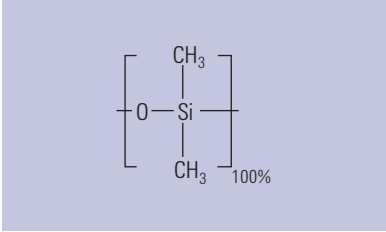
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DB-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	5	0.88	-60 to 325/350	125-100A		125-100ALTM
		2.65	-60 to 325/350	125-100B		125-100BLTM
		5.00	-60 to 325/350	125-1005		125-1005LTM
	7.5	1.50	-60 to 325/350	125-1002		125-1002LTM
	10	2.65	-60 to 260/280	125-10HB	125-10HBE	125-10HBLTM
		5.00	-60 to 260/280	125-10H5		125-10H5LTM
	15	0.15	-60 to 340/360	125-1011	125-1011E	125-1011LTM
		0.25	-60 to 320/340	125-101K		125-101KLTM
		0.50	-60 to 300/320	125-1017		125-1017LTM
		1.00	-60 to 300/320	125-101J		125-101JLTM
		1.50	-60 to 300/320	125-1012	125-1012E	125-1012LTM
		3.00	-60 to 260/280	125-1014		125-1014LTM
		5.00	-60 to 260/280	125-1015		125-1015LTM
	25	1.00	-60 to 300/320	125-102J		125-102JLTM
		5.00	-60 to 260/280	125-1025		125-1025LTM
	30	0.10	-60 to 340/360	125-1039		
		0.25	-60 to 320/340	125-103K	125-103KE	125-103KLTM
		0.50	-60 to 300/320	125-1037		125-1037LTM
		1.00	-60 to 300/320	125-103J		125-103JLTM
		1.50	-60 to 300/320	125-1032		125-1032LTM
		2.65	-60 to 260/280	125-103B		125-103BLTM
		3.00	-60 to 260/280	125-1034	125-1034E	125-1034LTM
		5.00	-60 to 260/280	125-1035	125-1035E	125-1035LTM
	50	5.00	-60 to 260/280	125-1055		
	60	1.00	-60 to 300/320	125-106J	125-106JE	
		1.50	-60 to 300/320	125-1062	125-1062E	
		3.00	-60 to 260/280	125-1064		
		5.00	-60 to 260/280	125-1065	125-1065E	
	105	5.00	-60 to 260/280	125-10B5		

HP-1

- 100% Dimethylpolysiloxane
- Non-polar
- Excellent general purpose column – "Industry Standard"
- Wide range of applications
- Superior performance for low molecular weight alcohols (< C_5)
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G2



Structure of HP-1

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1

HP-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*19091Z-577*	*19091Z-577E*	*19091Z-577LTM*
0.20	12	0.33	-60 to 325/350	19091-60312		
	17	0.11	-60 to 325/350	19091Z-008		19091Z-008LTM
	25	0.11	-60 to 325/350	19091Z-002		19091Z-002LTM
		0.33	-60 to 325/350	19091Z-102	19091Z-102E	19091Z-102LTM
		0.50	-60 to 325/350	19091Z-202		19091Z-202LTM
	50	0.11	-60 to 325/350	19091Z-005		
		0.33	-60 to 325/350	19091Z-105		
		0.50	-60 to 325/350	19091Z-205		
0.25	15	0.10	-60 to 325/350	19091Z-331		19091Z-331LTM
		0.25	-60 to 325/350	19091Z-431		19091Z-431LTM
		1.00	-60 to 325/350	19091Z-231		19091Z-231LTM
	30	0.10	-60 to 325/350	19091Z-333		19091Z-333LTM
		0.25	-60 to 325/350	19091Z-433	19091Z-433E	19091Z-433LTM
		1.00	-60 to 325/350	19091Z-233	19091Z-233E	19091Z-233LTM
	60	0.25	-60 to 325/350	19091Z-436		
		1.00	-60 to 325/350	19091Z-236	19091Z-236E	
	100	0.50	-60 to 325/350	19091Z-530	19091Z-530E	

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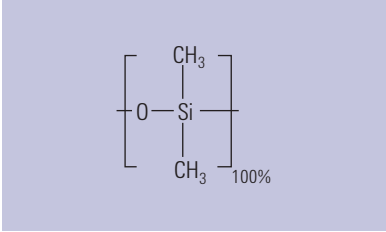
HP-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	0.25	-60 to 325/350	19091Z-411	19091Z-411E	19091Z-411LTM
		1.00	-60 to 325/350	19091Z-211		19091Z-211LTM
	25	0.17	-60 to 325/350	19091Z-012	19091Z-012E	19091Z-012LTM
		0.52	-60 to 325/350	19091Z-112	19091Z-112E	19091Z-112LTM
		1.05	-60 to 325/350	19091Z-212		19091Z-212LTM
	30	0.10	-60 to 325/350	19091Z-313	19091Z-313E	19091Z-313LTM
		0.25	-60 to 325/350	19091Z-413	19091Z-413E	19091Z-413LTM
		1.00	-60 to 325/350	19091Z-213	19091Z-213E	19091Z-213LTM
		3.00	-60 to 260/280	19091Z-513	19091Z-513E	19091Z-513LTM
		4.00	-60 to 260/280	19091Z-613		19091Z-613LTM
		5.00	-60 to 260/280	19091Z-713	19091Z-713E	19091Z-713LTM
	50	0.17	-60 to 325/350	19091Z-015		
		0.52	-60 to 325/350	19091Z-115	19091Z-115E	
		1.05	-60 to 325/350	19091Z-215		
	60	0.25	-60 to 325/350	19091Z-416		
		1.00	-60 to 325/350	19091Z-216	19091Z-216E	
		5.00	-60 to 260/280	19091Z-716		
0.53	5	0.15	-60 to 320/400	19095Z-220		
		0.88	-60 to 320/400	19095Z-020		
			-60 to 325/350	125-100A		
		2.65	-60 to 260/280	19095S-100	19095S-100E	19095S-100LTM
	7.5	5.00	-60 to 260/280	19095Z-627	19095Z-627E	19095Z-627LTM
	10	0.88	-60 to 300/320	19095Z-021	19095Z-021E	19095Z-021LTM
		2.65	-60 to 260/280	19095Z-121	19095Z-121E	19095Z-121LTM
	15	0.15	-60 to 320/400	19095Z-221	19095Z-221E	
		1.50	-60 to 300/320	19095Z-321		19095Z-321LTM
		3.00	-60 to 260/280	19095Z-421	19095Z-421LTM	19095Z-421LTM
		5.00	-60 to 260/280	19095Z-621		19095Z-621LTM
	30	0.88	-60 to 300/320	19095Z-023	19095Z-023E	19095Z-023LTM
		1.50	-60 to 300/320	19095Z-323	19095Z-323E	19095Z-323LTM
		2.65	-60 to 260/280	19095Z-123	19095Z-123E	19095Z-123LTM
		3.00	-60 to 260/280	19095Z-423	19095Z-423E	19095Z-423LTM
		5.00	-60 to 260/280	19095Z-623	19095Z-623E	19095Z-623LTM
	60	5.00	-60 to 260/280	19095Z-626		

CP-Sil 5 CB

- 100% dimethylpolysiloxane
- Non-polar
- General purpose phase
- Bonded and cross-linked
- Solvent rinsable
- Available in Fused Silica or UltiMetal
- Separation almost entirely based on boiling points, making this column suitable for a wide range of applications with a broad temperature range
- High temperature limit
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-1, Rtx-1, BP-1, OV-1, OV-101, 007-1(MS), SP-2100, SE-30, ZB-1, AT-1, MDN-1, ZB-1



Structure of CP-Sil 5 CB

CP-Sil 5 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	5	0.12	-60 to 330/350	CP7300	
	10	0.10	-60 to 330/350	CP7311	
		0.12	-60 to 330/350	CP7310	CP7310I5
		0.40	-60 to 325/350	CP7312	
	20	0.10	-60 to 330/350	CP7313	
0.15	*10*	*0.12*	*-60 to 330/350*	*CP7684*	*CP7684I5*
		2.00	*-60 to 325/350*	*CP7682*	*CP7682I5*
	25	*0.12*	*-60 to 330/350*	*CP7694*	
		1.20	*-60 to 325/350*	*CP7693*	
		2.00	*-60 to 325/350*	*CP7692*	*CP7692I5*
0.20	12	0.33	-60 to 325/350	CP7602	
	15	0.20	-60 to 330/350	CP7604	
	25	0.33	-60 to 325/350	CP7622	
	30	0.80	-60 to 325/350	CP7633	
	50	0.11	-60 to 330/350	CP7642	
		0.33	-60 to 325/350	CP7643	CP7643I5
		0.50	-60 to 325/350	CP7644	CP7644I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

CP-Sil 5 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	10	0.12	-60 to 330/350	CP7700	
	15	0.25	-60 to 330/350	CP8510	
	25	0.12	-60 to 330/350	CP7710	CP7710I5
		0.25	-60 to 330/350	CP7441	
		0.40	-60 to 325/350	CP7709	
		1.20	-60 to 325/350	CP7670	CP7670I5
	30	0.10	-60 to 330/350	CP8710	
		0.25	-60 to 330/350	CP8741	CP8741I5
		1.00	-60 to 325/350	CP8770	
	50	0.12	-60 to 330/350	CP7720	
		0.25	-60 to 330/350	CP7443	CP7443I5
		0.40	-60 to 325/350	CP7719	CP7719I5
	60	0.25	-60 to 330/350	CP8743	CP8743I5
		1.00	-60 to 325/350	CP8780	CP8780I5
0.32	10	0.12	-60 to 330/350	CP7730	
		1.20	-60 to 325/350	CP7758	CP7758I5
	15	0.10	-60 to 330/350	CP8529	
		0.25	-60 to 325/350	CP8530	
		3.00	-60 to 325/350	CP8550	CP8550I5
		1.00	-60 to 325/350	CP8540	
		5.00	-60 to 300/325	CP8560	CP8560I5
	25	0.12	-60 to 330/350	CP7740	
		0.25	-60 to 325/350	CP7442	
		0.40	-60 to 325/350	CP7739	
		0.52	-60 to 325/350	CP8430	CP8430I5
		1.20	-60 to 325/350	CP7760	CP7760I5
		5.00	-60 to 300/325	CP7680	CP7680I5
	30	0.25	-60 to 325/350	CP8742	CP8742I5
		1.00	-60 to 325/350	CP8760	CP8760I5
		3.00	-60 to 310/335	CP8687	CP8687I5
		5.00	-60 to 300/325	CP8688	CP8688I5
	50	0.12	-60 to 330/335	CP7750	CP7750I5
		0.25	-60 to 325/350	CP7444	CP7444I5
		0.40	-60 to 325/350	CP7749	CP7749I5
		1.20	-60 to 325/350	CP7770	CP7770I5
		5.00	-60 to 300/325	CP7690	CP7690I5
	60	0.25	-60 to 325/350	CP8744	CP8744I5
		1.00	-60 to 325/350	CP8870	
		3.00	-60 to 310/335	CP8689	
		5.00	-60 to 300/325	CP8690	CP8690I5

(Continued)

CP-Sil 5 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	1.00	-60 to 315/340	CP7625	
		2.00	-60 to 305/330	CP7620	CP7620I5
		5.00	-60 to 290/325	CP7645	
	15	0.15	-60 to 330/350	CP8673	CP8673I5
		1.50	-60 to 305/330	CP8674	CP8674I5
		3.00	-60 to 300/325	CP8675	
		5.00	-60 to 290/325	CP8676	
	20	5.00	-60 to 290/325	CP8774	
	25	1.00	-60 to 315/340	CP7635	CP7635I5
		2.00	-60 to 305/330	CP7630	
		5.00	-60 to 290/325	CP7675	CP7675I5
	30	1.50	-60 to 305/330	CP8735	CP8735I5
		2.00	-60 to 305/330	CP8730	CP8730I5
		3.00	-60 to 300/325	CP8677	CP8677I5
		5.00	-60 to 290/325	CP8775	CP8775I5
	50	1.00	-60 to 315/340	CP7695	
		2.00	-60 to 305/330	CP7640	
		5.00	-60 to 290/325	CP7685	CP7685I5
	60	1.50	-60 to 305/330	CP8799	
		5.00	-60 to 290/325	CP8685	
	100	0.50	-60 to 325/350	CP7608	
		2.00	-60 to 305/330	CP7650	
		5.00	-60 to 290/325	CP7688	

CP-Sil 5 CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	1.00	-60 to 325/350	CP7120	
		2.00	-60 to 325/350	CP7150	
		5.00	-60 to 325/350	CP6666	CP6666I5
	25	0.50	-60 to 325/350	CP7135	CP7135I5
		2.00	-60 to 325/350	CP7160	
		5.00	-60 to 325/350	CP6670	
	50	0.50	-60 to 325/350	CP7195	
		1.00	-60 to 325/350	CP7140	
		2.00	-60 to 325/350	CP7170	
		5.00	-60 to 325/350	CP6671	

TIPS & TOOLS

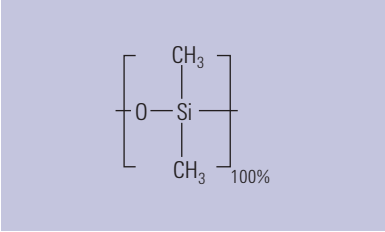
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Ultra 1

- 100% Dimethylpolysiloxane
- Non-polar
- Equivalent to HP-1 with tighter specifications for retention index and capacity factors
- Bonded and cross-linked
- Solvent rinsable

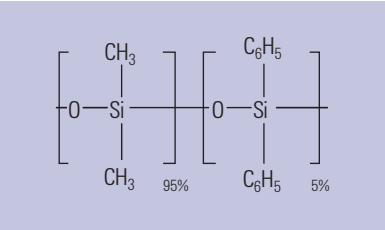
Similar Phases: SPB-1, Rtx-1, BP-1, 007-1(MS)



Structure of Ultra 1

Ultra 1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	12	0.33	-60 to 325/350	19091A-101		19091A-101LTM
	17	0.11	-60 to 325/350	19091A-008		19091A-008LTM
		0.33	-60 to 325/350	19091A-108		19091A-108LTM
	25	0.11	-60 to 325/350	19091A-002		19091A-002LTM
		0.33	-60 to 325/350	19091A-102	19091A-102E	19091A-102LTM
	50	0.11	-60 to 325/350	19091A-005		
		0.33	-60 to 325/350	19091A-105		
0.32	25	0.17	-60 to 325/350	19091A-012		19091A-012LTM
		0.52	-60 to 325/350	19091A-112		19091A-112LTM
	50	0.17	-60 to 325/350	19091A-015		
		0.52	-60 to 325/350	19091A-115		



Structure of Ultra 2

Ultra 2

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Equivalent to HP-5 with tighter specifications for retention index and capacity factors
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-5, Rtx-5, BP-5, CB-5, 007-5, 2B-5

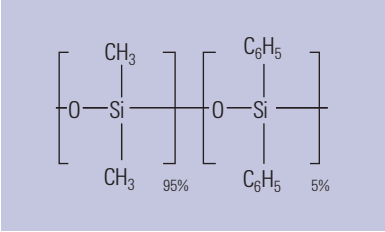
Ultra 2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	12	0.33	-60 to 325/350	19091B-101		19091B-101LTM
	25	0.11	-60 to 325/350	19091B-002		19091B-002LTM
		0.33	-60 to 325/350	19091B-102	19091B-102E	19091B-102LTM
	50	0.11	-60 to 325/350	19091B-005		
		0.33	-60 to 325/350	19091B-105	19091B-105E	
0.32	25	0.17	-60 to 325/350	19091B-012	19091B-012E	19091B-012LTM
		0.52	-60 to 325/350	19091B-112		19091B-112LTM
	50	0.17	-60 to 325/350	19091B-015		
		0.52	-60 to 325/350	19091B-115	19091B-115E	

DB-5

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Excellent general purpose column
- Wide range of applications
- Low bleed
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G27

Similar Phases: SPB-5, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, ZB-5, AT-5, MDN-5, ZB-5



Structure of DB-5

DB-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.10	10	0.10	-60 to 325/350	127-5012	127-5012E	127-5012LTM
		0.17	-60 to 325/350	127-501E	127-501EE	127-501ELTM
		0.33	-60 to 325/350	127-501N		127-501NLTM
		0.40	-60 to 325/350	127-5013		127-5013LTM
	20	0.10	-60 to 325/350	127-5022	127-5022E	127-5022LTM
		0.40	-60 to 325/350	127-5023		127-5023LTM
0.15	*10*	*1.20*	*-60 to 300/320*	*12A-5015*		*12A-5015LTM*
0.18	*10*	*0.18*	*-60 to 325/350*	*121-5012*	*121-5012E*	*121-5012LTM*
		0.40	*-60 to 325/350*	*121-5013*		*121-5013LTM*
	20	*0.18*	*-60 to 325/350*	*121-5022*	*121-5022E*	*121-5022LTM*
		0.40	*-60 to 325/350*	*121-5023*	*121-5023E*	*121-5023LTM*
	40	*0.18*	*-60 to 325/350*	*121-5042*		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

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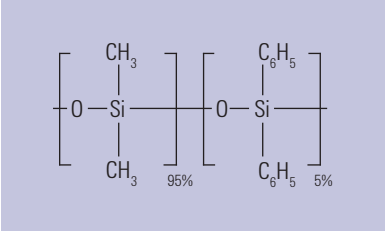
DB-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	12	0.33	-60 to 325/350	128-5012		128-5012LTM
	15	0.20	-60 to 325/350	128-50H7		128-50H7LTM
	25	0.33	-60 to 325/350	128-5022		128-5022LTM
	50	0.33	-60 to 325/350	128-5052		
0.25	15	0.10	-60 to 325/350	122-5011		122-5011LTM
		0.25	-60 to 325/350	122-5012		122-5012LTM
		0.50	-60 to 325/350	122-501E		122-501ELTM
		1.00	-60 to 325/350	122-5013		122-5013LTM
	25	0.25	-60 to 325/350	122-5022		122-5022LTM
	30	0.10	-60 to 325/350	122-5031		122-5031LTM
		0.25	-60 to 325/350	122-5032	122-5032E	122-5032LTM
		0.50	-60 to 325/350	122-503E		122-503ELTM
		1.00	-60 to 325/350	122-5033	122-5033E	122-5033LTM
	50	0.25	-60 to 325/350	122-5052		
	60	0.10	-60 to 325/350	122-5061		
		0.25	-60 to 325/350	122-5062		
		0.50	-60 to 325/350	122-506E		
		1.00	-60 to 325/350	122-5063		
0.32	10	0.50	-60 to 325/350	123-500E		123-500ELTM
	15	0.10	-60 to 325/350	123-5011		123-5011LTM
		0.25	-60 to 325/350	123-5012	123-5012E	123-5012LTM
		1.00	-60 to 325/350	123-5013	123-5013E	123-5013LTM
	25	0.17	-60 to 325/350	123-502D		123-502DLTM
		0.25	-60 to 325/350	123-5022		123-5022LTM
		0.52	-60 to 325/350	123-5026		123-5026LTM
		1.05	-60 to 325/350	123-502F		123-502FLTM
	30	0.10	-60 to 325/350	123-5031		123-5031LTM
		0.25	-60 to 325/350	123-5032	123-5032E	123-5032LTM
		0.50	-60 to 325/350	123-503E		123-503ELTM
		1.00	-60 to 325/350	123-5033	123-5033E	123-5033LTM
		1.50	-60 to 325/350	123-503B		123-503BLTM
	50	0.25	-60 to 325/350	123-5052		
		0.52	-60 to 325/350	123-5056		
		1.00	-60 to 325/350	123-5053		
	60	0.25	-60 to 325/350	123-5062		
		1.00	-60 to 325/350	123-5063	123-5063E	

(Continued)

DB-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.45	15	1.27	-60 to 300/320	124-5012		124-5012LTM
	30	0.42	-60 to 300/320	124-5037		124-5037LTM
		1.27	-60 to 300/320	124-5032		124-5032LTM
0.53	10	2.65	-60 to 260/280	125-50HB		125-50HBLTM
	15	0.25	-60 to 300/320	125-501K		125-501KLTM
		0.50	-60 to 300/320	125-5017		125-5017LTM
		1.00	-60 to 300/320	125-501J		125-501JLTM
		1.50	-60 to 300/320	125-5012	125-5012E	125-5012LTM
	25	5.00	-60 to 260/280	125-5025		125-5025LTM
	30	0.25	-60 to 300/320	125-503K		125-503KLTM
		0.50	-60 to 300/320	125-5037		125-5037LTM
		0.88	-60 to 300/320	125-503D		125-503DLTM
		1.00	-60 to 300/320	125-503J		125-503JLTM
		1.50	-60 to 300/320	125-5032	125-5032E	125-5032LTM
		2.65	-60 to 260/280	125-503B		125-503BLTM
		3.00	-60 to 260/280	125-5034	125-5034E	125-5034LTM
		5.00	-60 to 260/280	125-5035	125-5035E	125-5035LTM
	60	1.50	-60 to 300/320	125-5062	125-5062E	
		5.00	-60 to 260/280	125-5065	125-5065E	



Structure of HP-5

HP-5

- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Excellent general purpose column
- Wide range of applications
- High temperature limit
- Bonded and cross-linked
- Solvent rinsable
- Wide range of column dimensions available
- Equivalent to USP Phase G27

Similar Phases: SPB-5, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, ZB-5, AT-5, MDN-5, ZB-5

HP-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*19091J-577*	*19091J-577E*	*19091J-577LTM*
0.20	12	0.33	-60 to 325/350	19091J-101		19091J-101LTM
	17	0.33	-60 to 325/350	19091J-108		
	25	0.11	-60 to 325/350	19091J-002		19091J-002LTM
		0.33	-60 to 325/350	19091J-102	19091J-102E	19091J-102LTM
		0.50	-60 to 325/350	19091J-202		19091J-202LTM
	50	0.11	-60 to 325/350	19091J-005		
		0.33	-60 to 325/350	19091J-105	19091J-105E	
		0.50	-60 to 325/350	19091J-205		
0.25	5	0.10	-60 to 325/350	19091J-330		19091J-330LTM
	15	0.25	-60 to 325/350	19091J-431	19091J-431E	19091J-431LTM
		1.00	-60 to 325/350	19091J-231		19091J-231LTM
	30	0.10	-60 to 325/350	19091J-333		19091J-333LTM
		0.25	-60 to 325/350	19091J-433	19091J-433E	19091J-433LTM
		1.00	-60 to 325/350	19091J-233		19091J-233LTM
	60	0.25	-60 to 325/350	19091J-436	19091J-436E	
		1.00	-60 to 325/350	19091J-236	19091J-236E	

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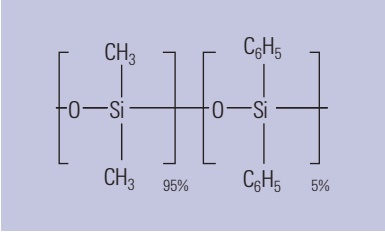
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HP-5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	0.25	-60 to 325/350	19091J-411		19091J-411LTM
	25	0.17	-60 to 325/350	19091J-012	19091J-012E	19091J-012LTM
		0.52	-60 to 325/350	19091J-112	19091J-112E	19091J-112LTM
		1.05	-60 to 325/350	19091J-212		19091J-212LTM
	30	0.10	-60 to 325/350	19091J-313		19091J-313LTM
		0.25	-60 to 325/350	19091J-413	19091J-413E	19091J-413LTM
		0.50	-60 to 325/350	19091J-113	19091J-113E	19091J-113LTM
		1.00	-60 to 325/350	19091J-213	19091J-213E	19091J-213LTM
	50	0.17	-60 to 325/350	19091J-015	19091J-015E	
		0.52	-60 to 325/350	19091J-115	19091J-115E	
		1.05	-60 to 325/350	19091J-215	19091J-215E	
	60	0.25	-60 to 325/350	19091J-416		
		1.00	-60 to 325/350	19091J-216	19091J-216E	
0.53	10	2.65	-60 to 260/280	19095J-121	19095J-121E	19095J-121LTM
	15	1.50	-60 to 300/320	19095J-321		19095J-321LTM
		5.00	-60 to 260/280	19095J-621		19095J-621LTM
	30	0.88	-60 to 300/320	19095J-023	19095J-023E	19095J-023LTM
		1.50	-60 to 300/320	19095J-323	19095J-323E	19095J-323LTM
		2.65	-60 to 260/280	19095J-123	19095J-123E	19095J-123LTM
		5.00	-60 to 260/280	19095J-623	19095J-623E	19095J-623LTM

TIPS & TOOLS

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Structure of CP-Sil 8 CB

CP-Sil 8 CB

- (5% phenyl) methylpolysiloxane
- Non-polar
- General purpose phase
- Cross-linked and bonded
- Solvent rinsable
- Low bleed
- High column-to-column reproducibility
- Wide choice of dimensions available
- Available in Fused Silica and UltiMetal
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-5, Rtx-5, BP-5, OV-5, 007-2(MPS-5), SE-52, SE-54, XTI-5, PTE-5, ZB-5, AT-5, MDN-5, ZB-5

CP-Sil 8 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	20	0.10	-60 to 330/350	CP7319	CP7319I5
0.15	*10*	*0.12*	*-60 to 330/350*	*CP7884*	
		1.20	*-60 to 325/350*	*CP7885*	
	25	*0.12*	*-60 to 330/350*	*CP7894*	
0.20	12	0.33	-60 to 325/350	CP7900	
	25	0.33	-60 to 325/350	CP7921	
	50	0.33	-60 to 325/350	CP7941	
	60	0.20	-60 to 330/350	CP7950	
0.25	15	0.25	-60 to 330/350	CP8511	
		1.00	-60 to 325/350	CP8521	
	25	0.12	-60 to 330/350	CP7711	
		0.25	-60 to 330/350	CP7451	CP7451I5
		0.40	-60 to 325/350	CP7759	
		1.20	-60 to 325/350	CP7671	
	30	0.25	-60 to 330/350	CP8751	CP8751I5
		1.00	-60 to 325/350	CP8771	CP8771I5
	50	0.12	-60 to 330/350	CP7721	
		0.25	-60 to 330/350	CP7453	CP7453I5
		0.40	-60 to 325/350	CP7769	
	60	0.10	-60 to 325/350	CP8750	
		0.25	-60 to 330/350	CP8753	
		1.00	-60 to 325/350	CP8781	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

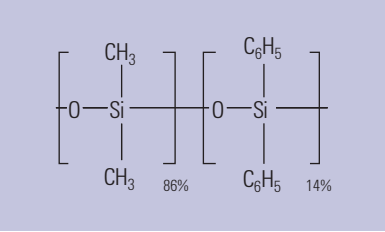


CP-Sil 8 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.12	-60 to 330/350	CP7731	
		5.00	-60 to 300/325	CP8014	CP8014I5
	15	0.25	-60 to 325/350	CP8531	
		1.00	-60 to 325/350	CP8541	
	25	0.12	-60 to 330/350	CP7741	CP7741I5
		0.25	-60 to 325/350	CP7452	
		0.40	-60 to 325/350	CP7779	
		0.52	-60 to 325/350	CP8431	
		1.20	-60 to 325/350	CP7761	
		5.00	-60 to 300/325	CP7681	CP7681I5
	30	0.10	-60 to 330/350	CP8791	
		0.25	-60 to 325/350	CP8752	CP8752I5
		1.00	-60 to 325/350	CP8761	CP8761I5
	50	0.12	-60 to 330/350	CP7751	CP7751I5
		0.25	-60 to 325/350	CP7454	
		0.40	-60 to 325/350	CP7789	
		1.20	-60 to 325/350	CP7771	
		5.00	-60 to 300/325	CP7691	CP7691I5
	60	0.25	-60 to 325/350	CP8754	
		1.00	-60 to 325/350	CP8871	CP8871I5
0.53	10	2.00	-60 to 305/330	CP7621	
		5.00	-60 to 290/325	CP7646	
	15	1.50	-60 to 305/330	CP8678	
	25	0.15	-60 to 325/350	CP7634	
		2.00	-60 to 305/330	CP7631	
		1.00	-60 to 315/340	CP7636	
		5.00	-60 to 290/325	CP7656	
	30	0.50	-60 to 325/350	CP8716	
		1.50	-60 to 305/330	CP8736	CP8736I5
		5.00	-60 to 290/325	CP8756	CP8756I5
	50	1.00	-60 to 315/340	CP7696	
		2.00	-60 to 305/330	CP7641	
		5.00	-60 to 290/325	CP7666	
	60	1.50	-60 to 305/330	CP8796	
	100	5.00	-60 to 290/325	CP7676	

CP-Sil 8 CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	25	5.00	-60 to 325/350	CP6680
	50	5.00	-60 to 325/350	CP7196



Structure of CP-Sil 13 CB
(with 14% phenyl substitution)

CP-Sil 13 CB

- 14% phenyl/86% dimethylpolysiloxane
- Mid polarity phase
- Specially developed for the analysis of medium polarity compounds
- Ideal for confirmational analyses using ECD
- Bonded and cross-linked
- Solvent rinsable
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: Rtx-20

CP-Sil 13 CB

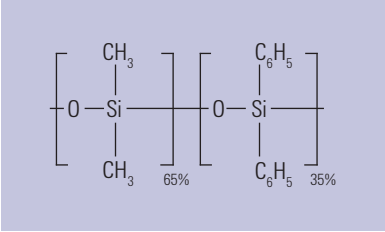
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*0.40*	*-25 to 300/330*	*CP7813*	
0.25	25	0.20	-25 to 300/330	CP7906	
		0.40	-25 to 300/330	CP7916	
		1.20	-25 to 300/330	CP7977	CP7977I5
	50	0.20	-25 to 300/330	CP7907	
		0.40	-25 to 300/330	CP7917	
0.32	25	0.20	-25 to 300/330	CP7926	CP7926I5
		0.40	-25 to 300/330	CP7936	
		1.20	-25 to 300/330	CP7946	
	50	0.20	-25 to 300/330	CP7927	
		0.40	-25 to 300/330	CP7937	
		1.20	-25 to 300/330	CP7947	
0.53	10	1.00	-25 to 300/330	CP7609	
	25	1.00	-25 to 300/330	CP7619	
		2.00	-25 to 300/330	CP7649	
	50	1.00	-25 to 300/330	CP7629	
		2.00	-25 to 300/330	CP7659	
	100	2.00	-25 to 300/330	CP7669	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-35

- (35%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly more polar than HP-35
- Low bleed
- Inert to active solutes
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G42

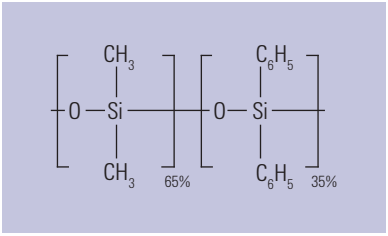
Similar Phases: Rtx-35, Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht



Structure of DB-35

DB-35

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	0.25	40 to 300/320	122-1932		122-1932LTM
	60	0.25	40 to 300/320	122-1962		
0.32	30	0.25	40 to 300/320	123-1932		123-1932LTM
		0.50	40 to 300/320	123-1933	123-1933E	123-1933LTM
0.53	15	1.00	40 to 280/300	125-1912		125-1912LTM
	30	0.50	40 to 280/300	125-1937		125-1937LTM
		1.00	40 to 280/300	125-1932		125-1932LTM



Structure of HP-35

HP-35

- (35%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly less polar than DB-35
- Inert to active solutes
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G42

Similar Phases: Rtx-35ms, Rxi-35Sil MS, SPB-35, AT-35, Sup-Herb, MDN-35, BPX-34, ZB-35, ZB-35 ht

HP-35

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.25	40 to 300/320	19091G-131	19091G-131E	19091G-131LTM
	30	0.25	40 to 300/320	19091G-133		19091G-133LTM
0.32	30	0.25	40 to 300/320	19091G-113		19091G-113LTM
		0.50	40 to 300/320	19091G-213		19091G-213LTM

TIPS & TOOLS

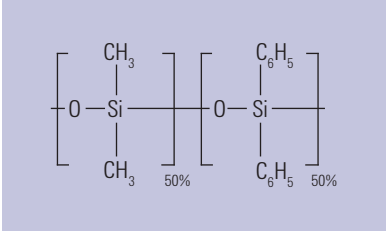
Order your free GC troubleshooting and GC column installation posters at **www.agilent.com/chem/GCposteroffer**



DB-17

- (50%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly more polar than HP-50+
- Excellent for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G3

Similar Phases: Rtx-50, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50

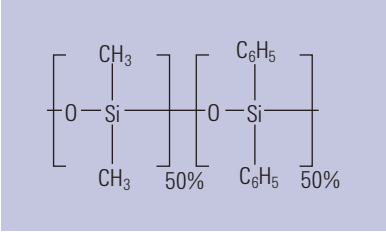


Structure of DB-17

DB-17

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.05	10	0.10	40 to 280/300	126-1713		126-1713LTM
0.10	10	0.10	40 to 280/300	127-1712		127-1712LTM
		0.20	40 to 280/300	127-1713		127-1713LTM
	20	0.10	40 to 280/300	127-1722		127-1722LTM
0.18	*20*	*0.18*	*40 to 280/300*	*121-1722*		*121-1722LTM*
		0.30	*40 to 280/300*	*121-1723*		*121-1723LTM*
0.25	15	0.15	40 to 280/300	122-1711		122-1711LTM
		0.25	40 to 280/300	122-1712		122-1712LTM
		0.50	40 to 280/300	122-1713	122-1713E	122-1713LTM
	30	0.15	40 to 280/300	122-1731	122-1731E	122-1731LTM
		0.25	40 to 280/300	122-1732	122-1732E	122-1732LTM
		0.50	40 to 280/300	122-1733		122-1733LTM
	60	0.25	40 to 280/300	122-1762		
0.32	15	0.15	40 to 280/300	123-1711		123-1711LTM
		0.25	40 to 280/300	123-1712		123-1712LTM
		0.50	40 to 280/300	123-1713		123-1713LTM
	30	0.15	40 to 280/300	123-1731		123-1731LTM
		0.25	40 to 280/300	123-1732	123-1732E	123-1732LTM
		0.50	40 to 280/300	123-1733	123-1733E	123-1733LTM
	60	0.25	40 to 280/300	123-1762		
0.53	5	2.00	40 to 280/300	125-1704		125-1704LTM
	15	0.25	40 to 260/280	125-1711		125-1711LTM
		0.50	40 to 260/280	125-1717		125-1717LTM
		1.00	40 to 260/280	125-1712		125-1712LTM
		1.50	40 to 260/280	125-1713		125-1713LTM
	30	0.25	40 to 260/280	125-1731		125-1731LTM
		0.50	40 to 260/280	125-1737		125-1737LTM
		1.00	40 to 260/280	125-1732	125-1732E	125-1732LTM
		1.50	40 to 260/280	125-1733		125-1733LTM
	60	1.00	40 to 260/280	125-1762		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of HP-50+

HP-50+

- (50%-Phenyl)-methylpolysiloxane
- Mid polarity – slightly less polar than DB-17
- Excellent for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G3

Similar Phases: Rtx-50, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50

HP-50+

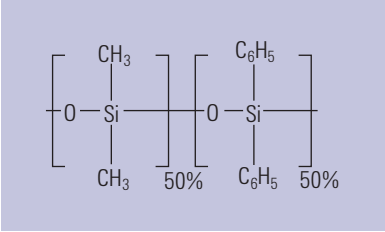
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*40 to 280/300*	*19091L-577*		*19091L-577LTM*
0.20	12	0.31	40 to 280/300	19091L-101		19091L-101LTM
0.25	5	0.15	40 to 280/300	19091L-330		19091L-330LTM
	15	0.25	40 to 280/300	19091L-431		19091L-431LTM
	30	0.15	40 to 280/300	19091L-333		19091L-333LTM
		0.25	40 to 280/300	19091L-433		19091L-433LTM
		0.50	40 to 280/300	19091L-133		19091L-133LTM
0.32	15	0.50	40 to 280/300	19091L-111		19091L-111LTM
	30	0.25	40 to 280/300	19091L-413	19091L-413E	19091L-413LTM
		0.50	40 to 280/300	19091L-113	19091L-113E	19091L-113LTM
	60	0.25	40 to 280/300	19091L-416		
0.53	15	1.00	40 to 260/280	19095L-021		19095L-021LTM
	30	0.50	40 to 260/280	19095L-523	19095L-523E	19095L-523LTM
		1.00	40 to 260/280	19095L-023	19095L-023E	19095L-023LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Sil 24 CB

- 50% phenyl/50% dimethylpolysiloxane
- Mid polarity phase
- Specially suitable for analysis of amines, drugs and pesticides
- Ideal for analysis using ECD
- Excellent confirmation column in combination with CP-Sil 5 CB or CP-Sil 8 CB
- Bonded and cross-linked
- Solvent rinsable
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

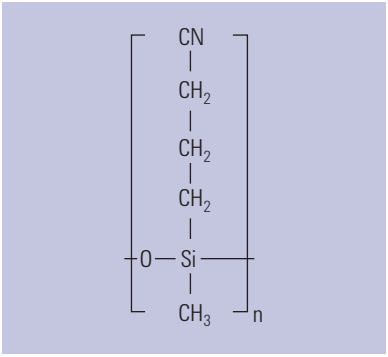
Similar Phases: Rtx-50, 007-17(MPS-50), SP-2250, SPB-50, ZB-50, AT-50



Structure of CP-Sil 24 CB

CP-Sil 24 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	15	0.25	40 to 280/300	CP7820	
	30	0.25	40 to 280/300	CP7821	
		0.50	40 to 280/300	CP7824	
	60	0.25	40 to 280/300	CP7822	CP7822I5
		0.50	40 to 280/300		CP7825I5
0.32	15	0.25	40 to 280/300	CP7830	CP7830I5
	30	0.25	40 to 280/300	CP7831	CP7831I5
	60	0.25	40 to 280/300	CP7832	
0.53	15	1.00	40 to 265/290	CP7870	
	30	0.50	40 to 280/300	CP7834	CP7834I5
		1.00	40 to 265/290	CP7871	CP7871I5



Structure of DB-23

DB-23

- (50%-Cyanopropyl)-methylpolysiloxane
- High polarity
- Designed for separation of fatty acid methyl esters (FAMEs)
- Excellent resolution for cis- and trans-isomers
- Bonded and cross-linked
- Solvent rinsable
- Replaces HP-23
- Close equivalent to USP Phase G5

Similar Phases: SP-2330, Rtx-2330, 007-23, AT-Silar, BPX-70, SP-2340

DB-23

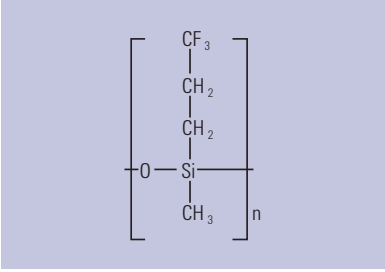
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*20*	*0.20*	*40 to 250/260*	*121-2323*		*121-2323LTM*
0.25	15	0.25	40 to 250/260	122-2312		122-2312LTM
	30	0.15	40 to 250/260	122-2331		122-2331LTM
		0.25	40 to 250/260	122-2332	122-2332E	122-2332LTM
	60	0.15	40 to 250/260	122-2361	122-2361E	
		0.25	40 to 250/260	122-2362	122-2362E	
0.32	30	0.25	40 to 250/260	123-2332	123-2332E	123-2332LTM
	60	0.25	40 to 250/260	123-2362		
0.53	15	0.50	40 to 230/240	125-2312		125-2312LTM
	30	0.50	40 to 230/240	125-2332		125-2332LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-200

- (35% Trifluoropropyl)-methylpolysiloxane
- 300/320 °C temperature limit
- Mid polarity – more polar than DB-1701 or DB-17
- Ideal for difficult-to-separate positional isomers
- Unique interactions with compounds containing nitro, halogen and carbonyl groups
- Low ECD bleed
- Unique selectivity
- Close equivalent to USP Phase G6

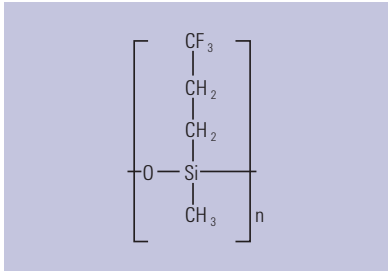
Similar Phases: Rtx-200



Structure of DB-200

DB-200

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	30 to 300/320	122-2032	122-2032LTM
		0.50	30 to 300/320	122-2033	122-2033LTM
0.32	30	0.25	30 to 300/320	123-2032	123-2032LTM
		0.50	30 to 300/320	123-2033	123-2033LTM
0.53	30	1.00	30 to 280/300	125-2032	125-2032LTM



Structure of DB-210

DB-210

- (50%-Trifluoropropyl)-methylpolysiloxane
- High polarity
- Excellent for U.S. EPA Methods 8140 and 609
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-210
- Close equivalent to USP Phase G6

Similar Phases: SP-2401

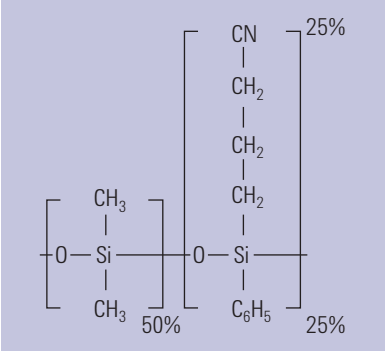
DB-210

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.25	45 to 240/260	122-0212		122-0212LTM
	30	0.25	45 to 240/260	122-0232	122-0232E	122-0232LTM
		0.50	45 to 240/260	122-0233		122-0233LTM
0.32	15	0.50	45 to 240/260	123-0213		123-0213LTM
	30	0.25	45 to 240/260	123-0232		123-0232LTM
		0.50	45 to 240/260	123-0233		123-0233LTM
0.53	15	1.00	45 to 220/240	125-0212		125-0212LTM
	30	1.00	45 to 220/240	125-0232		125-0232LTM

DB-225

- (50%-Cyanopropylphenyl)-dimethylpolysiloxane
- Mid/high polarity
- Excellent for separations of cis- and trans-fatty acid methyl esters (FAMEs)
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-225
- Close equivalent to USP Phase G7

Similar Phases: SP-2330, Rtx-225, BP-225, OV-225, 007-225, AT-225



Structure of DB-225

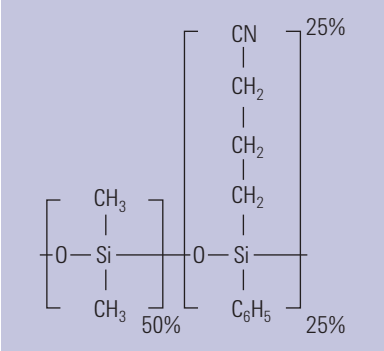
DB-225

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.10	20	0.10	40 to 220/240	127-2222		127-2222LTM
0.18	*20*	*0.20*	*40 to 220/240*	*121-2223*		*121-2223LTM*
0.25	15	0.25	40 to 220/240	122-2212		122-2212LTM
	30	0.15	40 to 220/240	122-2231		122-2231LTM
		0.25	40 to 220/240	122-2232		122-2232LTM
0.32	30	0.25	40 to 220/240	123-2232	123-2232E	123-2232LTM
0.53	15	1.00	40 to 200/220	125-2212		125-2212LTM
	30	0.50	40 to 200/220	125-2237		125-2237LTM
		1.00	40 to 200/220	125-2232		125-2232LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

TIPS & TOOLS

Need assistance selecting a column for your method? Contact our chromatography technical specialists at **www.agilent.com/chem/TechRep**



Structure of CP-Sil 43 CB

CP-Sil 43 CB

- 25% cyanopropyl/25% phenyl/50% dimethylpolysiloxane phase
- Mid polarity
- Separates aromatic from aliphatic hydrocarbons with selectivity equivalent to OV-255
- Bonded and cross-linked
- Solvent rinsable
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SP-2330, Rtx-225, BP-225, OV-225, 007-225, AT-225

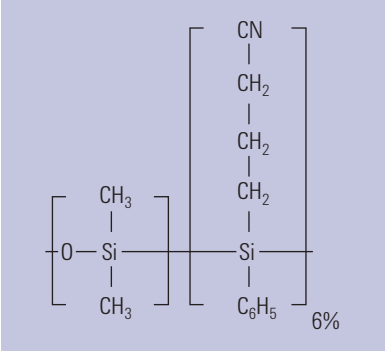
CP-Sil 43 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.20	45 to 200/225	CP7715	CP7715I5
	50	0.20	45 to 200/225	CP7725	CP7725I5
0.32	10	0.20	45 to 200/225	CP7735	
	25	0.20	45 to 200/225	CP7745	

DB-1301

- (6%-Cyanopropyl-phenyl) methylpolysiloxane
- Equivalent to USP Phase G43
- Low/mid polarity
- Bonded and cross-linked
- Exact replacement of HP-1301 and HP-1701
- Solvent rinsable

Similar Phases: Rtx-1301, PE-1301

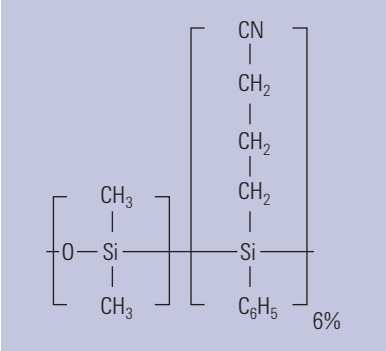


Structure of DB-1301

DB-1301

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.18	*10*	*0.40*	*-20 to 280/300*	*121-1313*		*121-1313LTM*
0.25	30	0.25	-20 to 280/300	122-1332	122-1332E	122-1332LTM
		1.00	-20 to 280/300	122-1333		122-1333LTM
	60	0.25	-20 to 280/300	122-1362		
		1.00	-20 to 280/300	122-1363	122-1363E	
0.32	30	0.25	-20 to 280/300	123-1332		123-1332LTM
		1.00	-20 to 280/300	123-1333		123-1333LTM
	60	1.00	-20 to 280/300	123-1363	123-1363E	
0.53	15	1.00	-20 to 260/280	125-1312		125-1312LTM
	30	1.00	-20 to 260/280	125-1332		125-1332LTM
		1.50	-20 to 260/280	125-1333		125-1333LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of CP-1301

CP-1301

- 6% cyanopropyl-phenyl/94% dimethylpolysiloxane
- Mid polarity
- Ideal for analysis of herbicides, pesticides and many pharmaceutical products
- High column-to-column reproducibility
- Good inertness for better quality of data, even with thick films
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rtx-1301, PE-1301

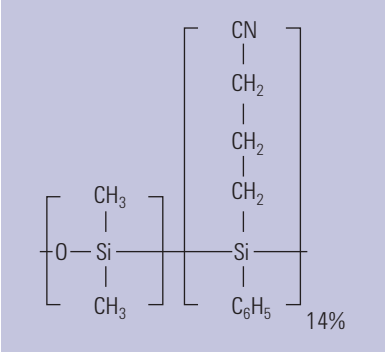
CP-1301

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	1.00	-25 to 265/280	CP8604
	60	0.25	-25 to 280/280	CP8602
		1.00	-25 to 265/280	CP8605
0.32	30	0.25	-25 to 280/280	CP8607
		1.00	-25 to 265/280	CP8610
	60	0.25	-25 to 280/280	CP8608
		1.00	-25 to 265/280	CP8611
0.53	30	1.00	-25 to 265/280	CP8613

DB-1701

- (14% Cyanopropyl-phenyl)-methylpolysiloxane
- Low/mid polarity
- Bonded and cross-linked
- Exact replacement of HP-1301 and HP-1701
- Solvent rinsable

Similar Phases: SPB-1701, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701



Structure of DB-1701

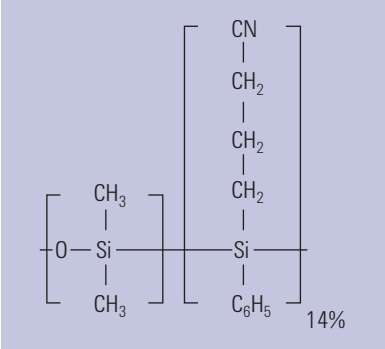
DB-1701

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.10	20	0.10	-20 to 280/300	127-0722		127-0722LTM
		0.40	-20 to 280/300	127-0723		127-0723LTM
0.18	*10*	*0.40*	*-20 to 280/300*	*121-0713*		*121-0713LTM*
	20	*0.18*	*-20 to 280/300*	*121-0722*		*121-0722LTM*
0.25	15	0.25	-20 to 280/300	122-0712		122-0712LTM
		1.00	-20 to 280/300	122-0713		122-0713LTM
	30	0.15	-20 to 280/300	122-0731		122-0731LTM
		0.25	-20 to 280/300	122-0732	122-0732E	122-0732LTM
		1.00	-20 to 280/300	122-0733	122-0733E	122-0733LTM
	60	0.15	-20 to 280/300	122-0761		
		0.25	-20 to 280/300	122-0762		
		0.50	-20 to 280/300	122-0766		
		1.00	-20 to 280/300	122-0763	122-0763E	
0.32	15	0.25	-20 to 280/300	123-0712		123-0712LTM
		1.00	-20 to 280/300	123-0713		123-0713LTM
	30	0.15	-20 to 280/300	123-0731		123-0731LTM
		0.25	-20 to 280/300	123-0732	123-0732E	123-0732LTM
		1.00	-20 to 280/300	123-0733	123-0733E	123-0733LTM
	50	1.00	-20 to 280/300	123-0753		
	60	0.25	-20 to 280/300	123-0762		
		1.00	-20 to 280/300	123-0763	123-0763E	
0.53	15	1.00	-20 to 260/280	125-0712	125-0712E	125-0712LTM
	30	0.25	-20 to 260/280	125-0731		125-0731LTM
		0.50	-20 to 260/280	125-0737		125-0737LTM
		1.00	-20 to 260/280	125-0732	125-0732E	125-0732LTM
		1.50	-20 to 260/280	125-0733		125-0733LTM
	60	1.00	-20 to 260/280	125-0762	125-0762E	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

TIPS & TOOLS

Agilent also offers DB-624 columns for the analysis of volatile priority pollutants and residual solvents.



Structure of CP-Sil 19 CB

CP-Sil 19 CB

- 14% cyanopropyl-phenyl/86% dimethylpolysiloxane
- Mid polarity
- Ideal for many environmental, food and beverage, and pharmaceutical applications
- Useful as confirmation column
- Bonded and cross-linked
- Solvent rinsable
- Broad range of configurations available
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SPB-1701, Rtx-1701, BP-10, OV-1701, 007-1701, ZB-1701

CP-Sil 19 CB

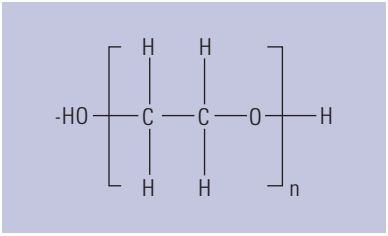
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.20	-25 to 275/300	CP7331	
0.15	*25*	*0.50*	*-25 to 275/300*	*CP7340*	
0.20	25	0.20	-25 to 275/300	CP7360	
0.25	10	0.20	-25 to 275/300	CP7702	
	15	0.15	-25 to 275/300	CP8502	
		0.25	-25 to 275/300	CP8512	CP8512I5
	25	0.20	-25 to 275/300	CP7712	
		0.40	-25 to 275/300	CP7809	
		1.20	-25 to 275/300	CP7672	
	30	0.25	-25 to 275/300	CP8712	CP8712I5
		1.00	-25 to 275/300	CP8562	CP8562I5
	50	0.20	-25 to 275/300	CP7722	
		0.40	-25 to 275/300	CP7819	CP7819I5
	60	0.15	-25 to 275/300	CP8592	CP8592I5
		0.25	-25 to 275/300	CP8722	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

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CP-Sil 19 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.20	-25 to 275/300	CP7732	
	15	0.25	-25 to 275/300	CP8542	CP8542I5
	25	0.20	-25 to 275/300	CP7742	
		0.40	-25 to 275/300	CP7829	
		1.20	-25 to 275/300	CP7762	
	30	0.25	-25 to 275/300	CP8842	
		1.00	-25 to 275/300	CP8762	
	50	0.20	-25 to 275/300	CP7752	
		0.40	-25 to 275/300	CP7839	
		1.20	-25 to 275/300	CP7772	
	60	0.15	-25 to 275/300	CP8662	
		0.25	-25 to 275/300	CP8852	
		1.00	-25 to 275/300	CP8772	CP8772I5
0.53	10	2.00	-25 to 275/300	CP7647	
	15	0.50	-25 to 275/300	CP8663	
	25	1.00	-25 to 275/300	CP7637	
		2.00	-25 to 275/300	CP7657	
	30	1.00	-25 to 275/300	CP8737	
	50	2.00	-25 to 275/300	CP7667	
		1.00	-25 to 275/300	CP7697	



Structure of Polyethylene Glycol (PEG)
This structure is applicable for all
WAX and FFAP phases.

Polyethylene Glycol (PEG) Columns

Agilent offers a full range of PEG columns. Even though each phase is based on the polyethylene glycol polymer, strict control of the cross-linking and deactivation processes result in a variety of unique phase characteristics to meet your varying analysis needs.

DB-WAX and DB-WaxFF

- Polyethylene glycol (PEG)
- Equivalent to USP Phase G16
- High polarity
- Lower temperature limit of 20 °C is the lowest of any bonded PEG phase; improves resolution of low boiling point analytes
- Column-to-column reproducibility
- Bonded and cross-linked
- Exact replacement of HP-WAX
- Solvent rinsable
- DB-WaxFF is a highly reproducible, specially tested microbore DB-Wax for fragrance analysis

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX, ZB-WAX plus

DB-WAX and DB-WaxFF

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
DB-WAX							
0.05	10	0.05	20 to 250/260	126-7012		126-7012LTM	
		0.10	20 to 240/250	126-7013		126-7013LTM	222-7013LTM
0.10	10	0.10	20 to 250/260	127-7012	127-7012E	127-7012LTM	
		0.20	20 to 240/250	127-7013		127-7013LTM	
	20	0.10	20 to 250/260	127-7022		127-7022LTM	
		0.20	20 to 240/250	127-7023	127-7023E	127-7023LTM	

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(Continued)

DB-WAX and DB-WaxFF

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
DB-WAX							
0.18	*10*	*0.18*	*20 to 250/260*	*121-7012*		*121-7012LTM*	
	20	*0.18*	*20 to 250/260*	*121-7022*	*121-7022E*	*121-7022LTM*	
		0.30	*20 to 240/250*	*121-7023*	*121-7023E*	*121-7023LTM*	
	40	*0.18*	*20 to 250/260*	*121-7042*	*121-7042E*		
		0.30	*20 to 240/250*	*121-7043*			
0.20	25	0.20	20 to 250/260	128-7022		128-7022LTM	
	30	0.20	20 to 250/260	128-7032		128-7032LTM	
	50	0.20	20 to 250/260	128-7052			
0.25	15	0.25	20 to 250/260	122-7012	122-7012E	122-7012LTM	
		0.50	20 to 240/250	122-7013		122-7013LTM	
	30	0.15	20 to 250/260	122-7031		122-7031LTM	
		0.25	20 to 250/260	122-7032	122-7032E	122-7032LTM	
		0.50	20 to 240/250	122-7033	122-7033E	122-7033LTM	222-7033LTM
	60	0.15	20 to 250/260	122-7061			
		0.25	20 to 250/260	122-7062	122-7062E		
		0.50	20 to 240/250	122-7063	122-7063E		
0.32	15	0.25	20 to 250/260	123-7012		123-7012LTM	
		0.50	20 to 240/250	123-7013		123-7013LTM	
	30	0.15	20 to 250/260	123-7031		123-7031LTM	
		0.25	20 to 250/260	123-7032	123-7032E	123-7032LTM	
		0.50	20 to 240/250	123-7033	123-7033E	123-7033LTM	
	60	0.25	20 to 250/260	123-7062			
		0.50	20 to 240/250	123-7063	123-7063E		
0.45	30	0.85	20 to 230/240	124-7032		124-7032LTM	
0.53	15	0.50	20 to 230/240	125-7017		125-7017LTM	
		1.00	20 to 230/240	125-7012	125-7012E	125-7012LTM	
	30	0.25	20 to 230/240	125-7031		125-7031LTM	
		0.50	20 to 230/240	125-7037		125-7037LTM	
		1.00	20 to 230/240	125-7032	125-7032E	125-7032LTM	
	60	1.00	20 to 230/240	125-7062	125-7062E		
DB-WaxFF							
0.10	20	0.20	20 to 240/250	127-7023FF			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-WAXetr

- Polyethylene glycol (PEG)
- Extended Temperature Range (etr)
- High polarity
- Excellent column-to-column repeatability
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G16

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX, ZB-WAX plus

DB-WAXetr

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	25	0.40	30 to 250/260	128-7323		128-7323LTM
0.25	30	0.25	30 to 260/280	122-7332	122-7332E	122-7332LTM
		0.50	30 to 250/260	122-7333		122-7333LTM
	60	0.25	30 to 260/280	122-7362		
		0.50	30 to 250/260	122-7363		
0.32	15	0.25	30 to 260/280	123-7312		123-7312LTM
		1.00	30 to 250/260	123-7314		123-7314LTM
	30	0.25	30 to 260/280	123-7332		123-7332LTM
		0.50	30 to 250/260	123-7333		123-7333LTM
		1.00	30 to 250/260	123-7334		123-7334LTM
	50	1.00	30 to 250/260	123-7354	123-7354E	
	60	0.25	30 to 260/280	123-7362		
		0.50	30 to 250/260	123-7363		
		1.00	30 to 250/260	123-7364		
0.53	15	1.00	30 to 240/260	125-7312		125-7312LTM
		2.00	50 to 230/250	125-7314		125-7314LTM
	30	1.00	30 to 240/260	125-7332	125-7332E	125-7332LTM
		1.50	30 to 230/240	125-7333		125-7333LTM
		2.00	50 to 230/250	125-7334	125-7334E	125-7334LTM
	60	1.00	30 to 240/260	125-7362		

HP-INNOWax

- Polyethylene glycol (PEG)
- High polarity
- Highest upper temperature limits of the bonded PEG phases
- Column-to-column repeatability
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G16

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, ZB-WAX, ZB-WAX+

HP-INNOWax

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*40 to 260/270*	*19091N-577*	*19091N-577E*	*19091N-577LTM*	*29091N-577LTM*
0.20	25	0.20	40 to 260/270	19091N-102		19091N-102LTM	
		0.40	40 to 260/270	19091N-202		19091N-202LTM	
	50	0.20	40 to 260/270	19091N-105	19091N-105E		
		0.40	40 to 260/270	19091N-205	19091N-205E		
0.25	4	0.25	40 to 260/270	19091N-130		19091N-130LTM	
	5	0.10	40 to 260/270	19091N-330			
		0.15	40 to 260/270	19091N-030		19091N-030LTM	
	15	0.10	40 to 260/270	19091N-331			
		0.25	40 to 260/270	19091N-131	19091N-131E	19091N-131LTM	
		0.50	40 to 260/270	19091N-231		19091N-231LTM	
	30	0.15	40 to 260/270	19091N-033		19091N-033LTM	
		0.25	40 to 260/270	19091N-133	19091N-133E	19091N-133LTM	29091N-133LTM
		0.50	40 to 260/270	19091N-233	19091N-233E	19091N-233LTM	
	60	0.15	40 to 260/270	19091N-036			
		0.25	40 to 260/270	19091N-136	19091N-136E		
		0.50	40 to 260/270	19091N-236			
0.32	15	0.25	40 to 260/270	19091N-111		19091N-111LTM	
	30	0.15	40 to 260/270	19091N-013		19091N-013LTM	
		0.25	40 to 260/270	19091N-113	19091N-113E	19091N-113LTM	
		0.50	40 to 260/270	19091N-213	19091N-213E	19091N-213LTM	
	60	0.25	40 to 260/270	19091N-116			
		0.50	40 to 260/270	19091N-216	19091N-216E		
0.53	15	1.00	40 to 240/250	19095N-121	19095N-121E	19095N-121LTM	
	30	1.00	40 to 240/250	19095N-123	19095N-123E	19095N-123LTM	
	60	1.00	40 to 240/250	19095N-126			

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CP-Wax 52 CB

- Polyethylene glycol phase
- High polarity
- Wider temperature range than non-bonded polyethylene glycols
- Bonded and cross-linked
- Solvent rinsable
- High resolution of low boiling point analytes
- High polarity provides separations for a broad range of applications
- Excellent reproducibility and temperature stability for a variety of EPA and ASTM methods
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Note: We recommend the UltiMetal column when working in rugged environments with process or portable instruments.

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, HP-INNOWax, Rtx-WAX, ZB-WAX, ZB-WAX+

CP-Wax 52 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.10	10	0.10	20 to 250/265	CP7334	CP7334I5
		0.20	20 to 250/265	CP7335	
0.15	*15*	*0.15*	*20 to 250/265*	*CP7791*	*CP7791I5*
	25	*0.25*	*20 to 250/265*	*CP7792*	*CP7792I5*
0.20	25	0.20	20 to 250/265	CP7765	
	30	0.20	20 to 250/265	CP7775	
	50	0.20	20 to 250/265	CP7785	
0.25	10	0.20	20 to 250/265	CP7703	
	15	0.25	20 to 250/265	CP8513	
	25	0.20	20 to 250/265	CP7713	CP7713I5
		1.20	20 to 250/265	CP7673	CP7673I5
	30	0.15	20 to 250/265	CP8745	
		0.25	20 to 250/265	CP8713	CP8713I5
		0.50	20 to 250/265	CP8746	CP8746I5
	50	0.20	20 to 250/265	CP7723	CP7723I5
	60	0.25	20 to 250/265	CP8723	CP8723I5
		0.50	20 to 250/265	CP8748	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

(Continued)

CP-Wax 52 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.20	20 to 250/265	CP7733	CP7733I5
		1.00	20 to 250/265	CP7628	
	15	0.15	20 to 250/265	CP8533	
		0.25	20 to 250/265	CP8543	
		0.50	20 to 250/265	CP8553	
	25	0.20	20 to 250/265	CP7743	
		0.40	20 to 250/265	CP7879	
		1.20	20 to 250/265	CP7763	CP7763I5
	30	0.25	20 to 250/265	CP8843	CP8843I5
		0.50	20 to 250/265	CP8763	CP8763I5
	50	0.20	20 to 250/265	CP7753	CP7753I5
		0.40	20 to 250/265	CP7889	
		1.20	20 to 250/265	CP7773	CP7773I5
	60	0.25	20 to 250/265	CP8853	
		0.50	20 to 250/265	CP8773	
		1.20	20 to 250/265	CP8073	CP8073I5
0.53	10	2.00	20 to 250/265	CP7648	
	15	1.00	20 to 250/265	CP8718	
	25	1.00	20 to 250/265	CP7638	
		2.00	20 to 250/265	CP7658	CP7658I5
	30	1.00	20 to 250/265	CP8738	CP8738I5
	50	1.00	20 to 250/265	CP7698	CP7698I5
		2.00	20 to 250/265	CP7668	
	60	1.00	20 to 250/265	CP8798	
	100	2.00	20 to 250/265	CP7678	

CP-Wax 52 CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Part No.
0.53	10	0.50	20 to 250/275	CP7128
		1.00	20 to 250/275	CP7148
		2.00	20 to 250/275	CP7177
	25	0.50	20 to 250/275	CP7138
		1.00	20 to 250/275	CP7158
		2.00	20 to 250/275	CP7178
	50	0.50	20 to 250/275	CP7198
		1.00	20 to 250/275	CP7168
		2.00	20 to 250/275	CP7179

DB-FFAP

- Nitroterephthalic acid modified polyethylene glycol
- High polarity
- Temperature range from 40 °C to 250 °C
- Designed for the analysis of volatile fatty acids and phenols
- Replaces OV-351
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G35

Note: We do not recommend the use of water or methanol to rinse DB-FFAP GC columns.

Similar Phases: Stabilwax-DA, Nukol, 007-FFAP, BP21, AT-1000, OV-351

DB-FFAP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.10	10	0.10	40 to 250	127-3212		127-3212LTM	
	15	0.10	40 to 250	127-32H2		127-32H2LTM	
0.25	15	0.25	40 to 250	122-3212		122-3212LTM	222-3212LTM
	30	0.25	40 to 250	122-3232	122-3232E	122-3232LTM	222-3232LTM
		0.50	40 to 250	122-3233		122-3233LTM	
	60	0.25	40 to 250	122-3262	122-3262E		
		0.50	40 to 250	122-3263			
0.32	15	0.25	40 to 250	123-3212		123-3212LTM	
	25	0.50	40 to 250	123-3223		123-3223LTM	
	30	0.25	40 to 250	123-3232	123-3232E	123-3232LTM	
		0.50	40 to 250	123-3233		123-3233LTM	
		1.00	40 to 250	123-3234		123-3234LTM	
	50	0.50	40 to 250	123-3253			
	60	0.25	40 to 250	123-3262			
		0.50	40 to 250	123-3263			
		1.00	40 to 250	123-3264			
0.45	30	0.85	40 to 250	124-3232		124-3232LTM	
0.53	10	1.00	40 to 250	125-32H2		125-32H2LTM	
	15	0.50	40 to 250	125-3217		125-3217LTM	
		1.00	40 to 250	125-3212		125-3212LTM	
	30	0.25	40 to 250	125-3231		125-3231LTM	
		0.50	40 to 250	125-3237		125-3237LTM	
		1.00	40 to 250	125-3232	125-3232E	125-3232LTM	
		1.50	40 to 250	125-3233		125-3233LTM	
	60	1.00	40 to 250	125-3262			

HP-FFAP

- Nitroterephthalic acid modified polyethylene glycol
- High polarity
- Temperature range from 60 °C to 240/250 °C (230/240 °C for 0.53 mm)
- Designed for the analysis of volatile fatty acids and phenols
- Replaces OV-351
- Bonded and cross-linked
- Solvent rinsable
- Close equivalent to USP Phase G35

Note: We do not recommend the use of water or methanol to rinse HP-FFAP GC columns.

Similar Phases: Stabilwax-DA, Nukol, 007-FFAP, BP21, AT-1000, OV-351

HP-FFAP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	25	0.30	60 to 240/250	19091F-102	19091F-102E	19091F-102LTM
	50	0.30	60 to 240/250	19091F-105	19091F-105E	
0.25	30	0.25	60 to 240/250	19091F-433	19091F-433E	19091F-433LTM
0.32	25	0.50	60 to 240/250	19091F-112	19091F-112E	19091F-112LTM
	30	0.25	60 to 240/250	19091F-413		19091F-413LTM
	50	0.50	60 to 240/250	19091F-115	19091F-115E	
0.53	10	1.00	60 to 240	19095F-121		19095F-121LTM
	15	1.00	60 to 240	19095F-120	19095F-120E	19095F-120LTM
	30	1.00	60 to 240	19095F-123	19095F-123E	19095F-123LTM

TIPS & TOOLS

Agilent also offers CAM columns for amine analysis.

CP-Wax 58 FFAP CB

- Nitroterephthalic acid-modified polyethylene glycol phase
- High polarity
- Ideal for analysis of acidic compounds, such as phenols, underivatized and derivatized free fatty acids
- Highest polarity bonded wax column for analyzing polar compounds
- Chemically-bonded
- Solvent rinsable
- High inertness provides excellent peak shape
- Supplied with an EZ-GRIP to simplify column installation, coupling and operation

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX

CP-Wax 58 FFAP CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.20	25	0.30	20 to 250/275	CP7787	CP7787I5
	50	0.30	20 to 250/275	CP7797	
0.25	25	0.20	20 to 250/275	CP7717	CP7717I5
	50	0.20	20 to 250/275	CP7727	
0.32	25	0.20	20 to 250/275	CP7747	CP7747I5
		1.20	20 to 250/275	CP7767	
	50	0.20	20 to 250/275	CP7757	
		0.50	20 to 250/275	CP7778	
		1.20	20 to 250/275	CP7777	
0.53	15	0.50	20 to 250/275	CP7665	
	25	1.00	20 to 250/275	CP7614	CP7614I5
		2.00	20 to 250/275	CP7654	
	50	1.00	20 to 250/275	CP7624	
		2.00	20 to 250/275	CP7664	

TIPS & TOOLS

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

Carbowax 20M and HP-20M

- Polyethylene glycol, MW 20,000
- Equivalent to USP Phase G16

Similar Phases: Rt-CW20M F&F

Because the Carbowax 20M and the HP-20M are not bonded or cross-linked, we do not recommend solvent rinsing. DB-WAX is the recommended bonded alternate for the HP-20M.

Carbowax 20M

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	60 to 220/240	112-2032	112-2032LTM
0.32	30	0.25	60 to 220/240	113-2032	113-2032LTM
	60	0.25	60 to 220/240	113-2062	

HP-20M

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	25	0.10	60 to 220	19091W-102		19091W-102LTM
	50	0.10	60 to 220	19091W-105		
0.32	25	0.30	60 to 220	19091W-012	19091W-012E	19091W-012LTM
	50	0.30	60 to 220	19091W-015	19091W-015E	
0.53	10	1.33	60 to 220	19095W-121		19095W-121LTM
	30	1.33	60 to 220	19095W-123		19095W-123LTM



Specialty Columns

Agilent chemists have developed many columns with unique characteristics designed to solve the most difficult separation problems of a given method. As a result, we offer a comprehensive line of specialty or "select" columns for a variety of applications to enhance the standard phase portfolio. With columns for volatiles, pesticides, petrochemicals and more – Agilent exceeds standard QA/QC procedures for the manufacturing and testing of all of our specialty columns to ensure they meet the stringent demands for their application. These columns offer reliable, accurate results with the shortest run times possible on complex sample lists and matrices.

High Temperature Columns

DB-1ht

- 100% Dimethylpolysiloxane
- Non-polar
- Specially processed for extended temperature limit of 400 °C
- High temperature, polyimide-coated, fused silica tubing
- Excellent peak shape and faster elution times for high boilers
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rxi-1HT, Stx-1ht, ZB-1ht

DB-1ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.25	15	0.10	-60 to 400	122-1111	122-1111E		222-1111LTM
	30	0.10	-60 to 400	122-1131			222-1131LTM
0.32	15	0.10	-60 to 400	123-1111		123-1111LTM	
	30	0.10	-60 to 400	123-1131	123-1131E	123-1131LTM	
0.53	30	0.17	-60 to 400	125-1131			

DB-5ht



- (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Specially processed for extended temperature limit of 400 °C
- High temperature, polyimide-coated, fused silica tubing
- Excellent peak shape and faster elution times for high boilers
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: HT5, Stx-5ht, ZB-5ht

DB-5ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.25	15	0.10	-60 to 400	122-5711	122-5711E	122-5711LTM	222-5711LTM
	30	0.10	-60 to 400	122-5731		122-5731LTM	222-5731LTM
0.32	10	0.10	-60 to 400	123-5701		123-5701LTM	
	15	0.10	-60 to 400	123-5711	123-5711E		
	30	0.10	-60 to 400	123-5731	123-5731E	123-5731LTM	

DB-17ht

- (50%-Phenyl)-methylpolysiloxane
- Mid-polarity
- Extended upper temperature limit of 365 °C
- High temperature, polyimide-coated, fused silica tubing
- Excellent peak shape and faster elution times for high boilers
- Improved resolution for triglycerides
- Ideal for confirmational analyses
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Rtx-65TG, BPX50

DB-17ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	5	0.15	40 to 340/365	122-1801		122-1801LTM
	15	0.15	40 to 340/365	122-1811		
	30	0.15	40 to 340/365	122-1831		122-1831LTM
0.32	15	0.15	40 to 340/365	123-1811		
	30	0.15	40 to 340/365	123-1831	123-1831E	
	60	0.15	40 to 340/365	123-1861		



TIPS & TOOLS

Learn more about the Agilent 7890A GC System at **www.agilent.com/chem/7890A**

VF-5ht and VF-5ht UltiMetal

- Enhanced selectivity improves column longevity and reduces downtime
- Superior detector performance provides improved detection limits
- For analyses of high boiling compounds by exhibiting ultra low bleed at high temperatures
- Optimized sensitivity and accuracy for analysis of high molecular weight compounds
- Identical selectivity as VF-5ms (bleed spec of 30 m x 0.25 mm column is < 5 pA at 400 °C)
- UltiMetal technology renders the stainless steel inert and enhances bonding of the stationary phase for improved column lifetime and excellent peak shape

Similar Phases: ZB-5ht, Rxi-5ht

VF-5ht

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	15	0.10	-60 to 400/400	CP9045
	30	0.10	-60 to 400/400	CP9046
0.32	10	0.10	-60 to 400/400	CP9044
	15	0.10	-60 to 400/400	CP9047
	30	0.10	-60 to 400/400	CP9048

Similar Phases: ZB-5ht, Rxi-5ht

VF-5ht UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	15	0.10	-60 to 430/450	CP9090	
		0.10	-60 to 430/450	CP9091*	
	30	0.10	-60 to 430/450	CP9092	CP9092I5
		0.10	-60 to 430/450	CP9093*	
0.32	15	0.10	-60 to 430/450	CP9094	CP9094I5
		0.10	-60 to 430/450	CP9095*	
	30	0.10	-60 to 430/450	CP9096	
		0.10	-60 to 430/450	CP9097*	

*These configurations include a 2 m x 0.53 mm id UltiMetal retention gap which are pre-connected to the VF-5ht UltiMetal column with a high-temperature column connector.

Petroleum Columns

Petroleum applications vary greatly in character. From noble gases to simulated distillation, Agilent offers a broad range of columns designed to meet the needs of the petroleum/petrochemical chromatographer. Refer to the PLOT column section for columns for the analysis of light gases.

Lowox

- Unique selectivity for a wide range of oxygenates
- Minimal particle loss preserves detector performance
- Industry proven for process and portable GC applications (ASTM D 7059)
- Analyze trace level oxygenate impurities in gas and liquid hydrocarbon streams
- High polarity
- Ideal for monitoring catalyst contamination by oxygenates

Lowox

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	10.00	0 to 350/350	CP8587	CP8587I5

GS-OxyPLOT

- Accurate analysis of ppm/ppb level oxygenates in C_1 to C_{10} hydrocarbons
- Strong selectivity for a wide range of oxygenates (ethers, alcohols, aldehydes, and ketones) in complex matrices such as gaseous hydrocarbons, motor fuels, and crude oil
- Suitable for ASTM methods for oxygenates
- Very high column stability (upper temperature limit of 350 °C) with no column bleed
- Stable phase coating virtually eliminates particle generation and detector spiking
- Excellent for low concentration, quantitative GC analysis
- Ideal for selective heart-cutting applications

GS-OxyPLOT

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	350	115-4912	115-4912E

CP-Sil 5 CB for Formaldehyde

- Optimized for analysis of formaldehyde, water and methanol
- Trace analysis of sulfur compounds possible
- Partial permanent gas analysis possible (especially in switching systems)
- Non-polar phase provides accurate separations based on volatility
- High inertness, elutes sulfur components without absorption for high quality data and low detection limits
- Highest efficiency for this apolar column with the thickest film

CP-Sil 5 CB for Formaldehyde

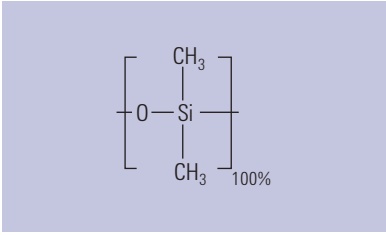
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	60	8.00	-60 to 300/325	CP7475	CP7475I5

HP-PONA

- 100% Dimethylpolysiloxane
- Configured for the analysis of petroleum process products
- Tested to ensure the resolution of m-xylene from p-xylene and of cyclopentane from 2,3-dimethylbutane
- PONA, PIANO
- High resolution
- Bonded and cross-linked
- Solvent rinsable

Note: 100 psi regulator required to reach optimum carrier gas velocity

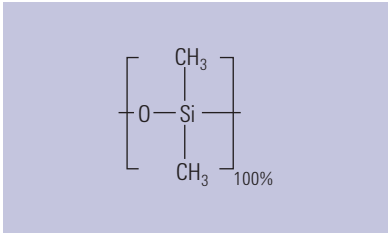
Similar Phases: Petrocol DH, SPB-1, 007-1, Rtx-1, MXT-1, Rtx-1PONA, Rtx-DHA



Structure of HP-PONA

HP-PONA

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
HP-PONA	0.20	50	0.50	-60 to 325/350	19091S-001	19091S-001E
HP-1	0.20	50	0.50	-60 to 325/350	19091Z-205	19091Z-205E
HP-1	0.25	100	0.50	-60 to 325/350	19091Z-530	19091Z-530E



Structure of CP-Sil PONA CB

CP-Sil PONA CB

- High resolution analysis of paraffins, olefins, napthalenes and aromatics in complex hydrocarbon mixtures
- Engineered for hydrocarbon analysis according to ASTM (DHA method)
- Inert to polar compounds for highly accurate data
- Excellent column-to-column reproducibility

Similar Phases: Petrocol DH, SPB-1, 007-1, Rtx-1, MXT-1

CP-Sil PONA CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.21	50	0.50	250/275	CP7531	CP7531I5
0.25	100	0.50	250/275	CP7530	CP7530I5
0.25	150	1.00	250/275	CP7945	

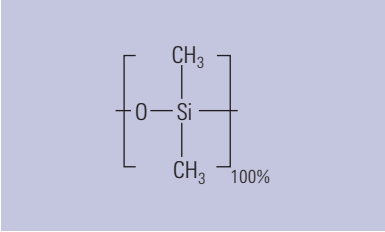
CP-Sil PONA for ASTM D 5134

- Optimized PONA analysis for ASTM D 5134
- Exact dimensions as specified in the ASTM method for full compliance
- Inert to polar additives

CP-Sil PONA for ASTM D 5134

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.21	50	0.50	250/275	CP7531

DB-Petro



Structure of DB-Petro

- 100% Dimethylpolysiloxane
- Configured for the analysis of petroleum process products
- PONA, PIANO
- High resolution
- Bonded and cross-linked
- Solvent rinsable

Note: 100 psi regulator required to reach optimum carrier gas velocity

Similar Phases: Petrocol DH, SPB-1, 007-1, Rtx-1, MXT-1



DB-Petro

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.20	50	0.50	-60 to 325/350	128-1056	
0.25	100	0.50	-60 to 325/350	122-10A6	122-10A6E

HP-1 Aluminum Clad

- 100% Dimethylpolysiloxane
- Aluminum clad fused silica tubing
- For high temperature simulated distillation
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: MXT-1

HP-1 Aluminum Clad

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	5	0.09	0 to 350/450	19095S-205
	10	0.09	0 to 350/450	19095S-200

DB-2887

- 100% Dimethylpolysiloxane
- Specifically designed for simulated distillation using ASTM Method D 2887
- Rapid conditioning, fast run time and low bleed when compared to packed columns
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Petrocol EX2887, MXT-2887, MXT-1, Rtx-2887

DB-2887

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	10	3.00	-60 to 350	125-2814	125-2814E	125-2814LTM



DB-HT SimDis

- 100% Dimethylpolysiloxane
- "Boiling point" phase for high temperature simulated distillation
- Durable stainless steel tubing
- 430 °C upper temperature limit
- Distillation range of C_6 to C_{110+}
- Low bleed, even at 430 °C
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: Petrocol EX2887, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887, ZB-1XT SimDist

DB-HT SimDis

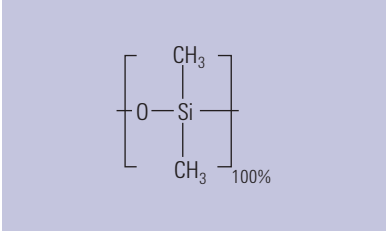
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	5	0.10	-60 to 400/430	145-1009
		0.15	-60 to 400/430	145-1001

CP-SimDist

- For simulated distillation analysis up to C_{100}
- High temperature non-polar stationary phase
- Low bleed improves quantitation
- High temperature polyimide coating extends lifetime

CP-SimDist Fused Silica columns are guaranteed for simulated distillation up to C_{100}. These columns are low bleed, typically only 4-5 pA at 400 °C. The high temperature stationary phase and polyimide coating extend column lifetime.

Similar Phases: Petrocol EX2887, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887, ZB-1XT SimDist



Structure of CP-SimDist

CP-SimDist

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	0.10	375/400	CP7521	
0.53	5	0.17	375/400	CP7522	CP7522I5
	10	0.10	375/400	CP7541	

TIPS & TOOLS

For optimum performance, ferrules should be replaced every time the column is replaced and during column maintenance.
See pages 33-34



CP-SimDist UltiMetal

- Designed for ASTM D2887 and the extended D2887 method compliance
- Low bleed
- Extended analysis to C_{120} with maximum temperature of 450 °C
- UltiMetal tubing for excellent durability (same id as 0.53 mm id fused silica)
- Excellent retention time repeatability and column lifetime due to special deactivation of UltiMetal surface

Similar Phases: Petrocol EX2887, MXT-2887, Rtx-2887, AC Controls High Temp Sim Dist, AT-2887, ZB-1XT SimDist

CP-SimDist UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	5	0.09	450/450	CP7569	CP7569I5
		0.17	450/450	CP7532	CP7532I5
		0.88	450/450	CP7570	
		2.65	400/400	CP7571	
	10	0.17	450/450	CP7542	CP7542I5
		0.06	450/450	CP6540	
		0.53	450/450	CP7592	
		0.88	450/450	CP7512	CP7512I5
		1.20	450/450	CP7562	
		2.65	400/400	CP7582	CP7582I5
		5.00	400/400	CP7572	
	20	0.11	450/450	CP7593	
	25	0.06	450/450	CP6550	
	50	0.06	450/450	CP6560	

CP-Sil 2 CB

- Lowest polarity bonded stationary phase available
- Superior replacement to squalane
- Unique selectivity toward cyclic hydrocarbons
- Separation almost entirely based on boiling point
- Stable at temperatures up to 200 °C

CP-Sil 2 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	25 to 200/200	CP7714	CP7714I5
	50	0.25	25 to 200/200	CP7724	
0.32	50	0.25	25 to 200/200	CP7754	CP7754I5
	25	1.20	25 to 200/200	CP7764	
	50	1.20	25 to 200/200	CP7774	
0.53	25	2.00	25 to 200/200	CP7653	

CP-TCEP for Alcohols in Gasoline

- Engineered for analysis of alcohols in gasoline
- Excellent peak shape for accurate separations of alcohols
- Temperature stability to 135 °C for high productivity
- Unique selectivity separates benzene after n-dodecane

Similar Phases: Rt-TCEP

CP-TCEP

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	50	0.40	135/140	CP7525	CP7525I5

Select Low Sulfur

- Highest degree of column inertness provides excellent peak shape for active compounds
- Low detection limits for sulfur compounds
- Unique selectivity prevents co-elution and matrix interferences in propylene streams
- Highly permeable PLOT stationary phase provides high retention of volatile compounds
- Unique QC testing results in consistent column inertness performance
- Mechanical stability results in no particle loss

Select Low Sulfur

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage
0.32	60	185	CP8575

CP-Sil 5 CB for Sulfur

- Optimized for analysis of Volatile Sulfur Compounds
- Trace analysis of sulfur compounds to C_7 mercaptan for high productivity
- Non-polar phase provides accurate separations based on volatility
- High inertness, elutes SO_2 for high quality data and low detection limits

CP-Sil 5 CB for Sulfur

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	30	4.00	-60 to 300/325	CP7529	CP7529I5

Select for Permanent Gases – Dual Column

- Set of two parallel columns: CP-Molsieve 5Å for permanent gases and PoraBOND Q for CO_2 analysis
- Isothermal separation at temperatures > 40 °C eliminates the need for cryogenics
- Temperature stability up to 300 °C allows short regeneration times and improves efficiency
- One injector, one detector simplifies operation
- Engineered for fast separation, low level analysis and quantification of argon/oxygen
- Separates permanent gases and CO_2 in a single run
- Coupled, tested and securely mounted on EZ-GRIP column mount
- For resolution of the difficult-to-separate argon/oxygen and helium/neon pairs, use CP7530 Select Permanent Gases/HR (High Resolution) column

Select for Permanent Gases – Dual Column

Description	Temp Limits (°C)	7 in Cage
Select Permanent Gases/CO_2	300/325	CP7429
Select Permanent Gases/HR	300/325	CP7430

Select Al_2O_3 MAPD

- Aluminum oxide PLOT column for the analysis of reactive hydrocarbons such as methyl acetylene and propadiene (MAPD)
- Optimized to improve sensitivity and response
- Faster run improves operating efficiency
- Two-fold higher response for MAPD, especially important when running impurity analyses

Similar Phases: Rt-Alumina BOND/MAPD, MXT-Alumina BOND/MAPD

Select Al_2O_3 MAPD

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage
0.32	50	-100 to 200/200	CP7431
0.53	25	-100 to 200/200	CP7433
	50	-100 to 200/200	CP7432



Agilent J&W Biodiesel Capillary GC Columns

Biofuels are becoming more attractive as a viable supplement or alternative to petroleum-based fuels. Agilent J&W Biodiesel Capillary GC columns are purposely designed and application-optimized for the analysis of biodiesel to meet ASTM and CEN testing standards.

Biodiesel EN14105 Free/Total Glycerin and Biodiesel ASTM D6584 Free/Total Glycerin

- Designed for the analysis of free and total glycerin in B100 according to EN14105 or ASTM D6584
- Specially processed for extended temperature limit of 400 °C
- High temperature, polyimide-coated fused silica tubing
- Excellent peak shape and extended column life
- Bonded and cross-linked
- Solvent rinsable
- Retention gaps please order P/N 160-BD65-5 (5 m x 0.53 mm)

Biodiesel EN14103 FAME Analysis

- Specially designed for the analysis of esters and linoleic acid methyl esters in B100 using EN14103
- Bonded and cross-linked
- Solvent rinsable

Biodiesel EN14110 Residual Methanol

- Specially designed for the determination of trace methanol in B100 using EN14110
- Bonded and cross-linked
- Solvent rinsable

Biodiesel Capillary GC Columns

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
Biodiesel ASTM D6584 Free/Total Glycerin	0.32	15	0.10	-60 to 400	123-BD11
Biodiesel EN14105 Free/Total Glycerin	0.32	10	0.10	-60 to 400	123-BD01
Biodiesel EN14103 FAME Analysis	0.32	30	0.25	40 to 260/270	1909BD-113
Biodiesel EN14110 Residual Methanol	0.32	30	1.80	20 to 260/280	123-BD34

Biodiesel Test Samples

Description	Part No.
Biodiesel MSTFA kit, 10 x 1 mL ampoules, N-Methyl-N-(trimethylsilyl)trifluoro-acetamide for ASTM method D6584	5190-1407
Biodiesel D6584 kit 2 internal standard solutions, 1 mL, 5/pk and 2 internal standard solutions, 5 mL	5190-1408
Biodiesel E14105 kit, 4 x 1 mL ampoules 4 standard solutions	5190-1409
Biodiesel Monoglyceride kit, 3 x 1 mL ampoules	5190-1410

Select Biodiesel

- Complete set of biodiesel columns for full compliance and ease-of-use
- UltiMetal technology provides high accuracy and longevity
- Pre-tested for complete confidence in results
- Good column lifetime when operating at temperatures up to 400 °C
- UltiMetal column with ultra stable stationary phase
- Convenient pre-coupled retention gap that is leak tested

Technical Specifications

Method	Analytes	Column	Injector Type	Analysis Time (min)
ASTM D 6584	Free and total glycerine	Select Biodiesel for Glycerides	On-column	32
EN14103	Ester and linoleic acid methyl esters	Select Biodiesel for FAME	Split/splitless	30
EN14105	Free and total glycerine; mono, di- and tri-glycerides	Select Biodiesel for Glycerides	On-column	35
EN14106	Free glycerol	Select Biodiesel for Glycerides	Split/splitless	10
EN14110	Methanol	Select Biodiesel for Methanol	Headspace with split/splitless	10

Select Biodiesel

Description	ID (mm)	Length (m)	Film (µm)	7 in Cage
For gylcerides, UltiMetal, with retention gap	0.32	15	0.10	CP9078
For gylcerides, UltiMetal	0.32	15	0.10	CP9079
For gylcerides, UltiMetal, with retention gap	0.32	10	0.10	CP9076
For gylcerides, UltiMetal	0.32	10	0.10	CP9077
For FAME, fused silica	0.32	30	0.25	CP9080
For Methanol, fused silica	0.32	30	3.00	CP9083
UltiMetal retention gap, methyl deactivated	0.53	2		CP6530

Select Silanes

- Stabilized trifluoropropyl-methyl polysiloxane phase for optimized ppm level analysis of silanes
- High capacity and retention
- Low bleed
- Reduced surface activity provides excellent peak shape
- Thick film offers high sample loading capacity and retention
- Typical applications include alkylated chlorosilanes at % levels as well as impurity analysis
- Valved, direct and split/splitless injections are possible

Select Silanes

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.32	30	1.80	0 to 270/300	CP7434
	60	1.80	0 to 270/300	CP7435
0.53	60	3.00	0 to 270/300	CP7437

CP-Volamine

- Non polar stationary phase
- Excellent stability for samples containing water expands the application range
- Maximum temperature of 265 °C for enhanced productivity
- Highly inert providing sharp amine peaks for accurate results
- Produces symmetrical peaks due to MPD (Multi-Purpose Deactivation) technology
- Excellent performance even when the sample contains high percentages of water
- Ideal for analyzing volatile amines like MMA, DMA and TMA (monomethyl, dimethyl and trimethyl amine)

Similar Phases: Rtx-Volatile Amines

CP-Volamine

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	15	265/300	CP7446	
	30	265/300	CP7447	CP7447I5
	60	265/275	CP7448	CP7448I5

CP-Sil 8 CB for Amines

- Base deactivated 5% phenyl polydimethylpolysiloxane
- Optimized inertness performance for a broad range of Amine compounds
- Thermal stability up to 350 °C enable separations of Amines up to C_{20} as well as alkanolamines
- Base deactivated columns also available as CP-Wax for Amines

Similar Phases: Rtx-5 Amine

CP-Sil 8 CB for Amines

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*2.00*	*325/350*	*CP7599*	
0.25	30	0.25	325/350	CP7598	CP7598I5
	30	0.50	325/350	CP7595	CP7595I5
0.32	30	1.00	325/350	CP7596	CP7596I5
0.53	30	1.00	325/350	CP7597	CP7597I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Wax for Volatile Amines and Diamines

Similar Phases: Stabilwax DB

CP-Wax for Volatile Amines and Diamines

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	25	1.20	220/220	CP7422	CP7422I5
0.53	25	2.00	220/220	CP7424	

PoraPLOT Amines

- Unique PLOT columns specially designed for high retention of very volatile amines
- High efficiency at temperatures above ambient eliminates the need for cryogenics
- High sensitivity for amines and ammonia

PoraPLOT Amines

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	25	10.00	-100 to 220/220	CP7591	CP7591I5
0.53	25	20.00	-100 to 220/220	CP7594	

Pesticides Columns

Agilent J&W low-bleed columns are ideal for the analysis of pesticides. Not only do they possess less bleed than a standard polymer, which improves the signal-to-noise ratio and minimum detectable quantities, but they also have higher upper temperature limits which allow for faster run times. Agilent also offers several common phases with additional pesticide-specific testing to ensure performance for your application.

Note: For CLP pesticides and other methods using electron capture detectors, see DB-35ms, DB-17ms and DB-XLB.

DB-CLP 1 and DB-CLP 2

- Universal column pair designed for pesticides analyses
- EPA Methods: CLP (Contract Lab Program) pesticides, 504.1, 505, 508.1, 551, 552.3, 8081B, 8082A, 8154A
- Ideal for dual column, dual ECD GC analyses
- Mid polarity stabilized phases provide fast and low bleed reliable analyses
- Special testing includes pesticides for proof of performance and column to column reproducibility
- DB-CLP1 primary, DB-CLP2 confirmation

DB-CLP 1 and DB-CLP 2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.32	30	0.25	50 to 340/360	123-8232
	30	0.5	50 to 340/360	123-8336

TIPS & TOOLS

Check out Agilent's complete line of sample preparation products for any type of GC and GC/MS analysis at **www.agilent.com/chem/sampleprep**



VF-5 Pesticides

- Specially designed for the determination of trace levels of pesticide residue
- Highly inert for enhanced ECD and MS detection
- Tested with key pesticides including endrin and aldrin for optimal performance and consistency of results
- Low bleed

VF-5 Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	0.25	-60 to 325/350	CP9074
	50	0.25	-60 to 325/350	CP9073
0.32	30	0.25	-60 to 325/350	CP9075

DB-1701P

- Low/mid-polarity
- Exact replacement of HP-PAS1701
- Specifically designed and processed for the analysis of organochlorine pesticides
- ECD tested to ensure minimal pesticide breakdown and low ECD bleed
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-1701, Rtx-1701, BP-10, CB-1701, OV-1701, 007-1701, ZB-1701P

DB-1701P

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	0.25	-20 to 280/300	122-7732		122-7732LTM
0.32	25	0.25	-20 to 280/300	123-7722		123-7722LTM
	30	0.25	-20 to 280/300	123-7732	123-7732E	123-7732LTM
0.53	30	1.00	-20 to 260/280	125-7732		125-7732LTM

VF-1701 Pesticides

- Specially designed for the determination of trace levels of pesticide residues
- Columns individually tested with key pesticides, including endrin and aldrin
- Highly inert for improved detection limits for trace pesticide determination
- Proven performance with ECD or MS detection
- Ultra low bleed to improve sensitivity

VF-1701 Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	0.25	-20 to 280/300	CP9070
	50	0.25	-20 to 280/300	CP9072
0.32	30	0.25	-20 to 280/300	CP9071

CP-Sil 8 CB for Pesticides

- Linear column response down to femtogram level for improved productivity
- Excellent inertness – tested with DDTs to provide very reliable data
- Can be used with on-column injection techniques
- Integrated retention gap helps avoid problems with solvent condensation allowing repeated splitless injections without phase deterioration

CP-Sil 8 CB for Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.12	300/325	CP7481
0.53	50	0.25	300/325	CP7504

CP-Sil 19 CB for Pesticides

- Ideal as a confirmation column for reliable results
- Specified for EPA and CLP analytes for ultimate compliance
- Supplied with a coupled retention gap for on-column injection for best detection limits

CP-Sil 19 CB for Pesticides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	30	0.25	275/300	CP7406	
	50	0.20	275/300	CP7407	CP7407I5
0.32	30	0.25	275/300	CP7408	
0.53	30	1.00	260/275	CP7409	

DB-608

- Specifically designed for the analysis of chlorinated pesticides and PCBs
- U.S. EPA Methods: 608, 508, 8080
- Excellent inertness and recoveries without pesticide breakdown
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-608

Similar Phases: SPB-608, NON-PAKD Pesticide, 007-608

DB-608

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*0.18*	*40 to 280/300*	*121-6822*	*121-6822LTM*	*221-6822LTM*
0.25	30	0.25	40 to 280/300	122-6832	122-6832LTM	
0.32	30	0.50	40 to 280/300	123-1730	123-1730LTM	
0.45	30	0.70	40 to 260/280	124-1730	124-1730LTM	
0.53	15	0.83	40 to 260/280	125-1710	125-1710LTM	
	30	0.50	40 to 260/280	125-6837	125-6837LTM	
		0.83	40 to 260/280	125-1730	125-1730LTM	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-PAS5

- Non-polar
- Specifically designed and processed for the analysis of organochlorine pesticides
- ECD tested to ensure minimal pesticide breakdown and low ECD bleed
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: SPB-5, RSL-200, Rtx-5, BP-5, CB-5, OV-5, 007-2 (MPS-5), SE-52, SE-54, XTI-5, PTE-5, CC-5, ZB-5

HP-PAS5

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	25	0.52	-60 to 325/350	19091S-010	19091S-010LTM

Rapid-MS

- Equivalent to 5% phenyl, 95% dimethylpolysiloxane
- Fast analysis time improves productivity
- Reduce analysis time by 3-5x for temperature programmed, and up to a 10x for isothermal runs
- The film thickness from 0.1 to 1 µm ensures high loadability and higher sensitivity
- Low bleed

Note: Rapid-MS columns utilize the high optimal carrier gas velocity obtained when a separation is performed under reduced pressure for fast analysis times

Rapid-MS

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	10	0.12	-60 to 325/325	CP8131
		0.25	-60 to 325/325	CP8132
		0.50	-60 to 325/325	CP8133
		1.00	-60 to 325/325	CP8134

Restriction for Rapid-MS

Description	Part No.
Restriction for Rapid-MS, fused silica, 0.1 mm id, 0.6 m, 5/pk	CP8121

PAH Columns

Select PAH

- Full separation for all PAH isomers avoids false positives and inaccurate results
- Full separation of EPA PAHs in less than 7 minutes and EU PAHs in less than 30 minutes including separation of chrysene, triphenylene and benzofluoranthene (type b, j, and k)
- Fast results with no need for further analysis
- Low bleed enhances sensitivity

Select PAH

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.15	*15*	*0.10*	*40 to 325/350*	*CP7461*
0.25	30	0.15	40 to 325/350	CP7462

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-EUPAH

- Specially designed for analysis of EU regulated PAHs
- Individually tested with application-specific QC test probe mixture
- Great resolution of critical isomers, e.g. benzo(b,j,k)fluoranthenes
- Superb thermal stability for accurate analysis of high boiling PAHs, e.g. dibenzopyrenes
- Excellent signal-to-noise ratio
- Optimized column dimensions for proven performance

DB-EUPAH

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*0.14*	*40 to 320/340*	*121-9627*
0.25	60	0.25	40 to 320/340	122-96L2
0.32	15	0.25	40 to 320/340	123-9612

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Sil PAH CB UltiMetal

- Separates all 16 PAHs according to EPA Method 610
- High temperature, low bleed phase
- Virtually unbreakable UltiMetal capillary column
- Maximum temperature of 400/425 °C

CP-Sil PAH CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	25	0.12	400/425	CP7440

Semivolatiles Columns

Semivolatiles are usually extracted from soil samples or other environmental matrices. GC columns with precise retention time reproducibility and good mass spectrometer performance are key enablers for these often demanding analyses.

DB-UI 8270D for Semivolatiles

- Designed for EPA Method 8270D and other regulated GC/MS semivolatiles analysis
- Special semivolatiles testing ensures poof of column to column performance for trace level analysis
- Excellent 2,4-dinitrophenol response
- Ultra Inertness and Low bleed
- Available in convenient and economical 6 packs (6 for the price of 5)

DB-UI 8270D for Semivolatiles

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*0.36*	*-60 to 325/350*	*121-9723*
			-60 to 325/350	*621-9723, 6/pk**
0.25	30	0.25	-60 to 325/350	122-9732
			-60 to 325/350	622-9732, 6/pk*
		0.50	-60 to 325/350	122-9736

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

*Only available in the U.S.

CP-Sil 8 CB for PCB

- Engineered for the analysis of PCBs according to DIN method 51527
- Ideal for trace level ECD detection of PCBs
- High temperature stability provides low bleed and extended lifetime

CP-Sil 8 CB for PCB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.25	300/325	CP7482

DB-5.625

- Close equivalent to a (5%-Phenyl)-methylpolysiloxane
- Non-polar
- Specially processed to exhibit excellent inertness for EPA Semivolatiles Methods 625, 1625, 8270 and CLP protocols*
- Surpasses EPA performance criteria for semivolatiles
- Inert for base, neutral and acidic compounds
- High temperature limit with excellent thermal stability and low bleed
- Bonded and cross-linked
- Solvent rinsable

*Pentachlorophenol, 2,4-dinitrophenol, carbazole, and N-nitrosodiphenylamine used to test response factors.

Similar Phases: XTI-5, Rtx-5, PTE-5, BPX-5

DB-5.625

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.18	*20*	*0.18*	*-60 to 325/350*	*121-5621*	*121-5621LTM*
		0.36	*-60 to 325/350*	*121-5622*	*121-5622LTM*
0.25	30	0.25	-60 to 325/350	122-5631	122-5631LTM
		0.50	-60 to 325/350	122-5632	122-5632LTM
		1.00	-60 to 325/350	122-5633	122-5633LTM
	60	0.25	-60 to 325/350	122-5661	
0.32	30	0.25	-60 to 325/350	123-5631	123-5631LTM
		0.50	-60 to 325/350	123-5632	123-5632LTM

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



HP-5ms Semivolatile

- (5%-Phenyl)-methylpolysiloxane, identical selectivity to HP-5
- Non-polar
- Very low bleed characteristics, ideal for GC/MS
- Specifically tested for inertness for active compounds including acidic and basic compounds
- Improved signal-to-noise ratio for better sensitivity and mass spectral integrity
- Bonded and cross-linked
- Solvent rinsable
- Equivalent to USP Phase G27

Similar Phases: Rtx-5ms, Rxi-5ms, Rxi-5Sil MS, PTE-5, BPX-5, AT-5ms, ZB-5ms, SLB-5ms, Equity-6

HP-5ms Semivolatile

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.50	-60 to 325/350	19091S-139	19091S-139LTM

CP-Sil 5/C18 CB for PCB

- Engineered for high resolution PCB analysis
- Lower polarity than 100% polydimethylpolysiloxane due to its C_{18} substitution
- Provides high signal-to-noise ratios for ECD detectors
- Optimized column length for separation of critical isomer pairs: 28/31, 56/60, 149/118, 105/153/132 and 170/190

CP-Sil 5/C18 CB for PCB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.10	275/300	CP7477
	100	0.10	275/300	CP7476
0.32	100	0.10	275/300	CP7478

DB-Dioxin

- Specifically engineered for the analysis of polychlorinated dibenzodioxins (PCDDs) and dibenzofurans (PCDFs)
- Resolves 2,3,7,8-TCDD and 2,3,7,8-TCDF from all other isomers in one run
- Low bleed
- Bonded and cross-linked
- Solvent rinsable

Note: 100 psi regulator required to reach optimum carrier gas velocity

Similar Phases: SP-2331, 007-23, Rtx-2332, Rtx-Dioxin

DB-Dioxin

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	60	0.15	40 to 250/270	122-2461	122-2461E
		0.25	40 to 250/270	122-2462	
0.32	60	0.15	40 to 250/270	123-2461	
		0.25	40 to 250/270	123-2462	

CP-Sil 88 for Dioxins

- High polarity stationary phase with specific selectivity for dioxins and dibenzofuran separations
- Integrated retention gap eliminates leaks and extends column lifetime with splitless injections
- 2,3,7,8-TCDD can be determined at low concentrations
- For fast runtimes, thin film configurations are available with maximum temperature program limit of 270 °C

Similar Phases: SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

CP-Sil 88 for Dioxins

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	0.10	50 to 250/270	CP7497
	50	0.20	50 to 225/240	CP7588
	60	0.10	50 to 250/270	CP7498
0.32	60	0.13	50 to 250/270	CP7499

Volatiles Columns

Agilent offers a selection of advanced polymer chemistries for increasingly demanding volatiles applications. Whether for a primary analytical column or as a complementary confirmation column, Agilent J&W capillaries are chromatographers' first choice.

TIPS & TOOLS

Don't forget, we have special offers throughout the year.

To learn more, visit
www.agilent.com/chem/specialoffers

DB-624 Ultra Inert

- Environmental volatile organic compounds (VOCs) methods
- Excellent for U.S. EPA Methods: 501.3, 502.2, 503.1, 524.2, 601, 602, 8010, 8015, 8020,8240, 8260,
- Industrial chemical analyses – solvents, petrochemicals, specialty chemicals
- Food and beverage – alcohols, fusel oils
- Pharmaceutical residual solvents per USP <467>
- Ultra inertness processing expands application range with excellent peakshape for low molecular weight acidic compounds
- UI testing ensure premium performance column to column
- Identical selectivity to the industry standard DB-624 – upgrade with no change in method required
- Optimized by the inventors of DB-624

DB-624 Ultra Inert

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.18	*20*	*1*	*-20 to 260*	*121-1324UI*
0.25	30	1.4	-20 to 260	122-1334UI
	60	1.4	-20 to 260	122-1364UI
0.32	30	1.8	-20 to 260	123-1334UI
	60	1.8	-20 to 260	123-1364UI
0.53	30	3	-20 to 260	125-1334UI
	75	3	-20 to 260	125-1374UI

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

DB-624

- Specifically designed for the analysis of volatile priority pollutants and residual solvents
- No cryogenics needed for U.S. EPA Method 502.2
- Excellent for U.S. EPA Methods: 501.3, 502.2, 503.1, 524.2, 601, 602, 8010, 8015, 8020, 8240, 8260, and USP 467
- Excellent inertness for active compounds
- Bonded and cross-linked
- Solvent rinsable
- Exact replacement of HP-624
- Equivalent to USP Phase G43

Similar Phases: AT-624, Rxi-624 Sil MS, Rtx-624, PE-624, 007-624, 007-502, ZB-624

DB-624

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*1.00*	*-20 to 280*	*121-1324*	*121-1324E*	*121-1324LTM*	*221-1324LTM*
0.20	25	1.12	-20 to 260	128-1324	128-1324E	128-1324LTM	
0.25	30	1.40	-20 to 260	122-1334	122-1334E	122-1334LTM	222-1334LTM
	60	1.40	-20 to 260	122-1364	122-1364E		
0.32	30	1.80	-20 to 260	123-1334	123-1334E	123-1334LTM	
	60	1.80	-20 to 260	123-1364	123-1364E		
0.45	30	2.55	-20 to 260	124-1334		124-1334LTM	
	75	2.55	-20 to 260	124-1374			
0.53	15	3.00	-20 to 260	125-1314			
	30	3.00	-20 to 260	125-1334	125-1334E	125-1334LTM	
	60	3.00	-20 to 260	125-1364	125-1364E		
	75	3.00	-20 to 260	125-1374	125-1374E		

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Select 624 CB

- 6% cyanopropyl, 94% dimethylpolysiloxane
- EPA volatiles methods 524.2, 624 and 8015
- Specified by Pharmacopoeia V.3.3.9 for residual solvents
- Excellent column-to-column reproducibility
- Low bleed

Similar Phases: AT-624, Rtx-624, PE-624, 007-624, 007-502, ZB-624

CP-Select 624 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*0.84*	*265/280*	*CP7411*	*CP7411I5*
0.25	30	1.40	265/280	CP7412	
	60	1.40	265/280	CP7413	CP7413I5
0.32	30	1.80	265/280	CP7414	CP7414I5
	60	1.80	265/280	CP7415	CP7415I5
0.53	30	3.00	265/280	CP7416	CP7416I5
	75	3.00	265/280	CP7417	
	105	3.00	265/280	CP7418	

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

TIPS & TOOLS

As part of Agilent's ongoing commitment to be your partner in chromatography, we have created a series of GC Troubleshooting videos, featuring Daron Decker, GC Applications Specialist, and Herb Brooks, Agilent Service Engineer. To view the videos, visit **www.agilent.com/chem/gctroubleshooting**



DB-VRX

- Unique selectivity engineered for optimum resolution of volatiles analysis: U.S. EPA Methods 502.2, 524.2 and 8260
- 0.45 mm id columns provide more plates per meter compared to 0.53 mm id columns for the fewest coelutions for GC method (an industry first)*
- No subambient cooling required to resolve the six "gases"
- Fast run time:
  <30 minutes for optimum sample throughput
  <8 minutes with 0.18 mm id
- Low polarity
- Excellent peak shape
- Bonded and cross-linked
- Solvent rinsable

*Two coelutions: 1) m- and p-xylene, for which U.S. EPA does not require separation, and 2) 1,1,2,2-tetrachloroethane and o-xylene which are separated by detectors PID and ELCD, respectively. **Note to GC/MS analysts:** These coeluting compounds have different primary characteristic ions of 83 and 106, respectively.

Similar Phases: VOCOL, NON-PAKD, Rtx-Volatiles, PE-Volatiles, 007-624, Rtx-VRX, Rtx-VGC

DB-VRX

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.18	*20*	*1.00*	*-10 to 260*	*121-1524*		*121-1524LTM*	*221-1524LTM*
	40	*1.00*	*-10 to 260*	*121-1544*	*121-1544E*	*121-1544LTM*	
0.25	30	1.40	-10 to 260	122-1534		122-1534LTM	222-1534LTM
	60	1.40	-10 to 260	122-1564	122-1564E		
0.32	30	1.80	-10 to 260	123-1534		123-1534LTM	
	60	1.80	-10 to 260	123-1564	123-1564E		
0.45	30	2.55	-10 to 260	124-1534		124-1534LTM	
	75	2.55	-10 to 260	124-1574			

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

HP-VOC

- Selectivity engineered for U.S. EPA Methods 502.2, 524.2 and 8260
- Low polarity – slightly more polar than DB-VRX
- Excellent peak shape
- Bonded and cross-linked
- Solvent rinsable

Similar Phases: NON-PAKD, Rtx-Volatiles, PE-Volatiles, 007-624, Rtx-VRX, Rtx-VGC

HP-VOC

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module	5975T LTM Toroid
0.20	30	1.10	-60 to 280/290	19091R-303	19091R-303LTM	29091R-303LTM
	60	1.10	-60 to 280/290	19091R-306		
0.32	60	1.80	-60 to 280/290	19091R-316		
	90	1.80	-60 to 280/290	19091R-319		
0.53	90	3.00	-60 to 280/290	19095R-429		
	105	3.00	-60 to 280/290	19095R-420		

DB-502.2

- Available in 105 m for volatiles analyses
- Excellent peak shape
- Bonded and cross-linked
- Solvent rinsable

DB-502.2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	60	1.40	0 to 260/280	122-1464
0.32	60	1.80	0 to 260/280	123-1464
0.45	75	2.55	0 to 260/280	124-1474
	105	2.55	0 to 260/280	124-14A4
0.53	105	3.00	0 to 260/280	125-14A4

DB-MTBE

- Low polarity stationary phase
- Resolves MTBE from 2-methylpentane and 3-methylpentane for better quantitation
- Engineered for purge and trap injection without the need for cryofocusing
- Bonded and cross-linked
- Solvent rinsable

DB-MTBE

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.45	30	2.55	35 to 260/280	124-0034		124-0034LTM
0.53	30	3.00	35 to 260/280	125-0034	125-0034E	125-0034LTM

CP-Select CB for MTBE

- Engineered for analysis of MTBE in reformulated gasoline
- Unique selectivity for MTBE
- Broad dynamic range for quantification of MTBE
- Ideal as primary or confirmation column

CP-Select CB for MTBE

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.25	200/200	CP7528

DB-TPH

- Specifically designed for the analysis of total petroleum hydrocarbons (TPHs), soil analysis, and LUFT
- Three analyses in one injection – gas range organics, diesel range organics and motor oil
- Fast run time
- Bonded and cross-linked
- Solvent rinsable

DB-TPH

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	30	0.25	-10 to 320	123-1632	123-1632LTM
0.45	30	1.00	-10 to 290	124-1632	

TIPS & TOOLS

For a precision cut on your capillary column, use Agilent's GC column cutting tool (P/N 5183-4620).



Select Mineral Oil

- Stabilized non-polar bonded phase engineered for fast mineral oil analysis
- Optimized selectivity for reliable Total Petroleum Hydrocarbon (TPH) results per DIN H53 N-ISO 9377-2 methods
- C_4 to C_{40} hydrocarbons can be analyzed in less than ten minutes
- Low bleed
- Available in Fused Silica or UltiMetal
- Fast run time
- High temperature stability up to 375/400 °C
- Available in economical 3 and 6 packs

Note: For optimal injection performance, use the 4 m x 0.53 mm id retention gap

Similar Phases: Rtx-Mineral Oil

Select Mineral Oil

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	Unit	7 in Cage	5 in Cage
0.32	15	0.10	-60 to 390/400	1/pk	CP7491	CP7491I5
	15	0.10	-60 to 390/400	3/pk	CP749103	
	15	0.10	-60 to 390/400	6/pk	CP749106	
Retention gap						
0.53	4		-60 to 325/350	3/pk	CP8015	

Select Mineral Oil UltiMetal

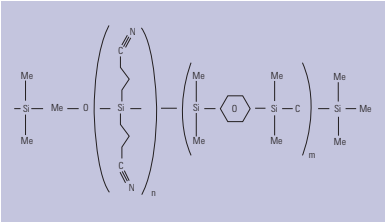
ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.32	15	0.10	-60 to 390/400	CP7493

TIPS & TOOLS

Ensure highest quality gas while keeping gas lines clean and leak-free with Agilent's high-capacity gas filter. Learn more at **www.agilent.com/chem/gasclean**







Structure of HP-88

Food, Flavors and Fragrances Columns

Food and flavor analyses place stringent demands on capillary columns. Samples have many components that are difficult to resolve and column-to-column reproducibility becomes critical. Agilent J&W GC columns are ideal for meeting these needs. Our rigorous quality control specifications and extensive QC testing ensure that the column you buy today will perform just like the column you buy tomorrow.

HP-88

- (88%-Cyanopropyl)aryl-polysiloxane
- 250/320 °C upper temperature limits
- High polarity
- Designed for separation of cis-trans fatty acid methyl esters (FAMEs)
- Even better separation than DB-23 of cis-trans isomers

Similar Phases: SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

HP-88

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	100	0.25	0 to 250/260	112-88A7	112-88A7E	
	60	0.20	0 to 250/260	112-8867	112-8867E	
	30	0.20	0 to 250/260	112-8837	112-8837E	112-8837LTM

CP-Sil 88

- High selectivity towards positional and geometric isomers for ease-of-use
- Highly substituted cyanopropyl phase
- Highest polarity, non-chemically bonded and stabilized

Similar Phases: SP-2560, SP-2340, SP-2330, BPX-70, BPX-90

CP-Sil 88

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.20	50 to 225/240	CP6172	CP6172I5
	50	0.20	50 to 225/240	CP6173	CP6173I5
0.32	25	0.20	50 to 225/240	CP6174	CP6174I5
	50	0.20	50 to 225/240	CP6175	

TIPS & TOOLS

Order your free GC troubleshooting and GC column installation posters at **www.agilent.com/chem/GCposteroffer**



Select FAME

- Tuned for optimal cis-tans separation of FAMEs, especially C_{18} isomers
- Excellent peak shape and separation for FAME isomers – especially if one component is present at a higher concentration
- Bonded and cross-linked
- Low bleed
- High efficiency and column loadability
- Column length up to 200 m available for detailed analysis of the C_{18}:1 isomer cluster

Select FAME

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	50	275/290	CP7419	CP7419I5
	100	275/290	CP7420	CP7420I5
	200	275/290	CP7421	

CP-Sil 88 for FAME

- Optimized for analysis of FAME cis/trans isomers
- High polarity stationary phase provides improved efficiency and higher productivity
- Use for FAME separations in the C_6 to C_{26} range

CP-Sil 88 for FAME

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	50	0.20	225/240	CP7488
	60	0.20	225/240	CP7487
	100	0.20	225/240	CP7489

CP-Wax 57 CB

- Unique high polarity bonded wax column
- Industry proven for the analysis of alcohols in the brewing and wine/spirits industry
- Excellent inertness for optimum peak shape of alcohols and glycols
- Offered in 0.15 mm id for significantly high speed throughput

Similar Phases: SUPELCOWAX 10, SUPEROX II, CB-WAX, Stabilwax, BP-20, 007-CW, Carbowax, Rtx-WAX, ZB-WAX

CP-Wax 57 CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*15*	*0.12*	*20 to 200/225*	*CP97711*	*CP97711I5*
	30	*0.12*	*20 to 200/225*	*CP97721*	
0.25	25	0.20	20 to 200/225	CP97713	
	50	0.20	20 to 200/225	CP97723	CP97723I5
	60	0.40	20 to 200/225	CP8120	
0.32	25	0.20	20 to 200/225	CP97743	
		1.20	20 to 200/225	CP97763	CP97763I5
	50	0.20	20 to 200/225	CP97753	CP97753I5
		1.20	20 to 200/225	CP97773	CP97773I5
0.53	25	1.00	20 to 200/225	CP97638	CP97638I5
	25	2.00	20 to 200/225	CP97658	CP97658I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

CP-Carbowax 400 for Volatiles in Alcohol

- Designed for the analysis of volatiles in alcoholic beverages
- High resolution for amyl alcohols for accurate quality control
- High efficiency
- Special testing ensure performance and column-to-column reproducibility

CP-Carbowax 400 for Volatiles in Alcohol

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	50	0.20	60/80	CP7527	CP7527I5

CP-Wax 57 CB for Glycols and Alcohols

- Optimized for the analysis of glycols, diols and alcohols
- Unique, high polarity wax phase
- Symmetrical peaks providing the most accurate results
- Cross-linked and bonded phase delivers robustness and enhanced column lifetime

CP-Wax 57 CB for Glycols and Alcohols

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	200/200	CP7615	CP7615I5
0.53	25	0.50	225/250	CP7617	CP7617I5

CP-TAP CB for Triglycerides

- Engineered phase for detailed analysis of triglycerides
- Separates complete triglyceride pattern in less than 16 minutes
- Separation based on carbon number and degree of unsaturation
- Stabilized phase for low bleed and enhanced column lifetime
- Available in Fused Silica and UltiMetal

CP-TAP CB for Triglycerides

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	25	0.10	350/360	CP7483

CP-TAP CB UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	25	0.10	355/370	CP7463

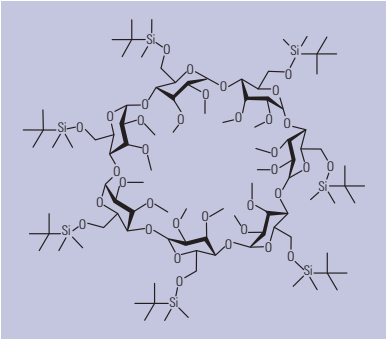
CP-FFAP CB for Free Fatty Acids in Dairy Products

- Ideal for flavors, aromas and free fatty acids C_1 to C_{26}
- Separates C_2-C_{24} acids in one run without derivatization
- Chemically-bonded for excellent longevity
- Water and solvent resistant

CP-FFAP CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.15	*25*	*0.25*	*250/275*	*CP7686*	*CP7686I5*
0.32	25	0.30	250/275	CP7485	CP7485I5
0.53	25	1.00	250/275	CP7486	CP7486I5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers



Structure of CycloSil-B

CycloSil-B

- 30% heptakis (2,3-di-O-methyl-6-O-t-butyl dimethylsilyl)-β-cyclodextrin in DB-1701
- Chiral separations without chiral-specific derivatization
- New stationary phase for improved resolution of many chiral separations
- Ideal for many chiral γ-lactones and terpenes

Note: Because CycloSil-B GC columns are not bonded or cross-linked, we do not recommend solvent rinsing.

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

CycloSil-B

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	35 to 260/280	112-6632	112-6632LTM
0.32	30	0.25	35 to 260/280	113-6632	113-6632LTM

Cyclodex-B

- 10.5% β-cyclodextrin in DB-1701
- Chiral separations without chiral-specific derivatization
- Broad range of resolving potential
- Excellent peak shape

Note: Because Cyclodex-B GC columns are not bonded or cross-linked, we do not recommend solvent rinsing.

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

Cyclodex-B

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	0.25	50 to 230/250	112-2532	112-2532E	112-2532LTM
	60	0.25	50 to 230/250	112-2562		
0.32	30	0.25	50 to 230/250	113-2532	113-2532E	113-2532LTM

HP-Chiral β

- β-cyclodextrin in (35%-Phenyl)-methylpolysiloxane
- Chiral separations without chiral-specific derivatization
- Phenyl-based polymer provides low bleed and does not interfere with nitrogen-specific detectors
- Available in two concentrations of β-cyclodextrin: 10% and 20%
- 20% β-cyclodextrin best choice for initial screening

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

HP-Chiral β

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
HP-Chiral 10β					
0.25	30	0.25	30 to 240/250	19091G-B133	
0.32	30	0.25	30 to 240/250	19091G-B113	
HP-Chiral 20β					
0.25	30	0.25	30 to 240/250	19091G-B233	19091G-B233E
0.32	30	0.25	30 to 240/250	19091G-B213	19091G-B213E

CP-Chirasil Val

- Designed for separations of optically active compounds including amino acids
- Both antipode phases are available (D and L) for maximum versatility
- Stabilized chiral phase, over 50% cross-linked for longevity
- Tested for separation of amino acid enantiomers
- Low bleed

Note: On Chirasil-L Val, D-amino acids elute before the L-amino acids, while on Chirasil-D-Val, this elution order is reversed. This is especially valuable when determining the optical purity of these compounds. Selecting the column from which the minor compound elutes before the major enantiomers results in the lowest detection levels.

CP-Chirasil Val

Description	ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
Antipode D	0.25	25	0.08	200/200	CP7494	CP7494I5
Antipode L	0.25	25	0.12	200/200	CP7495	CP7495I5

CP-Chirasil-Dex CB

- Cyclodextrin bonded to dimethylpolysiloxane for homogeneous enantioselectivity throughout the column
- High resolution factor between isomers across a broad application range
- Chemically bonded phase for excellent longevity
- No need for derivatization improved productivity
- Low elution temperature of polar compounds
- Suitable for all injection techniques

Similar Phases: LIPODEX C, Rt-β DEXm, β-DEX 110, β-DEX 120

CP-Chirasil-Dex CB

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	200/200	CP7502	CP7502I5
0.32	25	0.25	200/200	CP7503	CP7503I5

CP-Cyclodextrin-β-2,3,6-M-19

- Unique selectivity for optical and positional isomer separations
- High efficiency enables wide range of applications
- Separates o-,m-, and p-xylenes
- Excellent peak shape for underivatized polar compounds

CP-Cyclodextrin-β-2,3,6-M-19

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	0.25	225/250	CP7500	CP7500I5
0.32	50	0.25	225/250	CP7501	

TIPS & TOOLS

Agilent CrossLab GC supplies, including CrossLab Ultra Inert liners, perform seamlessly with a variety of instruments regardless of make or model, including Varian (now Bruker), PerkinElmer, Shimadzu, and Thermo Scientific GC systems. Learn more at **www.agilent.com/chem/CrossLab**



Life Sciences Columns

The life sciences offer some difficult challenges to capillary GC chromatographers. These include complex sample matrices, the necessity for low level detection and the chemically active characteristics of many of the samples. In response to this, Agilent offers a line of columns which are designed specifically for drugs of abuse testing.

DB-ALC1 and DB-ALC2

- Reliable blood alcohol analysis
- Optimized primary and confirmation column pair for U.S. blood alcohol analysis
- Faster GC run times
- Improved resolution of key ethanol/acetone peaks
- Available in 0.32 and 0.53 mm id
- Bonded and cross-linked

Similar Phases: Rtx-BAC1, Rtx-BAC2, ZB-BAC-1, ZB-BAC-2

DB-ALC1 and DB-ALC2

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
DB-ALC1						
0.32	30	1.80	20 to 260/280	123-9134		123-9134LTM
0.53	30	3.00	20 to 260/280	125-9134	125-9134E	125-9134LTM
DB-ALC2						
0.32	30	1.20	20 to 260/280	123-9234	123-9234E	123-9234LTM
0.53	30	2.00	20 to 260/280	125-9234		125-9234LTM

VF-DA

- Engineered for drugs of abuse confirmation testing
- High recovery for trace level analysis and excellent resistance to direct methanol injections
- Ultra low bleed

VF-DA

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.20	12	Optimized	-60 to 325/350	CP8964

HP-Blood Alcohol

- Reliable blood alcohol analysis
- Excellent confirmation column with DB-ALC2 for method using t-butanol as internal standard

Similar Phases: Aucune

HP-Blood Alcohol

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	7.5	2.00	-60 to 270/290	19091S-510	19091S-510E	19091S-510LTM

DB-5ms EVDX

- Specially configured and tested for drugs of abuse confirmation
- Drug test mix included: caffeine, glutethimide, lidocaine, phenobarbital, EDDP, methaqualone, methadone, cocaine, desipramine, carbamazepine
- DB-5ms EVDX is equivalent to (5%-Phenyl)-methylpolysiloxane
- Consistent retention and peak shape
- Low bleed for GC/MS analysis
- Bonded and cross-linked
- Solvent rinsable

DB-5ms EVDX

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.20	25	0.33	-60 to 325/350	128-8522

DB-Select 624 UI for <467>

- Engineered to optimize pharmaceutical residual solvents analysis per USP Method <467>
- Ultra Inertness and low bleed
- Resolution of USP regulated critical pairs, also separates benzene and 1,2-dichloroethane
- Identical selectivity to the popular VF-624 ms – upgrade with no changes in method.
- UI testing ensures premium performance column to column

DB-Select 624 UI for <467>

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	30	1.4	40 to 260/260	122-0334UI
	60	1.4	40 to 260/260	122-0364UI
0.32	30	1.8	40 to 260/260	123-0334UI
	60	1.8	40 to 260/260	123-0364UI
0.53	30	1.8	40 to 260/260	125-0334UI

HP-Fast Residual Solvent

- Equivalent to USP Phase G43
- Thinner film reduces run time by 2.5 times and increases Minimum Detection Limit (MDL) by 2 times compared to standard film thickness used for this method
- Bonded and cross-linked

Similar Phases: PE-624, 007-624, 007-502, ZB-624

HP-Fast Residual Solvent

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	30	1.00	-20 to 260	19095V-420	19095V-420E	19095V-420LTM

Metal Columns

DB-ProSteel and UltiMetal columns are engineered to combine the robustness of stainless steel with advanced surface deactivation for excellent peak shape.

- Configured for high temperature analyses such as simulated distillation
- Wide variety of stationary phases and configurations available
- Ideal for portable and process GC applications
- Superior replacement for MXT/Silco-steel columns

Metal Columns

Phase	ID (mm)	Length (m)	Film (µm)	7 in Cage	5 in Cage
Simulated distillation/high temperature					
DB-HT SimDis	0.53	5	0.10	145-1009	
			0.15	145-1001	
DB-PS2887	0.53	10	3.00	145-2814	
CP-SimDist UltiMetal	0.53	5	0.09	CP7569	CP7569I5
			0.17	CP7532	CP7532I5
			0.88	CP7570	
			2.65	CP7571	
		10	0.06	CP6540	
			0.17	CP7542	CP7542I5
			0.53	CP7592	
			0.88	CP7512	
			1.20	CP7562	
			2.65	CP7582	
			5.00	CP7572	
		20	0.11	CP7593	
		25	0.06	CP6550	
VF-5ht UltiMetal	0.25	15	0.10	CP9090	
	0.32	15	0.10	CP9094	CP9094I5
	0.25	30	0.10	CP9092	
	0.32	30	0.10	CP9096	

(Continued)

Metal Columns

Phase	ID (mm)	Length (m)	Film (µm)	7 in Cage	5 in Cage
Simulated distillation/high temperature					
VF-5ht UltiMetal with Retention Gap UltiMetal	0.25	15	0.10	CP9091	
	0.32	15	0.10	CP9095	
	0.25	30	0.10	CP9093	
	0.32	30	0.10	CP9097	
Standard phases and PEG					
DB-PS1	0.53	15	0.15	145-1011	
		30	1.50	145-1032	
CP-Sil 5 CB	0.53	10	0.50	CP7125	
			1.00	CP7120	
			2.00	CP7150	
			5.00	CP6666	CP6666I5
		25	0.50	CP7135	CP7135I5
			1.00	CP7130	
			2.00	CP7160	
			5.00	CP6670	
		50	0.50	CP7195	
			1.00	CP7140	
			2.00	CP7170	
			5.00	CP6671	
DB-HT SimDis	0.53	5	0.10	145-1009	
			0.15	145-1001	
DB-PS2887	0.53	10	3.00	145-2814	
CP-SimDist UltiMetal, 6/pk	0.53	5	0.09	CP67569	
CP-SimDist UltiMetal	0.53	5	0.09	CP7569	
			0.17	CP7532	
			0.88	CP7570	
			2.65	CP7571	
		10	0.06	CP6540	
			0.17	CP7542	
			0.53	CP7592	
			0.88	CP7512	
			1.20	CP7562	
			2.65	CP7582	
			5.00	CP7572	
		20	0.11	CP7593	
		25	0.06	CP6550	

(Continued)

Metal Columns

Phase	ID (mm)	Length (m)	Film (µm)	7 in Cage	5 in Cage
Standard phases and PEG					
CP-Sil 8 CB UltiMetal	0.53	10	1.00	CP7121	
		25	5.00	CP6680	
		50	5.00	CP7196	
				CP6681	
CP-Sil 13 CB UltiMetal	0.53	25	1.00	CP7141	
		50	0.50	CP7129	
DB-PSWAX	0.53	30	1.00	145-7032	
CP-WAX 52 CB UltiMetal	0.53	10	1.00	CP7148	
			2.00	CP7177	
		25	0.50	CP7138	
			1.00	CP7158	
			2.00	CP7178	
		50	0.50	CP7198	
			1.00	CP7168	
			2.00	CP7179	
PLOT columns					
PoraPLOT Q UltiMetal	0.53	10	20.00	CP6953	CP6953I5
		25	20.00	CP6954	CP6954I5
		50	20.00	CP6955	
CP-Al2O3/KCl UltiMetal	0.53	50	10.00	CP6918	
CP-Al2O3/Na2SO4 UltiMetal	0.53	50	10.00	CP6968	
CP-Molsieve 5Å UltiMetal	0.53	10	50.00	CP6937	
		25	50.00	CP6938	CP6938I5
		50	50		CP6937I5
Select application columns					
DB-PS624	0.53	30	3.00	145-1334	
CP-Sil PAH CB UltiMetal	0.25	25	0.12	CP7440	
CP-TAP CB	0.25	25	0.10	CP7463	
Select Biodiesel With retention gap	0.32	10	0.10	CP9076	
		15	0.10	CP9078	
Select Biodiesel	0.32	10	0.10	CP9077	
		15	0.10	CP9079	



PLOT Columns

PLOT columns are ideal for separating compounds that are gases at room temperatures. Agilent Technologies offers a comprehensive line of PLOT columns for analysis of fixed gases, low molecular weight hydrocarbon isomers, volatile polar compounds and reactive analytes such as sulfur gases, amines and hydrides. Our PLOT phases are offered in dimensions from 0.25 to 0.53 mm id, allowing for easy column selection for various detector and system requirements. For GC/MS systems, we offer several small diameter columns with truly bonded and immobilized stationary phases, eliminating potential detector fouling due to particle generation.

PoraBOND Q

- Bonded PLOT column for more reliable results for analysis of volatile solvents and hydrocarbons
- Extended analysis offers broad application range
- 300/320 °C temperature limits
- Engineered for high stability, withstands repeated water injections
- Proprietary manufacturing technique results in very pure porous polymer with virtually no catalytic activity, allowing operation to 320 °C without decomposition
- Bonding technology results in greatly reduced particle shedding, reduces the needs for particle traps

Similar Phases: Rt-Q BOND, Rt-QPLOT, SupelQ PLOT

PoraBOND Q

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	10	3.00	-100 to 300/300	CP7347	CP7347I5
	25	3.00	-100 to 300/320	CP7348	CP7348I5
0.32	10	5.00	-100 to 300/320	CP7350	CP7350I5
	25	5.00	-100 to 300/320	CP7351	CP7351I5
	50	5.00	-100 to 300/320	CP7352	CP7352I5
0.53	10	10.00	-100 to 300/320	CP7353	CP7353I5
	25	10.00	-100 to 300/320	CP7354	CP7354I5
	50	10.00	-100 to 300/320	CP7355	

PoraBOND U



- Highly stable polar-bonded porous polymer with maximum operating temperature of 300 °C
- Reduced bleed for low detection limits and fast stabilization time
- Bonded PLOT column for excellent longevity
- Ideal for use with method that pressure programs or valve switching

Similar Phases: Rt-U-BOND

PoraBOND U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.25	10	3.00	-100 to 300/300	CP7347

PoraPLOT Q and PoraPLOT Q-HT

- Recommended for column switching systems that analyze a broad range of polar and apolar volatile compounds
- Water elutes as a sharp peak enabling quantitation
- Retention of target compounds is not influenced by water in the sample
- Long term stability provides repeatable retention times
- Available in Fused Silica and UltiMetal

Similar Phases: Rt-Q BOND, Rt-QPLOT, SupelQ PLOT

PoraPLOT Q

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	10	8.00	-100 to 250/250	CP7548	
	25	8.00	-100 to 250/250	CP7549	CP7549I5
0.32	10	10.00	-100 to 250/250	CP7550	CP7550I5
	25	10.00	-100 to 250/250	CP7551	CP7551I5
	50	10.00	-100 to 250/250	CP7552	
0.53	10	20.00	-100 to 250/250	CP7553	CP7553I5
	25	20.00	-100 to 250/250	CP7554	CP7554I5
	50	20.00	-100 to 250/250	CP7555	

PoraPLOT Q UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	20.00	-100 to 250/250	CP6953	CP6953I5
	25	20.00	-100 to 250/250	CP6954	CP6954I5
	50	20.00	-100 to 250/250	CP6955	

PoraPLOT Q-HT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.32	10	10.00	-100 to 290/290	CP7556	
	25	10.00	-100 to 290/290	CP7557	CP7557I5
0.53	10	20.00	-100 to 290/290	CP7558	CP7558I5
	25	20.00	-100 to 290/290	CP7559	CP7559I5

HP-PLOT Q

- Bonded polystyrene-divinylbenzene based column
- Polarity between Porapak-Q and Porapak-N
- Excellent column for C_1 to C_3 isomers and alkanes to C_{12}, CO_2, methane, air/CO, oxygenated compounds, sulfur compounds and solvents
- Replaces packed gas-solid columns
- Separates ethane, ethylene and ethyne (acetylene)
- Improved resolution in less time than conventional packed columns
- Minimal conditioning time required – 1 hour
- Preferred "Q" column due to its robust nature

Similar Phases: Rt-QPLOT, SupelQ PLOT

HP-PLOT Q

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	20.00	-60 to 270/290	19091P-Q03		19091P-Q03LTM
	30	20.00	-60 to 270/290	19091P-Q04	19091P-Q04E	19091P-Q04LTM
0.53	15	40.00	-60 to 270/290	19095P-Q03	19095P-Q03E	19095P-Q03LTM
	30	40.00	-60 to 270/290	19095P-Q04	19095P-Q04E	19095P-Q04LTM

GS-Q

- Porous divinylbenzene homopolymer
- Polarity between Porapak-Q and Porapak-N
- Separates ethane, ethylene and ethyne (acetylene)
- Not recommended for quantification of polar compounds
- Minimal conditioning time required – 1 hour

Similar Phases: Rt-QPLOT, SupelQ PLOT

GS-Q

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	30	-60 to 250	113-3432	113-3432E	113-3432LTM
0.53	10	-60 to 250	115-34H2		115-34H2LTM
	15	-60 to 250	115-3412		115-3412LTM
	25	-60 to 250	115-3422		115-3422LTM
	30	-60 to 250	115-3432	115-3432E	115-3432LTM

TIPS & TOOLS

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

PoraPLOT U and PoraPLOT S

- The most polar porous polymer PLOT column ideal for halogenated compounds, C_1-C_6 hydrocarbons, ketones and solvents
- Excellent peak shape of polar and non-polar volatiles
- Water has no effect on retention times and elutes as a sharp quantifiable peak
- Reliable retention time repeatability

PoraPLOT U

Similar Phases: Rt-U-BOND

PoraPLOT U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	8.00	-100 to 190/190	CP7579	
0.32	10	10.00	-100 to 190/190	CP7580	
	25	10.00	-100 to 190/190	CP7581	
0.53	10	20.00	-100 to 190/190	CP7583	CP7583I5
	25	20.00	-100 to 190/190	CP7584	CP7584I5

PoraPLOT S

- Divinylbenzene/vinylpyridine polymer for hydrocarbons and ketones
- Ideal for the analysis of medium polarity volatile including hydrocarbons and ketones
- Higher temperature limit than PoraPLOT U

Similar Phases: Rt-S-BOND, MXT-SBOND

PoraPLOT S

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	25	20.00	-100 to 250/250	CP7574	CP7574I5

HP-PLOT U

- Bonded divinylbenzene/ethylene glycol dimethacrylate
- More polar than HP-PLOT Q
- Excellent column for C_1 to C_7 hydrocarbons, CO_2, methane, air/CO, water, oxygenates, amines, solvents, alcohols, ketones, and aldehydes
- Improved resolution in less time than conventional packed columns

Similar Phases: RTU PLOT

HP-PLOT U

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	30	10.00	-60 to 190	19091P-U04	19091P-U04E	19091P-U04LTM
0.53	15	20.00	-60 to 190	19095P-U03		19095P-U03LTM
	30	20.00	-60 to 190	19095P-U04	19095P-U04E	19095P-U04LTM

HP-PLOT Al_2O_3 KCl

- Least "polar" Alumina phase
- Aluminum oxide deactivated with KCl
- Standard column choice for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Low retention of olefins relative to comparable paraffin
- Excellent for quantitation of dienes, especially propadiene and butadiene from ethylene and propylene streams
- Recommended phase for many ASTM methods
- Preferred KCl deactivated Alumina

Similar Phases: Rt-Alumina PLOT, Alumina PLOT, Al_2O_3/KCl, AB-PLOT Al_2O_3 KCl, AT-Alumina

HP-PLOT Al_2O_3 KCl

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	5.00	-60 to 200	19091P-K33	19091P-K33E	19091P-K33LTM
0.32	50	8.00	-60 to 200	19091P-K15	19091P-K15E	
0.53	30	15.00	-60 to 200	19095P-K23		19095P-K23LTM
	50	15.00	-60 to 200	19095P-K25	19095P-K25E	

GS-Alumina KCl

- Least "polar" Alumina phase
- Aluminum oxide deactivated with KCl
- Good choice for light hydrocarbon analysis
- Good resolution of propadiene and butadiene from ethylene and propylene streams

Similar Phases: Al_2O_3/KCl, Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, AB-PLOT Al_2O_3 KCl, AT-Alumina

GS-Alumina KCl

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	30	-60 to 200	115-3332		115-3332LTM
	50	-60 to 200	115-3352	115-3352E	

CP-Al_2O_3/KCl and CP-Al_2O_3/Na_2SO_4

- Aluminum oxide PLOT columns offer high selectivity for separating ppm levels of C_1-C_5 hydrocarbons in process streams
- High capacity thick films
- No need for sub-ambient cooling
- Choice of two selectivities covers a broad range of applications
- Available in Fused Silica and UltiMetal

Note: The KCl deactivation salt results in a relatively apolar Al_2O_3 surface while the Na_2SO_4 deactivation provides a polar surface. Unsaturated compounds such as ethylene and acetylene (ethyne) are retained longer.

Selectivity Through KCl or Na_2SO_4 Deactivation

Note: Aluminum oxide PLOT columns are deactivated using KCl or NA_2SO_4 treatments which provides a reproducible and stable deactivation up to 200 °C. The KCl salt deactivation results in a relatively apolar Al_2O_3 surface, while the NA_2SO_4 deactivation provides a polar surface. Unsaturated compounds such as ethylene and acetylene (ethyne) are retained longer.

Similar Phases: Al_2O_3/KCl, Rt-Alumina PLOT, Alumina PLOT, RT-Alumina BOND/KCl , Alumina chloride PLOT, AB-PLOT Al_2O_3 KCl

CP-Al_2O_3/KCl

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	4.00	-100 to 200/200	CP7576	
	50	4.00	-100 to 200/200	CP7577	CP7577I5
0.32	10	5.00	-100 to 200/200	CP7511	CP7511I5
	50	5.00	-100 to 200/200	CP7515	CP7515I5
	25	5.00	-100 to 200/200	CP7519	CP7519I5
0.53	10	10.00	-100 to 200/200	CP7516	
	25	10.00	-100 to 200/200	CP7517	
	50	10.00	-100 to 200/200	CP7518	

CP-Al_2O_3/KCl UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	50	10.00	-100 to 200/200	CP6918

Similar Phases: Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, Rt-Alumina BOND/Na_2SO_4, MXT-AluminaBOND/Na_2SO_4, Alumina sulfate PLOT

CP-Al_2O_3/Na_2SO_4

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	4.00	-100 to 200/200	CP7586	
	50	4.00	-100 to 200/200	CP7587	
0.32	10	5.00	-100 to 200/200	CP7561	
	50	5.00	-100 to 200/200	CP7565	CP7565I5
0.53	25	10.00	-100 to 200/200	CP7567	
	50	10.00	-100 to 200/200	CP7568	

CP-Al_2O_3/Na_2SO_4 UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	50	10.00	-100 to 200/200	CP6968



HP-PLOT Al_2O_3 S

- Middle range of "polarity" for Alumina phases
- Aluminum oxide deactivated with sodium sulfate
- Excellent general use column for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Best for resolving acetylene from butane and propylene from isobutane

Similar Phases: Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, Rt-Alumina BOND/Na_2SO_4, MXT-AluminaBOND/Na_2SO_4, Alumina sulfate PLOT, AT-Alumina

HP-PLOT Al_2O_3 S

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	30	5.00	-60 to 200	19091P-S33		19091P-S33LTM
0.32	25	8.00	-60 to 200	19091P-S12		19091P-S12LTM
	50	8.00	-60 to 200	19091P-S15	19091P-S15E	
0.53	15	15.00	-60 to 200	19095P-S21		19095P-S21LTM
	30	15.00	-60 to 200	19095P-S23		19095P-S23LTM
	50	15.00	-60 to 200	19095P-S25	19095P-S25E	

GS-Alumina



- Most "polar" Alumina phase
- Aluminum oxide with proprietary deactivation
- Excellent general use column for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Separates C_1 to C_4 saturated and unsaturated hydrocarbons
- Best for resolving cyclopropane from propylene
- Faster, more efficient and provides more sensitivity than packed equivalents
- Minimal conditioning time required
- Preferred substitution for sodium sulfate deactivated Alumina because of its regenerative nature

Note: Alumina columns have a tendency to adsorb water and CO_2 which, over time, results in changes in retention time. We use an advanced, proprietary deactivation process which allows for rapid regeneration. Fully water saturated GS-Alumina columns regenerate in 7 hours or less at 200 °C.

Similar Phases: Al_2O_3/KCl, Al_2O_3/Na_2SO_4, Rt-Alumina PLOT, Alumina PLOT, AB-PLOT Al_2O_3 KCl, AT-Alumina

GS-Alumina

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.53	30	-60 to 200	115-3532	115-3532E	115-3532LTM
	50	-60 to 200	115-3552		

HP-PLOT Al_2O_3 M

- Most "polar" Alumina phase (similar to GS-Alumina)
- Aluminum oxide deactivated with proprietary deactivation
- Good general use column for light hydrocarbon analysis – C_1 to C_8 hydrocarbon isomers
- Good for resolving acetylene from butane and propylene from isobutane

Similar Phases: AB-PLOT Al_2O_3 M, BGB-PLOT Al_2O_3 M, AT-Alumina

HP-PLOT Al_2O_3 M

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	50	8.00	-60 to 200	19091P-M15	19091P-M15E	
0.53	30	15.00	-60 to 200	19095P-M23		19095P-M23LTM
	50	15.00	-60 to 200	19095P-M25		

GS-GasPro

- Unique bonded silica PLOT column technology
- Excellent choice for light hydrocarbons and sulfur gases
- Retention stability not affected by water
- Separates CO and CO_2 on a single column
- Ideal PLOT column for GC/MS – no particles

Similar Phases: CP-Silica PLOT

GS-GasPro

ID (mm)	Length (m)	Temp Limits (°C)	7 in Cage
0.32	5	-80 to 260/300	113-4302
	15	-80 to 260/300	113-4312
	30	-80 to 260/300	113-4332
	60	-80 to 260/300	113-4362

CP-SilicaPLOT

- No influence of water on retention times
- Elution of CO_2 and sulfur gases at ppm levels
- Separates cyclopropane from propylene
- Ideal for a wide range of applications such as COS in ethylene, freons, hydrocarbons, propylene and sulfur compounds
- High selectivity for C_1-C_4 isomers in the presence of water
- No negative influence on retention or peak shape when water is present in the sample
- Inert surface preparation results in no decomposition pentadienes or freons

Similar Phases: GS-GasPro

CP-SilicaPLOT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	30	3.00	-80 to 225/225	CP8564	
	60	3.00	-80 to 225/225	CP8565	
0.32	10	4.00	-80 to 225/225	CP8574	
	15	4.00	-80 to 225/225	CP8566	CP8566I5
	30	4.00	-80 to 225/225	CP8567	CP8567I5
	60	4.00	-80 to 225/225	CP8568	CP8568I5
0.53	30	6.00	-80 to 225/225	CP8570	CP8570I5
	60	6.00	-80 to 225/225	CP8571	

TIPS & TOOLS

Ensure a lifetime of peak performance and maximum productivity with Agilent's comprehensive GC supplies portfolio, learn more at **www.agilent.com/chem/GCsupplies**



CarboBOND and CarboPLOT P7

- Single column solution for ASTM D 2505 for higher productivity
- Stable and robust for high repeatability of results
- Available in bonded and PLOT versions for improved versatility and enhanced productivity

CarboBOND

CarboBOND

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	25	5.00	-100 to 200/300	CP7371
		10.00	-100 to 200/300	CP7374
	50	5.00	-100 to 200/300	CP7372
		10.00	-100 to 200/300	CP7375

CarboPLOT P7

CarboPLOT P7

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage
0.53	10	25.00	-200 to 115/115	CP7513
	25	25.00	-200 to 115/115	CP7514

GS-CarbonPLOT

- High stability, bonded carbon layer stationary phase
- Unique selectivity for inorganic and organic gases
- Extended temperature limit of 360 °C
- Ideal for GC/MS – no particle generation
- Retention stability not affected by water

Similar Phases: Carbopack, CLOT, Carboxen-1006 PLOT

GS-CarbonPLOT

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	15	1.50	0 to 360	113-3112	
	30	1.50	0 to 360	113-3132	113-3132LTM
		3.00	0 to 360	113-3133	113-3133LTM
	60	1.50	0 to 360	113-3162	
0.53	15	3.00	0 to 360	115-3113	
	30	3.00	0 to 360	115-3133	115-3133LTM

HP-PLOT Molesieve

- A PLOT column for the analysis of permanent gases
- O_2, N_2, CO and CH_4 resolve in less than 5 min
- Durable molecular sieve 5Å coating minimizes baseline spiking and damage to multiport valves
- Select a thick film for Ar/O_2 separation without cryogenic cooling
- Select thin film HP-PLOT Molesieve columns for routine air monitoring applications
- Replaces GS-Molesieve

Note: Molecular sieve columns will absorb water, which, over time results in changes in retention time. We use an advanced, proprietary deactivation process which allows for rapid regeneration. Fully saturated HP-PLOT Molesieve columns regenerate in 7 hours or less at 200 °C.

Similar Phases: Rt-Msieve 5A, MXT-Msieve 5A

HP-PLOT Molesieve

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.32	15	25.00	-60 to 300	19091P-MS7		19091P-MS7LTM
	30	12.00	-60 to 300	19091P-MS4	19091P-MS4E	19091P-MS4LTM
		25.00	-60 to 300	19091P-MS8		19091P-MS8LTM
0.53	15	25.00	-60 to 300	19095P-MS5		19095P-MS5LTM
		50.00	-60 to 300	19095P-MS9		19095P-MS9LTM
	30	25.00	-60 to 300	19095P-MS6	19095P-MS6E	19095P-MS6LTM
		50.00	-60 to 300	19095P-MS0	19095P-MS0E	19095P-MS0LTM

CP-Molsieve 5Å

- Separate argon and oxygen at ambient temperature to reduce costs
- High efficiency for increased productivity
- Symmetrical peaks for accurate results

Similar Phases: Rt-Msieve 5A, MXT-Msieve 5A, Mol Sieve 5A PLOT

CP-Molsieve 5Å

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.25	25	30.00	-200 to 350/350	CP7533	
0.32	10	30.00	-200 to 350/350	CP7535	CP7535I5
	25	30.00	-200 to 350/350	CP7536	CP7536I5
	30	10.00	-200 to 350/350	CP7534	CP7534I5
	50	30.00	-200 to 350/350	CP7540	CP7540I5
0.53	10	50.00	-200 to 350/350	CP7537	
	15	15.00	-200 to 350/350	CP7543	
	25	50.00	-200 to 350/350	CP7538	CP7538I5
	30	15.00	-200 to 350/350	CP7544	CP7544I5
	50	50.00	-200 to 350/350	CP7539	

CP-Molsieve 5Å UltiMetal

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage
0.53	10	50.00	-200 to 350/350	CP6937	CP6937I5
	25	50.00	-200 to 350/350	CP6938	CP6938I5

Particle Traps for Use with PLOT Columns

Though highly stabilized, it is impossible to guarantee that no particles will dislodge from the column wall. When used in valve-switching applications, the use of a particle trap can prevent scarring of the rotors.

Particle Traps for Use with PLOT Columns

ID (mm)	Length (m)	Part No.
0.32	2.5	5181-3351
0.53	2.5	5181-3352

Particle Traps for PoraPLOT Columns

ID (mm)	Length (m)	Material	Part No.
0.32	2.5	Fused Silica	CP4016
0.53	2.5	Fused Silica	CP4017
0.53	2.5	UltiMetal	CP4018*

*Includes CP-UltiMetal connector

Particle Trap Connectors for PoraPLOT Columns

ID (mm)	Material	Unit	Part No.
0.25/0.32	Fused Silica	10/pk	CP4788
0.53	Fused Silica	10/pk	CP4789
0.25	UltiMetal	5/pk	CP4795
0.53	UltiMetal	5/pk	CP4796

Columns with Non-Bonded Stationary Phases



Whenever possible Agilent recommends the use of bonded and cross-linked polymers. Bonded polymers are more rugged, will have longer lifetimes and can be solvent rinsed. However, Agilent recognizes that some methods have been developed on non-bonded phases and therefore maintains these columns to support established methods.

HP-101

- 100% Dimethylpolysiloxane

Because HP-101 columns are not bonded or cross-linked, we do not recommend solvent rinsing.

HP-101

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.20	10	0.20	-60 to 280	19091Y-101		
	25	0.20	-60 to 280	19091Y-102		19091Y-102LTM
	50	0.20	-60 to 280	19091Y-105		
	12	0.25	-60 to 280	19091-60010	19091-60010E	
0.32	25	0.30	-60 to 280	19091Y-012	19091Y-012E	19091Y-012LTM
	50	0.30	-60 to 280	19091Y-015		

HP-17

- 50% Phenyl and 50% Methyl siloxane

Because the HP-17 is not bonded or cross-linked, we do not recommend solvent rinsing.

HP-17

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.53	10	2.00	25 to 260/280	19095L-121	19095L-121LTM

CAM

- Base deactivated polyethylene glycol
- Specifically designed for amine analysis
- Excellent peak shape for primary amines
- Replaces HP-Basicwax

Because the CAM is not bonded or cross-linked, we do not recommend solvent rinsing.

CAM

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	5 in Cage	7890/6890 LTM Module
0.25	15	0.25	60 to 220/240	112-2112		112-2112LTM
	30	0.25	60 to 220/240	112-2132		112-2132LTM
		0.50	60 to 220/240	112-2133		112-2133LTM
	60	0.25	60 to 220/240	112-2162		
0.32	30	0.25	60 to 220/240	113-2132	113-2132E	113-2132LTM
		0.50	60 to 220/240	113-2133	113-2133E	113-2133LTM
0.53	30	1.00	60 to 200/220	115-2132		115-2132LTM

DX-1 and DX-4

- DX-1: 90% Dimethylpolysiloxane 10% Polyethylene Glycol
- DX-4: 15% Dimethylpolysiloxane 85% Polyethylene Glycol

Because DX series GC columns are not bonded and cross-linked, we do not recommend solvent rinsing.

DX-1

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	1.00	50 to 250/270	122-6133	
0.32	30	1.00	50 to 250/270	123-6133	123-6133LTM

DX-4

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	50 to 250/270	122-6432	122-6432LTM
	60	0.25	50 to 250/270	122-6462	
0.32	15	0.25	50 to 250/270	123-6412	123-6412LTM
	30	0.25	50 to 250/270	123-6432	123-6432LTM
	60	0.25	50 to 250/270	123-6462	

SE-30 and SE-54

- SE-30: 100% Dimethylpolysiloxane
- SE-54: (5%-Phenyl)(1%-Vinyl)-methylpolysiloxane

Because SE series GC columns are not bonded or cross-linked, we do not recommend solvent rinsing.

SE-30

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.32	30	0.25	0 to 325/350	113-3032	113-3032LTM

SE-54

ID (mm)	Length (m)	Film (µm)	Temp Limits (°C)	7 in Cage	7890/6890 LTM Module
0.25	30	0.25	0 to 325/350	112-5432	112-5432LTM
	60	0.25	0 to 325/350	112-5462	
0.32	30	0.25	0 to 325/350	113-5432	113-5432LTM

Guard Columns

- DuraGuard and EZ-Guard columns with "built-in" guard columns, no press-fit connectors
- Minimize front-end contamination and increase column lifetime
- Aid in focusing sample onto the front of the column for better peak shape
- Minimize MSD contamination originating from the column (when used in transfer line)

Guard columns (or retention gaps) are often added to the front of the analytical column to protect against contamination, or to act as a band-focusing device for liquid samples introduced by on-column and splitless injection techniques.

When resolution or response in a chromatogram diminishes, remove a coil from the guard column so that peak shapes will improve. By removing a coil, the column length is shortened and peaks will elute somewhat faster. For best results, check the integration time windows of your data system.

DuraGuard

DuraGuard

Phase	ID (mm)	Length (m)	Film (µm)	Guard Length (m)	Part No.
DB-1	0.25	30	0.25	10	122-1032G
DB-XLB	0.25	30	0.25	10	122-1232G
DB-5ms	0.25	30	0.25	10	122-5532G
			0.50	10	122-5536G
			1.00	10	122-5533G
		60	0.25	10	122-5562G
	0.32	30	1.00	10	123-5533G
	0.53	30	0.50	10	125-5537G
DB-5.625	*0.18*	*20*	*0.36*	*5*	*121-5622G5*
	0.25	*30*	*0.25*	*5*	*122-5631G5*
DB-1701	0.53	30	1.00	10	125-0732G
DB-624	0.53	30	3.00	5	125-1334G5

Agilent J&W High Efficiency GC columns are displayed using italicized descriptions and part numbers

TIPS & TOOLS

Column contamination from sample matrix components is the number one cause of column failure. Use Agilent DuraGuard GC columns with built-in guard if you do not want to use column connectors.



A special tab clearly distinguishes the EZ-Guard guard column section from the analytical column

EZ-Guard

EZ-Guard

Phase	ID (mm)	Length (m)	Film (µm)	Guard Length (m)	Part No.
VF-1ms	0.20	12	0.33	5	CP9023
	0.25	30	0.25	5	CP9010
			0.25	10	CP9011
VF-5ms	0.25	15	0.25	5	CP9021
		30	0.25	5	CP9012
			0.25	10	CP9013
			0.50	5	CP9014
			0.50	10	CP9015
		60	0.25	5	CP9016
	0.53	30	0.25	10	CP9020
VF-Xms	0.25	30	0.10	10	CP9022
			0.25	5	CP9018
			0.25	10	CP9019
VF-17ms	0.25	30	0.25	5	CP9024
			0.25	10	CP9025
VF-1701ms	0.25	30	0.25	5	CP9176
			0.25	10	CP9177
VF-35ms	0.25	30	0.25	5	CP9026
			0.25	10	CP9027

Agilent J&W LTM Column Modules



Agilent J&W LTM Column Modules for 7890 and 6890 Series GC Systems

This groundbreaking column technology is designed specifically for Agilent 7890A and 6890 series gas chromatographs, and delivers:

- The capacity to run up to four column modules simultaneously – with four different temperature programs – to maximize your productivity
- Rapid temperature programming rates of up to 1800 °C/min for higher analysis speeds
- Faster cooling times – as low as one minute or less – to decrease idling and downtime
- Shorter analytical cycle times than conventional air-bath GC oven techniques
- Excellent retention time repeatability and performance – comparable to conventional GC

Most Agilent J&W Capillary GC columns – including Wall Coated Open Tubular (WCOT) and Porous Layer Open Tubular (PLOT) columns – can be used for LTM column modules.



Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

This groundbreaking column technology is designed specifically for Agilent 5975T GC/MS systems. These modules include an integrated 3 in LTM capillary column toroid assembly with heated transfer lines, cooling fan assembly and sheet metal enclosure. Replacement column toroid assemblies are also available. Benefits of the LTM column modules include:

- Faster heating and cooling times – as low as one minute or less – for more rapid analytical cycle times than standard air-bath GC oven techniques
- Excellent retention time repeatability and performance comparable to conventional GC
- Less power consumption for longer in-field operation
- Integrated module design to facilitate easy column module change in the field

TIPS & TOOLS

Agilent LTM column module technology is compatible with metal capillary columns. However, LTM modules are generally not recommended for fast GC applications because of their poor cooling performance compared to fused silica capillaries.



Shorten analytical cycle times and boost your high speed gas chromatography capabilities

Agilent J&W LTM column modules combine a high quality fused silica capillary column with heating and temperature sensing components for a low thermal mass column assembly. The LTM column module contains a patented design which heats and cools the column very efficiently for significantly shorter analytical cycle times compared to conventional air-bath GC oven techniques, while simultaneously using less power.

Agilent offers LTM technology for our popular 7890 and 6890 Series GC systems, as well as the new 5875T GC/MS. Compatible with Agilent LTM and LTM II series GC systems and retrofit upgrades.

All LTM column modules are packaged with:

- Two 1 m guard columns (one each for the inlet and detector) made from deactivated fused silica tubing of the same id as the analytical column
- Five non-reusable ferrules that fit the dimensions of the analytical and guard columns

For more information, visit **www.agilent.com/chem/LTMcol**

TIPS & TOOLS

LTM column modules should never be programmed beyond the GC column temperature limits recommended by Agilent. For very fast ramping applications (e.g. 600 °C/min), limiting the maximum temperatures to 10-20 °C below the GC column temperature limits can increase the lifetime of the column modules.

Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

Phase	ID (mm)	Length (m)	Film (µm)	Toroid Assembly	Column Module
DB-5ms Ultra Inert	0.18	20	0.18	221-5522UILTM	G3900-63014
	0.25	15	0.25	222-5512UILTM	G3900-63031
		30	0.25	222-5532UILTM	G3900-63005
HP-5ms Ultra Inert	0.18	20	0.18	29091S-577UILTM	G3900-63039
	0.25	15	0.25	29091S-431UILTM	G3900-63038
		30	0.25	29091S-433UILTM	G3900-63001
DB-1	0.25	30	0.25	222-1032LTM	G3900-63002
DB-1ms	0.18	20	0.18	221-0122LTM	G3900-63009
	0.25	15	0.25	222-0112LTM	G3900-63016
		30	0.25	222-0132LTM	G3900-63017
DB-1ht	0.25	15	0.10	222-1111LTM	G3900-63018
		30	0.10	222-1131LTM	G3900-63019
HP-1ms	0.18	20	0.18	29091S-677LTM	G3900-63040
	0.25	30	0.10	29091S-833LTM	G3900-63041
		15	0.25	29091S-931LTM	G3900-63042
DB-5ms	0.18	20	0.18	221-5522LTM	G3900-63013
	0.25	15	0.25	222-5512LTM	G3900-63030
		30	0.25	222-5532LTM	G3900-63004
DB-5ht	0.25	15	0.10	222-5731LTM	G3900-63033
		30	0.10	222-5711LTM	G3900-63032

(Continued)







Agilent J&W LTM Column Modules for 5975T Transportable GC/MS Systems

Phase	ID (mm)	Length (m)	Film (µm)	Toroid Assembly	Column Module
HP-5ms	0.25	30	0.25	29091S-433LTM	G3900-63007
DB-35ms	0.18	20	0.18	221-3822LTM	G3900-63011
	0.25	15	0.25	222-3812LTM	G3900-63026
		30	0.25	222-3832LTM	G3900-63027
DB-17ms	0.18	20	0.18	221-4722LTM	G3900-63012
	0.25	15	0.25	222-4712LTM	G3900-63028
		30	0.25	222-4732LTM	G3900-63029
DB-225ms	0.25	15	0.25	222-2912LTM	G3900-63022
		30	0.25	222-2932LTM	G3900-63023
DB-1701	0.25	30	0.25	222-0732LTM	G3900-63003
DB-WAX	0.25	15	0.50	222-7013LTM	G3900-63034
		30	0.50	222-7033LTM	G3900-63035
HP-INNOWax	0.18	20	0.18	29091N-577LTM	G3900-63036
	0.25	30	0.25	29091N-133LTM	G3900-63008
DB-FFAP	0.25	15	0.25	222-3212LTM	G3900-63024
		30	0.25	222-3232LTM	G3900-63025
DB-608	0.18	20	0.18	221-6822LTM	G3900-63015
DB-VRX	0.18	20	1.00	221-1524LTM	G3900-63006
	0.25	30	1.40	222-1534LTM	G3900-63021
DB-624	0.18	20	1.00	221-1324LTM	G3900-63010
	0.25	30	1.40	222-1334LTM	G3900-63020
HP-VOC	0.20	30	1.12	29091R-303LTM	G3900-63037

Fused Silica Tubing

Deactivated Tubing

Deactivated tubing can be used as retention gaps, guard columns, or transfer lines. Our standard deactivation process is a phenyl methyl deactivation – the preferred choice for most applications due to its inertness and robustness.

Deactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.05	0.36	1	160-2655-1
		5	160-2655-5
		10	160-2655-10
0.10	0.19	1	160-1010-1
		5	160-1010-5
		10	160-1010-10
	0.36	1	160-2635-1
		5	160-2635-5
		5	19091-60620E
		10	160-2635-10
0.15	0.36	1	160-2625-1
		5	160-2625-5
		10	160-2625-10
0.18	0.34	1	160-2615-1
		5	160-2615-5
		10	160-2615-10
0.20	0.36	1	160-2205-1
		5	160-2205-5
		10	160-2205-10

(Continued)

Deactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.25	0.36	1	160-2255-1
		5	160-2255-5
		10	160-2255-10
		30	160-2255-30
0.32	0.43	1	160-2325-1
		5	160-2325-5
		10	160-2325-10
		30	160-2325-30
0.45	0.67	1	160-2455-1
		5	160-2455-5
		10	160-2455-10
0.53	0.67	1	160-2535-1
		5	160-2535-5
		10	160-2535-10
		30	160-2535-30

Deactivated Fused Silica High Temperature (400 °C)

ID (mm)	OD (mm)	Length (m)	Part No.
0.05	0.36	5	160-2815-5
0.10	0.36	5	160-2825-5
0.25	0.35	5	160-2845-5
		10	160-2845-10
0.32	0.43	5	160-2855-5
		10	160-2855-10
0.53	0.67	5	160-2865-5
		10	160-2865-10

ProSteel Deactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.53	0.67	5	160-4535-5

Undeactivated Fused Silica

Undeactivated tubing or bare fused silica is commonly used for capillary electrophoresis. It can also be used for transfer lines and other applications where inertness is not critical.

Undeactivated Fused Silica

ID (mm)	OD (mm)	Length (m)	Part No.
0.02	0.36	5	160-2660-5
0.05	0.36	5	160-2650-5
		10	160-2650-10
0.075	0.36	5	160-2644-5
		10	160-2644-10
0.10	0.36	5	160-2634-5
		10	160-2634-10
0.18	0.34	5	160-2610-5
		10	160-2610-10
0.20	0.36	5	160-2200-5
		10	160-2200-10
		50	19091-20050
0.25	0.36	5	160-2250-5
		10	160-2250-10
0.32	0.43	5	160-2320-5
		10	160-2320-10
		50	19091-21050
0.45	0.67	5	160-2450-5
		10	160-2450-10
0.53	0.67	5	160-2530-5
		10	160-2530-10

Agilent J&W Packed GC Columns



Agilent J&W Packed GC Columns are designed and manufactured to offer excellent and reproducible performance for all sample types associated with packed column separations, most important in the hydrocarbon processing industry.

The highly efficient and rigorous packing technology used in Agilent J&W Packed GC Columns assures column-to-column reproducibility and ultimate efficiency, while the UltiMetal treated stainless steel tubing allows for improved inertness and peak shape performance.

You can choose from a wide range of tubing materials – including stainless steel, UltiMetal, nickel, glass, copper and PTFE – plus hundreds of stationary phases, packings, and supports.

And, you can create your custom configurations by visiting
www.agilent.com/chem/packedcolumnsordering

Agilent J&W Packed GC Columns for Agilent 7820, 7890, and 6890 Instruments

Carbosieve S

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
20 in (0.51 m)	1/8	2	80/100	G3591-80105	G3591-81105	G3591-82105

15% Carbowax 1540

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
15 ft (4.57 m)	1/8	2	Chromosorb WHP	60/80	G3591-80095	G3591-81095	G3591-82095

5% Carbowax 20M (G16, G$1)

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
7.22 ft (2.2 m)	1/8	2	Chromosorb WHP	100/120	G3591-80084	G3591-81084	G3591-82084

20% Carbowax 20M (G16, G$1)

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
9.84 ft (3 m)	1/8	2	Chromosorb WHP	100/120	G3591-80099	G3591-81099	G3591-82099

7% Carbowax M + 3% Polyphenolether 6 ring + 2% KOH

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
4 ft (1.22 m)	1/8	2	Chromosorb W AW	80/100	G3591-80050	G3591-81050	G3591-82050

Carboxen-1000

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
1.5 ft (0.46 m)	1/8	2	80/100	G3591-80125	G3591-81125	G3591-82125
10 ft (3.05 m)	1/8	2	60/80	G3591-80055	G3591-81055	G3591-82055

Chromosorb 101

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
6 ft (1.83 m)	1/8	2	80/100	G3591-80021	G3591-81021	G3591-82021

Chromosorb 102

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
2 ft (0.61 m)	1/8	2	80/100	G3591-80139	G3591-81139	G3591-82139

25% DC-200

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
15 ft (4.57 m)	1/8	2	Chromosorb PAW	80/100	G3591-80001	G3591-81001	G3591-82001

30% DC-200

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
20 ft (6.1 m)	1/8	2	Chromosorb PAW	100/120	G3591-80140	G3591-81140	G3591-82140
30 ft (9.14 m)	1/8	2	Chromosorb PAW	80/100	G3591-80082	G3591-81082	G3591-82082

35% DC-200

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
10 ft (3.05 m)	1/8	2	Chromosorb PAW	80/100	G3591-80030	G3591-81140	G3591-82030
30 ft (9.14 m)	1/8	2	Chromosorb PAW	80/100	G3591-80032	G3591-81032	G3591-82032
3 ft (0.91 m)	1/8	2	Chromosorb PAW	80/100	G3591-80039	G3591-81039	G3591-82039
5 ft (1.52 m)	1/8	2	Chromosorb PAW	80/100	G3591-80027	G3591-81027	G3591-82027

15% Hallcomid m-18

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
9.84 ft (3 m)	1/8	2	Chromosorb WHP	100/120	G3591-80067	G3591-81067	G3591-82067

30% DC 200/500

Length	OD (in)	ID (mm)	Support	Mesh	UltiMetal	Nickel	Stainless Steel
30 ft (9.14 m)	1/8	2	Chromosorb PAW	68/80			G3591-80161
2 ft (0.61 m)	1/8	2	Chromosorb PAW	60/80			G3591-80160
30 ft (9.14 m)	1/8	2	Chromosorb PAW	60/80		G3591-82161	
2 ft (0.61 m)	1/8	2	Chromosorb PAW	60/80		G3591-82160	
2 ft (0.61 m)	1/8	2	Chromosorb PAW	60/80	G3591-81160		
30 ft (9.14 m)	1/8	2	Chromosorb PAW	60/80	G3591-81161		

HayeSep D

Length	OD (in)	ID (mm)	Mesh	Stainless Steel
6.56 ft (2 m)	1/8	2	80/100	G3591-80158

HayeSep DB

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
30 ft (9.14 m)	1/8	2	100/120	G3591-80088	G3591-81088	G3591-82088

HayeSep N

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
6 ft (1.83 m)	1/8	2	80/100	G3591-80037	G3591-81037	G3591-82037
7 ft (2.13 m)	1/8	2	60/80	G3591-80060	G3591-81060	G3591-82060
8 ft (2.44 m)	1/8	2	80/100	G3591-80011	G3591-81011	G3591-82011
20 ft (6.1 m)	1/8	2	80/100	G3591-80045	G3591-81045	G3591-82045

HayeSep N + HayeSep R 1:1

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
8 ft (2.44 m)	1/8	2	45/60	G3591-80091	G3591-81091	G3591-82091

HayeSep Q

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
1.64 ft (0.5 m)	1/8	2	80/100	G3591-80023	G3591-81023	G3591-82023
3 ft (0.91 m)	1/8	2	80/100	G3591-80020	G3591-81020	G3591-82020
3.3 ft (1 m)	1/8	2	80/100		G3591-81148	
3.9 ft (1.2 m)	1/8	2	80/100			G3591-82159
4 ft (1.22 m)	1/8	2	80/100	G3591-80019	G3591-81019	G3591-82019
6 ft (1.83 m)	1/8	2	80/100	G3591-80004	G3591-81004	G3591-82004
8 ft (2.44 m)	1/8	2	80/100	G3591-80047	G3591-81047	G3591-82047
9 ft (2.74 m)	1/8	2	80/100	G3591-80033	G3591-81033	G3591-82033
10 ft (3.05 m)	1/8	2	80/100	G3591-80002	G3591-81002	G3591-82002
12 ft (3.66 m)	1/8	2	80/100	G3591-80121	G3591-81121	G3591-82121
5.91 ft (1.8 m)	1/8	2	80/100	G3591-70011		
3.28 ft (1 m)	1/8	2	80/100	G3591-70007		
6.56 ft (2 m)	1/8	2	80/100	G3591-70005		
9.84 ft (3 m)	1/8	2	80/100	G3591-70006		

HayeSep R

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
6 ft (1.83 m)	1/8	2	80/100	G3591-80102	G3591-81102	G3591-82102
12 ft (3.66 m)	1/8	2	80/100	G3591-80100	G3591-81100	G3591-82100

HayeSep T

Length	OD (in)	ID (mm)	Mesh	UltiMetal	PTFE
1.64 ft (0.5 m)	1/8	2	80/100	G3591-81150	
1.64 ft (0.5 m)	1/8	2	60/80		G3591-74001

TIPS & TOOLS

To learn more about Agilent J&W Packed GC Columns please visit **www.agilent.com/chem/packedcolumns.**



MolSieve 5Å

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
1 ft (0.30 m)	1/8	2	60/80	G3591-80077	G3591-81077	G3591-82077
3 ft (0.91 m)	1/8	2	60/80	G3591-80103	G3591-81103	G3591-82103
3 ft (0.91 m)	1/8	2	80/100	G3591-80074	G3591-81074	G3591-82074
3 ft (0.91 m)	1/8	2	100/120	G3591-80075	G3591-81075	G3591-82075
3.3 ft (1 m)	1/8	2	60/80		G3591-81149	
4 ft (1.22 m)	1/8	2	45/60	G3591-80090	G3591-81090	G3591-82090
6 ft (1.83 m)	1/8	2	60/80	G3591-80035	G3591-81035	G3591-82035
4 ft (1.22 m)	1/8	2	60/80	G3591-80104	G3591-81104	G3591-82104
6 ft (1.83 m)	1/8	2	60/80	G3591-80017	G3591-81017	G3591-82017
7 ft (2.13 m)	1/8	2	45/60	G3591-80062	G3591-81062	G3591-82062
8 ft (2.44 m)	1/8	2	60/80	G3591-80022	G3591-81022	G3591-82022
9 ft (2.74 m)	1/8	2	60/80	G3591-80046	G3591-81046	G3591-82046
9 ft (2.74 m)	1/8	2	80/100	G3591-80064	G3591-81064	G3591-82064
15 ft (4.57 m)	1/8	2	45/60	G3591-80061	G3591-81061	G3591-82061
20 ft (6.1 m)	1/8	2	45/60	G3591-80107		
20 ft (6.1 m)	1/8	2	60/80	G3591-80056	G3591-81056	G3591-82056
25 ft (7.62 m)	1/8	2	60/80	G3591-80065	G3591-81065	G3591-82065
6.56 ft (2 m)	1/8	2	45/60	G3591-70013		
3.28 ft (1 m)	1/8	2	80/100	G3591-70008		
1.97 ft (0.6 m)	1/4	2	80/100	G3591-70004		
6.56 ft (2 m)	1/8	2	80/100	G3591-70003		
6.56 ft (2 m)	1/8	2	60/80	G3591-70002		

MolSieve 13X

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
2 ft (0.61 m)	1/8	2	45/60	G3591-80031	G3591-81031	G3591-82031
3 ft (0.91 m)	1/8	2	45/60	G3591-80028	G3591-81028	G3591-82028
4 ft (1.22 m)	1/8	2	45/60	G3591-80012	G3591-81012	G3591-82012
4.9 ft (1.5 m)	1/8	2	80/100	G3591-80085	G3591-81085	G3591-82085
6 ft (1.83 m)	1/8	2	60/80	G3591-80035	G3591-81035	G3591-82035
9 ft (2.74 m)	1/8	2	45/60	G3591-80054	G3591-81054	G3591-82054
10 ft (3.05 m)	1/8	2	46/60	G3591-80003	G3591-81003	G3591-82003
10 ft (3.05 m)	1/16	1	60/80	G3591-80097	G3591-81097	G3591-82097
10 ft (3.05 m)	1/8	2	60/80	G3591-80101	G3591-81101	G3591-82101
10 ft (3.05 m)	1/8	2	80/100	G3591-80043	G3591-81043	G3591-82043
12 ft (3.66 m)	1/8	2	60/80	G3591-80058	G3591-81058	G3591-82058
15 ft (4.57 m)	1/8	2	45/60	G3591-80098	G3591-81098	G3591-82098
9.84 ft (3 m)	1/8	2	45/60	G3591-70017		
9.84 ft (3 m)	1/8	2	80/100	G3591-70015		

1.5% OV-101

Length	OD (in)	ID (mm)	Support	Mesh	UltiMetal	Nickel	Stainless Steel
2 ft (0.61 m)	1/8	2	Chromosorb GHP	100/120			G3591-80162
2 ft (0.61 m)	1/8	2	Chromosorb GHP	100/120		G3591-82162	
2 ft (0.61 m)	1/8	2	Chromosorb GHP	100/120	G3591-81162		

10% OV-101

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
2.6 ft (0.79 m)	1/8	2	Chromosorb WHP	60/80	G3591-80048	G3591-81048	G3591-82048
5 ft (1.52 m)	1/8	2	Chromosorb PAW	80/100	G3591-80093	G3591-81093	G3591-82093

20% OV-101

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
4 ft (1.22 m)	1/8	2	Chromosorb WHP	80/100	G3591-80025	G3591-81025	G3591-82025

10% PEG-20M

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
6.56 ft (2 m)	1/8	2	Chromosorb W	80/100	G3591-80119	G3591-81119	G3591-82119

20% PEG-20M

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
6.56 ft (2 m)	1/8	2	Chromosorb W	80/100	G3591-80122	G3591-81122	G3591-82122
13.1 ft (4 m)	1/8	2	Chromosorb W	80/100	G3591-80123	G3591-81123	G3591-82123

Porapak N

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
3 ft (0.91 m)	1/8	2	80/100	G3591-80072	G3591-81072	G3591-82072
3.9 ft (1.2 m)	1/8	2	60/80	G3591-80087	G3591-81087	G3591-82087
6 ft (1.83 m)	1/8	2	80/100	G3591-80036	G3591-81036	G3591-82036
8.2 ft (2.5 m)	1/8	2	50/80	G3591-80086	G3591-81086	G3591-82086
9 ft (2.74 m)	1/8	2	80/100	G3591-80044	G3591-81044	G3591-82044
12 ft (3.66 m)	1/8	2	60/80	G3591-80059	G3591-81059	G3591-82059

Porapak N + Porapak R 1:1

Length	OD (in)	ID (mm)	Mesh	Stainless Steel
12 ft (3.66 m)	1/8	2	50/80	G3591-80110

Porapak Q

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
3 ft (0.91 m)	1/8	2	80/100	G3591-80135	G3591-81135	G3591-82135
6 ft (1.83 m)	1/8	2	60/80	G3591-80136	G3591-81136	G3591-82136
6 ft (1.83 m)	1/8	2	80/100	G3591-80005	G3591-81005	G3591-82005
6 ft (1.83 m)	1/8	2	80/100	G3591-80013	G3591-81013	G3591-82013
8 ft (2.44 m)	1/8	2	60/80	G3591-80137	G3591-81137	G3591-82137
8.2 ft (2.5 m)	1/8	2	80/100	G3591-80083	G3591-81083	G3591-82083
9 ft (2.74 m)	1/8	2	80/100	G3591-80016	G3591-81016	G3591-82016
13 ft (3.96 m)	1/8	2	80/100	G3591-80053	G3591-81053	G3591-82053
15 ft (4.57 m)	1/8	2	80/100	G3591-80066	G3591-81066	G3591-82066
25 ft (7.62 m)	1/8	2	100/120	G3591-80052	G3591-81052	G3591-82052
30 ft (9.14 m)	1/16	1	80/100	G3591-80096	G3591-81096	G3591-82096
3.28 ft (1 m)	1/8	2	80/100	G3591-70014		
5.91 ft (1.8 m)	1/8	2	80/100	G3591-70010		
9.84 ft (3 m)	1/8	2	80/100	G3591-70009		
6.56 ft (2 m)	1/8	2	80/100	G3591-70001		
4.92 ft (1.5 m)	1/8	2	50/80	G3591-70018		

Porapak QS

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
6.56 ft (2 m)	1/8	2	80/100	G3591-80157		
8 ft (2.44 m)	1/8	2	80/100	G3591-80051	G3591-81051	G3591-82051
5.91 ft (1.8 m)	1/8	2	80/100	G3591-70010		
9.84 ft (3 m)	1/8	2	80/100	G3591-70009		

Porapak R

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
6 ft (1.83 m)	1/8	2	60/80	G3591-80106	G3591-81106	G3591-82106

Porapak T

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
1.5 ft (0.46 m)	1/8	2	80/100	G3591-80138	G3591-81138	G3591-82138
6.56 ft (2 m)	1/8	2	80/100	G3591-80120	G3591-81120	G3591-82120

20% Sebaconitrile

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
2 ft (0.61 m)	1/8	2	Chromosorb PAW	80/100	G3591-80029	G3591-81029	G3591-82029
19.7 ft (6 m)	1/8	2	Chromosorb PAW	80/100	G3591-80071	G3591-81071	G3591-82071
30 ft (9.14 m)	1/8	2	Chromosorb PAW	80/100	G3591-80026	G3591-81026	G3591-82026

20% Sebaconitrile/2% H_3PO_4

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
2 ft (0.61 m)	1/8	2	Chromosorb PAW	80/100	G3591-80015	G3591-81015	G3591-82015
30 ft (9.14 m)	1/8	2	Chromosorb PAW	80/100	G3591-80014	G3591-81014	G3591-82014

Silica Gel

Length	OD (in)	ID (mm)	Mesh	Stainless Steel	UltiMetal	Nickel
2 ft (0.61 m)	1/8	2	60/80	G3591-80141	G3591-81141	G3591-82141
4 ft (1.22 m)	1/8	2	60/80	G3591-80142	G3591-81142	G3591-82142
6 ft (1.83 m)	1/8	2	60/80	G3591-80108		

0.1% SP-1000

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
7 ft (2.13 m)	1/8	2	Carbopak C	80/100	G3591-80063	G3591-81063	G3591-82063

25% SP-2100

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
1.64 ft (0.5 m)	1/16	1	Chromosorb PAW	80/100	G3591-80007	G3591-81007	G3591-82007
5.7 ft (1.75 m)	1/16	1	Chromosorb PAW	80/100	G3591-80008	G3591-81008	G3591-82008
15 ft (4.57 m)	1/8	2	Chromosorb PAW	80/100	G3591-80068	G3591-81068	G3591-82068

20% TCEP

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
1.84 ft (0.56 m)	1/16	1	Chromosorb PAW	80/100	G3591-80006	G3591-81006	G3591-82006
5 ft (1.52 m)	1/8	2	Chromosorb PAW	80/100	G3591-80094	G3591-81094	G3591-82094
15 ft (4.57 m)	1/8	2	Chromosorb PAW	80/100	G3591-80049	G3591-81049	G3591-82049

10% UC W982

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
1.5 ft (0.46 m)	1/8	2	Chromosorb PAW	80/100	G3591-80034	G3591-81034	G3591-82034
2 ft (0.61 m)	1/8	2	Chromosorb PAW	80/100	G3591-80040	G3591-81040	G3591-82040

12% UC W982

Length	OD (in)	ID (mm)	Support	Mesh	Stainless Steel	UltiMetal	Nickel
2 ft (0.61 m)	1/8	2	Chromosorb PAW	80/100	G3591-80000	G3591-81000	G3591-82000

Agilent J&W Packed GC Columns for All Instruments

30% DC 200/500

Length	OD (in)	ID (mm)	Support	Mesh	UltiMetal
2 ft (0.61 m)	1/8	2	Chromosorb PAW	60/80	CP2057
30 ft (9.14 m)	1/8	2	Chromosorb PAW	60/80	CP2058*

*Preconditioned and pretested

HayeSep D

Length	OD (in)	ID (mm)	Mesh	UltiMetal
6.56 ft (2 m)	1/8	2	80/100	CP1482

HayeSep DB

Length	OD (in)	ID (mm)	Mesh	UltiMetal
40 ft (12.2 m)	1/8	2	80/100	CP2047

HayeSep N

Length	OD (in)	ID (mm)	Mesh	UltiMetal
1.64 ft (0.5 m)	1/16	1	80/100	CP1307*
1.64 ft (0.5 m)	1/8	2	80/100	CP1480
6 ft (1.83 m)	1/8	2	80/100	CP2068*

*Preconditioned and pretested

HayeSep P

Length	OD (in)	ID (mm)	Mesh	UltiMetal
6 ft (1.83 m)	1/8	2	80/100	CP2062

HayeSep Q

Length	OD (in)	ID (mm)	Mesh	UltiMetal
0.82 ft (0.25 m)	1/16	1	80/100	CP1308*
1.64 ft (0.5 m)	1/8	2	80/100	CP81073*
3.28 ft (1 m)	1/8	2	80/100	CP81069*
4.92 ft (1.5 m)	1/16	1	80/100	CP1305*

*Preconditioned and pretested

HayeSep R

Length	OD (in)	ID (mm)	Mesh	UltiMetal
3.28 ft (1 m)	1/8	2	80/100	CP86678*
8.53 ft (2.6 m)	1/8	2	80/100	CP86677*
12 ft (3.66 m)	1/8	2	80/100	CP2055*

*Preconditioned and pretested

MolSieve 5Å

Length	OD (in)	ID (mm)	Mesh	UltiMetal
3.28 ft (1 m)	1/8	2	60/80	CP81025*
4.92 ft (1.5 m)	1/16	1	80/100	CP1306*
5 ft (1.52 m)	1/8	2	80/100	CP2046
6 ft (1.83 m)	1/8	2	45/60	CP2065
10 ft (3.05 m)	1/8	2	80/100	CP2045
13.1 ft (4 m)	1/8	2	80/100	CP1483*

*Preconditioned and pretested

MolSieve 13X

Length	OD (in)	ID (mm)	Mesh	UltiMetal
3 ft (0.91 m)	1/8	2	45/60	CP2059*
3.94 ft (1.2 m)	1/16	1	80/100	CP1309*
4 ft (1.22 m)	1/8	2	45/60	CP2060
4.92 ft (1.5 m)	1/8	2	80/100	CP81071*

*Preconditioned and pretested

1.5% OV-101

Length	OD (in)	ID (mm)	Support	Mesh	UltiMetal
2 ft (0.61 m)	1/8	2	Chromosorb G HP	100/120	CP2056

Porapak QS

Length	OD (in)	ID (mm)	Mesh	UltiMetal
6.56 ft (2 m)	1/8	2	80/100	CP1481

10% SE-30

Length	OD (in)	ID (mm)	Mesh	UltiMetal
2.5 ft (0.76 m)	1/8	2	80/100	CP2073

Silica Gel

Length	OD (in)	ID (mm)	Mesh	UltiMetal
10 ft (3.05 m)	1/8	2	60/80	CP2050

20% TCEP

Length	OD (in)	ID (mm)	Mesh	UltiMetal
1.84 ft (0.56 m)	1/16	0.75	80/100	CP2071
15 ft (4.57 m)	1/8	2	80/100	CP2072



Custom GC Column Ordering

Even though we offer over a thousand readily available columns, Agilent recognizes that sometimes you need something a little out of the ordinary. That's why we developed our Custom Column Shop. If you can't find what you're looking for in our standard order guides, we will design, build, and test capillary GC columns to meet your needs.

- We can create columns with non-standard lengths or unusual film thickness.
- We can connect columns together in series or as dual columns.
- We recognize that sometimes customers have specific column performance requirements for their applications that might not be met with standard test mixes. As a result, we can also custom-test your columns with your desired test mixture and test conditions to meet specific performance requirements.
- We can create DuraGuard or EZ-Guard columns with an integrated guard column (retention gap). Most phases can be manufactured with a built-in guard column, which means you get the advantages of a guard column without the union. Available in DB, CP and VF phases.

Custom columns are ordered using the P/Ns below. Be sure to provide the details of your desired custom service or column including phase, length, id, and film thickness.

- 100-2000 Custom Capillary DB & HP columns
- 100-6000 Custom Capillary CP & VF columns
- 100-9000 UltiMetal treated tubing and parts
- 100-2000 LTM – Custom Low Thermal Mass column configurations
- 100-5000 Custom packed columns or bulk phases/supports

Contact your local Agilent office or Authorized Agilent Distributor to receive a quote for your custom column needs. You can find order forms in the back of Agilent's Essential Chromatography Catalog.

Customers in the United States, Canada, and Puerto Rico can request a custom column quote online at **www.agilent.com/chem/CustomColumn**

Agilent J&W GC Column Test Standards

Compare your column's performance to the test chromatogram shipped with your Agilent J&W column. The column test standard contains components that test the column for resolution characteristics, efficiency, and inertness. The test mixes are supplied at a concentration of 250 ng/µL in 2 mL vials. Match the phase and column diameter in the chart below to find the test mix for your column.

Agilent J&W GC Column Test Standards

Column Description	Microbore (0.05 & 0.10 mm ID) Part No.	Capillary (0.18 & 0.32 mm ID) Part No.	Megabore (0.45 & 0.53 mm ID) Part No.
OV-351		200-0032	
DB-1ht		200-0010	
DB-1	200-0010	200-0310	200-0110
DB-5	200-0010	200-0310	200-0110
DB-5ht		200-0010	
DB-5ms		200-0185	200-0185
DB-624		200-0113	200-0113
DB-2887			200-0110
DB-WAX	200-0070	200-0370	200-0070
DB-WAXetr		200-0370	200-0070
SE-30		200-0010	
SE-52		200-0010	
SE-54		200-0010	200-0010
HP-1		5080-8858	8500-6812
HP-5		5080-8858	8500-6812
HP-FFAP	8500-6813	8500-6813	8500-6813
GS-OxyPLOT			5188-5379

Test Standards for Agilent J&W CP and VF Columns

Test Mix 31 Hazardous, 1/pk	Part No.
VF-1ms	CP0031
VF-5ms	CP0031
VF-17ms	CP0031
VF-35ms	CP0031
VF-Xms	CP0031
VF-1301ms	CP0031
VF-200ms	CP0031
VF Rapid-MS	CP0031
CP-Sil 5 CB	CP0031
CP-Sil 8 CB	CP0031
CP-Sil 24 CB	CP0031
CP-1301	CP0031
Test Mix 5, 1/pk	**Part No.**
CP-Sil 43 CB	CP0005

TIPS & TOOLS

Ensure highest quality gas while keeping gas lines clean and leak-free with Agilent's high-capacity gas filter. Learn more at **www.agilent.com/chem/gasclean**



Column Installation and Troubleshooting



Quick reference guides and tips to ensure peak performance

Agilent J&W GC columns are backed by decades of chromatography experience, so you can count on superior quality and dependability. And you can help ensure maximum performance, efficiency, and column life by implementing the most current installation and troubleshooting procedures.

In this section, you'll discover tips, techniques, and easy-reference guides that will help you:

- Confidently install any capillary column
- Condition and test new columns
- Alleviate and avoid column performance degradation due to thermal damage, oxygen damage, and other factors
- Pinpoint and fix the most common column problems

So you'll expand your hours of continuous operation, decrease downtime, and get the reproducible results that your lab demands.

Capillary Column Installation Quick Reference Guide

For more detailed installation information, refer to the GC Column Installation Guide which is provided with your column, or visit **www.agilent.com/chem/columninstall**

Precolumn Installation Check List

1. Replace oxygen, moisture, and hydrocarbon traps as needed.
2. Clean the injection port, replace critical injection port seals, replace injection port liners, and change septa as needed.
3. Check detector seals, and replace as necessary. Clean or replace detector jets as necessary.
4. Carefully inspect the column for damage or breakage.
5. Check your GC manufacturer's gas pressure requirements and verify gas cylinder delivery pressures to ensure that an adequate supply of carrier, makeup, and fuel gases are available. Minimum recommended carrier gas purity percentages are: Helium 99.995% and Hydrogen 99.995%, with H_20 < 1ppm and O_2 < 0.5ppm.
6. Gather the necessary installation tools: You will need a column cutter, column nuts, column nut wrench, ferrules, a magnifying loupe, and typewriter correction fluid.

Table 6:

Ferrule Sizes

Column ID	Ferrule ID (mm)
0.10	0.4
0.18	0.4
0.20	0.4
0.25	0.4
0.32	0.5
0.45	0.8
0.53	0.8

Installing the Column

1. Uncoil approximately 0.5 m of tubing (1 coil ~ 0.5 m) from the column basket at both ends of the column for injector and detector installation. Avoid using sharp bends in the tubing.
2. Mount the column in the oven. Use a handling bracket if available.
3. Install the column nut and Graphite/Vespel or Graphite ferrule at each column end; pull the nut and ferrule down the tubing approximately 15 cm. (**Table 6**)
4. Score (scratch) the column. Use a light touch to score the column about 4 to 5 cm from each end.

Installing the Column

5. Make a clean break. Grasp the column between the thumb and forefinger as close to the score point as possible. Gently pull and bend the column. The column should part easily. If the column does not break easily, do not force it. Score the column again in a different place (farther from the end than before) and try again for a clean break.
6. Use a magnifying loupe to inspect the cut. Make sure the cut is square across the tubing with no polyimide or "glass" fragments at the end of the tube.
7. Install the column in the inlet. Check the GC manufacturer's instrument manual for the correct insertion distance in the injection port type being used. Slide the column nut and ferrule to the proper distance and then mark the correct distance on the column with typewriter correction fluid just behind the column nut. Allow the fluid to dry. Insert the column into the injector. Finger tighten the column nut until it starts to grab the column, and then tighten the nut an additional 1/4 to 1/2 turn, so that the column cannot be pulled from the fitting when gentle pressure is applied. Verify that the correct column insertion distance has been maintained by looking at the typewriter correction fluid mark.
8. Turn on the carrier gas and establish the proper flow rate. Set head pressure, split flow, and septum purge flow to appropriate levels. See **Table 7** for nominal head pressures. If fusing a split/splitless inlet, check that the purge (split) valve is "on" (open).
9. Confirm carrier gas flow through the column. Immerse the end of the column in a vial of solvent and check for bubbles.
10. Install the column into the detector. Check the instrument manufacturer's manual for the proper insertion distance.
11. Check for leaks. **This is very important.** Do not heat the column without thoroughly checking for leaks.
12. Establish proper injector and detector temperatures.
13. Establish proper makeup and detector gas flows. Ignite or turn "on" the detector.
14. Purge the column for a minimum of 10 min at ambient temperature. Add the appropriate additional purge time following inlet or trap maintenance.
15. Inject non-retained substance to check for proper injector installation. Examples: butane or methane (FID), headspace vapors from Acetonitrile (NPD), headspace vapors from methylene chloride (ECD), air (TCD), argon (mass spectrometer). Proper installation is indicated by a symmetrical non-retained peak. If tailing is observed, reinstall the column into the inlet.



TIPS & TOOLS

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Conditioning and Testing the Column

1. Set oven temperature 20 °C above the maximum temperature of the analysis or at the maximum temperature of the column (whichever is lower) for 2 hours. If after 10 min at the upper temperature the background does not begin to fall, immediately cool the column and check for leaks.
2. If you are using Vespel or Graphite/Vespel ferrules, recheck column nut tightness after the conditioning process.
3. Confirm final proper average linear velocity by injecting a non-retained substance again.

Table 7:

Approximate Head Pressures (psig)						
	Column ID (mm)					
Column Length (m)	**0.18**	**0.2**	**0.25**	**0.32**	**0.45**	**0.53**
10	5-10					
12		10-15				
15			8-12	5-10		1-2
20	10-20					
25		20-30				
30			15-25	10-20	3-5	2-4
40	20-40					
50		40-60				
60			30-45	20-30	6-10	4-8
75					8-14	5-10
105						7-15

Causes of Column Performance Degradation

Column Breakage

Fused silica columns break wherever there is a weak point in the polymide coating. The polymide coating protects the fragile but flexible fused silica tubing. The continuous heating and cooling of the oven, vibrations caused by the oven fan, and being wound on a circular cage all place stress on the tubing. Eventually breakage occurs at a weak point. Weak spots are created where the polymide coating is scratched or abraded. This usually occurs when a sharp point or edge is dragged over the tubing. Column hangers and tags, metal edges in the GC oven, column cutters, and miscellaneous items on the lab bench are just some of the common sources of sharp edges or points.

It is rare for a column to spontaneously break. Column manufacturing practices tend to expose any weak tubing and eliminate it from use in finished columns. Larger diameter columns are more prone to breakage. This means that greater care and prevention against breakage must be taken with 0.45-0.53 mm id tubing than with 0.18-0.32 mm id tubing.

A broken column is not always fatal. If a broken column was maintained at a high temperature either continuously or with multiple temperature program runs, damage to the column is very likely. The back half of the broken column has been exposed to oxygen at elevated temperatures which rapidly damages the stationary phase. The front half is fine since carrier gas flowed through this length of column. If a broken column has not been heated or only exposed to high temperatures or oxygen for a very short time, the back half has probably not suffered any significant damage.

A union can be installed to repair a broken column. Any suitable union will work to rejoin the column. Problems with dead volume (peak tailing) may occur with improperly installed unions.



Thermal Damage

Exceeding a column's upper temperature limit results in accelerated degradation of the stationary phase and tubing surface. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). Fortunately, thermal damage is a slower process, thus prolonged times above the temperature limit are required before significant damage occurs. Thermal damage is greatly accelerated in the presence of oxygen. Overheating a column with a leak or high oxygen levels in the carrier gas results in rapid and permanent column damage.

Setting the GC's maximum oven temperature at or only a few degrees above the column's temperature limit is the best method to prevent thermal damage. This prevents the accidental overheating of the column. If a column is thermally damaged, it may still be functional. Remove the column from the detector. Heat the column for 8-16 hours at its isothermal temperature limit. Remove 10-15 cm from the detector end of the column. Reinstall the column and condition as usual. The column usually does not return to its original performance; however, it is often still functional. The life of the column will be reduced after thermal damage.

Oxygen Damage

Oxygen is an enemy to most capillary GC columns. While no column damage occurs at or near ambient temperatures, severe damage occurs as the column temperature increases. In general, the temperature and oxygen concentration at which significant damage occurs is lower for polar stationary phases. It is constant exposure to oxygen that is the problem. Momentary exposure such as an injection of air or a very short duration septum nut removal is not a problem.

A leak in the carrier gas flow path (e.g., gas lines, fittings, injector) is the most common source of oxygen exposure. As the column is heated, very rapid degradation of the stationary phase occurs. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). These are the same symptoms as for thermal damage. Unfortunately, by the time oxygen damage is discovered, significant column damage has already occurred. In less severe cases, the column may still be functional but at a reduced performance level. In more severe cases, the column is irreversibly damaged.

Maintaining an oxygen and leak-free system is the best prevention against oxygen damage. Good GC system maintenance includes periodic leak checks of the gas lines and regulators, regular septa changes, using high quality carrier gases, installing and changing oxygen traps, and changing gas cylinders before they are completely empty.

Chemical Damage



There are relatively few compounds that damage stationary phases. Introducing nonvolatile compounds (e.g., salts) in a column often degrades performance, but damage to the stationary phase does not occur. These residues can often be removed and performance returned by solvent rinsing the column.

Inorganic or mineral bases and acids are the primary compounds to avoid introducing into a column. The acids include hydrochloric (HCl), sulfuric (H_2SO_4), nitric (HNO_3), phosphoric (H_3PO_4), and chromic (CrO_3). The bases include potassium hydroxide (KOH), sodium hydroxide (NaOH), and ammonium hydroxide (NH_4OH). Most of these acids and bases are not very volatile and accumulate at the front of the column. If allowed to remain, the acids or bases damage the stationary phase. This results in the premature onset of excessive column bleed, peak tailing for active compounds and/or loss of efficiency (resolution). The symptoms are very similar to thermal and oxygen damage. Hydrochloric acid and ammonium hydroxide are the least harmful of the group. Both tend to follow any water that is present in the sample. If the water is not or only poorly retained by the column, the residence time of the HCl and NH_4OH in the column is short. This tends to eliminate or minimize any damage by these compounds. Thus, if HCl or NH_4OH are present in a sample, using conditions or a column with no water retention will render these compounds relatively harmless to the column.

The only organic compounds that have been reported to damage stationary phases are perfluoroacids. Examples include trifluoroacetic, pentafluoropropanoic, and heptafluorobutyric acid. They need to be present at high levels (e.g., 1% or higher). Most of the problems are experienced with splitless or Megabore direct injections where large volumes of the sample are deposited at the front of the column.

Since chemical damage is usually limited to the front of the column, trimming or cutting 0.5-1 meter from the front of the column often eliminates any chromatographic problems. In more severe cases, five or more meters may need to be removed. The use of a guard column or retention gap will minimize the amount of column damage; however, frequent trimming of the guard column may be necessary. The acid or base often damages the surface of the deactivated fused silica tubing which leads to peak shape problems for active compounds.

Column Contamination

Column contamination is one of the most common problems encountered in capillary GC. Unfortunately, it mimics a very wide variety of problems and is often misdiagnosed as another problem. A contaminated column is usually not damaged, but it may be rendered useless.

There are two basic types of contaminants: nonvolatile and semivolatile. Nonvolatile contaminants or residues do not elute and accumulate in the column. The column becomes coated with these residues which interfere with the proper partitioning of solutes in and out of the stationary phase. Also, the residues may interact with active solutes resulting in peak adsorption problems (evident as peak tailing or loss of peak size). Active solutes are those containing a hydroxyl (-OH) or amine (-NH) group, and some thiols (-SH) and aldehydes. Semivolatile contaminants or residues accumulate in the column, but eventually elute. Hours to days may elapse before they completely leave the column. Like nonvolatile residues, they may cause peak shape and size problems, and, in addition, are usually responsible for many baseline problems (instability, wander, drift, ghost peaks, etc.).

Contaminants originate from a number of sources, with injected samples being the most common. Extracted samples are among the worst types. Biological fluids and tissues, soils, waste and ground water, and similar types of matrices contain high amounts of semivolatile and nonvolatile materials. Even with careful and thorough extraction procedures, small amounts of these materials are present in the injected sample. Several to hundreds of injections may be necessary before the accumulated residues cause problems. Injection techniques such as on-column, splitless, and Megabore direct place a large amount of sample into the column, thus column contamination is more common with these injection techniques.

Occasionally, contaminants originate from materials in gas lines and traps, ferrule and septa particles, or anything coming in contact with the sample (vials, solvents, syringes, pipettes, etc.). These types of contaminants are probably responsible when a contamination problem suddenly develops and similar samples in previous months or years did not cause any problems.

Minimizing the amount of semivolatile and nonvolatile sample residues is the best method to reduce contamination problems. Unfortunately, the presence and identity of potential contaminants are often unknown. Rigorous and thorough sample cleanup is the best protection against contamination problems. The use of a guard column or retention gap often reduces the severity or delays the onset of column contamination induced problems. If a column becomes contaminated, it is best to solvent rinse the column to remove the contaminants.

Maintaining a contaminated column at high temperatures for long periods of time (often called baking-out a column) is not recommended. Baking-out a column may convert some of the contaminating residues into insoluble materials that cannot be solvent rinsed from the column. If this occurs, the column cannot be salvaged in most cases. Sometimes the column can be cut in half and the back half may still be useable. Baking-out a column should be limited to 1-2 hours at the isothermal temperature limit of the column.

TIPS & TOOLS

Column contamination from sample matrix components is the number one cause of column failure. Use Agilent DuraGuard GC columns with built-in guard if you do not want to use column connectors.

Solvent Rinsing Columns

Solvent rinsing columns involves removing the column from the GC and passing milliliters of solvent through the column. Any residues soluble in the rinse solvents are washed from the column. Injecting large volumes of solvent while the column is still installed is not rinsing and doing so will not remove any contaminants from the column. **A capillary GC column must have a bonded and cross-linked stationary phase before it can be solvent rinsed.** Solvent rinsing a non-bonded stationary phase results in severe damage to the column.



Column rinse kit, 430-3000

A column rinse kit is used to force solvent through the column (see picture). The rinse kit is attached to a pressurized gas source (N_2 or He), and the column is inserted into the rinse kit. Solvent is added to the vial, and the vial is pressurized using the gas source. The pressure forces solvent to flow through the column. Residues dissolve into the solvent and are backflushed out of the column with the solvent. The solvent is then purged from the column, and the column is properly conditioned.

Before rinsing a column, cut about 0.5 meter from the front (i.e., injector end) of the column. Insert the detector end of the column into the rinse kit. Multiple solvents are normally used to rinse columns. Each successive solvent must be miscible with the previous one. High boiling point solvents should be avoided especially as the last solvent. The sample matrix solvent(s) is often a good choice.

Methanol, methylene chloride and hexane are recommended and work very well for the majority of cases. Acetone can be substituted for methylene chloride to avoid using halogenated solvents; however, methylene chloride is one of the best rinsing solvents. If aqueous based samples (e.g., biological fluids and tissues) were injected, use water before the methanol. Some residues originating from aqueous based samples are only soluble in water and not organic solvents. Water and alcohols (e.g., methanol, ethanol, isopropanol) should be used to rinse bonded polyethylene glycol based stationary phases (e.g., DB-WAX, DB-WAXetr, DB-FFAP, HP-Innowax) **only as a last resort**.

Table 8 lists the suggested solvent volumes for different diameter columns. Using larger solvent volumes is not harmful, but rarely better and merely wasteful. After adding the first solvent, pressurize the rinse kit, but stay below 20 psi. Use the highest pressure that keeps the solvent flow rate below 1 mL/min. Except for most 0.53 mm id columns, the rinse kit pressure will reach 20 psi before the flow rate reaches 1 mL/min. Longer rinse times are required when using heavy or viscous solvents, and for longer or smaller diameter columns. When all or most of the first solvent has entered the column, add the next solvent. The previous solvent does not have to vacate the column before the next solvent is started through the column.

After the last solvent has left the column, allow the pressurizing gas to flow through the column for 5-10 min. Install the column in the injector and turn on the carrier gas. Allow the carrier gas to flow through the column for 5-10 min. Attach the column to the detector (or leave it unattached if preferred). Using a temperature program starting at 40-50 °C, heat the column at 2-3 °/min until the upper temperature limit is reached. Maintain this temperature for 1-4 hours until the column is fully conditioned.

Table 8:

Solvent Volumes for Rinsing Columns

Column ID (mm)	Solvent Volume (mL)
0.18-0.2	3-4
0.25	4-5
0.32	6-7
0.45	7-8
0.53	10-12

Using larger volumes will not damage the column



Column Storage

Capillary columns should be stored in their original box when removed from the GC. Place a GC septa over the ends to prevent debris from entering the tubing. Upon reinstallation of the column, the column ends need to be trimmed by 2-4 cm to ensure that a small piece of septa is not lodged in the column.

If a column is left in a heated GC, there should always be carrier gas flow. The carrier gas flow can be turned off only if the oven, injector, detector and transfer lines are turned off (i.e., not heated). Without carrier gas flow, damage to the heated portion of the column occurs.

Evaluating the Problem

The first step in any troubleshooting effort is to step back and evaluate the situation. Rushing to solve the problem often results in a critical piece of important information being overlooked or neglected. In addition to the problem, look for any other changes or differences in the chromatogram. Many problems are accompanied by other symptoms. Retention time shifts, altered baseline noise or drift, or peak shape changes are only a few of the other clues that often point to or narrow the list of possible causes. Finally, make note of any changes or differences involving the sample. Solvents, vials, pipettes, storage conditions, sample age, extraction, preparation techniques, or any other factor influencing the sample environment can be responsible.

Checking the Obvious

A surprising number of problems involve fairly simple and often overlooked components of the GC system or analysis. Many of these items are transparent in the daily operation of the GC and are often taken for granted ("set it and forget it"). The areas and items to check include:

- Gases: pressures, carrier gas average linear velocity, and flow rates (detector, split vent, septum purge)
- Temperatures: column, injector, detector, and transfer lines
- System parameters: purge activation times, detector attenuation and range, mass ranges, etc.
- Gas lines and traps: cleanliness, leaks, and expiration
- Injector consumables: septa, liners, O-rings, and ferrules
- Sample integrity: concentration, degradation, solvent, and storage
- Syringes: handling technique, leaks, needle sharpness, and cleanliness
- Data system: settings and connections

The Most Common Problems



Ghost Peaks or Carryover

System contamination is responsible for most ghost peaks or carryover problems. If the extra ghost peaks are similar in width to the sample peaks (with similar retention times), the contaminants were likely introduced into the column at the same time as the sample. The extra compounds may be present in the injector (i.e., contamination) or in the sample itself. Impurities in solvents, vials, caps and syringes are only some of the possible sources. Injecting sample and solvent blanks may help to find possible sources of the contaminants. If the ghost peaks are much broader than the sample peaks, the contaminants were most likely already in the column when the injection was made. These compounds were still in the column when a previous GC run was terminated. They elute during a later run and are often very broad. Sometimes numerous ghost peaks from multiple injections overlap and elute as a hump or blob. This often takes on the appearance of baseline drift or wander.

Increasing the final temperature or time in the temperature program is one method to minimize or eliminate a ghost peak problem. Alternatively, a short bake-out after each run or series of runs may remove the highly retained compounds from the column before they cause a problem.

Condensation Test

Use this test whenever injector or carrier gas contamination problems are suspected (e.g., ghost peaks or erratic baseline).

1. Leave the GC at 40-50 °C for 8 or more hours.
2. Run a blank analysis (i.e., start the GC, but with no injection) using the normal temperature conditions and instrument settings.
3. Collect the chromatogram for this blank run.
4. Immediately repeat the blank run as soon as the first one is completed. Do not allow more than 5 min to elapse before starting the second blank run.
5. Collect the chromatogram for the second blank run and compare it to the first chromatogram.
6. If the second chromatogram contains a substantially larger amount of peaks and baseline instability, the incoming carrier gas line or the carrier gas is contaminated.
7. If the second chromatogram contains few peaks or very little baseline drift, the carrier gas and incoming carrier gas lines are relatively clean.

Troubleshooting Guides

Excessive Baseline Noise

Possible Cause	Solution	Comments
Injector contamination	Clean the injector; replace liner, gold seal	Try a condensation test; gas lines may also need cleaning
Column contamination	Bake-out the column	Limit the bake-out to 1-2 hours
	Solvent rinse the column	Only for bonded and cross-linked phases
		Check for inlet contamination
Detector contamination	Clean the detector	Usually the noise increases over time and not suddenly
Contaminated or low quality gases	Use better grade gases; also check for expired gas traps or leaks	Usually occurs after changing a gas cylinder
Column inserted too far into the detector	Reinstall the column	Consult GC manual for proper insertion distance
Incorrect detector gas flow rates	Adjust the flow rates to the recommended values	Consult GC manual for proper flow rates
Leak when using an MS, ECD, or TCD	Find and eliminate the leak	Usually at the column fittings or injector
Old detector filament, lamp or electron multiplier	Replace appropriate part	
Septum degradation	Replace septum	For high temperature applications use an appropriate septum

Baseline Instability or Disturbances

Possible Cause	Solution	Comments
Injector contamination	Clean the injector	Try a condensation test; gas lines may also need cleaning
Column contamination	Bake-out the column	Limit a bake-out to 1-2 hours
Unequilibrated detector	Allow the detector to stabilize	Some detectors may require up to 24 hours to fully stabilize
Incompletely conditioned column	Fully condition the column	More critical for trace level analyses
Change in carrier gas flow rate during the temperature program	Normal in many cases	MS, TCD and ECD respond to changes in carrier gas flow rate

Tailing Peaks

Possible Cause	Solution	Comments
Column contamination	Trim the column	Remove 0.5-1 m from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
		Check for inlet contamination
Column activity	Irreversible; Replace the column	Only affects active compounds
Solvent-phase polarity mismatch	Change sample solvent to a single solvent	More tailing for the early eluting peaks or those closest to the solvent front
	Use a retention gap	3-5 m retention gap is sufficient
Solvent effect violation for splitless or on-column injections	Decrease the initial column temperature	Peak tailing decreases with retention
Too low of a split ratio	Increase the split ratio	Flow from split vent should be 20 mL/min or higher
Poor column installation	Reinstall the column	More tailing for early eluting peaks
Some active compounds always tail	None	Most common for amines and carboxylic acids

Split Peaks

Possible Cause	Solution	Comments
Injection technique	Change technique	Usually related to erratic plunger depression or having sample in the syringe needle; Use an auto injector
Mixed sample solvent	Change sample solvent to a single solvent	Worse for solvents with large differences in polarity or boiling points
Poor column installation	Reinstall the column	Usually a large error in the insertion distance
Sample degradation in the injector	Reduce the injector temperature	Peak broadening or tailing may occur if the temperature is too low
	Change to an on-column injection	Requires an on-column injector
Poor sample focusing	Use a retention gap	For splitless and on-column injection

Retention Time Shift

Possible Cause	Solution	Comments
Change in carrier gas velocity	Check the carrier gas velocity	All peaks will shift in the same direction by approximately the same amount
Change in column temperature	Check the column temperature	Not all peaks will shift by the same amount
Change in column dimension	Verify column identity	
Large change in compound concentration	Try a different sample concentration	May also affect adjacent peaks; Sample overloading is corrected with an increase in split ratio or sample dilution
Leak in the injector	Leak check the injector	A change in peak size usually occurs
Blockage in a gas line	Clean or replace the plugged line	More common for the split line; also check flow controllers and solenoids
Septum leak	Replace septum	Check for needle barb
Sample solvent incompatibility	Change sample solvent to a single solvent Use a retention gap	For splitless injection

Change in Peak Size

Possible Cause	Solution	Comments
Change in detector response	Check gas flows, temperatures and settings	All peaks may not be equally affected
	Check background level or noise	May be caused by system contamination and not the detector
Change in the split ratio	Check split ratio	All peaks may not be equally affected
Change in the purge activation time	Check the purge activation line	For splitless injection
Change in injection volume	Check the injection technique	Injection volumes are not linear
Change in sample concentration	Check and verify sample concentration	Changes may also be caused by degradation, evaporation, or variances in sample temperature or pH
Leak in the syringe	Use a different syringe	Sample leaks past the plunger or around the needle; Leaks are not often readily visible
Column contamination	Trim the column	Remove 0.5-1 m from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
Column activity	Irreversible	Only affects active compounds
Coelution	Change column temperature or stationary phase	Decrease column temperature and check for the appearance of a peak shoulder or tail
Change in injector discrimination	Maintain the same injector parameters	Most severe for split injections
Sample flashback	Inject less, use a larger liner, reduce the inlet temperature	Less solvent and higher flow rates are most helpful
Decomposition from inlet contamination	Clean the injector; replace liner, gold seal	Only use deactivated liners and glass wool in the inlet

Loss of Resolution

Possible Cause	Solution	Comments
Decrease in separation		
Different column temperature	Check the column temperature	Differences in other peaks will be visible
Different column dimensions or phase	Verify column identity	Differences in other peaks will be visible
Coelution with another peak	Change column temperature	Decrease column temperature and check for the appearance of a peak shoulder or tail
Increase in peak width		
Change in carrier gas velocity	Check the carrier gas velocity	A change in the retention time also occurs
Column contamination	Trim the column	Remove 0.5-1 m from the front of the column
	Solvent rinse the column	Only for bonded and cross-linked phases
Change in the injector	Check the injector settings	Typical areas: split ratio, liner, temperature, injection volume
Change in sample concentration	Try a different sample concentration	Peak widths increase at higher concentrations
Improper solvent effect, lack of focusing	Lower oven temperature, better solvent, sample phase polarity match, use a retention gap	For splitless injection



GC Applications

Industry-specific applications from your partner in chromatography

With over 40 years of chromatography expertise, Agilent is a great resource for all types of applications. In fact, we're developing new ones every day.

Simply turn to the pages listed below for the most current applications based on your area of specialization.

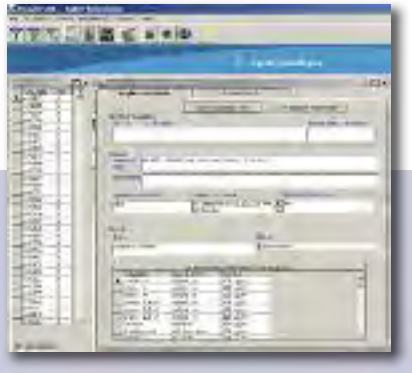
Environmental – you'll learn how to perform critical analyses – such as measuring the levels of atmospheric halocarbons and identifying organochlorine pesticides in soil – while meeting your increasing demands for speed and accuracy. **Turn to page 429.**

Food, Flavors, and Fragrances – we'll discuss how to ensure quality, safety, and regulatory compliance for fragrances, perfumes, and essential oils. Applications focus on chiral compounds, menthol, and FAMEs. **Turn to page 478.**

Industrial Chemicals – we'll help you maintain product quality – and production efficiency – by sharing the latest applications for alcohols, halogenated hydrocarbons, aromatic solvents, phenols, and inorganic gases. **Turn to page 501.**

Life Sciences – we'll bring you fully up-to-date on the newest screening methods for controlled substances such as amphetamines, narcotics, and alcohol. We'll also review the latest techniques for monitoring residual solvents. **Turn to page 535.**

Energy and Fuels – here you'll find applications – such as the analysis of sulfur compounds in propylene – that you can use right away to meet regulatory requirements, improve efficiency, and maintain good environmental stewardship. **Turn to page 552.**



TIPS & TOOLS

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Environmental Applications, Hydrocarbons

Methyl Tert-Butyl Ether (MTBE) FID, Extended 8020 Analysis

Column: **DB-MTBE**
124-0034
30 m x 0.45 mm, 2.55 µm

Carrier: Helium at 10 mL/min

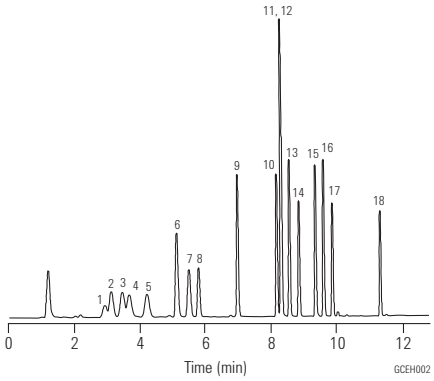
Oven: 35 °C for 4 min
35-200 °C at 20 °C/min
200 °C for 5 min

Sampler: Purge and Trap (O.I.A. 4560)
Trap: Tenax only
Preheat: 175 °C
Desorb: 180 °C for 3 min

Injection: LVI (Low Volume Injector), 150 °C

Detector: FID (O.I.A. 4410), 200 °C

Sample: 40 ppb per component in 5 mL water



1. Methyl-tert-butyl-ether (MTBE)
2. 2-Methylpentane
3. 3-Methylpentane
4. Diisopropyl ether (DIPE)
5. Ethyl-tert-butyl ether (ETBE)
6. Benzene
7. tert-Amyl methyl ether (TAME)
8. α,α,α-Trifluorotoluene
9. Toluene
10. Ethylbenzene
11. m-Xylene
12. p-Xylene
13. o-Xylene
14. Cumene
15. 1,3,5-Trimethylbenzene
16. 1,2,4-Trimethylbenzene
17. 1,2,3-Trimethylbenzene
18. Naphthalene

Unleaded Gasoline

Column: **DB-VRX**
124-1534
30 m x 0.45 mm, 2.55 µm

Carrier: Helium at 109 cm/sec (10.4 mL/min), measured at 40 °C

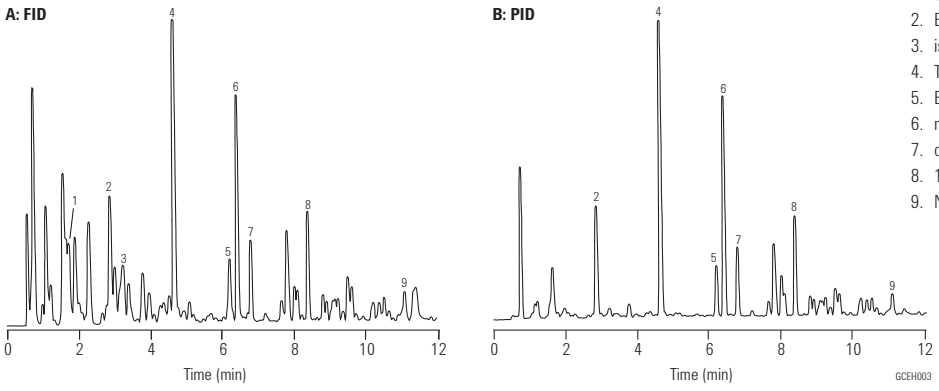
Oven: 40 °C for 2 min
40-200 °C at 12 °C/min
200 °C for 5 min

Sampler: Purge and Trap (O.I.A. 4560)
Trap: BTEX (Supelco) at 50 °C during purge
Preheat:
Desorb: 270 °C for 1 min

Injection: LVI (Low Volume Injector)

Detector: A: FID, 250 °C
B: PID (O.I.A. 4430), 200 °C

Sample: 115 ppb gasoline in 5 mL water



1. 3-Methylpentane
2. Benzene
3. iso-Octane
4. Toluene
5. Ethylbenzene
6. m, p-Xylene
7. o-Xylene
8. 1,2,4-Trimethylbenzene
9. Naphthalene

Determination of Chlorophenols in Water and Soil

Column: **VF-5ms**
CP8961
60 m x 0.32 mm, 0.25 µm

Oven: 60 °C, 30 °C/min to 300 °C

Carrier: He 80 kPa, 0.8 bar, 5.7 psi

Injection: Splitless, initial time: 1 min; Splitflow: 50 mL/min
250 °C
2 µL

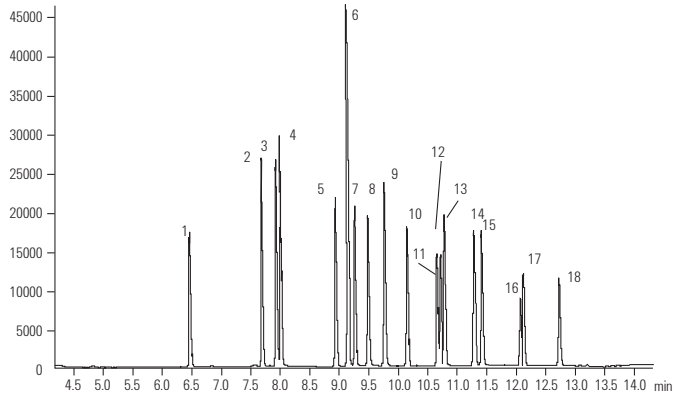
Detector: MS
280 °C

Sample: Isohexane

Sample Conc: Standard, 1 µg/mL, derivatization with acetic acid anhydride

Dr. Weßling, Laboratorien GmbH

1. Phenol
2. 2-chlorophenol
3. 3-chlorophenol
4. 4-chlorophenol
5. 2,6-dichlorophenol
6. 2,4+2,5-dichlorophenol
7. 3,5-dichlorophenol
8. 2,3-dichlorophenol
9. 3,4-dichlorophenol
10. 2,4,6-trichlorophenol
11. 2,3,6-trichlorophenol
12. 2,3,5-trichlorophenol
13. 2,4,5-trichlorophenol
14. 2,3,4-trichlorophenol
15. 3,4,5-trichlorophenol
16. 2,3,5,6-tetrachlorophenol
17. 2,3,4,6-tetrachlorophenol
18. 2,3,4,5-tetrachlorophenol



PBDEs by ECD

Column: **DB-XLB**
15 m x 0.18 mm, 0.07 µm
Agilent Technologies custom column

Carrier: Hydrogen at 72 cm/sec at 100 °C (4.0 mL/min), constant flow mode

Oven: 100 °C for 0.5 min
100 °C to 300 °C at 30 °C/min
300 °C for 5 min

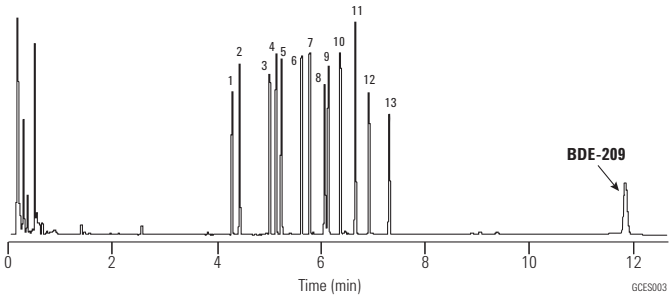
Injection: Split, 250 °C
Split ratio 20:1

Detector: ECD, 300 °C
Peak, Congener (2.5 mg/mL)

Sample: 1 µL

Special thanks to AccuStandard, Inc. of New Haven, CT, for PBDE standards.

1. 2,2',4-TriBDE (BDE-17)
2. 2,4,4'-TriBDE (BDE-28)
3. 2,3',4',6-Tetra-BDE (BDE-71)
4. 2,2',4,4'-Tetra-BDE (BDE-47)
5. 2,3',4,4'-TetraBDE (BDE-66)
6. 2,2',4,4',6-PentaBDE (BDE-100)
7. 2,2',4,4',5-PentaBDE (BDE-99)
8. 2,2',3,4,4'-PentaBDE (BDE-85)
9. 2,2',4,4',5,6'-HexaBDE (BDE-154)
10. 2,2',4,4',5,5'-HexaBDE (BDE-153)
11. 2,2',3,4,4',5'-HexaBDE (BDE-138)
12. 2,2',3,4,4',5',6-HeptaBDE (BDE-183)
13. 2,3,3',4,4',5,6-HeptaBDE (BDE-190)
14. DecaBDE (BDE-209) (12.5 mg/mL)



Diesel Fuel

Column: **DB-5ms**
125-5532
30 m x 0.53 mm, 1.50 µm

Carrier: Helium at 48.5 cm/sec, measured at 60 °C

Oven: 60 °C for 2 min
60-300 °C at 12 °C/min
300 °C for 10 min

Injection: Direct, 280 °C

Detector: FID, 250 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL injection in hexane
A - Standard, 50 ng/component
B - Sample, 0.6 mg/mL

Suggested Supplies

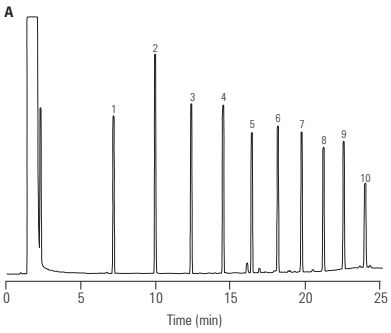
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

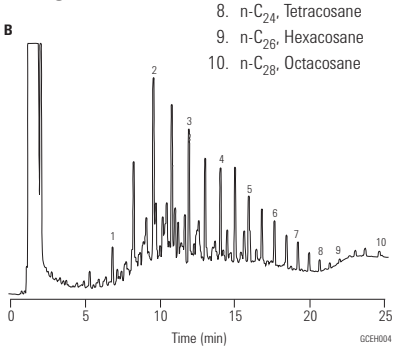
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. n-C_{10}, Decane
2. n-C_{12}, Dodecane
3. n-C_{14}, Tetradecane
4. n-C_{16}, Hexadecane
5. n-C_{18}, Octadecane
6. n-C_{20}, Eicosane
7. n-C_{22}, Docusane
8. n-C_{24}, Tetracosane
9. n-C_{26}, Hexacosane
10. n-C_{28}, Octacosane

Diesel Fuel Standard
50 ng/component



Diesel Fuel
0.6 mg/mL



Analysis of Polycyclic Aromatic Hydrocarbons

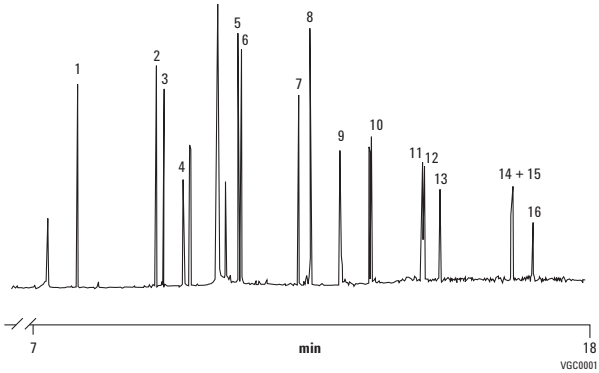
Column: **VF-Xms**
CP8805
30 m x 0.25 mm, 0.10 µm

Sample: 1 µL ca. 3 ng per component on-column

Carrier: Helium, 60 kPa

Injection: Split, T=275 °C

Detector: Ion Trap MS



1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Chrysene
10. Benzo(a)anthracene
11. Benzo(k)fluoranthene
12. Benzo(b)fluoranthene
13. Benzo(a)pyrene
14. Indeno(1,2,3-cd)pyrene
15. Dibenz(a,h)anthracene
16. Benzo(g,h,i)perylene

Dioxins and Dibenzofurans

Column: **CP-Sil 88**
CP6173
50 m x 0.25 mm, 0.20 µm

Sample: 1.0 µL Toluene

Sample Conc: 100 – 400 pg/µl

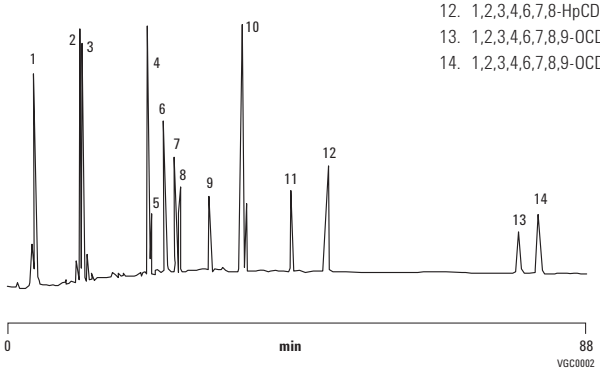
Carrier: Helium, 170 kPa (1.7 bar, 24 psi)

Oven: 100 °C to 180 °C to 230 °C, 3 °C/min

Injection: Splitless

Detector: MSD

1. 2,3,7-8-TCDD
2. 2,3,7,8-TCDF
3. 1,2,3,7,8-PeCDF
4. 1,2,3,4,7,8-HxCDF
5. 1,2,3,6,7,8-HxCDF
6. 2,3,4,7,8-PeCDF
7. 1,2,3,4,7,8-HxCDD + 1,2,3,7,8-PeCDD
8. 1,2,3,6,7,8-HxCDD
9. 1,2,3,7,8,9-HxCDD
10. 1,2,3,4,6,7,8-HxCDF
11. 2,3,4,6,7,8-HpCDD
12. 1,2,3,4,6,7,8-HpCDD
13. 1,2,3,4,6,7,8,9-OCDF
14. 1,2,3,4,6,7,8,9-OCDD



Large Mix 5 ng Column AccuStandard 8720 Mixes 1, 2, 3, 4a, 4b, 5 & 6 (93 compounds)

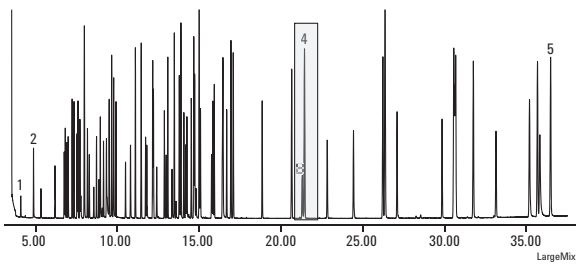
Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

Oven: 40 °C (1 min) to 100 °C (15 °C/min),
10 °C/min to 210 °C (1 min),
5 °C/min to 310 °C (8 min)

Injection: Splitless @ 260 °C, purge flow 50 °C mL/min
at 0.5 min, gas saver 80 mL/min on at 1 min

Detector: MSD; Transfer line 290 °C,
Source 300 °C, Quad 180 °C

1. n-Nitrosodimethylamine
2. 2-methyl pyridine
3. Benzidene
4. Fluoranthene
5. Benzo (g,h,i) perylene



Polybrominated Diphenyl Ethers (PBDEs)

Column: **DB-5ms Ultra Inert**
122-5512UI
15 m x 0.25 mm, 0.25 µm

Instrument: Agilent 6890N/5973B MSD

Sampler: Agilent 7683B, 5.0 µL syringe (P/N 5188-5246), 1.0 µL splitless injection, 5 ng each component on-column

Carrier: Helium 72 cm/s, constant flow

Inlet: Pulsed splitless; 325 °C, 20 psi until 1.5 min, purge flow 50 mL/min at 2.0 min

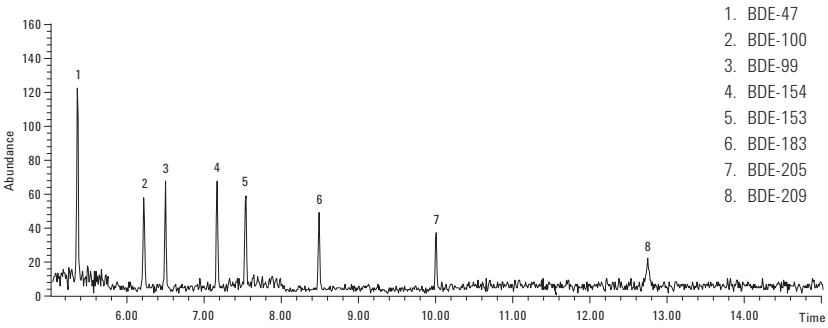
Oven: 150 to 325 °C (17 °C/min), hold 5 min

Detector: MSD source at 300 °C, quadropole at 150 °C, transfer line at 300 °C, scan range 200-1000 amu

Suggested Supplies

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Syringe: Autosampler syringe, 0.5 µL, 23 g, cone, 5188-5246



15+1 EU Priority PAHs

Resolution of Critical Pairs on an Agilent J&W DB-EUPAH Column

Column: **DB-EUPAH**
121-9627
20 m x 0.18 mm, 0.14 µm

Instrument: Agilent 6890N/5975B MSD

Sampler: Agilent 7683B, 5.0 µL syringe, 0.5 µL splitless injection, injection speed 75 µL/min

Carrier: Helium, ramped flow 1.0 mL/min (0.2 min), 5 mL/min^2 to 1.7 mL/min

Inlet: 325 °C splitless, purge flow 60 mL/min at 0.8 min

Oven: 45 °C (0.8 min) to 200 °C (45 °C/min), 2.5 °C/min to 225 °C, 3 °C/min to 266 °C, 5 °C/min to 300 °C, 10 °C/min to 320 °C (4.5 min)

Detector: MSD source at 300 °C, quadrupole at 180 °C, transfer line at 330 °C, scan range 50-550 AMU

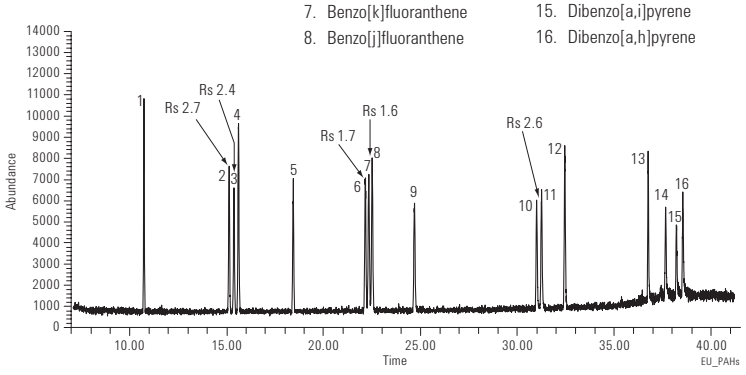
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Benzo[c]fluorene
2. Benz[a]anthracene
3. Cyclopenta[c,d]pyrene
4. Chrysene
5. 5-Methylchrysene
6. Benzo[b]fluoranthene
7. Benzo[k]fluoranthene
8. Benzo[j]fluoranthene
9. Benz[a]pyrene
10. Indeno[1,2,3-cd]pyrene
11. Dibenz[a,h]anthracene
12. Benzo[g,h,i]perylene
13. Dibenzo[a,l]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo[a,i]pyrene
16. Dibenzo[a,h]pyrene



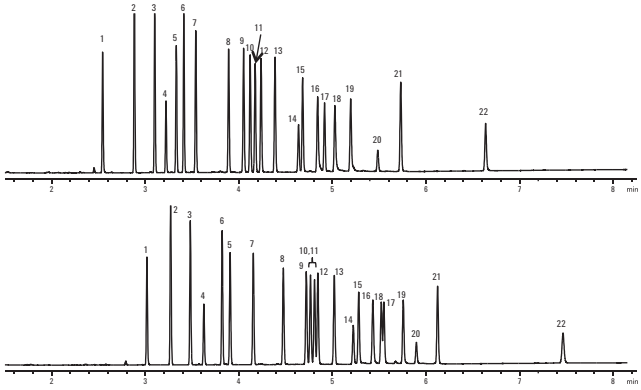
All 15+1 EU regulated priority PAHs are well resolved with the DB-EUPAH column. Challenging benzo[b,k,j]fluoranthene isomers are baseline resolved, allowing for accurate quantitation of each isomer. In addition, baseline resolution is achieved for critical pairs benz[a]anthracene and cyclopenta[c,d]pyrene, cyclopenta[c,d]pyrene and chrysene, and indeno[1,2,3-cd]pyrene and dibenz[a,h]anthracene. This application demonstrates that the DB-EUPAH column can provide excellent sensitivity and selectivity for the analysis of EU regulated PAHs.

Environmental Applications, Pesticides and Herbicides

Fast CLP Pesticides

Column:	**DB-CLP1** **123-8232** **30 m x 0.32 mm, 0.25 µm**
Column:	**DB-CLP2** **123-8336** **30 m x 0.32 mm, 0.5 µm**
Instrument:	Agilent 7890 GC with dual µECD
Carrier:	Helium, constant flow 3.5 mL/min
Oven:	150 °C (hold 0.2 min), 45 °C/min to 250 °C, 18 °C/min to 300 °C, 30 °C/min to 330 °C, hold 2.5 min
Sampler:	Agilent 7693
Injection:	1 µL splitless
Detector:	µECD @ 340 °C
Sample:	50 ng/mL CLP Pesticides

1. Tetrachloro-m-xylene
2. α-BHC
3. γ-BHC
4. β-BHC
5. Heptachlor
6. δ-BHC
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4′-DDE
13. Dieldrin
14. Endrin
15. 4,4′-DDD
16. Endosulfan II
17. 4,4′-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl



Organochlorine Pesticides, EPA Method 8081B

Column: **DB-CLP1**
123-8232
30 m x 0.32 mm, 0.25 µm

Column: **DB-CLP2**
123-8336
30 m x 0.32 mm, 0.25 µm

Instrument: Agilent 7890 GC with dual µECD

Carrier: Helium at 43,5 cm/sec (constant flow)

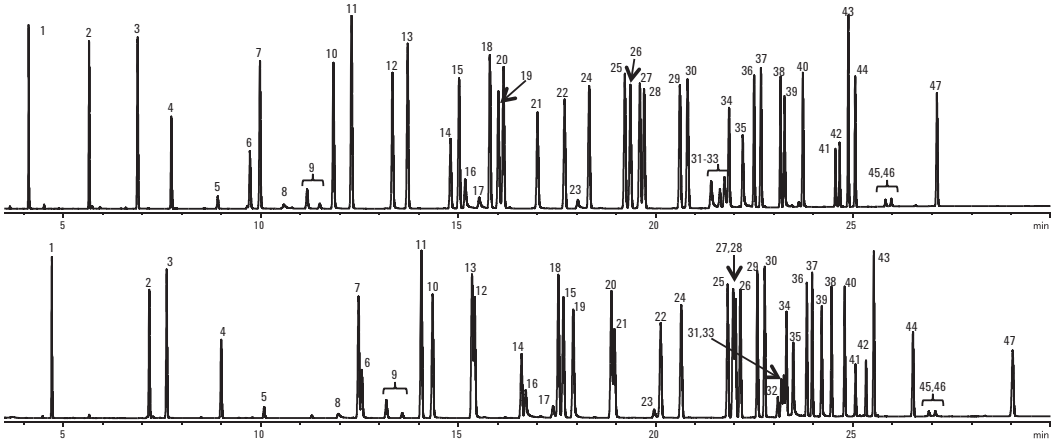
Oven: 80 °C (hold 0.5 min) to 150 °C at 20 °C/min,
5 °C/min to 235 °C, 15 °C/min to 300 °C, hold 5 min

Sampler: Agilent 7693

Injection: 2 µL splitless

Detector: µECD @ 325 °C

Sample: 50 ng/mL 8081B analytes



1. 1,2-Dibromo-3-chloropropane
2. Hexachlorocyclopentadiene
3. 1-Bromo-2-nitrobenzene
4. Etradiazole
5. Chloroneb
6. Trifluralin
7. TCMX
8. Propachlor
9. Diallate isomers (250ng/mL)
10. Hexachlorobenzene
11. α-BHC
12. Pentachloronitrobenzene
13. γ-BHC
14. β-BHC
15. Heptachlor
16. Dichlone
17. Alachlor
18. δ-BHC
19. Chlorothalonil
20. Aldrin
21. DCPA
22. Isodrin
23. Kelthane
24. Heptachlor epoxide
25. γ-Chlordane
26. trans-Nonachlor
27. α-Chlordane
28. Endosulfan I
29. 4,4'-DDE
30. Dieldrin
31. Chlorobenzilate (250ng/mL)
32. Perthane (250ng/mL)
33. Chloropropylate (250ng/mL)
34. Endrin
35. Nitrofen
36. 4,4'-DDD
37. Endosulfan II
38. 4,4'-DDT
39. Endrin aldehyde
40. Endosulfan sulfate
41. Captafol
42. Methoxychlor
43. Endrin ketone
44. Mirex
45. cis-Permethrin
46. trans-Permethrin
47. ΩΩΩΩDecachlorobiphenyl

DB-624UI Organic Acid Performance

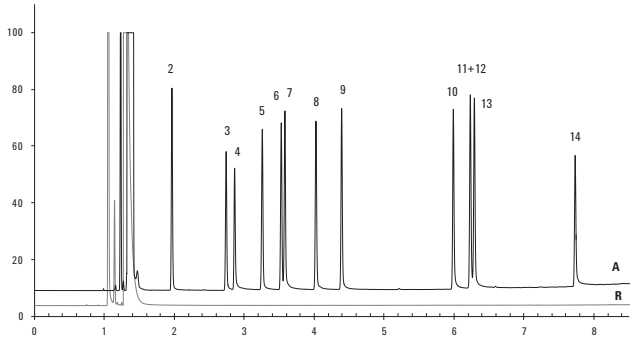
Column: **DB-Select 624 Ultra Inert**
122-0334UI
30 m x 0.25 mm, 1.4 µm

Carrier: Hydrogen 42 cm/s

Oven: 70 °C isothermal

Inlet: Split, 116:1 at 250 °C

Detector: FID at 260 °C



1. Formic acid
2. Acetic acid
3. Propionic acid
4. Acrylic acid
5. Isobutyric acid
6. n-Butyric acid
7. Methacrylic acid
8. Isopentanoic acid
9. n-Pentanoic acid
10. n-Heptanoic acid
11. Levulinic acid
12. 2-Propyl pentanoic acid
13. 2-Ethyl hexanoic acid
14. Citronellic acid

US EPA Method 551.1

Column A: **HP-1ms Ultra Inert**
19091S-733UI
30 m x 0.25 mm, 1.00 µm

Column B: **DB-1301**
122-1333
30 m x 0.25 mm, 1.00 µm

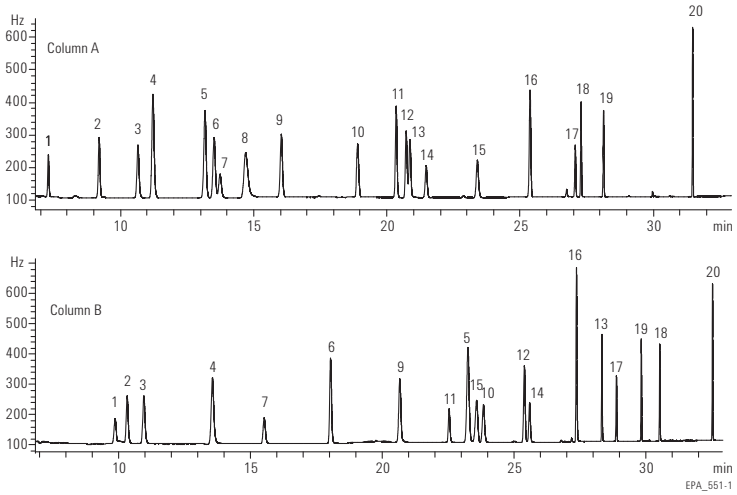
Instrument:	Agilent 7890A GC
Sampler:	Agilent 7683B, 5.0 µL syringe (Agilent p/n 5181-1273) 0.5 µL splitless injection
Carrier:	Helium 25 cm/s, constant flow
Inlet:	Splitless; 200 °C, purge flow 20 mL/min at 0.25 min
Retention Gap:	1 m, 0.32 mm id deactivated fused silica high-temperature tubing (Agilent p/n 160-2855-5)
Oven:	33 °C (14 min) to 60 °C (5 °C/min), hold 5 min, 15 °C/min to 275 °C, hold 20 min
Detector:	Dual G2397A µECD; 300 °C, const col + makeup (N_2) = 30 mL/min

This application successfully demonstrates the use of the HP-1ms Ultra Inert column for primary analysis of EPA 551.1 chlorinated solvents, trihalomethanes and disinfection by-products. The excellent peak shape of the chloral hydrate and resolution between bromodichloromethane and trichloroethylene emphasize the high column inertness of the HP-1ms Ultra Inert column, making it an excellent choice for EPA Method 551.1 analysis.

Suggested Supplies

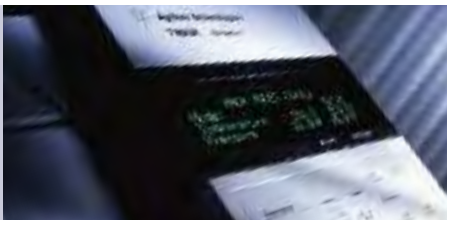
Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Direct connect, dual taper, deactivated, 4 mm id, G1544-80700
Syringe:	5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroacetonitrile
5. Dichloroacetonitrile
6. Bromodichloromethane
7. Trichloroethylene
8. Chloral hydrate
9. 1,1-Dichloro-2-propanone
10. 1,1,2-Trichloroethane
11. Chloropicrin
12. Dibromochloromethane
13. Bromochloroacetonitrile
14. 1,2-Dibromoethane
15. Tetrachloroethlyene
16. 1,1,1-Trichloro-2-propanone
17. Bromoform
18. Dibromoacetonitrile
19. 1,2,3-Trichloropropane
20. 1,2-Dibromo-3-chloropropane



TIPS & TOOLS

Learn more about the Agilent 7890A GC System at **www.agilent.com/chem/7890A**



Analysis of Semivolatiles

Column A: **DB-5.625**
122-5632
30 m x 0.25 mm, 0.50 µm

Column B: **DB-5.625**
121-5622
20 m x 0.18 mm, 0.36 µm

Carrier: He constant-flow mode, 1.1 mL/min

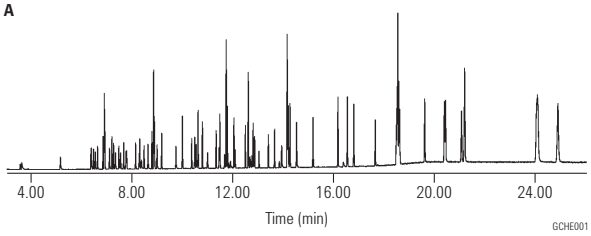
Oven: 40 °C (1 min), 25 °C/min to 320 °C
4.80 min hold

Injection: Splitless 0.5 µL injected at 300 °C, QuickSwap pressure 5.0 psi during acquisition, 80.0 psi during backflush with inlet set to 1.0 psi during backflush

Detector: Agilent 5975C Performance Turbo MSD equipped with 6 mm large-aperture drawout lens, P/N G2589-20045

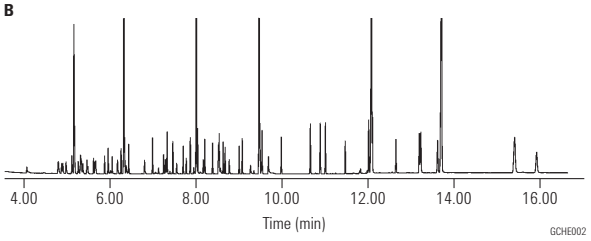
Translating 0.25 mm id column method to 0.18 mm id format results in 32% reduction in analysis time. Resolution of 77 peaks of interest is also maintained for the faster 0.18 mm id separation.

A



U.S. EPA Method 8270, 5 ng/mL System Performance Check Compounds Chromatogram using a DB-5.625, 30 m x 0.25 mm, 0.5 µm

B



U.S. EPA Method 8270, 5 ng/mL System Performance Check Compounds Chromatogram using a DB-5.625, 20 m x 0.18 mm, 0.36 µm

Pesticides, EPA 508.1

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 µm

Column: **DB-XLB**
123-1236
30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 75 °C for 0.5 min
75-300 °C at 10 °C/min
300 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: µECD, 350 °C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component

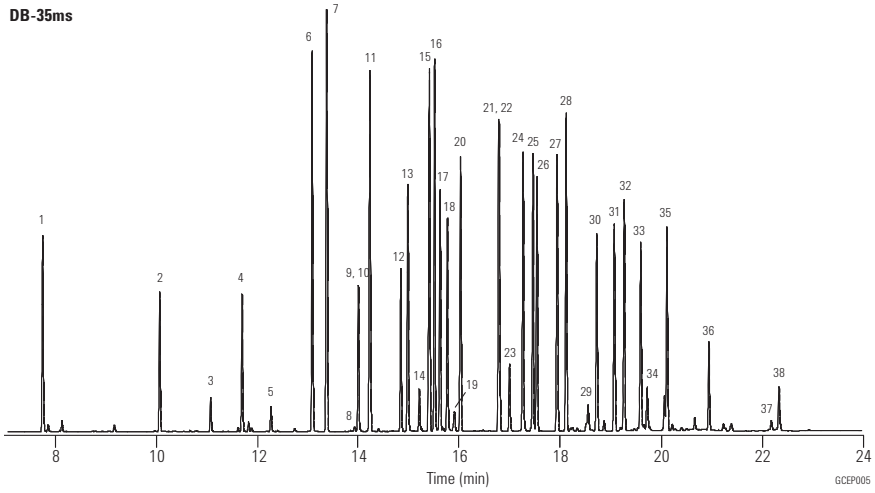
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

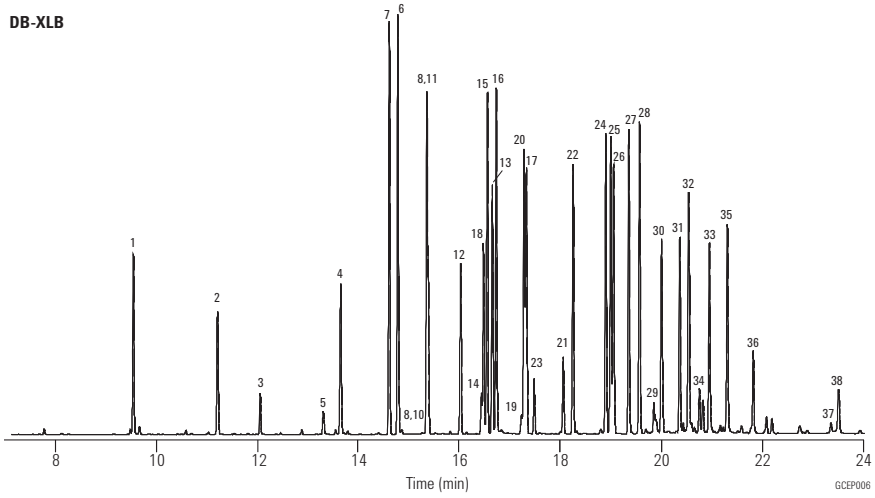
Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

DB-35ms



DB-XLB



1. Hexachlorocyclopentadiene
2. Etridiazole
3. Chloroneb
4. Trifluralin
5. Propachlor
6. Hexachlorobezene
7. α-BHC
8. Atrazine
9. Pentachloronitrobenzene
10. Simazine
11. γ-BHC
12. β-BHC
13. Heptachlor
14. Alachlor
15. δ-BHC
16. Chlorothalonil
17. Aldrin
18. Metribuzin
19. Metolachlor
20. DCPA
21. 4,4'-Dibromobiphenyl
22. Heptachlor epoxide
23. Cyanazine
24. γ-Chlordane
25. α-Chlordane
26. Endosulfan I
27. 4,4'-DDE
28. Dieldrin
29. Chlorobenzilate
30. Endrin
31. 4,4'-DDD
32. Endosulfan II
33. 4,4'-DDT
34. Endrin aldehyde
35. Endosulfan sulfate
36. Methoxychlor
37. cis-Permethrin
38. trans-Permethrin

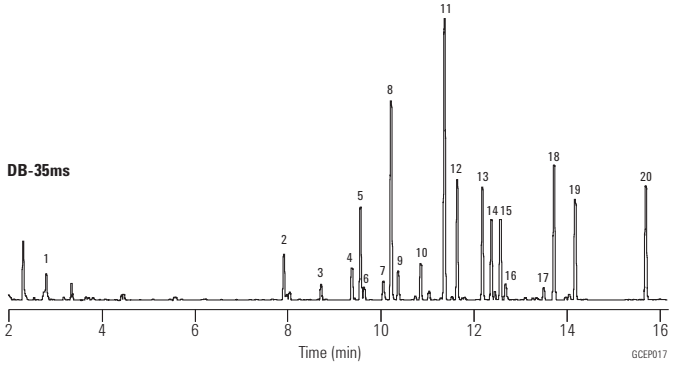
Phenoxy Acid Herbicides – Methyl Derivatives, EPA 8151A

Column:	**DB-35ms** **123-3832** **30 m x 0.32 mm, 0.25 µm**
Carrier:	Helium at 45 cm/sec (EPC in constant flow mode)
Oven:	50 °C for 0.5 min 50-100 °C at 25 °C/min 100-320 °C at 12 °C/min 320 °C for 2 min
Injection:	Splitless, 250 °C 30 sec purge activation time
Detector:	µECD, 350 °C Nitrogen makeup gas (column + makeup flow = 30 mL/min constant flow)
Sample:	50 pg per component

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe:	10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Dalapon
2. 3,5-Dichlorobenzoic acid
3. 4-Nitrophenol
4. Methyl-2,4-dichlorophenylacetate (SS)
5. Dicamba
6. MCPP
7. MCPA
8. 4,4'-Dibromooctafluorobiphenyl (IS)
9. Dichloroprop
10. 2,4-D
11. Pentachlorophenol
12. 2,4,5-T,P
13. 2,4,5-T
14. Chloramben
15. Dinoseb
16. 2,4-DB
17. Bentazone
18. DCPA
19. Picloram
20. Acifluorofen



Direct Comparison for Rapid CLP (Contract Laboratory Program) Pesticide Analysis

Column: **DB-17ms**
121-4722
20 m x 0.18 mm, 0.18 µm

Column: **DB-XLB**
121-1222
20 m x 0.18 mm, 0.18 µm

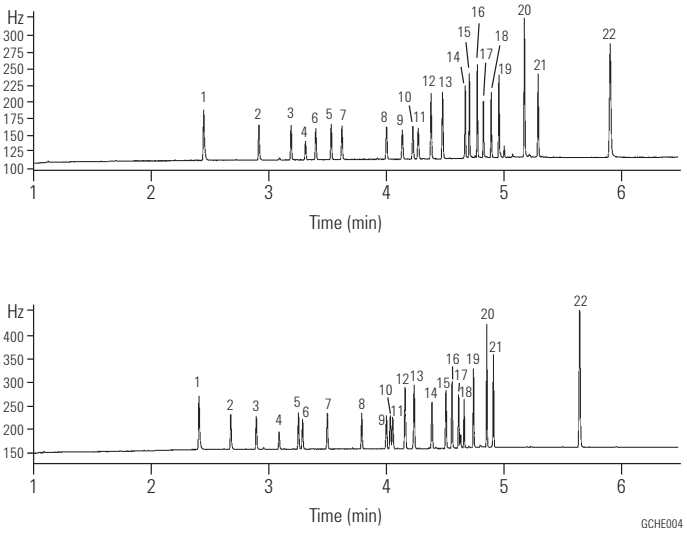
Carrier: Hydrogen (69 cm/sec at 120 °C, ramped at 99 mL/min to 106 cm/sec at 4.4 minutes)

Oven: 120 °C (0.32 min); 120 °C/min to 160 °C; 30 °C/min to 258 °C (0.18 min); 38.81 °C/min to 300 °C (1.5 min)

Injection: Split/splitless; 220 °C, pulsed splitless (35 psi for 0.5 min, purge flow of 40 mL/min on at 1 minute, gas saver flow 20 mL/min on 3 minutes)

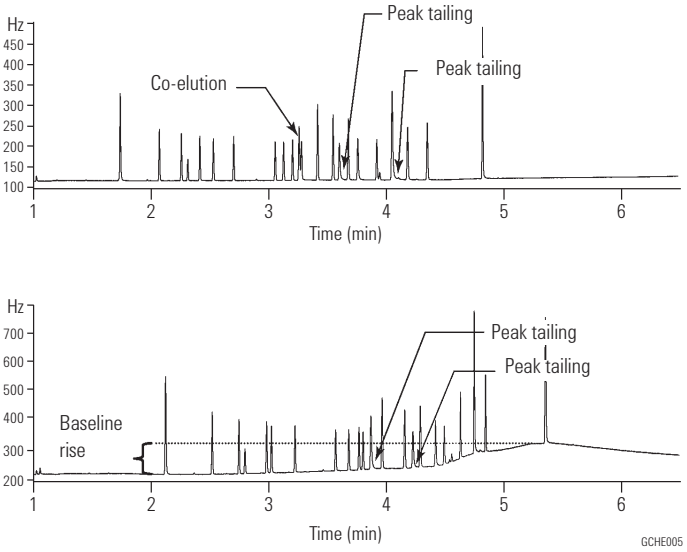
Detector: µECD 320 °C; nitrogen makeup; constant column + makeup flow 60 mL/min

DB-17ms primary column
DB-XLB confirmatory column



1. Tetrachloro-m-xylene
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor Epoxide
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4' DDE
13. Dieldrin
14. Endrin
15. 4,4' DDD
16. Endosulfan II
17. 4,4' DDT
18. Endrin Aldehyde
19. Endosulfan Sulfate
20. Methoxychlor
21. Endrin Ketone
22. Decachlorobiphenyl

Vendor R primary column, 20 m x 0.18 mm, 0.18 µm
Vendor R confirmatory column, 20 m x 0.18 mm, 0.14 µm



Agilent's DB-17ms primary column and DB-XLB confirmatory column sufficiently resolved all the peaks of interest in less than 6 minutes with sharp, symmetrical peaks and minimal baseline drift. In contrast, vendor R's primary analysis column resolved only 20 of 22 peaks with visible peak tailing. Vendor R's confirmatory column resolved all 22 peaks of interest but with peak tailing and an unacceptable level of temperature dependent baseline drift.

Aroclors 1016-1268 (without 1221)

Column: **DB-XLB**
121-1232
30 m x 0.18 mm, 0.18 µm

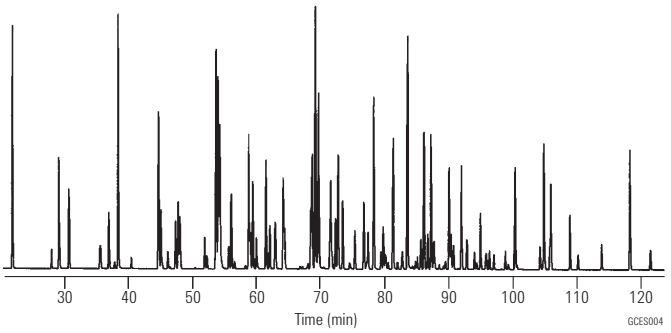
Carrier: Helium at 37 cm/sec, measured at 150 °C

Oven: 100 °C for 1 min
100-265 °C at 1.2 °C/min

Injection: Hot on-column, 250 °C

Detector: MSD, 340 °C transfer line, SIM

Sample: 1 µL in isooctane, 12.5 ppm



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

CLP Pesticides

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 µm

Column: **DB-XLB**
123-1236
30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 45 cm/sec
(EPC in constant flow mode)

Oven: 110 °C for 0.5 min
110-320 °C at 15 °C/min
320 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: µECD, 350 °C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min
constant flow)

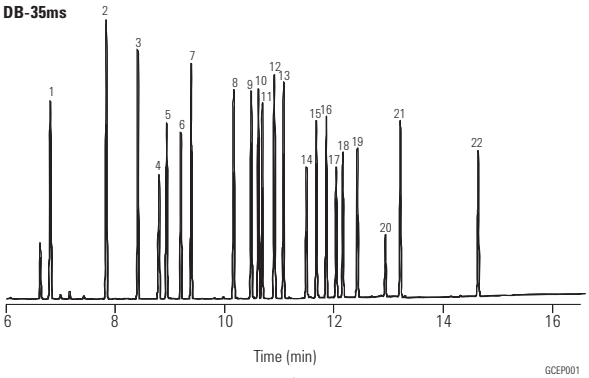
Sample: 50 pg per component

Suggested Supplies

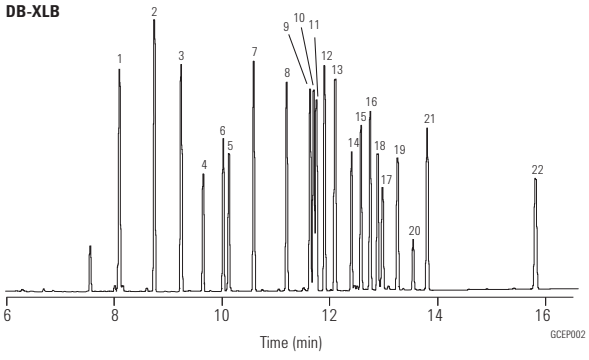
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



Complete resolution and confirmation of 22 CLP Pesticides in under 16 minutes!



1. Tetrachloro m-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. Heptachlor
6. δ-BHC
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (SS)

SS - Surrogate Standard

High Speed VOC, EPA Method 8260

Column: **DB-VRX**
121-1524
20 m x 0.18 mm, 1.00 µm

Carrier: Helium at 55 cm/sec (1.5 mL/min)

Oven:
45 °C for 3.0 min
45-190 °C at 36 °C/min
190-225 °C at 20 °C/min
225 °C for 0.5 min

Sampler: Purge and trap (Tekmar 3100)
Purge: 11 min
Trap: Vocarb 3000
Preheat: 245 °C
Desorb: 250 °C for 1min
Bake: 260 °C for 10 min
Line & valve: 100 °C

Injection:
Split, 150 °C
Split ratio 60:1

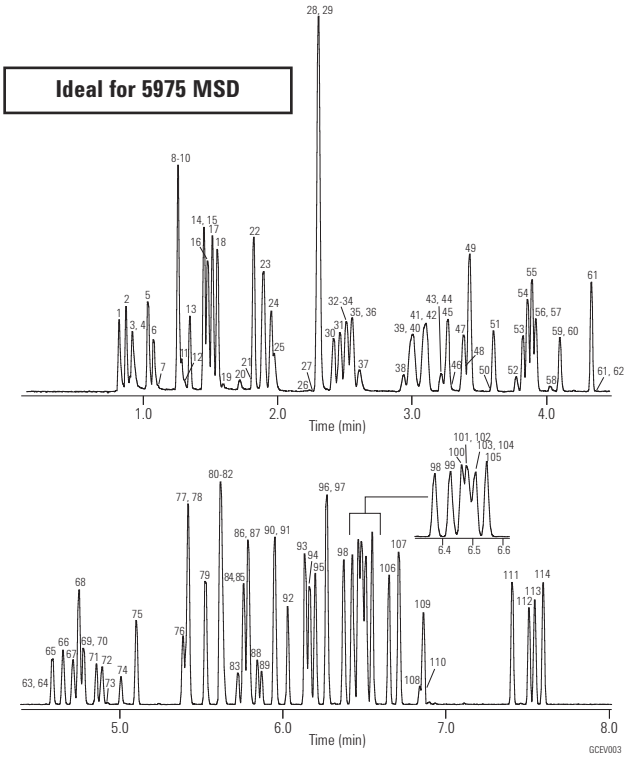
Detector: Agilent 5975 MSD
Scan range: 35-260 amu
Scan rate: 3.25 scans/sec
Quad temperature: 150 °C
Source temperature: 200 °C
Transfer line temp: 200 °C

Sample: 5 mL
- Halogentated and aromatic analytes at 40 ppb
- Internal standards at 20 ppb
- Polar analytes (i.e., ethers, alcohols and ketones at 100-800 ppb)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

Ideal for 5975 MSD



1. Dichlorodifluoromethane
2. Chloromethane
3. Hydroxypropionitrile
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Ethanol
8. Acetonitrile
9. Acrolein
10. Trichlorofluoromethane
11. Isopropyl alcohol
12. Acetone
13. Ethyl ether
14. 1,1-Dichloroethene
15. tert-Butyl alcohol
16. Acrylonitrile
17. Methylene chloride
18. Allyl chloride
19. Allyl alcohol
20. 1-Propanol
21. Propargyl alcohol
22. trans-1,2-Dichloroethene
23. MTBE
24. 1,1-Dichloroethane
25. Propionitrile
26. 2-Butanone
27. Diisopropyl ether
28. cis-1,2-Dichloroethene
29. Methacrylonitrile
30. Bromochloromethane
31. Chloroform
32. 2,2-Dichloropropane
33. Ethyl acetate
34. Ethyl-tert-butyl ether
35. Methyl acrylate
36. Dibromofluoromethane (IS)
37. Isobutanol
38. Dichloroethane-d4 (IS)
39. Pentafluorobenzene
40. 1,2-Dichloroethane
41. 1,1,1-Trichloroethane
42. 1-Chlorobutane
43. Crotonaldehyde
44. 2-Chloroethanol
45. 1,1-Dichloropropene
46. 1-Butanol
47. Carbon tetrachloride
48. Chloroacetonitrile
49. Benzene
50. tert-Amylmethyl ether
51. Fluorobenzene (IS)
52. 2-Pentanone
53. Dibromomethane
54. 1,2-Dichloropropane
55. Trichloroethene
56. Bromodichloromethane
57. 2-Nitropropane
58. 1,4-Dioxane
59. Epichlorohydrin
60. Methyl methacrylate
61. cis-1,3-Dichloropropene
62. Propiolactone
63. Bromoacetone
64. Pyridine
65. trans-1,3-Dichloropropene
66. 1,1,2-Trichloroethane
67. Toluene-d8 (IS)
68. Toluene
69. 1,3-Dichloropropane
70. Paraldehyde
71. Ethyl methacrylate
72. Dibromochloromethane
73. 3-Chloropropionitrile
74. 1,2-Dibromoethane
75. Tetrachloroethene
76. 1,1,1,2-Tetrachloroethane
77. 1-Chlorohexane
78. Chlorobenzene
79. Ethylbenzene
80. Bromoform
81. m-Xylene
82. p-Xylene
83. trans-Dichlorobutene
84. 1,3-Dichloro-2-propanol
85. Styrene
86. 1,1,2,2-Tetrachloroethane
87. o-Xylene
88. 1,2,3-Trichlropropane
89. cis-Dichlorobutene
90. 4-Bromofluorobenzene (IS)
91. Isopropylbenzene
92. Bromobenzene
93. Propylbenzene
94. 2-Chlorotoluene
95. 4-Chlorotoluene
96. 1,3,5-Trimethylbenzene
97. Pentachloroethane
98. tert-Butylbenzene
99. 1,2,4-Trimethylbenzene
100. sec-Butylbenzene
101. 1,3-Dichlorobenzene
102. Benzylchloride
103. 1,4-Dichlorobenzene-d4 (IS)
104. 1,4-Dichlorobenzene
105. Isopropyltoluene
106. 1,2-Dichlorobenzene
107. Butylbenzene
108. 1,2-Dibromo-3-chloropropane
109. Hexachloroethane
110. Nitrobenzene
111. 1,2,4-Trichlorobenzene
112. Naphthalene
113. Hexachlorobutadiene
114. 1,2,3-Trichlorobenzene

PBDEs

Column: **DB-XLB**
122-1231
30 m x 0.25 mm, 0.10 µm

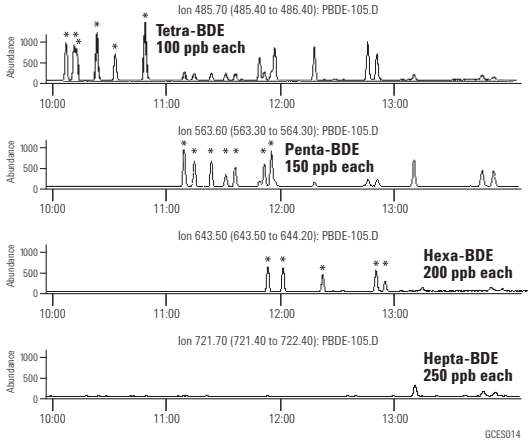
Carrier: Helium at 38 cm/sec at 100 °C (1.2 mL/min), constant flow mode

Oven: 100 °C for 1 min; 100 °C to 340 °C at 20 °C/min, 340 °C for 12 min

Injection: Cool on-column, oven-track mode

Detector: Agilent 5973 MSD, 325 °C transfer line, EI SIM
(ions monitored: 231.8, 248.0, 327.9, 398.6, 400.5, 405.8, 845.7, 563.6, 643.5, 721.4, 799.3)

Sample: 0.5 µL



For a complete Application Note, visit **www.agilent.com/chem**, select "Online Literature" from the Literature Library and type 5989-0094EN into the "Keyword" field.

EPA Volatiles by GC/MS (Split Injector)

Column: **DB-VRX**
122-1564
60 m x 0.25 mm, 1.40 µm

Carrier: Helium at 30 cm/sec, measured at 45 °C

Oven: 45 °C for 10 min
45-190 °C at 12 °C/min
190 °C for 2 min
190-225 °C at 6 °C/min
225 °C for 1 min

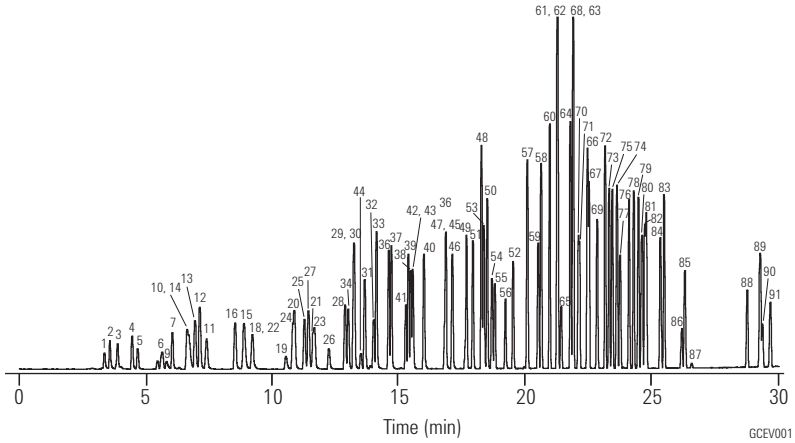
Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C
Split flow 30 mL/min

Detector: MSD, 235 °C transfer line
Full scan 35-260 amu (m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367



1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile
15. Methyl-tert-butyl ether
16. trans-1,2-Dichloroethene
17. Hexane
18. 1,1-Dichloroethane
19. 2-Butanone
20. cis-1,2-Dichloroethene
21. 2,2-Dichloropropane
22. Propionitrile
23. Methyl acrylate
24. Methacrylonitrile
25. Bromochloromethane
26. Tetrahydrofuran
27. Chloroform
28. Pentafluorobenzene (IS)
29. 1,1,1-Trichloroethane
30. 1-Chlorobutane
31. 1,1-Dichloropropene
32. Carbon tetrachloride
33. Benzene
34. 1,2-Dichloroethane
35. 2,2-Dimethylhexane
36. Fluorobenzene (IS)
37. 1,4-Difluorobenzene (IS)
38. Trichloroethene
39. 1,2-Dichloropropane
40. Methyl methacrylate
41. Dibromomethane
42. Bromodichloromethane
43. 2-Nitropropane
44. Chloroacetonitrile
45. cis-1,3-Dichloropropene
46. 4-Methyl-2-pentanone
47. 1,1-Dichloro-2-propanone
48. Toluene
49. trans-1,3-Dichloropropene
50. Ethyl methacrylate
51. 1,1,2-Trichloroethane
52. Tetrachloroethene
53. 1,3-Dichloropropane
54. 2-Hexanone
55. Dibromochloromethane
56. 1,2-Dibromoethane
57. 1-Chloro-3-fluorobenzene (IS)
58. Chlorobenzene
59. 1,1,1,2-Tetrachloroethane
60. Ethylbenzene
61. m-Xylene
62. p-Xylene
63. o-Xylene
64. Styrene
65. Bromoform
66. Isopropylbenzene
67. 4-Bromofluorobenzene (SS)
68. 1,1,2,2-Tetrachloroethane
69. Bromobenzene
70. 1,2,3-Trichloropropane
71. trans-1,4-Dichloro-2-butene
72. n-Propylbenzene
73. 2-Chlorotoluene
74. 1,3,5-Trimethylbenzene
75. 4-Chlorotoluene
76. tert-Butylbenzene
77. Pentachloroethane
78. 1,2,4-Trimethylbenzene
79. sec-Butylbenzene
80. 1,3-Dichlorobenzene
81. p-Isopropyltoluene
82. 1,4-Dichlorobenzene
83. n-Butylbenzene
84. 1,2-Dichlorobenzene
85. Hexachloroethane
86. 1,2-Dibromo-3-chloropropane
87. Nitrobenzene
88. 1,2,4-Trichlorobenzene
89. Hexachlorobutadiene
90. Naphthalene
91. 1,2,3-Trichlorobenzene

EPA Method 525.2

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 32 cm/sec, measured at 45 °C, constant flow mode

Oven:
45 °C for 1 min
45-130 °C at 30 °C/min
130 °C for 3 min
130-180 °C at 12 °C/min
180-240 °C at 7 °C/min
240-325 °C at 12 °C/min
325 °C for 5 min

Injection:
Splitless, 300 °C
1.0 min purge activation time
Focus liner

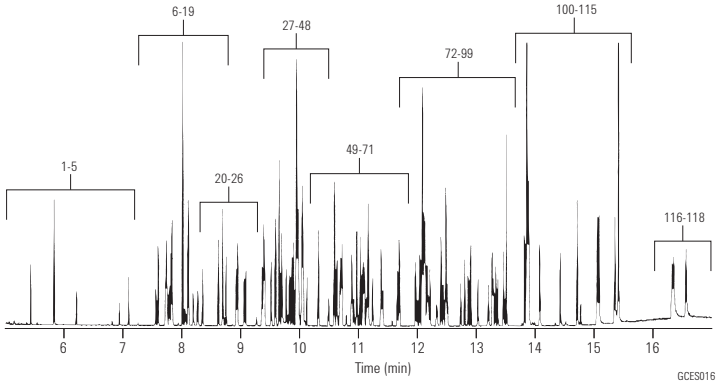
Detector:
MSD, 325 °C transfer line
Full scan m/z 45-450

Sample: Composite mixture of AccuStandard Method 525.2 standards (M-525.2-SV-ASL, M-525.2-FS-ASL, M-525.2-CP-ASL, M-525.2-NP1-ASL, M-525.2-NP2-ASL): target compounds at 2 ng/µL, IS/SS at 5 ng/µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Compound	RT	m/z
1. Isophorone	5.85	82
2. 1,3-Dimethyl-2-nitrobenzene (SS)	6.65	134
3. Dichlorvos	7.41	109
4. Hexachlorocyclo-pentadiene	8.87	237
5. EPTC	9.17	128
6. Mevinphos	10.09	127
7. Butylate	10.18	57/146
8. Vernolate	10.42	128
9. Dimethyl phthalate	10.45	163
10. Terrazole (Etridazole)	10.47	211/183
11. 2,6-Dinitrotoluene	10.56	165
12. Tillam (Pebulate)	10.61	128
13. Acenaphthylene	10.65	152
14. Acenaphthene-d10 (IS)	11	164
15. Chloroneb	11.17	191
16. 2-Chlorobiphenyl	11.19	188
17. Tebuthiuron	11.37	156
18. 2,4-Dinitrotoluene	11.51	165
19. Molinate	11.68	126
20. Diethyl phthalate	12.21	149
21. Fluorene	12.35	166
22. Propachlor	12.46	120
23. Ethoprop	12.82	158
24. Cycloate	12.86	83/154
25. Chlorpropham	13.08	127
26. Trifluralin	13.14	306
27. α-BHC	13.69	181
28. 2,3-Dichlorobiphenyl	13.74	222/152
29. Hexachlorobenzene	13.77	284
30. Gesatamine (Atraton)	13.99	196/169
31. Prometon	14.14	225/168
32. Atrazine	14.26	200/215
33. Simazine	14.27	201/186
34. β-BHC	14.28	181
35. Pentachlorophenol	14.35	266
36. Propazine	14.35	214/172
37. γ-BHC	14.52	181
38. Terbufos	14.62	57
39. Pronamide	14.69	173
40. Diazinon	14.76	137/179
41. Phenanthrene-d10 (IS)	14.85	188
42. Chlorothalonil	14.89	266
43. Phenanthrene	14.92	178
44. Terbacil	15.02	161
45. Methyl paraoxon	15.04	109
46. Disulfoton	15.05	88
47. Anthracene	15.06	178
48. δ-BHC	15.20	181
49. 2,4,5-Trichlorobiphenyl	15.59	256
50. Metribuzin	15.95	198
51. Alachlor	16.14	160
52. Simetryn	16.23	213
53. Ametryn	16.33	227/170
54. Heptachlor	16.36	100
55. Prometryne	16.40	241/184
56. Prebane (Terbutryne)	16.72	226/185
57. Bromacil	16.79	205
58. Di-n-butyl phthalate	16.90	149
59. 2,2',4,4'-Tetrachlorobiphenyl	17.02	292
60. Metolachlor	17.11	162
61. Dursban (Chlorpyrifos)	17.15	197/97
62. Cyanazine	17.23	225/68
63. Dacthal (DCPA methyl ester)	17.27	301
64. Aldrin	17.29	66
65. Triadimefon	17.43	57
66. Diphenamid	17.73	72/167
67. MGK-264 (Isomer A)	17.78	164/66
68. MGK-264 (Isomer B)	18.11	164
69. Heptachlor epoxide	18.28	81
70. 2,2',3',4,6-Pentachlorobiphenyl	18.34	326
71. Merphos	18.36	209/153
72. γ-Chlordane	18.88	373
73. Tetrachlorvinphos (Stirifos)	18.95	109
74. Butachlor	19.03	176/160
75. Pyrene-d10 (SS)	19.13	212
76. Pyrene	19.18	202
77. α-Chlordane	19.21	375/373
78. Endosulfan I	19.22	195
79. trans-Nonachlor	19.28	409
80. Fenamiphos	19.33	303/154
81. Napropamide	19.39	72
82. Tricyclazole	19.61	189
83. p,p'-DDE	19.76	246
84. DEF	19.84	57/169
85. 2,2',4,4',5,6'-Hexachlorobiphenyl	19.90	360
86. Dieldrin	19.92	79
87. Carboxin	19.97	143
88. Endrin	20.43	67/81
89. Chlorobenzilate	20.56	139
90. Endosulfan II	20.68	195
91. p,p'-DDD	20.77	235/165
92. Endrin aldehyde	21.01	67
93. Norflurazon	21.36	145
94. Benzyl butyl phthalate	21.49	149
95. Endosulfan sulfate	21.53	272
96. p,p'-DDT	21.61	235/165
97. Hexazinone	21.68	171
98. Bis(2-ethylhexyl) adipate	21.87	129
99. Triphenylphosphate (SS)	21.98	326/325
100. Endrin ketone (breakdown product)	22.52	67/317
101. 2,2',3,3',4,4',6-Heptachlorobiphenyl	22.59	394/396
102. Benz[a]anthracene	22.66	228
103. Chrysene-d12 (IS)	22.68	240
104. 2,2',3,3',4,5',6,6'-Octachlorobiphenyl	22.70	430/428
105. Methoxychlor	22.73	227
106. Chrysene	22.74	228
107. Bis(2-ethylhexyl) phthalate	23.10	149
108. Fenarimol	23.80	139
109. cis-Permethrin	24.38	183
110. trans-Permethrin	24.50	183
111. Benzo[b]fluoranthene	25.06	252
112. Benzo[k]fluoranthene	25.12	252
113. Fluridone	25.66	328
114. Benzo[a]pyrene	25.67	252
115. Perylene-d12 (SS)	25.78	264
116. Indeno[1,2,3-c,d]pyrene	27.63	276
117. Dibenz[a,h]anthracene	27.69	278
118. Benzo[g,h,i]perylene	28.11	276



Pesticides and Fire Retardants (US EPA 527)

Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

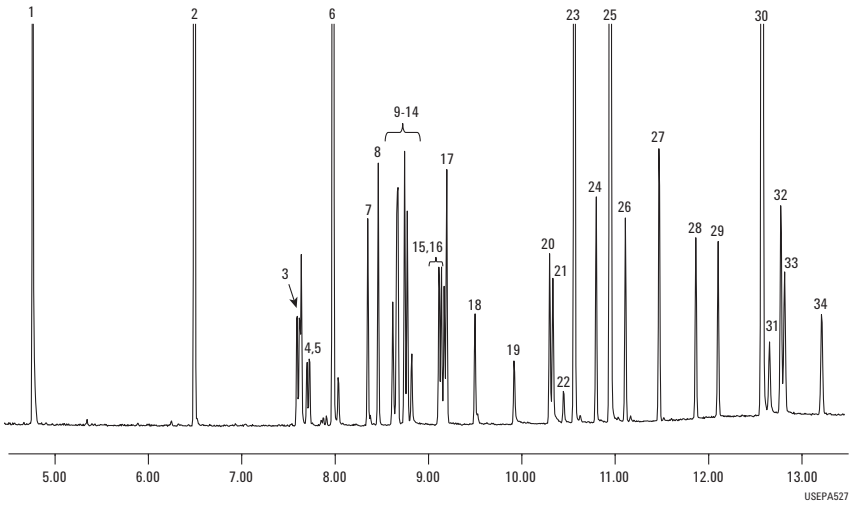
Carrier: Helium, 52 cm/sec, constant flow

Oven: 60 °C (1 min) to 210 °C (25 °C/min), 20 °C/min to 310 °C (3 min)

Injection: Splitless, 250 °C, purge flow 50 mL/min @ 1 in, gas saver 80 mL/min on @ 3 min

Detector: Transfer line 290 °C, source 300 °C, quad 180 °C

Sample: Pesticide/PBDE standards, 1 ng with 5 ng IS/SS on-column



1. 1,2-Dimethyl-2-nitrobenzene
2. Acenaphthalene-D10
3. Dimethoate
4. Atrazine
5. Propazine
6. Anthracene-D10
7. Vinclozoline
8. Prometryne
9. Bromacil
10. Malathion
11. Thiazopyr
12. Dursban
13. Benthiocarb
14. Parathion
15. Terbus sulfone
16. Bioallethrin
17. Oxychlordane
18. Fenamiphos
19. Nitrophen
20. Norflurazone
21. Kepone
22. Hexazinone
23. Triphenyl phosphate
24. Bifenthrin
25. Chrysene-D12
26. BDE-47
27. Mirex
28. BDE-100
29. BDE-99
30. Perylene-D12
31. Fenvalerate
32. Esfenvalerate
33. Hexabromobiphenyl
34. BDE-153

Organochlorine Pesticides I EPA Method 8081A

Column: **DB-35ms**
122-3832
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-100 °C at 25 °C/min
100-300 °C at 5 °C/min
300 °C for 5 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
Full scan at m/z 50-500

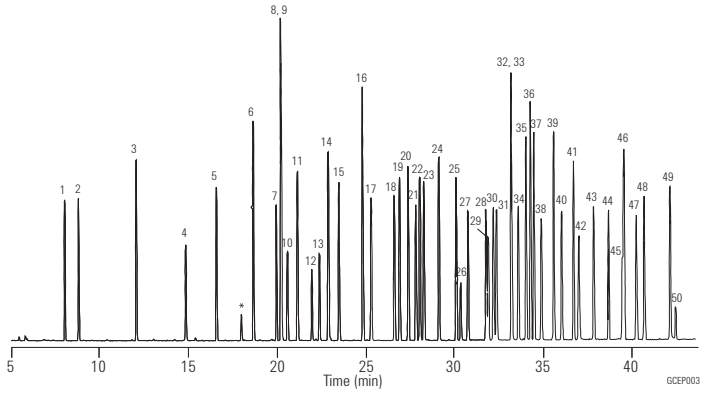
Sample: 1 µL of 35 µg/mL composite 8081A standards, AccuStandard Inc.

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α, α-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α-BHC
16. Pentachloronitrobenzene (IS)
17. γ-BHC
18. β-BHC
19. Heptachlor
20. Alachlor
21. δ-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ-Chlordane
29. trans-Nonachlor
30. α-Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard

Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

Chlorinated Pesticides, EPA Method 508

Column: **HP-5ms**
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 24 psi, 45 cm/sec (80 °C) constant flow

Oven: 80 °C for 1 min
80-180 °C at 30 °C/min
180-205 °C at 3 °C/min
205 °C for 4 min
205-290 °C at 2 °C/min
290 °C for 2 min

Injection: Splitless
1 min purge delay

Detector: ECD, 320 °C
Makeup gas Nitrogen, 60 mL/min
Anode purge 3 mL/min

Sample: 1 µL

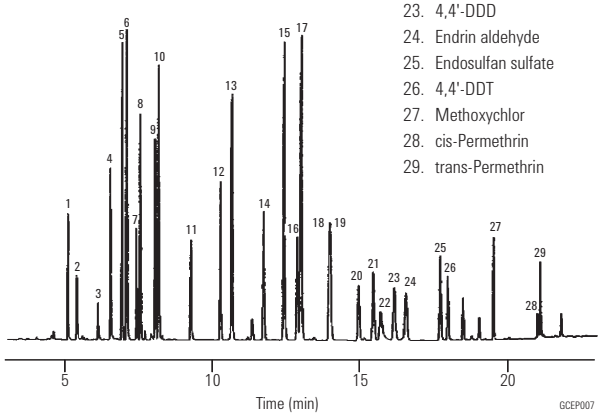
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Etridiazole
2. Chloroneb
3. Propachlor
4. Trifluralin
5. α-BHC
6. Hexachlorobezene
7. β-BHC
8. δ-BHC
9. γ-BHC
10. Chlorothalonil
11. Heptachlor
12. Aldrin
13. DCPA
14. Heptachlor epoxide
15. γ-Chlordane
16. Endosulfan I
17. α-Chlordane
18. Dieldrin
19. 4,4'-DDE
20. Endrin
21. Endosulfan II
22. Chlorobenzilate
23. 4,4'-DDD
24. Endrin aldehyde
25. Endosulfan sulfate
26. 4,4'-DDT
27. Methoxychlor
28. cis-Permethrin
29. trans-Permethrin



Organohalide Pesticides in Water, EPA Method 505

Column: **HP-5ms**
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 2.0 mL/min, constant flow, 42 cm/sec (22.4 psi at 80 °C)

Oven: 80 °C for 1 min
80-175 °C at 30 °C/min
175 °C for 4 min
175-215 °C at 6 °C/min
215 °C for 2 min
215-290 °C at 15 °C/min
290 °C for 5 min

Injection: Splitless, 250 °C
1 min purge delay

Detector: ECD, 300 °C
Makeup gas: N_2, 60 mL/min
Anode purge 6 mL/min

Sample: 1 µL injection volume
16 components EPA-505 targeted pesticides and 14 ppb Aroclor 1260 in hexane.
Concentration of pesticides:
50 ppb each except 1.25 ppm for atrazine and simazine.

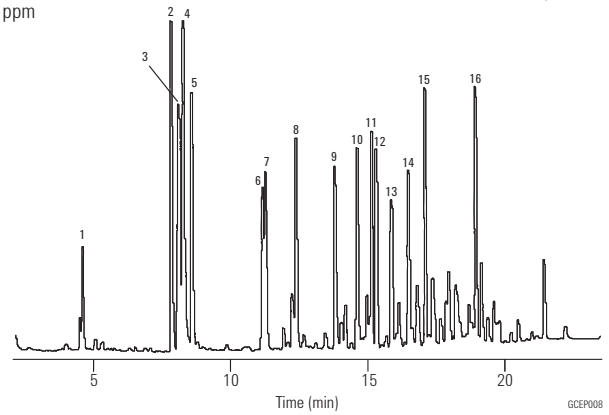
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Hexachlorocyclopentadiene
2. Hexachlorobenzene
3. Simazine
4. Atrazine
5. Lindane
6. Heptachlor
7. Alachlor
8. Adrin
9. Heptachlor epoxide
10. δ-Chlordane
11. α-Chlordane
12. trans-Nonachlor
13. Dieldrin
14. Endrin
15. cis-Nonachlor
16. Methoxychlor



Organochlorine Pesticides I

Column: **DB-5**
125-5037
30 m x 0.53 mm, 0.50 µm

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275 °C at 4 °C/min
275 °C for 30 min

Injection: Splitless, 250 °C

Detector: ECD, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.7 µL of 100 pg/µL standard in isooctane

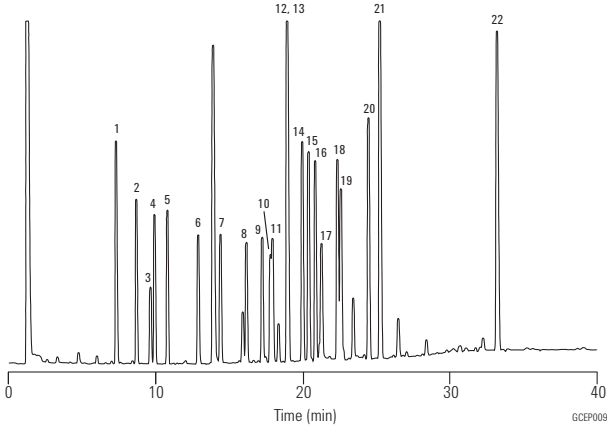
Suggested Supplies

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Septum: 11 mm Advanced Green septa, 5183-4759

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. 2,4,5,6-Tetrachloro-m-xylene (IS)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. Dieldrin
13. p,p′-DDE
14. Endrin
15. Endosulfan II
16. p,p′-DDD
17. Endrin aldehyde
18. Endosulfan sulfate
19. p,p′-DDT
20. Endrin ketone
21. Methoxychlor
22. Decachlorobiphenyl (IS)



Organochlorine Pesticides II

Column: **DB-608**
125-6837
30 m x 0.53 mm, 0.50 µm

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275 °C at 4 °C/min
275 °C for 30 min

Injection: Splitless, 250 °C

Detector: ECD, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.7 µL of 100 pg/µL standard in isooctane

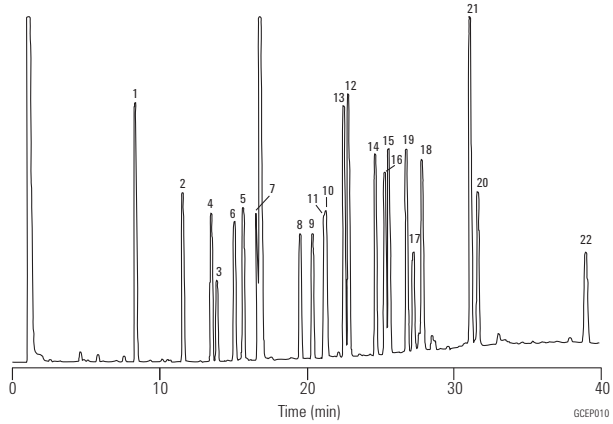
Suggested Supplies

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Seal: 11 mm Advanced Green septa, 5183-4759

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. 2,4,5,6-Tetrachloro-m-xylene (IS)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. Dieldrin
13. p,p′-DDE
14. Endrin
15. Endosulfan II
16. p,p′-DDD
17. Endrin aldehyde
18. Endosulfan sulfate
19. p,p′-DDT
20. Endrin ketone
21. Methoxychlor
22. Decachlorobiphenyl (IS)



Organochlorine Pesticides III

Column: **DB-1701**
125-0737
30 m x 0.53 mm, 0.50 µm

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275 °C at 4 °C/min
275 °C for 30 min

Injection: Splitless, 250 °C

Detector: ECD, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.7 µL of 100 pg/µL standard in isooctane

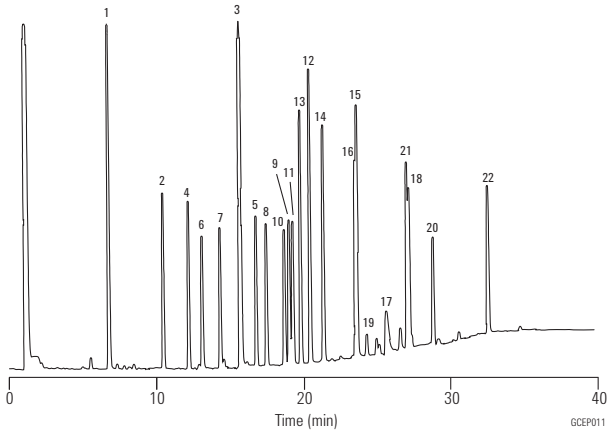
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. 2,4,5,6-Tetrachloro-m-xylene (IS)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. Dieldrin
13. p,p'-DDE
14. Endrin
15. Endosulfan II
16. p,p'-DDD
17. Endrin aldehyde
18. Endosulfan sulfate
19. p,p'-DDT
20. Endrin ketone
21. Methoxychlor
22. Decachlorobiphenyl (IS)



Organochlorine Pesticides IV

Column: **DB-35**
125-1937
30 m x 0.53 mm, 0.50 µm

Carrier: Helium at 30 cm/sec (4.0 mL/min)

Oven: 150-275 °C at 4 °C/min
275 °C for 30 min

Injection: Splitless, 250 °C

Detector: ECD, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.7 µL of 100 pg/µL standard in isooctane

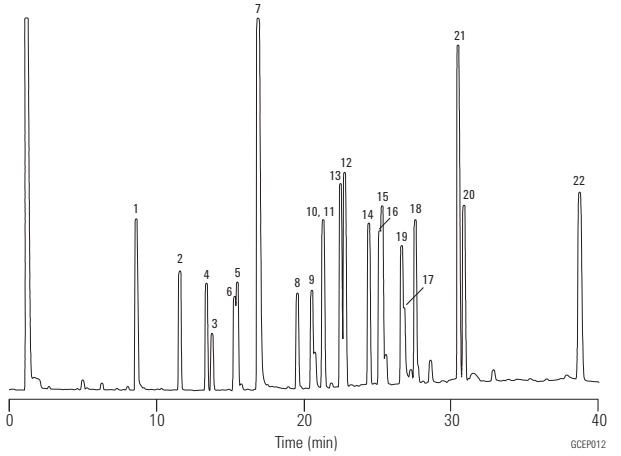
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. 2,4,5,6-Tetrachloro-m-xylene (IS)
2. α-BHC
3. β-BHC
4. γ-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. Endosulfan I
11. α-Chlordane
12. Dieldrin
13. p,p'-DDE
14. Endrin
15. Endosulfan II
16. p,p'-DDD
17. Endrin aldehyde
18. Endosulfan sulfate
19. p,p'-DDT
20. Endrin ketone
21. Methoxychlor
22. Decachlorobiphenyl (IS)



Organochlorine Pesticides, DB-5/DB-1701P

Column: **DB-5**
123-5032
30 m x 0.32 mm, 0.25 µm

Column: **DB-1701P**
123-7732
30 m x 0.32 mm, 0.25 µm

Column: **Guard Column**
160-2535-10
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 29.2 cm/sec, measured at 150 °C

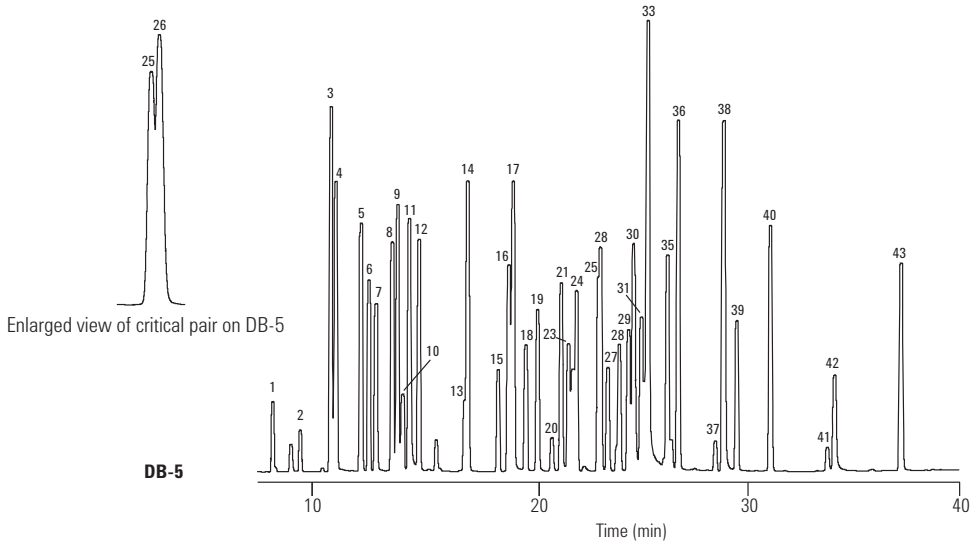
Oven: 60 °C for 0.5 min
60-140 °C at 20 °C/min
140-280 °C at 11 °C/min
280 °C for 23 min

Injection: Splitless, 200 °C

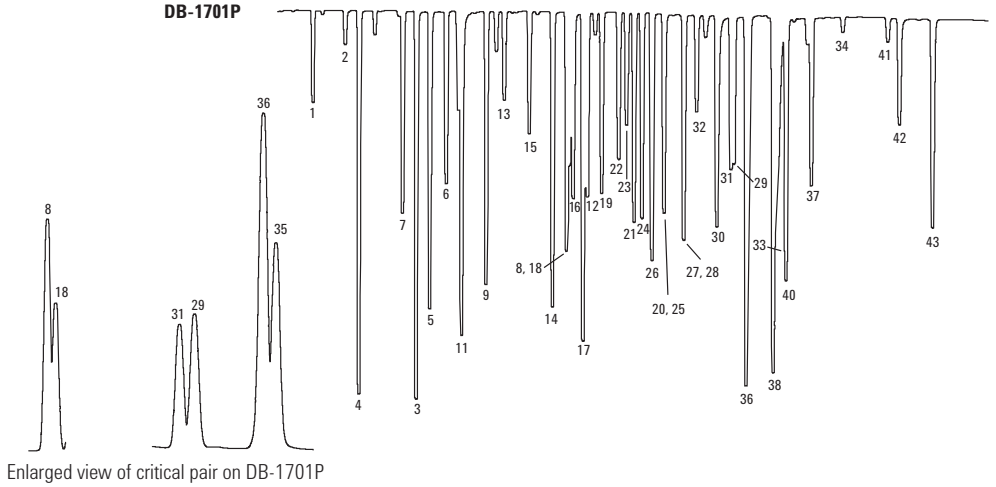
Detector: ECD, 325 °C
Nitrogen makeup gas at 30 mL/min

Sample: 2.0 µL, 20-200 pg/µL

1. Etridiazole
2. Chloroneb
3. Propachlor
4. Tetrachloro-m-xylene (IS)
5. Trifluralin
6. α-BHC
7. Hexachlorobenzene
8. β-BHC
9. γ-BHC
10. Pentachloronitrobenzene
11. p,p'-Dichlorobiphenyl
12. δ-BHC
13. Heptachlor
14. Alachlor
15. Aldrin
16. Chlorpyrifos
17. DCPA
18. Isodrin
19. Heptachlor epoxide
20. Captan
21. γ-Chlordane
22. o,p'-DDE
23. Endosulfan I
24. α-Chlordane
25. Dieldrin
26. p,p'-DDE
27. o,p'-DDD
28. Endrin
29. Endosulfan II
30. Chlorobenzilate
31. p,p'-DDD
32. o,p'-DDT
33. Endrin aldehyde
34. Endrin ketone
35. Carbophenothion
36. p,p'-DDT
37. Endosulfan sulfate
38. Hexabromobenzene (HBB)
39. Methoxychlor
40. Mirex
41. cis-Permethrin
42. trans-Permethrin
43. Decachlorobiphenyl (IS)



Enlarged view of critical pair on DB-5



Enlarged view of critical pair on DB-1701P

Organochlorine Pesticides

Column: **VF-17ms**
CP8982
30 m x 0.25 mm, 0.25 µm

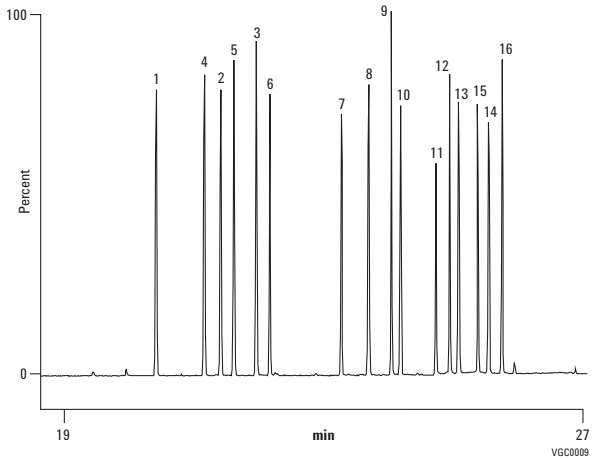
Sample: 1.0 µL

Sample Conc: 200 µg/mL

Carrier: Helium, 70 kPa

Injection: Splitter, 1:100

Detector: MS, Ion Trap, TIC



1. α-BHC
2. β-BHC
3. δ-BHC
4. γ-BHC (lindane)
5. Heptachlor
6. Aldrin
7. Heptachlorepoxide
8. Endosulfan I
9. 4,4'-DDE
10. Dieldrin
11. Endrin
12. 4,4'-DDD
13. Endosulfan II
14. Endrin aldehyde
15. 4,4'-DDT
16. Endosulfan sulfate

Nitrogen/Phosphorus Containing Pesticides, EPA Method 507

Column: **HP-5ms**
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 30 cm/sec (13.6 psi) pressure program

Oven: 80-178 °C at 30 °C/min
178 °C for 4 min
178-205 °C at 2 °C/min
205-310 °C at 30 °C/min
310 °C for 4 min

Injection: Splitless, 260 °C
1 min purge delay

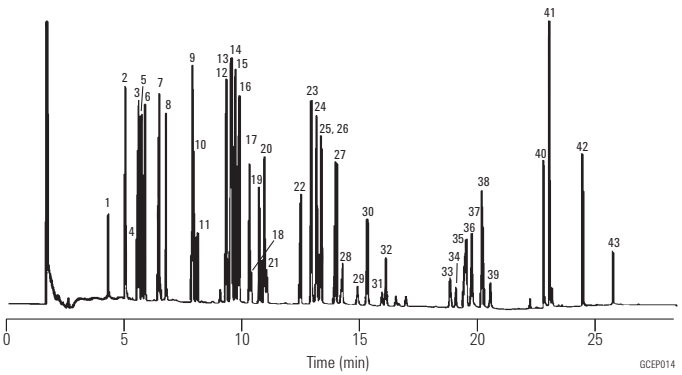
Detector: NPD, 290 °C
Helium makeup gas at 30 mL/min

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Dichlorvos
2. EPTC
3. Butylate
4. Mevinphos
5. Vernolate
6. Pebulate
7. Tebuthiuron
8. Molinate
9. Ethoprop
10. Cycloate
11. Chlorpropham
12. Atraton
13. Simazine
14. Prometon
15. Atrazine
16. Propazine
17. Terbufos
18. Pronamide
19. Diazinon
20. Disulfoton
21. Terbacil
22. Metribuzin
23. Simetryn
24. Alachlor
25. Ametryn
26. Prometryn
27. Terbutryn
28. Bromacil
29. Metolachlor
30. Triademefon
31. MGK-264
32. Diphenamid
33. Stirofos
34. Butachlor
35. Fenamiphos
36. Napropamide
37. Tricyclazole
38. Merphos
39. Carboxin
40. Norflurazon
41. Hexazinone
42. Fenarimol
43. Fluridone

Herbicides I

Column: **DB-XLB**
122-1232
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 32 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-180 °C at 10 °C/min
180-230 °C at 5 °C/min
230-320 °C at 10 °C/min
320 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
Full scan 50-400

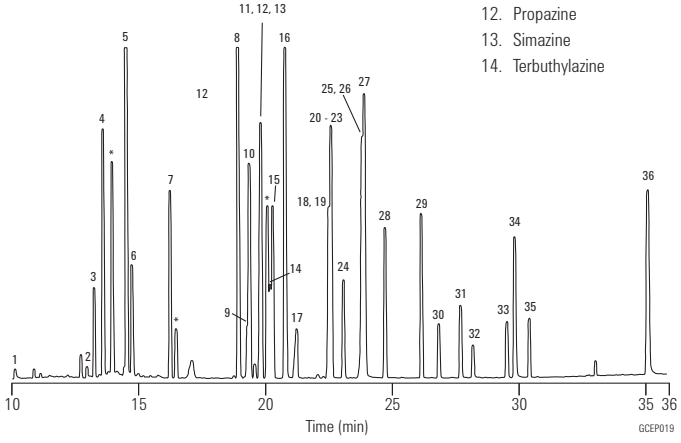
Sample: 2 µL x 10-50 ng/µL solution
in acetone

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Monuron
2. Diuron
3. EPTC
4. Dichlobenil
5. Vernolate
6. Pebulate
7. Molinate
8. Sulfallate
9. Atraton
10. Prometon
11. Atrazine
12. Propazine
13. Simazine
14. Terbuthylazine
15. Pronamide
16. Secbumeton
17. Terbacil
18. Alachlor
19. Propanil
20. Ametryn
21. Prometryne
22. Simetryn
23. Metribuzin
24. Terbutryn
25. Metolachlor
26. Bromacil
27. Dacthal
28. Diphenamid
29. Butachlor
30. Napropamide
31. Carboxin
32. Tricyclazole
33. Norflurazon
34. Hexazinone
35. Difolotan
36. Fluridone

* Impurity

Herbicides II

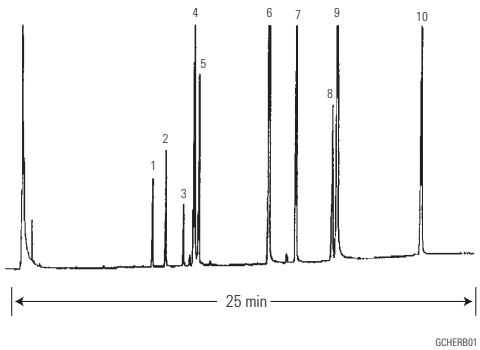
Column: **DB-210**
122-0232
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec

Oven: 140-215 °C at 3 °C/min

Injection: Split 1:50, 1 µL

Detector: ECD, 300 °C
Nitrogen makeup gas at 30 mL/min



1. Phorate
2. Ethoprop
3. Terbufos
4. Atrazine
5. Fonofos
6. Propachlor
7. Chlorpyrifos
8. Alachlor
9. Metolachlor
10. Cyanazine

C_1 and C_2 Halocarbons (Freons)

Column: **GS-GasPro**
113-4362
60 m x 0.32 mm

Carrier: Helium at 35 cm/sec, constant velocity

Oven: 40 °C for 2 min,
40-120 °C at 10 °C/min
120 °C for 3 min
120-200 °C at 10 °C/min

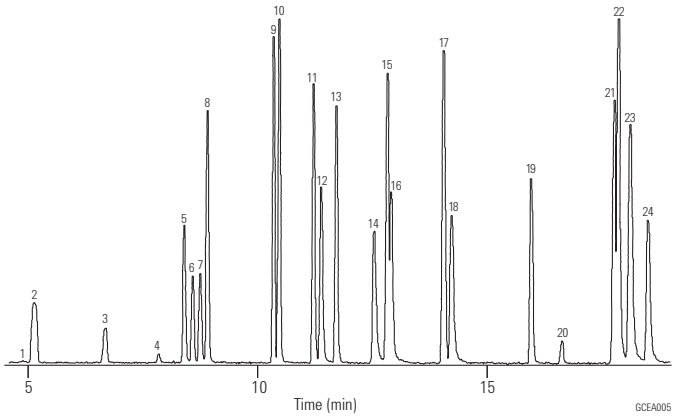
Injection: Splitless, 250 °C
0.20 min purge activation time

Detector: MSD, 280 °C,
full scan 45-180 amu

Sample: 1.0 µL of 100 ppm mixture of AccuStandard M-REF & M-REF-X in methanol

		Freon #
1.	Chlorotrifluoromethane*	13
2.	Trifluoromethane	23
3.	Bromotrifluoromethane	13B1
4.	Chloropentafluoroethane	115
5.	Pentafluoroethane	125
6.	1,1,1-Trifluoroethane	143a
7.	Dichlorodifluoromethane	12
8.	Chlorodifluoromethane	22
9.	1,1,1,2-Tetrafluoroethane	134a
10.	Chloromethane	40
11.	1,1,2,2-Tetrafluoroethane	134
12.	Bromochlorodifluoromethane	12B1
13.	1,1-Difluoroethane	152a
14.	1,2-Dichloro-1,1,2,2-tetrafluoroethane	114
15.	2-Chloro-1,1,1,2-tetrafluoroethane	124
16.	1-Chloro-1,1-difluoroethane	142b
17.	Dichlorofluoromethane	21
18.	Trichlorofluoromethane	11
19.	Chloroethane	160
20.	Dichloromethane	30
21.	1,1-Dichloro-1-fluoroethane	141b
22.	2,2-Dichloro-1,1,1-trifluoroethane	123
23.	1,1,2-Trichloro-1,2,2-trifluoroethane	113
24.	1,2-Dibromo-1,1,2,2-tetrafluoroethane	114B2

*Peak not shown



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Nitrogen Containing Herbicides (EPA Method 507)

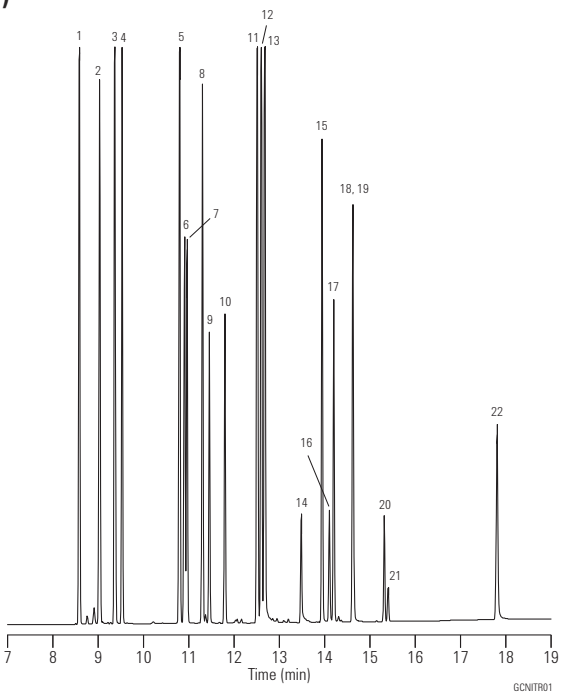
Column: **DB-35**
125-1937
30 m x 0.53 mm, 0.50 µm

Carrier: Helium at 38 cm/sec (5 mL/min), measured at 150 °C

Oven: 60 °C for 1 min
60-290 °C at 15 °C/min
290 °C for 5 min

Injection: Megabore Direct, 290 °C, 1 µL of 3 ng/µL standard

Detector: NPD, 290 °C



1. Eptam
2. Sutan
3. Vernam
4. Tillam
5. Ordram
6. Treflan
7. Balan
8. Ro-Neet
9. Propachlor
10. Tolban
11. Propazine
12. Atrazine
13. Simazine
14. Terbacil
15. Sencor
16. Dual
17. Paarlan
18. Prowl
19. Bromacil
20. Oxadiazon
21. GOAL
22. Hexazinone

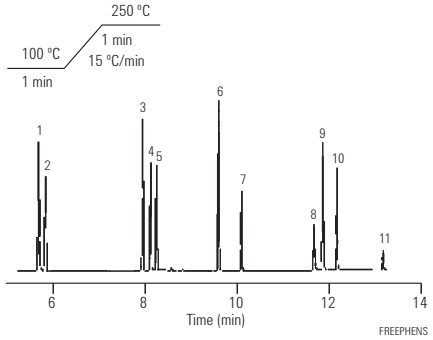
Free Phenols

Column: **HP-50+**
19091L-433
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen, constant flow 45 cm/sec

Injection: Split 100:1

Detector: FID 300 °C



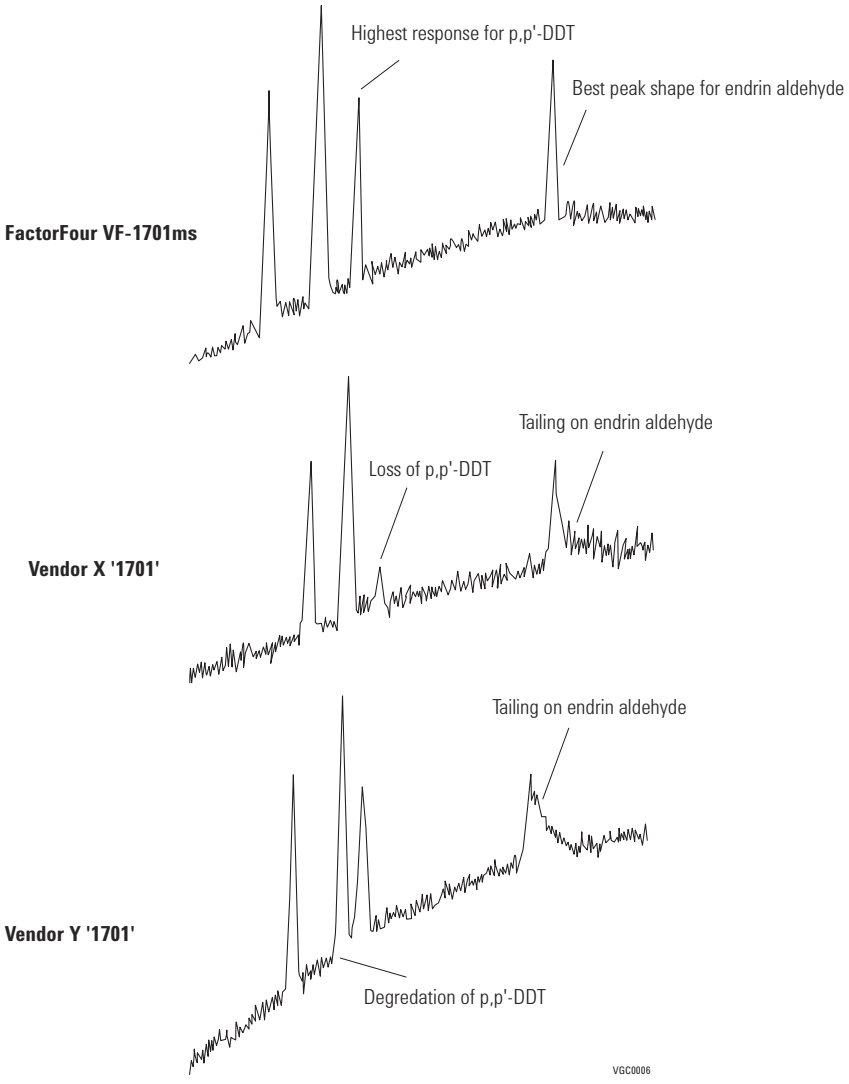
1. Phenol
2. 2-chlorophenol
3. 2,4-dimethylphenol
4. 2-nitrophenol
5. 2,4-dichlorophenol
6. 4-chloro-3-methylphenol
7. 2,4,6-trichlorophenol
8. 2,4-dinitrophenol
9. 4-nitrophenol
10. 2-methyl-4,6-dinitrophenol
11. Pentachlorophenol

EPA 625 Halogenated Pesticides on "1701" Type Phases

Column: **VF-1701 Pesticides**
CP9070
30 m x 0.25 mm, 0.25 µm

Oven: 150 °C, 5 °C/min to 275 °C

Injection: Split, T=275 °C
ECD: T=275 °C, 2 pg



Organochlorine Pesticides to EPA 625 via GC/MS

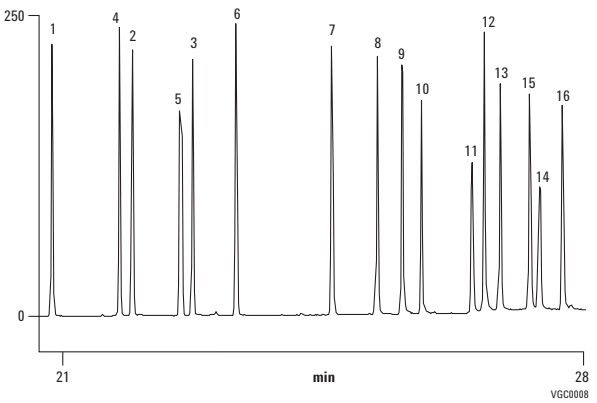
Column: **VF-35ms**
CP8877
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, approx. 1.0 mL/min, 60 kPa

Oven: 45 °C + 10 °C/min to 325 °C

Injection: Split/splitless, in split mode, 1:100

Detector: Ion Trap MS



1. α-BHC
2. β-BHC
3. δ-BHC
4. γ-BHC (lindane)
5. Heptachlor
6. Aldrin
7. Heptachlorepoxide
8. Endosulfan I
9. 4,4'-DDE
10. Dieldrin
11. Endrin
12. 4,4'-DDD
13. Endosulfan II
14. Endrin aldehyde
15. 4,4'-DDT
16. Endosulfan sulfate

Organochlorine Pesticides I EPA Method 8081A

Column: **DB-35ms**
122-3832
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-100 °C at 25 °C/min
100-300 °C at 5 °C/min
300 °C for 5 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
Full scan at m/z 50-500

Sample: 1 µL of 35 µg/mL composite 8081A standards, AccuStandard Inc.

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

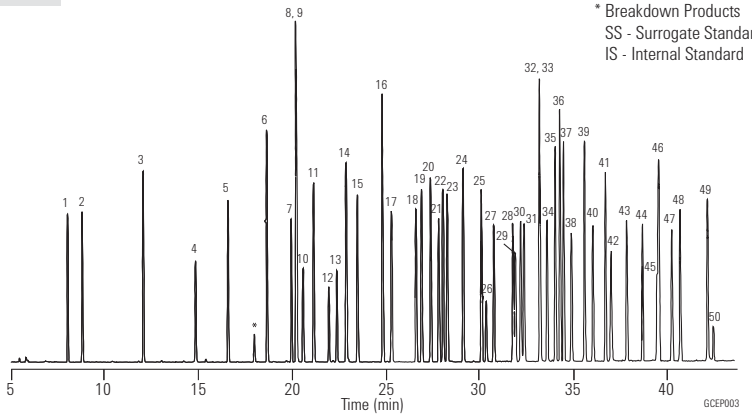
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α, α-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α-BHC
16. Pentachloronitrobenzene (IS)
17. γ-BHC
18. β-BHC
19. Heptachlor
20. Alachlor
21. δ-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ-Chlordane
29. trans-Nonachlor
30. α-Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard



Organochlorine Pesticides II EPA Method 8081A

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-100 °C at 25 °C/min
100-300 °C at 5 °C/min
300 °C for 5 min

Injection: Splitless, 250 °C
30 sec purge activation time

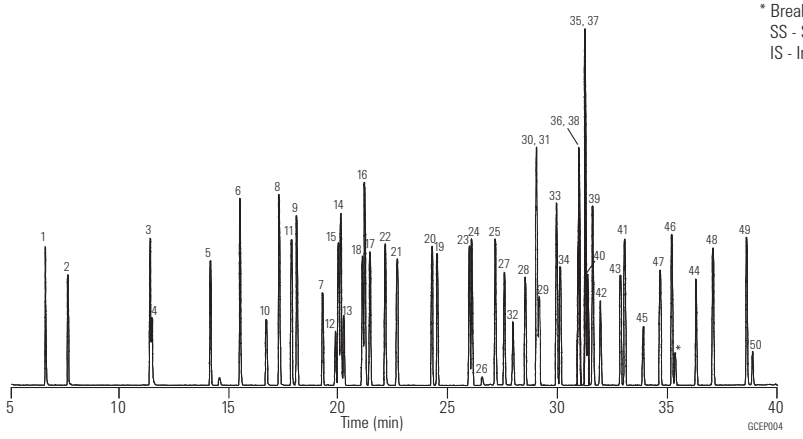
Detector: MSD, 300 °C transfer line
Full scan at m/z 50-500

Sample: 1 µL of 35 µg/mL composite 8081A standards, AccuStandard Inc.

Standards used were a composite of individual solutions supplied courtesy of AccuStandard Inc., 25 Science Park, New Haven, CT 06511, 800-442-5290.

1. 1,2-Dibromo-3-chloropropane
2. 4-Chloro-3-nitrobenzotrifluoride (SS)
3. Hexachloropentadiene
4. 1-Bromo-2-nitrobenzene (IS)
5. Terrazole
6. Chloroneb
7. Trifluralin
8. 2-Bromobiphenyl (SS)
9. Tetrachloro m-xylene (SS)
10. α, α-Dibromo-m-xylene
11. Propachlor
12. Di-allate A
13. Di-allate B
14. Hexachlorobenzene
15. α-BHC
16. Pentachloronitrobenzene (IS)
17. γ-BHC
18. β-BHC
19. Heptachlor
20. Alachlor
21. δ-BHC
22. Chlorothalonil
23. Aldrin
24. Dacthal
25. Isodrin
26. Kelthane
27. Heptachlor epoxide
28. γ-Chlordane
29. trans-Nonachlor
30. α-Chlordane
31. Endosulfan I
32. Captan
33. p,p'-DDE
34. Dieldrin
35. Chlorobenzilate
36. Perthane
37. Chloropropylate
38. Endrin
39. p,p'-DDD
40. Endosulfan II
41. p,p'-DDT
42. Endrin aldehyde
43. Endosulfan sulfate
44. Dibutylchlorendate (SS)
45. Captafol
46. Methoxychlor
47. Endrin ketone
48. Mirex
49. cis-Permethrin
50. trans-Permethrin

* Breakdown Products
SS - Surrogate Standard
IS - Internal Standard



Environmental Applications, Semivolatiles

Agilent's Ultra Inert Test Probe Mixture

Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen, constant pressure, 38 cm/s

Oven: 65 °C isothermal

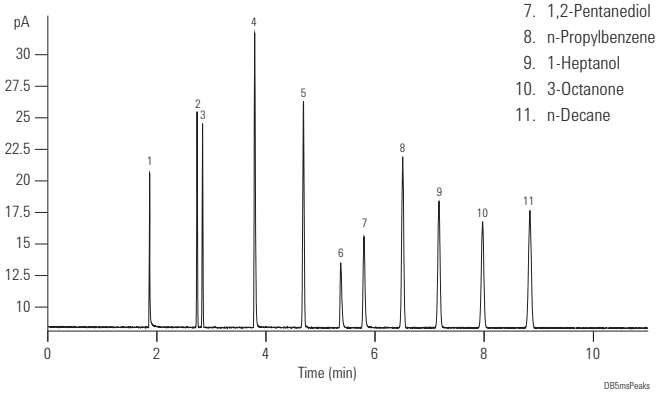
Sampler: Agilent 7683B, 0.5 µL syringe
(P/N 5188-5246), 0.02 µL split injection

Injection: Split/splitless; 250 °C, 1.4 mL/min; split column flow 900 mL/min; gas saver flow 75 mL/min at 2.0 min

Detector: FID at 325 °C; 450 mL/min air, 40 mL/min hydrogen, 45 mL/min nitrogen makeup

A properly deactivated DB-5ms Ultra Inert column delivers symmetrical peak shapes, along with increased peak heights, which allow for accurate integration and detection of trace analytes.

1. 1-Propionic acid
2. 1-Octene
3. n-Octane
4. 4-Picoline
5. n-Nonane
6. Trimethyl phosphate
7. 1,2-Pentanediol
8. n-Propylbenzene
9. 1-Heptanol
10. 3-Octanone
11. n-Decane



Trace Level Polycyclic Aromatic Hydrocarbon (PAH) Analyses

Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

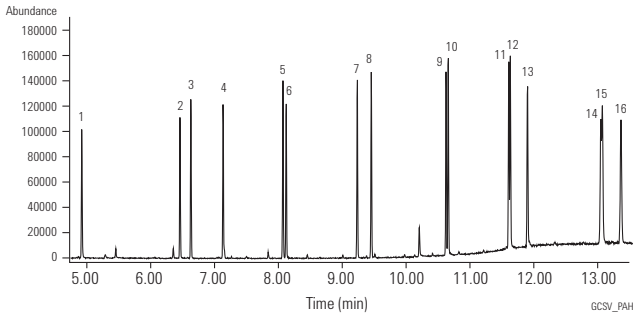
Carrier: Helium constant flow 30 cm/s

Oven: 40 °C (1 min) to 100 °C (15 °C/min)
10 °C to 210 °C (1 min)
5 °C/min. to 310 °C (8 min)

Injection: Split/splitless; 260 °C, 53.7 mL/min. total flow, purge flow 50 mL/min. on at 0.5 min., gas saver flow 80 mL/min. on at 3.0 min.

Detector: MSD source at 300 °C
Quadrapole at 180 °C
Transfer line at 290 °C
Scan range 50-550 AMU

1. Naphthalene
2. Acenaphthylene
3. Acenaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benz[a]anthracene
10. Chrysene
11. Benzo[b]fluoranthene
12. Benzo[k]fluoranthene
13. Benzo[a]pyrene
14. Indeno[1,2,3-cd]pyrene
15. Dibenz[a,h]anthracene
16. Benzo[g,h,i]perylene



Tetrachlorodibenzo-p-furans

Column A: **DB-225**
122-2232
30 m x 0.25 mm, 0.25 µm

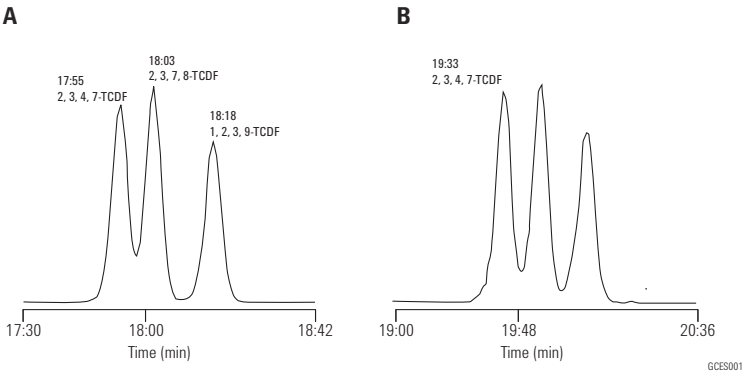
Column B: **DB-225ms**
122-2932
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 12 mL/min

Oven: 160-250 °C at 7 °C/min
250 °C until compounds elute

Injection: Splitless, 240 °C

Detector: VG Autospec Ultima



Note the separation between 2,3,7,8-TCDF and 2,3,4,7-TCDF on DB-225 is also easily achievable (and actually a little better!) on DB-225ms.

Congeners in DIN Method PCBs

Column: **DB-XLB**
122-1236
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 34.2 cm/sec, measured at 150 °C

Oven: 100 °C for 1 min
100-320 °C at 5.6 °C/min

Injection: Hot on-column, 250 °C
Split flow 100 mL/min

Detector: MSD, 300 °C transfer line
SIM of 221.9, 255.9, 291.9, 325.8, 359.8, 395.8, 429.7, 463.7

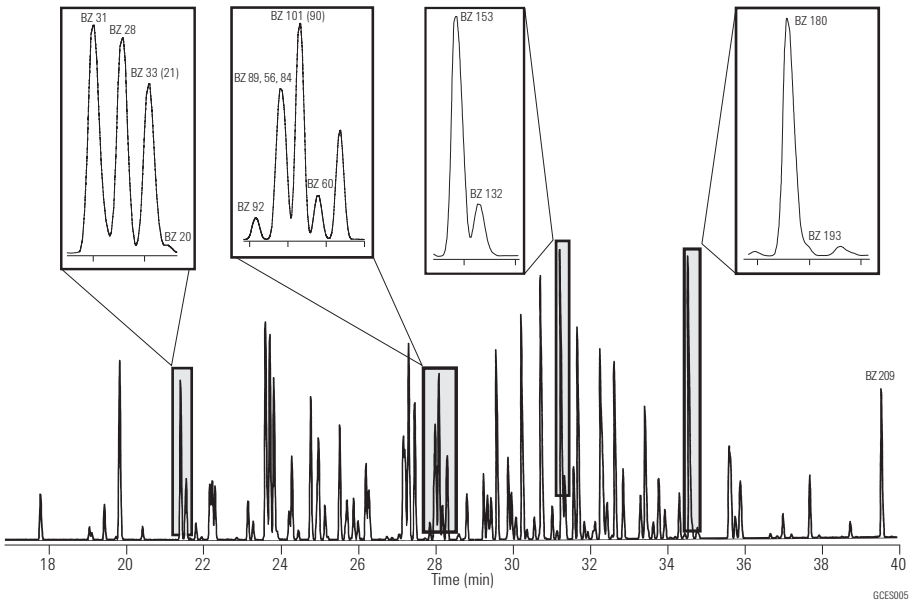
Sample: 2 µL dilute Aroclor mixture

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



Extended Temperature Program Resolving Congeners 52 and 138

Column: **DB-XLB**
122-1236
30 m x 0.25 mm, 0.50 µm

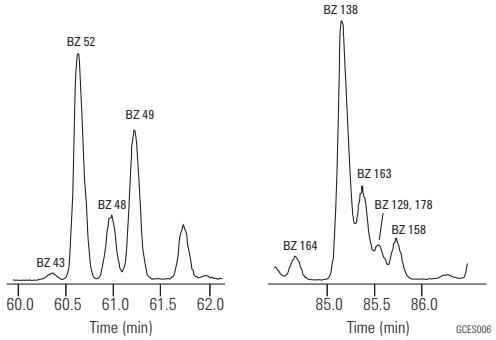
Carrier: Helium at 34.2 cm/sec, measured at 150 °C

Oven: 100 °C for 1 min
100-275 °C at 1.6 °C/min

Injection: Hot on-column, 250 °C
Split flow 100 mL/min

Detector: MSD, 300 °C transfer line
SIM of 221.9, 255.9, 291.9, 325.8, 359.8, 395.8, 429.7, 463.7

Sample: 2 µL dilute Aroclor mixture



PCBs by EPA Method 8082

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 µm

Column: **DB-XLB**
123-1236
30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 45 cm/sec (EPC in constant flow mode)

Oven: 110 °C for 0.5 min
110-320 °C at 15 °C/min
320 °C for 5 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: µECD, 350 °C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

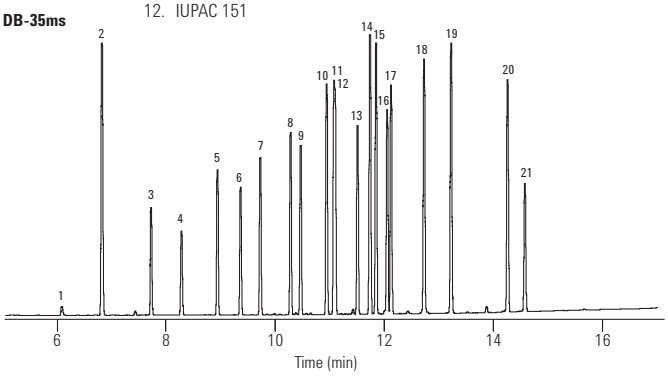
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

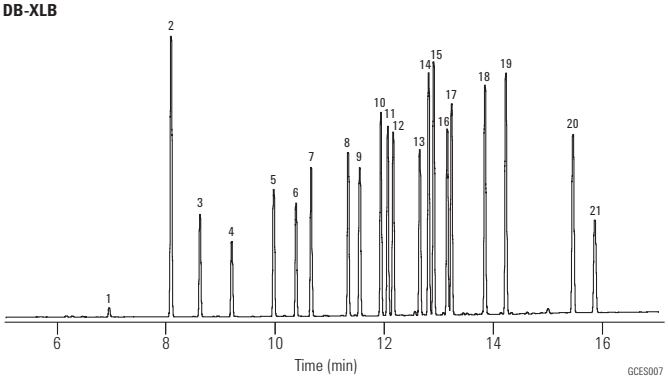
1. IUPAC 1
2. Tetrachloro-m-xylene (IS/SS)
3. IUPAC 5
4. IUPAC 18
5. IUPAC 31
6. IUPAC 52
7. IUPAC 44
8. IUPAC 66
9. IUPAC 101
10. IUPAC 87
11. IUPAC 110
12. IUPAC 151
13. IUPAC 153
14. IUPAC 141
15. IUPAC 137
16. IUPAC 187
17. IUPAC 183
18. IUPAC 180
19. IUPAC 170
20. IUPAC 206
21. Decachlorobiphenyl (IS/SS)

IS/SS - Internal Standard/ Surrogate Standard

DB-35ms



DB-XLB



Pyrethrins

Column: **DB-1**
123-1032
30 m x 0.32 mm, 0.25 µm

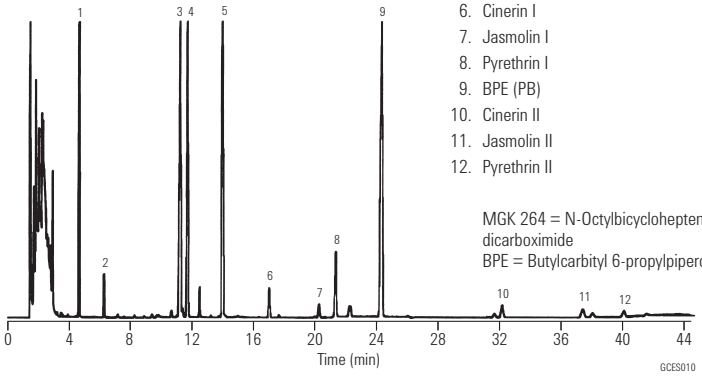
Carrier: Helium at 39 cm/sec, measured at 150 °C

Oven: 180 °C for 11 min
180-200 °C at 10 °C/min
200 °C for 8 min
200-210 °C at 10 °C/min
210 °C for 18 min
210-245 °C at 30 °C/min
245 °C for 4 min

Injection: Split, 250 °C
Split ratio 1:20

Detector: FID, 300 °C
Helium makeup gas at 30 mL/min

Sample: 1 µL



1. Heptadecane
2. Octadecane
3. Endo-MGK 264
4. Exo-MGK 264
5. Methoprene
6. Cinerin I
7. Jasmolin I
8. Pyrethrin I
9. BPE (PB)
10. Cinerin II
11. Jasmolin II
12. Pyrethrin II

MGK 264 = N-Octylbicycloheptene dicarboximide
BPE = Butylcarbityl 6-propylpiperonyl ether

Chromatogram courtesy of Khan Nguyen and Richard Moorman of Sandoz Agro Inc.

Organotin Compounds I

Column: **HP-1**
19091Z-012
25 m x 0.32 mm, 0.17 µm

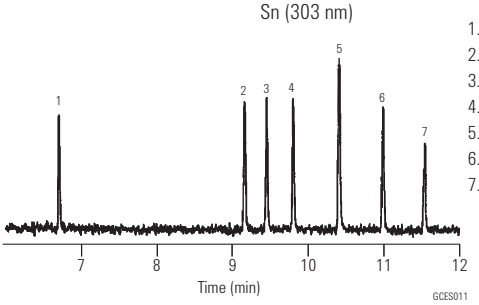
Carrier: Helium, 100 kPa

Oven: 50 °C for 1 min
50-260 °C at 15 °C/min

Injection: Splitless

Detector: AED, 330 °C

Sample: 1 µL



1. Dimethylpentyltin
2. Tetrabutyltin
3. Methyltripentyltin
4. Tributylpentyltin
5. Dibutylpentyltin
6. Butylpentyltin
7. Tetrapentyltin

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Organotin Compounds II

Column: **HP-5**
19091J-002
25 m x 0.20 mm, 0.11 µm

Carrier: Helium, 0.75 mL/min constant flow

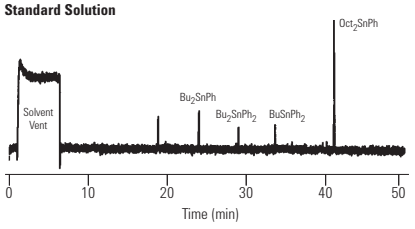
Oven: 60-360 °C at 5 °C/min

Injection: Splitless, 300 °C

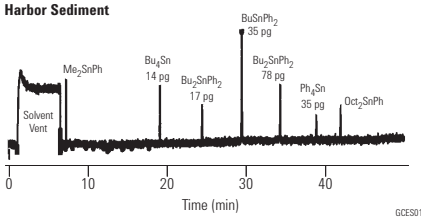
Detector: AED, 300 °C
Hg selective at 254 mm

Sample: 1 µL

Standard Solution



Harbor Sediment



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Semivolatile Compounds, US EPA Method 8270

Column: **HP-5ms**
19091S-133
30 m x 0.25 mm, 0.50 µm

Carrier: Ramped flow 1.2 mL/min for 0.0 min
Ramp at 99 mL/min to 2.0 mL/min
2.0 mL/min for 0.35 min
Ramp at 10 mL/min to 1.2 mL/min

Oven: 40 °C for 1.0 min
40-100 °C at 15 °C/min
100-240 °C at 20 °C/min
240-310 °C at 10 °C/min

Injection: Splitless, 250 °C
30 mL/min purge flow at 0.35 min

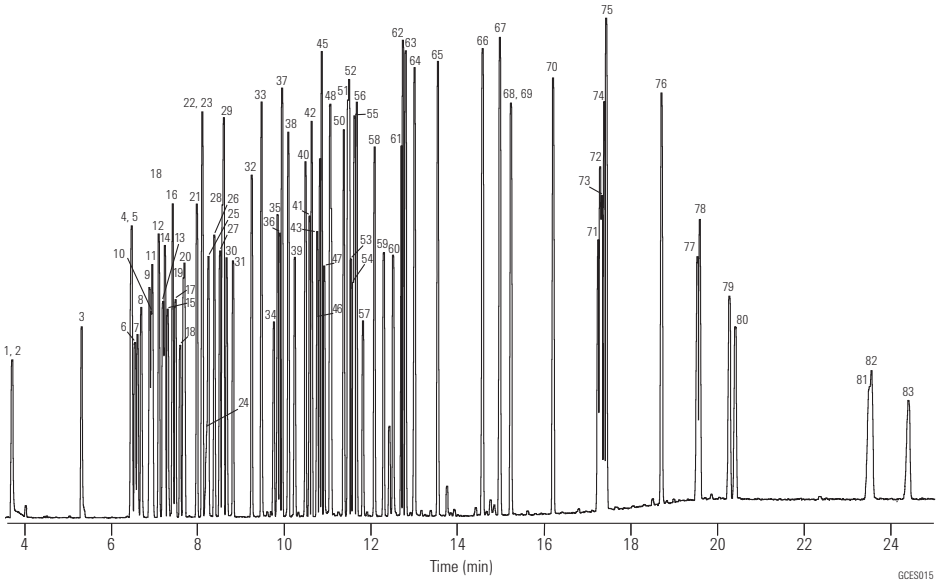
Detector: 5973 MSD, 310 °C transfer line
Scan range 35-500 amu, 3.25 scans/sec

Sample: 1 µL of 50 ng standard

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. n-Nitrosodimethylamine
2. Pyridine
3. 2-Fluorophenol
4. Phenol-d5
5. Phenol
6. Aniline
7. Bis(2-chloroethyl) ether
8. 2-Chlorophenol
9. 1,3-Dichlorobenzene
10. 1,4-Dichlorobenzene-d4
11. 1,4-Dichlorobenzene
12. Benzyl alcohol
13. 1,2-Dichlorobenzene
14. 2-Methylphenol
15. Bis(2-chloroisopropyl) ether
16. 4-Methylphenol
17. n-Nitroso-di-n-propylamine
18. Hexachloroethane
19. Nitrobenzene-d5
20. Nitrobenzene
21. Isophorone
22. 2-Nitrophenol
23. 2,4-Dimethylphenol
24. Benzoic acid
25. Bis(2-chloroethoxy) methane
26. 2,4-Dichlorophenol
27. 1,2,4-Trichlorobenzene
28. Naphthalene-d8
29. Naphthalene
30. 4-Chloroaniline
31. Hexachlorobutadiene
32. 4-Chloro-3-methylphenol
33. 2-Methylnaphthalene
34. Hexachlorocyclopentadiene
35. 2,4,6-Trichlorophenol
36. 2,4,5-Trichlorophenol
37. 2-Fluorobiphenyl
38. 2-Chloronaphthalene
39. 2-Nitroaniline
40. Dimethylphthalate
41. 2,6-Dinitrotoluene
42. Acenaphthylene
43. 3-Nitroaniline
44. Acenaphthene-d10
45. Acenaphthene
46. 2,4-Dinitrophenol
47. 4-Nitrophenol
48. Dibenzofuran
49. 2,4-Dinitrotoluene
50. Diethylphthalate
51. 4-Chlorophenyl-phenyl ether
52. Fluorene
53. 4-Nitroaniline
54. 4,6-Dinitro-2-methylphenol
55. n-Nitrosodiphenylamine
56. Azobenzene
57. 2,4,6-Tribromophenol
58. 4-Bromophenyl-phenylether
59. Hexachlorobenzene
60. Pentachlorophenol
61. Phenanthrene-d10
62. Phenanthrene
63. Anthracene
64. Carbazole
65. Di-n-butylphthalate
66. Fluoranthene
67. Pyrene
68. Terphenyl-d14
69. Benzidine
70. Butylbenzylphthalate
71. 3,3'-Dichlorobenzidine
72. Benzo[a]anthracene
73. Chrysene-d12
74. Chrysene
75. Bis(2-ethylhexyl) phthalate
76. Di-n-octylphthalate
77. Benzo[b]fluoranthene
78. Benzo[k]fluoranthene
79. Benzo[a]pyrene
80. Perylene-d12
81. Indeno[1,2,3-cd]pyrene
82. Dibenz[a,h]anthracene
83. Benzo[g,h,i]perylene



A variety of Agilent HP-5ms and DB-5ms columns can be used for 8270 and similar semivolatiles applications. The column shown above was chosen to maximize inertness and robustness to residues with a thicker 0.5 µm film, but the price paid is a slightly longer run time.
An HP-5ms, 30 m x 0.25 mm id, 0.25 µm, P/N 19091S-433 would give shorter run times, with slightly less inertness and robustness.
A DB-5ms, 30 m x 0.25 mm id, 0.25 µm, P/N 122-5532, would give slightly less inertness, but offer better resolution of PAHs such as Benzo[b]fluoranthene and Benzo[k]fluoranthene. A DB-5ms, 20 m x 0.18 mm x 0.18 µm, P/N 121-5522, can offer significantly reduced run times with a modest loss of inertness.

EPA Method 8061 (Phthalate Esters)

Column: **DB-5ms**
121-5522
20 m x 0.18 mm, 0.18 µm

Carrier: Helium at 49 cm/sec, measured at 80 °C
constant flow program

Oven: 80 °C for 0.5 min
80-160 °C at 30 °C/min
160-320 °C at 15 °C/min

Injection: Splitless, 300 °C
30 sec purge activation time

Detector: MSD, 325 °C transfer line
Full scan m/z 50-400

Sample: 1 µL of 20 ng/µL
Method 8061 mixture (Accustandard) in hexane

Suggested Supplies

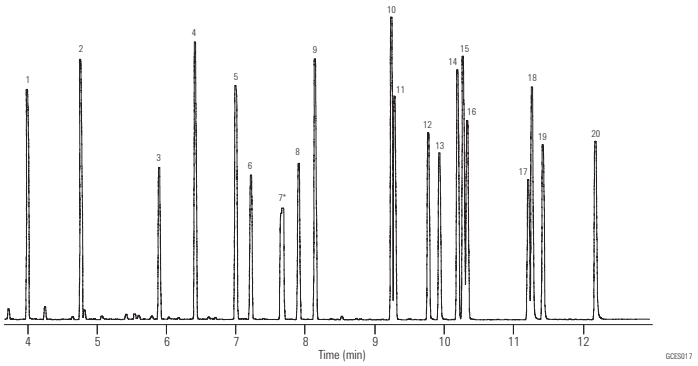
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Dimethyl phthalate
2. Diethyl phthalate
3. Benzyl benzoate (IS)
4. Diisobutyl phthalate
5. Di-n-butyl phthalate
6. Bis(4-methoxyethyl) phthalate
7. Bis(4-methyl-2-pentyl) phthalate *
8. Bis(2-ethoxyethyl) phthalate
9. Diamyl phthalate
10. Dihexyl phthalate
11. Butyl benzyl phthalate
12. Hexyl 2-ethylhexyl phthalate
13. Bis(2-n-butoxyethyl) phthalate
14. Dicyclohexyl phthalate
15. Bis(2-ethylhexyl) phthalate
16. Diphenyl phthalate (SS)
17. Diphenyl isophthalate (SS)
18. Di-n-octyl phthalate
19. Dibenzyl phthalate (SS)
20. Dinonyl phthalate

* Two isomers
IS - Internal Standard
SS - Surrogate Standard



US EPA Method 8270 Short Mix

Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

Carrier: Helium constant flow 30 cm/s

Oven: 40 °C (1 min) to 100 °C (15 °C/min),
10 °C to 210 °C (1 min),
5 °C/min to 310 °C (8 min)

Injection: Split/splitless; 260 °C, 53.7 mL/min
total flow, purge flow 50 mL/min on
at 0.5 min, gas saver flow 80 mL/min
on at 3.0 min

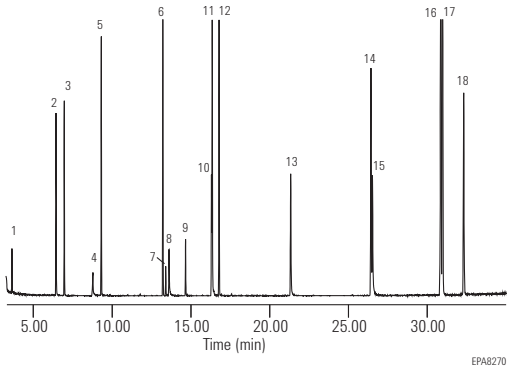
Detector: MSD source at 300 °C, quadrupole
at 180 °C, transfer line at 290 °C,
full scan m/z 50-550

Sample: 1.0 µL splitless injection,
5 ng each component on-column

Suggested Supplies

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Syringe: Autosampler syringe, 0.5 µL, 23g, cone, 5188-5246



1. N-nitrosodimethylamine
2. Aniline
3. 1,4 dichoronezene-D4
4. 1,4 dichlorobenzene
5. Naphthalene-D8
6. Acenapthene-D10
7. 2,4-dinitrophenol
8. 4-nitrophenol
9. 2-methyl-4,6-dinitrophenol
10. Pentachlorophenol
11. 4-aminobiphenyl
12. Phenanthrene- D10
13. Benzidine
14. Chrysene-D12
15. 3,3'-dichlorobenzidine
16. Benzo [b] fluoranthene
17. Benzo [k] fluoranthene
18. Perylene-D12

Semivolatile analysis using methods similar to US EPA Method 8270 is becoming increasingly important in environmental laboratories worldwide. Acidic compounds such as benzoic acid or 2,4-dinitrophenol – along with strong bases such as pyridine or benzidine – are examples of active species found in the semivolatile sample set. This DB-5ms Ultra Inert column demonstrates excellent inertness performance for these difficult analytes.

Phenols

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Column: **DB-XLB**
122-1232
30 m x 0.25 mm, 0.25 µm

Carrier: He at 1.2 mL/min Constant Flow

Oven: 40 °C for 2.00 min
40-100 °C at 40 °C/ min
100 °C for 0.50 min
100-140 °C at 2 °C/min
140-340 °C at 30 °C/min

Injection: Pulsed Splitless, 200 °C
Pulse Pressure & Time: 25.0 psi for 1.00 min
Purge Flow & Time: 50.0 mL/min for 0.25 min
Gas Saver Flow & Time: 20.0 mL/min for 3.00 min

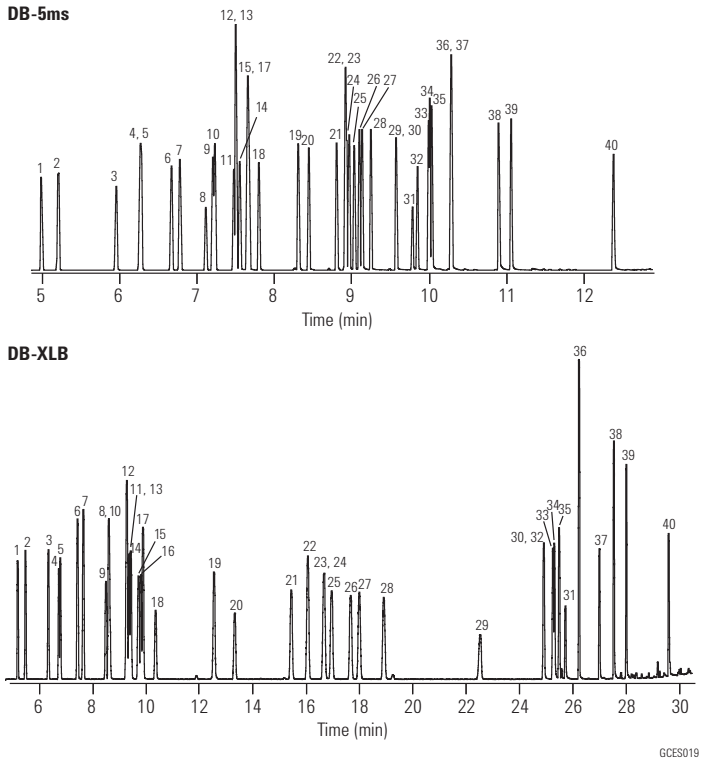
Detector: MSD, 320 °C Transfer Line
Quadrapole at 150 °C
Source at 230 °C

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Phenol
2. 2-Chlorophenol
3. 2-Methylphenol
4. 4-Methylphenol
5. 3-Methylphenol
6. 2-Chloro-5-methylphenol
7. 2,6-Dimethylphenol
8. 2-Nitrophenol
9. 2,4-Dimethylphenol
10. 2,5-Dimethylphenol
11. 2,4-Dichlorophenol
12. 2,3-Dimethylphenol
13. 2,5-Dichlorophenol
14. 2,3-Dichlorophenol
15. 2-Chlorophenol
16. 4-Chlorophenol
17. 3,4-Dimethylphenol
18. 2,6-Dichlorophenol
19. 4-Chloro-2-methylphenol
20. 4-Chloro-3-methylphenol
21. 2,3,5-Trichlorophenol
22. 2,4-Dibromophenol
23. 2,4,6-Trichlorophenol
24. 2,4,5-Trichlorophenol
25. 2,3,4-Trichlorophenol
26. 3,5-Dichlorophenol
27. 2,3,6-Trichlorophenol
28. 3,4,-Dichlorophenol
29. 3-Nitrophenol
30. 2,5-Dinitrophenol
31. 2,4-Dinitrophenol
32. 4-Nitrophenol
33. 2,3,5,6-Tetrachlorophenol
34. 2,3,4,5-Tetrachlorophenol
35. 2,3,4,6-Tetrachlorophenol
36. 3,4,5-Trichlorophenol
37. 2-Methyl-4,6-dinitrophenol
38. Pentachlorophenol
39. Dinoseb
40. 2-Cyclohexyl-4,6-dinitrophenol

PAHs

Column: **DB-17ms**
122-4732
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at: 34.1 cm/sec, measured at 150 °C

Oven: 95 °C for 0.5 min
95-340 °C at 5 °C/min
340 °C for 5 min

Injection: Split, 300 °C
Split ratio 1:40

Detector: MSD, 340 °C transfer line
Scan 80-330 amu

Sample: 2 µL, PAH standard

Suggested Supplies

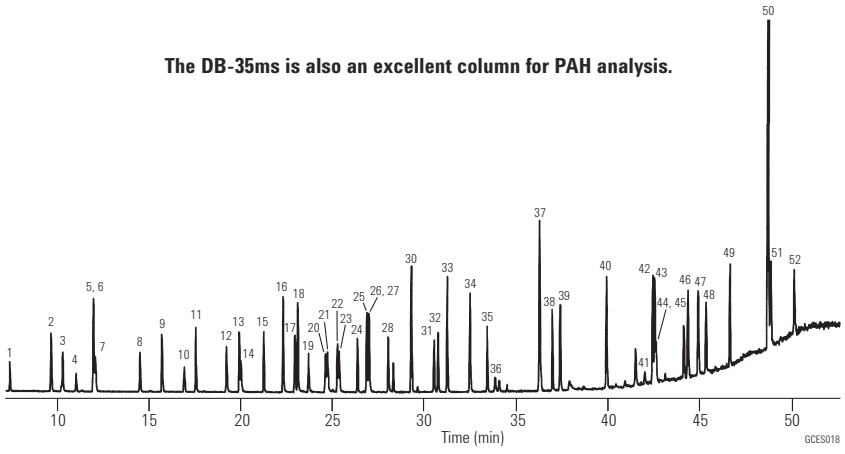
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

		Ions			Ions
1.	Naphthalene	128	27.	3,6-Dimethylphenanthrene	206, 191
2.	2-Methylnaphthalene	142, 141	28.	1,3-Dinitronaphthalene	126, 218
3.	1-Methylnaphthalene	142, 141	29.	1,5-Dinitronaphthalene	218, 114
4.	Azulene	128	30.	Fluoranthene	202
5.	Acenaphthene	154	31.	2,2'-Dinitrobiphenyl	198, 139
6.	Biphenyl	154	32.	Pyrene	202
7.	2,6-Dimethylnaphthalene	156, 155	33.	2-Methylfluoranthene	216, 215
8.	Acenaphthalene	152	34.	2,3-Benzofluorene	216, 215
9.	Dibenzofuran	168, 139	35.	Dodecahydrotriphenylene	240, 198
10.	Dibenzo-p-dioxin	184	36.	1-Amino-4-nitronaphthalene	188, 115
11.	Fluorene	166, 165	37.	9-Phenylanthracene	254, 253
12.	1-Nitronaphthalene	127, 173	38.	1,2-Benzanthracene	228
13.	9,10-Dihydroanthracene	179, 180	39.	Chrysene	240
14.	2-Nitronaphthalene	127, 173	40.	Benz[a]anthracene-7,12-dione	258, 202
15.	2-Nitrobiphenyl	152, 115	41.	2,7-Dinitrofluorene	256, 163
16.	Dibenzothiophene	184	42.	Benzo[b]fluoroanthene	252
17.	Phenanthrene	178	43.	Benzo[k]fluoranthene	252
18.	Anthracene	178	44.	7,12-Dimethylbenz[a]anthracene	256, 241
19.	3-Nitrobiphenyl	199, 152	45.	Benzo[e]pyrene	252
20.	4-Nitrobiphenyl	199, 152	46.	Benzo[a]pyrene	252
21.	5,6-Benzoquinoline	179	47.	Perylene	252
22.	Carbazole	167	48.	3-Methylcholanthrene	268
23.	2-Methylanthracene	192, 191	49.	9,10-Diphenylanthracene	330
24.	1,2,3,4-Tetrahydrofluoranthene	178, 206	50.	1,2,3,4-Dibenzanthracene	278
25.	2-Phenylnaphthalene	204	51.	1,2,5,6-Dibenzanthracene	278
26.	9-Methylanthracene	192, 191	52.	Benzo[g,h,i]perylene	276

The DB-35ms is also an excellent column for PAH analysis.



High Resolution Phenol Analysis by GC/MS

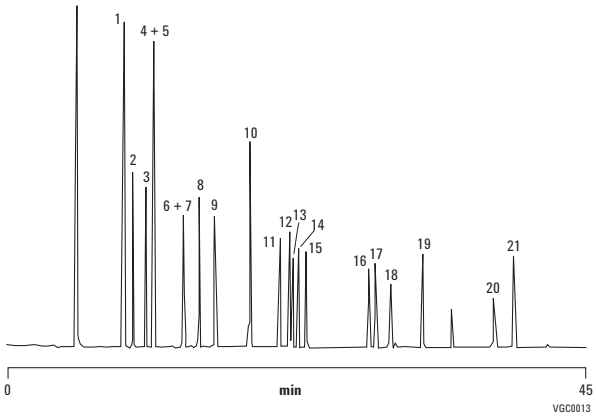
Column: **VF-5ms, CP8944, 30 m x 0.25 mm, 0.25 µm**

Sample Conc: Approx. 5-10 ng per component on-column

Carrier: Helium, 70 kPa

Injection: Split, 1:200, T=275 °C

Detector: Ion Trap MS



1. Phenol
2. 2-Chlorophenol
3. o-Cresol
4. m-Cresol
5. p-Cresol
6. 2-Nitrophenol
7. 2,4-Dimethylphenol
8. 2,4-Dichlorophenol
9. 2,6-Dichlorophenol
10. 4-Chloro-3-methylphenol
11. 2,3,5-Trichlorophenol
12. 2,4,6-Trichlorophenol
13. 2,4,5-Trichlorophenol
14. 2,3,4-Trichlorophenol
15. 2,3,6-Trichlorophenol
16. 4-Nitrophenol
17. 2,4-Dinitrophenol
18. 2,3,5,6 Tetrachlorophenol
19. 2-Methyl-4,6-dinitrophenol
20. Pentachlorophenol
21. 2-Se-butyl-4,6-dinitrophenol

Phenols According to EPA Method 8040

Column: **CP-Sil 8 CB**
CP7454
50 m x 0.32 mm, 0.25 µm

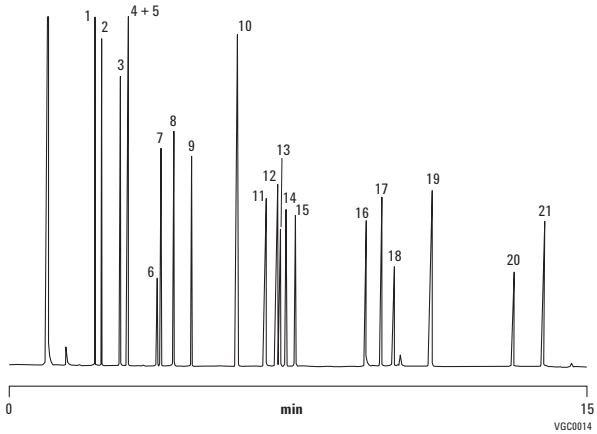
Sample Conc: 1 ppm

Oven: 80 °C to 200 °C, 8 °C/min

Carrier: H_2, 150 kPa (1.5 bar, 21 psi)

Injection: Split, 100 mL/min

Detector: FID



1. Phenol
2. 2-Chlorophenol
3. o-Cresol
4. m-Cresol
5. p-Cresol
6. 2-Nitrophenol
7. 2,4-Dimethylphenol
8. 2,4-Dichlorophenol
9. 2,6-Dichlorophenol
10. 4-Chloro-3-methylphenol
11. 2,3,5-Trichlorophenol
12. 2,4,6-Trichlorophenol
13. 2,4,5-Trichlorophenol
14. 2,3,4-Trichlorophenol
15. 2,3,6-Trichlorophenol
16. 4-Nitrophenol
17. 2,4-Dinitrophenol
18. 2,3,5,6-Tetrachlorophenol
19. 2-Methyl-4,6-dinitrophenol
20. Pentachlorophenol
21. 2-Sec-butyl-4,-dinitrophenol (Dinoseb)

EPA Method 552.2

Column: **DB-35ms**
123-3832
30 m x 0.32 mm, 0.25 µm

Column: **DB-XLB**
123-1236
30 m x 0.32 mm, 0.50 µm

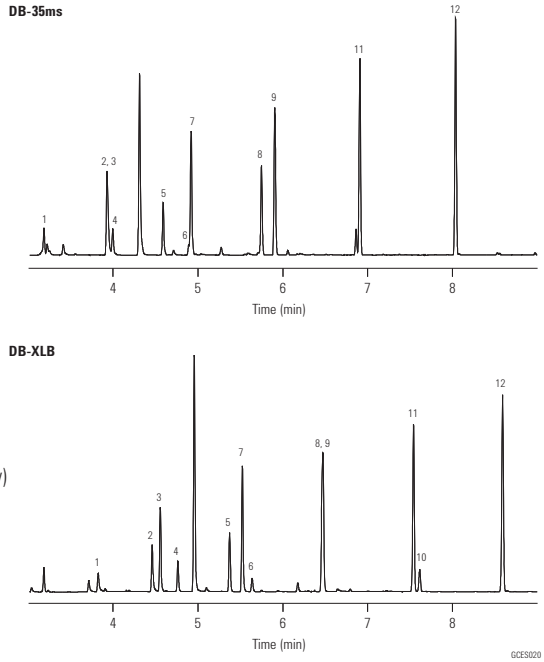
Carrier: Helium at 45 cm/sec
(EPC in constant flow mode)

Oven: 40 °C for 0.5 min
40-200 °C at 15 °C/min
200 °C for 2 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: µECD, 350 °C
Nitrogen makeup gas
(column + makeup flow = 30 mL/min constant flow)

Sample: 50 pg per component



1. Chloroacetic acid
2. Bromoacetic acid
3. Dichloroacetic acid
4. Dalapon
5. Trichloroacetic acid
6. 1,2,3-Trichloropropane (IS)
7. Bromochloroacetic acid
8. Bromodichloroacetic acid
9. Dibromoacetic acid
10. 2,3-Dibromopropionic acid (SS)
11. Chlorodibromoacetic acid
12. Tribromoacetic acid

IS - Internal Standard
SS - Surrogate Standard

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Environmental Applications, Volatiles

Extended Analyte List for EPA Method 8021

Column: **DB-624**
124-1374
75 m x 0.45 mm, 2.55 µm

Column: **DB-VRX**
124-1574
75 m x 0.45 mm, 2.55 µm

Carrier: Helium at 9 mL/min, measured at 35 °C

Oven:
35 °C for 12 min
35-60 °C at 5 °C/min
60 °C for 1 min
60-200 °C at 17 °C/min
200 °C for 5 min

Sampler: Purge and Trap (O.I.A. 4560)
Trap: Vocarb 3000
Preheat: 175 °C
Desorb: 260 °C for 1 min

Injection: J&W LVI (Low Volume Injector), 150 °C

Detector:
A: PID (O.I.A. 4430), 200 °C Helium makeup gas at 20 mL/min
B: ELCD (O.I.A. 4420), with NiCat reaction tube in the halogen mode, 950 °C reactor temperature

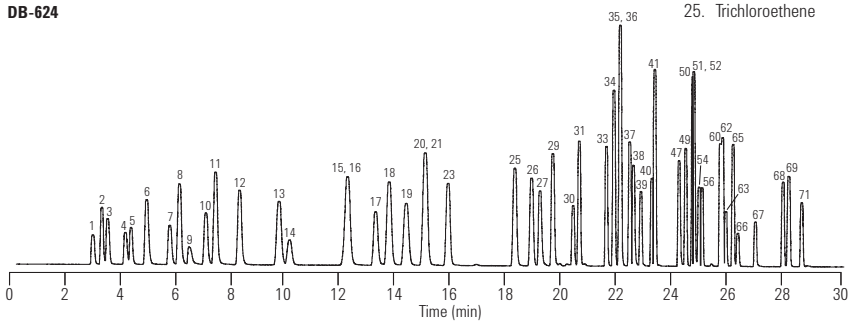
Sample: 20 ppb per component in 5 mL water

Suggested Supplies

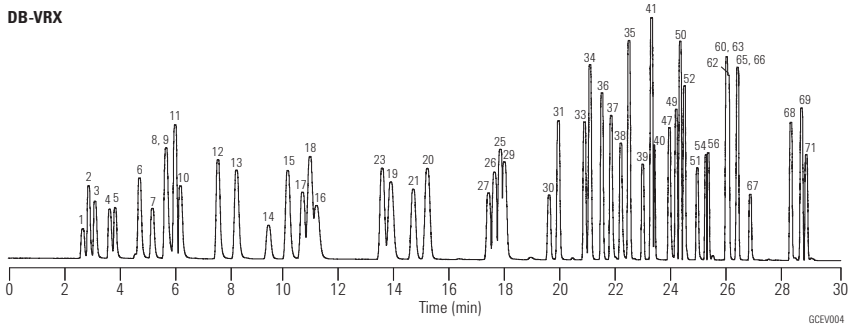
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885
Septum: 11 mm Advanced Green septa, 5183-4759

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 2-Chloropropane (IS)
8. 1,1-Dichloroethene
9. Iodomethane
10. Allyl chloride
11. Methylene chloride
12. trans-1,2-Dichloroethene
13. 1,1-Dichloroethane
14. Chloroprene
15. cis-1,2-Dichloroethene
16. 2,2-Dichloropropane
17. Bromochloromethane
18. Chloroform
19. 1,1,1-Trichloroethane
20. Carbon tetrachloride
21. 1,1-Dichloropropene
22. Benzene
23. 1,2-Dichloroethane
24. Fluorobenzene (IS)
25. Trichloroethene
26. 1,2-Dichloropropane
27. Dibromomethane
28. Trifluorotoluene (IS)
29. Bromodichloromethane
30. 2-Chloroethyl vinyl ether
31. cis-1,3-Dichloropropene
32. Toluene
33. trans-1,3-Dichloropropene
34. 1,1,2-Trichloroethane
35. Tetrachloroethene
36. 1,3-Dichloropropane
37. Dibromochloromethane
38. 1,2-Dibromoethane
39. 1-Chloro-3-fluorobenzene (IS)
40. Chlorobenzene
41. 1,1,1,2-Tetrachloroethane
42. Ethylbenzene
43. m-Xlyene
44. p-Xylene
45. Styrene
46. o-Xylene
47. Bromoform
48. Isopropylbenzene
49. cis-1,4-Dichlorobutene
50. 1,1,2,2-Tetrachloroethane
51. Bromobenzene
52. 1,2,3-Trichloropropane
53. n-Propylbenzene
54. 2-Chlorotoluene
55. 1,3,5-Trimethylbenzene
56. 4-Chlorotoluene
57. tert-Butylbenzene
58. 1,2,4-Trimethylbenzene
59. sec-Butylbenzene
60. 1,3-Dichlorobenzene
61. p-Isopropyltoluene
62. 1,4-Dichlorobenzene
63. Benzyl chloride
64. n-Butylbenzene
65. 1,2-Dichlorobenzene
66. Bis(2-chloroisopropyl) ether
67. 1,2-Dibromo-3-chloropropane
68. 1,2,4-Trichlorobenzene
69. Hexachlorobutadiene
70. Naphthalene
71. 1,2,3-Trichlorobenzene

DB-624



DB-VRX



GCEV004

Fast VOC Analysis

Column: **DB-624**
121-1324
20 m x 0.18 mm, 1.00 µm

Carrier: Helium at 37 cm/sec, (constant flow mode)

Oven:
35 °C for 4 min
35-200 °C at 15 °C/min
200 °C for 0.1 min
60-200 °C at 17 °C/min

Sampler: Purge and trap (Tekmar LSC 3000)
Purge: Helium for 11 min at 50 mL/min
Preheat: 250 °C
Desorb: 260 °C for 2 min
Line & valve: 100 °C

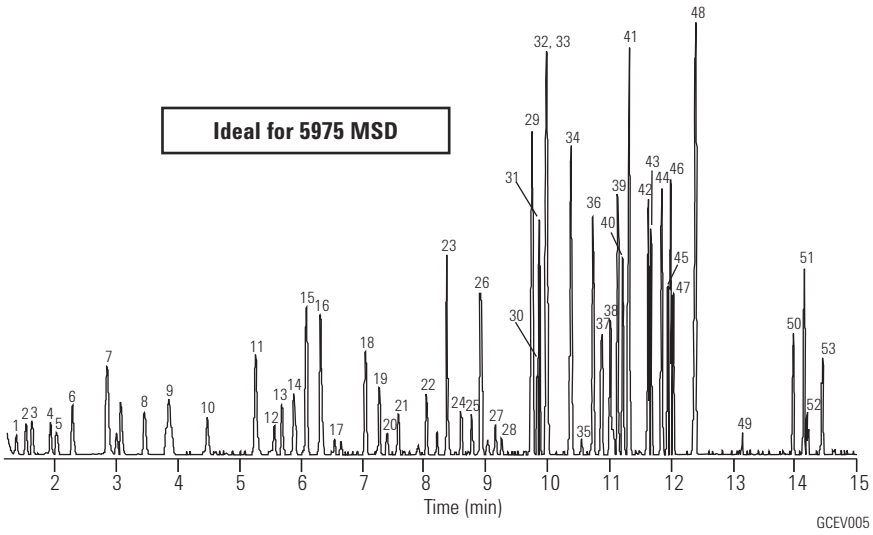
Detector: MSD, 250 °C transfer line
Full scan 35 -260 amu
3.25 scans per second

Sample: 10 ppb per component in 25 mL water

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Dichlorofluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Methylene chloride
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. Bromochloromethane
13. Chloroform
14. 1,1,1-Trichloroethane
15. Carbon tetrachloride
16. Benzene
17. Fluorobenzene
18. Trichloroethene
19. 1,2-Dichloropropane
20. Dibromomethane
21. Bromodichloromethane
22. cis-1,3-Dichloropropene
23. Toluene
24. trans-1,3-Dichloropropene
25. 1,1,2-Trichloroethane
26. Tetrachloroethene
27. Dibromochloromethane
28. 1,2-Dibromomethane
29. Chlorobenzene
30. 1,1,1,2-Tetrachloroethane
31. Ethylbenzene
32. m-Xylene
33. p-Xylene
34. o-Xylene
35. Bromoform
36. Isopropylbenzene
37. Bromofluorobenzene
38. Bromobenzene
39. n-Propylbenzene
40. 2-Chlorotoluene
41. 1,3,5-Trimethylbenzene
42. tert-Butylbenzene
43. 1,2,4-Trimethylbenzene
44. sec-Butylbenzene
45. 1,3-Dichlorobenzene
46. 4-Isopropyltoluene
47. 1,4-Dichlorobenzene
48. 1,2-Dichlorobenzene
49. 1,2-Dibromo-3-chloropropane
50. 1,2,4-Trichlorobenzene
51. Hexachlorobutadiene
52. Naphthalene
53. 1,2,3-Trichlorobenzene



GCEV005

EPA Method 551

Column: **DB-1**
122-1033
30 m x 0.25 mm, 1.00 µm

Carrier: Helium at 24.8 cm/sec, measured at 150 °C

Oven: 35 °C for 9 min
35-40 °C at 10 °C/min
40 °C for 3 min
40-150 °C at 6 °C/min
150 °C for 1 min

Injection: Splitless, 200 °C
15 sec purge activation time

Detector: ECD, 300 °C

Sample: 1 µL of 50 pg/µL, AccuStandard

Suggested Supplies

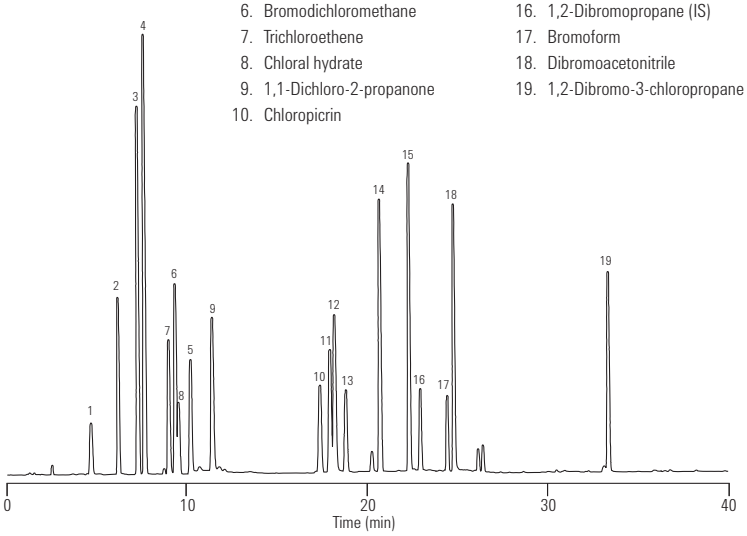
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Chloroform
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Trichloroacetonitrile
5. Dichloroacetonitrile
6. Bromodichloromethane
7. Trichloroethene
8. Chloral hydrate
9. 1,1-Dichloro-2-propanone
10. Chloropicrin
11. Dibromochloromethane
12. Bromochloroacetonitrile
13. 1,2-Dibromoethane
14. Tetrachloroethene
15. 1,1,1-Trichloropropanone
16. 1,2-Dibromopropane (IS)
17. Bromoform
18. Dibromoacetonitrile
19. 1,2-Dibromo-3-chloropropane



GCEV008

European Red List Volatiles

Column: **DB-5.625**
122-5632
30 m x 0.25 mm, 0.50 µm

Column: **DB-624**
122-1334
30 m x 0.25 mm, 1.40 µm

Carrier: Helium at 35 cm/sec, measured at 40 °C

Oven: 40 °C for 2 min
40-140 °C at 12 °C/min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of headspace of neat mixture

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

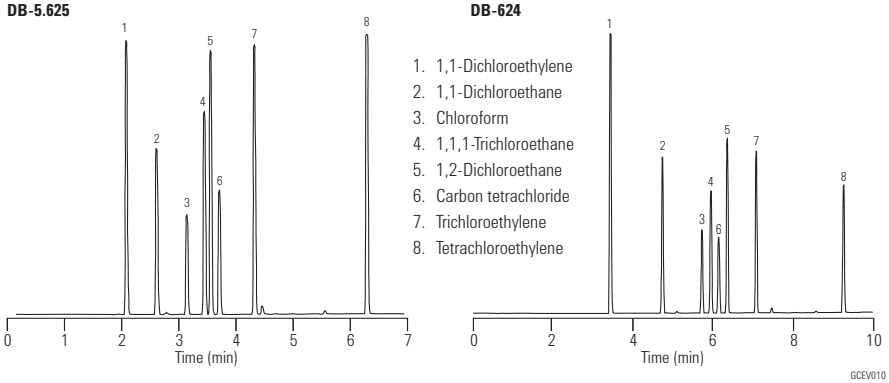
Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

DB-5.625

DB-624

1. 1,1-Dichloroethylene
2. 1,1-Dichloroethane
3. Chloroform
4. 1,1,1-Trichloroethane
5. 1,2-Dichloroethane
6. Carbon tetrachloride
7. Trichloroethylene
8. Tetrachloroethylene



GCEV010

EPA Volatiles by GC/MS (Split Injector)

Column: **DB-VRX**
122-1564
60 m x 0.25 mm, 1.40 µm

Carrier: Helium at 30 cm/sec, measured at 45 °C

Oven:
45 °C for 10 min
45-190 °C at 12 °C/min
190 °C for 2 min
190-225 °C at 6 °C/min
225 °C for 1 min

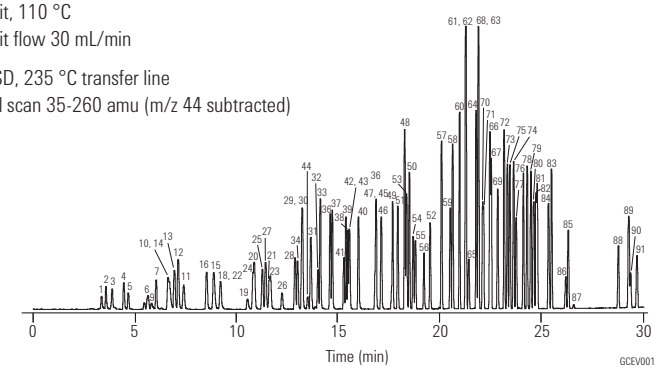
Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C
Split flow 30 mL/min

Detector: MSD, 235 °C transfer line
Full scan 35-260 amu (m/z 44 subtracted)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal kit, 5188-5367

Column: **DB-624**
122-1364
60 m x 0.25 mm, 1.40 µm

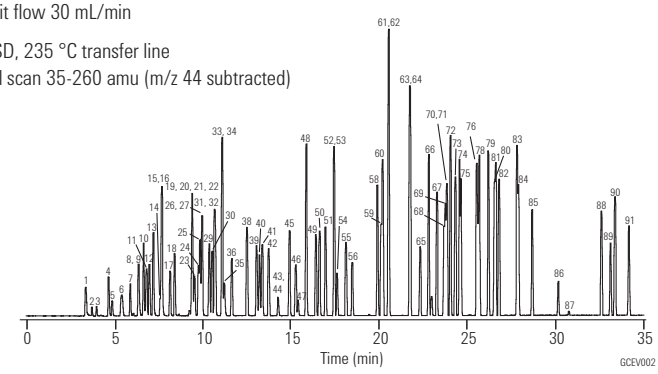
Carrier: Helium at 31 cm/sec, measured at 40 °C

Oven:
45 °C for 3 min
45-90 °C at 8 °C/min
90 °C for 4 min
90-200 °C at 6 °C/min
200 °C for 5 min

Sampler: Purge and trap (O.I.A. 4560)
Purge: Helium for 11 min at 40 mL/min
Trap: Tenax/Silica Gel/Carbosieve
Preheat: 175 °C
Desorb: 220 °C for 0.6 min

Injection: Split, 110 °C
Split flow 30 mL/min

Detector: MSD, 235 °C transfer line
Full scan 35-260 amu (m/z 44 subtracted)



1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Acetone
10. Iodomethane
11. Carbon disulfide
12. Allyl chloride
13. Methylene chloride
14. Acrylonitrile
15. Methyl-tert-butyl ether
16. trans-1,2-Dichloroethene
17. Hexane
18. 1,1-Dichloroethane
19. 2-Butanone
20. cis-1,2-Dichloroethene
21. 2,2-Dichloropropane
22. Propionitrile
23. Methyl acrylate
24. Methacrylonitrile
25. Bromochloromethane
26. Tetrahydrofuran
27. Chloroform
28. Pentafluorobenzene (IS)
29. 1,1,1-Trichloroethane
30. 1-Chlorobutane
31. 1,1-Dichloropropene
32. Carbon tetrachloride
33. Benzene
34. 1,2-Dichloroethane
35. 2,2-Dimethylhexane
36. Fluorobenzene (IS)
37. 1,4-Difluorobenzene (IS)
38. Trichloroethene
39. 1,2-Dichloropropane
40. Methyl methacrylate
41. Dibromomethane
42. Bromodichloromethane
43. 2-Nitropropane
44. Chloroacetonitrile
45. cis-1,3-Dichloropropene
46. 4-Methyl-2-pentanone
47. 1,1-Dichloro-2-propanone
48. Toluene
49. trans-1,3-Dichloropropene
50. Ethyl methacrylate
51. 1,1,2-Trichloroethane
52. Tetrachloroethene
53. 1,3-Dichloropropane
54. 2-Hexanone
55. Dibromochloromethane
56. 1,2-Dibromoethane
57. 1-Chloro-3-fluorobenzene (IS)
58. Chlorobenzene
59. 1,1,1,2-Tetrachloroethane
60. Ethylbenzene
61. m-Xylene
62. p-Xylene
63. o-Xylene
64. Styrene
65. Bromoform
66. Isopropylbenzene
67. 4-Bromofluorobenzene (SS)
68. 1,1,2,2-Tetrachloroethane
69. Bromobenzene
70. 1,2,3-Trichloropropane
71. trans-1,4-Dichloro-2-butene
72. n-Propylbenzene
73. 2-Chlorotoluene
74. 1,3,5-Trimethylbenzene
75. 4-Chlorotoluene
76. tert-Butylbenzene
77. Pentachloroethane
78. 1,2,4-Trimethylbenzene
79. sec-Butylbenzene
80. 1,3-Dichlorobenzene
81. p-Isopropyltoluene
82. 1,4-Dichlorobenzene
83. n-Butylbenzene
84. 1,2-Dichlorobenzene
85. Hexachloroethane
86. 1,2-Dibromo-3-chloropropane
87. Nitrobenzene
88. 1,2,4-Trichlorobenzene
89. Hexachlorobutadiene
90. Naphthalene
91. 1,2,3-Trichlorobenzene

IS - Internal Standard
SS - Surrogate Standard
Note: Some compounds not present in both chromatograms

High Speed VOC, EPA Method 8260

Column: **DB-VRX**
121-1524
20 m x 0.18 mm, 1.00 µm

Carrier: Helium at 55 cm/sec (1.5 mL/min)

Oven: 45 °C for 3.0 min
45-190 °C at 36 °C/min
190-225 °C at 20 °C/min
225 °C for 0.5 min

Sampler: Purge and trap (Tekmar 3100)
Purge: 11 min
Trap: Vocarb 3000
Preheat: 245 °C
Desorb: 250 °C for 1min
Bake: 260 °C for 10 min
Line & valve: 100 °C

Injection: Split, 150 °C
Split ratio 60:1

Detector: Agilent 5975 MSD,
Scan range: 35-260 amu
Scan rate: 3.25 scans/sec
Quad temperature: 150 °C
Source temperature: 200 °C
Transfer line temp: 200 °C

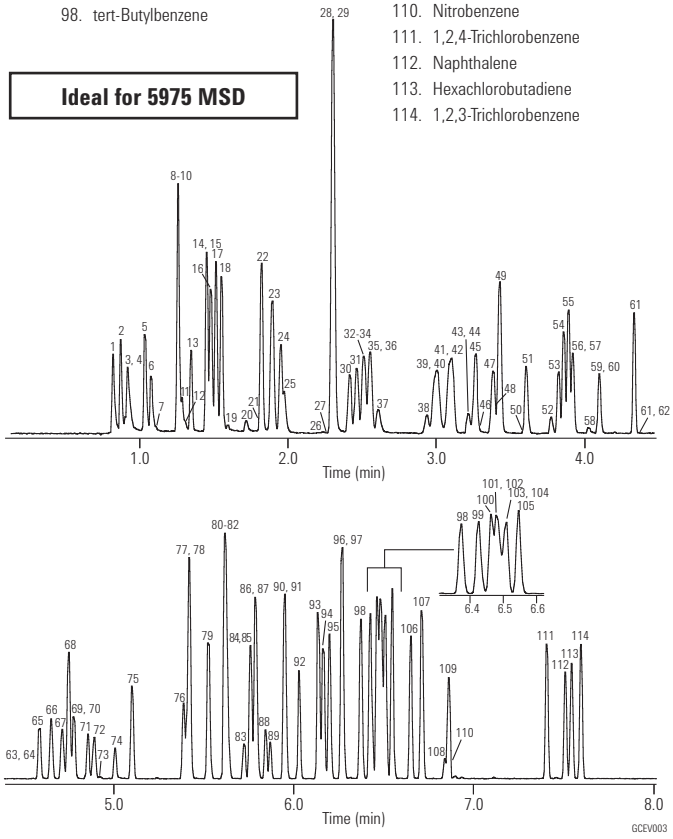
Sample: 5 mL
- Halogentated and aromatic analytes at 40 ppb
- Internal standards at 20 ppb
- Polar analytes (i.e., ethers, alcohols and ketones at 100-800 ppb)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Dichlorodifluoromethane
2. Chloromethane
3. Hydroxypropionitrile
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Ethanol
8. Acetonitrile
9. Acrolein
10. Trichlorofluoromethane
11. Isopropyl alcohol
12. Acetone
13. Ethyl ether
14. 1,1-Dichloroethene
15. tert-Butyl alcohol
16. Acrylonitrile
17. Methylene chloride
18. Allyl chloride
19. Allyl alcohol
20. 1-Propanol
21. Propargyl alcohol
22. trans-1,2-Dichloroethene
23. MTBE
24. 1,1-Dichloroethane
25. Propionitrile
26. 2-Butanone
27. Diisopropyl ether
28. cis-1,2-Dichloroethene
29. Methacrylonitrile
30. Bromochloromethane
31. Chloroform
32. 2,2-Dichloropropane
33. Ethyl acetate
34. Ethyl-tert-butyl ether
35. Methyl acrylate
36. Dibromofluoromethane (IS)
37. Isobutanol
38. Dichloroethane-d4 (IS)
39. Pentafluorobenzene
40. 1,2-Dichloroethane
41. 1,1,1-Trichloroethane
42. 1-Chlorobutane
43. Crotonaldehyde
44. 2-Chloroethanol
45. 1,1-Dichloropropene
46. 1-Butanol
47. Carbon tetrachloride
48. Chloroacetonitrile
49. Benzene
50. tert-Amylmethyl ether
51. Fluorobenzene (IS)
52. 2-Pentanone
53. Dibromomethane
54. 1,2-Dichloropropane
55. Trichloroethene
56. Bromodichloromethane
57. 2-Nitropropane
58. 1,4-Dioxane
59. Epichlorohydrin
60. Methyl methacrylate
61. cis-1,3-Dichloropropene
62. Propiolactone
63. Bromoacetone
64. Pyridine
65. trans-1,3-Dichloropropene
66. 1,1,2-Trichloroethane
67. Toluene-d8 (IS)
68. Toluene
69. 1,3-Dichloropropane
70. Paraldehyde
71. Ethyl methacrylate
72. Dibromochloromethane
73. 3-Chloropropionitrile
74. 1,2-Dibromoethane
75. Tetrachloroethene
76. 1,1,1,2-Tetrachloroethane
77. 1-Chlorohexane
78. Chlorobenzene
79. Ethylbenzene
80. Bromoform
81. m-Xylene
82. p-Xylene
83. trans-Dichlorobutene
84. 1,3-Dichloro-2-propanol
85. Styrene
86. 1,1,2,2-Tetrachloroethane
87. o-Xylene
88. 1,2,3-Trichlropropane
89. cis-Dichlorobutene
90. 4-Bromofluorobenzene (IS)
91. Isopropylbenzene
92. Bromobenzene
93. Propylbenzene
94. 2-Chlorotoluene
95. 4-Chlorotoluene
96. 1,3,5-Trimethylbenzene
97. Pentachloroethane
98. tert-Butylbenzene
99. 1,2,4-Trimethylbenzene
100. sec-Butylbenzene
101. 1,3-Dichlorobenzene
102. Benzylchloride
103. 1,4-Dichlorobenzene-d4 (IS)
104. 1,4-Dichlorobenzene
105. Isopropyltoluene
106. 1,2-Dichlorobenzene
107. Butylbenzene
108. 1,2-Dibromo-3-chloropropane
109. Hexachloroethane
110. Nitrobenzene
111. 1,2,4-Trichlorobenzene
112. Naphthalene
113. Hexachlorobutadiene
114. 1,2,3-Trichlorobenzene

Ideal for 5975 MSD



Environmental Applications, Air Analysis

EPA Air Analysis Compendium Method TO-14 Standard

Column: **DB-1**
123-1063
60 m x 0.32 mm, 1.00 µm

Carrier: Helium at 25 cm/sec measured off of CO_2 at 35 °C constant flow mode

Oven: 35 °C for 5 min
35-120 °C at 5 °C/min
120-220 °C at 30 °C/min
220 °C for 5 min

Injection: Entech 7100 cryogenic sample preconcentrator

Detector: MSD
Full scan of m/z 40-250

Sample: 400 mL of a 10 ppbV TO-14 standard and 100 mL of a 20 ppbV IS/SS standard

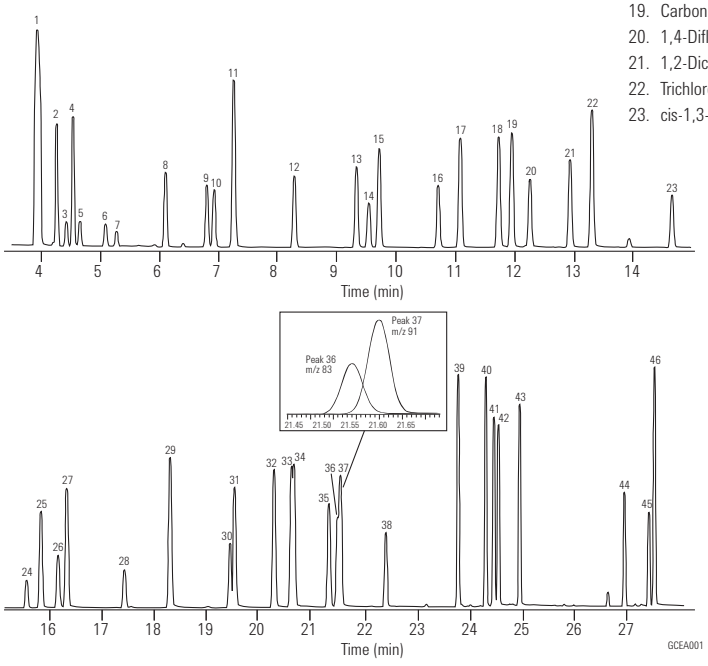
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

1. CO_2
2. Freon 12 (Dichlorodifluoromethane)
3. Chloromethane
4. Freon 114 (1,2-Dichloro-1,1,2,2-tetrafluoroethane)
5. Vinyl chloride
6. Bromomethane
7. Chloroethane
8. Freon 11 (Trichlorofluoromethane)
9. 1,1-Dichloroethene
10. Methylene chloride
11. Freon 113 (1,1,2-Trichloro-1,2,2-trifluoroethane)
12. 1,1-Dichloroethane
13. cis-1,2-Dichloroethene
14. Bromochloromethane (IS)
15. Chloroform
16. 1,2-Dichloroethane
17. 1,1,1-Trichloroethane
18. Benzene
19. Carbon tetrachloride
20. 1,4-Difluorobenzene (IS)
21. 1,2-Dichloropropane
22. Trichloroethene
23. cis-1,3-Dichloropropene
24. trans-1,3-Dichloropropene
25. 1,1,2-Trichloroethane
26. Toluene-d8 (SS)
27. Toluene
28. 1,2-Dibromoethane
29. Tetrachloroethene
30. Chlorobenzene-d5 (SS)
31. Chlorobenzene
32. Ethylbenzene
33. m-Xylene
34. p-Xylene
35. Styrene
36. 1,1,2,2-Tetrachloroethane
37. o-Xylene
38. 4-Bromofluorobenzene (SS)
39. 1,3,5-Trimethylbenzene
40. 1,2,4-Trimethylbenzene
41. 1,3-Dichlorobenzene
42. 1,2-Dichlorobenzene
43. 1,4-Dichlorobenzene
44. 1,2,4-Trichlorobenzene
45. 1,2-Dibromobenzene (IS)
46. Hexachloro-1,3-butadiene



Agilent wishes to thank Entech Instruments for providing this chromatogram.

Formaldehyde, 50ppb

Column: **DB-5ms**
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min

Oven: 35 °C for 5 min
35-85 °C at 10 °C/min

Sampler: Entech 7100 cryogenic sample preconcentrator

Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV

Sample: 100 cc 50 ppb Formaldehyde/20 ppb others

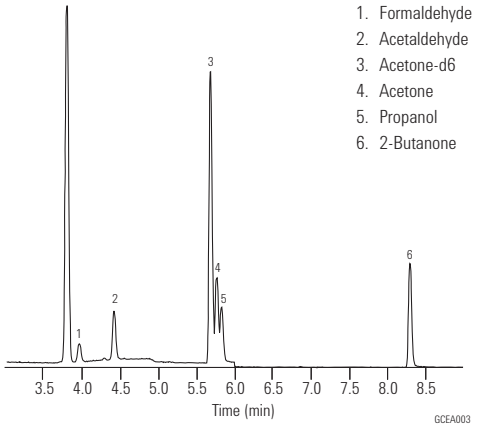
Agilent wishes to thank Entech Instruments for providing this chromatogram.

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Formaldehyde
2. Acetaldehyde
3. Acetone-d6
4. Acetone
5. Propanol
6. 2-Butanone

Sulfur in Air

Column: **DB-5ms**
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min

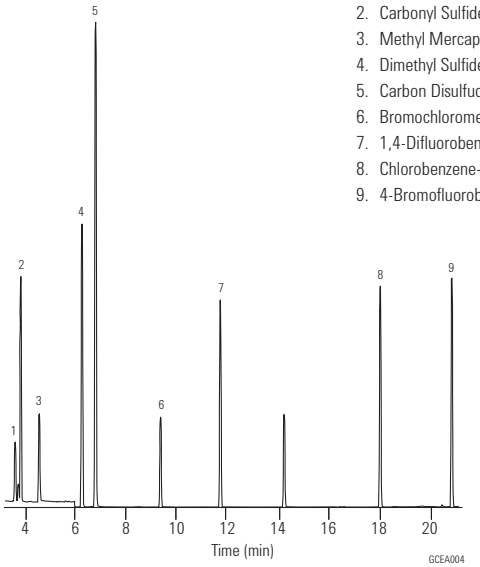
Oven: 35 °C for 5 min
35-140 °C at 6 °C/min
140-220 °C at 15 °C/min
220 °C for 3 min

Sampler: Entech 7100 cryogenic sample preconcentrator

Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV

Sample: 400 cc 10 ppb Sulfurs

Agilent wishes to thank Entech Instruments for providing this chromatogram.



1. Hydrogen Sulfide
2. Carbonyl Sulfide
3. Methyl Mercaptan
4. Dimethyl Sulfide
5. Carbon Disulfude
6. Bromochloromethane
7. 1,4-Difluorobenzene
8. Chlorobenzene-d5
9. 4-Bromofluorobenzene

N_2O I

Column: **HP PLOT Q**
19095P-Q04
30 m x 0.53 mm, 40.00 µm

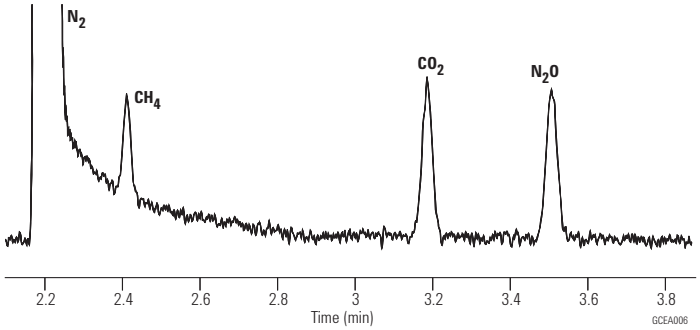
Carrier: Helium, 5 psi (approximately 8 mL/min)

Oven: 35 °C isothermal

Injection: 250 µL, injected
Split ratio 1:3

Detector: TCD, 200 °C

Sample: approximately 200 ppmV methane
200 ppmV CO_2
250 ppmV N_2O (nitrogen balance gas)



N_2O II

Column: **HP PLOT**
19095P-MS6
30 m x 0.53 mm, 25.00 µm

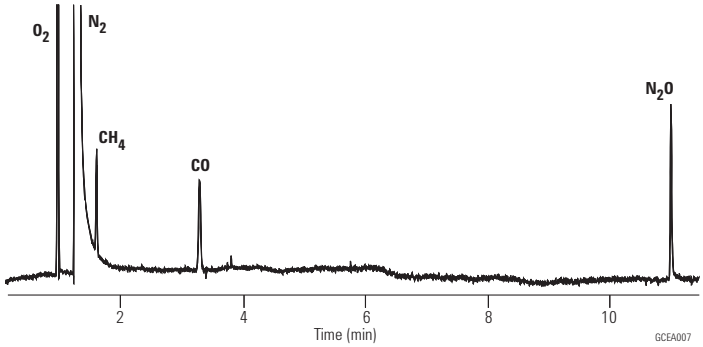
Carrier: Helium, 6 psi (approximately 10 mL/min)

Oven: 50 °C (5 min), 25 °C/min to 200 °C and hold

Injection: 250 µL injected
Split ratio 1:4

Detector: TCD, 250 °C
Column compensation on

Sample: approximately 200 ppmV methane
200 ppmV CO_2
250 ppmV N_2O (nitrogen balance gas)



N_2O III

Column: **GS-CarbonPLOT**
113-3133
30 m x 0.32 mm, 3.00 µm

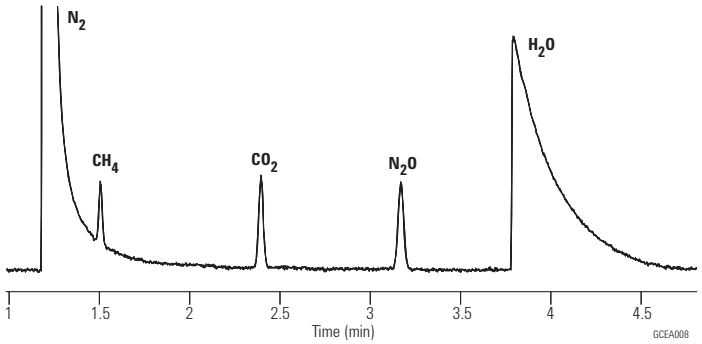
Carrier: Helium, 12 psi (approximately 3 mL/min)

Oven: 35 °C isothermal

Injection: 250 µL injected
Split ratio 1:4

Detector: TCD, 200 °C

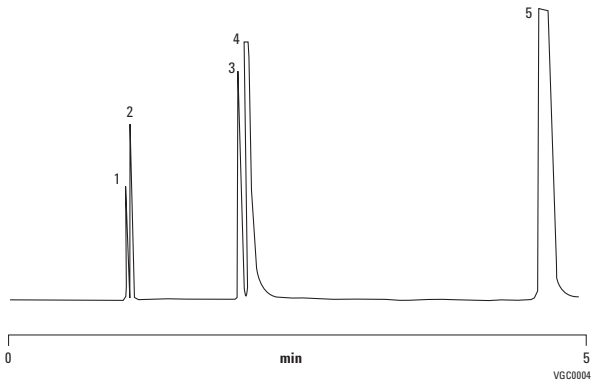
Sample: approximately 200 ppmV methane
200 ppmV CO_2
250 ppmV N_2O (nitrogen balance gas)



Permanent Gases on a Thick Film Molsieve Column

Column: **Molsieve 5Å**
CP7538
25 m x 0.53 mm, 50.00 µm

Sample: 10 µL
Sample Conc: % range
Carrier: H_2
Oven: 30 °C
Injection: Split, 100 mL/min
Detector: TCD

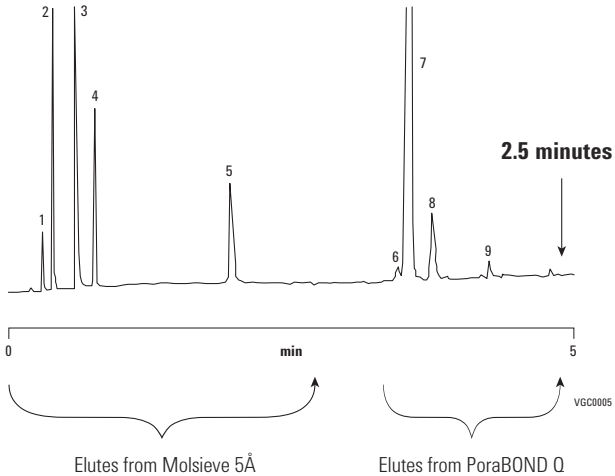


1. Helium
2. Neon
3. Argon
4. Oxygen
5. Nitrogen

Fast Analysis of Permanent Gases and CO_2 using Tandem PLOT Columns

Column: **CP-Sil PAH UltiMetal**
CP7429

Sample: 10 µL
Sample Conc: % level
Carrier: H_2, 60 kPA
Oven: 45 °C
Injection: Split 50 mL/min
Detector: µ-TCD



1. He (from ms-5A)
2. O_2 (from ms-5A)
3. N_2 (from ms-5Å)
4. Methane (from ms-5Å)
5. CO (from ms-5Å)
6. He (from PBQ)
7. $N_2 + O_2 + CO$ (from PBQ)
8. Methane (from PBQ)
9. CO_2 (from PBQ)

EPA Air Analysis Method TO-15 (1 ppbV Standard)

Column: **DB-5ms**
123-5563
60 m x 0.32 mm, 1.00 µm

Carrier: Helium, 1.5 mL/min

Oven: 35 °C for 5 min
35-140 °C at 6 °C/min
140-220 °C at 15 °C/min
220 °C for 3 min

Detector: GC/MS 6890/5973N
Scan 29-180 amu 0-6 min
33-280 amu 6-30 min
Electron Impact 70 eV

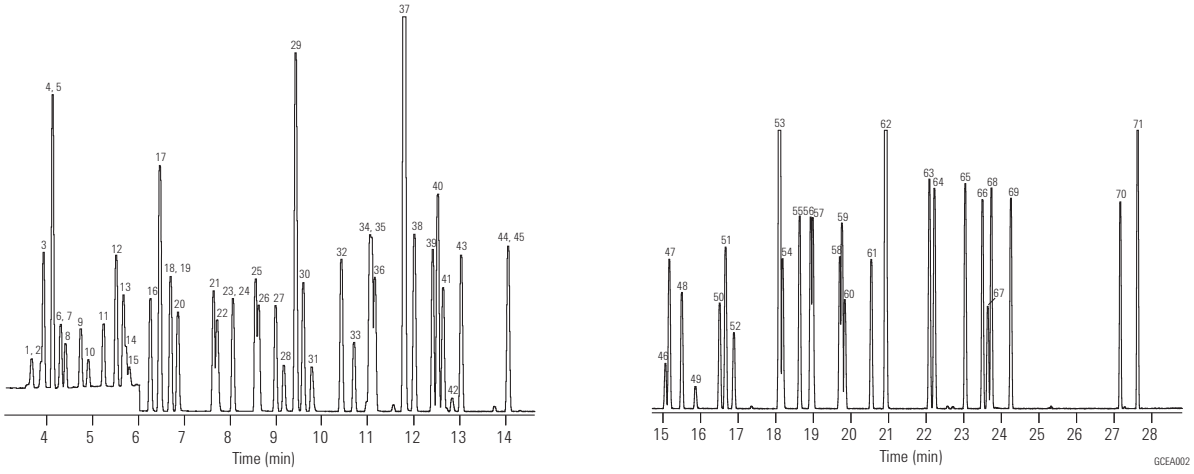
Sampler: Entech 7100 cryogenic sample preconcentrator

Sample: 400 mL sample load,
All compounds at 10 ppbV except Formaldehyde (50 ppbV), Acetaldehyde (20 ppbV), Propanol (20 ppbV), Acetone (30 ppbV), 2-Butanone (30 ppbV)

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

		Quantitation Ion			Quantitation Ion			Quantitation Ion
1.	Formaldehyde	30	26.	n-Hexane	57	51.	Tetrachloroethene	166
2.	Propene	41	27.	cis-1,2-Dichloroethene	96	52.	1,2-Dibromoethane	107
3.	Dichlorodifluoromethane	85	28.	Ethyl acetate	43	53.	Chlorobenzene-d5 (IS)	117
4.	Chloromethane	50	29.	Bromochloromethane (IS)	128	54.	Chlorobenzene	112
5.	Dichlorotetrafluoroethane	85	30.	Chloroform	83	55.	Ethylbenzene	91
6.	Acetaldehyde	29	31.	Tetrahydrofuran	42	56.	m-Xylene	91
7.	Vinyl chloride	62	32.	1,1,1-Trichloroethane	97	57.	p-Xylene	91
8.	1,3-Butadiene	39	33.	1,2-Dichloroethane	62	58.	Styrene	104
9.	Bromomethane	94	34.	Benzene	78	59.	o-Xylene	91
10.	Chloroethane	64	35.	Carbon tetrachloride	117	60.	Bromoform	173
11.	Bromoethene	106	36.	Cyclohexane	56	61.	1,1,2,2-Tetrachloroethane	83
12.	Trichlorofluoromethane	101	37.	1,4-Difluorobenzene (IS)	114	62.	4-Bromofluorobenzene	95
13.	Acetone	58	38.	2,2,4-Trimethylpentane (Isooctane)	57	63.	4-Ethyltoluene	105
14.	Propanal	29	39.	n-Heptane	41	64.	1,3,5-Trimethylbenzene	105
15.	Isopropyl alcohol	45	40.	Trichloroethene	130	65.	1,2,4-Trimethylbenzene	105
16.	1,1-Dichloroethene	61	41.	1,2-Dichloropropane	63	66.	1,3-Dichlorobenzene	146
17.	1,1,2-Trichloro-1,2-2-trifluoroethane	101	42.	1,4-Dioxane	88	67.	Benzyl chloride	91
18.	Methylene chloride	49	43.	Bromodichloromethane	83	68.	1,4-Dichlorobenzene	146
19.	3-Chloro-1-propene (Allyl chloride)	76	44.	4-Methyl-2-pentanone (MIBK)	43	69.	1,2-Dichlorobenzene	146
20.	Carbon disulfide	76	45.	cis-1,3-Dichloropropene	75	70.	1,2,4-Trichlorobenzene	180
21.	trans-1,2-Dichloroethene	96	46.	trans-1,3-Dichloropropene	75	71.	Hexachlorobutadiene	225
22.	tert-Butyl methyl ether (MTBE)	73	47.	Toluene	91			
23.	1,1-Dichloroethane	63	48.	1,1,2-Trichloroethane	97			
24.	Vinyl acetate	43	49.	2-Hexanone	43			
25.	2-Butanone (MEK)	72	50.	Dibromochloromethane	129			



Agilent wishes to thank Entech Instruments for providing this chromatogram.

Food, Flavor, and Fragrance Applications

DB-624UI 1 µL/L Fermented Beverage Standard Mix

Column: **DB-624UI**
123-1334UI
30 m x 0.32 mm, 1.8 µm

Carrier: Helium, 2.3 mL/min, constant flow set a 35 °C

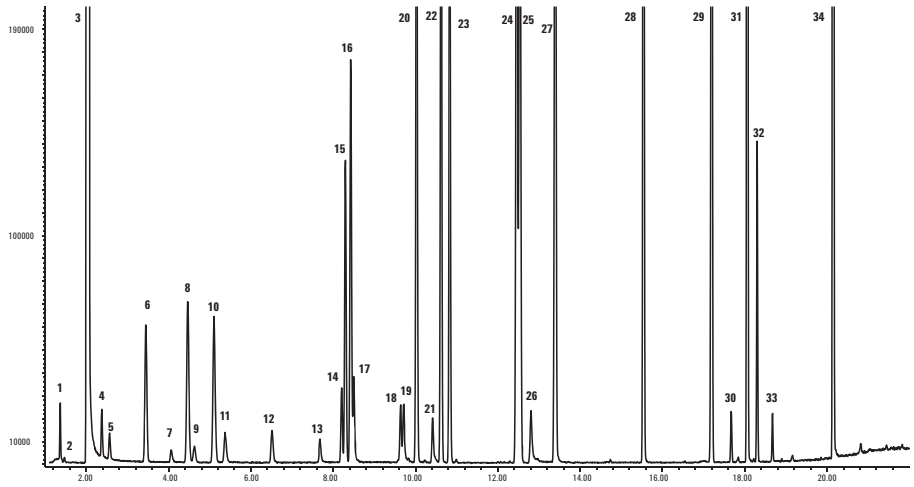
Oven: 35 °C for 5 min
10 °C/min to 100 °C for 1.5 min
15 °C/min to 220 °C for 3.0 min
25 °C/min to 250 °C for 2.8 min

Inlet: Split/splitless, 220 °C, 1 µL, split 20:1

MSD Restrictor: Scan mode 30-400 amu, source temp 230 °C,
quad temp 150 °C, transfer line temp 260 °C

Instrument: Agilent 7890/5975C equipped with MMI and FID

Sampler: Agilent 7697A headspace with 111 position tray, 1 mL sample loop



1. acetyl aldehyde
2. methanol
3. ethanol
4. acetone
5. isopropanol
6. isobutyl aldehyde
7. 1-propanol
8. butyl aldehyde
9. 2,3 butanedione (VDK)
10. ethyl acetate
11. 2-butanol
12. isobutyl alcohol
13. 1-butanol
14. 2,3 pentanedione (VDK)
15. ethyl propanoate
16. propyl acetate
17. 3 pentanol
18. isoamyl alcohol
19. active amyl alcohol
20. isobutyl acetate
21. 1-pentanol
22. ethyl butanonate
23. hexanal
24. isoamyl acetate
25. active amyl acetate
26. 1-hexanol
27. heptanal
28. octanal
29. 1,3,5-trioxane imp
30. 1,3,5-trioxane imp
31. ethyl caprylate
32. 1-phenyl ethyl acetate
33. benzaldehyde, 3 methoxy
34. ethyl caprate

Spearmint Oil

Column A: **DB-1**
122-1032
30 m x 0.25 mm, 0.25 µm

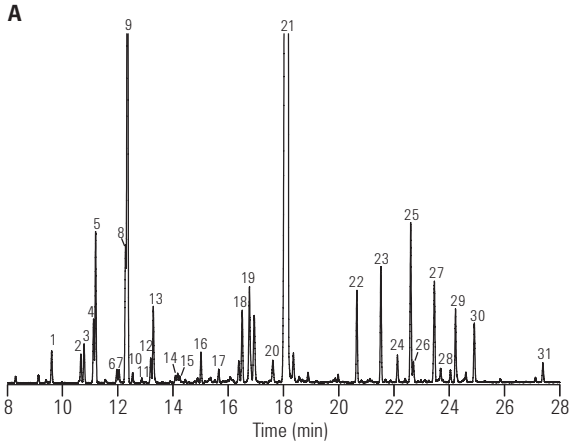
Column B: **DB-1**
121-1022
20 m x 0.18 mm, 0.18 µm

Carrier: A: Helium 25 cm/sec measured at 40 °C
B: Hydrogen 47 cm/sec measured at 40 °C

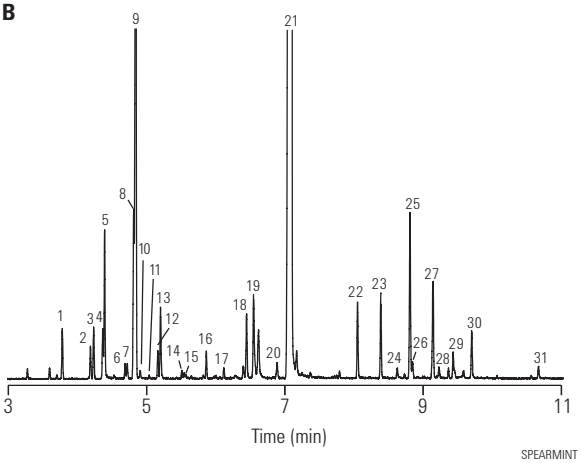
Oven: A: 40 °C hold 1 min, 5 °C/min to 290 °C
B: 40 °C hold 0.38 min, 13 °C/min to 290 °C hold 13.09 min

Injection: 250 °C, Split 40:1, 1 µL injection

Original Method with a DB-1, 30 m x 0.25 mm, 0.25 µm column and Helium carrier



Faster Method with a high efficiency DB-1, 20 m x 0.18 mm, 0.18 µm column and Hydrogen carrier



SPEARMINT

1. α-Pinene
2. Sabinene
3. β-Pinene
4. 3-Octanol
5. Myrcene
6. α-Terpinene
7. ρ-Cymene
8. 1,8-Cineol
9. Limonene
10. cis-Ocimene
11. trans-Ocimene
12. γ-Terpinene
13. trans-Sabinene hydrate
14. Terpinolene
15. Linalool
16. 3-Octyl acetate
17. Isomenthone
18. Terpinen-4-ol
19. Dihydrocarvone
20. trans-Carveol
21. l-Carvone
22. trans-Dihydrocarveol acetate
23. cis-Carvyl acetate
24. cis-Jasmone
25. β-Bourbonene
26. α-Bourbonene
27. β-Caryophylene
28. α-Copaene
29. trans-β-Farnesene
30. Germacrene-d
31. Viridiflorol

Using hydrogen as a carrier gas in conjunction with the high efficiency column resulted in an overall speed gain of 61% compared to the original method. In addition, the resolution was well maintained throughout the method translation process.

Lavender Oil Characterization

Column: **DB-1ms Ultra Inert**
122-0132UI
30 m x 0.25 mm, 0.25 µm

Instrument: Agilent 7890A/5975B MSD and a 6890N FID equipped

Sampler: Agilent 7683B, 5.0 µL syringe (P/N 5188-5246), 1.0 µL injection

Carrier: Helium 40 cm/s, constant flow MSD system, 35 cm/s FID system

Inlet: 200:1 split

Oven: 62 °C 12.5 min hold, 3 °C/min to 92 °C, then 5 °C/min to 165 °C, then 100 °C/min to 310 °C, 2.5 min hold

Detector: MSD source at 300 °C, quadrupole at 180 °C, transfer line at 280 °C, scan range 45-450 amu

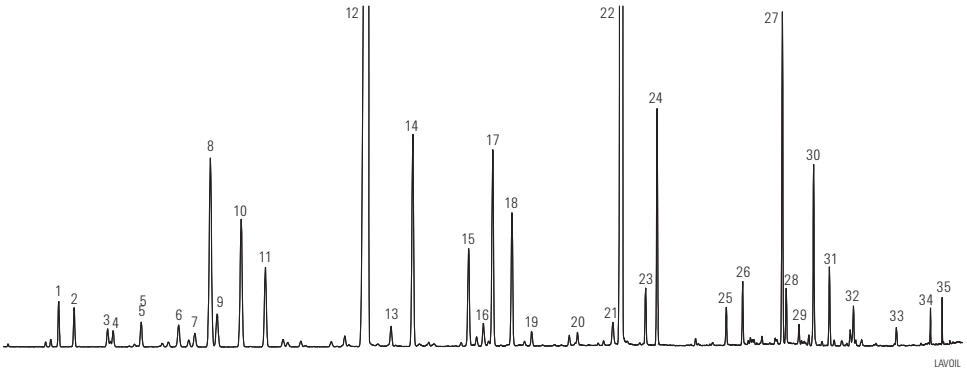
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split liner, single taper MS certified liner with restriction to hold glass wool, 5188-6576

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. α-Pinene
2. Camphene
3. 1-Octen-3-ol
4. 3-Octanone
5. β-Myrcene
6. 3-Carene
7. ω-Cymene
8. Eucalyptol
9. D-Limonene
10. β-trans-Ocimene
11. β-cis-Ocimene
12. β-Linalool
13. Octen-1-ol acetate
14. Camphor
15. Borneol
16. Lavandulol
17. Terpinen-4-ol
18. α-Terpinol
19. Hexyl butyrate
20. Cumic aldehyde
21. cis-Geraniol
22. Linalool acetate
23. Borneol acetate
24. Lavandulyl acetate
25. Nerol acetate
26. Geranyl Acetate
27. Caryophyllene
28. α-Santoloene
29. α-Bergamotene
30. β-Farnesene
31. Germacrene D
32. γ-Cardinene
33. Caryophyllene oxide
34. tau-Cardinol
35. α -Bisabolol



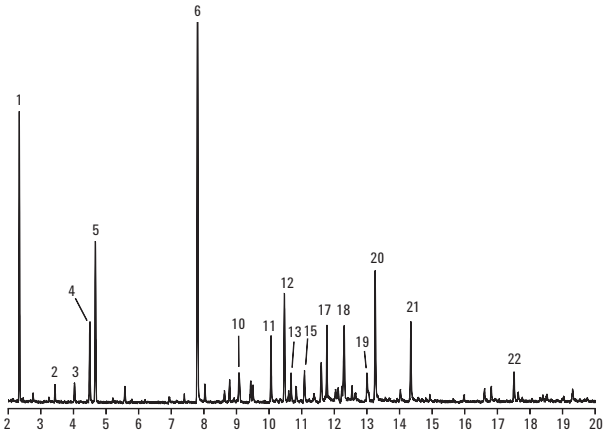
GC/MS total ion chromatogram of lavender oil sample on an Agilent J&W DB-1ms Ultra Inert 30 m x 0.25 mm, 0.25 µm capillary GC column (P/N 122-0132UI). The well-resolved, sharp peaks observed on the column ensure reliable analysis and fingerprinting of lavender oils.

Essential Oils

Column: **DB-WAX**
121-7022
20 m x 0.18 mm, 0.18 µm

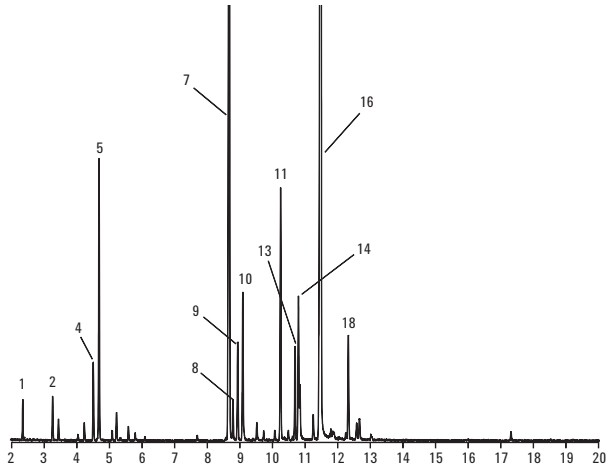
Carrier:	Hydrogen @ 44.3 cm/sec Measured @ 45 °C	Injection:	Split 1:30, 250 °C 1 µL of 1:35 oil in acetone
Oven:	45 °C hold 0.77 min 7.79 °C/min to 250 °C	Detector:	MSD full scan at m/z 40-500 250 °C transfer line

Wild chamomile



1. α-Pinene
2. β-Pinene
3. β-Myrcene
4. D-Limonene
5. Eucalyptol
6. 2,4-Hexadienal
7. Menthone
8. γ-Terpinene
9. Menthofuran
10. Iso-Menthone
11. Δ-Carane
12. Bornyl acetate
13. β-Caryophyllene
14. Isomenthol
15. Citronellyl formate
16. Menthol
17. t-β-Farnesene
18. γ-Cadinene
19. δ-Cadinene
20. Citronellol
21. Nerol
22. β-Maaliene

Peppermint



Fragrance Reference Standard

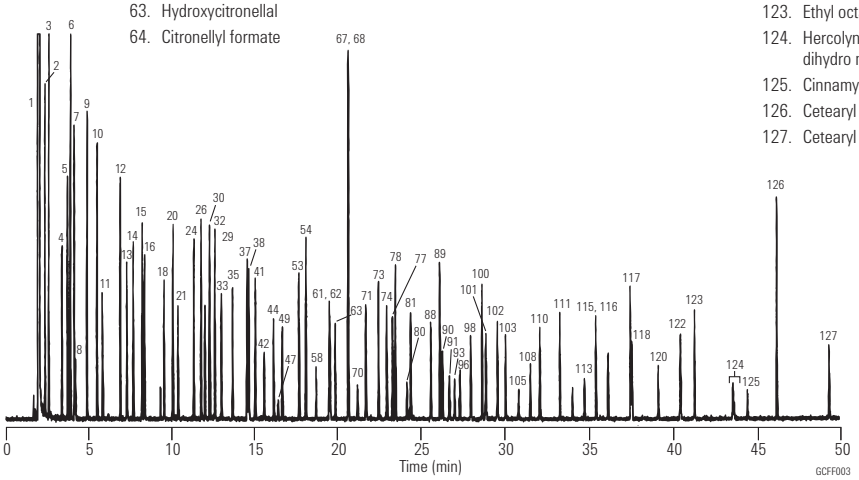
Column:	**DB-1** **122-1032** **30 m x 0.25 mm, 0.25 µm**
Carrier:	Helium at 25 cm/sec, measured at 150 °C
Oven:	40 °C for 1 min 40-290 °C at 5 °C/min
Injection:	Split, 250 °C Split ratio 1:50
Detector:	MSD, 300 °C transfer line
Sample:	1 µL of a 1:20 dilution of neat sample in acetone

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Split, single taper, low pressure drop, glass wool, 5183-4647
Seal:	Gold plated seal, 18740-20885
Syringe:	5 µL tapered, FN 23-26s/42/HP, 5181-1273

Many thanks to Carl Frey, Manager of Analytical Services, Dragoco, and Kevin Myung, Director of Flavor and Perfumery Research, Bush Boake Allen, Inc. for contributing to this work.

1. Acetone
2. 2,3-Butanedione (diacetyl)
3. Ethyl acetate
4. 2,3-Pentanedione (acetyl propionyl)
5. Ethyl propionate
6. Methyl butyrate
7. 3-Methylbutyl alcohol
8. 2-Methylbutyl alcohol
9. Isobutyl acetate
10. Ethyl butyrate
11. Furfural
12. Ethyl isovalerate
13. Hexanol
14. Allyl butyrate
15. Ethyl pentanoate
16. Hexylene glycol
17. α-Thujone
18. Benzaldehyde
19. α-Pinene
20. Camphene
21. 3,5,5-Trimethylhexanol
22. Sabinene
23. β-Pinene
24. Ethyl hexanoate
25. Myrcene
26. Hexyl acetate
    cis-Linalool oxide
    Methyl benzoate
    trans-Linalool oxide
28. Methyl-cresol
29. Benzyl alcohol
30. para-Cymene
31. 1,8-Cineol
32. Limonene
33. 2,6-Dimethylhept-5-enal
34. γ-Terpinene
35. Octanol
37. Ethyl heptanoate
38. Linalool
39. Benzene ethanol
41. Rose oxide, cis-rose
42. Rose oxide, trans-rose
43. Camphor
44. Citronellal
45. Benzyl acetate
46. Menthone
47. Isoborneol
48. Isomenthone
49. Borneol
51. Terpinen-4-ol
52. α-Terpineol
53. Ethyl octanoate
54. Octyl acetate
56. Fenchyl acetate
57. Citronellol
58. Neral
59. Carvonel
    Phenylethyl acetate
60. Geraniol
61. Linalyl acetate
62. Geranial
63. Hydroxycitronellal
64. Citronellyl formate
66. Bornyl acetate
67. Vertenex (isomer 1)
68. Ethyl nonanoate
69. Geranyl formate
70. Vertenex (isomer 2)
71. γ-Nonalactone
72. Citronellyl acetate
73. Neryl acetate
74. Geranyl acetate
76. Diphenyl oxide
78. Ethyl decanoate
79. α-Copaene
80. Florazone (isomer 1)
81. Florazone (isomer 2)
82. β-Caryophyllene
83. Citronellyl propionate
85. 3,7-Guaiadiene
88. Dodecanol
89. Ethyl undecanoate
90. Eugenyl acetate
91. Frambione (raspberry ketone)
93. Isoamyl salicylate
94. δ-Cadinene
95. cis-Nerolidol
96. Rosatol (rosetone)
    Geranyl butyrate
97. trans-Nerolidol
98. n-Amyl salicylate
99. Phenylethyl tiglate
100. Ethyl dodecanoate
101. Benzophenone
102. Dibenzyl ether
103. γ-Dodecalactone
104. Citronellyl tiglate
105. Evernyl
106. Geranyl tiglate
107. Geranyl-2-methyl valerate
108. Celestocide
109. Heptadec-1-ene
110. Benzyl benzoate
111. Ethyl tetradecanoate
112. Benzyl salicylate
113. Tonalid
114. Nonadec-1-ene
115. Isopropylmyristate
116. Ethyl pentadecanoate
    Nonadecane
117. Ethyl hexadecanoate
118. Musk T (ethylene brassylate)
119. Eicosane
120. Cinnamyl phenyl acetate
121. Heneicosane
122. Phenyl ethyl cinnamate
123. Ethyl octadecanoate
124. Hercolyn D (tetrahydro & dihydro methyl abietate)
125. Cinnamyl cinnamate
126. Cetearyl octanoate
127. Cetearyl decanoate



Fragrance Reference Standard

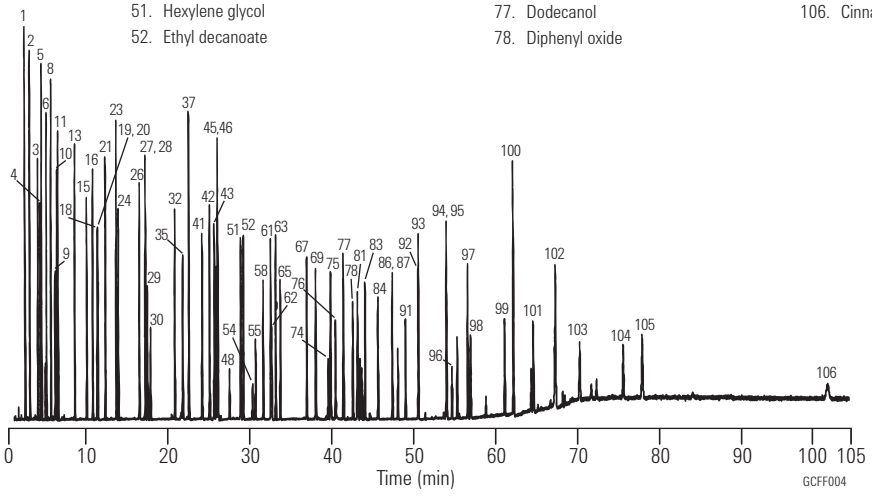
Column:	**DB-WAX** **122-7032** **30 m x 0.25 mm, 0.25 µm**
Carrier:	Helium at 25 cm/sec, measured at 150 °C
Oven:	45 °C for 2 min 45-250 °C at 3 °C/min 250 °C for 34 min
Injection:	Split, 250 °C Split ratio 1:50
Detector:	MSD, 250 °C transfer line
Sample:	1 µL of a 1:20 dilution of neat sample in acetone

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Split, single taper, low pressure drop, glass wool, 5183-4647
Seal:	Gold plated seal, 18740-20885
Syringe:	5 µL tapered, FN 23-26s/42/HP, 5181-1273

Many thanks to Carl Frey, Manager of Analytical Services, Dragoco, and Kevin Myung, Director of Flavor and Perfumery Research, Bush Boake Allen, Inc. for contributing to this work.

1. Acetone
2. Ethyl acetate
3. Ethyl propionate
4. 2,3-Butanedione (diacetyl)
5. Methyl butyrate
6. Isobutyl acetate
7. α-Pinene
8. Ethyl butyrate
9. 2,3-Pentanedione (acetyl propionyl)
10. Camphene
11. Ethyl isovalerate
12. β-Pinene
13. Ethyl pentanoate
14. Myrcene
15. Allyl butyrate
16. Limonene
17. 1,8-Cineol
18. 3,5,5-Trimethylhexanol
19. 3-Methylbutyl alcohol
20. 2-Methylbutyl alcohol
21. Ethyl hexanoate
22. γ-Terpinene
23. p-Cymene
24. Hexyl acetate
25. Terpinolene
26. Ethyl heptanoate
27. 2,6-Dimethylhept-5-enal (MelonalTM)
28. Rose oxide, cis-rose
29. Hexanol
30. Rose oxide, trans-rose
31. Methyl-para-cresol
32. Ethyl octanoate
33. cis-Linalool oxide
34. Menthone
35. Furfural
36. trans-Linalool oxide
37. Octyl acetate
38. Isomenthone
39. α-Copaene
40. Camphor
41. Benzaldehyde
42. Ethyl nonanoate
43. Linalool
44. Linalyl acetate
45. Vertenex (isomer 1)
46. Octanol
47. β-Caryophyllene
48. Vertenex (isomer 2)
49. Terpinen-4-ol
50. Methyl benzoate
51. Hexylene glycol
52. Ethyl decanoate
53. Citronellyl acetate
54. Isoborneol
55. Neral
56. α-Terpineol
57. Geranyl formate
58. Borneol
59. β-Bisabolene
60. Benzyl acetate
61. Neryl acetate
62. Geranial
63. Ethyl undecanoate
64. δ-Cadinene
65. Geranyl acetate
66. Citronellol
67. Ethyl dodecanoate
68. Geraniol
69. Benzyl alcohol
70. Geranyl butyrate
71. Nonadecane
72. Benzene ethanol
73. Nonadec-1-ene
74. Florazone (isomer 1)
75. Florazone (isomer 2)
76. Hydroxycitronellal
77. Dodecanol
78. Diphenyl oxide
79. Citronellyl tiglate
80. Eugenyl methyl ether
81. γ-Nonalactone
83. Ethyl tetradecanoate
84. n-Amyl salicylate
85. Geranyl tiglate
86. Ethyl pentadecanoate
87. Isopropylmyristate
90. Phenylethyl tiglate
91. Rosatol (rosetone)
92. Eugenyl acetate
93. Ethyl hexadecanoate
94. γ-Dodecalactone
95. Dibenzyl ether
96. Tonalid
97. Ethyl octadecanoate
98. Benzophenone
99. Benzyl benzoate
100. Cetearyl octanoate
101. Musk T (ethylene brassylate)
102. Cetearyl decanoate
103. Frambione (raspberry ketone)
104. Cinnamyl phenyl acetate
105. Phenyl ethyl cinnamate
106. Cinnamyl cinnamate



Perfume

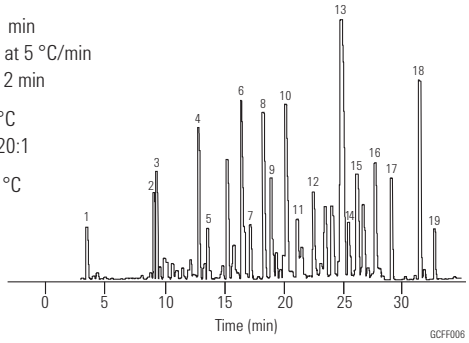
Column: **HP-INNOWax**
19091N-133
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 30 cm/sec
0.9 mL/min constant flow

Oven: 80 °C for 1 min
80-250 °C at 5 °C/min
250 °C for 2 min

Injection: Split, 250 °C
Split ratio 20:1

Detector: MSD, 280 °C



1. Limonene
2. Linalool
3. Linalyl acetate
4. Benzyl acetate
5. Citronellol
6. Benzene ethanol
7. α-Methyl Ionone
8. Carvocrol and geraiol
9. Isoamyl salicylate
10. n-Amyl salicylate
11. Commamyl acetate
12. Acetylcedrene
13. Diethyl phthalate
14. Tonalid
15. Coumarin
16. Musk xylene
17. Benzyl benzoate
18. Benzyl salicylate
19. Musk ketone

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Chiral Compounds in Essential Oils and Fragrances

Column: **HP Chiral β**
19091G-B233
30 m x 0.25 mm, 0.25 µm

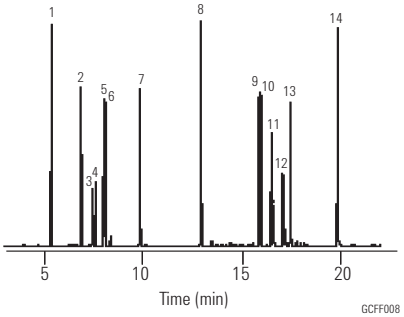
Carrier: Hydrogen, 39 cm/sec, constant pressure

Oven: 65 °C for 1 min
65-170 °C at 5 °C/min

Injection: Split, 250 °C
Split ratio 30:1

Detector: FID, 300 °C

Sample: 1 µL
0.25 ng/µL each analyte in Hexane



1. 1,2-Dimethylbenzene
2. Myrcene
3. (-)-Camphene
4. (+)-Camphene
5. (+)-β-Pinene
6. 1S-(-)-β-Pinene
7. Cineole
8. (R)-(+)-Citronellal
9. 1S,2R,5S-(+)-Menthol
10. 1R,2S,5R-(-)-Menthol
11. α-Terpineol
12. (+/-)-Isoborneol
13. (+)-Borneol
14. trans-Cinnamaldehyde

Menthol

Column: **Cyclodex-β**
112-2532
30 m x 0.25 mm, 0.25 µm

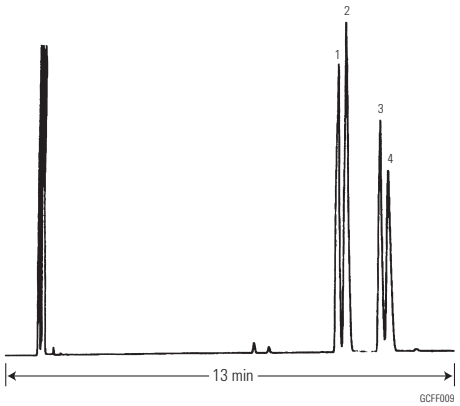
Carrier: Hydrogen, 55 cm/sec

Oven: 105 °C isothermal

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 1 µg/µL each chloroform



1. (+)-Neomenthol
2. (-)- Neomenthol
3. (+)-Menthol
4. (-)-Menthol

FAMEs

Column: **DB-23**
122-2362
60 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 43 cm/sec, constant pressure mode

Oven: 130 °C for 1.0 min
130-170 °C at 6.5 °C/min
170-215 °C at 2.75 °C/min
215 °C for 12 min
215-230 °C at 40 °C/min
230 °C for 3 min

Injection: Split, 270 °C
Split ratio 50:1

Detector: FID, 280 °C

Suggested Supplies

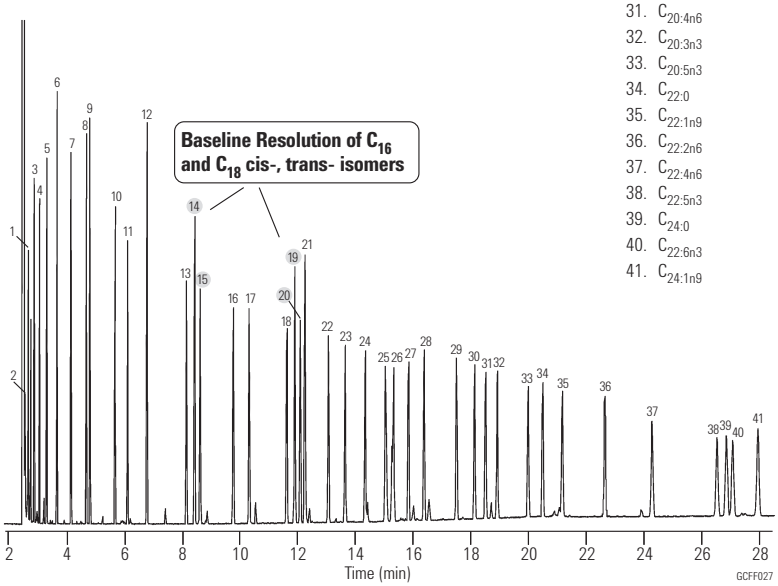
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. $C_{6:0}$
2. $C_{7:0}$
3. $C_{8:0}$
4. $C_{9:0}$
5. $C_{10:0}$
6. $C_{11:0}$
7. $C_{12:0}$
8. BHT
9. $C_{13:0}$
10. $C_{14:0}$
11. $C_{14:1n5}$
12. $C_{15:0}$
13. $C_{16:0}$
14. $C_{16:1n7(trans)}$
15. $C_{16:1n7(cis)}$
16. $C_{17:0}$
17. $C_{17:1}$
18. $C_{18:0}$
19. $C_{18:1n9(trans)}$
20. $C_{18:1n9(cis)}$
21. $C_{18:1n7}$
22. $C_{18:2n6}$
23. $C_{18:3n6}$
24. $C_{18:3n3}$
25. $C_{18:2(d9,11)}$
26. $C_{18:2(d10,12)}$
27. $C_{20:0}$
28. $C_{20:1n9}$
29. $C_{20:2n6}$
30. $C_{20:3n6}$
31. $C_{20:4n6}$
32. $C_{20:3n3}$
33. $C_{20:5n3}$
34. $C_{22:0}$
35. $C_{22:1n9}$
36. $C_{22:2n6}$
37. $C_{22:4n6}$
38. $C_{22:5n3}$
39. $C_{24:0}$
40. $C_{22:6n3}$
41. $C_{24:1n9}$



Chromatogram provided courtesy of Steve Watkins and Jeremy Ching, FAME Analytics, http://www.fameanalytics.com

Analysis of Fragrance and Allergens

Column: **VF-WAXms**
CP9205
30 m x 0.25 mm, 0.25 µm

Oven: 100 °C to 250 °C with 10 °C/min

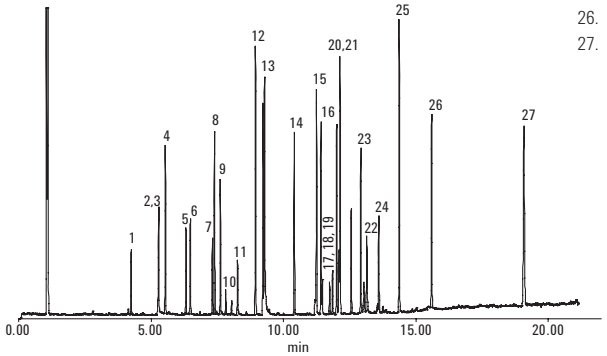
Carrier: Helium, 1.0 mL/min

Injection: Split 1:30, T = 250 °C

Detector: GC-MS Ion Trap
Trap: 200 °C
Manifold: 60 °C

Sample: 0.1 µL, Fragrances mixture (500 ppm)

1. Linalool
2. Methyl heptin carbonate
3. Phenyl acetaldehyde
4. Methyl chavicol
5. Methyl octin carbonate
6. Citronellol
7. Geraniol
8. Methyl gamma ionone
9. Benzyl alcohol
10. Cinnamaldehyde
11. Hydroxy citronellal
12. Methyl eugenol
13. Lilial
14. Eugenol
15. Amyl cinnamyl aldehyde
16. Anisic alcohol
17. Cinnamyl alcohol
18. Farnesol isomer I + II
19. Farnesol isomer III
20. iso-Eugenol
21. Hexyl cinnamic aldehyde
22. Lyral (4,4-isomer)
23. Coumarine
24. Amyl cinnamic alcohol
25. Benzyl benzoate
26. Benzyl salicylate
27. Benzyl cinnamate

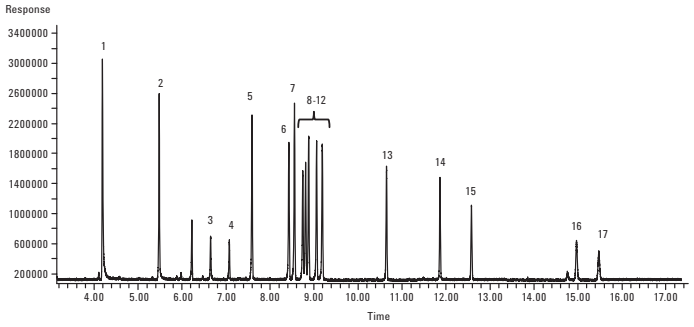


Organophosphorus Pesticide Residues in Olive Oil Extract

Column: **DB-35ms Ultra Inert**
122-3832UI
30 m x 0.25 mm, 0.25 µm

Instrument:	Agilent 7890/5975C
Sampler:	Agilent 7683B, 5.0 µL syringe (P/N 5181-1273)
CFT Device:	Purged 2-way splitter (P/N G3180B) Split Ratio MSD:FPD = 1:1
MSD Restrictor:	1.43 m x 0.18 mm id deactivated fused silica tubing
FPD Restrictor:	0.53 m x 0.18 mm id deactivated fused silica tubing
Aux EPC:	3.8 psi constant pressure
Inlet:	2 µL splitless; 250 °C, purge flow 60 mL/min at 0.25 min, gas saver on at 2 min 20 mL/min
Carrier:	Helium, constant pressure 28.85 psi at 95 °C
Oven:	95 °C (0.5 min), 25 °C/min to 210 °C, 10 °C/min to 250 °C (0.5 min), 20 °C to 290 °C (4.5 min)
Postrun Backflush:	7.5 min at 290 °C, Aux EPC pressure 54 psi during backflush, 2 psi inlet pressure during backflush
Detector:	MSD: 300 °C transfer line, 300 °C source, 150 °C quad FPD: 230 °C, Hydrogen 75 mL/min, Air 100 mL/min, Carrier + makeup (N_2) 60 mL/min

1. Methamidophos
2. Acephate
3. Omethoate
4. Diazinon
5. Dimethoate
6. Pirimiphos-methyl
7. Parathion-methyl
8. Malathion
9. Chlorpyrifos
10. Fenitrothion
11. Parathion
12. Fenthion
13. Methidathion
14. Carbophenthion
15. Triphenyl-phosphate (surrogate std)
16. Azinphos-methyl
17. Azinphos-ethyl



GC/FPD chromatogram of a 100 ng/mL matrix-matched organophosphorus pesticide standard with analyte protectant analyzed on an Agilent J&W DB-35ms UI GC column.

TIPS & TOOLS

View the latest GC column focused applications, products and educational resources at **www.agilent.com/chem/myGCcolumns**

Fragrance Allergens

Column: **HP-5ms**
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 1.2 mL/min,
constant pressure of 70 kPa

Oven: 50 °C - 1 min - 8 °C/min - 250 °C,
250-300 °C @ 35 °C/min
300 °C Hold, 5 min
5973N MSD in scan (40-350 amu)
Solvent Delay, 3.0 min

Injection: Split, 250 °C
Split ratio 1:50

Sample: 1 µL, 50 ppm standard

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

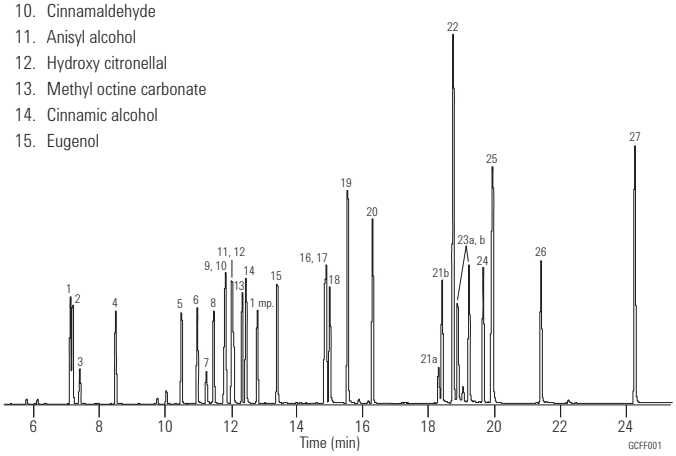
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Limonene
2. Benzyl alcohol
3. Phenyl acetaldehyde
4. Linalool
5. Methyl heptin carbonate
6. Citronellol
7. Neral
8. Geraniol
9. Citral (geranial)
10. Cinnamaldehyde
11. Anisyl alcohol
12. Hydroxy citronellal
13. Methyl octine carbonate
14. Cinnamic alcohol
15. Eugenol
16. Coumarin
17. Cinnamyl acetate
18. Isoeugenol
19. Alpha isomethyl ionone
20. Lilial (BMHCA)

21a. Lyral 1
21b. Lyral 2

22. Amyl cinnamyl alcohol

23a. Farnesol 1
23b. Farnesol 1
24. Hexyl cinnamaldeyde
25. Benzyl benzoate
26. Benzyl salicylate
27. Benzyl cinnamate



Flavor Mixture

Column: **ULTRA 2**
19091B-112
25 m x 0.32 mm, 0.52 µm

Carrier: Helium, 90 kPa., 2.2 mL/min constant flow

Oven: 80 °C for 1 min
80-210 °C at 8 °C/min
210 °C for 2 min

Injection: Split, 250 °C
Split ratio 20:1

Detector: IRD, 280 °C
Wide Band MCT, 550 to 4000 cm-1

Suggested Supplies

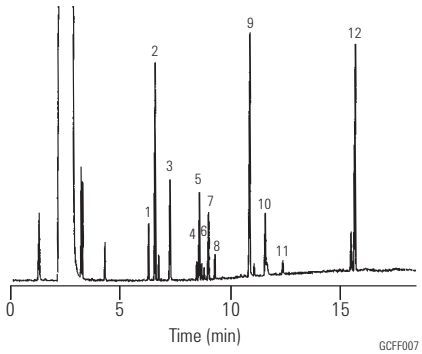
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Fenchone
2. Thujone
3. Benzaldehyde
4. trans-Carveol
5. Farnesol
6. cis-Carveol
7. trans-Geraniol
8. Citral
9. Eugenol
10. Vanillin
11. trans-Isoeugenol
12. trans-Citronellyl tiglate
13. cis-Citronellyl tiglate



Lemon Oil

Column: **DB-5**
127-5022
20 m x 0.10 mm, 0.10 µm

Carrier: Hydrogen at 60 cm/sec, measured at 40 °C

Oven: 40 °C for 3 min
40-185 °C at 30 °C/min
185 °C for 3 minV

Injection: Split, 275 °C
Split ratio 1:275

Detector: Nitrogen makeup gas at 30 mL/min

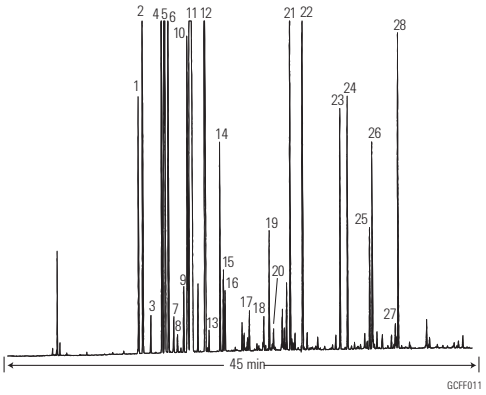
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. α-Thujone
2. β-Thujone
3. Camphene
4. Sabinene
5. β-Pinene
6. Myrcene
7. Octanal
8. α-Phellandrene
9. α-Terpinene
10. r-Cymene
11. δ-Limonene
12. γ-Trepinene
13. Octanol
14. Terpinolene
15. Linalool
16. Nonanal
17. Citronellal
18. Trepinen-4-ol
19. α-Trepineol
20. Decanal
21. Neral
22. Geranial
23. Nerylacetate
24. Geranylacetate
25. β-Caryophyllene
26. trans-α-Bergamotene
27. α-Humulene
28. β-Bisabolene

Fast analysis of lemon oil using Rapid-MS

Column: **Rapid MS**

Sample: 0.3 µL

Sample Conc: Pure lemon oil

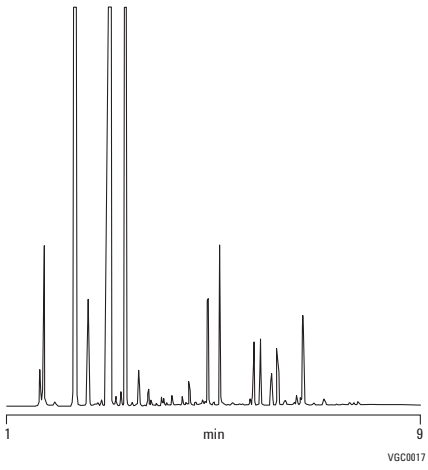
Solvent: Producto puro

Carrier: He, 100 kPa (1.0 bar, 14 psi)

Oven: 40 °C (2 min)
200 °C, 20 °C/min

Injection: Split

Detector: Ion Trap



Cold-Pressed Orange Oil

Column: **DB-5**
127-5022
20 m x 0.10 mm, 0.10 µm

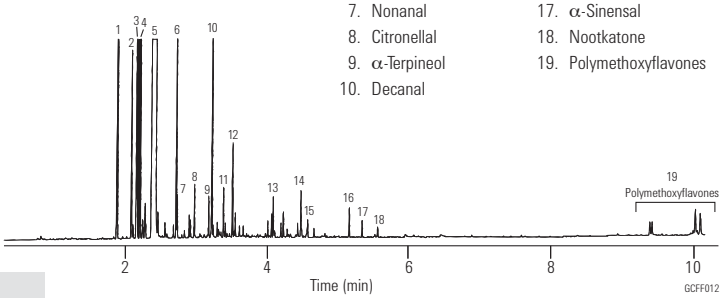
Carrier: Hydrogen at 60 cm/sec, measured at 70 °C

Oven: 70 °C for 1 min
70-250 °C at 30 °C/min
250-310 °C at 20 °C/min
310 °C for 2 min

Injection: Split, 275 °C
Split ratio 1:275

Detector: FID, 350 °C
Nitrogen makeup gas at 30 mL/min

1. α-Pinene
2. Sabinene
3. Myrcene
4. Octanal
5. Limonen
6. Linalool
7. Nonanal
8. Citronellal
9. α-Terpineol
10. Decanal
11. Neral
12. Geranial
13. Dodecenal
14. Valencene
15. Cadinene
16. β-Sinensal
17. α-Sinensal
18. Nootkatone
19. Polymethoxyflavones



Chromatogram courtesy of Tastemaker

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Peppermint Oil

Column: **DB-WAX**
122-7062
60 m x 0.25 mm, 0.25 µm

Carrier: Helium at 25 cm/sec (0.73 mL/min)

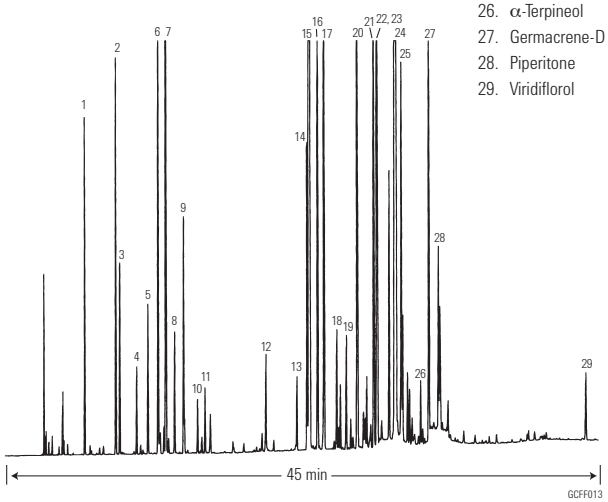
Oven: 75 °C for 8 min
75-200 °C at 4 °C/min
200° C for 5 min

Injection: Split, 270 °C
Split ratio 1:150

Detector: FID, 270 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1µL neat

1. α-Pinene
2. β-Pinene
3. Sabinene
4. Myrcene
5. α-Terpinene
6. (+/-)-Limonene
7. 1,8-Cineol
8. cis-Ocimene
9. Terpinene
10. r-Cymene
11. γ-Terpinolene
12. 3-Octanol
13. 1-Octen-3-ol
14. trans-Sabinene hydrate
15. (+/-)-Methone
16. Methofuran
17. d-Isomethone
18. β-Bourbonene
19. Linalool
20. Menthyl acetate
21. Neomenthol
22. Trepinen-4-ol
23. β-Caryophyllene
24. (+/-)-Menthol
25. Pulegone
26. α-Terpineol
27. Germacrene-D
28. Piperitone
29. Viridiflorol



Thanks to Mr. William Faas of A.M. Todd Company for providing the sample and assisting with peak identification.

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Spearmint Oil (Western)

Column: **DB-WAX**
122-7062
60 m x 0.25 mm, 0.25 µm

Carrier: Helium at 25 cm/sec (0.73 mL/min)

Oven: 75 °C for 8 min
75-200 °C at 4 °C/min
200 °C for 5 min

Injection: Split, 270 °C
Split ratio 1:150

Detector: FID, 270 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL neat

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

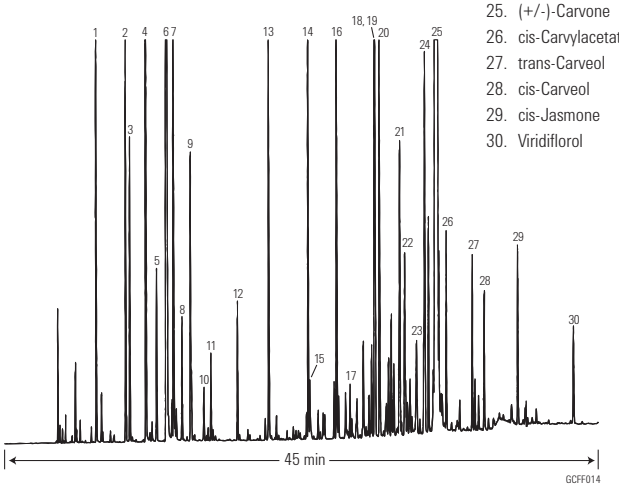
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Thanks to Mr. William Faas of A.M. Todd Company for providing the sample and assisting with peak identification.

1. α-Pinene
2. β-Pinene
3. Sabinene
4. Myrcene
5. α-Terpinene
6. (+/-)-Limonene
7. 1,8-Cineol
8. cis-Ocimene
9. γ-Terpinene
10. r-Cymene
11. Terpinolene
12. 3-Octylacetate
13. 3-Octanol
14. trans-Sabinene hydrate
15. (+/-)-Methone
16. β-Bourbonene
17. Linalool
18. Trepinen-4-ol
19. β-Caryophyllene
20. Dihydrocarvone
21. trans-Dihydrocarvyl
22. trans-β-Farnesene
23. α-Terpineol
24. Germacrene-D
25. (+/-)-Carvone
26. cis-Carvylacetate
27. trans-Carveol
28. cis-Carveol
29. cis-Jasmone
30. Viridiflorol



Ylang Ylang Oil

Column: **DB-XLB**
122-1232
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 34 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-250 °C at 3.5 °C/min

Injection: Split, 250 °C
Split ratio 1:125

Detector: MSD, 310 °C transfer line
full scan at m/z 35-550

Sample: 1 µL of 10% oil in methylene chloride

Suggested Supplies

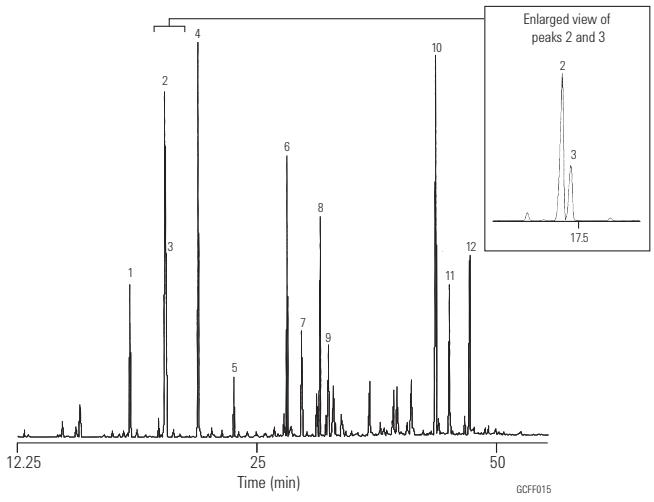
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. r-Methylansiole
2. Linalool
3. Methylbenzoate
4. Benzylacetate
5. Geraniol
6. Geranylacetate
7. β-Caryophyllene
8. Cinnamylacetate
9. Germacrene-D
10. Benzyl benzoate
11. Faneosolacetate
12. Benzyl salicylate



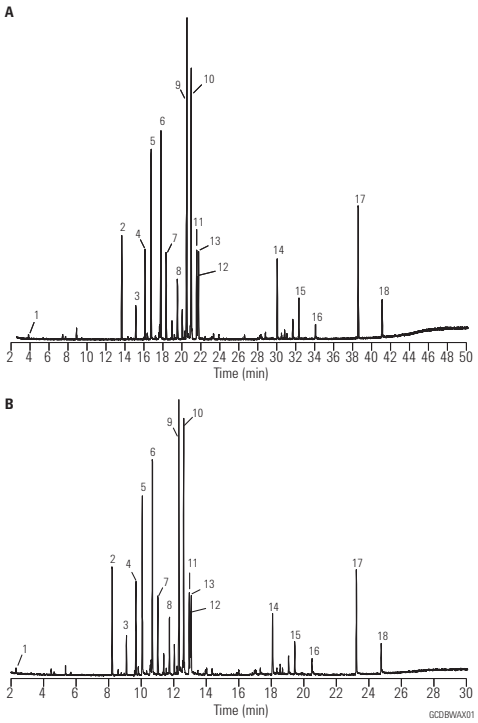
Ylang Ylang Oil

Column: **DB-WAX**
121-7022
20 m x 0.18 mm, 0.18 µm

Carrier: A: Helium 26.3 cm/sec measured at 45 °C
B: Hydrogen 44.3 cm/sec measured at 45 °C

Oven: A: 45 °C hold 1.28 min
4.68 °C/min to 250 °C hold 21.81 min

B: 45 °C hold 0.77 min
7.79 °C/min to 250 °C hold 13.09 min



1. α-Pinene
2. Methyl-ρ-cresol
3. α-Copaene
4. α-Gurjunene
5. Linalool
6. β-Caryophyllene
7. Methyl benzoate
8. α-Caryophyllene
9. Germacrene-d
10. Benzyl acetate
11. Farnescene
12. δ-Cadinene
13. Geranial acetate
14. trans-Cinnamyl acetate
15. β-Bisbolene
16. Farnesyl acetate
17. Benzyl benzoate
18. Benzyl salicylate

Rosemary Oil

Column: **Cyclosil-B**
112-6632
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 40 cm/sec, measured at 60 °C

Oven: 55 °C for 1 min
50-180 °C at 5 °C/min

Injection: Split, 250 °C
Split ratio 50:1

Detector: FID, 340 °C

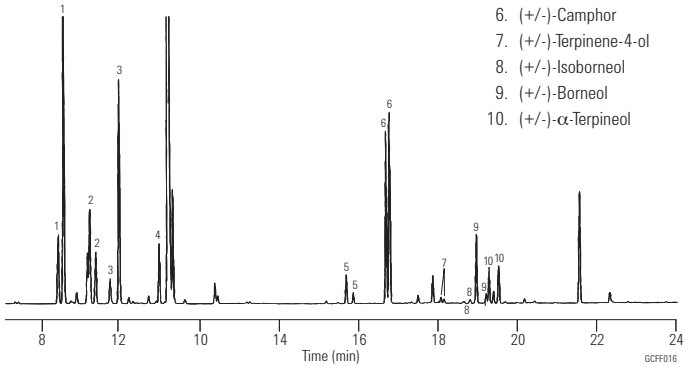
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. (+/-)-α-Pinene
2. (+/-)-Camphene
3. (+/-)-β-Pinene
4. (+/-)-Limonene
5. (+/-)-Linalool
6. (+/-)-Camphor
7. (+/-)-Terpinene-4-ol
8. (+/-)-Isoborneol
9. (+/-)-Borneol
10. (+/-)-α-Terpineol

Citrus Flavored Carbonated Beverage (Soda)

Column: **Cyclosil-B**
112-6632
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 37 cm/sec, measured at 40 °C

Oven: 40-190 °C at 2 min

Sampler: Headspace
no stir, NaCl 1g/10 mL sample
Adsorption: 27 °C for 68 min
Desorbtion: 250 °C for 15 min

Injection: Split, 1:5
Polyacrylate fiber, 85 µm

Detector: MSD, 280 °C transfer line

Suggested Supplies

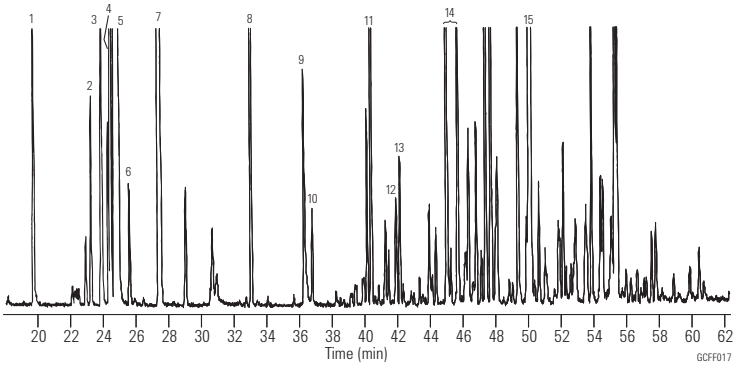
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. S-(-)-Limonene
2. p-Cymene
3. (+)-Limonene
4. Octanol
5. γ-Terpinene
6. Nonanol
7. 2-Ethyl-1-Hexanol
8. Linalool
9. Decanol
10. Terpinen-4-ol
11. Phenethylalcohol
12. α-Terpineol
13. BHT



Alcohol Beverage Standard

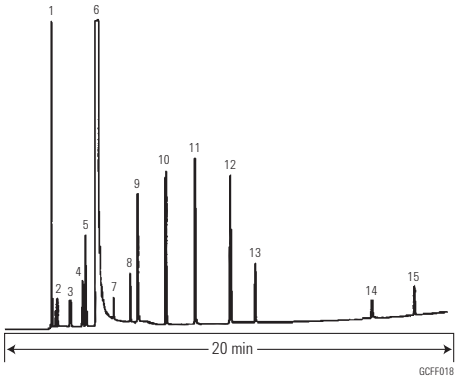
Column: **HP-FFAP**
19091F-105
50 m x 0.20 mm, 0.30 µm

Carrier: Hydrogen

Oven: 60 °C for 4 min
60-200° C at 6 °C/min
200 °C for 2 min

Detector: FID

1. Acetaldehyde
2. Acetone
3. Ethyl formate
4. Ethyl acetate
5. Methanol
6. Ethanol
7. Diacetyl
8. sec-Butanol
9. n-Propanol
10. Isobutanol
11. n-Butanol
12. Isoamyl alcohol
13. n-Amyl alcohol
14. Acetic acid
15. Propionic acid



Bourbon

Column: **HP-INNOWax**
19091N-133
30 m x 0.25 mm, 0.25 µm

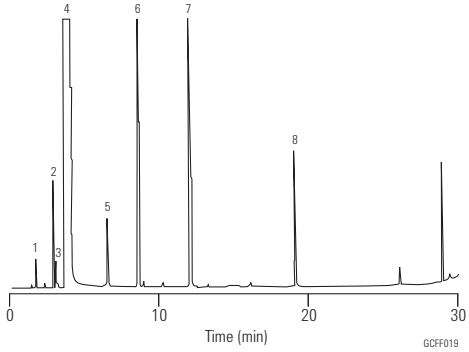
Carrier: Helium, 33 cm/sec, 15.5 psi (35°C)
1.5 mL/min constant flow

Oven: 35 °C for 5 min
35-150 °C at 5 °C/min
150-250 °C at 20 °C/min
250 °C for 2 min

Injection: Split, 220 °C
Split ratio 25:1

Detector: FID 280 °C

Sample: 1 µL



1. Acetaldehyde
2. Ethyl acetate
3. Methanol
4. Ethanol
5. Acetic acid
6. n-Propanol
7. Isobutanol
8. 2-Methyl-1-butanol or 3-Methyl-1-Butanol

Alditol Acetates

Column: **DB-225**
122-2231
30 m x 0.25 mm, 0.15 µm

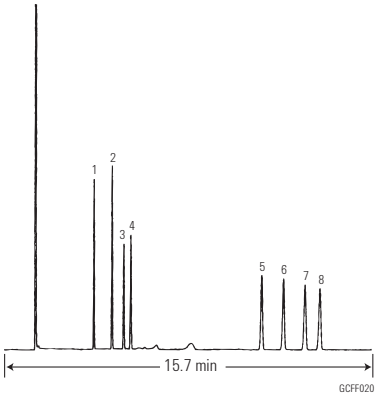
Carrier: Hydrogen a 36.5 cm/sec

Oven: 220 °C isothermal

Injection: Split, 225 °C
Split ratio 1:50

Detector: FID, 250 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL



1. Rhamnitol
2. Fucitol
3. Ribitol
4. Arabinitol
5. Mannitol
6. Galactitol
7. Glucitol
8. Inositol

Strawberry Syrup

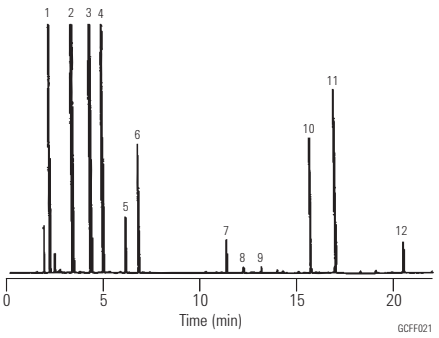
Column: **HP-INNOWax**
19091N-213
30 m x 0.32 mm, 0.50 µm

Carrier: Helium, 40 cm/sec, 11.7 psi (60°C)
2.5 mL/min constant flow

Oven: 60 °C for 1 min
60-250 °C at 10 °C/min
250 °C for 2 min

Injection: Split, 220 °C
Split ratio 60:1

Detector: FID 275 °C



1. Ethyl acetate
2. Ethyl butyrate
3. Isoamyl acetate
4. Amyl acetate
5. Isoamyl butyrate
6. Amyl butyrate
7. Ethyl benzoate
8. Citronellol
9. Geraniol
10. Ethyl-3-phenyl oxiran carboxylate
11. Strawberry aldehyde
12. Benzyl benzoate

Separation of TMS-derivatized sugars using VF-1ms

Column: **VF-1ms**
CP8912
30 m x 0.25 mm, 0.25 µm

Sample: 5 µL, splitless 1 µL

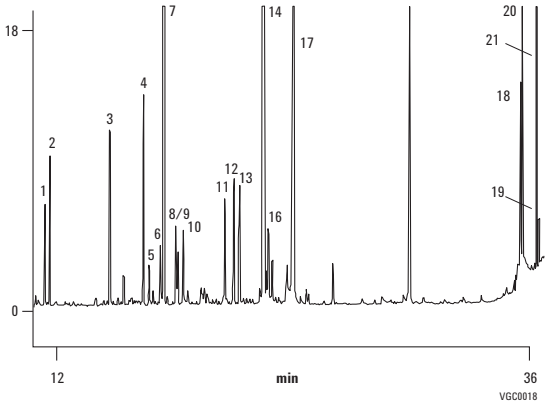
Sample Conc: 40 ppb

Carrier: He, 1.0 mL/min

Oven: 105 °C to 240 °C,
4 °C/min to 300 °C,
20 °C/min

Injection: Split; 1:15

Detector: MS



1. Threitol
2. Erythritol
3. Rhamnose 1
4. Rhamnose 2
5. Xylose 1
6. Arabitol
7. Ribitol
8. 3-0-Methylglucose 1
9. Xylose 2
10. Rhamnitol
11. 3-0-Methylglucose 2
12. Glucuron acid-1,5-lacton
13. Ribose 2
14. Manitol
15. Sorbitol (not identified)
16. Galactitol
17. Glucuron acid
18. Lactulose
19. Lactose
20. Sucrose
21. Threhalose

Organic Acids

Column: **DB-FFAP**
122-3232
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 40 cm/sec, measured at 100 °C

Oven: 100 °C for 5 min
100-250 °C at 10 °C/min
250 °C for 12 min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

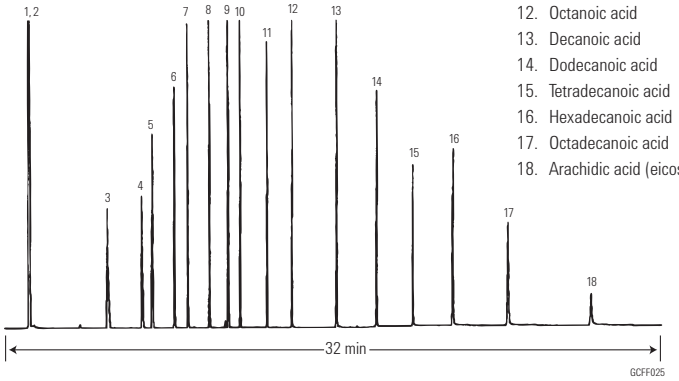
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Acetone
2. Formic acid
3. Acetic acid
4. Propionic acid
5. Isobutyric acid
6. Butyric acid
7. Isovaleric acid
8. Valeric acid (pentanoic acid)
9. Isocaproic acid
10. Caproic acid (hexanoic acid)
11. Heptanoic acid
12. Octanoic acid
13. Decanoic acid
14. Dodecanoic acid
15. Tetradecanoic acid
16. Hexadecanoic acid
17. Octadecanoic acid
18. Arachidic acid (eicosanoic acid)

Acids

Column: **VF-WAXms**
CP9205
30 m x 0.25 mm, 0.25 µm

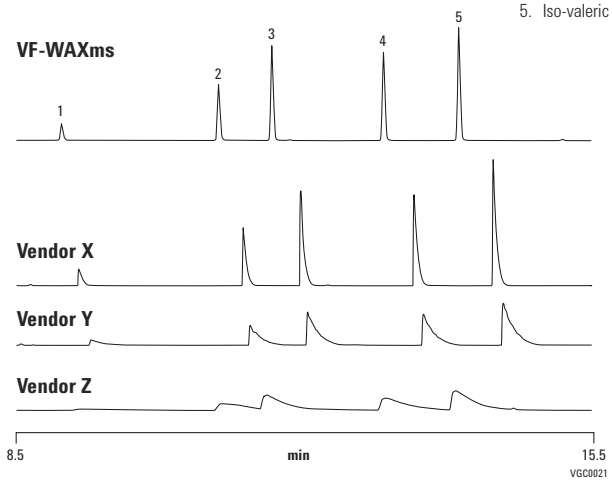
Sample: Acid sample, 0.1% (Cyclohexane), 1.0 µL

Carrier: Hydrogen, 75 kPa

Oven: 60 °C to 200 °C, 5 °C/min

Injection: 250 °C, split 100 mL/min

1. Acetic acid
2. Propionic acid
3. Iso-butyric acid
4. Butyric acid
5. Iso-valeric acid



Bacterial Fatty Acid Methyl Esters

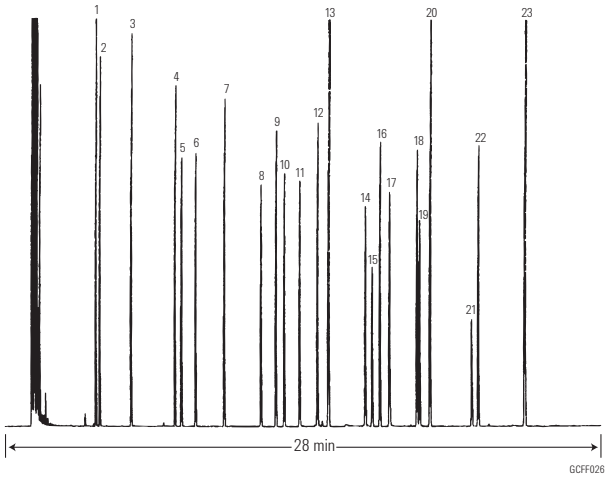
Column: **DB-5**
122-5032
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 42 cm/sec

Oven: 150 °C for 4 min
150-250 °C at 4 °C/min

Injection: Split ratio 1:100

Detector: FID
Nitrogen makeup gas at 30 mL/min



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. $C_{11:0}$ Methylundecanoate
2. 2-OH $C_{10:0}$ Methyl 2-hydroxydecanoate
3. $C_{12:0}$ Methyl laurate
4. $C_{13:0}$ Methyl tridecanoate
5. 2-OH $C_{12:0}$ Methyl 2-hydroxydodecanoate
6. 3-OH $C_{12:0}$ Methyl 3-hydroxydodecanoate
7. $C_{14:0}$ Methyl myristate
8. 12-Me $C_{14:0}$ Methyl 12-methyltetradecanoate
9. $C_{15:0}$ Methyl pentadecanoate
10. 2-OH $C_{14:0}$ Methyl 2-hydroxytetradecanoate
11. 3-OH $C_{14:0}$ Methyl 3-hydroxytetradecanoate
12. $C_{16:1}$ Methyl palmitoleate
13. $C_{16:0}$ Methyl palmitate
14. 14-Me $C_{16:0}$ Methyl 14-methylhexadecanoate
15. 9,10-diMe $C_{16:0}$ Methyl cis-9,10-methyl hexadecanoate
16. $C_{17:0}$ Methyl heptadecanoate
17. 2-OH $C_{16:0}$ Methyl 2-hydroxyhexadecanoate
18. $C_{18:1}$ Methyl oleate
19. $C_{18:1}$ Methyl elaidate
20. $C_{18:0}$ Methyl stearate
21. 9,10-diMe $C_{18:0}$ Methyl cis-9,10-methylene octadecanoate
22. $C_{19:0}$ Methyl nonadecanoate
23. $C_{20:0}$ Methyl arachidate

Separation of cis-trans FAME isomers

Column: **Select FAME**
CP7421
200 m x 0.25 mm,

Sample: 0.5 µL

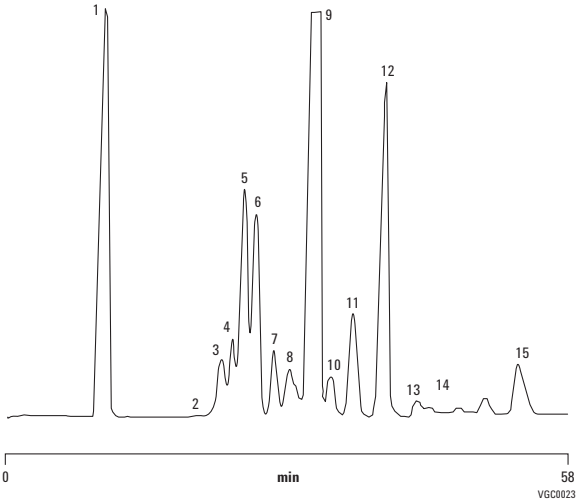
Sample Conc: 5 g approx. per component on the column

Carrier: Helium, 520 kPa

Oven: 185 °C

Injection: Split, 1:20

Detector: FID



1. C18:0
2. C18:1 7 trans
3. C18:1 8 trans
4. C18:1 9 trans
5. C18:1 10 trans
6. C18:1 11 trans
7. C18:1 12 trans
8. C18:1 13 trans + ?
9. C18:1 9 cis
10. C18:1 10 cis
11. C18:1 11 cis
12. C18:1 12 cis
13. C18:1 13 cis
14. C18:1 14 cis
15. C18:1 15 cis

69 Component FAME Mix

Column: **HP-88**
112-8867
60 m x 0.25 mm, 0.20 µm

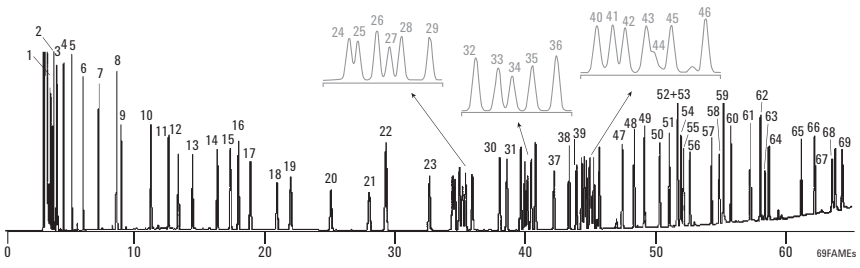
Carrier: He at 1.4 mL/min constant flow

Oven: 125 °C
125 °C to 145 °C at 8 °C/min
145 °C for 26 min
145 °C to 220 °C at 2 °C/min
220 °C for 1 min

Injection: Split, 250 °C
Split ratio 50:1
1 µL of 70 ppm each in $CHCl_3$

Detector: FID, 260 °C

1. nC6:0
2. nC7:0
3. nC8:0
4. nC9:0
5. nC10:0
6. nC11:0
7. nC12:0
8. C12:1 (11c)
9. nC13:0
10. nC14:0
11. C14:1 (9t)
12. C14:1 (9c)
13. nC15:0
14. C15:1 (10t)
15. C15:1 (10c)
16. C15:1 (14c)
17. nC16:0
18. C16:1 (9t)
19. C16:1 (9c)
20. nC17:0
21. C17:1 (10t)
22. C17:1 (10c)
23. nC18:0
24. C18:1 (6t)
25. C18:1 (9t)
26. C18:1 (11t)
27. nC18:1 (6c)
28. C18:1 (9c)
29. C18:1 (11c)
30. nC18:2 (9t,12t)
31. C19:1 (10t)
32. nC19:0
33. C19:1 (7t)
34. C18:2 (9c,12c)
35. C19:1 (7c)
36. C19:1 (10c)
37. C18:3 g(6c,9c,12c)
38. nC20:0
39. C18:3 (9c,12c,15c)
40. C20:1 (5c)
41. C19:2 (10c,13c)
42. C20:1 (11t)
43. C18:2 CONJ
44. C20:1 (8c)
45. C20:1 (11c)
46. C18:2 (10t,12c)
47. nC21:0
48. C20:2 (11c,14c)
49. C21:1 (12c)
50. C20:3 (8c,11c,14c)
51. nC22:0
52. C22:1 (13t)
53. C20:4 (5c,8c,11c,14c)
54. C20:3 (11c,14c,17c)
55. C21:2 (12c,15c)
56. C22:1 (13c)
57. nC23:0
58. C20:5 (EPA)
59. C22:2 (13c,16c)
60. C23:1 (14c)
61. nC24:0
62. C22:3 (13c,16c,19c)
63. C22:4 (7c,10c,13c,16c)
64. C24:1 (15c)
65. C22:5 (DPA)
66. C22:6 (DHA)
67. C18:1-12 Hydroxy (9t)
68. C18:0 12 Hydroxy
69. C18:1-12 Hydroxy (9c)



FAME Standard

Column: **DB-WAX**
127-7012
10 m x 0.10 mm, 0.10 µm

Carrier: Hydrogen at 77 cm/sec, measured at 40 °C

Oven: 40 °C for 0.5 min
40-195 °C at 25 °C/min
195-205 °C at 3 °C/min
205-230 °C at 8° C/min
230° C for 1 min

Injection: Split, 250 °C
Split ratio 1:30

Detector: FID, 250 °C

Suggested Supplies

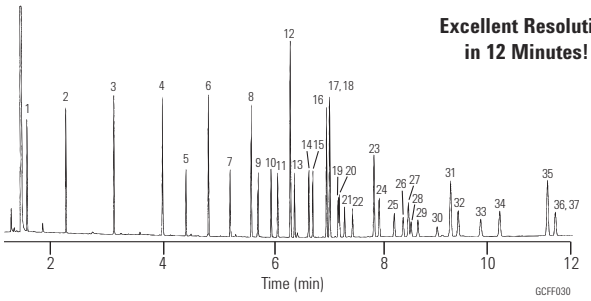
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Butyric acid methyl ester ($C_{4:0}$)
2. Caproic acid methyl ester ($C_{6:0}$)
3. Caprylic acid methyl ester ($C_{8:0}$)
4. Capric acid methyl ester ($C_{10:0}$)
5. Undecanoic acid methyl ester ($C_{11:0}$)
6. Lauric acid methyl ester ($C_{12:0}$)
7. Tridecanoic acid methyl ester ($C_{13:0}$)
8. Myristic acid methyl ester ($C_{14:0}$)
9. Myristoleic acid methyl ester ($C_{14:1}$)
10. Pentadecanoic acid methyl ester ($C_{15:0}$)
11. cis-10-Pentadecenoic acid methyl ester ($C_{15:1}$)
12. Palmitic acid methyl ester ($C_{16:0}$)
13. Palmitoleic acid methyl ester ($C_{16:1}$)
14. Heptadecanoic acid methyl ester ($C_{17:0}$)
15. cis-10-Heptadecenoic acid methyl ester ($C_{17:1}$)
16. Stearic acid methyl ester ($C_{18:0}$)
17. Oleic acid methyl ester ($C_{18:1n9c}$)
18. Elaidic acid methyl ester ($C_{18:1n9t}$)
19. Linoleic acid methyl ester ($C_{18:2n6c}$)
20. Linolelaidic acid methyl ester ($C_{18:2n6t}$)
21. γ-Linolenic acid methyl ester ($C_{18:3n6}$)
22. Linolenic acid methyl ester ($C_{18:3n3}$)
23. Arachidic acid methyl ester ($C_{20:0}$)
24. cis-11-Eicosenoic acid methyl ester ($C_{20:1}$)
25. cis-11,14-Eicosadienoic acid methyl ester ($C_{20:2}$)
26. cis-8,11,14-Eicosatrienoic acid methyl ester ($C_{20:3n6}$)
27. Heneicosanoic acid methyl ester ($C_{21:0}$)
28. cis-11,14,17-Eicosatrienoic acid methyl ester ($C_{20:3n3}$)
29. Arachidonic acid methyl ester ($C_{20:4n6}$)
30. cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester ($C_{20:5n3}$)
31. Behenic acid methyl ester ($C_{22:0}$)
32. Erucic acid methyl ester ($C_{22:1n9}$)
33. cis-13,16-Docosadienoic acid methyl ester ($C_{22:2}$)
34. Tricosanoic acid methyl ester ($C_{23:0}$)
35. Lignoceric acid methyl ester ($C_{24:0}$)
36. cis-4,7,10,13,16,19-Docosahexaenoic acid methyl ester ($C_{22:6n3}$)
37. Nervonic acid methyl ester ($C_{24:1}$)



FAME Standard

Column: **DB-225**
127-2222
20 m x 0.10 mm, 0.10 µm

Carrier: Hydrogen at 59.3 cm/sec, measured at 35 °C

Oven: 35 ° for 0.5 min
35-195 °C at 25 °C/min
195-205 °C at 3 °C/min
205-230 °C at 8 °C/min
230 °C for 1 min

Injection: Split, 250 °C
Split ratio 1:30

Detector: FID, 250 °C

Suggested Supplies

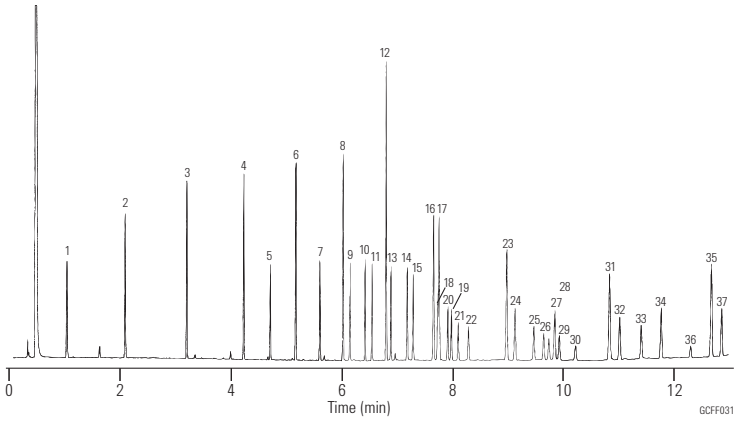
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Butyric acid methyl ester (C4:0)
2. Caproic acid methyl ester (C6:0)
3. Caprylic acid methyl ester (C8:0)
4. Capric acid methyl ester (C10:0)
5. Undecanoic acid methyl ester (C11:0)
6. Lauric acid methyl ester (C12:0)
7. Tridecanoic acid methyl ester (C13:0)
8. Myristic acid methyl ester (C14:0)
9. Myristoleic acid methyl ester (C14:1)
10. Pentadecanoic acid methyl ester (C15:0)
11. cis-10-Pentadecenoic acid methyl ester (C15:1)
12. Palmitic acid methyl ester (C16:0)
13. Palmitoleic acid methyl ester (C16:1)
14. Heptadecanoic acid methyl ester (C17:0)
15. cis-10-Heptadecenoic acid methyl ester (C17:1)
16. Stearic acid methyl ester (C18:0)
17. Oleic acid methyl ester (C18:1n9c)
18. Elaidic acid methyl ester (C18:1n9t)
19. Linoleic acid methyl ester (C18:2n6c)
20. Linolelaidic acid methyl ester (C18:2n6t)
21. γ-Linolenic acid methyl ester (C18:3n6)
22. Linolenic acid methyl ester (C18:3n3)
23. Arachidic acid methyl ester (C20:0)
24. cis-11-Eicosenoic acid methyl ester (C20:1)
25. cis-11,14-Eicosadienoic acid methyl ester (C20:2)
26. cis-8,11,14-Eicosatrienoic acid methyl ester (C20:3n6)
27. Heneicosanoic acid methyl ester (C21:0)
28. cis-11,14,17-Eicosatrienoic acid methyl ester (C20:3n3)
29. Arachidonic acid methyl ester (C20:4n6)
30. cis-5,8,11,14,17-Eicosapentaenoic acid methyl ester (C20:5n3)
31. Behenic acid methyl ester (C22:0)
32. Erucic acid methyl ester (C22:1n9)
33. cis-13,16-Docosadienoic acid methyl ester (C22:2)
34. Tricosanoic acid methyl ester (C23:0)
35. Lignoceric acid methyl ester (C24:0)
36. cis-4,7,10,13,16,19-Docosahexaenoic acid methyl ester (C22:6n3)
37. Nervonic acid methyl ester (C24:1)



Canola Oil Margarine Partially Hydrogenated FAMEs AOCS Method 1c-89

Column: **DB-23**
122-2362
60 m x 0.25 mm, 0.25 µm

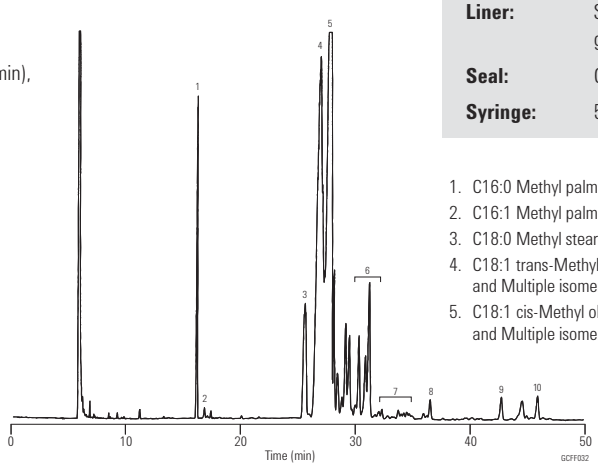
Carrier: Helium at 15 cm/sec (0.44 mL/min), measured at 150 °C

Oven: 150-200 °C at 1.3 °C/min
200 °C for 10 min

Injection: Split, 210 °C
Split 1:100

Detector: FID, 210 °C

Sample: 1 µL



1. C16:0 Methyl palmitate
2. C16:1 Methyl palmitoleate
3. C18:0 Methyl stearate
4. C18:1 trans-Methyl elaidate and Multiple isomers
5. C18:1 cis-Methyl oleate and Multiple isomers
6. C18:2 trans-Multiple isomers
7. C18:2 cis-Multiple isomers
8. C18:3 Methyl linolenate
9. C20:0 Methyl arachidate
10. C20:1 Methyl 11-eicosanoate

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Butter Triglycerides I

Column: **DB-5ht**
123-5731
30 m x 0.32 mm, 0.10 µm

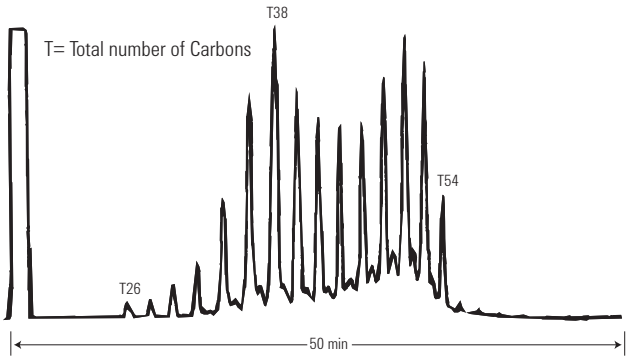
Carrier: Hydrogen at 55 cm/sec, measured at 250°C

Oven: 35-250 °C at 70 °/min
250-400 °C at 5 °C/min
400 °C for 20 min

Injection: Cool on-column

Detector: FID, 400 °C
Nitrogen makeup gas at 30 mL/min
Baseline corrected

Sample: 1 µL of 9 µg/µL in toluene
(approx. 1% w/w solution)



Butter Triglycerides II

Column: **DB-17ht**
123-1831
30 m x 0.32 mm, 0.15 µm

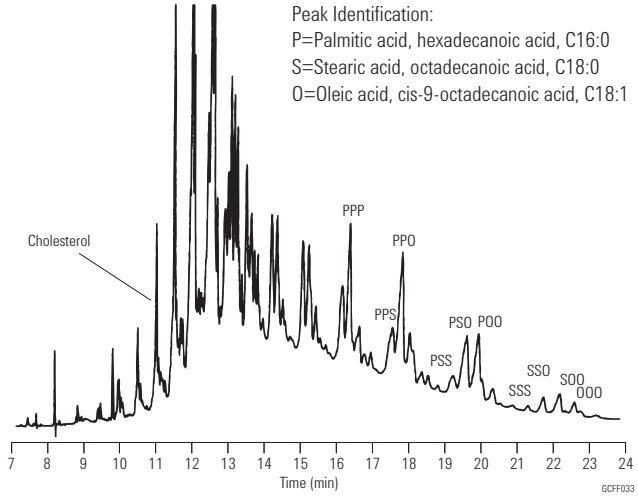
Carrier: Hydrogen at 40 cm/sec

Oven: 250-365 °C at 5 °C/min
365 °C for 1 min

Injection: Cool on-column

Detector: FID, 400 °C
Nitrogen makeup gas at 30 mL/min
Baseline corrected

Sample: 1 µL of 9 µg/µL in toluene
(approx. 1% w/w solution)



Fast screening of FAME isomers in butter

Column: **VF-23ms**
CP8822
30 m x 0.25 mm, 0.25 µm

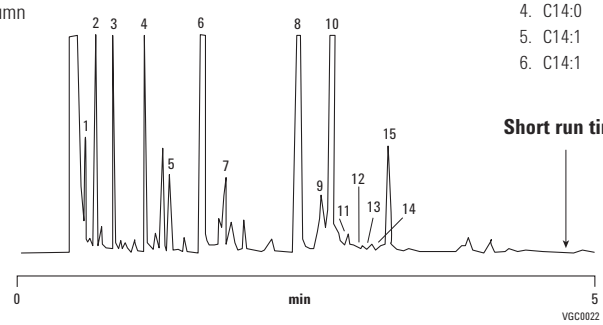
Sample: 0.5 µL ca. 5 ng per component on column

Carrier: Hydrogen, 70 kPa

Oven: 185 °C

Injection: Split, 1:100
T=275 °C

Detector: FID



1. C8:0
2. C10:0
3. C12:0
4. C14:0
5. C14:1
6. C14:1
7. C16:1 9-cis
8. C16:1 9-cis
9. C18:1 trans
10. C18:1 9-cis
11. C18:1 13-cis
12. C18:2 9-trans, 12-trans
13. C18:2 9-cis, 12-trans
14. C18:2 9-trans,12-cis
15. C18:2 9-cis, 12-cis

Pesticides in sunflower oil

Column: **VF-5ms**
CP8960
60 m x 0.25 mm, 0.25 µm

Sample: 5 µL, splitless

Sample Conc: 40 ppb

Carrier: He, 1.2 mL/min, constant flow

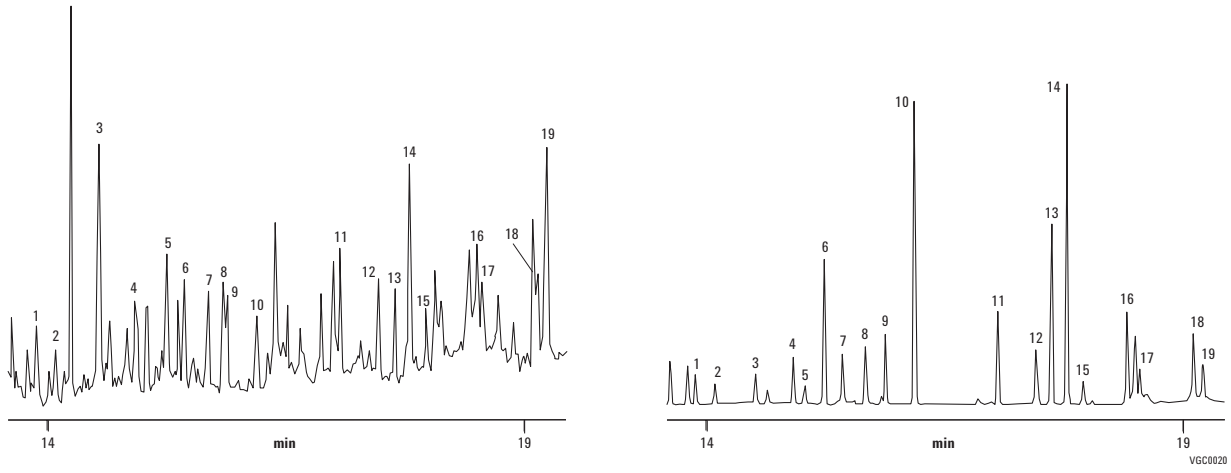
Oven: 70 °C (3.0 min), 25 °C to 190 °C/min (0.0 min) to 10 °C/min to 320 °C (10 min)

Injection: 1079 with carbofrit liner

Detector: Ion Trap in MS/MS, full scan (left chromatogram) MS/MS (right chromatogram)

1. β-HCH
2. γ-HCH
3. δ-HCH
4. + Vinclozolin
5. Pyrimiphos methyl
6. + Malathion
7. Chloropyrifos
8. Ethyl parathion
9. Pyrimiphos ethyl
10. Bromofos
11. o,p'-DDE
12. α-Endosulfan
13. p,p'-DDE
14. o,p'-DDD
15. Dieldrin
16. p,p'-DDD
17. b Endosulfan
18. p,p'-DDT
19. Endosulfan sulfate

1. β-HCH
2. γ-HCH
3. δ-HCH
4. + Vinclozolin
5. Methyl parathion
6. Pyrimiphos methyl
7. + +Fenitrothion
8. Chloropyrifos
9. Pyrimiphos ethyl
10. Promofos
11. o,p'-DDE
12. α-Endosulfan
13. p,p'-DDE
14. o,p'-DDD
15. Dieldrin
16. p,p'-DDD
17. b Endosulfan
18. p,p'-DDT
19. Endosulfan sulfate



Industrial Chemical Applications

Alcohols I

Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min
260 °C for 3 min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 0.01-0.05% each solvent in CS_2

Suggested Supplies

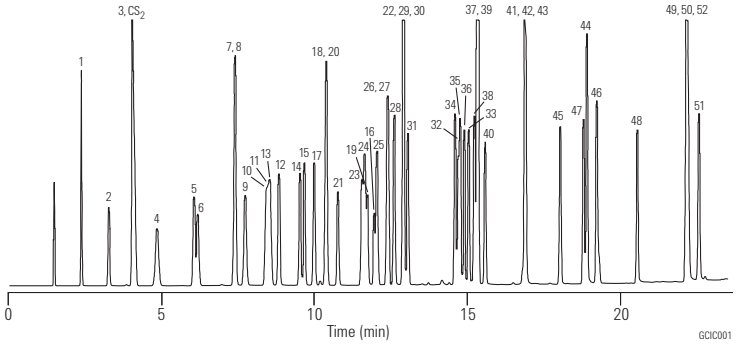
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal kit, 5188-5367

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Methanol
2. Ethanol
3. Isopropanol
4. tert-Butanol
5. 2-Propen-1-ol (allyl alcohol)
6. 1-Propanol
7. 2-Propyn-1-ol (propargyl alcohol)
8. sec-Butanol
9. 2-Methyl-3-buten-2-ol
10. Isobutanol
11. 2-Methoxyethanol (methyl Cellosolve)
12. 3-Buten-1-ol
13. 2-Methyl-2-butanol (tert-amyl alcohol)
14. 1-Butanol
15. 2-Buten-1-ol (crotyl alcohol)
16. Ethylene glycol
17. 1-Penten-3-ol
18. 2-Pentanol
19. Glycidol
20. 3-Pentanol
21. 2-Ethoxyethanol (Cellosolve)
22. Propylene glycol
23. 3-Methyl-1-butanol (isoamyl alcohol)
24. 2-Methyl-1-butanol (active amyl alcohol)
25. 4-Methyl-2-pentanol
26. 1-Pentanol
27. 2-Penten-1-ol
28. 3-Methyl-2-buten-1-ol
29. Cyclopentanol
30. 3-Hexanol
31. 2-Hexanol
32. 4-Hydroxy-4-methyl-2-pentanone
33. Furfuryl alcohol
34. cis-3-Hexen-1-ol
35. 1-Hexanol
36. cis-2-Hexen-1-ol
37. Cyclohexanol
38. 3-Heptanol
39. 2-Heptanol
40. 2-Butoxyethanol (butyl Cellosolve)
41. cis-4-Hepten-1-ol
42. trans-2-Hepten-1-ol
43. 1-Heptanol
44. Benzyl alcohol
45. 2-Ethyl-1-hexanol
46. a-Methylphenyl alcohol
47. 1-Octanol
48. 1-Nonanol
49. 2-Phenoxyethanol
50. a-Ethylphenethyl alcohol
51. b-Ethylphenethyl alcohol
52. 1-Decanol



Halogenated Hydrocarbons I

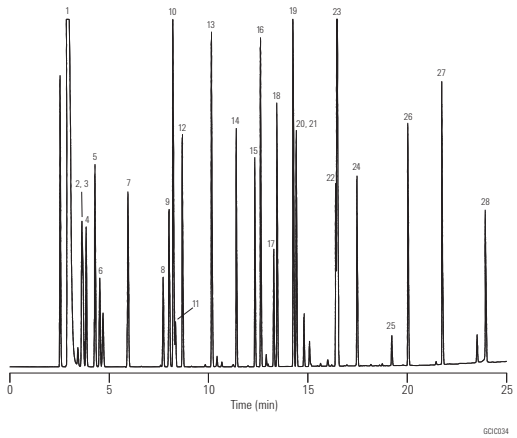
Column: **DB-624**
123-1334
30 m x 0.32 mm, 1.80 µm

Carrier: Helium at 35 cm/sec

Oven: 35 °C for 5 min
35-245 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal kit, 5188-5367

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Pentane
2. Iodomethane
3. 1,1-Dichloroethene
4. 1,1,2-Trichlorotrifluoroethane (Freon-113)
5. 3-Chloropropene (allyl chloride)
6. Methylene chloride
7. 1,1-Dichloroethane
8. Chloroform
9. 1,1,1-Trichloroethane
10. 1-Chlorobutane
11. Carbon tetrachloride
12. 1,2-Dichloroethane
13. 1,2-Dichloropropane
14. cis-1,2-Dichloropropene
15. trans-1,2-Dichloropropene
16. 1,1,2-Trichloroethane
17. 1,1,1,2-Tetrachloroethane
18. 1,2-Dibromoethane (EDB)
19. 1-Chlorohexane
20. trans-1,4-Dichloro-2-butene
21. Iodoform
22. Hexachlorobutadiene
23. 1,2,3-Trichloropropane
24. 1,1,2,2-Tetrachloroethane
25. Pentachloroethane
26. 1,2-Dibromo-3-chloropropane (DBCP)
27. Hexachloroethane
28. Hexachlorocyclopentadiene

Aromatic Solvents

Column: **DB-200**
122-2032
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec

Oven: 50 °C for 5 min
50-160 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.5 µL of 0.5 µg/µL
standard in hexane

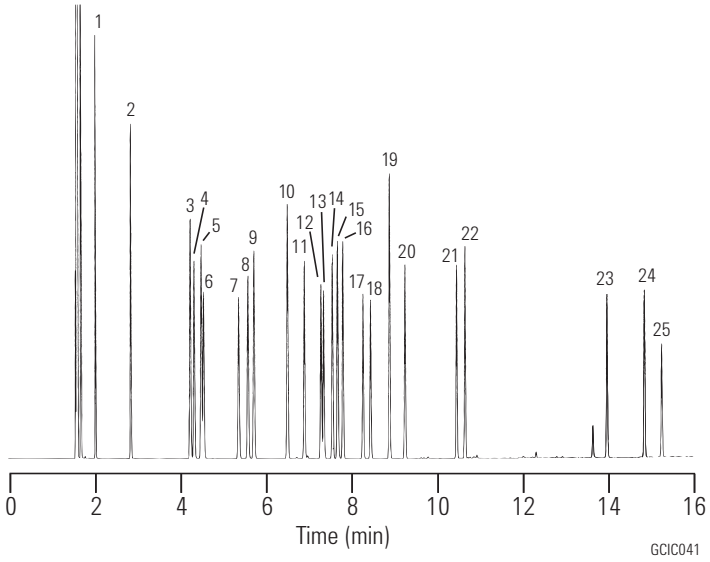
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal kit, 5188-5367

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Benzene
2. Toluene
3. Ethylbenzene
4. Chlorobenzene
5. p-Xylene
6. m-Xylene
7. o-Xylene
8. Styrene
9. Isopropylbenzene
10. n-Propylbenzene
11. 2-Chlorotoluene
12. 3-Chlorotoluene
13. 4-Chlorotoluene
14. tert-Butylbenzene
15. sec-Butylbenzene
16. Isobutylbenzene
17. 1,3-Dichlorobenzene
18. 1,4-Dichlorobenzene
19. n-Butylbenzene
20. 1,2-Dichlorobenzene
21. 1,3-Diisopropylbenzene
22. 1,4-Diisopropylbenzene
23. 2-Nitrotoluene
24. 3-Nitrotoluene
25. 4-Nitrotoluene

Phenols I

Column: **HP-5ms**
19091S-433
30 m x 0.25 mm, 0.25 µm

Carrier: Helium, 33 cm/sec, constant flow

Oven: 35 °C for 5 min
35-220 °C at 8 °C/min

Injection: Splitless, 250 °C

Detector: FID, 300 °C

Sample: 1 µL
20 µg/mL phenols in methylene chloride

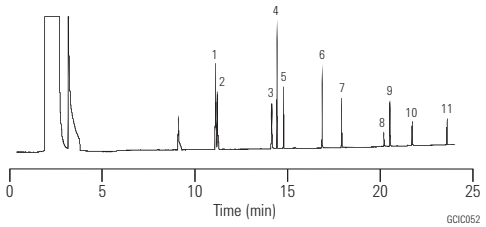
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal kit, 5188-5367

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Phenol
2. 2-Chlorophenol
3. 2-Nitrophenol
4. 2,4-Dimethylphenol
5. 2,4-Dichlorophenol
6. 4-Chloro-3-methylphenol
7. 2,4,6-Trinitrophenol
8. 2,4-Dinitrophenol
9. 4-Nitrophenol
10. 2-Methyl-4,6-dinitrophenol
11. Pentachlorophenol

Inorganic Gases

Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Carrier: Helium at 53 cm/sec

Oven: 25 °C for 3 min
25-200 °C at 10 °C/min
200 °C Hold

Injection: Split, 200 °C
Split ratio 1:50

Detector: TCD, 250 °C

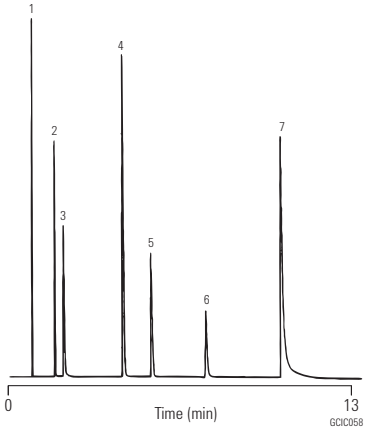
Sample: 50 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal kit, 5188-5367



1. Nitrogen
2. CO_2
3. SF_6
4. COS
5. H_2S
6. Ethylene oxide
7. SO_2

Alcohols II

Column: **DB-WAXetr**
123-7354
50 m x 0.32 mm, 1.00 µm

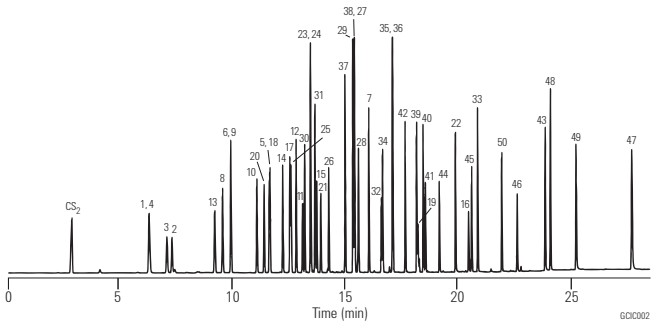
Carrier: Helium at 50 cm/sec,
measured at 40 °C

Oven: 40 °C for 5 min
40-230 °C at 10 °C/min
230 °C for 5 min

Injection: Split, 250 °C
Split ratio 1:5

Detector: FID, 250 °C
Nitrogen makeup gas at 35 mL/min

Sample: 1 µL of 0.15%
each solvent in CS_2



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal kit, 5188-5367

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

1. Methanol
2. Ethanol
3. Isopropanol
4. tert-Butanol
5. 2-Propen-1-ol (allyl alcohol)
6. 1-Propanol
7. 2-Propyn-1-ol (propargyl alcohol)
8. sec-Butanol
9. 2-Methyl-3-buten-2-ol
10. Isobutanol
11. 2-Methoxyethanol (methyl Cellosolve)
12. 3-Buten-1-ol
13. 2-Methyl-2-butanol (tert-amyl alcohol)
14. 1-Butanol
15. 2-Buten-1-ol (crotyl alcohol)
16. Ethylene glycol
17. 1-Penten-3-ol
18. 2-Pentanol
19. Glycidol
20. 3-Pentanol
21. 2-Ethoxyethanol (Cellosolve)
22. Propylene glycol
23. 3-Methyl-1-butanol (isoamyl alcohol)
24. 2-Methyl-1-butanol (active amyl alcohol)
25. 4-Methyl-2-pentanol
26. 1-Pentanol
27. 2-Penten-1-ol
28. 3-Methyl-2-buten-1-ol
29. Cyclopentanol
30. 3-Hexanol
31. 2-Hexanol
32. 4-Hydroxy-4-methyl-2-pentanone
33. Furfuryl alcohol
34. cis-3-Hexen-1-ol
35. cis-2-Hexen-1-ol
36. Cyclohexanol
37. 3-Heptanol
38. 2-Heptanol
39. 2-Butoxyethanol (butyl Cellosolve)
40. cis-4-Hepten-1-ol
41. trans-2-Hepten-1-ol
42. 1-Heptanol
43. Benzyl alcohol
44. 2-Ethyl-1-hexanol
45. 1-Octanol
46. 1-Nonanol
47. 2-Phenoxyethanol
48. a-Ethylphenethyl alcohol
49. b-Ethylphenethyl alcohol
50. 1-Decanol

Alcohols III

Column: **HP-InnoWax**
19095N-123
30 m x 0.53 mm, 1.00 µm

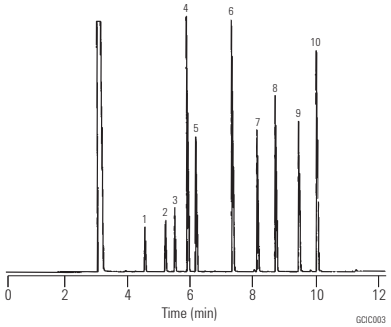
Carrier: Helium, 29 cm/sec, 3.0 psi (45 °C)

Oven: 45 °C for 1 min
45-150 °C at 10 °C/min
4 mL/min constant flow

Injection: Split, 250 °C
Split ratio 25:1

Detector: FID 250 °C

Sample: 1 µL

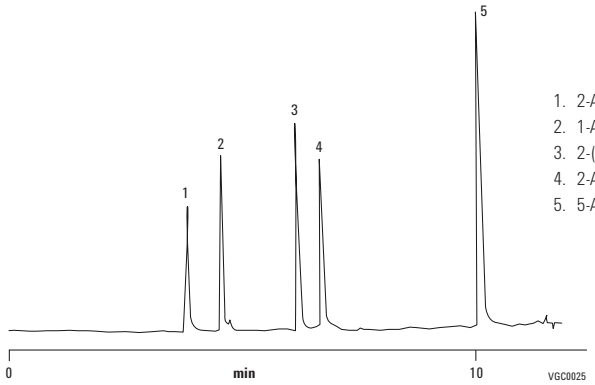


1. 1-Propanol
2. iso-Butanol
3. 3-Methyl-3-pentanol
4. 1-Butanol
5. 4-Methyl-2-pentanol
6. 1-Pentanol
7. 2-Ethyl-1-Butanol
8. 1-Hexanol
9. Cyclohexanol
10. 1-Heptanol

Analysis of Amino Alcohols in Water

Column: **CP-Sil 5 CB**
CP7640
50 m x 0.53 mm, 2.00 µm

Sample:	0.2 µL
Sample Conc:	1 ppm
Solvent:	Water
Carrier:	He, 0.7 mL/min, 70 kPa (0.7 bar, 9 psi)
Oven:	65 °C to 100 °C, 10 °C/min
Injection:	Splitless
Detector:	MS



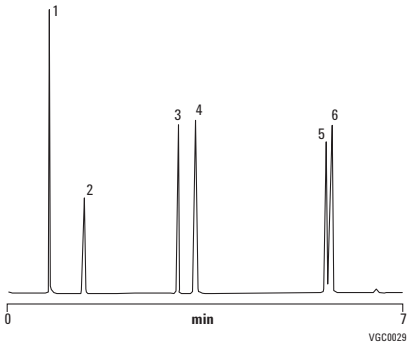
1. 2-Amino-ethanol
2. 1-Amino-2-propaol
3. 2-(Ethlamino)-ethanol
4. 2-Amino-1-butanol
5. 5-Amino-1-pentanol

Victor Berezkin and Aleksey B. Lapin, Institute of Petrochemical Synthesis, Russian Academy of Science, Moscow, Russia.

Amines and Alcohols

Column: **CP-Volamine**
CP7446
15 m x 0.32 mm,

Sample:	0.5 µL
Sample Conc:	1000 ppm, approx. 5 ng per component on the column
Solvent:	methanol
Carrier:	Helium, 50 pKa, 55 cm/s
Oven:	35 °C (0.5 min) to 240 °C, 30 °C/min
Injection:	Split
Detector:	MS



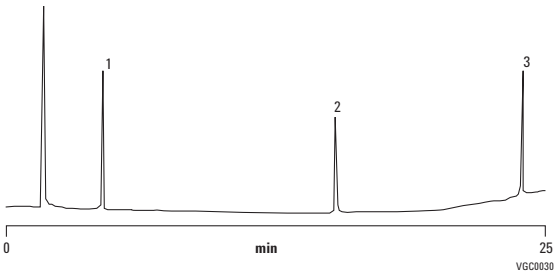
1. Methanol
2. IPA
3. Mono ethylene glycol
4. MMEA methyl monoethanolamine
5. Diethanolamine
6. MDEA methyl diethanolamine

Courtesy of J. Luong, Dow Chemical Canada

Analysis of Ethanolamines

Column: **CP-Sil 8 CB for Amines**
CP7596
30 m x 0.32 mm, 1.00 µm

Sample Conc:	5-10 ng per component on the column
Solvent:	methanol
Carrier:	Helium, 50 kPa (0.5 bar, 7 psi)
Oven:	60 °C (5 min) to 220 °C, 6 °C/min
Injection:	Split
Detector:	FID



1. MEA (mono-ethanolamine)
2. DEA (di-ethanolamine)
3. TEA (tri-ethanolamine)

Ethoxyethanol

Column: **HP-FFAP**
19095F-123
30 m x 0.53 mm, 1.00 µm

Carrier: Helium, 10 mL/min

Oven: 60 °C for 1 min
60-100 °C at 5 °C/min
100-210 °C at 10 °C/min

Injection: Split ratio 10:1

Detector: TCD

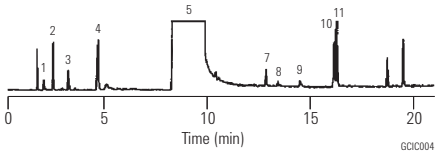
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Ethylene oxide
2. Ethyl formate
3. Ethyl alcohol
4. Water
5. 2-Ethoxyethanol
6. 2-Ethoxyethyl acetate
7. Hydroxy acetate
8. Acetic acid
9. Formic acid
10. Ethylene glycol/monoformate
11. Ethylene glycol/monoacetate

Organic Acids

Column: **DB-WAXetr**
125-7332
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 37 cm/sec,
measured at 40 °C

Oven: 125 °C for 5 min
125-180 °C at 15 °C/min
180 °C for 12 min

Injection: Split, 250 °C

Detector: FID, 250 °C

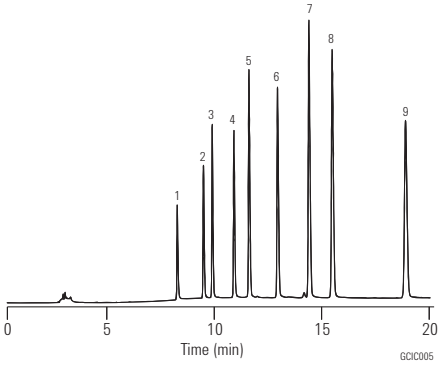
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Acetic acid
2. Propionic acid
3. Isobutyric acid
4. Butyric acid
5. Isovaleric acid
6. Valeric acid (pentanoic acid)
7. Isocaproic acid
8. Caproic acid (hexanoic acid)
9. Heptanoic acid

Free Organic Acids/C4-C5 Isomers

Column: **HP-INNOWax**
19091N-133
30 m x 0.25 mm, 0.25 µm

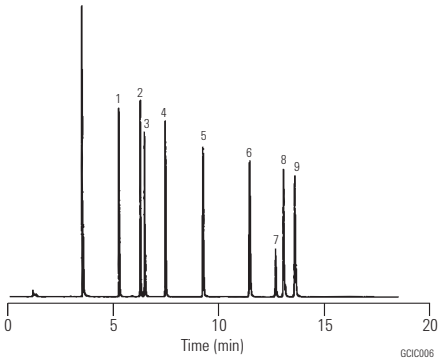
Carrier: Helium 42 cm/sec, 24 psi (120 °C)
1.8 mL/min constant flow

Oven: 110 °C for 1 min
110-133 at 2 °C/min
133-160 °C at 3 °C/min

Injection: Split, 250 °C
Split ratio 40:1

Detector: FID 300 °C

Sample: 1 µL



1. Isobutyric acid
2. Butyric acid
3. Valerolactone
4. 2-Methyl butyric acid
5. Valeric acid
6. 4-Pentenoic acid
7. trans-2-Methyl-2-butenoic acid
8. trans-3-Pentenoic acid
9. trans-2-Pentenoic acid

Volatile Amines

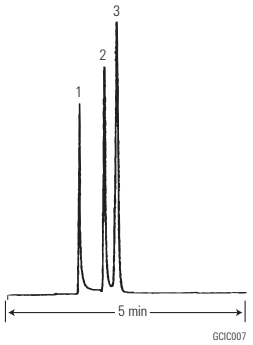
Column: **DB-1**
125-1035
30 m x 0.53 mm, 5.00 µm

Oven: 30 °C isothermal

Sampler: Headspace

Injection: Split ratio 1:10

Detector: FID
Nitrogen makeup gas at 30 mL/min



1. Methylamine
2. Dimethylamine
3. Trimethylamine

Trace Active Amines, 10 ng on-column

Column: **HP-5ms**
19091S-213
30 m x 0.32 mm, 1.00 µm

Carrier: Helium, constant pressure 9.79 psi

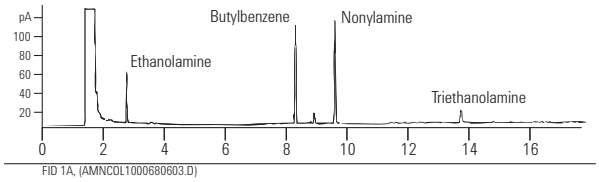
Oven: 75 °C for 0.5 min
75-250 °C at 10 °C/min
250-320 °C at 25 °C/min
320 °C for 5 min

Injection: On-column
Oven tracking mode

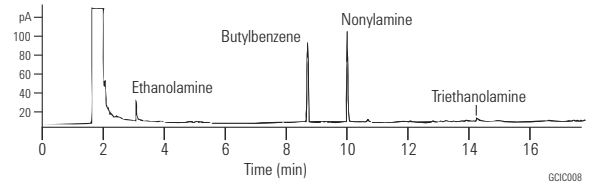
Detector: FID 300 °C

Sample: 0.5 µL of each standard in methanol

HP-5ms



Another 5% Phenyl Amines Column



Primary Amines

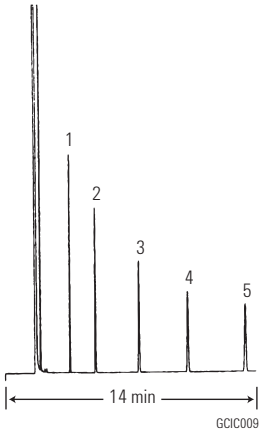
Column: **CAM**
112-2132
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 40 cm/sec

Oven: 110 °C isothermal

Injection: Split

Detector: FID
Nitrogen makeup gas at 30 mL/min



1. n-Octylamine
2. n-Nonylamine
3. n-Decylamine
4. Benylamine
5. Dicyclohexylamine

Polyethyleneamines

Column: **DB-5ms**
122-5536
30 m x 0.25 mm, 0.50 µm

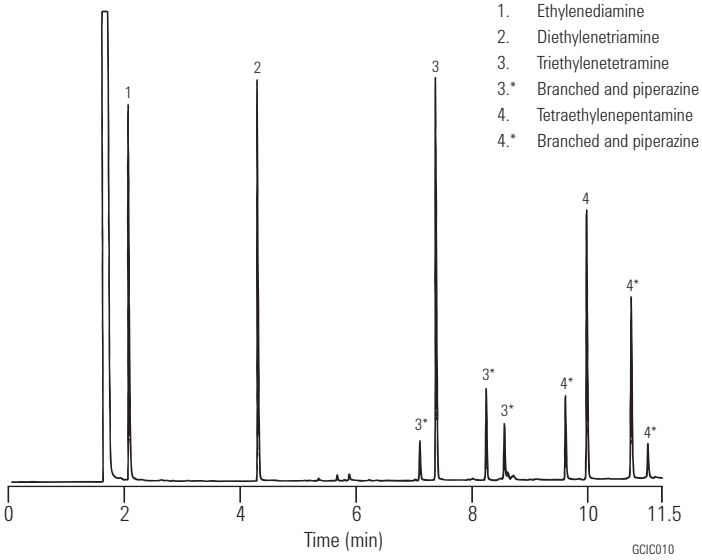
Carrier: Helium at 30 cm/sec, measured at 100 °C

Oven: 100 °C for 1 min
100-320 °C at 20 °C/min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 100 ng/µL standard in methanol



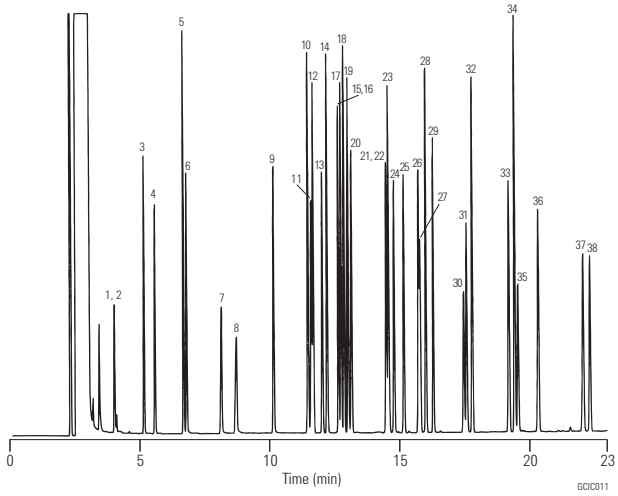
1. Ethylenediamine
2. Diethylenetriamine
3. Triethylenetetramine
3.* Branched and piperazine analogs of peak #3
4. Tetraethylenepentamine
4.* Branched and piperazine analogs of peak #4

Amines and Nitriles

Column:	**DB-5ms** **122-5536** **30 m x 0.25 mm, 0.50 µm**
Carrier:	Helium at 22 cm/sec, measured at 40 °C
Oven:	40 °C for 1 min 40-260 °C at 10 °C/min
Injection:	Split, 250 °C Split ratio 1:50
Detector:	FID, 300 °C Nitrogen makeup gas at 30 mL/min
Sample:	1 µL of 100 ng/µL standard in methanol

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Split, single taper, low pressure drop, glass wool, 5183-4647
Seal:	Gold plated seal, 18740-20885
Syringe:	5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Diethylamine
2. Propionitrile
3. Diisopropylamine
4. Triethylamine
5. Pyridine
6. Pyrimidine
7. Pyrazole
8. Acrylamide
9. Pyridazine
10. Aniline
11. 3-Bromopyridine
12. Benzonitrile
13. 3-Cyanopyridine
14. Benzylamine
15. n-Octylamine
16. 1-Methyl-2-pyrrolidine
17. N,N-Dimethylbenzylamine
18. Phenylethylamine
19. N-Benzylmethylamine
20. 2-Cyanopyridine
21. 2-Chloroaniline
22. n-Nonylamine
23. 2,4-Dimethylaniline
24. 4-Chlorobenzonitrile
25. 2,6-Dimethylaniline
26. 3-Chloroaniline
27. 4-Chloroaniline
28. N,N-Diethylaniline
29. n-Decylamine
30. 4-Bromoaniline
31. 3,4-Diaminotoluene
32. 2,6-Diethylaniline
33. 2-Nitroaniline
34. Dicyclohexylamine
35. 3,4-Dichloroaniline
36. 3-Nitroaniline
37. 4-Nitroaniline
38. Diphenylaniline

Amines in Water

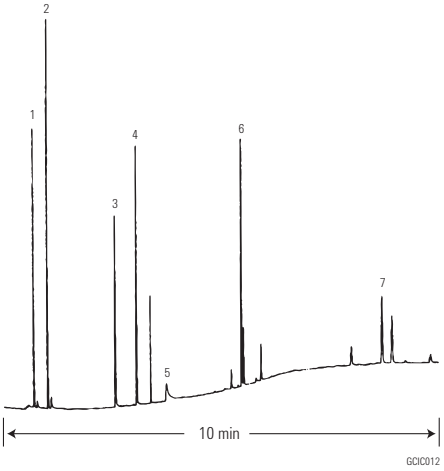
Column: **CAM**
112-2132
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 38 cm/sec

Oven: 120-220 °C at 10 °C/min

Injection: Split

Detector: FID
Nitrogen makeup gas at 30 mL/min



1. Ethylenediamine
2. Piperazine
3. Diethylenetriamine
4. N-(2-Aminoethyl) piperazine
5. Aminoethylethanolamine
6. Triethylenetetramine (4 isomers)
7. Tetraethylenepentamine (4 isomers)

Aldehydes and Acids

Column: **HP-INNOWax**
19091N-213
30 m x 0.32 mm, 0.50 µm

Carrier: Helium, 40 cm/sec, 11.7 psi (60 °C)

Oven: 60 °C for 1 min
60-250 °C at 10 °C/min
2.5 mL/min constant flow

Injection: Split, 250 °C
Split ratio 40:1

Detector: FID 275 °C

Sample: 0.5 µL

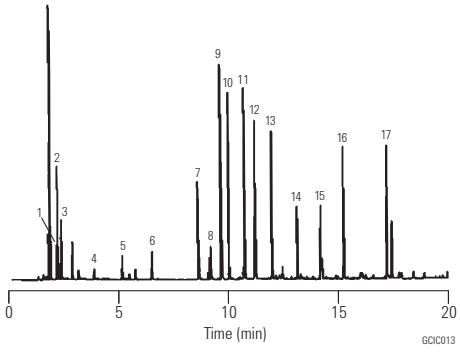
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Butanal
2. 2-Methyl butanal
3. Pentanal
4. Hexanal
5. Heptanal
6. Octanal
7. Acetic acid
8. Decanal
9. Propanoic acid
10. iso-Butyric acid
11. Butyric acid
12. iso-Valeric acid
13. Valeric acid
14. Hexanoic acid
15. Heptanoic acid
16. Octanoic acid
17. Decanoic acid

Aldehydes and Ketones

Column: **DB-1**
123-1034
30 m x 0.32 mm, 3.00 µm

Column: **DB-WAX**
123-7033
30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 32 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-210 °C at 10 °C/min 40 °C for 5 min
40-210 °C at 10 °C/min

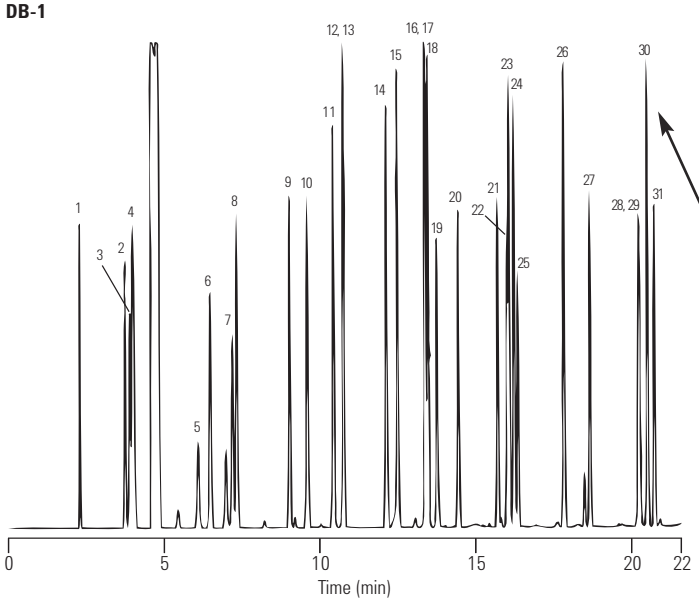
Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

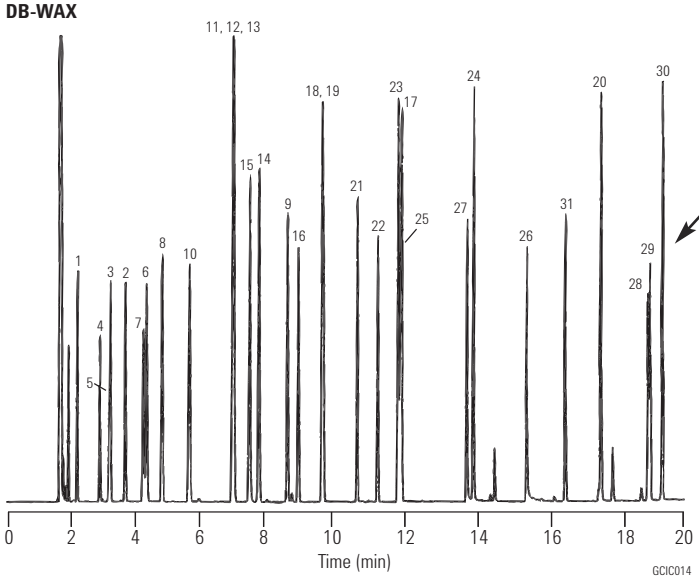
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Split, single taper, low pressure drop, glass wool, 5183-4647
Seal: Gold plated seal, 18740-20885
Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

DB-1



DB-WAX



DB-1 provides the best overall resolution; however, DB-WAX provides better resolution of o- and m-tolualdehyde.

1. Acetaldehyde
2. Acrolein
3. Acetone
4. Propionaldehyde
5. Isobutyraldehyde
6. Methacrolein
7. Butyraldehyde
8. 2-Butanone (MEK)
9. Crotonaldehyde
10. 3-Methyl-2-butanone
11. 2-Pentanone
12. 3-Pentanone
13. Valeraldehyde (pentanal)
14. 4-Methyl-2-pentanone (MIBK)
15. 2-Methyl-3-pentanone
16. 3-Hexanone
17. Cyclopentanone
18. 2-Hexanone
19. Hexanal
20. Furfural
21. 4-Heptanone
22. 3-Heptanone
23. 2-Heptanone
24. Cyclohexanone
25. Heptanal
26. Benzaldehyde
27. Octyl aldehyde
28. o-Tolualdehyde
29. m-Tolualdehyde
30. p-Tolualdehyde
31. Nonyl aldehyde

Formaldehyde Underivatized

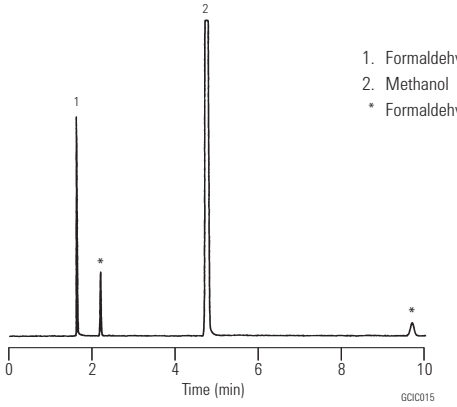
Column: **DB-WAX**
123-7033
30 m x 0.32 mm, 0.50 µm

Carrier: Helium at 36 cm/sec, measured at 35 °C

Oven: 35 °C isothermal

Injection: Split, 200 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min



1. Formaldehyde
2. Methanol
* Formaldehyde by-products

DNPH Derivative

Column: **DB-1**
123-1012
15 m x 0.32 mm, 0.25 µm

Carrier: Helium at 35 cm/sec, measured at 150 °C

Oven: 150-250 °C at 20 °C/min

Injection: Split, 300 °C
Split ratio 1:100

Detector: ECD, 375 °C
Nitrogen makeup gas at 35 mL/min

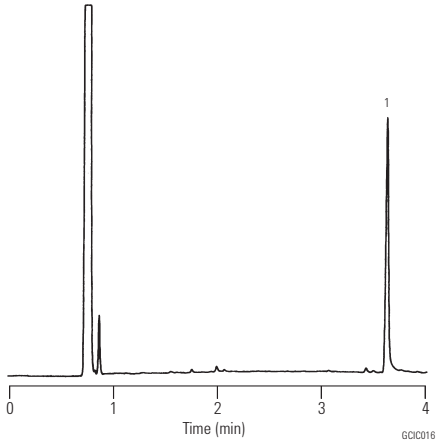
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Formaldehyde-DNPH

PFBHA Derivative

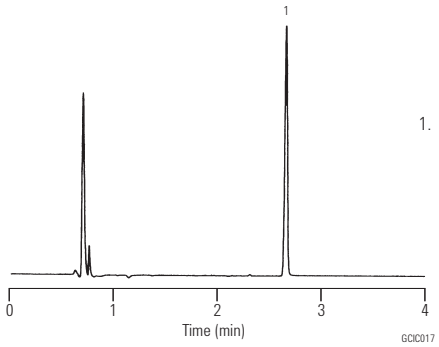
Column: **DB-1**
123-1012
15 m x 0.32 mm, 0.25 µm

Carrier: Helium at 40 cm/sec, measured at 60 °C

Oven: 60-100 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 375 °C
Nitrogen makeup gas at 35 mL/min



1. Formaldehyde-PFBHA

Aromatics I

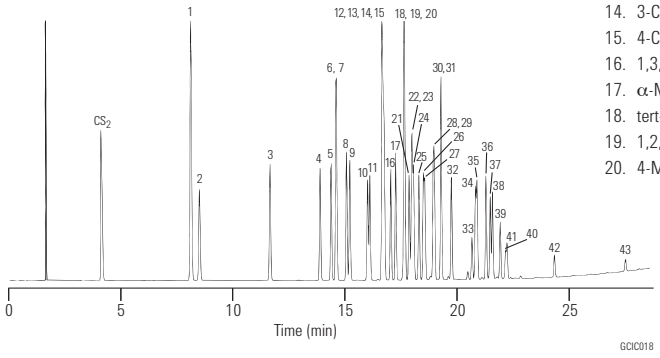
Column: **DB-1**
125-1034
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min



1. Benzene
2. Fluorobenzene
3. Toluene
4. Chlorobenzene
5. Ethylbenzene
6. m-Xylene
7. p-Xylene
8. Styrene
9. o-Xylene
10. Isopropylbenzene (cumene)
11. Bromobenzene
12. Propylbenzene
13. 2-Chlorotoluene
14. 3-Chlorotoluene
15. 4-Chlorotoluene
16. 1,3,5-Trimethylbenzene (mesitylene)
17. α-Methylstyrene
18. tert-Butylbenzene
19. 1,2,4-Trimethylbenzene (pseudocumene)
20. 4-Methylstyrene
21. 1,3-Dichlorobenzene
22. 1,4-Dichlorobenzene
23. Isobutylbenzene
24. sec-Butylbenzene
25. 1,2,3-Trimethylbenzene (hemimellitene)
26. 1,2-Dichlorobenzene
27. Iodobenzene
28. Styrene oxide
29. Butylbenzene
30. 4-Chlorostyrene
31. Nitrobenzene
32. 4-tert-Butyltoluene
33. 1,3,5-Trichlorobenzene
34. 2-Nitrotoluene
35. 1,3-Diisopropylbenzene
36. 1,4-Diisopropylbenzene
37. 1,2,4-Trichlorobenzene
38. 3-Nitrotoluene
39. 4-Nitrotoluene
40. 1,2,3-Trichlorobenzene
41. 1-Chloro-4-nitrobenzene
42. 1,2,4,5-Tetrachlorobenzene
43. Pentachlorobenzene

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Aromatics II

Column: **DB-WAX**
125-7032
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 30 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-230 °C at 10 °C/min
230 °C for 7 min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

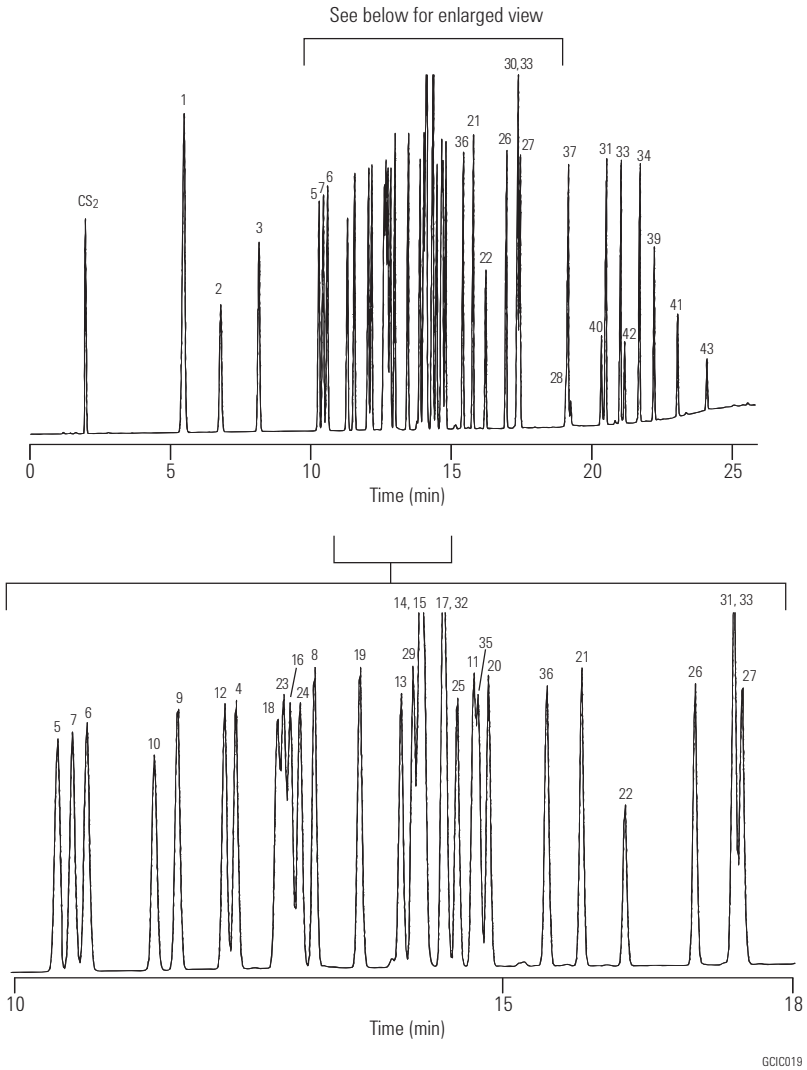
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Benzene
2. Fluorobenzene
3. Toluene
4. Chlorobenzene
5. Ethylbenzene
6. m-Xylene
7. p-Xylene
8. Styrene
9. o-Xylene
10. Isopropylbenzene (cumene)
11. Bromobenzene
12. Propylbenzene
13. 2-Chlorotoluene
14. 3-Chlorotoluene
15. 4-Chlorotoluene
16. 1,3,5-Trimethylbenzene (mesitylene)
17. α-Methylstyrene
18. tert-Butylbenzene
19. 1,2,4-Trimethylbenzene (pseudocumene)
20. 4-Methylstyrene
21. 1,3-Dichlorobenzene
22. 1,4-Dichlorobenzene
23. Isobutylbenzene
24. sec-Butylbenzene
25. 1,2,3-Trimethylbenzene (hemimellitene)
26. 1,2-Dichlorobenzene
27. Iodobenzene
28. Styrene oxide (peak not shown)
29. Butylbenzene
30. 4-Chlorostyrene
31. Nitrobenzene
32. 4-tert-Butyltoluene
33. 1,3,5-Trichlorobenzene
34. 2-Nitrotoluene
35. 1,3-Diisopropylbenzene
36. 1,4-Diisopropylbenzene
37. 1,2,4-Trichlorobenzene
38. 3-Nitrotoluene
39. 4-Nitrotoluene
40. 1,2,3-Trichlorobenzene
41. 1-Chloro-4-nitrobenzene
42. 1,2,4,5-Tetrachlorobenzene
43. Pentachlorobenzene

Impurities in Styrene

Column: **DB-WAXetr**
123-7363
60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 29.4 cm/sec, measured at 70 °C

Oven: 80 °C isothermal

Injection: Split, 230 °C
Split ratio 1:150

Detector: FID, 240 °C

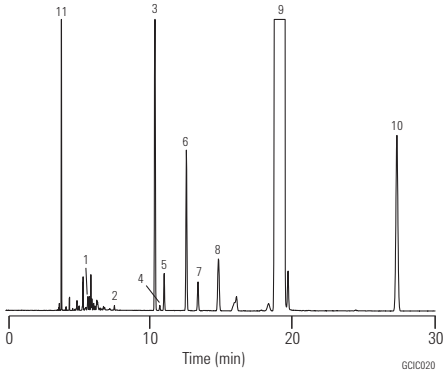
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Benzene
2. Toluene
3. Ethylbenzene
4. p-Xylene
5. m-Xylene
6. Isopropylbenzene
7. o-Xylene
8. n-Propylbenzene
9. Styrene
10. α-Methylstyrene
11. Heptane (IS)

Impurities in Ethylbenzene

Column: **HP-INNOWax**
19091N-216
60 m x 0.32 mm, 0.50 µm

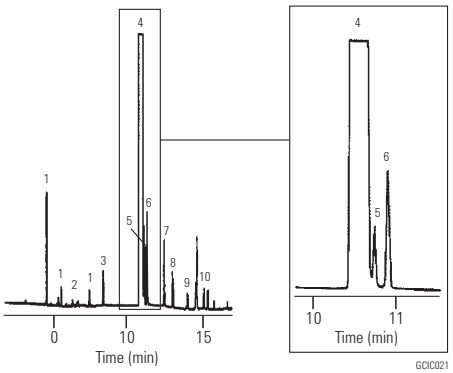
Carrier: Helium, 32 cm/sec, 19.9 psi (60 °C)
2.5 mL/min constant flow

Oven: 60 °C for 1 min
60-92 °C at 4 °C/min
92 °C for 4.5 min
92-220 °C at 20 °C/min

Injection: Split, 220 °C
Split ratio 100:1
ASTM Method D5060

Detector: FID 270 °C

Sample: 0.5 µL
Neat, 99%+



1. Hydrocarbon
2. Benzene
3. Toluene
4. Ethylbenzene
5. p-Xylene
6. m-Xylene
7. Cumene
8. o-Xylene
9. Propylbenzene
10. Styrene

Pyrolysates of Polystyrene

Column: **ULTRA 1**
19091A-105
50 m x 0.20 mm, 0.33 µm

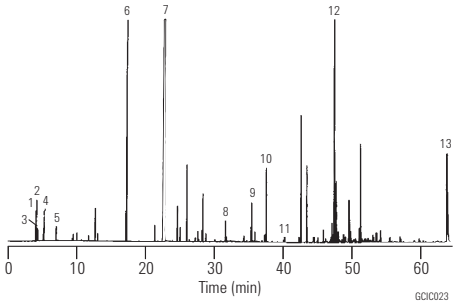
Carrier: Helium, 30 psi, 12 mL/min

Oven: 0-280 at 5 °C/min

Injection: Split, 280 °C
Split ratio 30:1
Pyrolyzer 600 °C

Detector: FID 300 °C

Sample: 100 mg pyrolyzed



1. Propylene
2. Propane
3. 1-Butene
4. Butene
5. Pentane
6. Toluene
7. Styrene
8. C_2H_5-C(Ph) = CH_2
9. C_4H_9-CH_2CH_2-Ph
10. C_4H_9-C(Ph) = CH_2
11. C_4H_9-CH=C(Ph)CH_3
12. Styrene dimer
13. Styrene trimer

Esters I

Column: **DB-1**
125-1034
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

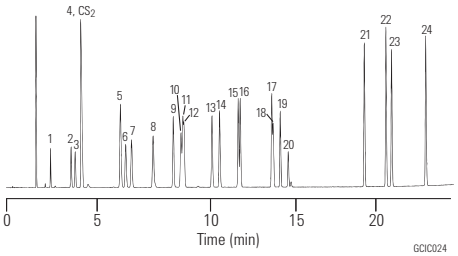
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Methyl formate
2. Ethyl formate
3. Methyl acetate
4. Vinyl acetate
5. Ethyl acetate
6. Propyl formate
7. Methyl propionate
8. Isopropyl acetate
9. Ethyl acrylate
10. tert-Butyl acetate
11. Ethyl propionate
12. Propyl acetate
13. sec-Butyl acetate
14. Isobutyl acetate
15. Propyl propionate
16. Butyl acetate
17. Isoamyl acetate
18. Amyl acetate
19. 2-Ethoxyethyl acetate
20. 2-Methylbutyl acetate
21. Methyl benzoate
22. Benzyl acetate
23. Ethyl benzoate
24. Propyl benzoate

Esters II

Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min
260 °C for 3 min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

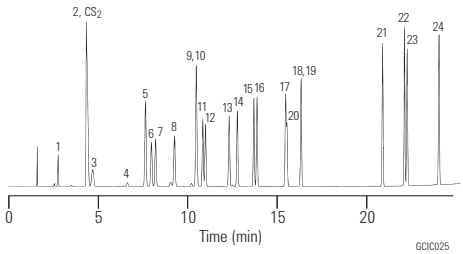
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Methyl formate
2. Ethyl formate
3. Methyl acetate
4. Vinyl acetate
5. Ethyl acetate
6. Propyl formate
7. Methyl propionate
8. Isopropyl acetate
9. Ethyl acrylate
10. tert-Butyl acetate
11. Ethyl propionate
12. Propyl acetate
13. sec-Butyl acetate
14. Isobutyl acetate
15. Propyl propionate
16. Butyl acetate
17. Isoamyl acetate
18. Amyl acetate
19. 2-Ethoxyethyl acetate
20. 2-Methylbutyl acetate
21. Methyl benzoate
22. Benzyl acetate
23. Ethyl benzoate
24. Propyl benzoate

Esters III

Column: **HP-InnoWax**
19095N-123
30 m x 0.53 mm, 1.00 µm

Carrier: Helium 29 cm/sec, 3.0 psi (45 °C)
4 mL/min constant flow

Oven: 45 °C for 1 min
45-200 °C at 5 °C/min

Injection: Split, 250 °C
Split ratio 25:1

Detector: FID 250 °C

Sample: 1 µL

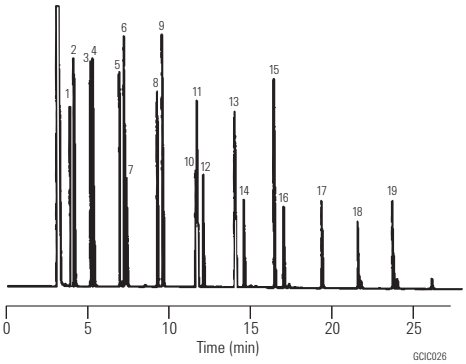
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Ethyl propionate
2. Propyl acetate
3. Ethyl butyrate
4. Propyl propionate
5. Propyl butyrate
6. Ethyl valerate
7. Butyl propionate
8. Propyl valerate
9. Ethyl caproate
10. Butyl valerate
11. Propyl caproate
12. Methyl decanoate
13. Butyl caproate
14. Methyl dodecanoate
15. Butyl heptanoate
16. Methyl tetradecanoate
17. Methyl hexadecanoate
18. Methyl octadecanoate
19. Methyl eicosenoate

Ethers

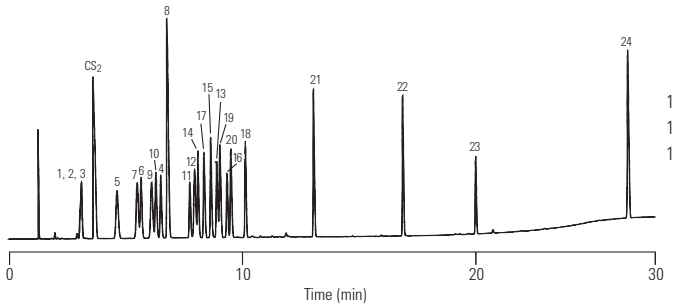
Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min
260 °C for 3 min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min



GCIC027

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Furan
2. Ethyl vinyl ether
3. Ethyl ether
4. 1,3-Dioxalane
5. Methyl-tert-butyl ether (MTBE)
6. Allyl ethyl ether
7. Isopropyl ether
8. Tetrahydrofuran (THF)
9. tert-Amyl methyl ether
10. Butyl methyl ether
11. Glyme (propylene glycol dimethyl ether)
12. tert-Amyl methyl ether
13. Diglyme (diethylene glycol dimethyl ether)
14. Propyl ether
15. Allyl ether
16. 1,4-Dioxane
17. Butyl ethyl ether
18. Epichlorohydrin
19. Tetrahydropyran
20. Acetal (acetaldehyde diethyl acetal)
21. Butyl ether
22. Pentyl ether
23. Triglyme (triethylene glycol dimethyl ether)
24. Benzyl ether

Glycols I

Column: **DB-WAX**
124-7032
30 m x 0.45 mm, 0.85 µm

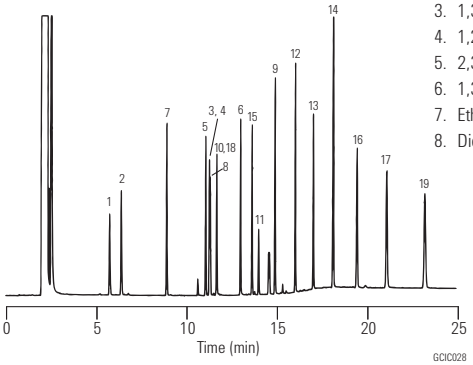
Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 2 min
50-220 °C at 10 °C/min

Injection: Megabore Direct, 250 °C

Detector: FID, 280 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL



GCIC028

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Ethylene glycol monomethyl ether
2. Ethylene glycol monoethyl ether
3. 1,3-Propanediol
4. 1,2-Propanediol (propylene glycol)
5. 2,3-Butanediol
6. 1,3-Butanediol
7. Ethylene glycol monobutyl ether
8. Diethylene glycol monomethyl ether
9. 1,4-Butanediol
10. Diethylene glycol monoethyl ether
11. Dipropylene glycol
12. 1,5-Pentanediol
13. 1,6-Hexanediol
14. 1,7-Heptanediol
15. Diethylene glycol monobutyl ether
16. 1,8-Octanediol
17. 1,9-Nonanediol
18. Ethylene glycol
19. 1,10-Decanediol

Glycols II

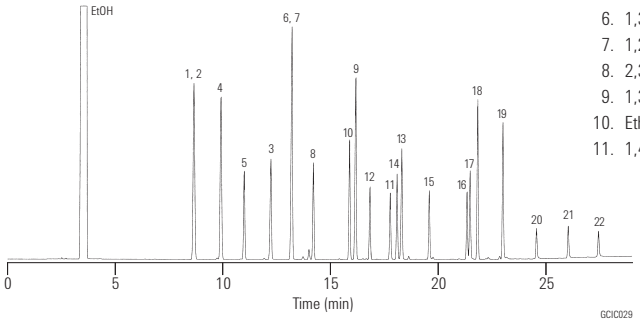
Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min
260 °C for 3 min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Ethylene glycol monomethyl ether
2. Glyme
3. Ethylene glycol
4. Diglyme
5. Ethylene glycol monoethyl ether
6. 1,3-Propanediol
7. 1,2-Propanediol (propylene glycol)
8. 2,3-Butanediol
9. 1,3-Butanediol
10. Ethylene glycol monobutyl ether
11. 1,4-Butanediol
12. Diethylene glycol monomethyl ether
13. Diethylene glycol
14. Diethylene glycol monoethyl ether
15. 1,5-Pentanediol
16. 1,6-Hexanediol
17. Diethylene glycol monobutyl ether
18. Triglyme
19. 1,7-Heptanediol
20. 1,8-Octanediol
21. 1,9-Nonanediol
22. 1,10-Decanediol

Glycols III

Column: **DB-1**
124-1032
30 m x 0.45 mm, 1.27 µm

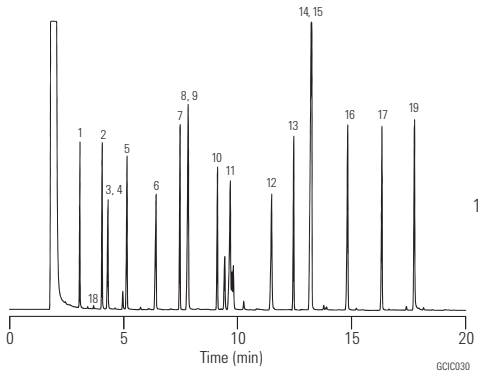
Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 2 min
50-260 °C at 10 °C/min

Injection: Split, 250 °C

Detector: FID, 280 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Ethylene glycol monomethyl ether
2. Ethylene glycol monoethyl ether
3. 1,3-Propanediol
4. 1,2-Propanediol
5. 2,3-Butanediol
6. 1,3-Butanediol
7. Ethylene glycol monobutyl ether
8. Diethylene glycol monomethyl ether
9. 1,4-Butanediol
10. Diethylene glycol monoethyl ether
11. Dipropylene glycol
12. 1,5-Pentanediol
13. 1,6-Hexanediol
14. 1,7-Heptanediol
15. Diethylene glycol monobutyl ether
16. 1,8-Octanediol
17. 1,9-Nonanediol
18. Ethylene glycol
19. 1,10-Decanediol

Triethylene Glycol and Impurities

Column: **DB-1**
124-1032
30 m x 0.45 mm, 1.27 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 170 °C isothermal

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 280 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.5 µL

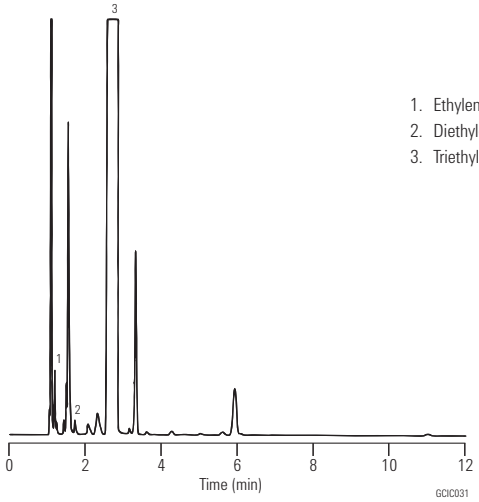
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Ethylene glycol
2. Diethylene glycol
3. Triethylene glycol

Ethylene Glycol Mixture

Column: **ULTRA 1**
19091A-101
12 m x 0.20 mm, 0.33 µm

Carrier: Helium, 25 cm/sec

Oven: 100 °C for 0.5 min
100-200 °C at 20 °C/min

Injection: Split, 250 °C
Split ratio 100:1

Detector: FID

Sample: 1 µL

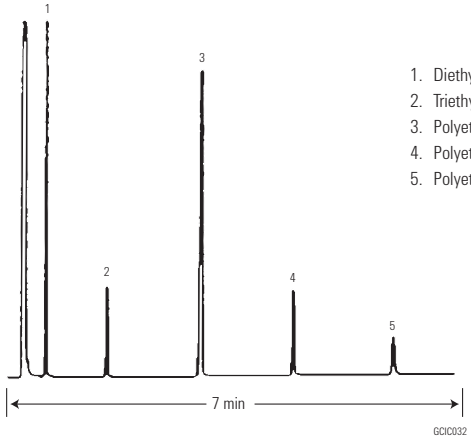
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Liner, splitless, single-taper, glass wool, deactivated, 5062-3587

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Diethylene glycol
2. Triethylene glycol
3. Polyethylene glycol 200
4. Polyethylene glycol 400
5. Polyethylene glycol 600

Glycols/Diols

Column: **HP-1**
19095Z-023
30 m x 0.53 mm, 0.88 µm

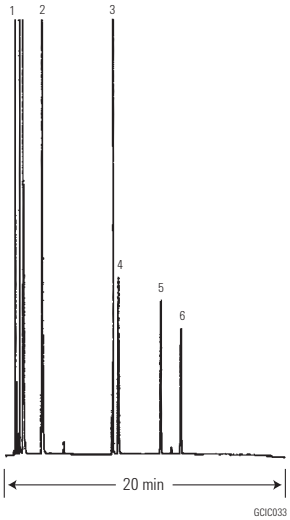
Carrier: Helium

Oven: 50 °C for 3 min
50-180 °C at 8 °C/min

Injection: On-column

Detector: FID 250 °C

Sample: 1 µL



1. Ethylene glycol
2. 1,3-Butanediol
3. Ethylene glycol phenyl ether
4. 1,7-Hepatanediol
5. 1,9-Nonanediol
6. 1,10-Decanediol

Halogenated Hydrocarbons II

Column: **DB-1**
123-1034
30 m x 0.32 mm, 3.00 µm

Carrier: Helium at 35 cm/sec, measured at 35 °C

Oven: 35 °C for 5 min
35-245 °C at 10 °C/min
245 °C for 2 min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: In pentane

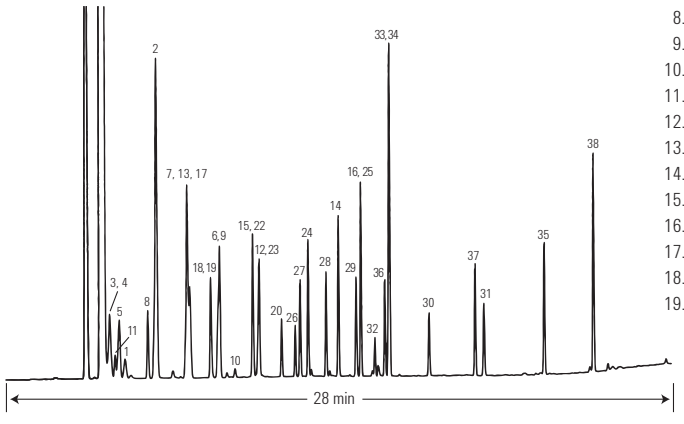
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. 1,1,2-Trichlorotrifluoroethane (Freon-113)
2. 1,1-Dichloroethene
3. Bromoethane (ethyl bromide)
4. Iodomethane
5. 3-Chloropropene (allyl chloride)
6. 1-Chlorobutane
7. 2,2-Dichloropropane
8. trans-1,2-Dichloroethene
9. 1,1,1-Trichloroethane
10. Carbon tetrachloride
11. Methylene chloride
12. Trichloroethene
13. Chloroform
14. Tetrachloroethene
15. 1,2-Dichloropropane
16. 1-Chlorohexane
17. Bromochloromethane
18. 1,1-Dichloroethane
19. 1,2-Dichloroethane
20. Iodoform
21. cis-1,3-Dichloropropene
22. Dibromomethane
23. Bromodichloromethane
24. 1,3-Dichloropropane
25. 1,1-Dichloropropane
26. trans-1,3-Dichloropropene
27. 1,1,2-Trichloroethane
28. 1,2-Dibromoethane (EDB)
29. 1,1,1,2-Tetrachloroethane
30. Pentachloroethane
31. Hexachloroethane
32. Bromoform
33. trans-1,4-Dichloro-2-butene
34. 1,2,3-Trichloropropane
35. Hexachlorobutadiene
36. 1,1,2,2-Tetrachloroethane
37. 1,2-Dibromo-3-chloropropane (DBCP)
38. Hexachlorocyclopentadiene

Chlorinated Isooctane

Column: **HP-INNOWax**
19091N-136
60 m x 0.25 mm, 0.25 µm

Carrier: Helium, 33 cm/sec, 35.7 psi (80 °C) 2 mL/min

Oven: 80 °C isothermal

Injection: Split, 250 °C
Split ratio 150:1

Detector: FID 300 °C

Sample: Monochloro isomers, 0.5 µL

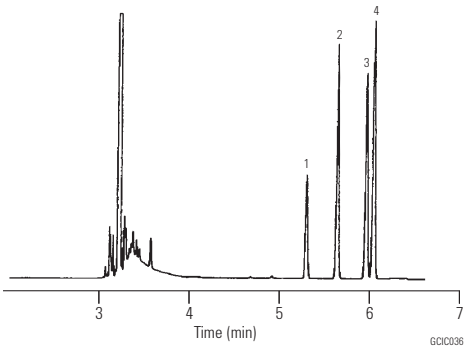
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. 1-Chloro isooctane
2. 4-Chloromethyl 2,2'-dimethyl pentane
3. 3-Chloro isooctane
4. 4-Chloro isooctane

Solvents I

Column: **DB-WAXetr**
125-7332
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40 °C

Oven: 40 °C for 5 min
40-140 °C at 5 °C/min

Injection: Split, 250 °C

Detector: FID, 250 °C

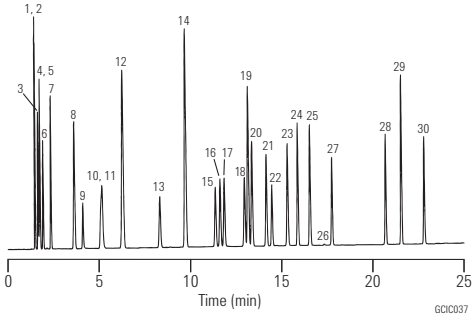
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. 3-Methylpentane
2. Hexane
3. Isooctane
4. Methyl-tert-butyl ether (MTBE)
5. Heptane
6. Cyclohexane
7. Octane
8. Nonane
9. Methanol
10. Ethanol
11. Benzene
12. Decane
13. Toluene
14. Undecane
15. Ethylbenzene
16. p-Xylene
17. m-Xylene
18. Cumene
19. Dodecane
20. o-Xylene
21. Propylbenzene
22. Chlorobenzene
23. Mesitylene
24. Styrene
25. 1,2,4-Trimethylbenzene
26. Naphthalene
27. 4-Chlorotoluene
28. 1,3-Dichlorobenzene
29. 1,4-Dichlorobenzene
30. 1,2-Dichlorobenzene

Solvents II

Column: **DB-WAXetr**
123-7354
50 m x 0.32 mm, 1.00 µm

Carrier: Helium at 41 cm/sec, measured at 50 °C

Oven: 50 °C for 5 min
50-170 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 280 °C
Nitrogen makeup gas at 30 mL/min

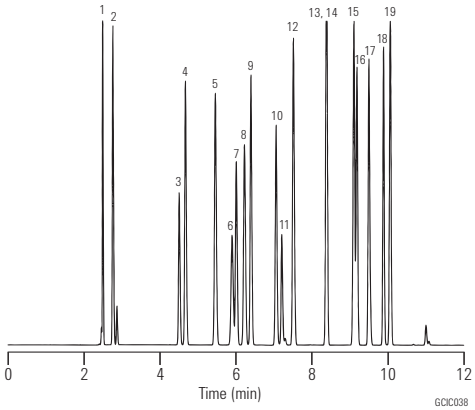
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Hexane
2. Isooctane
3. Acetone
4. Ethyl formate
5. Tetrahydrofuran
6. Trichloroethane
7. Ethyl acetate
8. Isopropyl acetate
9. Methyl ethyl ketone
10. Isopropyl alcohol
11. Methylene chloride
12. Benzene
13. 2-Pentanone
14. Methyl isobutyl ketone
15. Isobutyl acetate
16. Chloroform
17. sec-Butyl alcohol
18. Toluene
19. n-Propanol

Solvents III

Column: **DB-200**
122-2033
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 31 cm/sec

Oven: 45 °C for 7 min
45-145 °C at 20 °C/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.5 µL of 0.5-1.0 µg/µL
standard in water

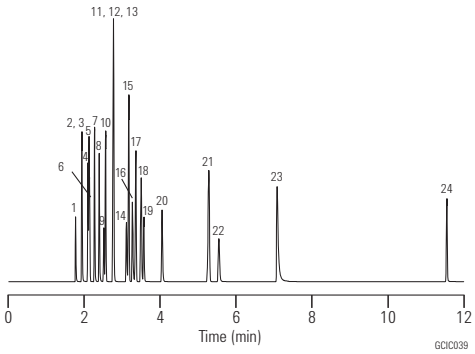
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Methanol
2. Ethanol
3. Ethyl ether
4. Isopropanol
5. n-Hexane
6. Methylene chloride
7. tert-Butanol
8. n-Propanol
9. Chloroform
10. Cyclohexane
11. sec-Butanol
12. n-Heptane
13. Acetone
14. Acetonitrile
15. Benzene
16. Tetrahydrofuran (THF)
17. Trichloroethylene
18. n-Butanol
19. Ethyl acetate
20. Methyl ethyl ketone (MEK)
21. Toluene
22. 1,4-Dioxane
23. Pyridine
24. Dimethylformamide (DMF)

Solvents IV

Column: **HP-1**
19091Z-205
50 m x 0.20 mm, 0.50 µm

Carrier: Helium, 30 psi

Oven: 70-200 °C at 5 °C/min
200 °C for 2 min

Injection: Split

Detector: TCD

Sample: 1 µL

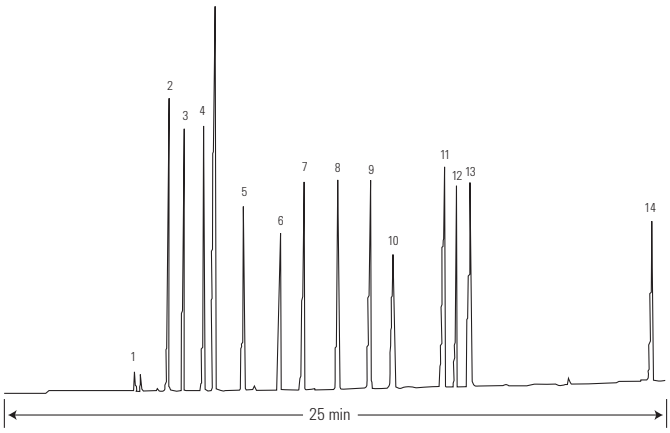
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Isopropanol
2. Methyl ethyl ketone
3. Ethyl acetate
4. n-Butyl alcohol
5. Ethyl cellosolve
6. Methyl isobutyl ketone
7. Toluene
8. n-Butyl acetate
9. Diacetone alcohol
10. p-Xylene
11. Cellosolve acetate
12. o-Xylene
13. Butyl cellosolve
14. Butyl cellosolve acetate

Common Industrial Solvents

Column: **HP-1**
19091Z-212
25 m x 0.32 mm, 1.05 µm

Carrier: Helium, 35 kPa

Oven: 30-140 °C at 10 °C/min

Injection: Split ratio 200:1

Detector: IRD, 200 °C

Sample: 1 µL

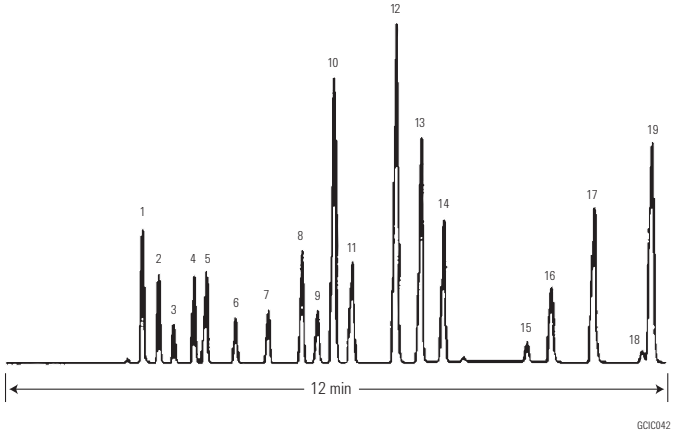
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Methanol
2. Methyl formate
3. Ethanol
4. Acetone
5. Isopropanol
6. Dichloromethane
7. n-Propanol
8. Methyl ethyl ketone
9. sec-Butanol
10. Ethyl acetate
11. Isobutanol
12. Isopropyl acetate
13. Nitropropane
14. 1,4-Dioxane
15. Toluene
16. Mesityl oxide
17. Diacetone-alcohol
18. m-Xylene
19. Cyclohexanone

Analysis of Solvents

Column: **PoraBOND Q**
CP7354
25 m x 0.53 mm, 10.00 µm

Sample: 5 µL

Sample Conc: 0.1% per compound

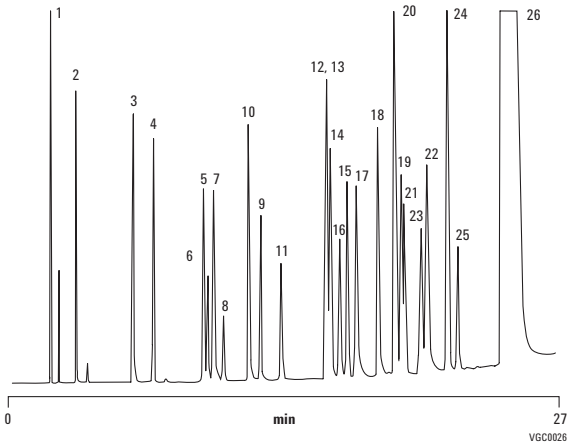
Solvent: DMSO

Carrier: He, 25 kPa (0.25 bar, 3.5 psi)

Oven: 100 °C (2 min) to 300 °C, 5 °C/min

Injection: Split, T=250 °C

Detector: FID, T=250 °C



1. Methane
2. Methanol
3. Ethanol
4. Acetonitrile
5. Acetone
6. Dichloromethane
7. 2-Propanol
8. Dimethyl sulfide
9. Diethyl ether
10. 1-propanol
11. Pentane
12. 2-Butanone
13. Trichloromethane
14. Tetrahydofuran
15. Ethyl acetate
16. 2-Methoxyethanol
17. Isobutanol
18. Butanol
19. Hexane
20. Benzene
21. Trichloroethylene
22. Cyclohexane
23. 1,4-Dioxane
24. Pyridine
25. N,N-dimethylformamide
26. Dimethyl sulfoxide

Nitrogen Based Solvents I

Column: **DB-1**
125-1034
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

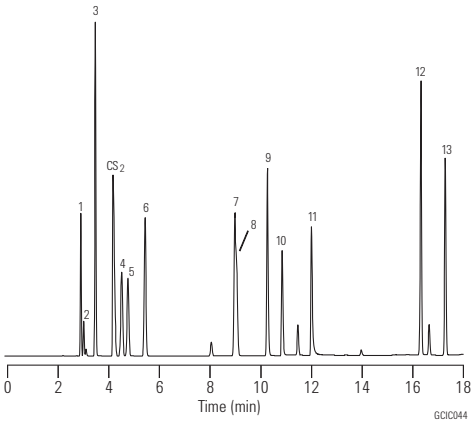
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Acetonitrile
2. Acrolein
3. Acrylonitrile
4. Propionitrile
5. Methacrolein
6. Methacrylonitrile
7. Triethylamine
8. Ethyl acrylate
9. Pyridine
10. DMF (dimethylformamide)
11. DMSO (dimethyl sulfoxide)
12. Benzonitrile
13. 1-Methyl-2-pyrrolidinone

Nitrogen Based Solvents II

Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 30 cm/sec,
measured at 40 °C

Oven: 40 °C for 5 min
40-260 °C at 10 °C/min
260 °C for 3 min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

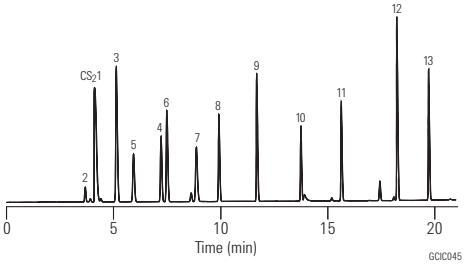
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Acetonitrile
2. Acrolein
3. Acrylonitrile
4. Propionitrile
5. Methacrolein
6. Methacrylonitrile
7. Triethylamine
8. Ethyl acrylate
9. Pyridine
10. DMF (dimethylformamide)
11. DMSO (dimethyl sulfoxide)
12. Benzonitrile
13. 1-Methyl-2-pyrrolidinone

Acrylate Impurities I

Column: **DB-200**
125-2032
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 34.5 cm/sec
measured at 35 °C

Oven: 35 °C for 5 min,
35-200 °C at 10 °C/min

Injection: Split, 230 °C
Split ratio 1:10

Detector: FID, 250 °C

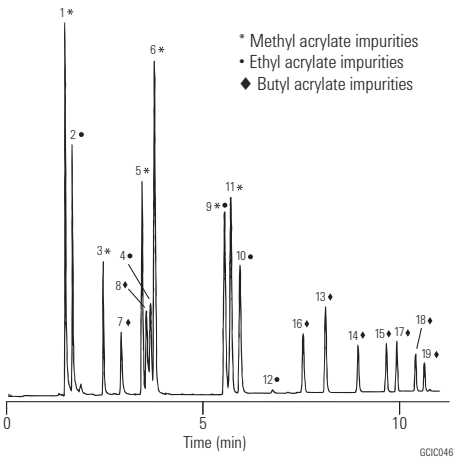
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Methanol
2. Ethanol
3. Methyl acetate
4. Ethyl acetate
5. Methyl acrylate
6. Methyl propionate
7. Isobutanol
8. Butanol
9. Ethyl acrylate
10. Ethyl propionate
11. Methyl methacrylate
12. Isopropyl acrylate
13. Isobutyl acetate
14. Butyl acetate
15. Isobutyl acrylate
16. Dibutyl ether
17. Isobutyl propionate
18. Butyl acrylate
19. Butyl propionate

Acrylate Impurities II

Column: **DB-1701**
125-0732
30 m x 0.53 mm, 1.00 µm

Carrier: Helium at 36.8 cm/sec
measured at 35 °C

Oven: 35 °C for 5 min,
35-200 °C at 10 °C/min

Injection: Split, 230 °C
Split ratio 1:10

Detector: FID, 250 °C

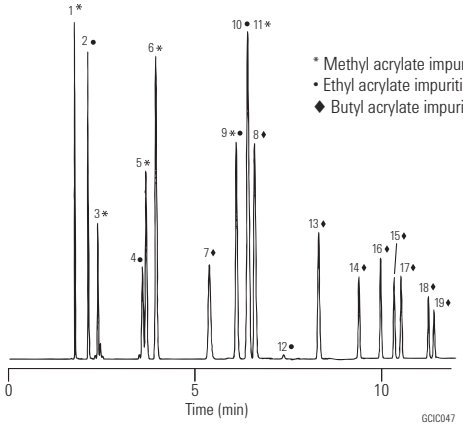
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. Methanol
2. Ethanol
3. Methyl acetate
4. Ethyl acetate
5. Methyl acrylate
6. Methyl propionate
7. Isobutanol
8. Butanol
9. Ethyl acrylate
10. Ethyl propionate
11. Methyl methacrylate
12. Isopropyl acrylate
13. Isobutyl acetate
14. Butyl acetate
15. Isobutyl acrylate
16. Dibutyl ether
17. Isobutyl propionate
18. Butyl acrylate
19. Butyl propionate

Acrylates

Column: **HP-FFAP**
19095F-121
10 m x 0.53 mm, 1.00 µm

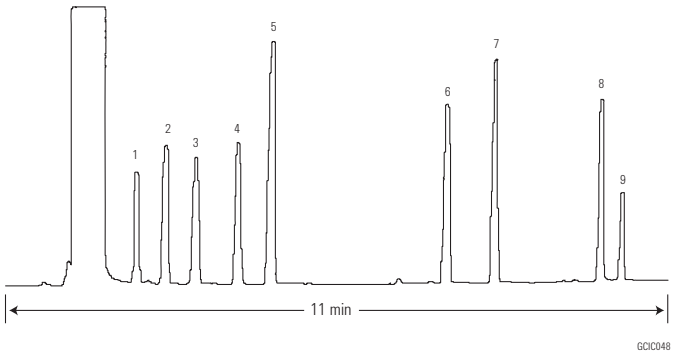
Carrier: Hydrogen

Oven: 35 °C for 1 min
35-60 °C at 10 °C/min
60-160 °C at 15 °C/min

Injection: On-column

Detector: FID

Sample: 1 µL



1. Methyl methacrylate
2. Ethyl methacrylate
3. sec-Butyl methacrylate
4. Allyl acrylate
5. n-Butyl acrylate
6. Hexyl methacrylate
7. Cyclohexyl methacrylate
8. Hydroxypropyl acrylate
9. Unknown

Anilines

Column: **DB-35ms**
128-3822
25 m x 0.20 mm, 0.33 µm

Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 2 min
50-340 °C at 20 °C/min
340 °C for 10 min

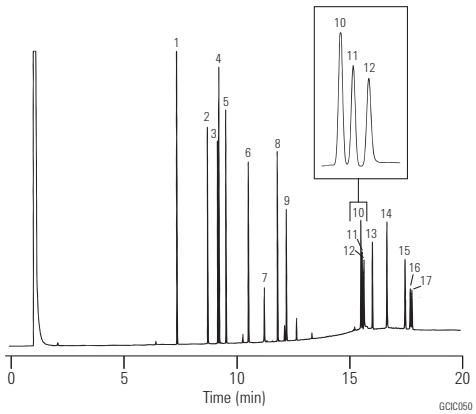
Injection: Splitless, 280 °C
0.50 min purge activation time

Detector: FID, 320 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 5 ng
on-column per component

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. o-Toluidine
2. 4-Chloroaniline
3. 2-Methoxy-5-methylaniline
4. 2,4,5-Trimethylaniline
5. 4-Chloro-2-methylaniline
6. 2,4-Diaminotoluene
7. 2,4-Diaminoanisole
8. 2-Aminonaphthalene
9. 2-Methyl-5-nitroaniline
10. 4,4'-Oxydianiline
11. 4,4'-Methylenedianiline
12. Benzidine
13. 2-Aminoazotoluene
14. o-Tolidine
15. 4,4'-Thiodianiline
16. 3,3'-Dimethoxybenzidine
17. 3,3'-Dichlorobenzidine

Substituted Anilines

Column: **DB-5ms**
122-5536
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 33.3 cm/sec, measured at 150 °C

Oven: 40 °C for 5 min
40-290 °C at 12 °C/min
290 °C for 10 min

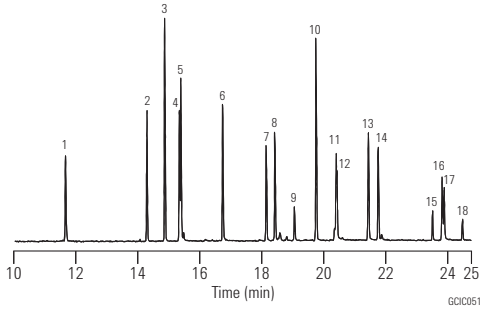
Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 325 °C transfer line

Sample: 1 µL of 25 ng/µL standard

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316
Seal: Gold plated seal, 18740-20885
Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



		m/z
1.	Aniline	93
2.	2-Chloroaniline	127
3.	2,6-Dimethylaniline	121
4.	3-Chloroaniline	127
5.	4-Chloroaniline	127
6.	4-Bromoaniline	171
7.	2-Nitroaniline	138
8.	3,4-Dichloroaniline	161
9.	3-Nitroaniline	65
10.	2,4,5-Trichloroaniline	195
11.	4-Chloro-2-nitroaniline	172
12.	4-Nitroaniline	138
13.	2-Chloro-4-nitroaniline	172
14.	2,6-Dichloro-4-nitroaniline	176
15.	2-Chloro-4,6-dinitroaniline	217
16.	2,6-Dibromo-4-nitroaniline	266
17.	2,4-Dinitroaniline	183
18.	2-Bromo-4,6-dinitroaniline	261

Phenols II

Column: **DB-5ms**
122-5536
30 m x 0.25 mm, 0.50 µm

Carrier: Helium at 22 cm/sec, measured at 100 °C

Oven: 100 °C for 1 min
100-270 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 50 ng/µL standard in toluene/p-xylene

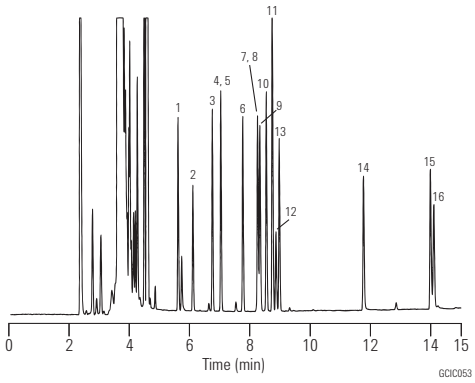
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Phenol
2. 2-Chlorophenol
3. o-Cresol
4. m-Cresol
5. p-Cresol
6. 2,6-Xylenol
7. 2,4-Xylenol
8. 2,5-Xylenol
9. 2-Nitrophenol
10. 3,5-Xylenol
11. 2,3-Xylenol
12. 2,4-Dichlorophenol
13. 3,4-Xylenol
14. 2,4,6-Trichlorophenol
15. 2,4-Dinitrophenol
16. 1-Naphthol

Phenols III

Column: **DB-WAX**
122-7032
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 43 cm/sec

Oven: 165 °C isothermal

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

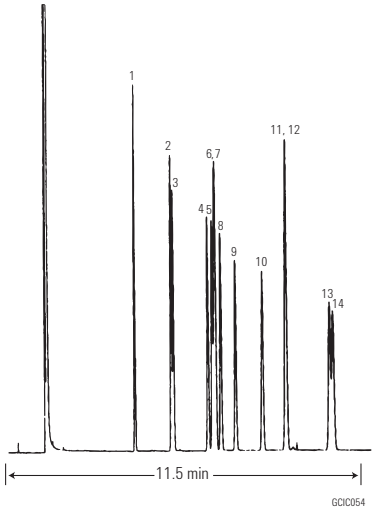
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273



1. 2,6-Xylenol
2. 2-Cresol
3. Phenol
4. 2-Ethylphenol
5. 2,5-Xylenol
6. 4-Cresol
7. 2,4-Xylenol
8. 3-Cresol
9. 2-Isopropylphenol
10. 2,3-Xylenol
11. 3,5-Xylenol
12. 4-Ethylphenol
13. 3,4-Xylenol
14. 2,3,5-Trimethylphenol

Halocarbons

Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Carrier: Helium at 30 cm/sec

Oven: 130 °C for 4 min
130-225 °C at 10 °C/min
225 °C Hold

Injection: Split, 250 °C
Split ratio 1:67

Detector: FID, 250 °C

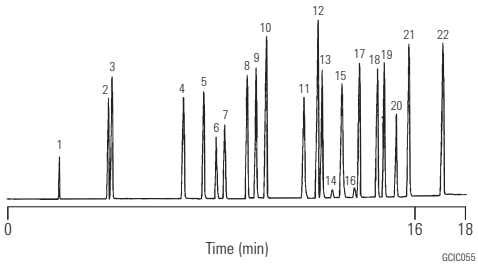
Sample: 1 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. CH_4
2. $CHClF_2$ (Freon 22)
3. CCl_2F_2 (Freon 12)
4. $ClCF_2CF_2Cl$ (Freon 114)
5. $CHCl_2F$ (Freon 21)
6. CCl_3F (Freon 11)
7. CF_2Br_2 (Freon 12B2)
8. CH_3I
9. CH_2Cl_2
10. trans-ClCH=CHCl
11. CF_3CCl_3 (Freon 113)
12. cis-ClCH=CHCl
13. $CHCl_3$
14. ? from CCl_4
15. CCl_4
16. ? from CCl_4
17. CH_3CH_2I
18. CH_2Br_2
19. $CHCl_2Br$
20. C_4F_9I
21. $CHClBr_2$
22. $CH_3CH_2CH_2I$

Ethylene Oxide

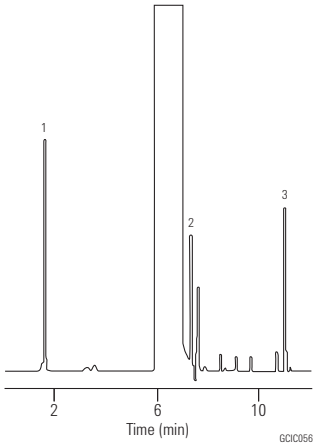
Column: **DB-WAX**
122-7032
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 1 mL/min

Oven: 60 °C for 2 min
60-180 °C at 16 °C/min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min



1. Ethylene oxide
2. 2-Chloroethanol
3. Ethylene glycol (solvent: Dimethylformamide)

(Courtesy of J. Chromatogr. Sci., 28:97 [1990])

Impurities in Mixed Xylenes

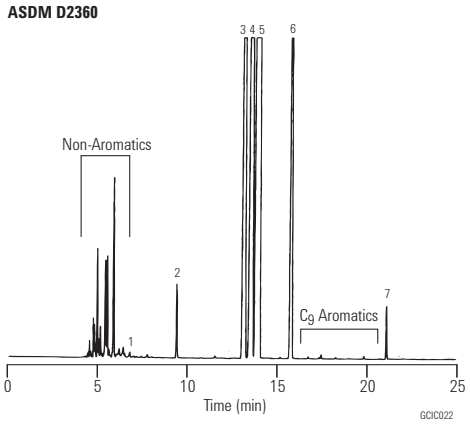
Column: **DB-WAXetr**
123-7362
60 m x 0.32 mm, 0.25 µm

Carrier: Helium at 20 cm/sec, measured at 145 °C

Oven: 60 °C for 10 min
60-150 °C at 5 °C/min
150 °C for 10 min

Injection: Split, 230 °C
Split ratio 1:150

Detector: FID, 240 °C



1. Benzene
2. Toluene
3. Ethylbenzene
4. p-Xylene
5. m-Xylene
6. o-Xylene
7. n-Butylbenzene (IS)

High Resolution Separation of Xylene Isomers

Column: **CP-Chirasil-Dex CB**
CP7502
25 m x 0.25 mm, 0.25 µm

Sample: 0.5 µL

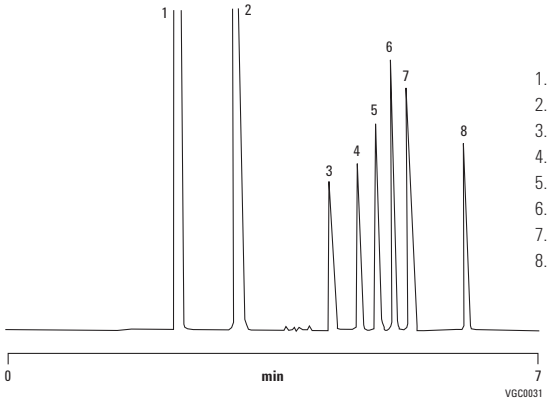
Sample Conc: 10-20%

Carrier: Helium, 40 kPA, 6 psi

Oven: 80 °C, (6 min) to 130 °C, 25 °C/min

Injection: Split, T = 210 °C, 1:20

Detector: FID, T=230 °C



1. Benzene
2. Toluene
3. Para xylene
4. Meta xylene
5. Ethyl benzene
6. Ortho xylene
7. Styrene
8. Cumene

Halothane

Column: **GS-GasPro**
113-4312
15 m x 0.32 mm,

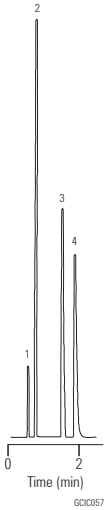
Carrier: Helium at 45 cm/sec

Oven: 240 °C, isothermal

Injection: Split, 200 °C
Split ratio 1:100

Detector: FID, 200 °C

Sample: 0.2 µL



1. Nitrogen
2. Halothane
3. Diethyl ether
4. Acetone

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

Inorganic Hydride Gases

Column: **HP-1**
19091Z-205
50 m x 0.20 mm, 0.50 µm

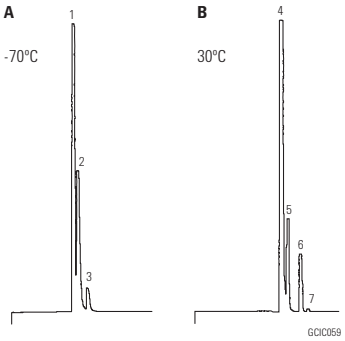
Carrier: Helium, 35 cm/sec

Oven: A: -70 °C isothermal
B: 30 °C isothermal

Injection: Split ratio 25:1

Detector: FPD, 535 µm filter

Sample: 1 µL



1. Arsine 0.1%
2. Phosphine 0.1%
3. Selenide 0.1%
4. Diborane 0.10 ppm
5. Tetraborane 0.10 ppm
6. Pentaborane 0.10 ppm
7. Dihydropentaborane 0.60 ppm

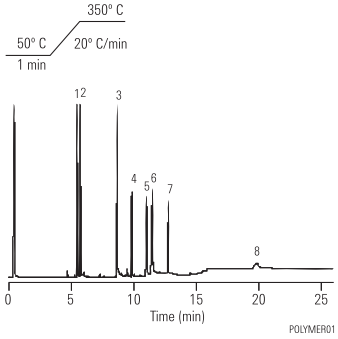
Polymer Additives

Column: **HP-35 (use only 10 meters)**
19091G-013
30 m x 0.32 mm, 0.15 µm

Carrier: Helium, 6 psi (4 mL/min at 50 °C) hold for 5 min. ramp to 50 psi (21 mL/min at 350 °C) at 5 psi/min.

Injection: EPC on-column, oven track 0.5 µL injection

Detector: FID



1. BHT
2. BHEB
3. Tinuvin P
4. Isonox 129
5. Irgafos 168
6. Irganox 1076
7. MD 1024
8. Irganox 1010

Fast Separation of Silanes

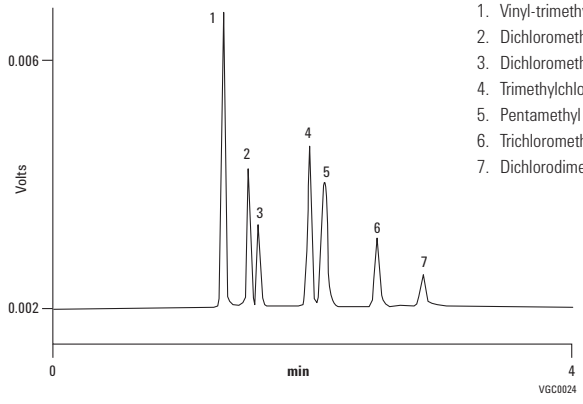
Column: **VF-200ms**
CP8860
30 m x 0.25 mm, 1.00 µm

Carrier: Hydrogen, ca 1.0 mL/min, 60 kPa

Oven: 50 °C

Injection: Split/splitless, in split mode, 1:100

Detector: FID



1. Vinyl-trimethyl silane
2. Dichloromethyl silane
3. Dichloromethane
4. Trimethylchloro silane
5. Pentamethyl disiloxane
6. Trichloromethyl silane
7. Dichlorodimethyl silane

Sulfur Gases

Column: **PoraPLOT U**
CP7584
25 m x 0.53 mm, 20.00 µm

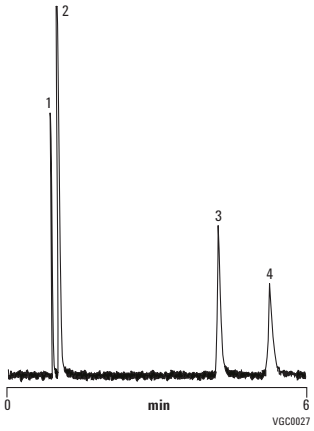
Sample: ±100 ppm

Carrier: H_2

Oven: 50 °C

Injection: 100 mL/min

Detector: FPD



1. Hydrogen sulfide
2. Carbonyl sulfide
3. Sulfur dioxide
4. Methyl sulfide

Analysis of Acetylenes Mixture

Column: **Select Al2O3**
CP7432
50 m x 0.53 mm,

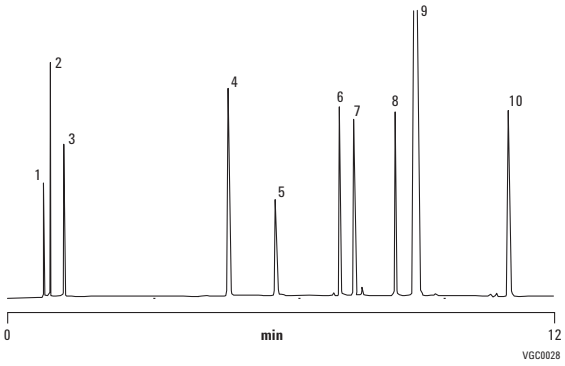
Sample Conc: Approx 100 ppm in nitrogen, synthetic standard

Carrier: Helium, 4 psig, 4 min to 11 psig, 0.5 psig/min, 2 min

Oven: 40 °C, 5 min to 160 °C, 10 °C/min to 200 °C, 20 °C/min, hold 1 min

Injection: Split 60 mL/min

Detector: FID



1. Methane
2. Ethane
3. Ethylene
4. n-Butane
5. Propadiene
6. 1-Butene
7. Iso-butene
8. 1,2-Butadiene
9. 1,3-Butadiene
10. Ethyl acelytene

Courtesy of J. Luong, Dow Chemical Canada.

Life Science Applications

DB-Select 624 UI for Mega Bore Early Eluting Peaks

Column: **DB-Select 624 UI for <467>**
125-0334UI
30 m x 0.53 mm x 3.0 um

Carrier: Helium 44 cm/s (approx. 6 mL/min) set at 40 °C, EPC-Constant Flow

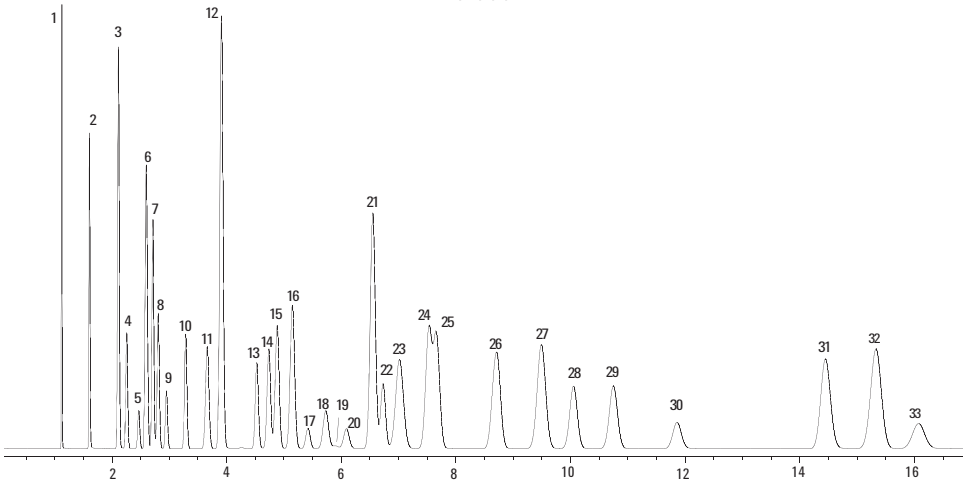
Oven: 40 °C 20 min hold, then 10°/min to170 °C

Injection: 20 Hz

Detector: FID at 240 °C, H2 at 30 mL/min
Air at 400 mL/min
N2 makeup at 35 mL/min
(constant column + makeup)

Sample: FIDSignal

1. Methane
2. Methanol
3. Ethanol
4. Diethyl ether
5. 1,1-Dichloroethylene
6. 2-Propanol
7. Acetonitrile
8. Methyl acetate
9. Dichloromethane
10. trans-1,2-Dichloroethylene
11. n-Hexane
12. 1-Propanol
13. Nitromethane
14. cis-1,2-Dichloroethylene
15. Ethyl acetate
16. 2-Butanol
17. Chloroform
18. 1,1,1-Trichloroethane
19. Cyclohexane
20. Carbon tetrachloride
21. Benzene
22. 1,2-Dichloroethane
23. Isooctane (2,2,4-Trimethylpentane)
24. 3-Methyl-2-butanone
25. n-Heptane
26. Trichloroethylene
27. Methycyclohexane
28. 1,4-Dioxane
29. Propy acetate
30. 2-Ethoxyethanol
31. Pyridine excellent peak shape
32. Toluene
33. 3-Methy-1-butanol



Benzodiazepines I

Column: **DB-5ms Ultra Inert**
122-5532UI
30 m x 0.25 mm, 0.25 µm

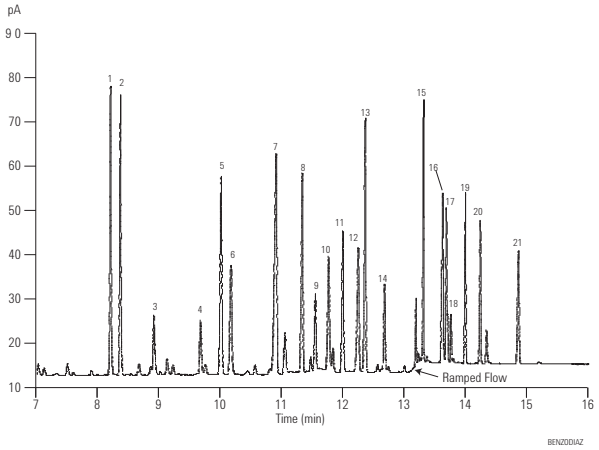
Carrier: Hydrogen, 53 cm/sec, constant flow
1.6 for 11 min
1.6 to 2.4 at 60 mL/min hold 2 min
2.4 to 5.0 at 50 mL/min hold 9 min

Oven: 170 °C for 3.2 min
170-250 °C at 24.7 °C/min, hold 5.3 min
250-280 °C at 18.6 °C/min, hold 4.0 min
280-325 °C at 50.0 °C/min, hold 4.0 min

Injection: Pulsed splitless, 280 °C
20 psi pulse pressure for 0.38 min
50 mL/min purge at 0.40 min
Direct connect liner G1544-80730

Detector: FID, 350 °C

Sample: 1 µL of 5-10 ppm



1. Medazepam
2. Halazepam
3. Oxazepam
4. Lorazepam
5. Diazepam
6. Desalkyl Aurazepam
7. Nordazepam
8. Clonazam
9. Oxazopam
10. Temazepam
11. Flunitrazepam
12. Bromazepam
13. Prazepam
14. Lormetazepam
15. Nitrazepam
16. Chlordiazepoxide
17. Clonazepam
18. Demoxepam
19. Estazolam
20. Alprazolam
21. Triazolam

Analysis of benzodiazepines and other drugs is particularly challenging because of their high level of activity. For this reason, all aspects of the sample path – particularly the GC Column – must be as inert as possible.

Amphetamines and Precursors – TMS Derivatives

Column: **DB-5**
121-5023
20 m x 0.18 mm, 0.40 µm

Carrier: Helium at 39 cm/sec, measured at 100 °C

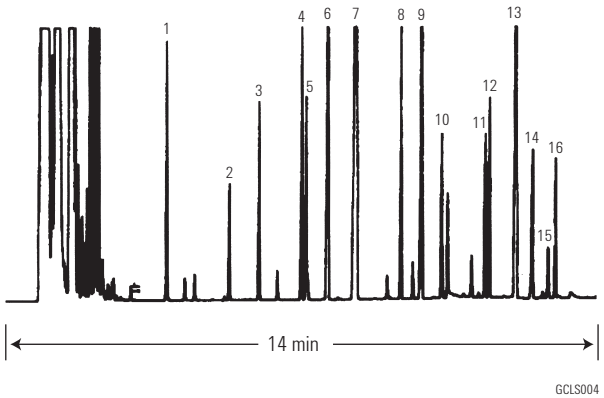
Oven: 100-240 °C at 10 °/min

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 2 µg/µL each in pyridine

1. Phenylacetone
2. Dimethylamphetamine
3. Amphetamine
4. Phentermine
5. Methamphetamine
6. Methyl ephedrine
7. Nicotinamine
8. Ephedrine
9. Phenacetin
10. 3,4-Methylenedioxyamphetamine (MDA)
11. 3,4-Methylenedioxymethylamphetamine
12. 4-Methyl-2,5-dimethoxyamphetamine (STP)
13. Phenyl ephedrine
14. 3,4-Methylenedioxyethylamphetamine (MDE; Eve)
15. Caffeine
16. Benzphetamine



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Barbiturates

Column: **DB-35ms**
122-3832
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec, measured at 50 °C

Oven: 50 °C for 0.5 min
50-150 °C at 25 °C/min
150-300 °C at 10 °C/min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 280 °C transfer line
full scan at m/z 40-270

Suggested Supplies

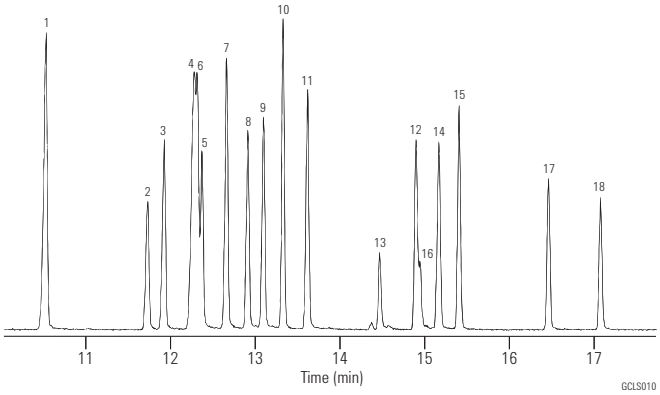
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Barbital
2. Allobarbital
3. Aprobarbital
4. Butabarbital
5. Butethal
6. Butalbital
7. Amobarbital
8. Talbutal
9. Pentobarbital
10. Methohexital
11. Secobarbital
12. Hexobarbital
13. Thiopental
14. Cyclopentylbarbital
15. Mephobarbital
16. Thiamylal
17. Phenobarbital
18. Alphenal



Narcotics

Column: **DB-5ms**
122-5532
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec, measured at 50 °C

Oven: 50 °C for 0.5 min
50-150 °C at 25 °C/min
150-325 °C at 10 °C/min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
full scan at m/z 40-380

Suggested Supplies

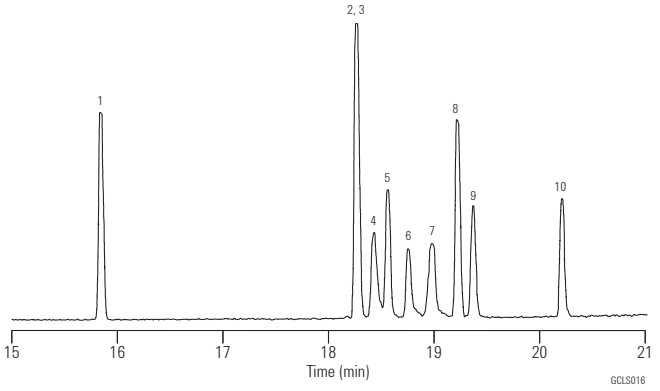
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Dextromethorphan
2. Codeine
3. Dihydrocodeine
4. Norcodeine
5. Ethylmorphine
6. Morphine
7. Normorphine
8. 6-Acetylcodeine
9. 6-Monoacetylmorphine
10. Heroin



Blood Alcohols I (Static Headspace/Split)

Column: **DB-ALC1**
125-9134
30 m x 0.53 mm, 3.00 µm

Carrier: Helium at 80 cm/sec, measured at 40 °C

Oven: 40 °C Isothermal

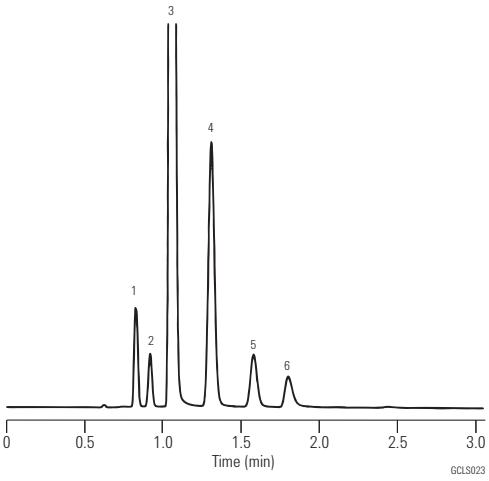
Sampler: Headspace

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 23 mL/min

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885



1. Methanol
2. Acetaldehyde
3. Ethanol
4. Isopropanol
5. Acetone
6. 1-Propanol

Blood Alcohols II (Static Headspace/Split)

Column: **DB-ALC2**
125-9234
30 m x 0.53 mm, 2.00 µm

Carrier: Helium at 80 cm/sec, measured at 40 °C

Oven: 40 °C Isothermal

Sampler: Headspace

Oven:	70 °C
Loop:	80 °C
Transfer line:	90 °C
Vial equil. time:	10 min
Pressurization time:	0.20 min
Loop fill time:	0.20 min
Loop equil. time:	0.05 min
Inject time:	0.1 - 0.2 min
Sample loop size:	1.0 mL

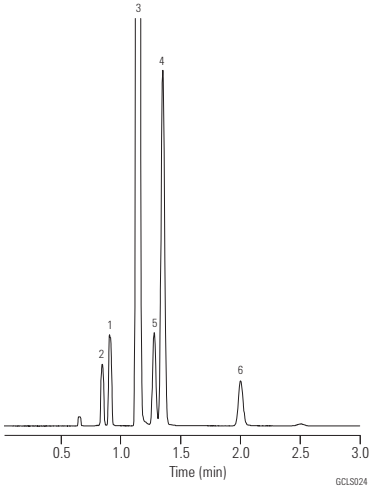
Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C
Nitrogen makeup gas at 23 mL/min

Sample: 0.1% Ethanol, 0.001% Others

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885



1. Methanol
2. Acetaldehyde
3. Ethanol
4. Isopropanol
5. Acetone
6. 1-Propanol

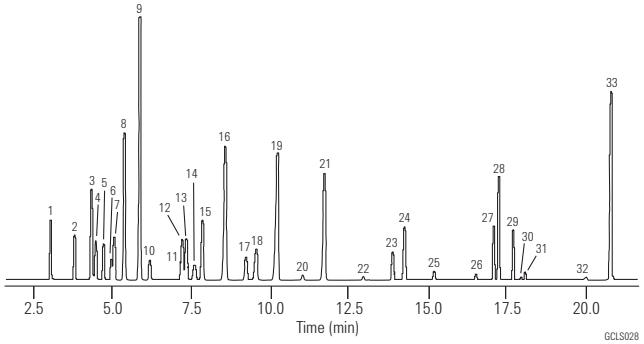
Residual Solvents, DMI Diluent

Column:	**DB-624** **123-1364** **60 m x 0.32 mm, 1.80 µm**
Oven:	50-60 °C, 1 °C/min 60-115 °C, 9.2 °C/min 115-220 °C, 35 °C/min 220 °C – hold 6 min
Sampler:	Headspace Platen 140 °C Transfer line, valve 250 °C Sample loop 2 mL
Injection:	Split, 250 °C Split ratio 1:18
Detector:	FID, 270 °C Nitrogen makeup
Sample:	5,000 ppm standard

Suggested Supplies

Septum:	11 mm Advanced Green septa, 5183-4759
Liner:	Direct, 1.5 mm id, 18740-80200
Seal:	Gold plated seal, 18740-20885

1. Methanol
2. Ethanol
3. Acetone
4. 2-Propanol
5. Acetonitrile
6. Methylene chloride
7. 2-Methyl-2-propanol (tert-butanol)
8. MTBE
9. Hexane
10. 1-Propanol
11. DMI impurity
12. 2-Butanone (MEK)
13. Ethyl acetate
14. 2-Butanol
15. Tetrahydrofuran
16. Cyclohexane
17. Isopropyl acetate
18. 1,2-Dimethoxyethane
19. Heptane
20. 1-Methoxy-2-propanol
21. Methylcyclohexane
22. 2-Ethoxyethanol
23. MIBK (2-Pentanone)
24. Toluene
25. 1-Pentanol
26. n,n-Dimethylformamide (DMF)
27. Ethyl benzene
28. m,p-Xylene
29. o-Xylene
30. Dimethyl sulfoxide (DMSO)
31. n,n-Dimethylacetamide
32. n-Methylpyrrolidone
33. 1,3-Dimethyl-2-imidazolidinone (DMI)

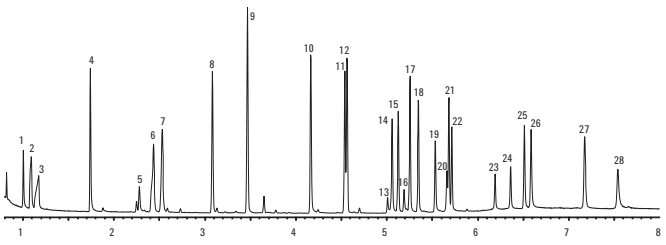


Special thanks to Julie Kancler, Brian Wallace, Teledyne.

Underivatized Drugs of Abuse – Agilent Fast Toxicology Analyzer

Column:	**DB-35 ms Ultra Inert** **122-3812UI** **15 m x 0.25 mm, 0.25 µm**
Carrier:	Helium fixed pressure 35.0 psi
Injection:	Splitless 1 µL 280 °C, total flow 56.4 mL/min, 3 mL/min switched septum purge, gas saver off, 50 mL/min after 0.4 min
Liner:	Splitless, dual taper, deactivated, 4 mm id, 5181-3315
Sample:	Agilent GC/MS Toxicology Checkout Mixture (P/N 5190-0471)
Backflush:	Post run: 1 min 1 psi inlet, 75 psi aux EPC
Oven:	100 °C (0.25 min) to 345 °C (40 °C/min, 2.25 min hold)
Detector:	MSD: Transfer line 300 °C, source 300 °C, quadrapole 180 °C scan mode NPD: Blos bead 300 °C H_2 3 mL/min, 60 mL/min air, 11 mL/min makeup and col flow
CFT Device:	2-Way splitter with solvent venting between MSD and NPD

1. Amphetamine
2. Phentermine
3. Methamphetamine
4. Nicotine
5. Methylenedioxyamphetamine (MDA)
6. Methylenedioxymethamphetamine (MDMA)
7. Methylenedioxyethylamphetamine
8. Meperidine
9. Phencyclidine
10. Methadone
11. Cocaine
12. SKF-525a (RTL Compound)
13. Oxazepam
14. Tetrahydrocannabinol
15. Codeine
16. Lorazepam
17. Diazepam
18. Hydrocodone
19. Oxycodone
20. Temazepam
21. Diacetylmorphine
22. Flunitrazepam
23. Nitrazepam
24. Clonazepam
25. Alprazolam
26. Verapamil
27. Strychnine
28. Trazodone



Example NPD chromatogram of underivatized drugs of abuse 5 ng/component on an Agilent J&W DB-35ms UI column.
Component number 12 is used for retention time locking in the deconvolution reporting software database.

Benzodiazepines II

Column: **DB-35ms**
122-3832
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 31 cm/sec, measured at 50 °C

Oven: 50 °C for 0.5 min
50-150 °C at 25 °C/min
150-340 °C at 10 °C/min
340 °C for 6 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 280 °C transfer line
full scan at m/z 40-400

Suggested Supplies

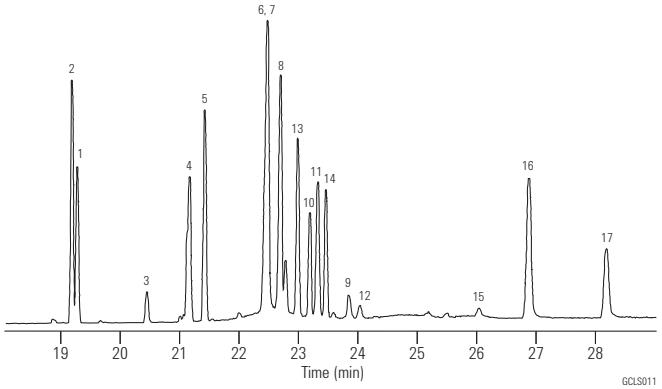
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Medazepam
2. Halazepam
3. Oxazepam
4. Lorazepam
5. Diazepam
6. Demoxepam
7. Desmethyldiazepam
8. Clobazam
9. Temazepam
10. Flunitrazepam
11. Delorazepam
12. Bromazepam
13. Prazepam
14. Flurazepam
15. Clonazepam
16. Alprazolam
17. Triazolam



Drug Screen

Column: **DB-1ms**
122-0132
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 40 cm/sec,
measured at 50 °C

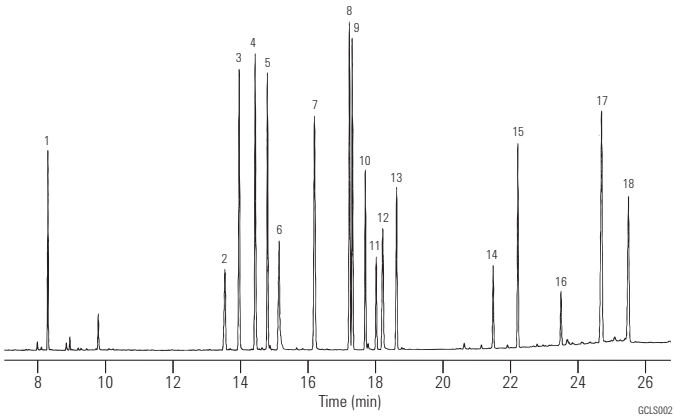
Oven: 50 °C for 1.0 min
50-125 °C at 25 °C/min
125-325 °C at 10 °C/min
325 °C for 5 min

Injection: Cold Splitless
Optic II injector, 50-250 °C at 10 °C/sec
45 sec purge activation time

Detector: FID, 300 °C

Sample: 1 µL injection of 50-150 ppm standard

1. Nicotine
2. Caffeine
3. Glutethimide
4. Lidocaine
5. PCP
6. Phenobarbital
7. Methadone primary metabolite
8. Methaqualone
9. Methadone
10. Cocaine
11. Desipramine
12. Carbazepine
13. Trimipramine
14. Heroin
15. Fentanyl
16. Ibogaine
17. Triazolam
18. LSD



Common Drug Screen

Column: **DB-5**
122-5032
30 m x 0.25 mm, 0.25 µm

Column: **DB-17**
122-1732
30 m x 0.25 mm, 0.25 µm

Carrier: Hydrogen at 41 cm/sec, measured at 80 °C

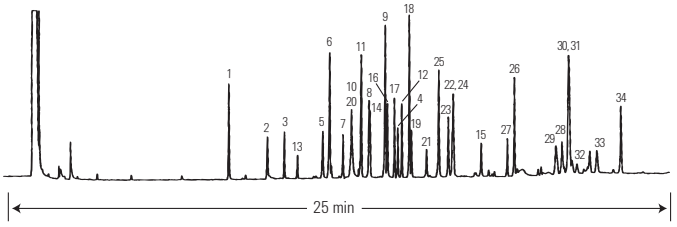
Oven: 80 °C for 1 min
80-280 °C at 10 °C/min
280 °C for 9 min

Injection: Split, 250 °C
Split ratio 1:40

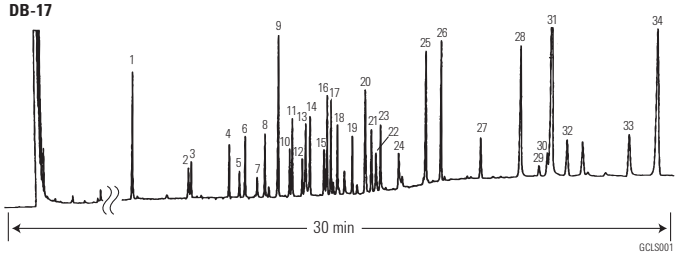
Detector: FID, 300 °C

	DB-17 Time	DB-5 Time
1. Nicotine	9.87	8.57
2. Phenmetrazine	11.8	9.95
3. Ibuprofen	12.06	10.64
4. Procaine	13.48	14.82
5. Allobarbital	13.91	12.02
6. Aprobarbital	14.14	12.27
7. Butabarbital	14.56	12.76
8. Secobarbital	14.87	14.31
9. Pentobarbital	15.41	13.73
10. Phenacetin	15.72	12.94
11. Amobarbital	15.87	13.43
12. Benzphetamine	16.14	14.96
13. Acetaminophen	16.34	11.12
14. Hydroxyphenamate	16.47	15.31
15. Dimenhydrinate	16.93	13.79
16. Meprobamate	17.12	14.44
17. Benactyzine	17.26	14.71
18. Hexobarbital	17.52	15.22
19. Doxylamine	17.69	15.87
20. Caffeine	18.05	13.11
21. Chlorpheniramine	18.47	16.35
22. Methapyrilene	18.72	16.68
23. Thenyldiamine	18.87	16.85
24. Phenobarbital	19.11	16.29
25. Bromopheniramine	19.71	17.39
26. Chlorcyclizine	20.75	19.13
27. Cocaine	21.32	18.88
28. Pyrrobutamine	22.79	20.89
29. Codeine	24.27	20.66
30. Diazepam	25.27	21.13
31. Morphine	25.36	21.12
32. Hydrocodone	25.98	21.26
33. Oxymorphone	28.27	22.21
34. Heroin	29.32	23.14

DB-5



DB-17



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Urine Drug Screen

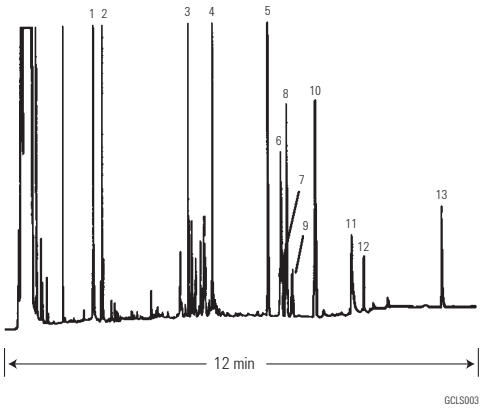
Column: **ULTRA 2**
19091B-115
50 m x 0.32 mm, 0.52 µm

Carrier: Hydrogen 80 cm/sec

Oven: 45 °C for 1.5 min
45-300 °C at 6 °C/min

Injection: Splitless

Detector: FID



1. Amphetamine
2. Methamphetamine
3. Meperidine
4. Phencyclidine (PCP)
5. Methadone
6. Proposyphene
7. Amitriptyline
8. Cocaine
9. Imipramine
10. Cyheptamide (ISTD)
11. Codeine
12. Diazepam
13. Flurazepam

Analysis of Drugs of Abuse in Urine via GC/MS

Column: **VF-DA**
CP8964
12 m x 0.20 mm, Optimized µm

Sample: 1 µL

Solvent: Methanol

Carrier: He, ca 1.0 mL/min

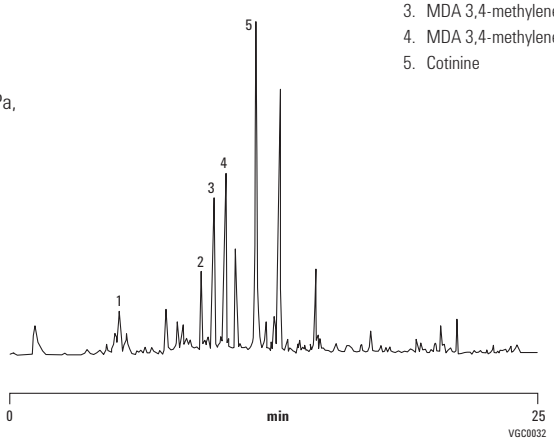
Oven: 70 °C, 1.2 min to 200 °C, 20 °C/min to 270 °C,
7 °C/min to 320 °C, 20 °C/min

Pressure: 58.7 kPa, 2.2 min to 97 kPa, 58 kPa/min to 132 kPa,
3 kPa/min to 180 kPa, 12 kPa/min

Injection: Splitless

Detector: MS

Derivatization: Acetic acid anhydride to form acetates



1. Amphetamine
2. MDA 3,4-methylenedioxyamphetamine
3. MDA 3,4-methylenedioxymethamphetamine
4. MDA 3,4-methylenedioxy-ethylamphetamine
5. Cotinine

Anesthetics

Column: **DB-5ms EVDX**
128-8522
25 m x 0.20 mm, 0.33 µm

Carrier: Helium at 35 cm/sec, measured at 55 °C

Oven: 55 °C for 1 min
55-130 °C at 25 °C/min
130-325 °C at 15 °C/min

Injection: Splitless, 250 °C
45 sec purge activation time

Detector: MSD, 280 °C transfer line
full scan at m/z 35-400

Sample: 1 µL of 50-100 ng/µL standard in methanol

Suggested Supplies

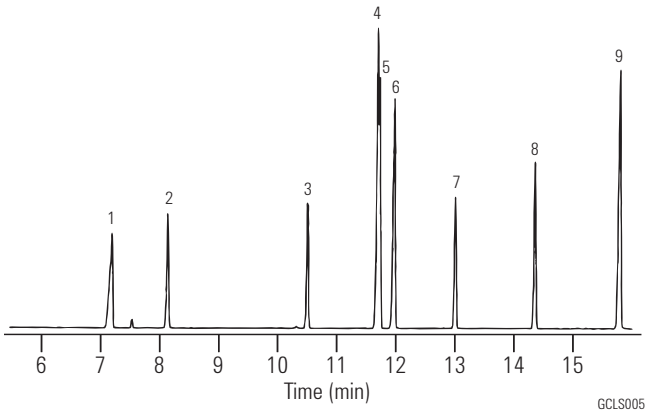
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Salicylamide
2. Benzocaine
3. Lidocaine
4. Procaine
5. Nefopam
6. Mepivacaine
7. Tetracaine
8. Butacaine
9. Dibucaine



Anticonvulsants

Column: **DB-1**
125-1032
30 m x 0.53 mm, 1.50 µm

Carrier: Helium at 8 mL/min

Oven: 160 °C for 2 min
160-275 °C at 15 °C/min

Injection: Megabore Direct, 250 °C

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 100 ng/µL in methanol

Suggested Supplies

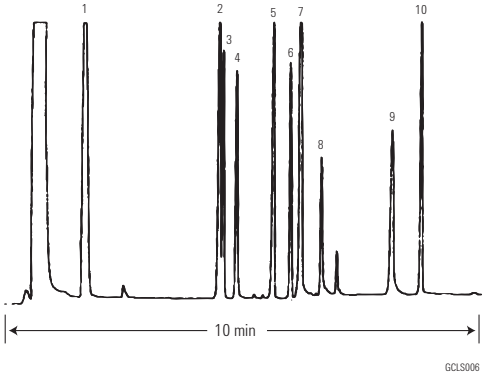
Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

1. Ethosuximide
2. Methsuximide
3. Phensuximide
4. N-Desmethyl methsuximide
5. Phenylethylmalonamide
6. Phenobarbital
7. Primidone
8. Carbamazepine
9. Phenytoin
10. 5-Methyl-5-phenylhydantoin



Antihistamines

Column: **DB-5**
123-5032
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 40 cm/sec, measured at 55 °C

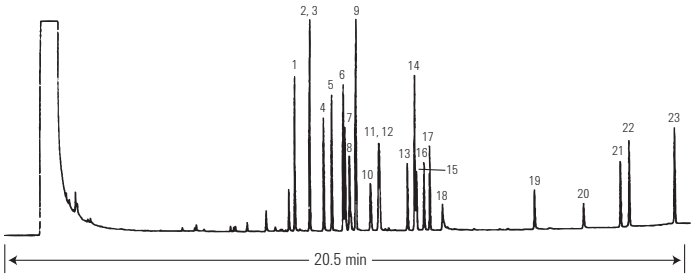
Oven: 55 °C for 1 min
55-175 °C at 30 °C/min
175-320 °C at 10 °C/min
320 °C for 1 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 1 µL of 50 ng/µL each in methanol

1. Pheniramine
2. Dimenhydrinate
3. Diphenhydramine
4. Doxylamine
5. Phenyltoloxamine
6. Tripelennamine
7. Methapyrilene
8. Chlorpheniramine
9. Cyclizine
10. Carbinoxamine
11. Diphenylpyraline
12. Bromopheniramine
13. Thonzylamine
14. Chlorcyclizine
15. Pyrilamine
16. Triprolidine
17. Promethazine
18. Antazoline
19. Clemizole
20. Hydroxyzine
21. Meclizine
22. Cinnanzine
23. Buclizine



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Splitless, single taper, deactivated, 4 mm id, 5181-3316

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Antiepileptic Drugs

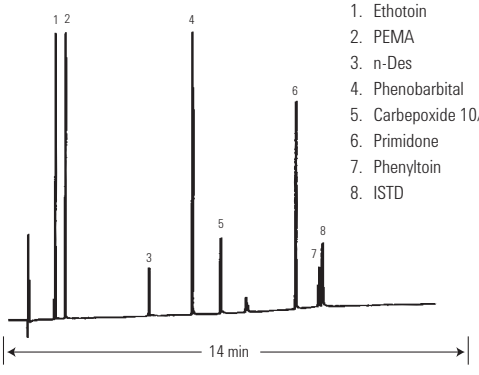
Column: **ULTRA 2**
19091B-012
25 m x 0.32 mm, 0.17 µm

Carrier: Helium, 14 psi

Oven: 100-230 °C at 15 °C/min

Injection: Split ratio 35:1

Detector: NPD



1. Ethotoin
2. PEMA
3. n-Des
4. Phenobarbital
5. Carbepoxide 10/11
6. Primidone
7. Phenyltoin
8. ISTD

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Tricyclic Antipsychotics

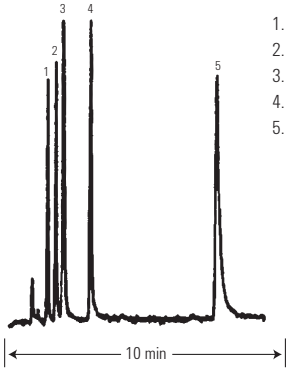
Column: **ULTRA 2**
19091B-101
12 m x 0.20 mm, 0.33 µm

Carrier: Hydrogen, 106 cm/sec

Oven: 250 °C for 3 min
250-290 °C at 10 °C/min
290 °C for 10 min

Injection: Split ratio 75:1

Detector: FPD



1. Triflupromazine
2. Promethazine
3. Promazine
4. Chlorpothixene
5. Thioridazine

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Fentanyls

Column: **DB-1701**
125-0732
30 m x 0.53 mm, 1.00 µm

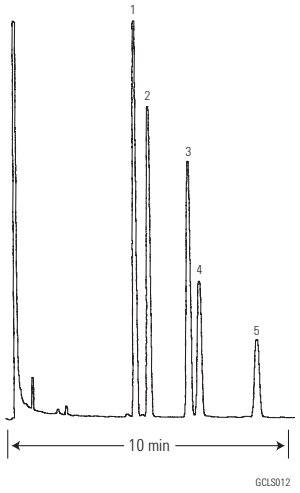
Carrier: Hydrogen at 15 mL/min

Oven: 270 °C isothermal

Injection: Split, 250 °C
Split ratio 1:5

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.8 µL



1. Fentanyl
2. Sufentanyl
3. Carfentanyl
4. Lofentanyl
5. Alfentanyl

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Tocopherols

Column: **DB-17ms**
122-4732
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 40 cm/sec, measured at 150 °C

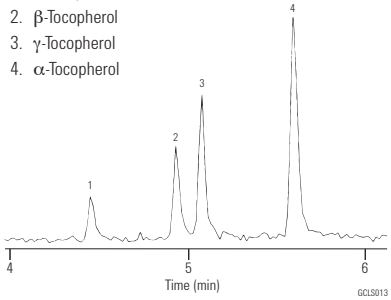
Oven: 300 °C for 1 min
300-320 °C at 25 °C/min
320 °C for 4 min

Injection: Split, 310 °C
Split ratio 1:25

Detector: MSD, 310 °C transfer line
full scan at m/z 45-550

Sample: 1 µL of 1-10 ng/µL in isooctane

1. δ-Tocopherol
2. β-Tocopherol
3. γ-Tocopherol
4. α-Tocopherol



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Split, single taper, low pressure drop, glass wool, 5183-4647

Seal: Gold plated seal, 18740-20885

Syringe: 5 µL tapered, FN 23-26s/42/HP, 5181-1273

Hallucinogens

Column: **DB-17ms**
122-4732
30 m x 0.25 mm, 0.25 µm

Carrier: Helium at 30 cm/sec, measured at 50 °C

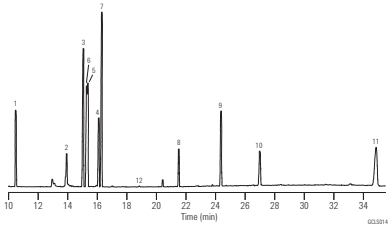
Oven: 50 °C for 0.5 min
50-125 °C at 25 °C/min
125-255 °C at 10 °C/min
255-320 °C at 25 °C/min
320 °C for 16 min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: MSD, 300 °C transfer line
full scan at m/z 40-350

Sample: 1 µL of 10-50 ng/µL standard in methanol

1. 4-Methylaminorex
2. Mescaline
3. Dimethyltryptamine
4. Ketimine
5. TCP (Tenocyclidine)
6. Phencyclidine (PCP)
7. Diethyltryptamine
8. Bufotenine
9. Fentanyl
10. Ibogaine
11. LSD
12. Psilocin (peak not shown)



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Sedative Hypnotics

Column: **DB-5ms EVDX**
128-8522
25 m x 0.20 mm, 0.33 µm

Carrier: Helium at 35 cm/sec, measured at 55 °C

Oven: 55 °C for 1 min
55-130 °C at 25 °C/min
130-325 °C at 15 °C/min
325 °C for 4 min

Injection: Splitless, 250 °C
45 sec purge activation time

Detector: MSD, 280 °C transfer line
full scan at m/z 35-400

Sample: 1 µL of 50-100 ng/µL standard in methanol

1. Ethchlorvynol
2. Ethinamate
3. Pyrithyldione
4. Talbutal
5. Meprobamate
6. Glutethimide
7. Methaqualone
8. Propiomazine
9. Haloperidol
10. Sulpiride
11. Droperidol

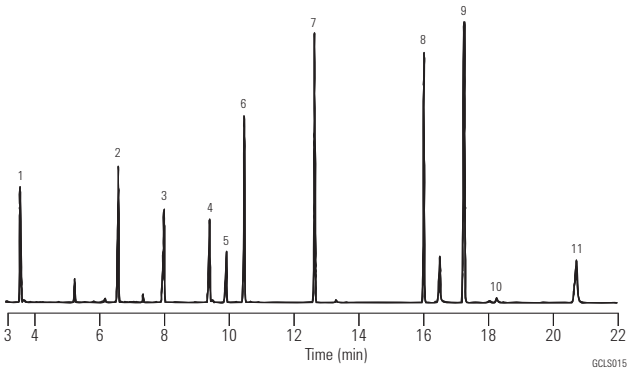
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



Narcotics and Adulterants

Column: **DB-5**
123-5032
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 40 cm/sec, measured at 140 °C

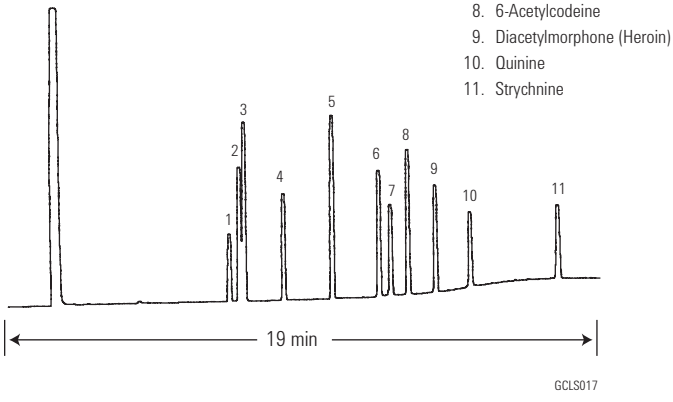
Oven: 140-320 °C at 12 °C/min
320 °C for 4 min

Injection: Split, 250 °C
Split ratio 1:75

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

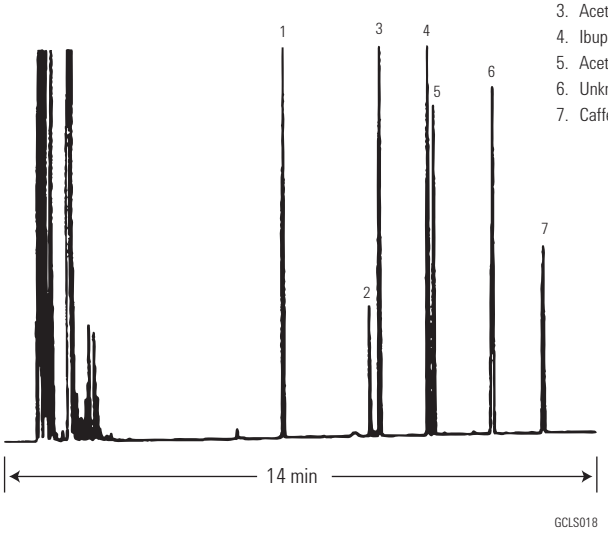
Sample: 1 µL of 0.5 µg/µL each in methanol

1. Caffeine
2. Ketamine
3. Lidocaine
4. Procaine
5. Cocaine
6. Codeine
7. Morphine
8. 6-Acetylcodeine
9. Diacetylmorphone (Heroin)
10. Quinine
11. Strychnine



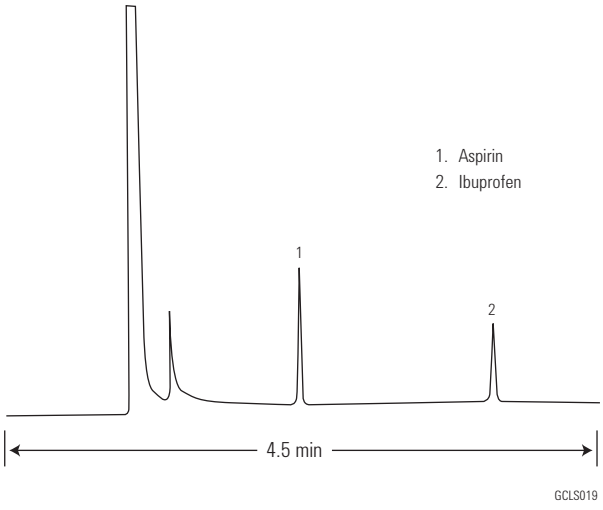
Over-the-Counter Pain Killers – TMS Derivatives

Column:	**DB-5** **121-5023** **20 m x 0.18 mm, 0.40 µm**
Carrier:	Helium at 39 cm/sec, measured at 100 °C
Oven:	100-240 °C at 10 °C/min
Injection:	Split, 250 °C Split ratio 1:100
Detector:	FID, 300 °C Nitrogen makeup gas at 30 mL/min
Sample:	1 µL of 2 µg/µL each in pyridine



Aspirin and Ibuprofen in Methanol

Column:	**DB-FFAP** **122-3232** **30 m x 0.25 mm, 0.25 µm**
Carrier:	Hydrogen at 24 cm/sec, measured at 180 °C
Oven:	180 °C isothermal
Injection:	Split, 250 °C Split ratio 1:50
Detector:	FID, 300 °C Nitrogen makeup gas at 30 mL/min



Free Steroids

Column: **DB-17**
122-1731
30 m x 0.25 mm, 0.15 µm

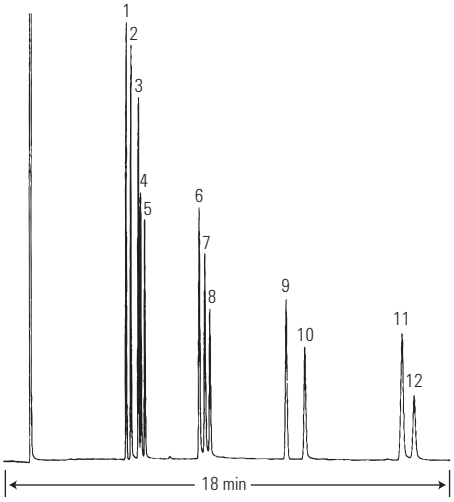
Carrier: Hydrogen at 44 cm/sec

Oven: 260 °C isothermal

Injection: Split, 250 °C
Split ratio 1:100

Detector: FID, 300 °C
Nitrogen makeup gas at
30 mL/min

Sample: 1 µL



1. Coprostane (5-ß-cholestane)
2. 5-β-Androsterone
3. 5-α-Cholestane
4. Androsterone
5. Epiandrosterone (trans-androsterone)
6. 17-α-Estradiol
7. β-Estradiol
8. Estrone
9. Progesterone
10. Cholesterol
11. Estriol
12. Stigmasterol

Anabolic Steroids

Column: **DB-1**
122-1031
30 m x 0.25 mm, 0.10 µm

Carrier: Helium at 40 cm/sec, measured at 180 °C

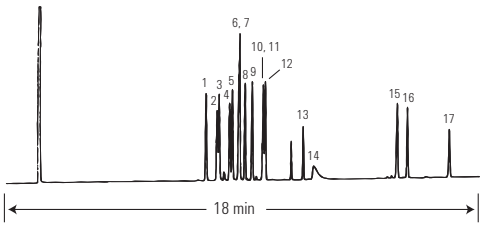
Oven: 180-320 °C at 10 °C/min
320 °C for 4 min

Injection: Split ratio 1:40

Detector: FID, Nitrogen makeup gas at 30 mL/min

Sample: 2 µL of 0.125 µg/µL each in methanol

1. Dehydroisoandrosterone (Prasterone)
2. 5α-Androstan-17α-ol-3-one (Stanolone)
3. 19-Nortestosterone (Nandrolone)
4. Mesterolone
5. Testosterone
6. 1-Dehydrotestosterone (Boldenone)
7. 17α-Methyltestosterone
8. 1-Dehydro-17-α-methyltestosterone (Methandrostenolone)
9. Norethandrolone
10. 1-Dehydrotestosterone acetate
11. Oxymetholone
12. 19-Nortestosterone-17-propionate
13. 4-Chlortestosterone-17-acetate (Clostebal)
14. Stanozolol
15. 1-Dehydrotestosterone benzoate
16. 19-Nortestosterone-17-decanoate
17. 1-Dehydrotestosterone undecylenate



Marijuana (Δ9-THC) and Major Metabolites – TMS Derivatives

Column: **DB-5**
123-5032
30 m x 0.32 mm, 0.25 µm

Carrier: Helium at 40 cm/sec, measured at 100 °C

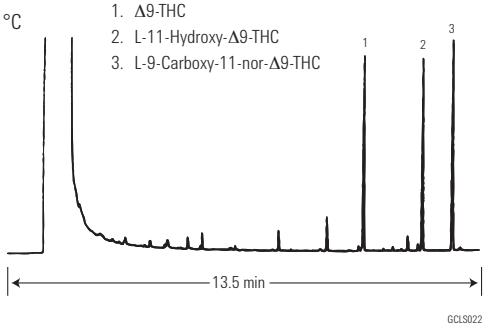
Oven: 100 °C for 1 min
100-175 °C at 30 °C/min
175-295 °C at 12 °C/min

Injection: Splitless, 250 °C
30 sec purge activation time

Detector: FID, 300 °C
Nitrogen makeup
gas at 30 mL/min

Sample: 1 µL of 0.1 µg/µL each in pyridine

1. Δ9-THC
2. L-11-Hydroxy-Δ9-THC
3. L-9-Carboxy-11-nor-Δ9-THC



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, single taper, deactivated, 4 mm id, G1544-80730

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267

Blood Pollutants I

Column: **HP-Blood Alcohol**
125-9134
30 m x 0.53 mm, 3.00 µm

Carrier: Helium, 36 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-210 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C

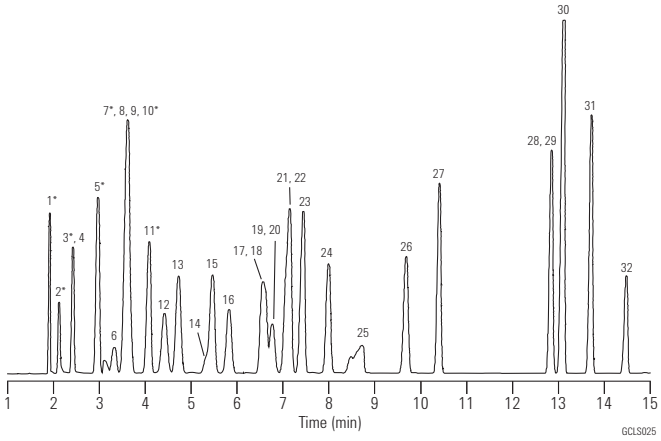
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

1. Methanol*
2. Acetaldehyde*
3. Ethanol*
4. Diethyl ether
5. Isopropyl alcohol*
6. Methylene Chloride
7. Acetone*
8. Acetonitrile
9. Ethyl formate
10. t-Butyl alcohol*
11. 1-Propanol
12. MTBE
13. Hexane
14. Chloroform
15. sec-Butyl alcohol
16. 2-Chlorobutane
17. MEK (2-Butanone)
18. Ethyl acetate
19. 1,1-Trichloroethane
20. Carbon tetrachloride
21. 1-Chlorobutane
22. Benzene
23. 1-Butanol
24. Heptane
25. Ethylene glycol
26. soamyl alcohol
27. Toluene
28. Isopropyl amine (not shown)
29. Ethylbenzene
30. m,p-Xylene
31. o-Xylene
32. DMSO



Blood Pollutants II

Column: **HP-Blood Alcohol**
125-9234
30 m x 0.53 mm, 2.00 µm

Carrier: Helium, 36 cm/sec, measured at 40 °C

Oven: 40 °C for 5 min
40-210 °C at 10 °C/min

Injection: Split, 250 °C
Split ratio 1:10

Detector: FID, 300 °C

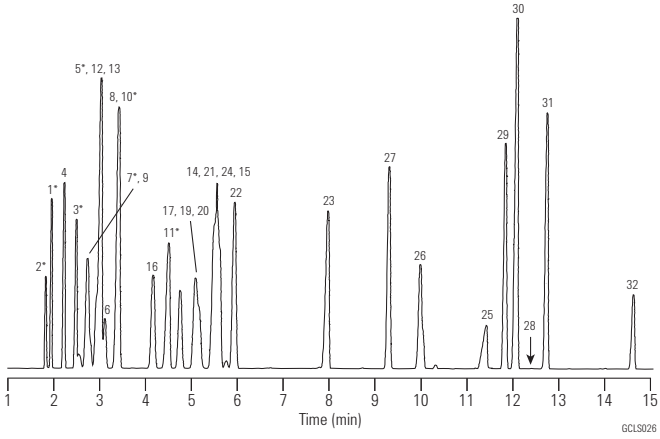
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

1. Methanol*
2. Acetaldehyde*
3. Ethanol*
4. Diethyl ether
5. Isopropyl alcohol*
6. Methylene Chloride
7. Acetone*
8. Acetonitrile
9. Ethyl formate
10. t-Butyl alcohol*
11. 1-Propanol
12. MTBE
13. Hexane
14. Chloroform
15. sec-Butyl alcohol
16. 2-Chlorobutane
17. MEK (2-Butanone)
18. Ethyl acetate
19. 1,1-Trichloroethane
20. Carbon tetrachloride
21. 1-Chlorobutane
22. Benzene
23. 1-Butanol
24. Heptane
25. Ethylene glycol
26. soamyl alcohol
27. Toluene
28. Isopropyl amine (not shown)
29. Ethylbenzene
30. m,p-Xylene
31. o-Xylene
32. DMSO



Residual Solvents, USP 467

Column: **DB-624**
125-1334
30 m x 0.53 mm, 3.00 µm

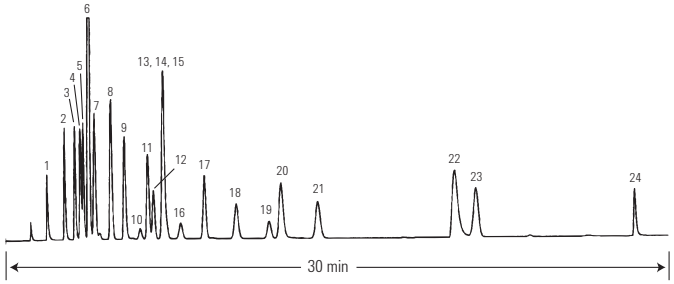
Carrier: Helium at 35 cm/sec, measured at 40 °C

Oven: 40 °C for 20 min
40-90 °C at 5 °C/min

Injection: Megabore Direct, 250 °C
5 m phenylmethylsilane deactivated retention gap

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

1. Methanol
2. Ethanol
3. Ethyl ether
4. Acetone
5. Isopropanol
6. Acetonitrile
7. Methylene chloride
8. tert-Butanol
9. n-Hexane
10. n-Propanol
11. Methyl ethyl ketone (MEK)
12. Ethyl acetate
13. Tetrahydrofuran (THF)
14. Chloroform
15. sec-Butanol
16. Cyclohexane
17. Benzene
18. n-Heptane
19. Trichloroethylene
20. n-Butanol
21. 1,4-Dioxane
22. Pyridine
23. Toluene
24. Dimethylformamide (DMF)



GCLS027

Residual Solvents

Column: **DB-624**
123-1364
60 m x 0.32 mm, 1.80 µm

Carrier: Helium, 35-40 cm/sec, set to yield same RT for Hexane on all columns.

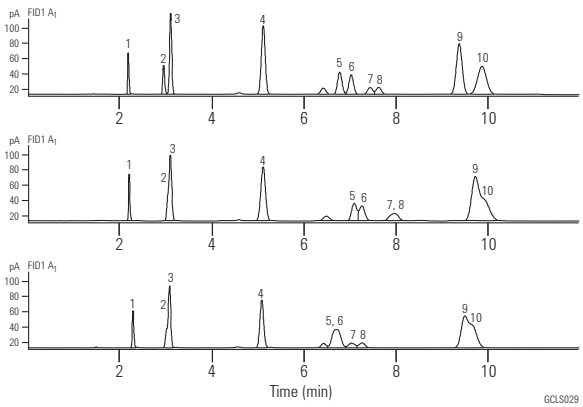
Oven: 40 °C Isothermal

Sampler: Ambient Headspace

Injection: Split ratio 1:8

Detector: FID, 240 °C

Sample: 4 µL



1. Methanol
2. Ethanol
3. Diethyl ether
4. Hexane
5. Ethyl Acetate
6. 2-Butanone
7. 2-Butanol
8. Chloroform
9. Benzene
10. Isooctane

Peak Numbers	Critical Pair	% Resolution* DB-624	Manufacturer A's 624	Manufacturer B's 624
2,3	ethanol and diethyl ether	100%	0%	0%
5,6	ethyl acetate and 2-butanone	95%	38%	0%
7,8	2-butanol and chloroform	60%	0%	60%
9,10	benzene and isooctane	100%	0%	0%

*Resolution calculated as follows: %R = 100% x valley height/average of peak height 1 + peak height 2

The three chromatograms above show how widely different the two other manufacturer's columns are compared to the DB-624, the original USP G-43 stationary phase column recommended for the analysis of these common organic volatile impurities in pharmaceutical samples.

Top Chromatogram: DB-624
Middle Chromatogram: Manufacturer A's "-624"
Bottom Chromatogram: Manufacturer B's "-624"

TIPS & TOOLS

For the latest residual solvent application for USP 467, request publication number 5989-8085EN.

Energy and Fuels Applications

Fast Analysis of Aromatic Solvent

Column: **HP-INNOWax**
19091N-577
20 m x 0.18 mm, 0.18 µm

Carrier: Helium at 33 psi constant pressure mode

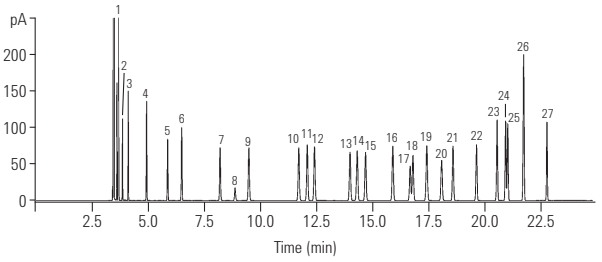
Oven: 70 °C (3 min); 45 °C/min to 145 °C (1 min)

Injection: Split/splitless at 250 °C
100:1 to 600:1 split ratio

Detector: FID at 250 °C

Sample: 0.2 to 1.0 µL

Unified aromatic solvent method



Column: **HP-INNOWax**
19091N-216
60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 20 psi constant pressure mode

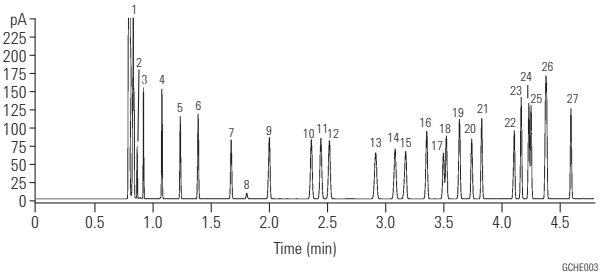
Oven: 75 °C (10 min); 3 °C/min to 100 °C (0 min)
10 °C/min to 145 °C (0 min)

Injection: Split/splitless at 250 °C
100:1 split ratio

Detector: FID at 250 °C

Sample: 1.0 µL

Optimized unified aromatic solvent method



1. Heptane
2. Cyclohexane
3. Octane
4. Nonane
5. Benzene
6. Decane
7. Toluene
8. 1,4-Dioxan
9. Undecane
10. Ethylbenzene
11. p-Xylene
12. m-Xylene
13. Cumene
14. Dodecane
15. o-Xylene
16. Propylbenzene
17. p-Ethyltoluene
18. m-Ethyltoluene
19. t-Butylbenzene
20. s-Butylbenzene
21. Styrene
22. Tridecane
23. 1,3-Diethylbenzene
24. 1,2-Diethylbenzene
25. n-Butylbenzene
26. a-Methylstyrene
27. Phenylacetylene

This application showcases the practicality using High Efficiency GC columns in daily aromatic solvent analysis. The result: a three-fold reduction in run time (compared to a 0.32 mm id column) with no compromise in resolution.

Refinery Gas I

Column: **HP PLOT Q**
19095P-Q04
30 m x 0.53 mm, 40.00 µm

Carrier: Helium p=9.0 psi at 60 °C

Oven: 60 °C for 5 min
60-200 °C at 20 °C/min
200 °C for 1 min

Injection: Split, 250 °C
Split flow 100 mL/min
0.25 cc valve

Detector: TCD, 250 °C

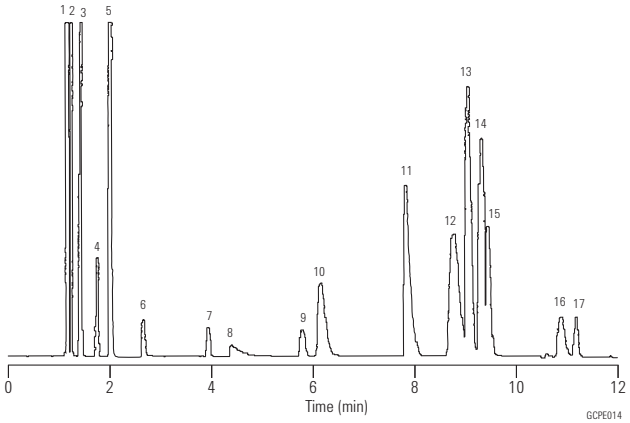
Sample: Refinery gas and others

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Air/CO
2. C_1
3. CO_2
4. Ethylene
5. C_2
6. H_2S
7. COS
8. H_2O
9. Propylene
10. C_3
11. MeOH
12. i-C_4
13. t-C_4
14. n-C_4
15. cis-C_4
16. i-C_5
17. n-C_5

Unleaded Gasoline

Column: **DB-Petro**
122-10A6
100 m x 0.25 mm, 0.50 µm

Carrier: Helium at 25.6 cm/sec

Oven: 0 °C for 15 min
0-5 0 °C at 1 °C/min
50-130 °C at 2 °C/min
130-180 °C at 4 °C/min
180 °C for 20 min

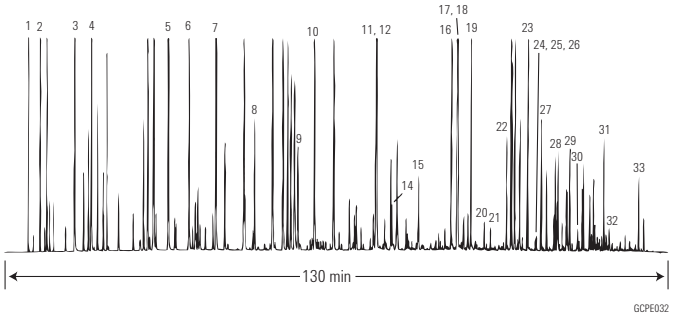
Injection: Split, 200 °C
Split ratio 1:300

Detector: FID, 250 °C
Nitrogen makeup gas
at 30 mL/min

Sample: 1 µL of neat sample

1. Methane
2. n-Butane
3. Isopentane
4. n-Pentane
5. n-Hexane
6. Methylcyclopentane
7. Benzene
8. Cyclohexane
9. Isooctane
10. n-Heptane
11. Toluene *
12. 2,3,3-Trimethylpentane
13. 2-Methylheptane
14. 4-Methylheptane
15. n-Octane
16. Ethylbenzene
17. m-Xylene **
18. p-Xylene
19. o-Xylene
20. n-Nonane
21. Isopropylbenzene
22. Propylbenzene
23. 1,2,4-Trimethylbenzene
24. Isobutylbenzene
25. sec-Butylbenzene
26. n-Decane
27. 1,2,3-Trimethylbenzene
28. Butylbenzene
29. n-Undecane
30. 1,2,4,5-Tetramethylbenzene
31. Naphthalene
32. Dodecane
33. Tridecane

*Valley point with 12 = 78%
**Valley point with 18 = 87%



n-Paraffin Standard

Column: **DB-HT SimDis**
145-1001
5 m x 0.53 mm, 0.15 µm

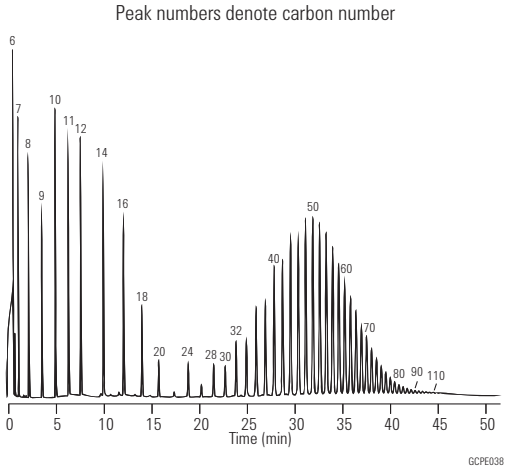
Carrier: Helium at 18 mL/min, measured at 35 °C

Oven: -30-430 °C at 10 °C/min

Injection: OPTIC PTV
55-450 °C at 2 °C/sec

Detector: FID, 450 °C
Nitrogen makeup gas at 15 mL/min

Sample: 0.5 µL of about 2% n-paraffins in CS_2



Volatile Sulfur Compounds

Column: **DB-1**
123-1035
30 m x 0.32 mm, 5.00 µm

Carrier: Helium at 23 cm/sec (H_2S at 50 °C)

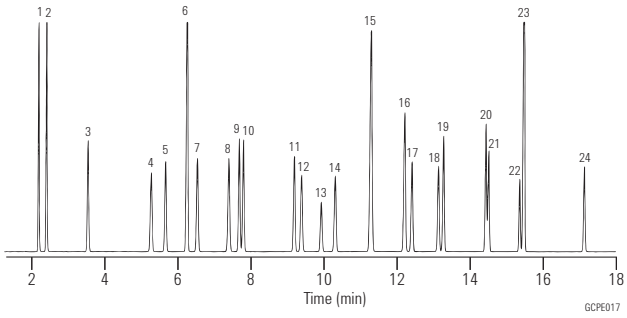
Oven: 50 °C for 4 min, 50-120 °C at 20 °C/min, 120 °C for 4 min, 120-220 °C at 25 °C/min, 220 °C for 2.5 min

Injection: Split, 200 °C
Split ratio 1:10

Detector: PFPD (OI Analytical), 220 °C

Sample: 600 µL of sulfur gas standard
3 ppmV each component

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Carbon disulfide
7. 2-Propanethiol
8. 2-Methyl-2-propanethiol
9. 1-Propanethiol
10. Ethyl methyl sulfide
11. Thiophene
12. 2-Methyl-1-propanethiol
13. Diethyl sulfide
14. 1-Butanethiol
15. Methyl disulfide
16. 2-Methylthiophene
17. 3-Methylthiophene
18. Tetrahydrothiophene
19. 1-Pentanethiol
20. 2-Ethylthiophene
21. 2,5-Dimethylthiophene
22. 1-Hexanethiol
23. Ethyl disulfide
24. 1-Heptanethiol



Agilent wishes to thank Air Toxics, Ltd. (Folsom, CA) for providing the standard mixture shown in this chromatogram.

Sulfur Compounds in Propylene (1 ppm)

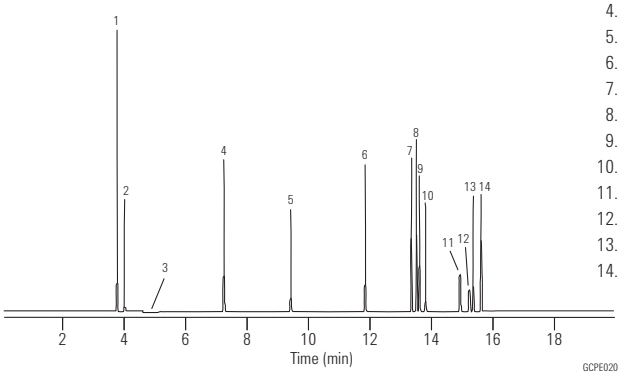
Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Oven: 60 °C for 2.5 min
60-250 °C at 10 °C/min

Injection: OI Analytical Volatiles Inlet
Split ratio 5:1
200 µL gas sampling valve

Detector: OI Analytical Model 5380 PFPD

Sample: 1 ppm Sulfur compounds in Propylene



1. COS
2. H_2S
3. Propylene
4. CS_2
5. Methyl mercaptan
6. Ethyl mercaptan
7. Thiophene
8. Dimethyl sulfide
9. 2-Propanethiol
10. 1-Propanethiol
11. 2-Methyl-2-propanethiol
12. 2-Methyl-1-propanethiol
13. 1-Methyl-1-propnaethiol
14. 1-Butanethiol

Chromatogram courtesy of OI Analytical.

Sulfur Impurities in Propylene

Column: **Select Low Sulfur**
CP8575
60 m x 0.32 mm

Oven: 65 °C for 4 min, 30 °C/min to 120 °C for 5 min

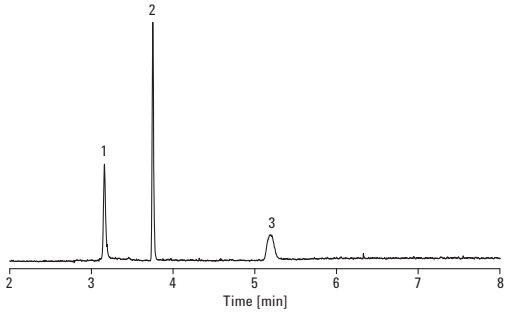
Carrier: Helium, constant flow, 2.0 mL/min

Injection: Gas sampling valve
220 °C, split 1:10

Detector: SCD, 200 °C

Sample: Polypropylene matrix containing ~300 ppb H_2S and CH_3SH, ~500 ppb COS

Injection Volume: 1 mL



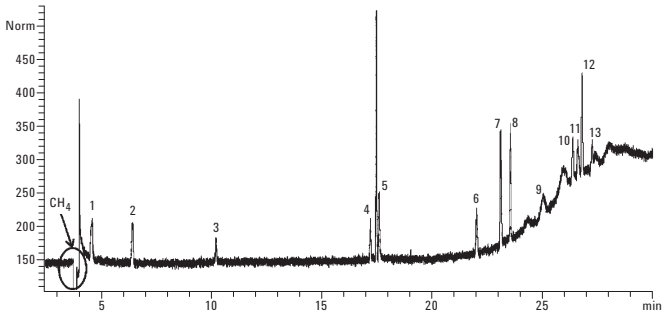
1. H_2S
2. COS
3. CH_3SH

Trace Sulfur Compounds in Methane (50 ppbv)

Column: **Select Low Sulfur CP8575 60 m x 0.32 mm**

Oven: 40 °C (6 min), to 120 °C at 6 °C/min, to 180 °C (5 min) at 10 °C/min

Sample: 1 mL, split ratio: 3:1



	Compound	Signal/noise
1.	Hydrogen sulfide	3.8
2.	Carbonyl sulfide	4.0
3.	Methylmercaptan	2.2
4.	Ethylmercaptan	3.8
5.	Dimethyl sulfide	6.3
6.	2-Propanethiol	4.3
7.	Methyl ethyl sulfide	11
8.	Thiophene	11
9.	Tert-Butyl mercaptan	2.1
10.	2-Butanthiol	4.5
11.	2-Methyl-1 propanethiol	3.7
12.	Diethylsulfide	9.8
13.	1-Butanethiol	2.4

Trace Oxygenates in Light Hydrocarbon Matrices

Column: **DB-1 125-102J 25 m x 0.53 mm, 1.00 µm**

Column: **GS-OxyPLOT 115-4912 10 m x 0.53 mm,**

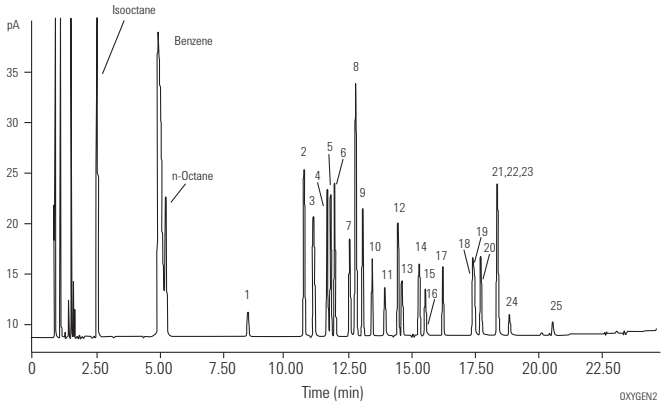
Carrier: Helium (tm = 0.96 min at 50 °C)

Oven: 50 °C for 5 min
50 °C to 240 °C

Injection: Split

Detector: FID

1. Dimethyl ether
2. Diethyl ether
3. Acealdehyde
4. Ethyl t-butyl ether
5. Methyl t-butyl ether
6. Diisopropyl ether
7. Propionaldehyde
8. Tert-amyl methyl ether
9. Propyl ether
10. Isobutylaldehyde
11. Butylaldehyde
12. Methanol
13. Acetone
14. Isovaleraldehyde
15. Valeraldehyde
16. Methyl ethyl ketone
17. Ethanol
18. n-Propanol
19. Isopropanol
20. Allyl alcohol
21. Isobutanol
22. t-Butyl alcohol
23. s-Butyl alcohol
24. n-Butyl alcohol
25. 2-methyl-2 pentanol



Selected Oxygenates

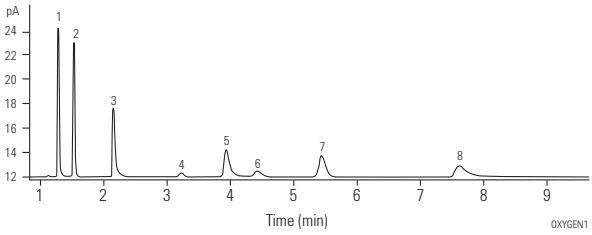
Column: **GS-OxyPLOT**
115-4912
10 m x 0.53 mm,

Carrier: Helium at 41 cm/s

Oven: 150 °C Isothermal

Injection: Split, 1:40, 250 °C

Detector: FID, 290 °C



1. n-Dodecane
2. Methyl t-butyl ether
3. n-Tridecane
4. Iso-Buteraldehyde
5. n-Tetradecane
6. Methanol
7. Acetone
8. n-Pentadecane

Noble Gases

Column: **HP PLOT**
19095P-MS0
30 m x 0.53 mm, 50.00 µm

Carrier: Helium, 4 mL/min

Oven: 35 °C for 3 min
35-120 °C at 25 °C/min
120 °C for 5 min

Injection: Split ratio 50:1

Detector: TCD

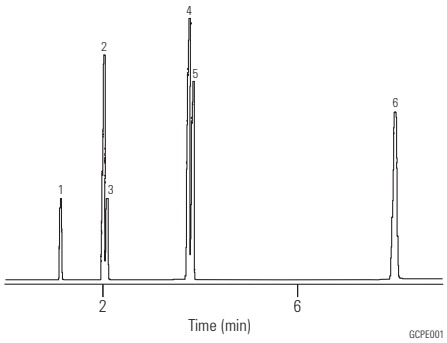
Sample: 250 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Neon
2. Argon
3. Oxygen
4. Nitrogen
5. Krypton
6. Xenon

Permanent Gases

Column: **HP PLOT Molesieve**
19091P-MS4
30 m x 0.32 mm, 12.00 µm

Carrier: Helium, 2 mL/min

Oven: 40 °C Isothermal

Injection: Split ratio 75:1

Detector: TCD

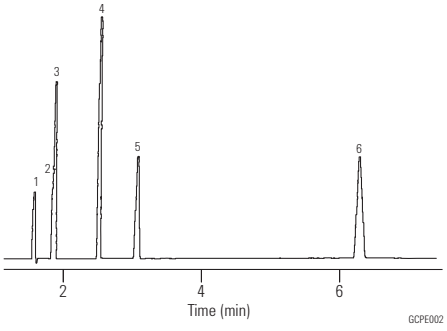
Sample: 250 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Neon
2. Argon
3. Oxygen
4. Nitrogen
5. Methane
6. Carbon monoxide

Baseline Resolution of Air/CO, CO_2, and Methane in a Natural Gas Sample

Column: **HP PLOT Q**
19095P-Q04
30 m x 0.53 mm, 40.00 µm

Carrier: Helium (8.6 mL/min @ 60 °C)

Oven: 60 °C for 2 min
60-240 °C at 30 °C/min
240 °C for 1 min

Injection: Split ratio 12:1

Detector: TCD, 250 °C

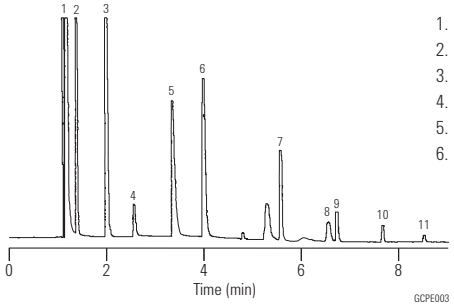
Sample: 0.25 cc natural gas sample, Methane, 80%+

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Air/CO
2. CO_2
3. Ethane
4. H_2S
5. Water
6. C_3
7. $i\text{-}C_4/n\text{-}C_4$
8. $neo\text{-}C_5$
9. $i\text{-}C_5/n\text{-}C_5$
10. C_6
11. C_7

Natural Gas

Column: **HP PLOT Al_2O_3 S**
19095P-S21
15 m x 0.53 mm, 15.00 µm

Carrier: Helium, 50 cm/sec (100 °C), 6 mL/min

Oven: 100 °C for 1.5 min
100-180 °C at 30 °C/min

Injection: Split, 250 °C
Split ratio 50:1

Detector: FID, 250 °C

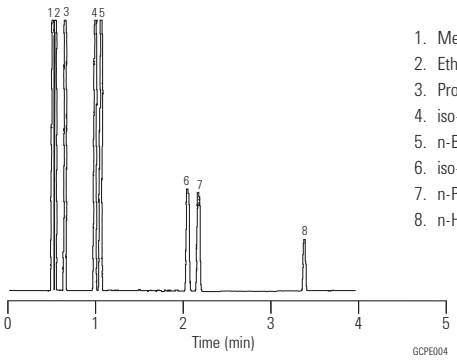
Sample: 5 µL
Natural Gas P/N 5080-8756

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Methane
2. Ethane
3. Propane
4. iso-Butane
5. n-Butane
6. iso-Pentane
7. n-Pentane
8. n-Hexane

Ethylene

Column: **HP PLOT Al_2O_3 S**
19095P-S25
50 m x 0.53 mm, 15.00 µm

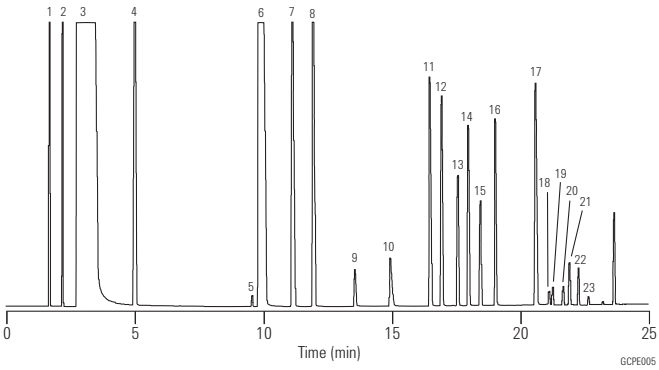
Carrier: Helium, 50 cm/sec (35 °C),
7 mL/min constant flow

Oven: 35 °C for 2 min
35-100 °C at 5 °C/min

Injection: Split, 250 °C
Split ratio 65:1

Detector: FID, 250 °C

Sample: 5 µL
Ethylene 98.4%



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. n-Butane
9. Propadiene
10. Acetylene
11. trans-2-Butene
12. Butene-1
13. Isobutylene
14. cis-2-Butene
15. Isopentane
16. n-Pentane
17. 1,3-Butadiene
18. Propyne
19. trans-2-Pentene
20. 2-Methyl-2-butene
21. Pentene-1
22. cis-2-Pentene
23. n-Hexane

Impurities in Ethylene

Column: **GS-Alumina KCl**
115-3352
50 m x 0.53 mm,

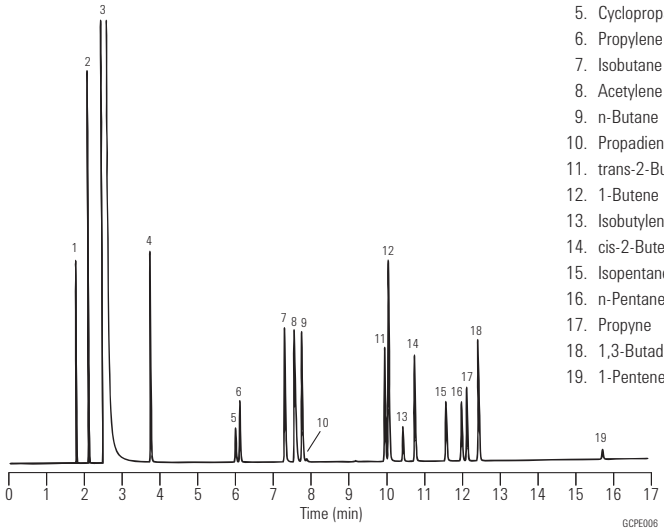
Carrier: Helium at 8 mL/min, measured at 35 °C

Oven: 35 °C for 2 min
35-190 °C at 10 °C/min
190 °C for 3 min

Injection: Split, 200 °C
Split ratio 1:40

Detector: FID, 200 °C
Nitrogen makeup gas at 20 mL/min

Sample: 0.2 mL of trace hydrocarbons
in ethylene



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. Acetylene
9. n-Butane
10. Propadiene
11. trans-2-Butene
12. 1-Butene
13. Isobutylene
14. cis-2-Butene
15. Isopentane
16. n-Pentane
17. Propyne
18. 1,3-Butadiene
19. 1-Pentene

Impurities in Propylene

Column: **GS-Alumina KCl 115-3352 50 m x 0.53 mm,**

Carrier: Helium at 10 mL/min, measured at 35 °C

Oven: 35 °C for 2 min
35-190 °C at 10 °C/min
190 °C for 3 min

Injection: Split, 200 °C
Split ratio 1:30

Detector: FID, 200 °C
Nitrogen makeup gas at 20 mL/min

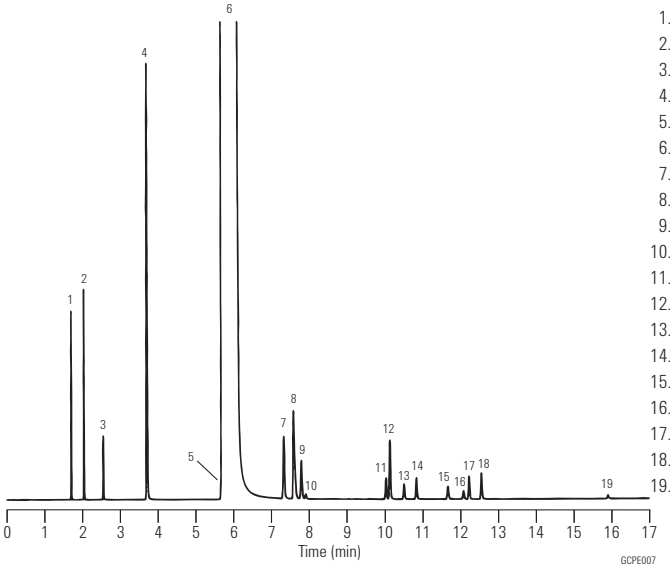
Sample: 0.2 mL of trace hydrocarbons in propylene

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. Acetylene
9. n-Butane
10. Propadiene
11. trans-2-Butene
12. 1-Butene
13. Isobutylene
14. cis-2-Butene
15. Isopentane
16. n-Pentane
17. Propyne
18. 1,3-Butadiene
19. 1-Pentene

Propylene

Column: **GS-Alumina 115-3552 50 m x 0.53 mm**

Carrier: Helium at 10 mL/min, measured at 35 °C

Oven: 35 °C for 2 min
35-190 °C at 10 °C/min
190 °C for 3 min

Injection: Split, 200 °C
Split ratio 1:30

Detector: FID, 200 °C
Nitrogen makeup gas at 20 mL/min

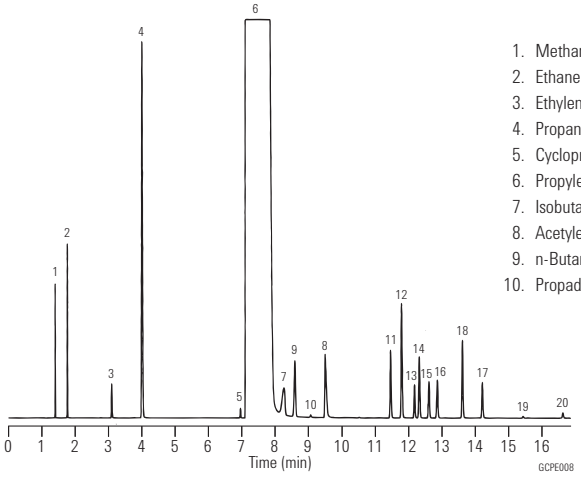
Sample: 0.2 mL of trace hydrocarbons in propylene

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. Acetylene
9. n-Butane
10. Propadiene
11. trans-2-Butene
12. 1-Butene
13. Isobutylene
14. cis-2-Butene
15. Isopentane
16. n-Pentane
17. Propyne
18. 1,3-Butadiene
19. 1-Pentene
20. n-Hexane

1,3-Butadiene

Column: **DB-624**
128-1324
25 m x 0.20 mm, 1.12 µm

Carrier: Helium at 1.0 mL/min

Oven: -20 °C for 3 min
-20 °C-20 °C at 4 °C/min
20 °C-200 °C at 8 °C/min
200 °C for 10 min

Injection: Split, 250 °C
Split ratio 1:150

Detector: FID, 250 °C

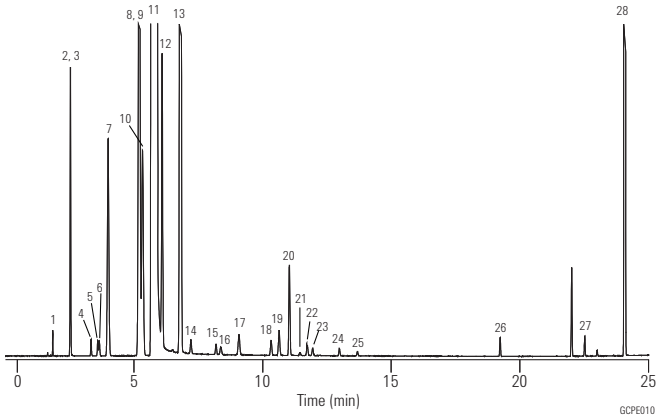
Sample: 0.5 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



Refined Butadiene Standard Component	Gravimetric concentration (PPM)
1. Acetylene	20.7
2. Propane	19.8
3. Propylene	296
4. Propadiene (allene)	21.1
5. Propyne (methylacetylene)	21
6. Cyclopropane	20
7. Isobutane	506
8. Butene-1	999
9. Isobutylene	495
10. n-Butane	494
11. 1,3-Butadiene	balance
12. trans-2-Butene	442
13. cis-2-Butene	1946
14. 1-Butyne (ethylacetylene)	20.2
15. 1,2-Butadiene	28.9
16. 3-Methyl-1-butene	19.8
17. Isopentane	50.1
18. Pentene-1	29.8
19. n-Pentane	50.1
20. 2-Butyne (dimethylacetylene)	150
21. trans-2-Pentene	5.57
22. Isoprene	20
23. cis-2-Pentene	13.9
24. trans-1,3-Pentadiene	13.8
25. cis-1,3-Pentadiene	7.73
26. Benzene	20.3
27. Toluene	20.2
28. Dimer (4-vinylcyclohexene-1)	

Agilent Technologies wishes to thank DCG Industries (Pearland, TX) for providing this chromatogram.

1,3-Butadiene Purity

Column: **GS-Alumina**
115-3552
50 m x 0.53 mm

Carrier: Helium, 6.0 mL/min
(constant flow mode)

Oven: 45 °C for 3 min
6 °C/min to 195 °C
195 °C for 15 min

Injection: Split, 250 °C
Split ratio 1:50

Detector: FID, 250 °C

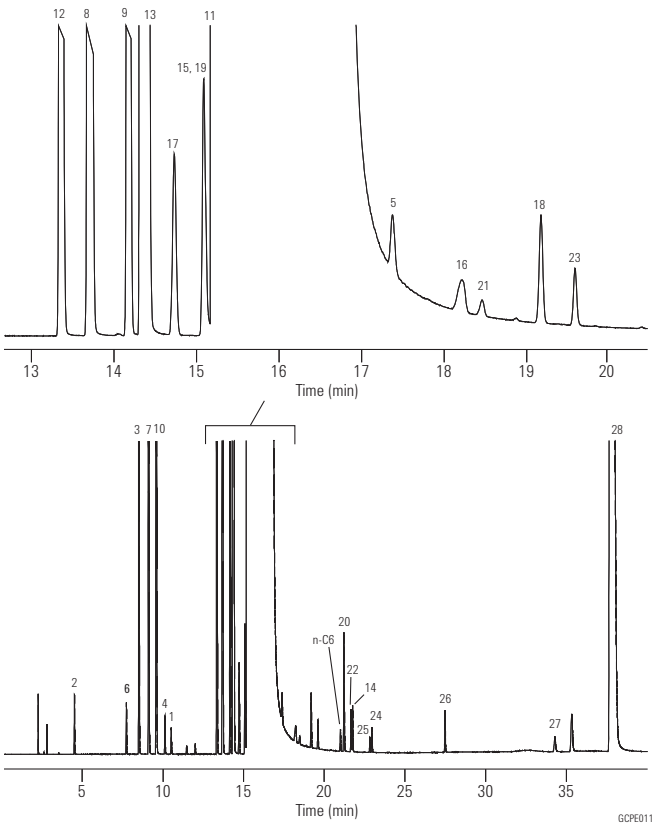
Sample: 0.5 µL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



Refined Butadiene Standard Component	Gravimetric concentration (PPM)
1. Acetylene	20.7
2. Propane	19.8
3. Propylene	296
4. Propadiene (allene)	21.1
5. Propyne (methylacetylene)	21
6. Cyclopropane	20
7. Isobutane	506
8. Butene-1	999
9. Isobutylene	495
10. n-Butane	494
11. 1,3-Butadiene	balance
12. trans-2-Butene	442
13. cis-2-Butene	1946
14. 1-Butyne (ethylacetylene)	20.2
15. 1,2-Butadiene	28.9
16. 3-Methyl-1-butene	19.8
17. Isopentane	50.1
18. Pentene-1	29.8
19. n-Pentane	50.1
20. 2-Butyne (dimethylacetylene)	150
21. trans-2-Pentene	5.57
22. Isoprene	20
23. cis-2-Pentene	13.9
24. trans-1,3-Pentadiene	13.8
25. cis-1,3-Pentadiene	7.73
26. Benzene	20.3
27. Toluene	20.2
28. Dimer (4-vinylcyclohexene-1)	

Extended Hydrocarbon Analysis I

Column: **GS-Alumina**
115-3532
30 m x 0.53 mm

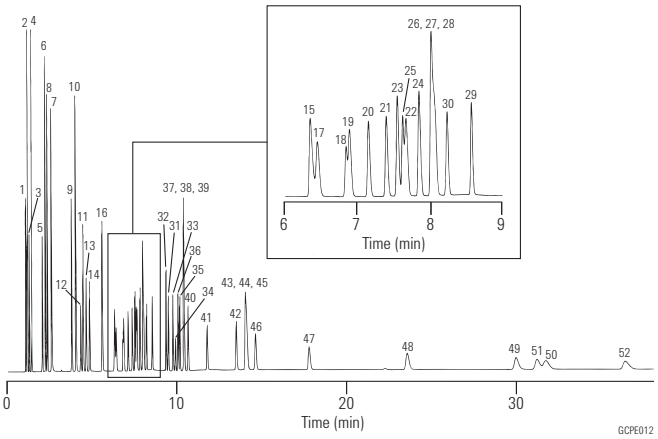
Carrier: Helium at 52 cm/sec (6.7 mL/min), measured at 100 °C

Oven: 100 °C for 1 min
100-140 °C at 8 °C/min
140 °C for 0.5 min
140-200 °C at 30 °C/min

Injection: Split, 250 °C
Split ratio 1:8

Detector: FID, 275 °C
Nitrogen makeup gas at 29 mL/min

Sample: 300 µL injection of 100 ppm V SUMMA cannister mixture



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759
Liner: Direct, 1.5 mm id, 18740-80200
Seal: Gold plated seal, 18740-20885

1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. Acetylene
8. n-Butane
9. trans-2-Butene
10. 1-Butene
11. cis-2-Butene
12. Cyclopentane
13. Isopentane
14. n-Pentane
15. Propyne
16. 1,3-Butadiene
17. Cyclopentene
18. 3-Methyl-1-butene
19. trans-2-Pentene
20. 2-Methyl-2-butene
21. 1-Pentene
22. cis-2-Pentene
23. Methylcyclopentane
24. 2,2-Dimethylbutane
25. Cyclohexane
26. 2,3-Dimethylbutane
27. 2-Methylpentane
28. 3-Methylpentane
29. Isoprene
30. n-Hexane
31. 4-Methyl-1-pentene
32. trans-2-Hexene
33. 2-Methyl-1-pentene
34. cis-2-Hexene
35. 2,4-Dimethylpentane
36. Methylcyclohexane
37. 2,3-Dimethylpentane
38. 2-Methylhexane
39. 3-Methylhexane
40. n-Heptane
41. Benzene
42. Isooctane (2,2,4-Trimethylpentane)
43. 2,3,4-Trimethylpentane
44. 3-Methylheptane
45. 2-Methylheptane
46. n-Octane
47. Toluene
48. n-Nonane
49. Ethylbenzene
50. m-Xylene
51. p-Xylene
52. o-Xylene

Extended Hydrocarbon Analysis II

Column: **GS-GasPro**
113-4362
60 m x 0.32 mm

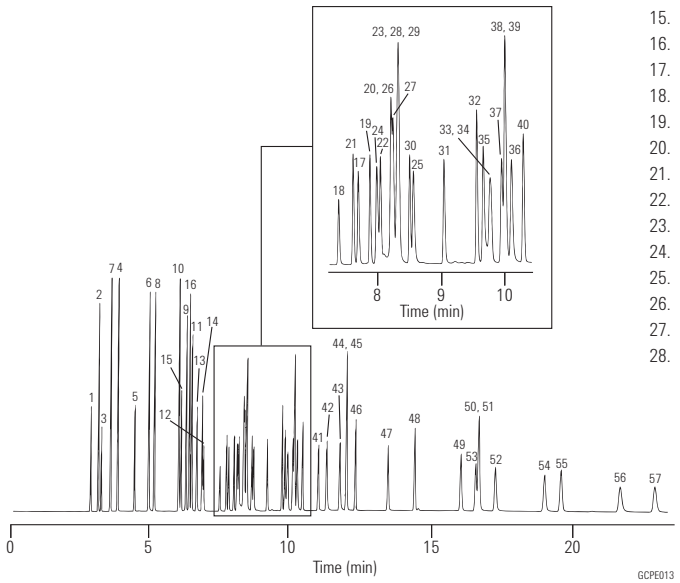
Carrier: Helium at 40 cm/sec (3.3 mL/min), measured at 80 °C

Oven: 80 °C for 0.5 min
80-175 °C at 25 °C/min
175 °C for 2 min
175-250 °C at 25 °C/min

Injection: Split, 250 °C
Split ratio 1:17

Detector: FID, 275 °C
Nitrogen makeup gas at 32 mL/min

Sample: 500 µL injection of 100 ppmV
SUMMA cannister mixture



Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. Acetylene
8. n-Butane
9. trans-2-Butene
10. 1-Butene
11. cis-2-Butene
12. Cyclopentane
13. Isopentane
14. n-Pentane
15. Propyne
16. 1,3-Butadiene
17. Cyclopentene
18. 3-Methyl-1-butene
19. trans-2-Pentene
20. 2-Methyl-2-butene
21. 1-Pentene
22. cis-2-Pentene
23. Methylcyclopentane
24. 2,2-Dimethylbutane
25. Cyclohexane
26. 2,3-Dimethylbutane
27. 2-Methylpentane
28. 3-Methylpentane
29. Isoprene
30. n-Hexane
31. 4-Methyl-1-pentene
32. trans-2-Hexene
33. 2-Methyl-1-pentene
34. cis-2-Hexene
35. 2,4-Dimethylpentane
36. Methylcyclohexane
37. 2,3-Dimethylpentane
38. 2-Methylhexane
39. 3-Methylhexane
40. n-Heptane
41. Benzene
42. Isooctane (2,2,4-Trimethylpentane)
43. 2,3,4-Trimethylpentane
44. 3-Methylheptane
45. 2-Methylheptane
46. n-Octane
47. Toluene
48. n-Nonane
49. Ethylbenzene
50. m-Xylene
51. p-Xylene
52. o-Xylene
53. Styrene
54. Isopropylbenzene (Cumene)
55. n-Propylbenzene
56. 1,3,5-Trimethylbenzene
57. 1,2,4-Trimethylbenzene

Refinery Gas

Column: **HP PLOT Al_2O_3 S**
19095P-S25
50 m x 0.53 mm, 15.00 µm

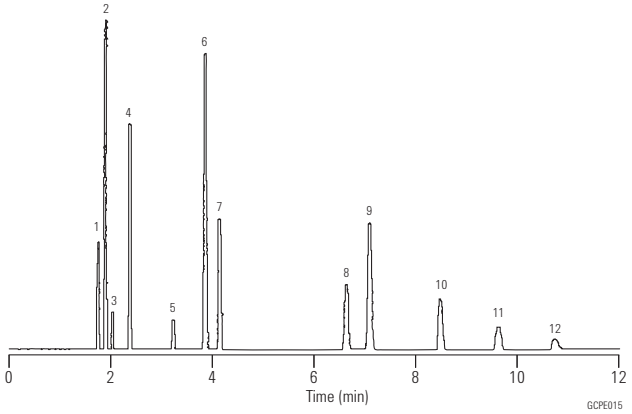
Carrier: Helium 7 mL/min

Oven: 100 °C Isothermal

Injection: Split, 250 °C
Split ratio 100:1

Detector: FID, 250 °C

Sample: 5 µL



1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. iso-Butane
7. n-Butane
8. trans-2-Butene
9. 1-Butene
10. cis-2 Butene
11. iso-Pentane
12. n-Pentane

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

Sulfur Gas Analysis in Light Hydrocarbon Streams I

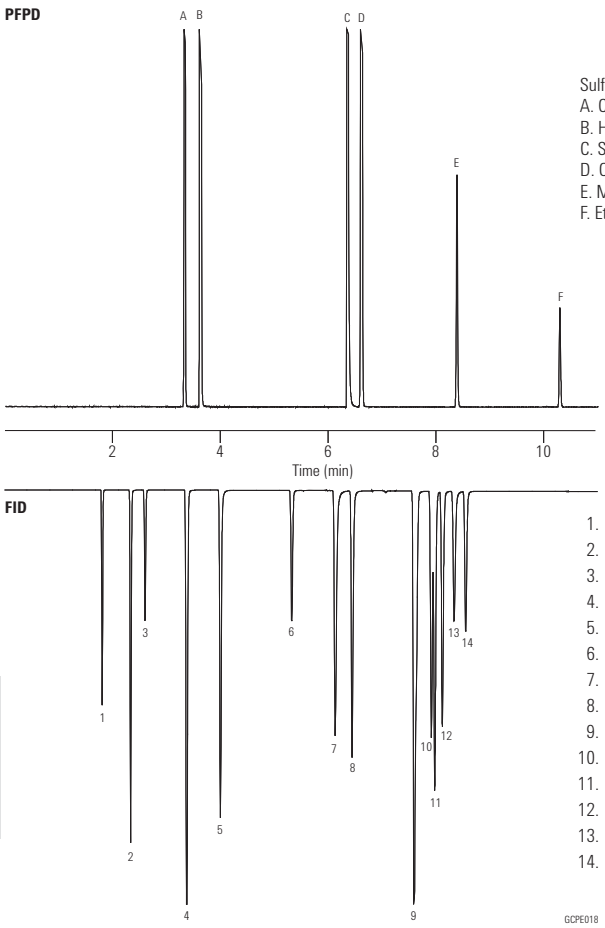
Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Carrier: Helium, 10 psig,
2.0 mL/min @ 60 °C

Oven: 60 °C for 2 min,
20 °C/min to 260 °C and hold

Injection: Split, 200 °C
Split ratio 1:20

Detector: Two separate analyses under identical conditions on FID and PFPD



Sulfur compounds (PFPD)
A. Carbonyl sulfide
B. Hydrogen sulfide
C. Sulfur dioxide
D. Carbon disulfide
E. Methyl mercaptan
F. Ethyl mercaptan

1. Methane
2. Ethane
3. Ethylene
4. Acetylene
5. Propane
6. Propylene
7. iso-Butane
8. n-Butane
9. 1-Butene/Methyl acetylene
10. trans-2-Butene
11. 1,3-Butadiene
12. cis-2-Butene
13. iso-Pentane
14. n-Pentane

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

Sulfur Gas Analysis in Light Hydrocarbon Streams II

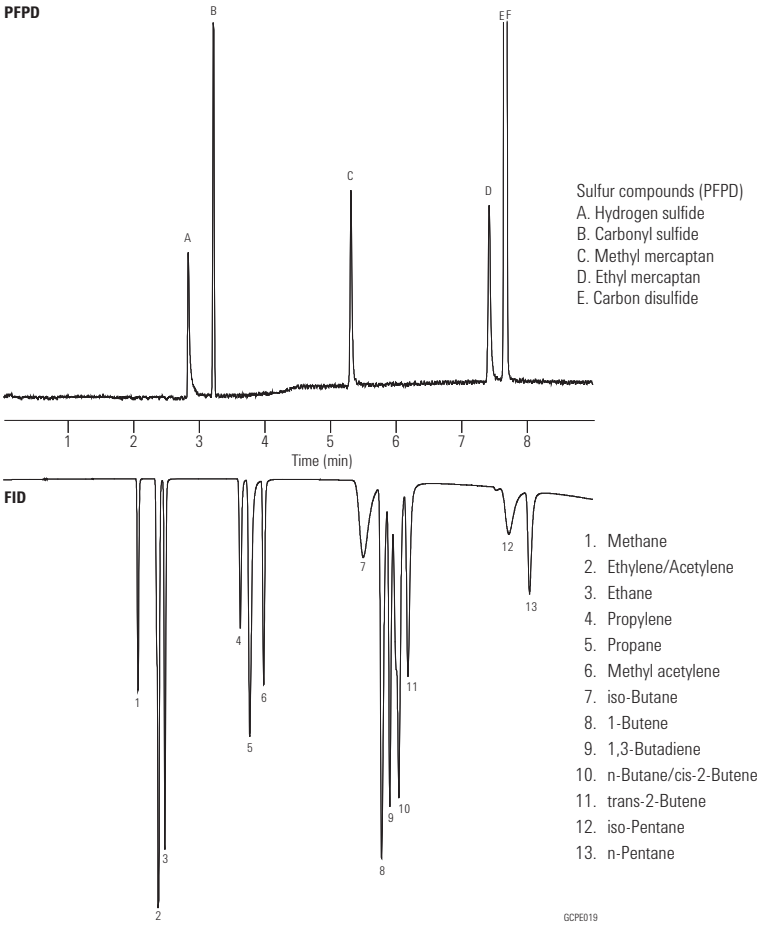
Column: **GS-Q**
113-3432
30 m x 0.32 mm, 0.20 µm

Carrier: Helium, 10 psig, 1.7 mL/min @ 100 °C

Oven: 100 °C for 2 min, 20 °C/min to 250 °C and hold

Injection: Split, 200 °C
Split ratio 1:20

Detector: Two separate analyses under identical conditions on FID and PFPD



Sulfur compounds (PFPD)
A. Hydrogen sulfide
B. Carbonyl sulfide
C. Methyl mercaptan
D. Ethyl mercaptan
E. Carbon disulfide

1. Methane
2. Ethylene/Acetylene
3. Ethane
4. Propylene
5. Propane
6. Methyl acetylene
7. iso-Butane
8. 1-Butene
9. 1,3-Butadiene
10. n-Butane/cis-2-Butene
11. trans-2-Butene
12. iso-Pentane
13. n-Pentane

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885

Sulfur Compounds in Propylene (1 ppm)

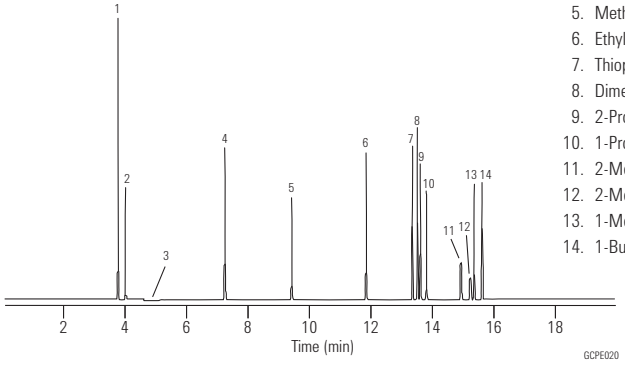
Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Oven: 60 °C for 2.5 min
60-250 °C at 10 °C/min

Injection: OI Analytical Volatiles Inlet
Split ratio 5:1
200 µL gas sampling valve

Detector: OI Analytical Model 5380 PFPD

Sample: 1 ppm Sulfur compounds in Propylene



1. COS
2. H_2S
3. Propylene
4. CS_2
5. Methyl mercaptan
6. Ethyl mercaptan
7. Thiophene
8. Dimethyl sulfide
9. 2-Propanethiol
10. 1-Propanethiol
11. 2-Methyl-2-propanethiol
12. 2-Methyl-1-propanethiol
13. 1-Methyl-1-propnaethiol
14. 1-Butanethiol

Chromatogram courtesy of OI Analytical.

Mercaptans

Column: **GS-GasPro**
113-4332
30 m x 0.32 mm

Carrier: Helium at 25 cm/sec

Oven: 175 °C for 2 min
175-260 °C at 10 °C/min

Injection: Split
Split flow 80 mL/min

Detector: FID

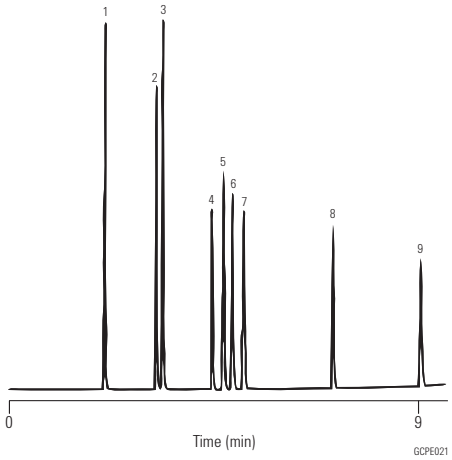
Sample: 0.2 mL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Ethyl mercaptan
2. 2-Propyl mercaptan
3. 1-Propyl mercaptan
4. 2-Methyl-2-propyl mercaptan
5. 2-Methyl-1propyl mercaptan
6. 1-Methyl-1-propyl mercaptan
7. 1-Butyl mercaptan
8. 1-Pentyl mercaptan
9. 1-Hexyl mercaptan

Sulfur Compounds in Natural Gas – Synthetic Mixture

Column: **HP-1**
19091Z-205
50 m x 0.20 mm, 0.50 µm

Carrier: Helium

Oven: 35 °C for 10 min
35-300 °C at 7 °C/min

Injection: Split 100:1

Detector: FPD

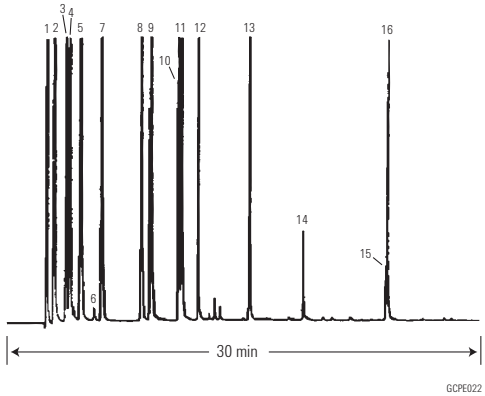
Sample: 0.5 mL

Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct, 1.5 mm id, 18740-80200

Seal: Gold plated seal, 18740-20885



1. Hydrogen sulfide
2. Methyl mercaptan
3. Ethyl mercaptan
4. Dimethyl sulfide
5. Isopropyl mercaptan
6. tert-Butyl mercaptan
7. n-Propyl mercaptan
8. Thiophene and sec-Butyl mercaptan
9. Isobutyl mercaptan
10. n-Butyl mercaptan
11. tert-Amyl mercaptan
12. Isoamyl mercaptan
13. n-Amyl mercaptan
14. n-Hexyl mercaptan
15. tert-Dibutyl disulfide
16. n-Octyl mercaptan

Sulfur Compounds in Naphtha

Column: **HP-PONA**
19091S-001
50 m x 0.20 mm, 0.50 µm

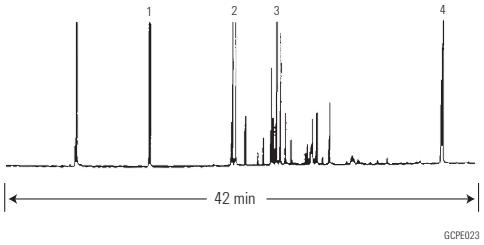
Carrier: Helium, 26 cm/sec

Oven: 35 °C for 15 min
35-70 °C at 8 °C/min
70-130 °C at 15 °C/min

Injection: Split ratio 400:1

Detector: FPD

Sample: 3 µL



1. Thiophene
2. Methyl thiophenes
3. Ethyl and dimethyl thiophenes
4. Benzothiophene

Aromatics Analysis – ASTM D16 Analytes

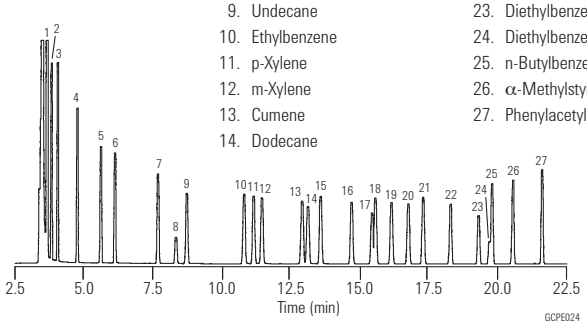
Column: **HP-INNOWax**
19091N-216
60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 20 psi, constant pressure mode

Oven: 75 °C for 10 min
3 °C/min to 100 °C
10 °C/min to 145 °C

Injection: Split, 250 °C
Split ratio 100:1 to 400:1

Detector: FID, 250 °C
Data aquisition rate at 20 Hz



1. Heptane
2. Cyclohexane
3. Octane
4. Nonane
5. Benzene
6. Decane
7. Toluene
8. 1-4-Dioxane
9. Undecane
10. Ethylbenzene
11. p-Xylene
12. m-Xylene
13. Cumene
14. Dodecane
15. o-Xylene
16. Propylbenzene
17. p-Ethyltoluene
18. m-Ethyltoluene
19. tert-Butylbenzene
20. sec-Butylbenzene
21. Styrene
22. Tridecane
23. Diethylbenzene isomer
24. Diethylbenzene isomer
25. n-Butylbenzene
26. α-Methylstyrene
27. Phenylacetylene

Aromatics Analysis – Ethylbenzene Impurities

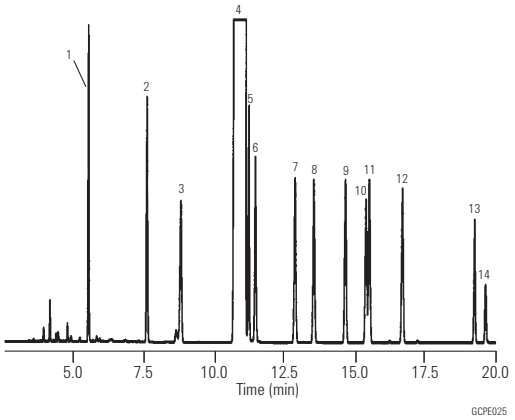
Column: **HP-INNOWax**
19091N-216
60 m x 0.32 mm, 0.50 µm

Carrier: Helium at 20 psi, constant pressure mode

Oven: 75 °C for 10 min
3 °C/min to 100 °C
10 °C/min to 145 °C

Injection: Split, 250 °C
Split ratio 100:1 to 400:1

Detector: FID, 250 °C
Data aquisition rate at 20 Hz



1. Benzene
2. Toluene
3. Undecane
4. Ethylbenzene
5. p-Xylene
6. m-Xylene
7. Isopropylbenzene
8. o-Xylene
9. n-Propylebenzene
10. p-Ethyltoluene
11. m-Ethyltoluene
12. s-Butylbenzene
13. Diethylbenzene
14. Diethylbenzene

Impurities in p-Xylene – ASTM D3798

Column: **HP-INNOWax**
19091N-216
60 m x 0.32 mm, 0.50 µm

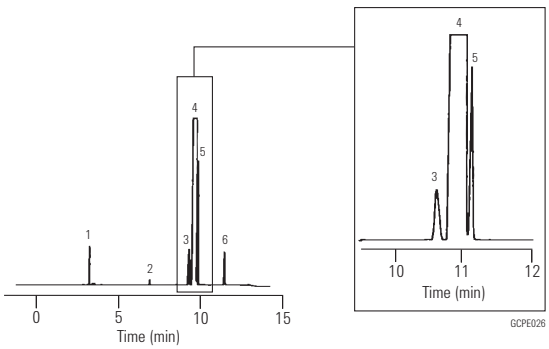
Carrier: Helium, 32 cm/sec, 19.9 psi (60 °C),
2.5 mL/min constant flow

Oven: 60 °C for 1 min
60-92 °C at 4 °C/min
92 °C for 4.5 min
92-220 °C at 20 °C/min
220 °C for 5 min

Injection: Split, 220 °C
Split ratio 100:1

Detector: FID, 270 °C

Sample: 0.5 µL
Neat, 99%+



1. Non aromatic hydrocarbon
2. Toluene
3. Ethylbenzene
4. p-Xylene
5. m-Xylene
6. o-Xylene

Ethylene Oxide Synthetic Standard

Column: **HP PLOT Q**
19095P-QO4
30 m x 0.53 mm, 40.00 µm

Carrier: Helium, 25 psi

Oven: 50 °C for 2 min
50-250 °C at 15 °C/min

Injection: Split ratio 40:1

Detector: FID

Sample: 1 µL liquid injection
sample 2000 ppm v/v

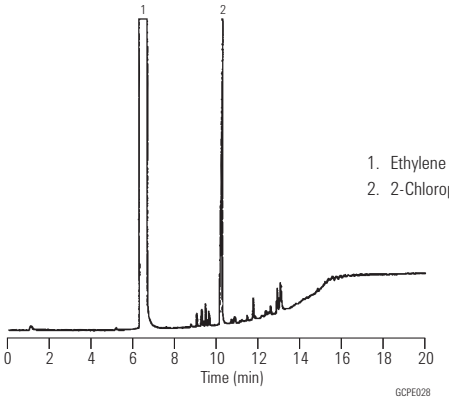
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: General purpose split/splitless liner, taper, glass wool, 5183-4711

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. Ethylene oxide
2. 2-Chloropropene

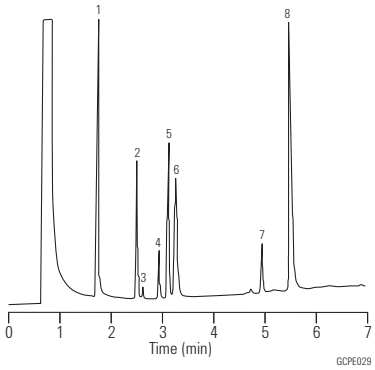
Oxygenates

Column: **HP PLOT Q**
19095P-QO4
30 m x 0.53 mm, 40.00 µm

Carrier: Helium, 25 psig

Oven: 150 °C for 2 min
150-250 °C at 15 °C/min

Detector: FID



1. Ethanol
2. 2-Propanone
3. Dichloromethane
4. Acetic acid, methyl ester
5. Diethyl ether
6. Pentane
7. Acetic acid, ethyl ester
8. Hexane

Oxygenates in Gasoline ASTM D5599 (GC-OFID)

Column: **HP-1**
19091Z-236
60 m x 0.25 mm, 1.00 µm

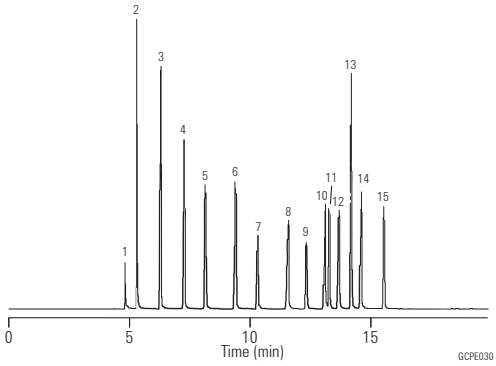
Carrier: Helium 30 cm/sec constant flow

Oven: 40 °C for 6 min
40-50 °C at 5 °C/min
50 °C for 4 min
50-175 °C at 25 °C/min
175 °C for 5 min

Injection: Split ratio 150:1

Detector: Wasson ECE OFID

Sample: 0.5 µL



1. Water
2. Methanol
3. Ethanol
4. 2-Propanol
5. t-Butanol
6. 1-Propanol
7. MTBE
8. sec-Butanol
9. DIPE
10. Isobutanol
11. ETBE
12. TAA
13. 1,2-Dimethoxyethane
14. 1-Butanol
15. TAME

Denatured Fuel Ethanol – ASTM D5501

Column: **HP-1**
19091Z-530
100 m x 0.25 mm, 0.50 µm

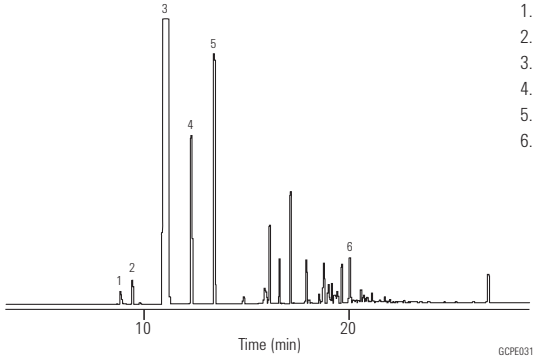
Carrier: Helium 24 cm/sec

Oven: 15 °C for 12 min
15-250 °C at 19 °C/min
250 °C for 20 min

Injection: Split ratio 200:1

Detector: FID 250 °C
Nitrogen makeup
gas at 30 mL/min

Sample: 0.5 µL



1. Methanol
2. n-Butane
3. Ethanol
4. Isopentane
5. n-Pentane
6. Other hydrocarbons

PONA Mix as Specified by AFNOR Method #2

Column: **DB-Petro**
128-1056
50 m x 0.20 mm, 0.50 µm

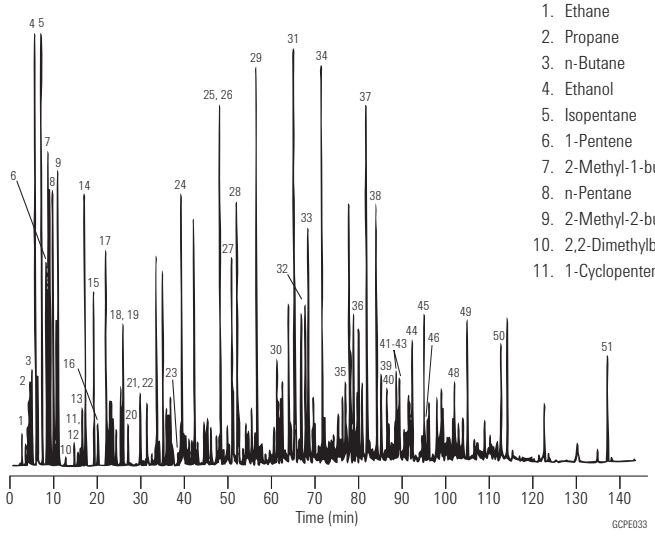
Carrier: Helium at 16.7 cm/sec, measured at 35 °C

Oven: 10 °C for 15 min
10-70 °C at 1.3 °C/min
70-250 °C at 1.7 °C/min

Injection: Split, 250 °C
Split ratio 1:200

Detector: FID, 250 °C
Nitrogen makeup gas at 30 mL/min

Sample: 0.3 µL petroleum reformate



1. Ethane
2. Propane
3. n-Butane
4. Ethanol
5. Isopentane
6. 1-Pentene
7. 2-Methyl-1-butene
8. n-Pentane
9. 2-Methyl-2-butene
10. 2,2-Dimethylbutane
11. 1-Cyclopentene
12. Cyclopentane
13. 2,3-Dimethylbutane
14. 2-Methylpentane
15. 3-Methylpentane
16. 2-Methyl-1-pentene
17. n-Hexane
18. 2,2-Dimethylpentane
19. Methylcyclopentane
20. 2,4-Dimethylpentane
21. Benzene
22. 1-Methyl-1-cyclopentene
23. Isooctane
24. n-Heptane
25. Toluene
26. 2,3,3-Trimethylpentane
27. 2-Methylheptane
28. 3-Methylheptane
29. n-Octane
30. Ethylbenzene
31. m-Xylene
32. p-Xylene
33. o-Xylene
34. n-Nonane
35. n-Propylbenzene
36. 1,3,5-Trimethylbenzene
37. 1,2,4-Trimethylbenzene
38. n-Decane
39. 1,2,3-Trimethylbenzene
40. Indan
41. 1,3-Diethylbenzene
42. 1-Methyl-3-propylbenzene
43. 1,3-Diethyl-5-ethylbenzene
44. 1,2-Diethyl-4-ethylbenzene
45. n-Undecane
46. 1,2,4,5-Tetramethylbenzene
47. 1,2,3,5-Tetramethylbenzene
48. Naphthalene
49. n-Dodecane
50. 2-Methylnaphthalene
51. Tetradecane

Aromatics in Finished Gasoline – ASTM Method 5769

Column: **DB-1**
122-1063
60 m x 0.25 mm, 1.00 µm

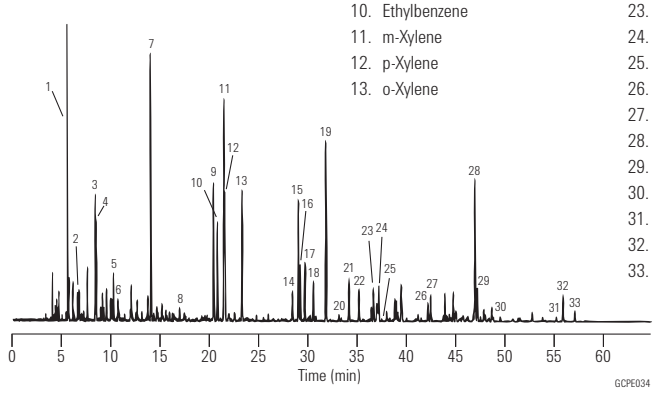
Carrier: Helium at 35 cm/sec, measured at 50 °C

Oven: 50 °C for 1 min
50-190 °C at 2 °C/min
190 °C for 1 min

Injection: Split, 250 °C
Split ratio 1:100

Detector: MSD

Sample: 0.3 µL unleaded gasoline
Calib std: ASTM/EPA gasoline refinery aromatics (AccuStandard M-GRA-CAL/IS-SET)



1. Methyl-tert-butyl-ether (MTBE)
2. n-Hexane
3. Benzene-d6 (IS)
4. Benzene
5. Isooctane
6. n-Heptane
7. Toluene
8. n-Octane
9. Ethylbenzene-d10 (IS)
10. Ethylbenzene
11. m-Xylene
12. p-Xylene
13. o-Xylene
14. n-Propylbenzene
15. 1-Methyl-3-ethylbenzene
16. 1-Methyl-4-ethylbenzene
17. 1,3,5-Trimethylbenzene
18. 1-Methyl-2-ethylbenzene
19. 1,2,4-Trimethylbenzene
20. n-Decane
21. 1,2,3-Trimethylbenzene
22. Indan
23. 1,4-Diethylbenzene
24. n-Butylbenzene (valley)
25. 1,2-Diethylbenzene
26. 1,2,4,5-Tetramethylbenzene
27. 1,2,3,5-Tetramethylbenzene
28. Naphthalene-d8 (IS)
29. Naphthalene
30. n-Dodecane
31. Pentamethylbenzene
32. 2-Methylnaphthalene
33. 1-Methylnaphthalene

Simulated Distillation

Column: **DB-2887**
125-2814
10 m x 0.53 mm, 3.00 µm

Carrier: Helium at 7 mL/min

Oven: 35-350 °C at 15 °C/min

Injection: Direct

Detector: FID
Nitrogen makeup gas
at 30 mL/min

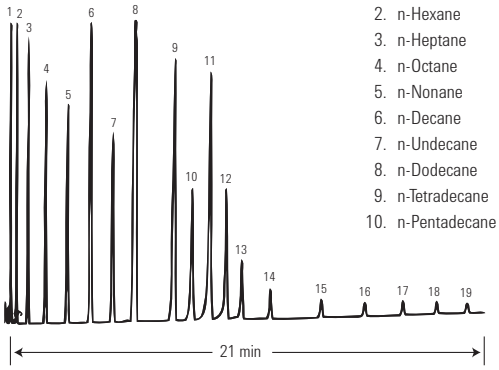
Suggested Supplies

Septum: 11 mm Certified BTO septa, 5183-4757

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



1. n-Pentane
2. n-Hexane
3. n-Heptane
4. n-Octane
5. n-Nonane
6. n-Decane
7. n-Undecane
8. n-Dodecane
9. n-Tetradecane
10. n-Pentadecane
11. n-Hexadecane
12. n-Heptadecane
13. n-Octadecane
14. n-Eicosane
15. n-Tetracosane
16. n-Octacosane
17. n-Dotriacontane
18. n-Hexatriacontane
19. n-Tetracontane

Reference Gas Oil

Column: **DB-2887**
125-2814
10 m x 0.53 mm, 3.00 µm

Carrier: Helium at 7 mL/min

Oven: 35-350 °C at 15 °C/min

Injection: Direct

Detector: FID
Nitrogen makeup gas
at 30 mL/min

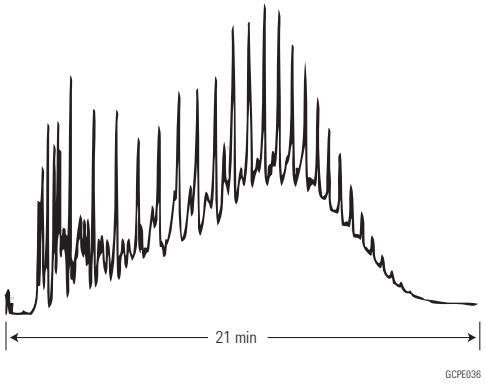
Suggested Supplies

Septum: 11 mm Advanced Green septa, 5183-4759

Liner: Direct connect, dual taper, deactivated, 4 mm id, G1544-80700

Seal: Gold plated seal, 18740-20885

Syringe: 10 µL tapered, FN 23-26s/42/HP, 5181-1267



Regular Unleaded Gasoline (California Phase 1) – "Normal" GC Run I

Column: **DB-Petro 122-10A6 100 m x 0.25 mm, 0.50 µm**

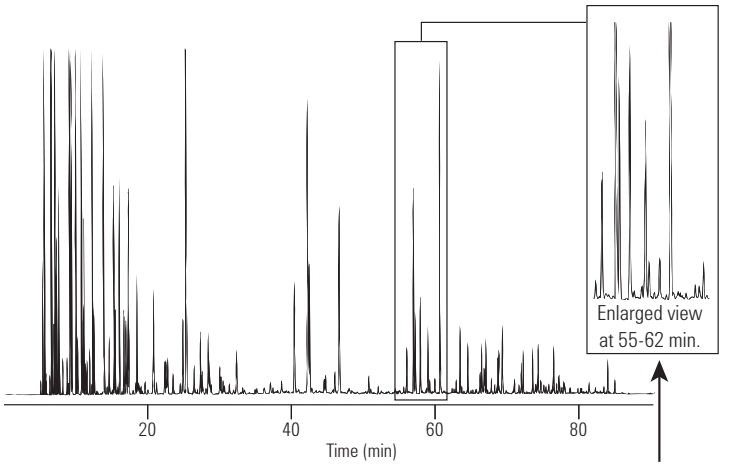
Carrier: Hydrogen at 31 cm/sec

Oven:
35 °C for 9.5 min
35-45 °C at 13.3 °C/min
45 °C for 11 min
45-60 °C at 1.4 °C/min
60 °C for 11 min
60-220 °C at 2.7 °C/min
220 °C for 3.6 min

Injection: Split ratio 1:200

Detector: FID, 300 °C

Sample: 0.2 µL



Compare Resolution

Regular Unleaded Gasoline (California Phase 1) – "Normal" GC Run II

Column: **DB-1 127-1046 40 m x 0.10 mm, 0.20 µm**

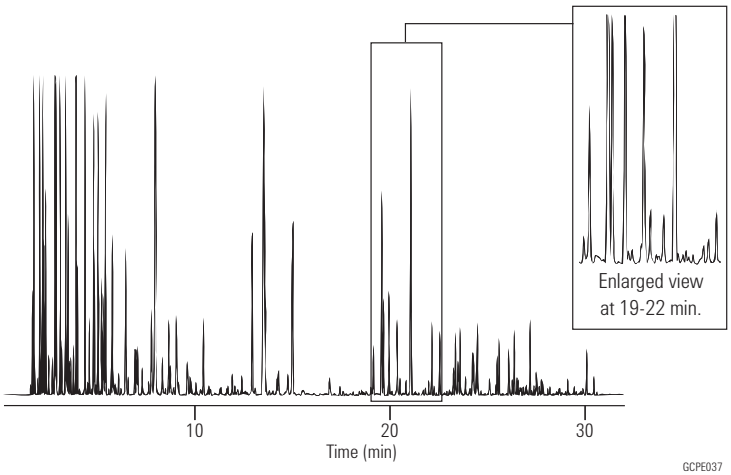
Carrier: Hydrogen at 34.8 cm/sec

Oven:
35 °C for 3.6 min
35-45 °C at 36.1 °C/min
45 °C for 4.2 min
45-60 °C at 3.9 °C/min
60 °C for 4.2 min
60-220 °C at 6.9 °C/min
220 °C for 1.4 min

Injection: Split ratio 1:400

Detector: FID, 300 °C

Sample: 0.2 µL



Gasoline Unleaded ASTM D 5769

Column: **CP-Sil PONA CB**
CP7530
100 m x 0.25 mm, 0.50 µm

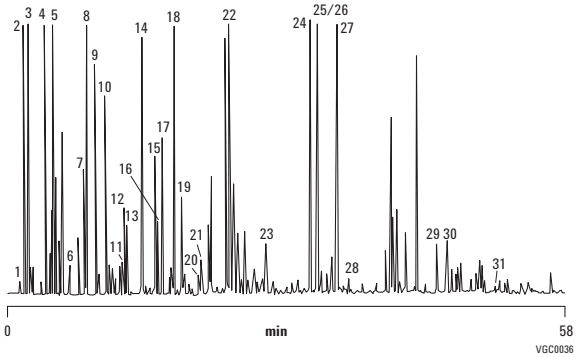
Sample: 0.1 µL

Carrier: Helium, 240 pKa (2.4 bar, 34 psi)

Oven: 35 °C (7 min) to 250 °C, 3 °C/min

Injection: Split 80 mL/min

Detector: FID



1. Propane
2. Isobutane
3. Butane
4. 2-Methylbutane
5. Pentane
6. 2,2-Dimethylbutnae
7. 2,3-Dimethylbutane
8. 2-Methylpantane
9. 3-Methylpentane
10. Hexane
11. 2,2-Dimethylpentane
12. Methylcyclopentane
13. 2,4-Dimethylpentane
14. Benzene
15. 2-Methylhexane
16. 2,3-Dimethylpentane
17. 3-Methylhexane
18. Tert. amyl methyl ether (TAME)
19. Unknown
20. 2,2-Dimethylhexane
21. Methylcyclohexane
22. Toluene
23. Octane
24. Ethylbenzane
25. p-Xylene
26. m-Xylene
27. o-Xylene
28. Nonane
29. Decane
30. 1,2,3-Trimethylbenzene
31. Undecane

Polyethylene

Column: **DB-1**
125-1011
15 m x 0.53 mm, 0.15 µm

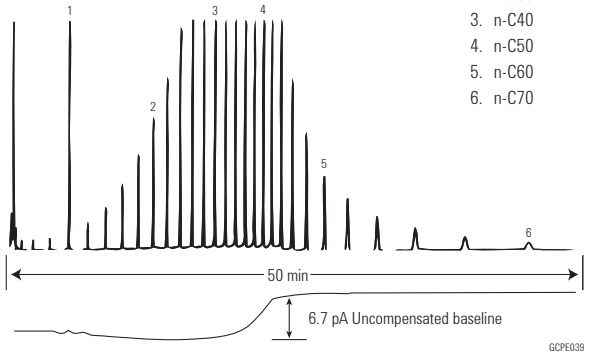
Carrier: Helium at 8 mL/min

Oven: 120-360 °C at 10 °C/min

Injection: Split ratio 1:500

Detector: FID, 300 °C
Nitrogen makeup gas at 30 mL/min

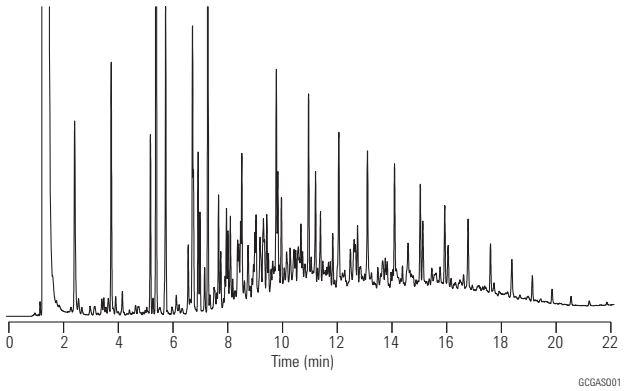
Sample: 0.5 µL
3% Solution in CS_2



1. n-C20
2. n-C30
3. n-C40
4. n-C50
5. n-C60
6. n-C70

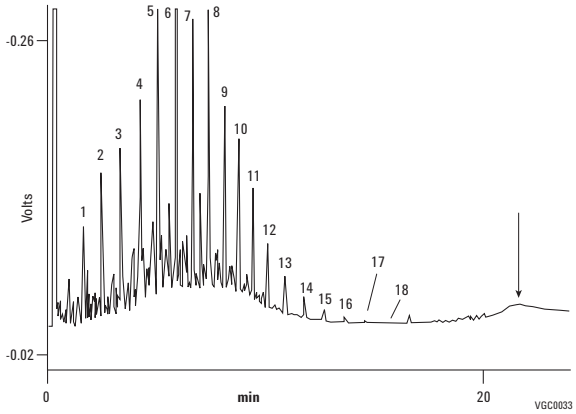
Direct Injection of Gasoline and Diesel Fuel in Methylene Chloride

Column:	**DB-TPH** **124-1632** **30 m x 0.45 mm, 1.00 µm**
Carrier:	Helium at 67 cm/sec, measured at 40 °C
Oven:	40 °C for 2 min 40-280 °C at 12 °C/min
Injection:	Megabore Direct, 250 °C
Detector:	FID, 250 °C Nitrogen makeup gas at 30 mL/min



Diesel Analysis

Column:	**VF-5ht Fused Silica** **CP9047** **15 m x 0.32 mm, 0.10 µm**
Carrier:	H_2, 60 kPa, 0.6 bar, 8.6 psi
Oven:	50 °C (1 min), 15 °C to 180 °C, 7 °C to 230 °C, 30 °C to 380 °C
Detector:	FID

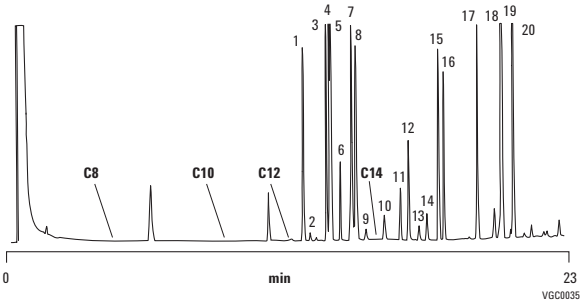


1. C10
2. C11
3. C12
4. C13
5. C14
6. C15
7. C16
8. C17
9. C18
10. C19
11. C20
12. C21
13. C22
14. C23
15. C24
16. C25
17. C26
18. C27

Analysis of Oxygenates in a C1 to C5 Hydrocarbon Mix

Column:	**Lowox** **CP8587** **10 m x 0.53 mm, 10.00 µm**
Sample:	1 µL
Sample Conc:	0.01% per compound
Solvent:	Ciclohexano
Carrier:	He, 28.8 kPa (0.288 bar, 4.1 psi)
Oven:	50 °C (5 min) to 240 °C, 10 °C/min
Injection:	Split, T=250 °C
Detector:	FID, T=250 °C

1. Acetaldehyde
2. Diethyl ether
3. Ethyl tert-butyl ether
4. Methyl tert-butyl ether
5. Diisopropyl ether
6. Propionaldehyde (propanol)
7. Tert-amyl methyl ether
8. Dipropyl ether
9. Isobutyraldehyde
10. Butyraldehyde
11. Methanol
12. Acetone
13. Isovaleraldehyde
14. Valeraldehyde
15. 2-Butanone
16. Ethanol
17. 1-Propanol
18. 2-Methyl-1-propanol (isobutanol)
19. 2-Methyl-2-propanol (tert-butanol)
20. 1-Butanol



Analysis of Gases C1 to C4

Column: **PoraPLOT Q**
CP7554
25 m x 0.53 mm, 20.00 µm

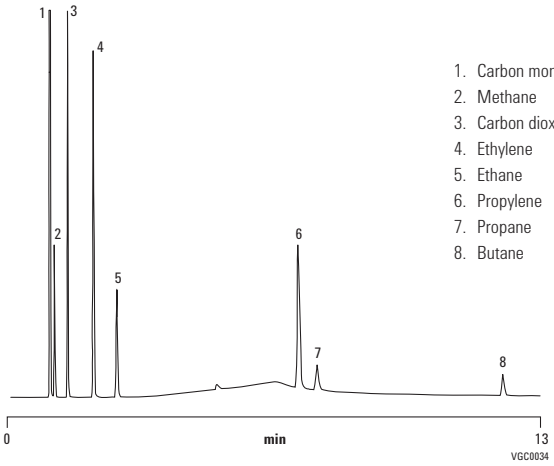
Sample: 50 µL

Carrier: He, 65 kPA (0.65 bar, 8 psi)

Oven: 40 °C (3 min) to 150 °C, 10 °C/min

Injection: Split, 1:50, T=225 °C

Detector: TCD, T=250 °C



1. Carbon monoxide
2. Methane
3. Carbon dioxide
4. Ethylene
5. Ethane
6. Propylene
7. Propane
8. Butane

Detailed Hydrocarbon Analysis of Petroleum Naphthas Through N-nonane Using ASTM D-5134

Column: **CP-Sil PONA para ASTM D-5134**
CP7531
50 m x 0.21 mm, 0.50 µm

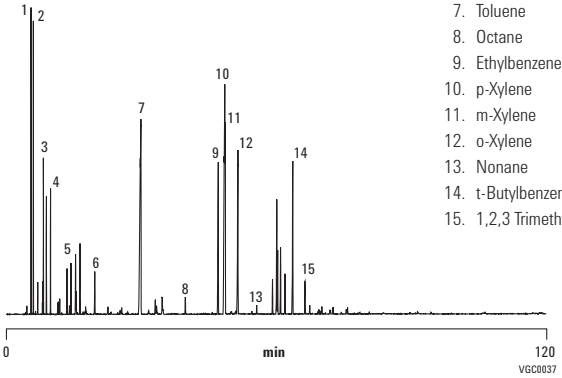
Sample: 0.2 µL

Carrier: Helium

Oven: 35 °C (30 min) @ 2 °C/min to 200 °C (10 min)

Injection: Split/splitless 1177, full EFC control, 250 °C, split 200 mL/min

Detector: FID, 250 °C



1. i-Pentane
2. Pentane
3. Cyclopentane
4. Hexane
5. Benzene
6. Heptane
7. Toluene
8. Octane
9. Ethylbenzene
10. p-Xylene
11. m-Xylene
12. o-Xylene
13. Nonane
14. t-Butylbenzene
15. 1,2,3 Trimethylbenzene

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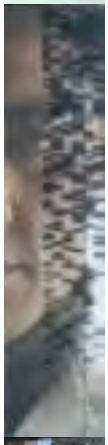
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Unmatched confidence of Ultra High Definition Time-of-Flight (TOF) technology

The Agilent 6200 Series TOF systems deliver unmatched speed, mass accuracy and resolution performance in a compact benchtop design. Superior data quality offers certainty for screening, identification and quantitative studies.

Agilent 6224 – Affordable and easy-to-use instrument with <2 mg/L mass accuracy and 20,000 resolution for routine analysis of a wide variety of molecules such as pesticides, pharmaceuticals, peptides and intact proteins.

Agilent 6230 with Agilent Jet Stream Technology – Offers 5-10x more sensitivity for confident screening of compounds at low concentration.



Agilent 6400 Series Triple Quadrupole LC/MS Systems

Clearly better sensitivity gives better results

The Agilent 6400 Series Triple Quadrupole systems offer unmatched sensitivity and reliability for trace analysis in food safety, environmental samples, biomarker validation, and ADME/DMPK studies for drug candidates. Powered by Agilent MassHunter software, with Optimizer to automatically fine tune parameters for ion transitions, the 6400 Series Triple Quadruple systems offer simplified method development to achieve outstanding results.



Agilent 6420 – Economical, easy to use, with Agilent 1260 Infinity LC, a perfect workhorse instrument for labs with basic needs for quantitative capabilities.

Agilent 6430 – Offers added sensitivity to achieve outstanding performance for most assays.

Agilent 6460 with Agilent Jet Stream Technology – Provides dramatically improved sensitivity for your most demanding quantitative applications.

Agilent 6490 – Incorporates the revolutionary iFunnel technology to give ultimate sensitivity for the most challenging quantitative analyses in pharmaceutical, clinical, food safety, and environmental applications.

Agilent 6500 Series Accurate-Mass Q-TOF LC/MS Systems

Ultra high definition MS/MS, uncompromised performance

The Agilent 6500 Series Q-TOF systems deliver an unmatched combination of mass accuracy, mass resolution, sensitivity, dynamic range and speed. With best-in-class MS and MS/MS mass accuracy, they provide the capabilities you need to profile, identify, characterize, and even quantify samples as diverse as drug impurities, endogenous metabolites, and protein biomarkers.



Agilent 6520 – Easy-to-use instrument for routine analysis of a wide range of compounds day in and day out.

Agilent 6530 with Agilent Jet Stream Technology – Provides 5-10x more sensitivity for screening of low level compounds.

Agilent 6538 – Provides enhanced resolution in a bench top instrument for confident characterization of complex samples.

Agilent 6540 with Agilent Jet Stream Technology – Combines the highest levels of sensitivity with enhanced resolution to address the most challenging applications.



Agilent ZORBAX 300 StableBond Columns

ZORBAX 300 StableBond columns are an ideal choice for the reproducible separations of proteins and peptides. 300 StableBond columns are unmatched in their durability at low pH, such as with the TFA containing mobile phases typically used for protein and peptide separations. For LC/MS separations at low pH, 300 StableBond columns can also be used with formic acid and acetic acid mobile phase modifiers.

Turn to page 367.



Agilent Poroshell Columns

As new biopharmaceutical research and manufacturing practices focus more and more on peptides and proteins, and as time to market becomes increasingly critical, the rapid HPLC separation of biomolecules becomes increasingly valuable. The speed and resolution benefit shown here by Agilent Poroshell columns improve chances that the desired separation will be achieved while facilitating separation analysis times.

For Poroshell 120, turn to page 228.
For Poroshell 300, turn to page 380-381.

Agilent LC Capillaries

Agilent LC capillary starter kits contain the most often used capillaries and fittings. Our genuine flexible stainless steel capillaries make the best connection in your LC system, no matter the brand. The kits are for use with 3-4 or 1-2 mm id columns, as well as for Micro LC columns. The free Cybertool, which contains over 30 tools, is useful in every laboratory.

Turn to page 16.



Agilent ZORBAX RRHD HILIC Plus

HILIC can have distinct advantages over traditional RPLC in terms of LC/MS sensitivity, due to the use of highly organic mobile phases. These mobile phases have higher volatility than traditional RPLC mobile phases, making HILIC well suited for applications with mass spectrometers. Agilent ZORBAX RRHD HILIC Plus is the column to choose.

Turn to page 324.



General LC Supplies

Agilent offers a wide range of supplies for operation and maintenance of LC systems. These products have been carefully designed or selected by Agilent to work with your Agilent instruments for maximum performance and uptime.

LC Tools

Your Agilent LC system arrives with a full complement of tools needed to perform general maintenance and operation procedures. Should you need additional or replacement tools, Agilent offers a selection of high-precision, high-quality, stainless steel tools, to avoid any deformation of the screws or nuts.

LC Tools

Description	Part No.
Tool kit hex keys, Rheotool Includes 3 hex keys, 4 mm, 1.5 mm, and 9/64 in, with straight or T-handle plus Rheotool	5064-8211
Torque wrench adapter Used with nanoliter flow cell for Diode Array Detector to mount capillaries of cell (P/N G1315-68714)	G1315-45003
Insert tool (seal wash option)	01018-23702
Mounting tool for flangeless nut	0100-1710
Mounting clamp	5021-1866
Velocity regulator	5062-2486
USB memory stick	G4208-68700
Compact flash card	01100-68700
HPLC system tool kit	G4203-68708
Compact tool kit	G4296-68715
Torque wrench, 2-25 Nm	G4220-20012
Bit kit for torque wrench	5023-0282
PEEK Luer lok needle assembly	5190-0924
Plastic tubing cutter	8710-1930
Blades for plastic cutter, 5/pk	8710-1931
Tubing clip	5042-9967
Tubing clip	5042-9954
Open end wrench, 14 mm	8710-1924



Hex keys, Rheotool 5064-8211



Mounting tool, 0100-1710



HPLC system tool kit, G4203-68708



Compact tool kit, G4296-68715



Torque wrench, 2-25 Nm, G4220-20012



Plastic tubing cutter, 8710-1930



Tubing clip, 5042-9967

HPLC In-Line Filters

Column inlet frit contamination can increase column backpressure and reduce efficiency. Microbore column blockages are a particular problem, due to the small diameter of the inlet frit. To prevent blockages, always use the appropriate filters in your LC system. Agilent offers two types of high pressure in-line filter kits for use with any HPLC system.

HPLC In-Line Filters

Description	Frit Porosity (µm)	Frit Inlet ID (mm)	Comments	Part No.	Replacement Frits
RRLC in-line filter 4.6 mm, 0.2 µm pore size filter, connecting capillary, max 600 bar	0.2	4.6	max 600 bar	5067-1553	5067-1562, 10/pk
RRLC in-line filter 2.1 mm, 0.2 µm pore size filter, connecting capillary, max 600 bar	0.2	2.1	max 600 bar	5067-1551	5067-1555, 10/pk
Low dispersion in-line filter Includes two frits, 2.1 mm, 2 µm pore size filter holder with inserts, 60 x 0.12 mm connecting capillary	2 0.5	2.1	< 1 mL/min	01090-68702	280959-904, 10/pk 280959-907, 10/pk
Universal in-line filter Includes two frits, 4.8 mm, 2 µm pore size filter holder with inserts, 130 x 0.25 mm connecting capillary	2	4.8	1-5 mL/min	01090-68703	01090-27609, 2/pk
Semi-prep filter	0.5	12.7	1-5 mL/min	5064-8273	5022-2185
High pressure semi-prep filter	10	19	5-10 mL/min	5022-2165	5022-2166, 10/pk
Prep filter	10		10-100 mL/min	5065-4500	5065-9901 Replacement Glass Cartridge
In-line filter for G1311A	Recommended when high salt concentrations are used			G1311-60006	
1290 Infinity LC in-line filter (0.3 µm)	0.3	2.0	1200 bar	5067-4638	5023-0271, 5/pk



RRLC in-line filter, 5067-1551



Low dispersion in-line filter, 01090-68702



Semi-prep filter, 5064-8273



High pressure semi-prep filter, 5022-2165



1290 Infinity LC in-line filter, 5067-4638

Solvent Filters/Degassers

An added benefit of filtering solvents is that degassing occurs at the same time. This is particularly beneficial if you do not have an on-line degasser in your system. The benefits of solvent filtration:

- Degasses eluents as particulates are removed
- Prevents the formation of spurious peaks within the detector due to solvent outgassing at the low-pressure end of the chromatograph
- Increases solvent inlet lifetime
- Eliminates pump downtime caused by air locks and particulates in check valves
- Decreases piston wear, while increasing column life



Glass solvent filter degasser, 3150-0577

Solvent Filters/Degassers

Description	Part No.
HPLC solvent filter/degasser assembly	3150-0577
Replacement Parts for 3150-0577	
Glass funnel, 250 mL	5188-2743
PTFE coated sieve	5188-2744
PTFE seal	5188-2745
Funnel base, glass	5188-2746
Filter Membranes	
Regenerated cellulose filter membranes Diameter 47 mm, pore size 0.45 µm, 100/pk	3150-0576
Nylon filter membranes Diameter 47 mm, pore size 0.45 µm, 100/pk	9301-0895
PTFE filter membranes Diameter 47 mm, pore size 0.45 µm, 10/pk	3150-0509



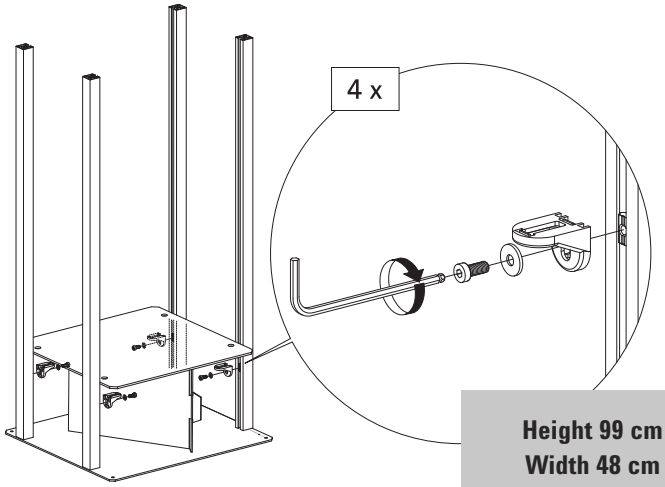
Agilent rack for LC systems, 5001-3726

Agilent Rack for LC Systems

Reclaim critical bench space with the stable, robust rack for LC systems. The sturdy and open design offers complete protection for your sensitive LC system and easy maintenance for fast, safe access to instruments and cables. It is designed for all Agilent LC modules stacks and features:

- Easy assembly saves time and expense (see diagram)
- Adjustable shelves allow full customization for all Agilent LC modules
- Open design ensures proper airflow management and distribution of equipment and cabling

Description	Part No.
Agilent rack for LC systems	5001-3726



Height 99 cm
Width 48 cm
Depth 43 cm
Weight 27 kg

TIPS & TOOLS

The Agilent rack can be used to optimize your 1290 Infinity LC for ultra-low dispersion, which can enhance performance of high-efficiency columns. Further information can be found in application note 5990-9502EN at **www.agilent.com/chem/library**

LC Standards

LC Standards

Description	Part No.
Caffeine standards kit for LC OQ/PV Includes one 10 mL ampoule: 125.0 µg/mL; four 5 mL ampoules: 5.0, 25.0, 250.0 and 500.0 µg/mL caffeine in water	8500-6762
Caffeine standards kit for capillary OQ/PV Includes 5 ampoules, 5 mL: 2.0, 4.0, 20.0, 100.0, 200.0 µg/mL caffeine in water	5065-4420
Caffeine OQ/PV sample for dissolution test, 150 mg/L caffeine in water, 500 mL	5042-6476
Caffeine standard, 250 µg/mL	G4218-85000
Enterprise Edition caffeine standard kit	5190-0488
Fluorescence detector calibration sample, 1 g glycogen	5063-6597
RI detector OQ/PV test sample Includes 5 ampoules, 5 mL: 5, 10, 15, 25, and 50 mg/mL glycerin in water	5064-8220
Isocratic and gradient standards Contains 0.15% diethylphthalate, 0.01% biphenyl, and 0.03% terphenyl in MeOH (w/w). Gradient standard includes 0.32% dioctyl phthalate as well. Two 0.5 mL ampoules of each.	01080-68702
Isocratic standard, 0.5 mL ampoule	01080-68704
RRLC Check out sample, 1 mL ampoule	5188-6529
Chip cube high mass reference (HP-1221), 0.5 mL	G1982-85001
Chip cube high mass solvent (FC-70), 25 mL Fluorinert	G1982-85002
Chip cube low mass reference sample, 1 g Methyl stearate	G1982-85003
ESI+APCI LC demo sample Contains 5 x 1 mL ampoules with 33 ng/µL crystal violet, 77 ng/µL carbazole, 300 ng/µL 9-phenanthrol, 1 ng/µL 1-hexanesulfonic acid sodium salt in water/methanol 60:40	G1978-85000
ES-TOF biopolymer reference standard kit Contains 7 x 2 mL ampoules with 5 mM purine, 1 M ammonium formate, 0.5 mM HP-0285, 0.1 mM HP-0321,0.2 mM HP-1221, 0.2 mM HP-1821, 0.5 mM HP-2421	G1969-85003
HSA peptide standard mix kit 2 vials with 6 lyophilized peptides	G2455-85001



Caffeine OQ/PV sample for dissolution test, 5042-6476



Agilent's unique laser welding process ensures that the capillary ends are absolutely flat, eliminating any chance of capillary-induced dead volume.

LC Capillaries

Your LC system's components are only as reliable as the connections between them

Think of your LC system as a chain from analyte... to pump... to column... to detector... to waste. Every link must operate at maximum efficiency, or the whole chain risks failure – compromising your results.

Agilent LC capillaries: Your link to analytical success

At Agilent, we invest heavily in the quality of our capillary connections. All are engineered and manufactured to the same quality standards as our columns and instruments, so you can protect the integrity of your results at every step of your LC flow path.

Using our flexible stainless steel and polymer capillaries and fittings can provide:

- Tight, leak-free connections
- Zero dead volume connections
- An inert surface (when using polymer or PEEK/stainless steel bio-inert capillaries)
- High flexibility without sacrificing durability
- Easy cutting to the exact length you need (PEEK tubing)
- Predefined lengths for specific flow path locations (capillaries)

In addition, all Agilent capillaries are precision cut with square ends, are burr-free, have no inner-diameter distortion, and come in a variety of materials to suit your needs.



Engineering of Agilent Capillaries

The same professional engineers in our LC manufacturing facility in Germany who design our industry-leading LC instruments, also play a critical role in developing capillaries and fittings for your instrument. Their attention to detail helps you to get the best performance possible for your applications.

Our LC manufacturing tools – like high-end, special laser-cutting machines – result in completely tight, smooth and perfect-cut capillaries. Our broad selection of capillaries is made only from the highest-quality materials and will meet any of your application needs.

Avoid chromatographic issues – like peak broadening and system leaks – by choosing Agilent's selection of premium capillaries. Agilent is committed to Fast LC and high-productivity performance, together with accurate quantitation.

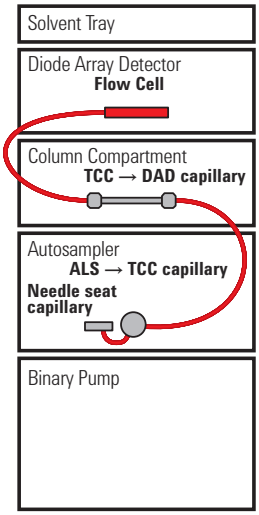


Advantages for Bio Capillaries

- Laser-welded capillary tip for precise capillary cut
- Metal-free connection for all HPLC applications
- PEEK and stainless steel design allows you to exceed typical pressure limit reached with conventional polymer

Recommended HPLC Stack Configuration

Agilent 1290 Infinity LC: default stacking and capillary tubing configuration



Needle Seat capillary:
0.12 x 100 mm = 1.1 µL

ALS → TCC capillary
0.12 x 340 mm = 3.8 µL

TCC → DAD Capillary:
0.12 x 220 mm = 2.5 µL

Flow Cell V(σ)1.0 µL = 2.3 µL

Total extra-column volume = 9.7 µL

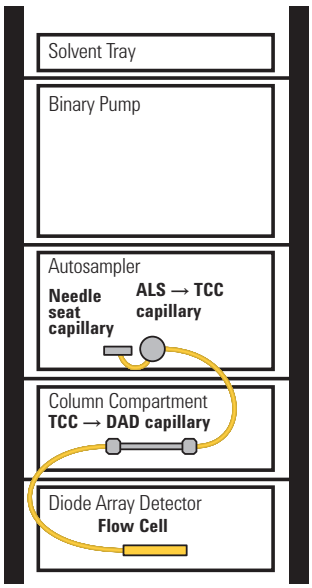
Volume of 2.1 x 50 mm column = 172.3 µL

Void volume of column = 103.9 µL

Percent extra-column volume = 9.3%

60% Reduction in extra-column volume

Agilent 1290 Infinity LC: with LC system rack and ultra-low dispersion optimizations



Needle Seat Capillary:
0.11 x 100 mm = 0.9 µL

ALS → TCC Capillary:
0.08 x 220 mm = 1.1 µL

TCC → DAD Capillary:
0.08 x 220 mm = 1.1 µL

Flow Cell V(σ)0.6 µL = 0.8 µL

Total extra-column volume = 3.9 µL

Volume of 2.1 x 50 mm column = 172.3 µL

Void Volume of Column = 103.9 µL

Percent extra-column volume = 3.7%

Syntax for capillary description

The tables below will be your guide to identifying the proper specifications for your capillary. On all capillaries, dimensions are noted in id (mm), length (mm) and where applicable, volume (µL). When you receive your capillary, these abbreviations are printed on the packaging.

Using the guide: This fitting is coded as "SPF", for Swagelok, PEEK, Finger-tight.

Type

Key	Description
Capillary	Connection capillaries
Loop	Loop capillaries
Seat	Autosampler needle seats
Tube	Tubing
Heat exchanger	Heat exchanger

Material

Key	Description
SS	Stainless steel
Ti	Titanium
PK	PEEK
FS/PK	PEEK-coated fused silica*
PK/SS	Stainless steel-coated PEEK**
PTFE	PTFE
FS	Fused silica

*Fused silica in contact with solvent

**PEEK in contact with solvent

Fitting Left/Fitting Right

Key	Description
W	Swagelok + 0.8 mm Port id
S	Swagelok + 1.6 mm Port id
M	Metric M4 + 0.8 mm Port id
E	Metric M3 + 1.6 mm Port id
U	Swagelok union
L	Long
X	Extra long
H	Long head
G	Small head SW 4 mm
N	Small head SW 5 mm
F	Finger-tight
V	1200 bar
B	Bio
P	PEEK

The **type** gives some indication on the primary function, like a loop or a connection capillary.
The **material** indicates which raw material is used.
The **fitting** left/right indicate which fitting is used on both ends of the capillary.

At-a-glance color-coding keys

The color of your capillary will help you quickly identify the capillary id – see the chart to the right for reference.

Color-coding key for Agilent capillary tubing

Internal Diameter in mm	Color code
0.015	Orange
0.025	Yellow
0.05	Beige
0.075	Black
0.1	Purple
0.12	Red
0.17	Green
0.20/0.25	Blue
0.3	Grey
0.50	Bone White

Tip: As you move to smaller-volume, high efficiency columns, you'll want to use narrow id tubing, as opposed to the wider id tubing used for conventional HPLC instruments.

Agilent capillary supplies are made from a variety of top-quality materials to suit your lab's every need



Stainless Steel: good resistance to pitting corrosion

Stainless steel is ideal for most standard applications – except where bio-inertness is required, in which case we recommend PEEK-lined or Bio-inert titanium capillaries. Agilent's 0.6 mm od flexible grade 316L stainless steel capillaries (chrome/nickel/molybdenum bearing grade) are also much easier to handle than conventional, rigid 1.6 mm od capillaries.



Titanium: high inertness for biological applications

Analyzing metal-sensitive proteins and biotherapeutics presents challenging solvent conditions for LC instruments. In addition, bio-molecules tend to bind non-specifically to surfaces. For these reasons, bio-inert titanium is the best choice for these applications. Titanium is biocompatible, making Bio-inert Titan capillaries perfect for applications where bio-inertness is paramount.



Stainless Steel-coated PEEK: high-pressure bio-inertness and robustness

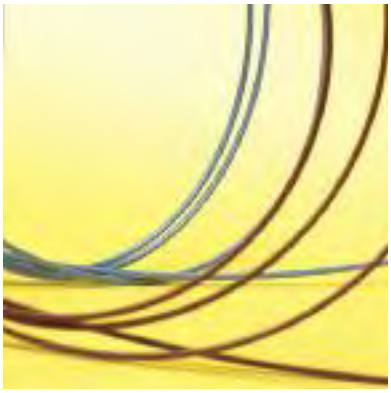
In bio-chromatography, capillaries and connectors should be inert to ensure the lowest interaction with protein samples. They must also be highly robust to withstand harsh cleaning procedures.

Unfortunately, metal-free PEEK capillaries can only withstand pressures of up to 200 bar in a thermostatically controlled cabinet with acetonitrile; even then, flexibility is compromised. To meet the growing need for bio-inertness, robustness, and higher operating pressures, Agilent has engineered a bio-inert PEEK liner clad with high-strength stainless steel to withstand pressures of at least 600 bar. This same technology is used in Agilent capillary fittings – giving you a strong, metal-free, capillary/ connector flow path for bio-inert applications.



PEEK-coated fused silica: rugged and pliable

Since their introduction in the early 1980s, fused silica capillaries have become the industry standard for many GC and LC applications – as well as capillary electrophoresis. Agilent fused-silica capillaries are made from high-purity silicon dioxide, and coated with PEEK for strength, durability, and pliability.



PEEK: durable and abrasion-resistant

Agilent PEEK capillaries are best for standard and bio-inert applications. PEEK (polyetheretherketone) is a thermoplastic polymer that resists mechanical and solvent damage, even at high temperatures. Because it is less vulnerable to corrosion than stainless steel, PEEK can be used in place of stainless steel when the capillary's external diameter is 1/16 in or less. It also resists abrasion, making it an excellent coating for fused silica capillaries. **Tip:** Use our color-coded PEEK fittings to track inlets and outlets of valves, columns, and detectors.

To learn more about Agilent LC capillary supplies, or to order now, visit **www.agilent.com/chem/LCcapillaries**

Agilent capillaries for routine applications

Category	Applications	Internal diameter (mm)	Pressure limit (bar)	pH range	Comments
Stainless steel	• All capillary applications, except where bio-inertness is required • 1/32 in od designed for Agilent 1100 systems • 1/16 in and 1/8 in od for most applications	0.075 0.12 0.17 0.25 0.3 0.5 0.61 0.93	1200	1-14	• Flexible for easy routing • Ready to use: cleaned and passivated to a high standard • Pre-cut capillaries are optimized for the lowest internal volume • Use pre-cut lengths to maintain zero-dead-volume performance
Titanium	• Where ultimate bio-inertness is essential	0.17 0.61	600	1-14	
Stainless-steel-coated PEEK	• Universal for standard and bio-inert applications • UHPLC bio-inert applications	0.17	600	1-14	• Metal-free flow path • Robust • Flexible • Resists corrosion better than stainless steel
PEEK-coated fused silica	• Industry standard for most LC applications	0.025 0.050 0.075 0.100 0.125	690	1-10	• Mechanically strong • Consistent, rigid flow path • Ideal replacement for stainless steel • To avoid permanent tube damage, always use pre-cut lengths
PEEK	• Most HPLC applications	0.13 0.18 0.25 0.50	480* 200**	1-14	• Smooth internal surface minimizes turbulence for improved resolution • Flexible, easily cut to length • Use with PEEK or stainless steel fittings • Excellent solvent compatibility

*At ambient temperature with water

**With acetonitrile at non-ambient temperature



Fittings for a strong, capillary flow path

Agilent offers more than 20 fitting varieties for Swagelok-type or metric M4/M3-type connections. Depending on your application, different materials must be used:

- Stainless steel or PEEK delivers permanent high-pressure sealing performance for connections such as valves, heaters, and columns
- Stainless steel ensures permanent high-pressure sealing and optimal performance throughout your LC system up to 1200 bar
- Finger-tight fittings (polymeric for 400 bar and polyketone for 600 bar) are a convenient option; They allow easy end fitting adjustment, so you can seat the capillary into the column properly, preventing extra-column voids and leaks
- High-pressure fittings, which can be used with pressures up to 1200 bar, can be removed and replaced
- It's a good idea to use stainless steel nuts and ferrules for instrument connections, and PEEK nuts and ferrules for column and guard column connections, since these are changed most frequently

Agilent fittings for leak-free connections

Fitting type	Advantages/Tips

Swagelok-type fittings	• Suitable for most connections
	• Available in a variety of combinations:
	  • One piece or multiple pieces with nut + front and back ferrules
	  • Stainless steel, PEEK, polyketone, or a stainless steel/PEEK combination

Metric M4/Metric M3	• For micro valve connections
Stainless steel	• At least 1200 bar • Most popular material for permanent, high-pressure sealing • Use our slitted socket wrench (Part No. 8710-2391 or 5023-0240) for optimal tightness
1200 bar removable fittings for 1290 Infinity LC	• 1200 bar • Available in standard, long, and extra-long sizes for compatibility with columns that have different sized nuts • Removable and replaceable • Use our slotted socket wrench (Part No. 8710-2391 or 5023-0240) for optimal tightness
PEEK	• Up to 400 bar (at ambient temperature with water) • Easy, finger-tight column connections • Ideal for frequently changed connections, such as column connections • Pressure is less critical
Polyketone	• <600 bar (600 bar pressure rating) • Easy, finger-tight column connections • Fits stainless steel tubing

Agilent 1260/1200/1100 Infinity Series LC

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Part No.
Pump	Autosampler	SS	0.17	900	S	S	Pre-swaged on A	G1329-87300
Pump	Autosampler	SS	0.17	700	S	S	Pre-swaged on A and B	G1312-87304
Pump	Autosampler	SS	0.17	500	S	S	Pre-swaged on A	G1312-67305
Pump	Autosampler	SS	0.17	400	S	S	Pre-swaged on A and B	G1312-87303
Pump	Autosampler	SS	0.17	380	S	S	Pre-swaged on A and B	01090-87306
Manual Injector	Column	SS	0.17	180	S	S	Pre-swaged on A	G1313-87305
Manual Injector	TCC	SS	0.17	500	SH	S		G1328-87600
Heater	Column	SS	0.17	90	S	S		G1316-87300
Column	Detector	SS	0.17	380	S	S	Pre-swaged on A; thermal isolation	G1315-87311
TCC\VWD	MS	SS	0.12	500	S	S	Pre-swaged on A	G1316-87309
Column	VWD	PK	0.17	600			Finger-tight fittings not included (0100-1516, 2/pk)	5062-8522
Pump Purge Valve	Waste	PK	1.3	5000*			No fitting needed	5062-2461
Detector	Waste	PTFE	0.8	5000*			Finger-tight fittings not included (0100-1516, 2/pk)	5062-2462
VWD	Waste	PK	0.25	500			Finger-tight fittings not included (0100-1516, 2/pk)	5062-8535
Autosampler	TCC	SS	0.12	180	S	S	Pre-swaged on A; can also be connected to low dispersion heat exchanger	G1313-87304
Thermostatted Autosampler	TCC	SS	0.12	280	S	S	Pre-swaged on A; can also be connected to low dispersion heat exchanger	01090-87610
TCC	Column	SS	0.12	105	S	S	Pre-swaged on A	01090-87611
Column	DAD	SS	0.12	150	S	S	Pre-swaged on A	G1315-87312
Female adapter for connecting long columns		SS	0.17	150	S			G1315-87303
Purge Valve**	Waste	SS and FS	0.17	150	S	U		G1312-67500

*Capillary is intended to be cut to the right length for your need.

**Calibration capillary assembly

Material

Key	Description
SS	Stainless steel
PK	PEEK
PTFE	PTFE
FS	Fused silica
S	Swagelok 1.6 mm port id
SH	Swagelok 1.6 mm port id, long head
U	Swagelok union

Agilent 1290 Infinity Series LC

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Part No.
Pump	Autosampler	SS	0.17	300	S	S	Pre-swaged on A and B	5067-4657
Pump	Thermostatted Autosampler	SS	0.17	450	S	S	Pre-swaged on A and B	5067-4658
Autosampler	TCC	SS	0.12	340	S	S	Pre-swaged on A	5067-4659
Column	DAD	SS	0.12	220	S	S	Pre-swaged on A	5067-4660
1290 System	CTC Autosampler	SS	0.17	600	S	SH	Pre-swaged on A	5067-4670
CTC Autosampler	Column	SS	0.12	600	S	S		5067-4669
Detector	Waste	PTFE	0.8	5000*			Finger-tight fittings not included (0100-1516, 2/pk)	5062-2462

*Capillary is intended to be cut to the right length for your need.



Stainless steel fittings (S), 5062-2418



Finger-tight PEEK fitting (SPF), 0100-1516



Stainless steel back ferrule, 5180-4114

Images shown are capillary fittings. For complete information on fittings, turn to page 40.

Agilent 1290 Valve Head

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Valve Information	Part No.
Autosampler	Valve with Swagelok port	SS	0.12	340	S	SX	Pre-swaged on A		5067-4684
Autosampler	Valve with Swagelok port	SS	0.12	340	S	SX	Pre-swaged on B	G4231A/B 2 Position/6 Port valve head, 600/1200 bar	5067-4647
Autosampler	Valve with M4 port	SS	0.12	340	SLV	M		G4232A 2 Position/10 Port micro valve head, 600 bar	5067-4744
Autosampler	Valve with M4 port	SS	0.12	500	SLV	M		G4234A/B 6 column selector valve, 600/1200 bar	5067-4745
Valve with 10/32 Swagelok port	Heat exchanger	SS	0.12	90	SX	S	Pre-swaged on A and B	G4231A/B 2 Position/6 Port valve head, 600/1200 bar	5067-4649
Valve with M4 port	Heat exchanger	SS	0.12	90	M	SL	Pre-swaged on B	G4232A 2 Position/10 Port micro valve head, 600 bar	5067-5106
Short column	Valve with M4 port	SS	0.12	130	SV	M		G4234A/B 6 column selector valve, 600/1200 bar	5067-4735
Short column	Valve with M4 port	SS	0.12	150	SV	M		G4232A 2 Position/10 Port micro valve head, 600 bar	5067-5104
Long column	Valve with M4 port	SS	0.12	280	SV	M		G4232A 2 Position/10 Port micro valve head, 600 bar	5067-5107
Short column	Valve with Swagelok port	SS	0.12	150	SL	SX	Pre-swaged on B	G4231A/B 2 Position/6 Port valve head, 600/1200 bar	5067-4650
Short column	Valve with 10/32 Swagelok port	SS	0.12	150	SL	SX		G4232B 2 Position/10 Port valve head, 1200 bar	5067-4686
Long column	Valve with Swagelok port	SS	0.12	280	SL	SX	Pre-swaged on B	G4231A/B 2 Position/6 Port valve head, 600/1200 bar	5067-4651
Long column	Valve with Swagelok port	SS	0.12	280	SL	SX		G4232B 2 Position/10 Port valve head, 1200 bar	5067-4687

(Continued)

Material

Key	Description
SS	Stainless steel
S	Swagelok 1.6 mm port id
SH	Swagelok 1.6 mm port id, long head
SL	Swagelok 1.6 mm port id, long
SLV	Swagelok 1.6 mm port id, long, 1200 bar
SX	Swagelok 1.6 mm port id, extra-long
M	Metric M4 0.8 mm port id

Agilent 1290 Valve Head

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Valve Information	Part No.
Valve Swagelok port	Detector	SS	0.12	200	SX	S	Pre-swaged on A and B	G4231A/B 2 Position/6 Port valve head, 600/1200 bar	5067-4653
Valve with Swagelok port	Detector	SS	0.12	200	SX	S	Pre-swaged on A	G4232B 2 Position/10 Port valve head, 1200 bar	5067-4689
Valve with M4 port	Detector	SS	0.12	250	M	SLV		G4232A 2 Position/10 Port micro valve head, 600 bar	5067-4746
Heat exchanger	Valve with M4 port	SS	0.17	90	SL	M	Pre-swaged on A	G4232A 2 positions/10 ports valve head, 1200 bar	5067-5109
Column	Valve with M4 port	SS	0.17	90	SV	M		G4232A 2 positions/10 ports valve head, 1200 bar	5067-5110
Column	Valve with M4 port	SS	0.17	150	SV	M		G4232A 2 positions/10 ports valve head, 1200 bar	5067-5111
Column	Valve with M4 port	SS	0.17	280	SV	M		G4232A 2 positions/10 ports valve head, 1200 bar	5067-5112
G4232A 2 positions/ 10 ports valve head, 1200 bar		SS	0.17	250	SL	M	Pre-swaged on A	G4232A 2 positions/10 ports valve head, 1200 bar	5067-5113

Agilent 1200 and 1100 Prep LC Systems

From	To	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Part No.
Prep Isocratic	Autosampler	ST	0.6	400	S	S	Pre-swaged on A and B	G1361-67302
Autosampler	Column	ST	0.5	600	S	S/SX		G2260-87300
Autosampler	Column	ST	0.5	400	S	SH		G2260-87301



Stainless steel fittings (S), 5062-2418



Stainless steel extra long fitting (SX), 5065-9967



1200 bar removable long fitting (SLV), 5067-4738



1200 bar removable fitting (SV), 5067-4733



PEEK fittings, plugs (MP), 5065-4410

Images shown are capillary fittings. For complete information on fittings, turn to page 40.

Miscellaneous Capillaries

Material	ID (mm)	Length (mm)	Fitting Type From (A)	Fitting Type To (B)	OD (mm) A*	OD (mm) B*	Notes	Part No.
SS	0.12	70	S	S	1.6	1.6		G1316-87303
SS	0.12	2000	U	U			Restriction Capillary	5022-2159
SS	0.12	105			1.6	1.6	Capillary without fitting	5021-1820
SS	0.12	400			1.6	1.6	Capillary without fitting	5021-1823
SS	0.12	150			1.6	1.6	Capillary without fitting	5021-1821
SS	0.12	280			1.6	1.6	Capillary without fitting	5021-1822
SS	0.12	500			1.6	1.6	Capillary without fitting	5065-9964
SS	0.12	200			1.6	1.6	Capillary without fitting	5065-9935
SS	0.12	50	S	U	1.6			G1316-87312
SS	0.12	340	S	S	1.6	1.6		G1316-87319
SS	0.12	170	S	S	1.6	1.6		G1316-87316
SS	0.12	300	S	S	1.6	1.6		G1316-87318
SS	0.12	210	S	S	1.6	1.6		G1316-87317
SS	0.12	70	S	U	1.6			G1316-87313
SS	0.12	90	S	U	1.6			G1316-87314
SS	0.12	60	S	S			Pre-swaged on A and B	79841-87610
SS	0.12	340	S	M		0.8	Pre-swaged on A	G1316-87305

*1.6 mm = 1/16 in

(Continued)

Material

Key	Description
SS	Stainless steel
S	Swagelok 1.6 mm port id
U	Swagelok union
SL	Swagelok 1.6 mm port id, long
SLV	Swagelok 1.6 mm port id, long, 1200 bar
SX	Swagelok 1.6 mm port id, extra-long
M	Metric M4 0.8 mm port id



Stainless steel fittings (S), 5062-2418

Images shown are capillary fittings. For complete information on fittings, turn to page 40.

Miscellaneous Capillaries

Material	ID (mm)	Length (mm)	Fitting Type From (A)	Fitting Type To (B)	OD (mm) A*	OD (mm) B*	Notes	Part No.
SS	0.12	100	M	M	0.8	0.8		G1316-27301
SS	0.12	75	S	M	1.6	0.8		G1316-87306
SS	0.12	90	S	SX	1.6	1.6		5067-4685
SS	0.12	120	SX	SX	1.6	1.6		5067-4688
SS	0.17	105			1.6	1.6	Capillary without fitting	5021-1816
SS	0.17	400			1.6	1.6	Capillary without fitting	5021-1819
SS	0.17	150			1.6	1.6	Capillary without fitting	5021-1817
SS	0.17	280			1.6	1.6	Capillary without fitting	5021-1818
SS	0.17	280	S	S	1.6	1.6	Pre-swaged on A	01090-87304
SS	0.17	200			1.6	1.6	Capillary without fitting	5065-9931
SS	0.17	600			1.6	1.6	Capillary without fitting	5065-9933
SS	0.17	800	S	S	1.6	1.6	Pre-swaged on A	01048-87302
SS	0.17	900			1.6	1.6	Capillary without fitting	5065-9963
SS	0.17	105	S	S	1.6	1.6		G1316-87321
SS	0.17	700			1.6	1.6	Capillary without fitting	5065-9932
SS	0.17	170	S	S	1.6	1.6		G1316-87323
SS	0.17	250	S	S	1.6	1.6	Pre-swaged on A and B	G1367-87304
SS	0.17	150	S	S	1.6	1.6	Pre-swaged on A and B	G1312-87305
SS	0.17	800	SL	S	1.6	1.6	Pre-swaged on A	01078-87305
SS	0.17	105	S	S	1.6	1.6	Pre-swaged on A and B	G1312-87306
SS	0.17	280	SX	S	1.6	1.6	Pre-swaged on A and B	5067-4608
SS	0.17	700	S	SX	1.6	1.6	Pre-swaged on A and B	5067-4648
SS	0.17	150	M	M	0.8	0.8		5067-4737
SS	0.17	700	SL	M	1.6	0.8	Pre-swaged on A	5067-5120

*1.6 mm = 1/16 in

(Continued)



Stainless steel extra long fitting (SX), 5065-9967



Stainless steel ferrule (M), 5067-1557

Images shown are capillary fittings. For complete information on fittings, turn to page 40.

Miscellaneous Capillaries

Material	ID (mm)	Length (mm)	Fitting Type From (A)	Fitting Type To (B)	OD (mm) A*	OD (mm) B*	Notes	Part No.
SS	0.17	280	SX	SX	1.6	1.6	Pre-swaged on A and B	5067-4607
SS	0.17	280	SX	S	1.6	1.6	Pre-swaged on A and B	5067-4608
SS	0.17	400			1.6	1.6	Capillary without fitting	5021-1819
SS	0.17	500	SX	Nut (P/N 0100-2086)	1.6	1.6	Pre-swaged on A	5067-4609
SS	0.17	600			1.6	1.6	Capillary without fitting	5065-9933
PK/SS	0.17	100			1.6	1.6	Capillary without fitting	5067-4777
PK/SS	0.17	150			1.6	1.6	Capillary without fitting	5067-4778
PK/SS	0.17	200			1.6	1.6	Capillary without fitting	5067-4779
PK/SS	0.17	300			1.6	1.6	Capillary without fitting	5067-4780
PK/SS	0.17	400			1.6	1.6	Capillary without fitting	5067-4781
PK/SS	0.17	500			1.6	1.6	Capillary without fitting	5067-4782
SS	0.25	320	S	S	1.6	1.6	Pre-swaged on A and B	79835-87638
SS	0.5	105			1.6	1.6	Capillary without fitting	5065-9927
SS	0.5	150			1.6	1.6	Capillary without fitting	5022-6509
SS	0.5	200			1.6	1.6	Capillary without fitting	5022-6510
SS	0.5	800			1.6	1.6	Capillary without fitting	5065-9926

*1.6 mm = 1/16 in

Material

Key	Description
SS	Stainless steel
PK	PEEK
PK/SS	PEEK and Stainless steel
Ti	Titanium
S	Swagelok 1.6 mm port id
U	Swagelok union
SL	Swagelok 1.6 mm port id, long
SLB	Swagelok 1.6 mm port id, long bio
SV	Swagelok 1.6 mm port id, 1200 bar
SLV	Swagelok 1.6 mm port id, long, 1200 bar
SX	Swagelok 1.6 mm port id, extra-long



Stainless steel fittings (S), 5062-2418



Stainless steel extra long fitting (SX), 5065-9967



Stainless steel ferrule (M), 5067-1557

Images shown are capillary fittings. For complete information on fittings, turn to page 40.

Supplies for the Agilent Infinity 1260 Bio-inert LC System

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Part No.
Pump	Thermostatted autosampler	Ti	0.17	700	SLB	SLV	Pre-swaged on A	G5611-60501
Pump	Manual injection valve	Ti	0.17	900	SLB	SLV	Pre-swaged on A	G5611-60502
Pump	Injector	Ti	0.17	400	SLB	SLV	Pre-swaged on A	G5611-60500
Injector	Detector	PK/SS	0.17	400	SV	SV		G5667-60500
Manual injector	Detector	PK/SS	0.17	500	SV	SV		G5667-60501
Autosampler injection valve	Autosampler analytical head	Ti	0.17	160	SLB	SV	Pre-swagged on A	G5611-60503
Damper	Pump head	Ti	0.6	234	SLB	SLB	For pump only. Pre-swaged on A and B	G5611-67301
Outlet ball valve	Damper	Ti	0.6	248	SLB	SLB	For pump only. Pre-swaged on A and B	G5611-67300
Autosampler injection valve	Column	PK/SS	0.17	100	SV	SV	Included in the Bio Capillary starter kit; used for 2 position/6 port and 4 column selector valve	G5667-60502
Autosampler injection valve	Column	PK/SS	0.17	150	SV	SV	Included in the Bio Capillary starter kit	G5667-60503
Autosampler injection valve	Column	PK/SS	0.17	200	SV	SV	Included in the Bio Capillary starter kit	G5667-60504
Autosampler injection valve	Column	PK/SS	0.17	300	SV	SV	Included in the Bio Capillary starter kit; used for 2 position/6 port and 4 column selector valve	G5667-60505
Autosampler injection valve	Column	PK/SS	0.17		SV	SV	Bio-inert Low Dispersion Heat exchanger	G5616-60050



1200 bar removable fitting (SV), 5067-4733



1200 bar removable long fitting (SLV), 5067-4738



Titanium fitting (SLB), G5611-60502



Bio-inert Low Dispersion Heat Exchanger, G5616-60050

Images shown are capillary fittings. For complete information on fittings, turn to page 40.

PEEK Coated Fused Silica Capillaries for Nano LC

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Part No.
Switching valve	Column	FS/PK	25	100	MP	WPF	G1375-87320
EMPV	Flow sensor	FS/PK	25	220	WG	MP/WG	G1375-87321
Flow sensor	Injection valve	FS/PK	25	350	MP/WG	MP	G1375-87322
Switching valve	Column	FS/PK	25	550	MP	WPF	G1375-87323
Switching valve	Column	FS/PK	25	550	MP	WPF	G1375-87323
Switching valve	Column	FS/PK	25	700	MP	WPF	G1375-87324
Switching valve	Column	FS/PK	50	100	MP	WPF	G1375-87325
Injection valve	Injector seat or to 2nd pump	FS/PK	75	650	MP	WG/WPF	G1375-87327

PEEK Coated Fused Silica Capillaries – 20 µL/min Flow

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Part No.
EMPV	Flow sensor	FS/PK	50	220	WG	WG	G1375-87301
Flow sensor	Injection valve	FS/PK	50	550	WG	MP	G1375-87310
Injection valve	Metering device	FS/PK	50	200	MP	WG	G1375-87302
Injection valve	Column	FS/PK	50	500	MP	WPF	G1375-87304
Column	Detector	FS/PK	50	400	WPF		G1315-68703
Detector	Waste	FS/PK	75	700			G1315-68708
µ-switching valve	Column	FS/PK	50	280	MP	WPF	G1375-87309



Stainless steel fittings, male (G), 5063-6593



Ferrule and stainless steel lock ring (W), 5065-4423



PEEK fittings, plugs (MP), 5065-4410



Double winged PEEK nut & ferrule (WPF), 5065-4422



Images shown are capillary fittings. For complete information on fittings, turn to page 40.

PEEK Coated Fused Silica Capillaries – 100 µL/min Flow

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Part No.
EMPV	Flow sensor	FS/PK	100	220	WG	WG	G1375-87305
Flow sensor	Injection valve	FS/PK	100	550	WG	MP	G1375-87306
Injection valve	Metering device	FS/PK	100	200	MP	WG	G1375-87312
Injection valve	Column	FS/PK	75	500	MP	WPF	G1375-87311
Column	Detector	FS/PK	75	400	WPF		G1375-87308
Detector	Waste	FS/PK	75	700			G1315-68708
µ-switching valve	Column	FS/PK	50	280	MP	WPF	G1375-87309

Loop Capillaries

Volume (µL)	Agilent Autosampler	Part No.
8	G1389A	G1375-87303
	G1377A	G1375-87315
20	G1367E, G4226A	G4226-60310
40	G1367D	G1377-87310
	G1367E, G4226A	5067-4703
	G1377A	G1377-87300
	G1389A	G1329-87302
100	G1313A, G1329A/B, 1120, 1220 Infinity LC	01078-87302
	G1367A/B/C	G1367-87300
	G1367E, G4226A	5067-4710
	G5667A	G5667-60310
900	G1329A/B, G2260A	G1313-87303
5000	G2260A	G2260-68711

Material

Key	Description
FS/PK	Fused silica/PEEK
W	Swagelok 0.8 mm port id
WG	Swagelok 0.8 mm port id, small head SW 4 mm
MP	Metric M4 0.8 mm port id, PEEK
WPF	Swagelok 0.8 mm port id, PEEK, finger-tight

Agilent 1220/1120 Infinity Series LC

From (A)	To (B)	Material	ID (mm)	Length (mm)	Fitting Type From	Fitting Type To	Notes	Part No.
Pump	Autosampler	SS	0.17	380	S	S	Pre-swaged on A and B	01090-87306
Manual injector	Column	SS	0.17	180	S	S	Pre-swaged on A	G1313-87305
Heater	Column	SS	0.17	90	S	S		G1316-87300
Column	Detector	SS	0.17	380	S	S	Pre-swaged on A; thermal isolation	G1315-87311
VWD	Waste	PK	0.25	500			Finger-tight fittings not included (0100-1516, 2/pk)	5062-8535
Detector	Waste	PTFE	0.8	5000			Finger-tight fittings not included (0100-1516, 2/pk)	5062-2462

Material

Key	Description
SS	Stainless steel
S	Swagelok 1.6 mm port id
PK	PEEK
PTFE	PTFE



Stainless steel fittings (S), 5062-2418



Finger-tight PEEK fitting (SPF), 0100-1516



Images shown are capillary fittings. For complete information on fittings, turn to page 40.

Tubing

PEEK Tubing

- Flexible and easy to cut to desired lengths
- Color coded for easy tracking
- Accepts both stainless steel and PEEK fittings
- 1/16 in od

PEEK Tubing

ID (mm)	Length (m)	Color Code	Part No.
0.50	1.5	Orange	0890-1761
0.25	1.5	Blue	0890-1762
0.25	5	Blue	5042-6463
0.18	1.5	Yellow	0890-1763
0.18	5	Yellow	5042-6462
0.13	1.5	Red	0890-1915
0.13	5	Red	5042-6461

Other Tubing

Description	Length (m)	ID (mm)	OD (mm)	Part No.
PTFE tubing, FEP, primary use for valve solutions	5	0.7	1.6	5062-2462
PTFE solvent tubing, primary use for flow path from solvent bottle to degasser, to pump	5	1.5	3.1	5062-2483
Corrugated tubing, polypropylene	5	6.5		5062-2463
Silicone tubing	5	1	3	5065-9978
Clamps and micro clamps, 10/pk				5065-9976
Barbed Y-Connector PP for 3/16 in id tube, 10/pk				5065-9971
For G2258A 1100/1200 Series Dual Loop Autosampler				
Front seat tube, SS	0.1	0.5		G2258-87316
Back seat tube, SS	0.12	0.5		G2258-87315
Front seat tube, PTFE	0.1	0.2		G2258-87312
Back seat tube, PTFE	0.12	0.25		G2258-87313
Waste tube	0.15	0.8		G2258-87310
Waste tube	0.1	0.8		G2258-87311
Drawing tube assembly for flush solvent				G2258-87307
Tubing assembly, solvent flush				G2258-87314
For G1313/27/29A 1100/1200 Series Autosampler				
Waste tube				G1313-87300
Corrugated tubing, polypropylene	5	6.5		5062-2463
For G1387A 1100/1200 Series Micro Autosampler				
Waste tube, FEP		0.8	1.6	G1375-87326

Accessories

Description	Part No.
Plastic tubing cutter	8710-1930
Blades for plastic cutter, 5/pk	8710-1931
Fitting screws, stainless steel, 10-32, 4 mm, 5/pk	5065-9948
PEEK ferrule and stainless steel ring for 2 mm tube, 5/pk	5065-9950
Union, PEEK for 1/8 in od tubing	0100-2410
Waste adapter, 1200 Series autosamplers, gray	G1313-43216



Plastic tubing cutter, 8710-1930

Rigid Capillary Tubing

- Squarely cut, pre-cleaned and ready to use
- Use with stainless steel fittings and ferrules (P/N 5062-2418) or PEEK fittings (P/N 0100-1516)



Fitting screws, 5065-9948

Rigid Capillary Tubing

Length (mm)	ID (mm)	Unit	Part No.
100	0.17	10/pk	5061-3361
200	0.17	10/pk	5061-3362



PEEK ferrules and SS rings, 5065-9950



Fittings and Unions

Your best value: Agilent multi-use capillary and fitting kits with FREE cybertool

Agilent starter kits contain the most widely used capillary tubing, Swagelok connectors, and fittings in a variety of sizes, so you can find just the right length to minimize your connections and tubing volume. We've also included our flexible stainless steel capillaries to help you make the best LC connections, regardless of equipment brand. Plus, as a special bonus, all multi-use kits (the first three listed here) feature a FREE cybertool that puts more than 30 lab essentials at your fingertips.

For high-efficiency columns, it's best to use narrow-diameter red tubing (0.12 mm id), instead of conventional green (0.17 mm id) tubing.

Capillary and fittings kits

Description	Contents	Part No.
Capillary/fitting starter kit for 1100 Capillary LC System Multi-use kit, a collection of various capillaries and tools for use in the lab.	Kit includes: Qty 2 – Fused silica/PEEK capillary, 50 µm, 55 cm Qty 1 – Fused silica/PEEK capillary, 50 µm, 20 cm Qty 1 – Fused silica/PEEK capillary, 100 µm, 110 cm Qty 2 – Fused silica/PEEK capillary, 50 µm, 50 cm Qty 2 – Fused silica/PEEK capillary, 50 µm, 40 cm Qty 4 – 4 mm stainless steel fitting, male 10-32 Qty 4 – 1/32 in PEEK ferrule and stainless steel lock ring Qty 4 – PEEK fittings for µ-valves Qty 4 – Double winged PEEK nuts and 1/32 in ferrules Cybertool	5065-9938
Capillary/fitting starter kit, 0.12 mm id Multi-use kit, a collection of various capillaries and tools for use in the lab.	Kit includes: Qty 1 – PEEK capillary, 0.13 mm id, 1.5 m Qty 4 – Stainless steel capillary, 0.12 x 105 mm Qty 4 – Stainless steel capillary, 0.12 x 150 mm Qty 2 – Stainless steel capillary, 0.12 x 170 mm Qty 2 – Stainless steel capillary, 0.12 x 200 mm Qty 2 – Stainless steel capillary, 0.12 x 220 mm Qty 2 – Stainless steel capillary, 0.12 x 280 mm Qty 1 – Stainless steel capillary, 0.12 x 400 mm Qty 3 – Stainless steel ZDV union Tubing cutter for PEEK capillaries 1/16 in Stainless steel fittings, 10/pk 1/16 in PEEK fittings, color, 10/pk 1/16 in PEEK fittings, 10/pk Rheotool Cybertool	5065-9937

(Continued)

Capillary and fittings kits

Description	Contents	Part No.
Capillary/fitting starter kit, 0.17 mm id Multi-use kit, a collection of various capillaries and tools for use in the lab.	Kit includes: Qty 1 – PEEK capillary, 0.18 mm id, 1.5 m Qty 4 – Stainless steel capillary, 0.17 x 105 mm Qty 4 – Stainless steel capillary, 0.17 x 150 mm Qty 2 – Stainless steel capillary, 0.17 x 200 mm Qty 2 – Stainless steel capillary, 0.17 x 280 mm Qty 1 – Stainless steel capillary, 0.17 x 400 mm Qty 3 – Stainless steel ZDV union Tubing cutter for PEEK capillaries 1/16 in Stainless steel fittings, 10/pk 1/16 in PEEK fittings, color, 10/pk 1/16 in PEEK fittings, 10/pk Rheotool Cybertool	5065-9939
Capillary starter kit, 0.17 mm BIO	Kit includes: Qty 1 – 1.5 m PEEK tubing PEEK finger-tight fitting, 10/pk Colored finger-tight PEEK fittings, 10/pk Qty 3 – Bio-inert union, 600 bar Qty 1 – Plastic tubing cutter Qty 1 – Rheotool socket wrench, 1/4 in Qty 1 – Ti capillary, 0.17 x 400 mm Qty 2 – PK/SS capillary, 0.17 x 105 mm Qty 2 – PK/SS capillary, 0.17 x 150 mm Qty 1 – PK/SS capillary, 0.17 x 300 mm Qty 2 – PK/SS capillary, 0.17 x 200 mm Multifunction tool	G5611-68710
Rapid Resolution High Throughput capillary kit Used for converting an Agilent 1200 instrument to the RRLC configuration, to enable use of high efficiency columns (to 600 bar). Can also be used for Agilent 1100 instruments.	Kit includes: Qty 1 – PEEK fitting long for 1/32 in od capillaries Qty 1 – Stainless steel capillary, 0.12 x 280 mm Qty 1 – Stainless steel capillary, 0.12 x 150 mm Qty 1 – Stainless steel capillary, 0.12 x 70 mm Qty 1 – Needle seat capillary, 12 µL x 0.12 mm Qty 1 – PEEK capillary, 0.125 x 550 mm	5065-9947
Low dispersion capillary kit for G1316C	Kit includes: Qty 1 – Flexible tubing, 280 mm, 0.12 mm id Qty 1 – Heater Long Down 0.12 id (1.6 µL internal) Qty 1 – Carrier for heat exchanger TCC SL Plus	5067-4633

(Continued)

Capillary and fittings kits

Description	Contents	Part No.
1200 Infinity Series capillary kit 0.12 mm id, G1316C for installing valves G4231A (2 position/6 ports – 600 bar) and G4231B (2 position/6 ports – 1200 bar)	Kit includes: Qty 1 – Column clip set,eight colors Qty 1 – Stainless steel capillary 0.12 x 340 mm Qty 1 – Stainless steel capillary 0.17 x 700 mm Qty 2 – Stainless steel capillary 0.12 x 90 mm Qty 2 – Stainless steel capillary 0.12 x 150 mm Qty 2 – Stainless steel capillary 0.12 x 280 mm Qty 1 – Stainless steel capillary 0.12 x 120 mm Qty 1 – Stainless steel capillary 0.12 x 200 mm Qty 1 – Heater Long Up 0.12 id (1.6 µL internal) Qty 1 – Heater Long Down 0.12 id (1.6 µL internal) Qty 2 – Carrier for heat exchanger TCC SL Plus	5067-4646
1200 Infinity Series capillary kit 0.17 mm id G1316C for installing a 2 position/10 port valve G4232A (600 bar)	Kit includes: Qty 2 – PEEK tubing, 1/32 in od, 0.4 mm id, 450 mm Qty 1 – Column clip set,eight colors Qty 3 – Stainless steel capillary 0.17 x 150 mm Qty 1 – Stainless steel capillary 0.17 x 340 mm Qty 4 – Stainless steel capillary 0,17 x 90 mm Qty 2 – Stainless steel capillary 0.17 x 280 mm Qty 1 – Stainless steel capillary 0.17 x 250 mm Qty 1 – Stainless steel capillary 0.17 x 700 mm	5067-5103
1200 Infinity Series capillary kit 0.12 mm id G1316C for installing a 2 position/10 port valve G4232B (1200 bar)	Kit includes: Qty 1 – Stainless steel capillary 0.12 x 120 mm Qty 2 – Stainless steel capillary 0.12 x 150 mm Qty 1 – Stainless steel capillary 0.12 x 200 mm Qty 2 – Stainless steel capillary 0.12 x 280 mm Qty 1 – Stainless steel capillary 0.12 x 340 mm Qty 1 – Stainless steel capillary 0.17 x 700 mm Qty 2 – Stainless steel capillary 0.12 x 90 mm Qty 1 – Column clip set,eight colors Qty 1 – Heater Long Up 0.12 id (1.6 µL internal) Qty 1 – Heater Long Down 0.12 id (1.6 µL internal) Qty 2 – Carrier for heat exchanger TCC SL Plus	5067-4682
1200 capillary kit for 0.12 mm id	Kit includes: Qty 1 – Stainless steel capillary, 0.12 x 130 mm Qty 2 – Stainless steel capillary, 0.12 x 170 mm Qty 1 – Stainless steel capillary, 0.12 x 210 mm Qty 1 – Stainless steel capillary, 0.12 x 300 mm Qty 3 – Stainless steel capillary, 0.12 x 500 mm Qty 1 – Stainless steel capillary, 0.12 x 700 mm Qty 1 – Stainless steel capillary, 0.12 x 340 mm Qty 1 – Low carry over seat Qty 1 – DAD heat exchanger capillary, 0.12 x 310 mm	G1316-68716

(Continued)

Capillary and fittings kits

Description	Contents	Part No.
Stainless steel flexible capillary tubing kit	Kit includes: Qty 10 – 1.6 mm (1/16 in) Stainless steel back ferrules Qty 10 – 1.6 mm (1/16 in) Stainless steel front ferrules Qty 10 – Stainless steel fittings Qty 3 – Stainless steel Swagelok nut, 0.12 x 105 mm Qty 1 – Stainless steel capillary, 0.12 x 150 mm Qty 1 – Stainless steel capillary, 0.12 x 280 mm	5061-3304
Stainless steel flexible capillary tubing kit	Kit includes: Qty 2 – Stainless steel capillary, 0.12 x 35 mm Qty 3 – Stainless steel capillary, 0.12 x 105 mm Qty 1 – Stainless steel capillary, 0.12 x 280 mm	5061-3315
1200 Infinity Series low dispersion capillary kit for installing a 6 position/14 port valve G4234A (600 bar) and G4234B (1200 bar)	Kit includes: Qty 1 – Stainless steel capillary, 0.12 x 250 mm, with removable fitting Qty 1 – Stainless steel capillary, 0.12 x 340 mm, with removable fitting Qty 1 – Stainless steel capillary, 0.12 x 500 mm, with removable fitting Qty 8 – Stainless steel capillary, 0.12 x 130 mm, with removable fitting Qty 1 – Stainless steel capillary, 0.17 x 150 mm, with 2 long pre-swaged fittings Qty 4 – Stainless steel capillary, 0.12 x 170 mm Qty 2 – PEEK tubing, 1/32 in od, 0.4 mm id, 450 mm Qty 2 – PEEK fitting, special for Chip-LC Qty 1 – Column clip set, eight colors Qty 2 – Heater Long Up 0.12 mm id (1.6 µL internal) Qty 2 – Heater Long Down 0.12 mm id (1.6 µL internal) Qty 2 – Carrier for heat exchanger TCC Qty 2 – Fitting holder assembly	5067-4729
Ultra-low dispersion capillary kit for the 1290 Infinity LC	Kit includes: Qty 1 – Stainless steel capillary, 0.075 x 220 mm SV/SLV Qty 1 – Stainless steel capillary, 0.075 x 340 mm SV/SLV Qty 1 – Low dispersion needle seat for 1290 Infinity LC Qty 1 – Heater Long Up 0.075 mm (nominal 1.0 µL) Qty 1 – 1290 Infinity LC Low Dispersion Kit Note	5067-5189



Ultra-low dispersion capillary kit, 5067-5189



Stainless steel fittings (S), 5062-2418



PEEK fittings (SPF), 0100-1516/5063-6591



Stainless steel long fittings (SL), 5065-4454



Finger-tight PEEK fitting (SPF), 0100-1516



Stainless steel extra long fitting (SX), 5065-9967



PEEK long fittings (SPFL), 5062-8541



Stainless steel nut, 5061-3303



Finger-tight PEEK fittings (SPF), 5065-4426



Stainless steel front ferrules, 5180-4108



Double winged fitting (SPF), 5042-6500



Stainless steel back ferrule, 5180-4114



PEEK RheFlex fittings (SPF), 0100-1631



1200 bar removable fitting (SV), 5067-4733



PEEK RheFlex fittings (SPF), 0100-2175



1200 bar removable long fitting (SLV), 5067-4738



Stainless steel blanking nut, 01080-83202



1200 bar removable extra long fitting (SXV), 5067-4739

Fittings

Description	Key	Unit	Part No.
Swagelok 1.6 mm stainless steel fitting	S	10/pk	5062-2418
Swagelok 1.6 mm stainless steel fitting, long screw	SL	10/pk	5065-4454
Swagelok 1.6 mm stainless steel fitting, extra long screw	SX	10/pk	5065-9967
Swagelok 1.6 mm screw		10/pk	5061-3303
1.6 mm stainless steel front ferrule		10/pk	5180-4108
1.6 mm stainless steel back ferrule		10/pk	5180-4114
Swagelok 1.6 mm 1200 bar removable fitting	SV	1/ea	5067-4733
Swagelok 1.6 mm 1200 bar removable fitting, long screw	SLV	1/ea	5067-4738
Swagelok 1.6 mm 1200 bar removable fitting, extra long screw	SXV	1/ea	5067-4739
Swagelok 1.6 mm finger-tight PEEK fitting	SPF	10/pk	5063-6591
Swagelok 1.6 mm PEEK finger-tight fitting	SPF	2/pk	0100-1516
Swagelok 1.6 mm PEEK finger-tight long fitting	SPLF	10/pk	5062-8541
Swagelok 1.6 mm PEEK finger-tight fitting (mixed colors)	SPF	10/pk	5065-4426
Swagelok 1.6 mm finger-tight PEEK double winged fitting	SPF	10/pk	5042-6500
Swagelok 1.6 mm finger-tight PEEK Rheflex fitting	SPF	5/pk	0100-1631
Swagelok 1.6 mm finger-tight PEEK Rheflex fitting (mixed color)	SPF	10/pk	0100-2175
Swagelok 1.6 mm stainless steel blanking nut	S	1/ea	01080-83202

Material

Key	Description
S	Swagelok 1.6 mm port id
SL	Swagelok 1.6 mm port id, long
SX	Swagelok 1.6 mm port id, extra-long
SV	Swagelok 1.6 mm port id, 1200 bar
SLV	Swagelok 1.6 mm port id, long, 1200 bar
SLB	Swagelok 1.6 mm port id, long bio
SXV	Swagelok 1.6 mm port id, extra-long, 1200 bar
SPF	Swagelok 1.6 mm port id, PEEK, finger-tight
SPLF	Swagelok 1.6 mm port id, PEEK, long, finger-tight

Fittings

Description	Key	Unit	Part No.
Swagelok 1.6 mm stainless steel screw for PEEK ferrule 5067-1547	S	6/pk	5067-1540
Swagelok stainless steel screw with 1.6 mm PEEK ferrule	SP	1/ea	0100-2086
1.6 mm PEEK ferrule for 5067-1540 screw	SP	6/pk	5067-1547
Swagelok 1.6 mm finger-tight polyketone fitting	SPF	10/pk	5042-8957
M4 stainless steel screw for stainless steel ferrule 5067-1557	M	6/pk	5067-1558
0.8 mm stainless steel ferrule for 5067-1558 screw	M	6/pk	5067-1557
Swagelok 1.6 mm plastic blank nut	M	1/ea	0100-1259
Swagelok 1.6 mm ST screw, 4 mm head	G	10/pk	5063-6593
0.8 mm PEEK ferrule and stainless steel ring for 5063-6593 screw	W	10/pk	5065-4423
M4 0.8 mm PEEK fitting	MP	6 fittings, 2 plugs	5065-4410
Swagelok 0.8 mm finger-tight PEEK double winged fitting	WPF	10/pk	5065-4422
Swagelok 0.8 mm finger-tight PEEK long fitting	WPFL	1/ea	5022-6536
Swagelok 2.0 mm stainless steel screw, 4 mm head		5/pk	5065-9948
2.0 mm PEEK ferrule and stainless steel ring		5/pk	5065-9950

Material

Key	Description
S	Swagelok 1.6 mm port id
SP	Swagelok 1.6 mm port id, PEEK
SPF	Swagelok 1.6 mm port id, PEEK, finger-tight
W	Swagelok 0.8 mm port id
G	Small head SW 4 mm
WG	Swagelok 0.8 mm port id, small head SW 4 mm
MP	Metric M4 0.8 mm port id, PEEK
WPF	Swagelok 0.8 mm port id, PEEK, finger-tight



Stainless steel nut and PEEK ferrule, 5067-1540



Ferrule and stainless steel lock ring (W), 5065-4423



PEEK ferrule, 5067-1547



PEEK fittings, plugs (MP), 5065-4410



Finger-tight polyketone fitting (SPF), 5042-8957



Double winged PEEK nut & ferrule (WPF), 5065-4422



M4 stainless steel screw, 5067-1558



PEEk fitting, long (WPFL), 5022-6536



Stainless steel ferrule (M), 5067-1557



Fitting screws, 5065-9948

Plastic blank nut, 0100-1259



PEEK ferrules and SS rings, 5065-9950



Stainless steel screw, 5063-6593



ZDV union, 5022-2145



Adapter, PEEK, 0100-2298



ZDV universal union, 5022-2184



Barbed Y-connector PP, 5065-9971



ZDV union with fittings, 0100-0900



Union, female to female, 5042-8517



ZDV union, PEEK with fittings, 0100-2441



High flow union, 5022-2133



Adapter, male Luer to female, 5042-8518



PEEK adapter, 0100-1847



Adapter, female to male, 5023-1803



Bio-inert union, 600 bar, 5067-4741



Micro T-connector, PEEK, 5042-8519

Unions

Description	Use With	Part No.
ZDV union, no fittings	Nano LC	5022-2145
ZDV universal union, stainless steel, no fittings	Standard LC	5022-2184
ZDV union, with fittings	Standard LC	0100-0900
ZDV union, PEEK with fittings	Bio-applications	0100-2441
High flow union, no fittings	Prep LC	5022-2133
PEEK adapter 1/4-28 to 10-32		0100-1847
Adapter, PEEK int. 1/4-28 to ext. 10-32		0100-2298
Barbed Y-connector PP for 3/16 in id tube, 10/pk		5065-9971
Adapter, union PEEK 1/4-28		5042-8517
Adapter, male Luer to female 1/4-28		5042-8518
SS adapter Swagelok to 1/4-28		5023-1803
T-connector, PEEK, swept volume 0.57 µL	For 1/16 in od tubing	5022-2144
Micro T-connector, PEEK, swept volume 29 mL, with 1/32 in id fittings		5042-8519
Bio-inert union, stainless steel with PEEK insert 600 bar	Bio-applications	5067-4741

Tips and tools for creating the best possible connections



How do I tighten fittings correctly?

The chart below describes the steps you'll need to follow.

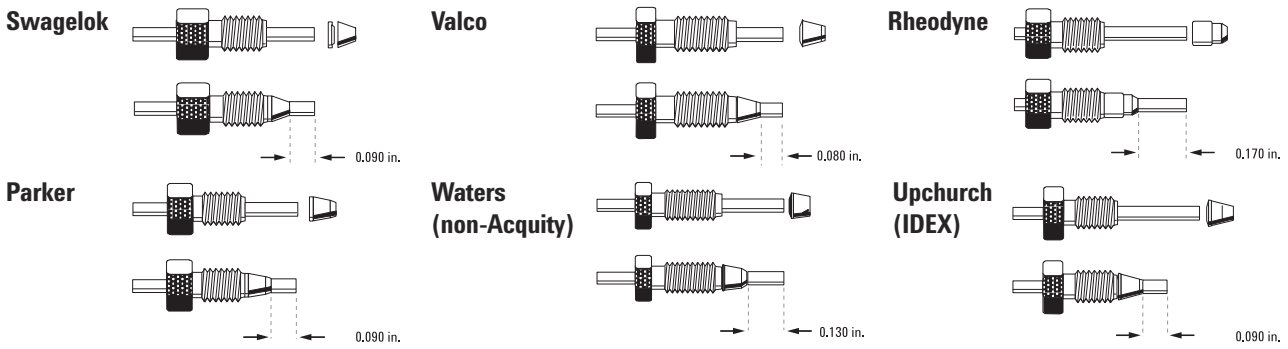
Fitting type	First Connection	Further connection
Stainless steel	1. Slide the screw, along with the back and front ferrules, onto the capillary. 2. Insert capillary into the port until it is completely seated in the end fitting. 3. Finger-tighten the nut until the capillary does not rotate. 4. Tighten the nut ½ to ¾ turn with a slitted socket wrench or Rheotool (P/N 8710-2391). If you are using a torque wrench, tightening torque should be between 1.5 and 3.0 Nm)	Finger-tighten, then tighten an extra ¼ to ½ turn with a slitted socket wrench or Rheotool (P/N 8710-2391). (If using a torque wrench, tightening torque should be between 1.5 and 3.0 Nm).
Polymeric finger-tight: PEEK and polyketone	1. Slide the screw and ferrule onto the capillary. 2. Insert capillary into the port until it is completely seated in the end fitting. 3. Finger-tighten the nut until the capillary does not rotate. 4. Make sure the capillary cannot be easily pulled out.	Additional tightening if necessary See "good connections" step by step
1200 bar removable fitting	1. Slide the screw, along with the back and front ferrules, onto the capillary. 2. Insert capillary into the port until it is completely seated in the end fitting. 3. Finger-tighten the nut until the capillary does not rotate. 4. Tighten the nut about ¾ turn with a socket wrench. 5. For stainless steel capillaries, if using a torque wrench, tightening torque should be between 1.0 and 1.2 Nm. 6. For stainless steel coated PEEK capillaries, do not exceed 0.8 Nm.	Finger-tighten, then tighten an extra ¼ to ½ turn with a socket wrench. For stainless steel capillaries, if using a torque wrench, tightening torque should be between 1.0 and 1.2 Nm. For stainless steel coated PEEK capillaries, if using a torque wrench, do not exceed 0.8 Nm.
PEEK/stainless steel	1. Slide the screw, along with the back and front ferrules, onto the capillary. 2. Insert capillary into the port until it is completely seated in the end fitting. 3. Finger-tighten the nut until the capillary does not rotate. 4. Tighten the nut about ½ turn with a socket wrench.	Finger-tighten, then tighten an extra ¼ to ½ turn with a socket wrench.

How do I prepare the perfect fitting connection?

Problems with stainless steel tubing connections are commonly mistaken for column issues – and are the source of many calls to Agilent's technical support line.

Connection problems often arise because different manufacturers supply different types of fittings, as you can see in the following diagram:

Common HPLC column connectors by manufacturer



Ideally, you should use the fittings recommended by your column manufacturer. Most analytical reversed phase columns are compatible with Swagelok or Parker-type fittings when correctly seated in the column.

Stainless steel fittings are the best choice for permanent, high-pressure sealing. Agilent recommends Swagelok-type fittings with front and back ferrules, because they deliver the best performance for Agilent LC systems – and can be used on most instrument connections, including valves, heaters, and column connections.

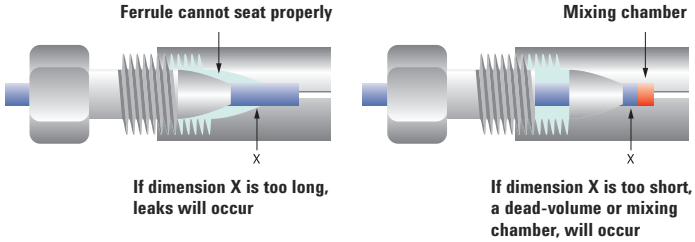
For lower-pressure operation, finger-tight polymeric fittings allow you to easily adjust the end-fitting to seat the capillary into the column properly – helping avoid extra-column voids and leaks. These connectors can be tightened without wrenches. High-pressure fittings, which are designed to be removed and resealed, are also available for pressures up to 1200 bar.

How do I align the connection properly?

The importance of correct tubing length (relative to the distance from the end of the tubing to the bottom of the ferrule) cannot be overstated. If the tubing is too long, the ferrule will not seat properly and leaks will occur. Likewise, if the tubing is not pushed in far enough, a void occurs, creating extra-column volume that acts as a "mixing chamber", which can cause peak tailing, and/or poor peak shape.

Always make sure you use the correct fittings, and that all fittings are properly seated in the column end fitting – especially if you use columns from different manufacturers.

Examples of incorrect fittings



A good connection, step by step

This connection uses a Swagelok-type fitting which is good for connections to the instrument. For column connections, it is ideal to use polymeric finger-tight fittings, which are removable, or the 1200 bar removable fitting.

1. Select a nut that is long enough for the fitting you'll be using.
2. Slide the nut over the end of the tubing.
3. Carefully slide the ferrule components on after the nut, then finger-tighten the assembly while making sure the tubing is completely seated in the bottom of the end fitting.
4. Use a wrench to gently tighten the fitting; this will force the ferrule to seat onto the tubing, ½ to ¾ turn with a wrench. Do not over-tighten! That will shorten the useful life of the fitting.
5. Once you are sure your fitting is complete, loosen the nut and inspect the ferrule for correct position on the tubing.

Note: Avoid re-using a capillary on a different location. The position of the fitting is done the first time it is screwed on a port and all the ports are not strictly identical.











What are the benefits of a small internal diameter?

The roughness of the internal capillary surface is a function of the capillary's outer diameter. A smaller outer diameter provides better smoothness for the internal capillary surface.

Agilent's unique stainless steel LC capillary connections for liquid chromatography are designed for small inner diameters, reducing backpressure and blocking. To make these connections compatible with standard 1/16 in capillaries, we weld a tight, flat sleeve at both ends. Agilent's unique laser welding process ensures that the capillary ends are absolutely flat, eliminating any chance of additional dead volume.

Which capillary connection size is right for me?

Choose the shortest practical length and narrowest diameter that your application and system allows. For 4.6 mm id columns, 0.17 mm capillaries are usually sufficient, but for narrower id columns like 2.1 mm, 0.12 mm id capillaries are used to keep sample dispersion as low as possible. There are also new ultra-low dispersion capillaries (0.075 mm id) for use with the 1290 Infinity LC.

How can I get rid of extra-column volume effects?

Extra-column volume effects can be caused by capillaries that are too long, so try a shorter- length capillary. For low-volume, high efficiency columns (e.g., Agilent ZORBAX Eclipse Plus C18, 2.1 x 50 mm, 1.8 µm), replace 0.17 mm id (green) capillaries with 0.12 mm id (red).

For additional information on extra-column volume and its effect, see our application note *"Reduce Tubing Volume to Optimize Column Performance"* at **www.agilent.com/chem/library/applications/5990-4964EN.pdf**

What should I do about high backpressure?

High backpressure issues are usually not caused by capillaries. However, you should check to make sure the capillary isn't blocked, and replace if necessary, as part of your troubleshooting.

How can I reduce peak broadening, related to my capillary?

In addition to optimizing the length and diameter of the capillary, proper positioning in the fitting is important. The distance between the end of the capillary and the bottom of the ferrule may be too long or too short (creating a void), resulting in a poor connection. This can cause leaks or peak shape issues, such as broadening when the sample mixes in the void. A re-usable fitting can be adjusted, but with stainless steel a new fitting will need to be made.

How do I eliminate detector spikes and bubbles?

Check for air leaks at the capillary connections, and tighten as needed.

Pump Supplies

Regular pump maintenance helps lower operating costs and generate precise results that make you feel confident.

You can count on Agilent isocratic, binary, quaternary, capillary, and preparative pumps for superior flow and composition stability. And by following a regular maintenance routine, you can also count on maximum uptime and a steady, accurate solvent flow for the life of the pump.



Sapphire piston and seals

Pump Routine Maintenance Procedures

- Replace the seals and pistons
- Replace the PTFE frit
- Replace the cartridge in the Active Inlet Valve
- Clean the outlet ball valve
- Clean or replace the solvent inlet frits

Routine pump maintenance should be done on a regular basis to keep your Agilent LC system performing at its optimum. You can perform all maintenance procedures at once or as needed. Some parts may need to be replaced more than others depending upon your application and solvent preparation procedures.

Pump Routine Maintenance Procedures

Symptom	Cause	Solution
Solvent dripping out of waste outlet when valve closed	Leak on pump head	Exchange the purge valve frit or the purge valve
Pressure ripple unstable	Dirty active inlet valve cartridge	Run leak test for verification and exchange the active inlet valve cartridge
	Leak on pump head	Run leak test for verification and exchange the outlet ball valve sieve or the complete valve
Gradient performance problems, intermittent pressure fluctuations	Solvent filter is blocked	Change the solvent filter
A pressure drop of >10 bar across the frit (5 mL/min H_2O with purge valve open) indicates blockage	Dirty frit	Exchange the purge valve frit or the purge valve
Leaks at lower pump head side Unstable retention time Pressure ripple unstable	High seal wear	Run leak test for verification and exchange the pump seals
Seal lifetime shorter than normally expected	Scratch on plunger	Check plungers while changing the seals
Loss of wash solvent	Leaky wash seals	Exchange the wash seals



Purge valve assembly, G1311-60009



Purge valve with PTFE frit, G4280-60061



PTFE frits, 01018-22707

Purge Valves

Description	Comments	Part No.
Purge valve with PTFE frit, 400 bar	For G1310A, G1311A, G1312A, G1376A, G2226A	G1311-60009
Purge valve with PTFE frit	For 1120	G4280-60031
Purge valve with PTFE frit	For G1311C, G1312C, 1220	G4280-60061
Purge valve with PTFE frit	For G1310B, G1311B, G1312B, G4302A,	G1312-60061
PTFE frit	For G1310A, G1311A, G1312A, G1376A, G2226A, 1120, 1220, 1220, G1310B, G1311B, G1312B, G1311C, G1312C, G4202A	01018-22707
Seal cap	Not suitable for outlet ball valves with integrated seal	5067-4728
Seal for purge valve	For 1120	0905-1192
Purge valve actuator	For 1120	G4280-60033
Bio-inert purge valve	For G5611A	G5611-60061
5 position / 7 port rotor seal	For G4220A, G4220B	5068-0005
5 position / 7 port stator	For G4220A, G4220B	5068-0004
Multi purpose valve head	For G4204A	5067-4174
Stator for 5067-4174 multi purpose valve head	For G4204A	5068-0122
Rotor for 5067-4174 multi purpose valve head	G4204A	5068-0123
Stainless steel filter assembly with PEEK ring, 2 µm pore size	For G1361A	5022-2192
Open end wrench, 14 mm	To remove purge valve	8710-1924

TIPS & TOOLS

Information on maintenance procedures can be found at **www.agilent.com/chem/LCmaintenancenotes**

Inlet and Outlet Valves

Inlet Valves

Description	Comments	Part No.
Active inlet valve without cartridge	For G1310A, G1311A, G1312A, G1376A, G2226A, G1312B, G1312C	G1312-60025
Cartridge for active inlet valve 400 bar	For G1310A, G1311A, G1312A, G1376A, G2226A, G1312C	5062-8562
Cartridge for active inlet valve 600 bar	For G1312B	G1312-60020
Bio-inert active inlet valve	For G5611A	G5611-60025
Bio-inert cartridge for active inlet valve, 600 bar	For G5611A	G5611-60020
Inlet valve for 1290 quaternary pump	For G4204A	G4204-60022*
Valve assemblies (inlet/outlet) for prep pumps	For G1361A	G1361-60012
Passive inlet valve	For G1310B, G1311B, G1311C, 1120, 1220, G4302A	G1312-60066*
Passive inlet valve	For G4220A, G4220B	G4220-60022*
Seal cap	Not suitable for outlet ball valves with integrated seal	5067-4728

*Inlet valve with integrated seal.



Active inlet valve without cartridge, G1312-60025



Cartridge, 400 bar, 5062-8562



Passive inlet valve, G1312-60066

Outlet Valves

Description	Comments	Part No.
Outlet ball valve	For G1310A, G1311A, G1312A,G1376A, G2226A, 1120, 1220, G1310B, G1311B, G1311C, G1312B, G1312C, G4302A	G1312-60067*
Outlet ball valve	For G4220A, G4220B, G4204A	G4220-60028*
Bio-inert outlet ball valve	For G5611A	G5611-60067*
Valve assemblies (inlet/outlet) for prep pumps	For G1361A	G1361-60012
Seal cap	Not suitable for outlet ball valves with integrated seal	5067-4728

*Outlet ball valve with integrated seal.



Seal cap, 5067-4728



Outlet ball valve, G1312-60067



Outlet ball valve, G4220-60028

TIPS & TOOLS

Information on maintenance procedures can be found at
www.agilent.com/chem/LCmaintenancenotes



Sapphire piston and seals

Pistons and Seals

Agilent pistons are made from a high purity, monocrystalline sapphire for maximum durability. Although ceramic pistons can be manufactured at a lower cost, ceramic is a sintered, polycrystalline material, which can cause undesirable variations during the production process. Agilent sapphire pistons are:

- Meticulously cut at just the right angle, making them durable – and long lasting
- Precisely aligned in their stainless steel holder to minimize wear on the piston and seal

Agilent seals are designed to fit snugly around our pistons, and are capable of adapting to a wide range of flow rates and pressures. Agilent piston seals are:

- Spring-loaded and engineered to deliver optimal performance over highly dynamic flow and pressure ranges
- Manufactured from a proprietary polymer blend, and feature a spring made from the same high-quality stainless steel that is used in our pump's flow path

The combination of our piston and seal has undergone extensive testing under temperature stress, with all common HPLC solvents, and in many instruments. More importantly, they yield consistent, reproducible results.

Pistons

Description	Comments	Part No.
Sapphire plunger	For G5611A, 4302A	5067-4695
Zirconium based ceramic plunger	For G4220A, G4220B, G4204A	5067-4678
Sapphire plunger	For G1310A, G1311A, G1312A, G1376A, G2226A, 1120, 1220, G1310B, G1311B, G1312B, G1311C, G1312C	5063-6586
Sapphire plunger	For G1361A	G1361-22402

Seals

Description	Comments	Part No.
Bio-inert piston seal	For G5611A	G5611-21503
Piston seal polyethylene	For G4220A, G4220B, G4204A	0905-1719
Piston seal graphite filled PTFE (reversed-phase) (2/pk)	For G1310A, G1311A, G1312A, G1376A, G2226A, 1120, 1220, G1310B, G1311B, G1312B, G1311C, G1312C, G4302A	5063-6589
Piston seal Polyethylene (normal phase)	For G1310A, G1311A, G1312A, G1376A, G2226A, 1120, 1220, G1310B, G1311B, G1312B, G1311C, G1312C, G4302A	0905-1420
Piston seal	For G1361A	5022-2188



Piston seals, 5063-6589

Specific parts for 1290 Infinity LC pumps

Description	Comments	Part No.
Jet Weaver 35 µL/100 µL	For G4220A, G4220B, G4204A	G4220-60006
Jet Weaver 380 µL	For G4220A, G4220B, G4204A	G4220-60012
Clamp for in-line filter	For G4204A	G4204-40000
Outlet filter 1290 quaternary pump	For G4204A	G4204-60004
Inlet valve for flush pump		5067-4717
Outlet valve for flush pump		5067-4716
Tubing kit 270 mm, 2/pk		5067-4661
Tubing kit 140 mm, 2/pk		G4220-60035
Shut-off valve	For G4220A, G4220B, G4204A	5067-4124
Inline pressure relief valve kit	For G4220A, G4220B	G4212-68001
Solvent selection valve bridge tube		5067-4697
Pressure relief valve	For G4220A, G4220B	G4212-60022
PEEK seal for inlet weaver assembly	For G4204A	G4204-40005
Support ring	For G4220A, G4220B	G4220-60015
Seal keeper	For G4220A, G4220B	G4220-60016

TIPS & TOOLS

Information on maintenance procedures can be found at **www.agilent.com/chem/LCmaintenancenotes**



Peristaltic pump, 5042-8507



Peristalitic pump with ChemSure tubing, 5065-9952

Seal Wash

The routine use of highly concentrated buffer solutions (100 mM) will reduce the life of seals and pistons in your pump. Counteract the problem with one of Agilent's seal wash kits, which flush the back of the seal with a wash solvent. **Note:** Water/isopropanol (90/10) is recommended as the wash solvent.

Seal Wash

Description	Comments	Part No.
Peristaltic pump cassette with silicone tubing	For 1100/1200/1200 RRLC and 1260 Infinity LC pumps	5042-8507
Silicone tubing, 1 mm id, 3 mm od, 5 m		5065-9978
Peristalitic pump with ChemSure tubing	For 1100/1200/1200 RRLC and 1260 Infinity LC pumps	5065-9952
ChemSure tubing for peristaltic pump		5042-8954
Wash Seal and Wash Keeper		
Wash seal	For 1100/1200/1200 RRLC, 1120 and 1260/1220 Infinity LC pumps	0905-1175
Seal keeper	For 1100/1200/1200 RRLC and 1120 pumps	5001-3743
Bio-inert seal keeper	For G5611A LC pump	G5611-26210
Wash seal gasket, 6/pk	For 1100/1200/1200 RRLC, 1120 and 1260/1220 Infinity LC pumps	5062-2484
Wash seal PE	For 1290/1260/1220 Infinity LC pump	0905-1718
Support ring	For 1290/1260/1220 Infinity LC pump	G4220-63010
Support ring	For 1290 Infinity pump without seal wash	G4220-63015
Backup ring for seal holder	For 1290/1260/1220 Infinity LC pump	G4220-24013
Seal keeper	For 1290/1260/1220 Infinity LC pump	G4220-26210

TIPS & TOOLS

Information on maintenance procedures can be found at **www.agilent.com/chem/LCmaintenancenotes**

Solvent Reservoir and Supplies

Solvent Reservoir and Supplies

Description	Part No.
Solvent Reservoir	
Solvent reservoir, 1 L	9301-1420
Solvent reservoir, 1 L, with cap	9301-1421
Solvent reservoir, 1 L, F29/32	9301-0656
Solvent reservoir, amber, 1 L	9301-1450
Solvent bottle, clear, 2 L, 2 inlets	5065-4421
Solvent bottle, amber, 2 L	9301-6341
Solvent bottle, clear, 2 L	9301-6342
Bottle Head Assembly	
Bottle head assembly for screw bottle	G1311-60003
Bottle head assembly for F29/32 tapered solvent bottle	G1312-68716
Bottle head assembly with tubing and filter For capillary and nano systems (with stainless steel solvent filter)	G1376-60003
Bottle head assembly for prep system	G1361-60022
Bottle head assembly	G4220-60007
Bottle cap with 3-hole insert	5063-6531



Solvent reservoirs



Prep bottle, 5065-4421



Solvent bottle, amber, 9301-6341



Glass filter, 5041-2168

Cleaning the Solvent Filter

If the filter is in good condition, the solvent will freely drip out of the solvent tube (hydrostatic pressure). If the solvent filter is partially blocked, only very little solvent will drip out of the solvent tube.

Caution: Small particles can permanently block the capillaries and valves of the module.

- Always filter solvents
- Never use the module without solvent inlet filter

Solvent Filters

Description	Recommended Use	Part No.	Frit Adapter	Part No.	Frit Inlet ID (mm)	Tube OD (mm)
Glass filter, solvent inlet, 20 µm pore size	Analytical scale, micro scale	5041-2168	Frit adapter, PTFE, 3 mm, 4/pk	5062-8517	5	3.2
Glass filter, solvent inlet, 40 µm pore size	Preparative LC	3150-0944	Frit adapter, PTFE for 4.7 mm od tubing	G1361-23205	7	4.7
Glass filter, solvent inlet, 40 µm pore size	Preparative LC	3150-0944	Frit adapter, PTFE, 4 mm	G1361-23204	7	4
Glass filter, solvent inlet, 40 µm pore size	For G2258A Dual Loop Autosampler	3150-0944	Frit adapter, PTFE for 3.2 mm od tubing	G2258-23201	7	3.2
Solvent inlet filter, stainless steel	For use in capillary and nano systems	01018-60025				



Filter frit adapters, 5062-8517



Solvent inlet filter, 01018-60025

Frits and Adapters

Description	Part No.
Solvent mixer, 1100 Series	G1312-87330
Solvent mixer, short, 200 µL	5067-1565
Frit adapter, PTFE, for 4.7 mm od tubing	G1361-23205
Frit adapter, PTFE, for 3.2 mm od tubing For G2258A Dual Loop Autosampler	G2258-23201
O-ring, Viton, 30 mm	0905-1516
Stainless steel filter assembly with PEEK ring, 2 µm pore size	5022-2192

Safety Caps

Open or partially covered solvent bottles can lead to the evaporation of solvents and harmful solvent vapors. Prevent solvent evaporation and possible chemical spills with solvent safety caps from Agilent. These safety caps have been designed for optimal sealing with an integrated exhaust valve providing pressurization during solvent extraction and allowing proper solvent flow to your HPLC system. The exhaust valve contains a PTFE membrane to prevent contamination of your solvents from dirt and dust particles.

- Designed to fit all solvent bottles
- Constructed of PTFE and PFA for high chemical resistance
- Caps rotate freely, preventing tube twisting during bottle exchange
- Available in GL40, GL45, S60 and NS29/32 thread sizes



10 L waste can assembly, S60, 5043-0243

Installation Details for Solvent Safety Caps

Installation Guide for Standard Safety Caps – 4 Simple Steps to Install a Safety Cap

1. Guide the solvent tube through the fitting on the safety cap
2. Re-connect the solvent inlet filter to the solvent tube (open end)
3. Screw the safety cap on top of your solvent bottle
4. Adjust the length of the solvent tube in the solvent bottle and fix the tube by tightening the fitting



Safety Cap I, 5043-0223

Installation Instructions for Safety Caps with Stopcocks

These caps have a shut-off valve which can be closed. This keeps the solvent tube in the bottle during maintenance activities with no risk of having solvent dropping out of the flow path.

4 Simple Steps to Install a Safety Cap with Stopcocks

1. Cut the solvent tube in 2 parts
2. Connect the upper part to the fitting (red or blue) on the safety cap (Top)
3. Cut a suitable length and connect the lower part to the fitting on the safety cap (Bottom)
4. Screw the safety cap on top of your bottle



Safety Cap II, 5043-0224



Safety Cap IV for GL45 bottles, 5043-0226



Safety Cap IV for S60 threaded waste bottles, 5043-0227



5 L waste can assembly, GL45, 5043-0242



10 L waste can assembly, S60, 5043-0243

Safety Caps and Accessories

Description	Kit Contents	Part No.
Safety Cap II with 2 ports – NS29/32	Includes 1 safety cap, 2 fittings 3.2 mm PFA, 1 venting valve with 1 µm PTFE membrane	5043-0221
Safety Cap I with 1 port – GL 45	Includes 1 safety cap, 1 fitting 3.2 mm PFA, 1 venting valve with 1 µm PTFE membrane	5043-0223
Safety Cap II with 2 ports – GL 45	Includes 1 safety cap, 2 fittings 3.2 mm PFA, 1 venting valve with 1 µm PTFE membrane	5043-0222
Safety Cap I with 1 port for prep – GL45	Includes 1 safety cap, 1 fitting 4.7 mm PFA, 1 venting valve with 1 µm PTFE membrane	5043-0300
Safety Cap I with 1 stopcock – GL45	Includes 1 safety cap, 1 fitting 2.3 mm PFA, 1 fitting 2.3 mm PTFE, 1 venting valve with 1 µm PTFE membrane	5043-0225
Safety Cap II with 2 stopcocks – GL 45	Includes 1 safety cap, 2 fittings 2.3 mm PFA, 2 fittings 2.3 mm PTFE, 1 venting valve	5043-0224
Safety Cap IV with 4 ports – 1 leak port – GL45	Includes 1 safety cap, 4 fittings 2.3 mm PFA, 4 fittings 1.6 mm PFA, 4 fittings 2.3 mm PFA, 1 leak hose. Must be used with charcoal filter, P/N 5043-0230.	5043-0226
Safety Cap IV with 4 ports – 1 leak port – S60	Includes 1 safety cap, 4 fittings 2.3 mm PFA, 4 fittings 1.6 mm PFA, 1 leak hose. Must be used with charcoal filter, P/N 5043-0230.	5043-0227
5 L waste can GL45 with 4 ports and 1 leak port	Includes 5 L waste can, 1 safety cap (5043-0226), 2 ports collector PTFE. Must be used with charcoal filter, P/N 5043-0230.	5043-0242
10 L waste can S60 with 4 ports and 1 leak port	Includes 10 L waste can, 1 safety cap (5043-0227), 2 ports collector PTFE. Must be used with charcoal filter, P/N 5043-0230.	5043-0243
Safety Waste Set S50	Includes 5 L space saving waste can, 1 safety cap, 4 fittings 2.3 mm PFA, 1 x 6.4 mm tubing connector, Charcoal filter (48 g)	5043-0831
Venting valve with 1 µm PTFE membrane*		5043-0232
Thread Adapter GL45-GL40 (PTFE)		5043-0234
Thread Adapter PTFE, GL45-GL38		5043-0272
Thread adapter GL45-GPI38-23, (PTFE)		5043-0832
Safety funnel + cover S60, PEHD, conductive		5043-0828
Safety funnel + cover S60, PEHD		5043-0829
Tool for fitting		5043-0830

*Valve change is recommended every six months

Replacement Parts for Safety Caps

Description	Unit	Part No.
Fitting for 3.2 mm tube, PFA	6/pk	5043-0255
Fitting for 2.3 mm tube, PFA	5/pk	5043-0228
Fitting for 1.6 mm tube, PFA	5/pk	5043-0229
Charcoal filter, 48 g		5043-0230
Screw plug 1/4 in, PTFE		5043-0231
Venting valve with 1 µm PTFE membrane*		5043-0232
Screw plug 1/8 in, PTFE	5/pk	5043-0233
2 ports collector, PTFE		5043-0235
5 L waste can, GL45		5043-0236
10 L waste can, S60		5043-0237
3 port collector		5043-0238
Adapter for two 3.2 mm tubes		5043-0239

*Valve change is recommended every 6 months



2.3 mm fittings to connect waste tubes from the purge valve, 5043-0228



1.6 mm fitting to connect wash tubes going to the peristaltic pump of the High Performance ALS/Wellplate Sampler, 5043-0229



Charcoal filter, 48 g, 5043-0230



Screw plug, 1/4 in, PTFE, 5043-0231



Replacement PTFE filter (replace every six months), 5043-0232



Screw plug, 1/8 in, PTFE, 5043-0233



2 ports collector (PTFE), 5043-0235



1200 Series Vacuum Degasser

Vacuum Degassers

A vacuum degasser is recommended for:

- Maximum sensitivity in the low UV wavelength range
- High injection precision
- High retention time reproducibility
- Flow rates below 0.5 mL/min



Mounting tool, 0100-1710

Vacuum Degasser Care

- To generally clean the vacuum degasser tubing, flush the system with isopropanol
- Flush the degasser with water after using buffers
- Speed solvent changes by drawing solvent through the degasser and tubing with syringe adapter kit



Plastic tubing cutter, 8710-1930

Vacuum Degassers

Description	Comments	Part No.
Tubing kit, degasser to pump, 4/pk, 30 cm pieces of tubing with screws and bushings	For G1322A, G1379A/B	G1322-67300
Inlet tubing	For Agilent 1260 Infinity Quaternary Pump VL	5067-5378
Mounting tool for flangeless nut	For G1322A, G1379A/B	0100-1710
Plastic tubing cutter	For G1322A, G1379A/B	8710-1930
Tefzel ferrules and SS lock rings, 1/8 in, 10/pk	For G1322A, G1379A/B	5063-6598
PPS nuts, 1/8 in, 1/4-28 thread, 10/pk	For G1322A, G1379A/B	5063-6599
Union, 1/4-28 thread, polypropylene	For G1322A, G1379A/B	5022-2155
PTFE solvent tubing, 5 m, 1.5 mm id, 3 mm od	For G1322A, G1379A/B	5062-2483
Disposable syringes, 20 mL, 10/pk	For G1322A	5062-8534
Syringe adapter, 1/16 in od, 2 in long	For G1322A	9301-1337
Micro vacuum degasser tubing kit	For G1379A	G1379-67310
Micro vacuum degasser tubing kit	For G1379B	5042-8922
Online degasser accessory kit Includes 8 screws, 8 bushings, 4 markers, tubing, syringe and syringe adapter	For G1322A, G1379A/B	G1322-68705
Vaccum chamber (2 channel)	For G1379A, G1379B	5067-4798
Tubing kit for 5067-4798 vaccum chamber	For G1379A, G1379B	5067-5380
Vaccum chamber replacement kit Includes two 5067-4798 and one 5067-5380	For G1379A, G1379B	5067-5383



Ferrules and rings, 5063-6598



PPS nuts, 5063-6599

Pump Kits

Pump Kits

Description	Kit Contents	Part No.
Start-up Kits		
Pump start-up kit For 1100/1200/1220 RRLC pumps	Includes 1 outlet cap, 5 PTFE frits, 4 piston seals, 1 outlet gold seal, 2 glass solvent inlet filters, 20 µm, and 1 cartridge for active inlet valve	G1311-68710
Nanoflow LC start-up kit	Includes PEEK coated fused silica capillaries, column and fittings to start up a Nanoflow LC System	G2228-68700
Seal Wash Kits		
Active seal wash kit	Includes 2 wash seal gaskets, 2 pump seals, peristaltic pump (includes pump cassette and motor), 2 seal keepers, 2 support ring assemblies, seal insert tool and silicone tubing	G1311-68711
Active seal wash kit	Includes 4 wash seal gaskets, 4 pump seals, 2 peristaltic pumps (includes pump cassette and motor), 4 seal keepers, 4 support ring assemblies, seal insert tool and silicone tubing	G1312-68711
Continuous seal wash kit For 1100/1200/1200 RRLC pumps	Includes 2 wash seal gaskets, 4 m flex tubing, 2 pump seals, 1 flow regulator, 2 seal keepers, 2 support ring assemblies, 20 mL luer lock syringe, seal insert tool and abrasive paper	01018-68722
Seal wash kit for 1260 Capillary/Nano pump	Includes 3 adaptor luer/barbs, 2 film washers, 1 insert tool, 2 seal pumps, 1 clamp hose, 2 seal wash, 1 syringe, 2 support ring 1290 Infinity LC w/seal wash, 2 seal keepers for 1290 Infinity LC, and 2 backup rings for seal keeper 1290 Infinity	G1376-60005
Seal wash PM kit For 1260 Infinity LC pumps	Includes 2 PTFE wash seals (P/N 0905-1175), 2 gasket wash seals (P/N 01018-07102)	G1310-68742
PM kit for seal wash option	Includes 2 wash seals and 1 pack of 6 wash seal gaskets	G1310-68731
Preventive Maintenance Kits		
For 1260 Infinity LC isocratic or quaternary and 1220 pumps	Includes 1 PTFE pump seal (P/N 0905-1503), PTFE frits, 5/pk (P/N 01018-22707), 1 seal cap (P/N 5067-4728)	G1310-68741
For 1260 Infinity LC binary pump	Includes 1 PTFE pump seals (P/N 0905-1503), PTFE frits, 5/pk (P/N 01018-22707), 1 seal cap (P/N 5067-4728), sieves for outlet valve, 10/pk (P/N 5063-6505)	G1312-68741
For 1100/1200 isocratic or quaternary pumps	Includes piston seal, PTFE frits, and 2 seal caps	G1310-68730
For 1290 Infinity pump	Includes pump seal exchange tool, torque wrench, and hex bit	5067-4699
For Bio-inert quaternary pump	Includes bio-inert piston seal, 5/pk PTFE frits, seal cap assembly, film washer, peristaltic pump, silicone tubing, Bio-inert wash seal	G5611-68741

(Continued)



Pump start-up kit, G1311-68710

Pump Kits

Description	Kit Contents	Part No.
Preventive Maintenance Kits		
For 1100/1200 binary pump	Includes 4 piston seals, PTFE frits, 2 sieves, and 3 seal caps	G1312-68730
For G1376A capillary pump	Includes 4 pump seals, 1 stainless steel frit, and 4 seal cap assemblies	G1376-68710
For 1100/1200 and 1260 Infinity LC prep pump	Includes 1 filter cup (P/N 3150-0942), 4 seal prep flange (P/N 5022-2188), 1 filter assembly (P/N 5022-2192), 1 peristaltic pump	G1361-68710
For 1120 manual injector systems	Includes 1 piston seal, 5 PTFE frits, 1 PEEK rotor seal, and 2 seal cap assemblies	G4280-68710
For 1220 manual injector systems	Includes piston seals, PTFE frits, rotor seal, and 2 seal cap assemblies	G4280-68750
For 1220 automated injector systems	Includes piston seals, PTFE frits, rotor seal, 2 seal cap assemblies, needle and needle seat	G4280-68770
For 1120 automated injector systems	Includes 1 piston seal, 5 PTFE frits, 1 Vespel rotor seal, 1 needle, 1 needle seat, and 2 seal cap assemblies	G4280-68730
Extended PM kit For 1100/1050/1200 pumps	Includes 2 piston seals (P/N 5063-6589), PTFE frits, 5/pk (P/N 01018-22707), cartridge active inlet valve (P/N 5062-8562), outlet ball valve (P/N G1312-60067) and 2 pistons (P/N 5063-6586)	5065-4499
Accessory Kits		
1260 Infinity LC binary pump accessory kit	Includes 1 tubing assembly (P/N 5063-6527), 1 CAN cable (P/N 5181-1519), 1 RRLC system configurator, 1 stainless steel capillary, 400 x 0.17 mm (P/N G1312-87303), 1 stainless steel capillary, 700 x 0.17 mm (P/N G1312-87304)	G1312-68755
1100/1200 pump accessory kit	Includes 3 wrenches, 5 PTFE frits, tubing, capillary and wrist strap	G1311-68705
Pump configuration kit for G1312B with G1158B 2 position/6 port valve	Includes side cover with fixed rail, top and right cover for pump housing, and 6 connecting capillaries. Allows automatic switching between different delay volumes to optimize the system for 2.1 mm id or 4.6 mm id columns	G1312-68726
Capillary pump accessory kit	Includes purge valve and holder, hex keys 2.5 and 3 mm, 2 wrenches 1/2 in x 1/16 in, wrenches 1/4 in x 5/16 in and 14 mm, wrist strap, torque adaptor and stainless steel frit, 0.5 µm	G1376-68705
Accessory kit prep pump/gradient G1361A	Includes stainless steel connecting capillaries, solvent mixer, 2 L solvent bottle, bottle head assembly, filter, glass stop valve, stainless steel union, tubing and other parts	G1361-68707
Online degasser accessory kit	Includes 8 screws, 8 bushings, 4 markers, tubing, syringe and syringe adapter	G1322-68705
Extended flow range kit, 100 µL/min	Includes all parts to go from 20 µL/min to 100 µL/min flow rate in a capillary LC system	G1376-68707
Manual prep injection valve kit, stainless steel	Includes position sensing, 10 mL loop, 25 mL syringe, ring mounting bracket, start cable and SS connecting capillaries, 0.5 mm id, 40 cm and 60 cm	5065-9922



Outlet ball valve, G1312-60067

Autosampler Supplies

Your Agilent autosampler is designed to deliver accurate measurements, precise injection volumes, and high-quality data. And by following a regular schedule of preventive maintenance, you can ensure a lifetime of defensible results.



Autosampler Maintenance Schedule

Procedure	When to Perform	Time Required
Exchanging the needle assembly	When needle shows indication of damage or blockage	15 minutes
Exchanging the seat assembly	When the seat shows indication of damage or blockage	10 minutes
Exchanging the metering seal	When autosampler reproducibility indicates seal wear	30 minutes

Injection Valves

Valve	Use With	Part No.	RheBuild Kit	Rotor Seal Material	Rotor Seal	Stator	Stator Face
2 position/6 port injection valve, 400 bar	G1313A, G1329A, G1367A/B, 1120	0101-0921	0101-1257	Vespel	0100-1853	0100-1850	0100-1851
				Tefzel	0100-1849		
				PEEK	0100-2231		
2 position/6 port micro injection valve, 400 bar	G1377A, G1389A	0101-1050		Vespel	0100-2088	0100-2089	
2 position/6 port injection valve, 600 bar	G1329B, G1367C SL, G1367D SL Plus, G1367E, 1220 Infinity LC	0101-1422		PEEK	0101-1416	0101-1417	
10 port, dual loop valve, 400 bar	G2258A	0101-1385		Vespel	0101-2415	0101-1390	
2 position/6 port MBB injection valve, 400 bar	G2260A	0101-1267	0101-1268	PEEK	0101-1268*	0100-2195	
2 position/6 port ultra high pressure valve, 1200 bar	G4226A	5067-4114		Vespel	5068-0007	5068-0006	

*Includes seal and stator face



Injection Valve Assembly, 0101-0921



Stator for 2 position/6 port injection valve, 600 bar, 0101-1417



Stator for 2 position/6 port ultra high pressure valve, 1200 bar, 5068-0006



Needles and Needle Seats

The needle should be replaced when it becomes bent, burred or blunt, or when it is leaking or plugged. You should suspect a leak if you notice a trail of buffer crystals on the needle seat. The needle seat can become blocked if the sample contains particulates, as this is the first restriction that the sample experiences. If this occurs, try backflushing the needle seat capillary.

Needles and Needle Seats

Agilent Autosampler	Needle Assembly Description	Part No.	Compatible with Needle Seat	Part No.
G1313A, G1329A/B, 1120, 1220 Infinity LC (automated sampler only)	Needle assembly, standard autosampler	G1313-87201	Standard needle seat, PEEK 0.17 mm id capillary, 2.3 µL	G1329-87017
			Standard needle seat, PEEK 0.12 mm id capillary, 1.2 µL	G1329-87012
G1313A, G1329A, 1120, 1220 Infinity LC (automated sampler only)	Needle assembly, for use with PEEK seat	G1313-87203	Standard needle seat, PEEK 0.17 mm id capillary, 2.3 µL	G1313-87102
G1313A, G1329A/B, 1120, 1220 Infinity LC (automated sampler only)	Needle assembly, 900 µL upgrade	G1313-87202	Standard needle seat 0.17 mm id capillary, 2.3 µL	G1329-87017
G1389A	Needle assembly, micro LC autosampler	G1329-80001	Micro LC Needle seat 100 µm id capillary, 1.2 µL	G1329-87101
			Micro LC Needle seat 50 µm id capillary, 0.3 µL	G1329-87103
G1367A/B	Needle assembly, well plate autosampler (green)	G1367-87200	Needle seat Vespel, well plate autosampler 0.17 mm id capillary, 2.3 µL	G1367-87101
	Needle assembly, well plate autosampler (blue)	G1367-87201	Needle seat Vespel, well plate autosampler 0.12 mm id capillary, 1.2 µL	G1367-87102

(Continued)



Seat Assembly 0.17 mm id standard autosampler, G1329-87017



Seat Assembly 0.12 mm id standard autosampler, G1329-87012

Needles and Needle Seats

Agilent Autosampler	Needle Assembly Description	Part No.	Compatible with Needle Seat	Part No.
G1367C SL and G1367D SL Plus	Needle assembly, well plate autosampler (black)	G1367-87202	Needle seat, 600 bar, with seat capillary 0.17 mm id x 100 mm, 0.8 mm od	G1367-87017
			Needle seat, PEEK 600 bar, with seat capillary 0.12 mm id x 100 mm, 0.8 mm od	G1367-87012
G1367E	Needle assembly, 1290/1260 Infinity LC autosampler	G4226-87201	Needle seat, PEEK 600 bar, with seat capillary 0.12 mm id x 100 mm, 0.8 mm od	G1367-87012
G1377A	Needle assembly, micro well plate sampler	G1377-87201	Micro needle seat with seat capillary, 100 µm	G1377-87000
			Micro needle seat with seat capillary, 75 µm	G1377-87001
			Micro needle seat with seat capillary, 50 µm	G1377-87002
G2258A	Needle assembly, dual loop autosampler	G2258-68710	Twin needle seat, dual loop autosampler	G2258-87102
G2260A	Needle assembly, prep autosampler	G2260-87201	Needle seat, prep autosampler 0.5 mm id, 20 µL	G2260-87101
G4226A	Needle assembly, 1290/1260 Infinity LC autosampler	G4226-87201	Seat assembly, Vespel 0.12 mm, 1290 Infinity LC autosampler	G4226-87012
G4226A	Needle assembly, 1290/1260 Infinity LC autosampler	G4226-87201	Low dispersion needle seat	G4226-87020
G5667A	Bio-inert needle, 600 bar	G5667-87200	Bio-inert needle seat assembly, 600 bar	G5667-87017

Accessories

Description	Use With	Part No.
Seat adapter	G1313A, G1329A, G1389A, G2260A, 1120 and 1220 Infinity LC	G1313-43204
Finger caps, for Autosampler Gripper, 15/pk	G1313A, G1329A, G1389A, G2260A, 1120 and 1220 Infinity LC	5063-6506
Tool for micro seat capillary mounting	G1377A	G1377-44900



Needle seat, PEEK 600 bar, with seat capillary, G1367-87012



Seat assembly for 1290/1260 Infinity LC, G4226-87012



Needle Assembly for 1290/1260 Infinity LC, G4226-87201

Metering Device Supplies

Infrequently, the metering device seal and piston may need replacement if you see loss in injection volume precision or metering device leaking.

Metering Device Supplies

Piston Description	Use With	Part No.	Seal Description	Part No.
Sapphire piston, 40 µL	G1367D, G1389A, G1377A, G4226A	5064-8293	Piston seal, 2 mm, for G1367D, G1389A, G1377A	5022-2175
			Piston seal for G4226A	0905-1717
Sapphire plunger, 100 µL	G1313A, G1329A/B, G1367A/B/C, G1367E	5063-6586	Piston seal graphite filled PTFE (reversed-phase), 2/pk	5063-6589
Sapphire plunger, 100 µL	G5667A	5067-4695	Bio-inert piston seal	G5611-21503
Sapphire piston, 900 µL	G1313A, G1329A/B, G1367E	5062-8587	Metering valve seal	0905-1294
Piston, 5 mL	G2258A	G2258-60003	Piston seal	0905-1599



Piston seals, 5063-6589



Sample loop, 01078-87302



Loop capillary, 20 µL, G4226-60310

Loop Capillaries

Description	Agilent Autosampler	Part No.
Stainless steel loop capillary, 100 µL	G5667A	G5667-60320
	G1313A	01078-87302
	G1329A/B	
	1120	
	1220 Infinity LC	
	G1367A/B/C	G1367-87300
	G4226A	5067-4710
	G1367E	
Stainless steel loop capillary, 900 µL	G1329A/B	G1313-87303
	G2260A	
Loop capillary, 40 µL	G1367D	G1377-87310
	G4226A	5067-4703
	G1367E	
	G1377A	G1377-87300
	G1389A	G1329-87302
Loop capillary, 20 µL	G4226A	G4226-60310
	G1367E	
Loop capillary, 8 µL	G1389A	G1375-87303
	G1377A	G1375-87315
Loop capillary, 5 mL	G2260A	G2260-68711

Autosampler Trays

Autosampler Trays

Description	Part No.
For G1313A, G1329A/B, 1120, 1220 Infinity LC samplers	
100 position tray for 2 mL vials	G1313-44510
100 position tray for 2 mL vials, thermostattable	G1329-60011
40 position tray for 2 mL vials	G1313-44512
15 position tray for 6 mL vials	G1313-44513
External vial tray for 17 vials (disposal position)	G1313-60004
Disposal tube for external vial tray	G1313-27302
For G1367A/B/C/D/E, G2258A, G4226A	
Well plate tray, 2 well plates, 10 vials (supports 50 mm plates)	G2258-60011
Vial plate for 54 x 2 mL vials, 6/pk	G2255-68700
Vial plate for 15 x 6 mL vials	5022-6539
For G1367A/B/C/D/E	
100 position tray for micro vials Also for G4226A	G4226-60021
Plate for 27 Eppendorf Safe-lock tubes, 0.5/1.5/2 mL	5022-6538
For G2257A	
8.5 in well plate rack, 2/pk For 16 shallow well plates, 4 deep well plates (max 48 mm height) or 6 vial racks	G2255-68709
10 in well plate rack, 2/pk For 20 shallow well plates (max height 16 mm), not compatible with deep well plates	G2255-68710
8.5 in well plate rack extension Includes 3 racks for 3 x 16 shallow well plates, 2 x 4 deep well plates (max 48 mm height) or 3 x 6 vial racks	G2255-68720
10 in well plate rack extension Includes 3 racks for 3 x 20 shallow well plates (max height 16 mm), not compatible with deep well plates	G2255-68730
For G2250A	
205H rack, two 96-deep well plates	G2250-04504
200 rack, 13 x 100 mm tubes (9 mL), 96	G2250-04503
207 rack, 16 x 100 mm tubes (12 mL), 75	G2250-04502
209 rack, 12 x 32 mm tubes (12 mL), 96	G2250-04501
94A special holding 1100 tray	G2250-04500



Vial plate, G2255-68700



Vial plate, 5022-6539



Plate for 27 Eppendorf Safe-lock tubes, 5022-6538

Autosampler Kits

Autosampler Kits

Description	Kit Contents	Part No.
Preventive Maintenance Kits		
For G1329B autosamplers	Includes 1 PEEK rotor seal, 1 needle seat, 1 needle	G1313-68719
For G1313A, G1329A autosamplers	Includes 1 Vespel rotor seal, 1 needle seat, 1 needle, 2 metering seals and 15 finger caps	G1313-68709
For G1313A, G1329A samplers	Includes 1 Vespel rotor seal, 1 needle seat, 1 needle	G1313-68730
For G1367A/B autosamplers	Includes 1 Vespel rotor seal, 1 needle seat, 1 needle, 1 peristaltic pump cartridge, 1 seal tight nut	G1367-68730
For G1367C/D autosamplers	Includes 1 needle assembly, 1 low carry over seat, 1 peristaltic pump, 1 rotor seal	G1367-68734
For G1367E autosampler	Includes 1 PEEK rotor seal, 1 needle seat, 1 needle, 1 peristaltic pump cartridge, 1 metering seal	G1367-68741
For 1220 manual injector systems	Includes piston seals, PTFE frits, gold seals and rotor seal	G4280-68750
For 1220 automated injector systems	Includes piston seals, PTFE frits, gold seals, rotor seal, needle and needle seat	G4280-68770
For 1120 manual injector systems	Includes 1 piston seal, 5 PTFE frits, 2 gold seals, 4 outlet caps and 1 PEEK rotor seal	G4280-68710
For 1120 automated injector systems	Includes 1 piston seal, 5 PTFE frits, 2 gold seals, 4 outlet caps, 1 Vespel rotor seal, 1 needle and 1 needle seat	G4280-68730
For G4226A HiP autosampler	Includes 1 needle seat, 1 needle, 1 rotor 2 position/6 ports, 1 peristaltic pump, 1 metering seal	G4226-68735
Extended PM kit For G1313A, G1329A autosamplers	Includes 1 Vespel rotor seal, 1 needle seat, 1 needle, 1 metering seal, 1 stator face	5065-4498

(Continued)



Maintenance kit, G1313-68709



PM kit for 1220 manual injector systems, G4280-68750

Autosampler Kits

Description	Kit Contents	Part No.
Door Replacement Kits		
Cabinet upgrade kit for 1260 Infinity LC sampler	Includes side panel, top cover and front door	G1329-68736
Cabinet kit for G1367E and G4226A	Includes side panel, base plate and top cover	5067-4662
Door replacement kit for 1260 Infinity LC sampler	Includes front and side doors	G1329-68737
Door repair kit for G1367E and G4226A	Includes front door	G4226-67001
Light protection kit for G1329A	Includes opaque front and side doors and front cover	G1329-68718
Door replacement kit for G1329A	Includes transparent front and side doors	G1329-68727
Upgrade Kits		
Multidraw upgrade kit for G1313A/G1327A/G1329A autosamplers	Includes 500 µL capillary, 1500 µL capillary and ZDV union	G1313-68711
Large volume injection kit for the Agilent 1290 Infinity autosampler G4226A	80 µL seat capillary	G4216-68711



Cabinet upgrade kit, G1329-68736



Door replacement kit, G1329-68737



Fraction Collector Supplies

Agilent fraction collectors are designed to process data in real-time for instantaneous and precise fraction collection, while increasing throughput on your purification system. So you can be certain that you are getting the highest degree of recovery and purity for your fractions – even with low flow rates.

Fraction Collector Maintenance Schedule

Procedure	When to Perform
Analytical and Preparative Fraction Collector Maintenance	
Replace the inlet/waste tubing	Once per year – or when you notice signs of damage or wear
Replace the valve-to-needle tubing	Once per year – or when you notice signs of damage or wear
Exchange the preparative needle assembly	When the needle shows signs of damage or blockage
Exchange the analytical needle assembly	When the needle shows signs of damage or blockage, or when using the short needle assembly with tall test tubes (>45 mm)
Exchange the diverter valve	When the valve is leaking or not switching properly
Exchange the internal tray	When the flow delay sensor no longer works
Repair or exchange a funnel within the internal tray or funnel tray	When defective, leaky, blocked or contaminated
Micro Fraction Collector/Spotter Maintenance	
Replace fraction collector capillary	At least every six months or when worn, blocked or damaged
Exchange the capillary guiding assembly	When bent or damaged
Exchange the internal tray	When the flow delay sensor no longer works properly
Exchange the flap septum and waste tubing	At least every six months or when defective or contaminated



Micro fraction collector

Collecting Tubes and Trays

Tray Part No.	Hole Diameter (mm)	No. of Tubes	Tube Dimensions	Tube Part No.	Unit
G1364-84523	30	40	30 x 100 mm	5042-6458	100/pk
			30 x 48 mm	5042-6470	100/pk
G1364-84524	25	60	25 x 100 mm	5042-6459	100/pk
G1364-84525	16	126	16 x 100 mm	5022-6532	250/pk
			16 x 48 mm	5022-6533	100/pk
G1364-84516	12	215	12 x 100 mm	5022-6531	250/pk
			12 x 48 mm	5022-6534	100/pk
G1364-84532	Funnel tray	40	Any size		



Funnel tray for G1364C fraction collector, G1364-84532

Well Plate Trays

Tray Part No.	Description	Well Plate Part No.	Description	Unit
G1364-84521	Tray for 4 well plates, cooled	5042-1385	96-well plates, 0.5 mL, polypropylene	120/pk
		5042-1386	96-well plates, 0.5 mL, polypropylene	10/pk
G1364-84531	Tray for 4 well plates, adjustable, cooled	5042-6454	96-deep well plates, 1 mL, polypropylene	50/pk
		5042-1389	Closing mats for 96-well plates, silicone, pre-slit, fits 96-well plates P/N 5042-1385 and 5042-1386 only	50/pk
G1364-84522	Tray for 2 well plates, 10 funnels, cooled	5042-1388	384-well plates, 90 µL, polypropylene	30/pk
		5065-4402	96-deep well collection plates with glass inserts, caps, and septa, pre-assembled, 0.35 mL	
G1367-60001	Tray for 2 well plates, 10 vials, 2 mL	5188-5321	Glass inserts, 350 µL	1000/pk
		5188-5322	Caps/septa for glass inserts	1000/pk
		5042-8502	96-well plates, 150 µL, conical, polypropylene	25/pk
		G2255-68700	Vial plate for 54 x 2 mL vials	6/pk
		5022-6538	Plate for 27 Eppendorf Safe-lock tubes, 0.5/1.5/2 mL	
		5022-6539	Vial plate for 15 x 6 mL vials	



Collection plate, showing 96-position closing mat, 5042-1389



Vial plate, G2255-68700



Plate for 27 Eppendorf Safe-lock tubes, 5022-6538



Vial plate, 5022-6539

Fraction Collector Capillary Kits and Needles

Module	Max Flow Rate	Tube Size	Tubing Kit	Needle Length	Needle	Typical Use
G1364B	100 mL/min	0.8 mm id	G1364-68711		G1364-87201	Tubes (max 100 mm)
G1364C	1 mL/min	0.15 mm id	G1364-68723	50 mm	G1367-87200	Tubes (max 48 mm), well plates, vials
	10 mL/min	0.25 mm id	G1364-68712	50 mm	G1367-87200	
	10 mL/min	0.25 mm id	G1364-68712	20 mm	G1364-87202	Funnel tray (tubes max 75 mm)
	100 mL/min	0.8 mm id	G1364-68711	20 mm	G1364-87202	
G1364D	4 µL/min	25 µm id	G1364-87304			MALDI targets, well plates
	4-30 µL/min	50 µm id	G1364-87305			
	30-100 µL/min	100 µm id	G1364-87306			



TIPS & TOOLS

Information on maintenance procedures can be found at **www.agilent.com/chem/LCmaintenancenotes**

G1364D Micro Fraction Collector Supplies

Description	Part No.
MALDI spotting adapter for G1364D	G1364-83205
Well plate adapter assembly for G1364C/D	G1364-60021
Flap septum, PEEK, for internal tray	G1364-27107
Fused silica/PEEK capillary, 25 µm, 50 cm	G1364-87304
Fused silica/PEEK capillary, 50 µm, 50 cm	G1364-87305
Fused silica/PEEK capillary, 100 µm, 50 cm	G1364-87306
Waste tube, PTFE, 20 cm, 1.4 mm id, 2.0 mm od	G1364-86711
MALDI plate carrier Bruker	5022-6541
MALDI plate carrier Bruker PAC	5022-6546
MALDI plate carrier ABI	5022-6542
MALDI plate carrier ABI Opti-TOF	5023-0238
MALDI plate carrier Agilent	5022-6543
MALDI plate carrier Micromass	5022-6544
Target plate for AP-MALDI LC/MS	G1972-60025
Calibration plate Bruker	5023-0208
Calibration plate ABI 192	5023-0209
Calibration plate ABI 10x10 & 20x20	5023-0213
Calibration plate Agilent	5023-0214
Calibration plate Micromass	5023-0215
On-line matrix kit for MALDI spotting Includes BCD board/cable, syringe, needles, adapters, connector and capillary	G1364-68706
Adapter, female to female 1/4-28	5042-8517
Adapter, male Luer to female 1/4-28	5042-8518
Syringe, glass, 1 mL, 1/4-28 connector	5181-1541
Micro T-connector, PEEK, swept volume 29 nL, with 1/32 in id fittings	5042-8519
MALDI spotting tips, PTFE, 10/pk	G1364-81701



MALDI spotting adapter, G1364-83205



Well plate adapter assembly, G1364-60021



MALDI plate carrier Bruker, 5022-6541



Calibration plate Bruker, 5023-0208



Union, female to female, 5042-8517



Adapter, male Luer to female, 5042-8518



Micro T-connector, PEEK, 5042-8519



Injection Valve Assembly, 0101-0921

Valve Supplies

Agilent's industry-leading Manual Injection Valves are designed to ensure trouble-free operation with your HPLC System.

Our valves also feature patented "Make-Before-Break" architecture that allows you to switch between LOAD and INJECT positions without interrupting the flow. So you can analyze more samples in less time.

Valve Maintenance Notes

- Vespel is a polyimide with low wear and high chemical resistance. Vespel tolerates a pH range of 0 to 10. More basic solutions dissolve Vespel, which damages the rotor seal
- PEEK offers a high chemical resistance and versatility, and will tolerate the entire pH range from 0 to 14
- Tefzel is recommended for use in applications where PEEK cannot be used, such as methylene chloride or DMSO in higher concentrations

pH Range	0-7	7-10	10-14
Vespel			
PEEK			
Tefzel			

Injection Valves

Injection Valves

Valve	Use With	Part No.	RheBuild Kit	Rotor Seal Material	Rotor Seal	Stator	Stator Face
2 position/6 port injection valve, 400 bar	G1313A, G1329A, G1367A/B, 1120	0101-0921	0101-1257	Vespel	0100-1853	0100-1850	0100-1851
				Tefzel	0100-1849		
				PEEK	0100-2231		
2 position/6 port micro injection valve, 400 bar	G1377A, G1389A	0101-1050		Vespel	0100-2088	0100-2089	
2 position/6 port injection valve, 600 bar	G1329B, G1367C SL, G1367D SL Plus, G1367E, 1220 Infinity LC	0101-1422		PEEK	0101-1416	0101-1417	
10 port, dual loop valve, 400 bar	G2258A	0101-1385		Vespel	0101-2415	0101-1390	
2 position/6 port MBB injection valve, 400 bar	G2260A	0101-1267	0101-1268	PEEK	0101-1268*	0100-2195	
2 position/6 port ultra high pressure valve, 1200 bar	G4226A	5067-4114		Vespel	5068-0007	5068-0006	

*Includes seal and stator face



Stator for 2 position/6 port ultra high pressure valve, 1200 bar, 5068-0006



Switching valve

Switching Valve Supplies

A set of valve types specially designed for Agilent HPLC systems allows you to extend your HPLC applications. New valve offerings give you:

- More flexibility in solvent selection and column selection
- New automation capabilities in sample preparation
- Increased sample throughput through alternating column regeneration
- Increased separation performance with multidimensional chromatography

External Switching Valve Replacement Parts

Description	Use With	Valve Head	Rotor Seal Material	Rotor Seal	Stator Face	Stator Head	Repair Kit	Bearing Ring
2 position/6 port valve head, 600 bar	G4231A	5067-4131	PEEK	0101-1409	N/A	0101-1417	N/A	1535-4045
2 position/6 port valve head, 1200 bar	G4231B	5067-4117	Vespel	5068-0008	N/A	5068-0006		
2 position/10 port micro valve head, 600 bar	G4232A	5067-4144	PEEK	0101-1415	N/A	0101-1421		
2 position/10 port valve head, 1200 bar	G4232B	5067-4118	Vespel	5068-0012	N/A	5068-0011		
6-Column selector valve head, 600 bar	G4234A	5067-4146	PEEK	5068-0076	N/A	5068-0077		
6-Column selector valve head, 1200 bar	G4234B	5067-4142	Vespel	5068-0067	N/A	5068-0077		
Bio-inert 12 position/13 port valve POD, 210 bar	G4235A	5067-4159	PEEK	Repair Kit	Repair Kit	5068-0097	0101-1288	
Bio-inert 2 position/6 port, 600 bar	G5631A	5067-4148	PEEK	0101-1409	0100-1851	5068-0060	N/A	
2 position/10 port valve head Bio-inert, 600 bar	G5632A	5067-4132	PEEK	5068-0041	5068-0095	5068-0040		
Bio-inert 4-Column selector, 600 bar	G5639A	5067-4134	PEEK	5068-0045	5068-0093	5068-0044		

Internal Switching Valves Replacement Parts

Description	Use With	Part No.	Rotor Seal Material	Rotor Seal	Stator Face	Stator Head	Bearing Ring	Repair Kit
2 position/6 port, 400 bar	G1316A/B	G1316-67005	Tefzel	0100-1854	0100-1851	0100-1850	0100-1852	0101-1258
			Vespel	0100-1855				
			PEEK	0100-2233				
2 position/10 port CSV, 400 bar	G1316A	G1316-67007	PEEK	Repair Kit	Repair Kit	0101-1362	0100-1852	0101-1360
2 position/6 port HP CSV, 600 bar	G1316A 1260 Series/G1316B	G1353-68750	PEEK	0101-1409	N/A	0101-1417	1535-4045	N/A
2 position/6 port micro CSV, 400 bar	G1316A	G1316-67006	Vespel	0100-2087	N/A	0100-2089		
2 position/10 port CSV, 600 bar	G1316B	G1316-67009	PEEK	0101-1415	N/A	0101-1421		
2 position/6 port valve head, 600 bar	G1316C	5067-4137	PEEK	0101-1409	N/A	0101-1417		
2 position/6 port valve head, 1200 bar	G1316C	5067-4117	Vespel	5068-0008	N/A	5068-0006		
2 position/10 port micro valve head, 600 bar	G1316C	5067-4144	PEEK	0101-1415	N/A	0101-1421		
2 position/10 port valve head, 1200 bar	G1316C	5067-4118	Vespel	5068-0012	N/A	5068-0011		
6-Column selector valve head, 600 bar	G1316C	5067-4146	PEEK	5068-0076	N/A	5068-0077		
6-Column selector valve head, 1200 bar	G1316C	5067-4142	Vespel	5068-0067	N/A	5068-0077		
8 position/9 port valve head, 400 bar	G1316C	5067-4108	PEEK	5067-4113	5067-4113	5067-4112		
8 position/9 port valve head, 600 bar	G1316C	5067-4107	PEEK	5067-4111	N/A	5068-0001		
8 position/9 port valve head, 1200 bar	G1316C	5067-4121	Vespel	5068-0002	N/A	5068-0001		
2D-LC, valve head, 1200 bar	G1316C	5067-4170	Vespel	5068-0116	N/A	5068-0115		
Bio-inert 12 position/13 port valve POD, 210 bar	G1316C	5067-4159	PEEK	0101-1288	0101-1288	5068-0097		
Bio-inert 2 position/6 port, 600 bar	G1316C	5067-4148	PEEK	0101-1409	0100-1851	5068-0060		
Bio-inert 4-Column selector, 600 bar	G1316C	5067-4134	PEEK	5068-0045	5068-0093	5068-0044		
2 position/10 port valve head Bio-inert, 600 bar	G1316C	5067-4132	PEEK	5068-0041	5068-0095	5068-0040		



Valve head, 2 position/6 port, 600 bar, 5067-4137



2 position/6 port ultra high pressure valve, 5067-4117



Valve head, 2 position/10 ports for ultra high pressure, 1200 bar, 5067-4118



Stator for 2 position/6 port ultra high pressure valve, 600 bar, 0101-1417



Rotar seal, 2 position/6 port, 600 bar for C1316B, 0101-1409

Manual Injection Valves



Agilent provides the latest developments in LC injection technology from Rheodyne.

- Continuous flow path with "Make-Before-Break" design
- Sample capacity
- Choice of stainless or PEEK flow path
- Easy access to fittings due to wide 30° port angles

Series 7725i and 9725i Analytical Injection Valves

Stainless steel (SS) 7725i and PEEK 9725i valves are the most popular injection valves for analytical HPLC. Features include:

- A 20 µL loop (installed). Loops are also available in stainless steel or PEEK from 5 µL to 5 mL (10 mL for PEEK)
- Make-Before-Break (MBB) technology allows switching without flow interruption
- Wide 30° port angles offer easier access to fittings
- Built-in position sensing switch provides the chromatograph with a reproducible start signal



7725i manual injection valve, 5063-6502

Series 3725i-038 and 3725i Preparative Injection Valves

The series 3725i-038 (stainless steel) and 3725i (PEEK) are the most suitable manual valves for large sample volumes, high flow rates, and preparative columns sized 1.0-10 cm in diameter.

- Versatile ports accommodate 1/8 in (3.2 mm) and 1/16 in (1.6 mm) od tubing.
  Note: 1/16 in od tubing requires an adapter, P/N 5067-1503
- 1.0 mm diameter passages allow flow rates up to 800 mL/min with virtually no pressure drop
- Make-Before-Break technology allows switching without flow interruption
- High reproducibility for both partial-filling and complete-filling methods
- Sample range is 100 µL to 20 mL (10 mL loop is installed)
- Flow range is 10 to 800 mL/min
- Built-in position sensing switch gives the chromatograph a reproducible start signal

Manual Injection Valves with Position Sensing Switches

Description	Comments	Part No.	Rotor Seal Material	Rotor Seal	Stator Face	Stator Head	Bearing Ring	Isolation Seal	Repair Kit	Needle Port Adaptor
2 position/ 6 port valve, 400 bar, for G1328A/B	Analytical	5063-6502	Tefzel	0101-0620	0100-1859	0100-1860	1535-4045	1535-4046	0101-1254	N/A
			Vespel	0101-0623						
			PEEK	0101-1255						
2 position/ 6 port valve, 600 bar, for G1328C	Analytical	5067-4141	PEEK	5068-0052	N/A	5068-0053	1535-4045	1535-4046	N/A	N/A
2 position/ 6 port valve, 400 bar, for 1120	Analytical	5067-4104	PEEK	5067-4105	N/A	0100-1850	1535-5045	N/A	N/A	5067-1581
2 position/ 6 port, 600 bar, for 1220	Analytical	5067-4202	PEEK	0101-1409	N/A	0101-1417	1535-4045	N/A	N/A	5067-1581
2 position/ 6 port valve, 600 bar, for Bio-inert	Bio	5067-4158	PEEK	5068-0082	0100-1851	5068-0060	1535-4045	N/A	N/A	5067-1581
2 position/ 6 port valve, 400 bar PEEK	Analytical	0101-1253	Tefzel	0101-0620	0100-1859	1535-5082	N/A	1535-4046	N/A	N/A
Manual prep injection valve, SSt 400 bar, for 3725i	Preparative	0101-1232	PEEK	0101-1233	N/A	N/A	N/A	1535-4046	N/A	N/A
Manual prep injection valve, PEEK	Preparative	0101-1231	PEEK	0101-1233	N/A	N/A	N/A	1535-4046	N/A	N/A

Manual Injection Valve Replacement Parts

- Rotor seals wear with use and need routine replacement
- Stators only need replacement if the ports are damaged
- PEEK rotor seals are incompatible with concentrated nitric and sulfuric acids



Stainless steel sample loops

Manual Injection Valve Sample Loops

The right mix of injection valve sample loops are available for your application needs. Agilent offers factory-cut and finished loops of the highest quality.

- Stainless steel loops are square cut and free of burrs for a flush connection
- Flexible PEEK loops have a clean, straight cut for low dead volume connections

Stainless Steel Sample Loops

- Sample loops for Rheodyne 7725 Series and 7125 Series valves are not interchangeable due to the change in port angle
- Actual volumes can differ due to tolerance of metal tubing bore
- Accuracy of large metal loops is ±5%, intermediate loops ±10%, small loops ±30%

PEEK Sample Loops

- Inert to most organic solvents
- Wall thickness, temperature, exposure time and concentration of organic solvents affect the durability of PEEK tubing
- Concentrated nitric acid and sulfuric acid weaken PEEK tubing
- THF, methylene chloride and DMSO cause PEEK to swell
- Actual volumes can differ because of tolerance of tubing bore
- Accuracy of large PEEK loops is ±14%, intermediate loops ±21%, small loops ±65%

Manual Injection Valve Sample Loops

Volume	ID (mm)	Material	Use With	Part No.
5 µL	0.18	SS	7125 and 7010	1535-4860
	0.18	SS	7725	0101-1248
	0.18	PEEK	9725	0101-1241
10 µL	0.30	SS	7125 and 7010	0101-0376
	0.30	SS	7725	0100-1923
	0.25	PEEK	9725	0101-1240
20 µL	0.51	SS	7125 and 7010	0101-0377
	0.30	SS	7725	0100-1922
	0.25	PEEK	9725	0101-1239
50 µL	0.51	SS	7125 and 7010	0101-0378
	0.51	SS	7725	0100-1924
	0.51	PEEK	9725	0101-1238
100 µL	0.51	SS	7125 and 7010	0101-0379
	0.51	SS	7725	0100-1921
	0.51	PEEK	9725	0101-1242
200 µL	0.76	SS	7125 and 7010	0101-1252
	0.76	SS	7725	0101-1247
	0.51	PEEK	9725	0101-1237
500 µL	0.76	SS	7125 and 7010	0101-1251
	0.76	SS	7725	0101-1246
	0.76	PEEK	9725	0101-1236
1 mL	0.76	SS	7125 and 7010	0101-1219
	0.76	SS	7725	0101-1245
	0.76	PEEK	9725	0101-1235
2 mL	1.00	SS	7125 and 7010	0101-1250
	1.00	SS	7725	0101-1244
	0.76	PEEK	9725	0101-1234
	1.6	PEEK	3725	0101-1229
5 mL	1.00	SS	7125 and 7010	0101-1249
	1.00	SS	7725	0101-1243
	0.76	PEEK	9725	0101-1230
	1.6	PEEK	3725	0101-1228
10 mL	2.0	PEEK	3725	0101-1227
20 mL	2.0	PEEK	3725	0101-1226



PEEK sample loops

Syringes for Manual Injection

Agilent syringes for manual injection valves have a blunt-tip point style needle to prevent damaging the valve's internal parts. They can be used with any type/brand of manual injection valve.

LC Manual Syringes with Fitted Plungers

Volume (µL)	Description	Unit	Needle	Part No.
5	Fixed		22 gauge/2 in/LC tip	5190-1480
10	Fixed		22 gauge/2 in/LC tip	5190-1484
	Removable		22 gauge/2 in/LC tip	5190-1485
	Replacement needle for 10 µL syringe	3/pk		5190-1486
25	Fixed		22 gauge/2 in/LC tip	5190-1494
50	Fixed		22 gauge/2 in/LC tip	5190-1501
100	Fixed		22 gauge/2 in/LC tip	5190-1508
250	Fixed		22 gauge/2 in/LC tip	5190-1515
500	Fixed		22 gauge/2 in/LC tip	5190-1522



Syringe, 100 µL FN LC tip, 5190-1508

LC Manual Syringes with PTFE-Tipped Plungers

Volume (µL)	Description	Unit	Needle	Part No.
10	Removable		22 gauge/2 in/LC tip	5190-1492
	Replacement needle for 10 µL syringe	3/pk		5190-1486
	Replacement plunger with PTFE tip for 10 µL syringe			5190-1558
25	Removable		22 gauge/2 in/LC tip	5190-1499
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 25 µL syringe			5190-1560
50	Removable		22 gauge/2 in/LC tip	5190-1505
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 50 µL syringe			5190-1561
100	Removable		22 gauge/2 in/LC tip	5190-1512
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 100 µL syringe			5190-1562
250	Removable		22 gauge/2 in/LC tip	5190-1520
	Replacement needle	3/pk		5190-1571
500	Removable		22 gauge/2 in/LC tip	5190-1526
	Replacement needle	3/pk		5190-1571
	Replacement plunger with PTFE tip for 500 µL syringe			5190-1564

TIPS & TOOLS

Agilent has made vial, cap and septum selection easy with its new Interactive Vial Selection Tool, available online in both desktop and mobile versions. The tool identifies the right vial and closures for your particular application, and provides the rationale for the choices offered. Visit **www.agilent.com/chem/SelectVials**



Thermostatted Column Compartment Supplies



High temperature heat exchanger, G1316-80002



High temperature heat exchanger, G1316-80003



Heat exchanger/cooler, G1316-80004



Column Identification Module, 5062-8588

Thermostatted Column Compartment Supplies

Description	Part No.
Capillary system for 0.12 mm id use	G1316-68744
Rapid Resolution High Throughput capillary kit Used for converting an Agilent 1200 instrument to the RRLC configuration, to enable use of high efficiency columns (to 600 bar). Can also be used for Agilent 1100 instruments.	5065-9947
1200 capillary kit for 0.12 mm id	G1316-68716
High temperature heat exchanger, 1.6 µL, 0.12 mm id, "R"	G1316-80002
High temperature heat exchanger, 1.6 µL, 0.12 mm id, "L"	G1316-80003
Heat exchanger/cooler, 1.5 µL, 0.12 mm id	G1316-80004
Carrier for heat exchanger 1290 Infinity TCC and 1200 Series TCC SL	G1316-83200
Column Identification Module (CIM), 3/pk	5062-8588
Column clamp, 6/pk	5063-6526
Column holder for micro LC columns	5001-3702
Column connecting capillary with fittings, 7 cm, 0.12 mm id, 1/16 in male/male	G1316-87303
Column connecting capillary with fittings, 9 cm, 0.17 mm id, 1/16 in male/male	G1316-87300
Column connecting capillary with fittings, 18 cm, 0.12 mm id, 1/16 in male/male	G1313-87304
Column connecting capillary with fittings, 18 cm, 0.17 mm id, 1/16 in male/male	G1313-87305
PEEK tubing, 1/32 in od, 0.4 mm id, 450 mm, Micro valve to waste	5022-6503
Thermal column insulation enclosure kit	G1316-60001

Capillary Tubing Kits

Capillary kits are available for easy ordering and setup of the switching valves. They include all capillaries and fittings for specific applications, as well as bulk PEEK capillaries and a capillary cutter to add maximum flexibility.

Capillary Tubing Kits

Application	Valve Kit	Part No.
Column regeneration Capillaries: 0.17 mm id	G1157A	G1156-68711
Column regeneration Capillaries: 0.25 mm id	G1157A	G1156-68713
Capillary kit column regeneration intern Capillaries: 0.17 mm id	2 position/10 port 400 bar valve, for G1316A/B	G1316-68711
Column selection Capillaries: 0.17 mm id	G1159A	G1156-68712
Sample enrichment Capillaries: 0.17 mm id	G1316A #055	G1316-68710
Sample enrichment Capillaries: 0.17 mm id	G1158A	G1156-68714
Solvent selection Flow rate up to 10 mL/min	G1160A	G1160-68706 5067-4601*

*Use for method development applications. Kit contains longer tubing.

Capillary Kits for Internal Switching Valves

Description	Use With	Part No.
Capillary kit column switching valve	2 position/6 port 400 bar valve, for G1316A/B	G1316-68708
Capillary kit column regeneration intern	2 position/10 port 400 bar valve, for G1316A/B	G1316-68711
Column regeneration kit for µ-LC columns	2 position/10 port CSV 600 bar, for G1316B	G1316-68721

Capillary Kits for Column Selection Valve

Capillary Kits Part Numbers			Valve Kit		
0.12 mm ID-A	**0.17 mm ID**	**Other**	**Part No.**	**Valve Type**	**Pressure**
5067-4646	5067-4730		G4231A	2 position/6 port	600
5067-4646			G4231B	2 position/6 port	1200
5067-4800	5067-5103		G4232A	2 position/10 port	600
5067-4682			G4232B	2 position/10 port	1200
5067-4729			G4234A	6 position/14 port	600
5067-4729			G4234B	6 position/14 port	1200
		5067-4601	G4235A	12 position/13 port Bio-inert	210
	5067-4767		G5631A	2 position/6 port Bio-inert	600
	5067-4769		G5639A	4 position/10 port Bio-inert	600
5067-1595				8 position/9 port	1200
	5067-1596			8 position/9 port	1200
5067-1597				8 position/9 port	1200

Capillary Kit Contents

Part No.	Description	Quantity
5067-1595	Heater long-up 0.12 id, 1.6 µL internal	4
	Heater long-down 0.12 id, 1.6 µL internal	4
	Carrier for heat exchanger, TCC SL Plus	4
	Flexible tubing, 280 mm, 0.12 mm id	2
	SS capillary, 340 x 0.12 mm, m/m, n-s/n-s	1
	SS capillary, 280 x 0.12 mm, ps/ps, 1 long nut, 1 short nut	8
	SS capillary, 280 x 0.12 mm, ps-ns, 2 long nuts, 1 short nut	8
	SS capillary, 280 x 0.17 mm, ps/ps, 1 long nut	1
	Flexible capillary, 0.12 x 500 mm, no fittings	1
	Fitting holder assembly	4
	Column clip set, eight colors	2
	Long fittings and ferrules, SS, 10/pk	1

(Continued)



TIPS & TOOLS

For internal switching valves for your TCC, see page 75

Capillary Kit Contents

Part No.	Description	Quantity
5067-1596	Capillary, 0.17 x 90 mm, 1/16 in male/male	6
	Flexible tubing, 400 mm, 0.17 mm id	1
	Flexible capillary, 0.17 x 280 mm, no fitting	2
	Plastic fitting	8
	Long fittings and ferrules, SS, 10/pk	2
	SS capillary, 280 x 0.17 mm, ps/ps, 2 long nut	1
	SS capillary, 280 x 0.17 mm, ps/ps, 1 long nut, 1 short nut	6
	SS capillary, 500 x 0.17 mm, ps-ns, 2 long nuts, 1 short nut	6
	Flexible capillary, 0.17 mm id x 600 mm	1
	Column clip set, eight colors	2
	VHP-fitting standard length (10 each = 1/pk)	6
5067-1597	Heater long-up 0.12 id, 1.6 µL internal	3
	Heater long-down 0.12 id, 1.6 µL internal	3
	Carrier for heat exchanger, TCC SL Plus	3
	Flexible tubing, 280 mm, 0.12 mm id	2
	SS capillary, 340 x 0.12 mm, m/m, n-s/n-s	1
	SS capillary, 280 x 0.12 mm, ps/ps, 1 long nut, 1 short nut	6
	SS capillary, 400 x 0.12 mm, ps-ns, 2 long nuts, 1 short nut	6
	SS capillary, 280 x 0.17 mm, ps/ps, 2 long nut	1
	Flexible capillary, 0.12 x 500 mm, no fittings	1
	Column clip set, eight colors	2
	Fitting holder assembly	3
	Long fittings and ferrules, SS, 10/pk	1
5067-4601	Bottle head assembly	4
	Tefzel ferrules/SS rings, 1/8 in, 10/pk	1
	Flexible tubing, 1 ea / 1 meter	5
	PPS nuts, 1/8 in, 1/4-28 thread, 10/pk	1
	Long fittings and ferrules, SS, 10/pk	5

(Continued)

Capillary Kit Contents

Part No.	Description	Quantity
5067-4646	SS capillary, 0.12 mm id, 340 mm pre-swaged	1
	SS capillary, 0.17 mm id, 700 mm pre-swaged	1
	SS capillary, 0.12 mm id, 90 mm pre-swaged	2
	SS capillary, 0.12 mm id, 150 mm pre-swaged	2
	SS capillary, 0.12 mm id, 280 mm pre-swaged	2
	SS capillary, 0.12 mm id, 120 mm pre-swaged	1
	SS capillary, 0.12 mm id, 200 mm pre-swaged	1
	PTFE flexible tubing	1
	Heat exchanger, long-up, 1.6 µL	1
	Heat exchanger, long-down, 1.6 µL	1
	Carrier for heat exchanger, TCC SL Plus	2
	Fitting holder assembly	1
	Column clip set, eight colors	1
5067-4682	SS capillary, 120 x 0.12 mm, ns ns, 1 large, 1 large	1
	SS capillary, 150 x 0.12 mm, ns ns, 1 large, 1 large	2
	SS capillary, 200 x 0.12 mm, ns ps, 1 short, 1 large	1
	SS capillary, 280 x 0.12 mm, ns ns, 1 large, 1 large	2
	SS capillary, 340 x 0.12 mm, ps ns, 1 short, 1 large	1
	SS capillary, 0.17 mm id, 700 mm pre-swaged	1
	SS capillary, 90 x 0.12 mm, ns ns, 1 short, 1 large	2
	Column clip set, eight colors	1
	Fitting holder assembly	2
	Heater long-up 0.12 id, 1.6 µL internal	1
	Heater long-down 0.12 id, 1.6 µL internal	1
	Carrier for heat exchanger, TCC SL Plus	2

(Continued)

Capillary Kit Contents

Part No.	Description	Quantity
5067-4729	SS capillary, 0.8 x 0.11 mm, 340 mm, RF/M4	1
	SS capillary, 0.8 x 0.11 mm, 5000 mm, RF/M4	1
	SS capillary, 0.8 x 0.11 mm, 130 mm, lg RF/M4	8
	SS capillary, 0.8 x 0.17 mm, 150 mm, lg M4/M4	1
	SS capillary, 0.8 x 0.11 mm, 250 mm, lg ps/M4	1
	Flexible PEEK tubing	2
	Heater long-up 0.12 id, 1.6 µL internal	2
	Heat exchanger, long-down, 1.6 µL	2
	Carrier for heat exchanger, TCC SL Plus	2
	Fitting holder assembly	2
	Column clip set, eight colors	1
5067-4730	SS capillary, 340 x 0.17 mm, ps-ns, 1 short, 1 long	1
	SS capillary, 0.17 mm id, 700 mm pre-swaged	1
	SS capillary, 90 x 0.17 mm, ns-ns, 1 short, 1 long	4
	SS capillary, 150 x 0.17 mm, ns-ns, 1 large, 1 large	2
	SS capillary, 280 x 0.17 mm, ns-ns, 1 large, 1 large	2
	SS capillary, 120 x 0.17 mm, ns-ns, 1 large, 1 large	1
	SS capillary, 200 x 0.17 mm, ns-ps, 1 short, 1 large	1
	PTFE flexible tubing	1
	Column clip set, eight colors	1
5067-4800	SS capillary, 340 x 0.11 mm, SW-1/16/M4	1
	SS capillary, 0.17 mm id, 700 mm, SW-1/16/M4	1
	SS capillary, 90 x 0.11 mm, SW-1/16/M4	2
	SS capillary, 0.8 x 0.11 mm, 150 mm, large RF/M4	2
	SS capillary, 0.8 x 0.11 mm, 280 mm, large RF/M4	1
	SS capillary, 0.8 x 0.17 mm, 150 mm, large M4/M4	1
	SS capillary, 0.8 x 0.12 mm, 250 mm, large ps/M4	1
	PEEK tubing, 1/32 in od, 0.4 mm id, 450 mm	2
	Heat exchanger, long-down, 1.6 µL	1
	Heater long-up 0.12 id, 1.6 µL internal	1
	Carrier for heat exchanger, TCC SL Plus	2
	Fitting holder assembly	2
	Column clip set, eight colors	1

(Continued)

Capillary Kit Contents

Part No.	Description	Quantity
5067-4767	Capillary, 400 x 0.17 mm Bio	1
	Capillary, 300 x 0.17 mm Bio	2
	Fitting holder assembly	2
	Column clip set, eight colors	1
	Finger-tight fittings, long, 1/16 in, 10/pk	1
5067-4769	Capillary, 400 x 0.17 mm Bio	1
	Capillary, 300 x 0.17 mm Bio	4
	Fitting holder assembly	2
	Column clip set, eight colors	1
	Finger-tight fittings, long, 1/16 in, 10/pk	1
5067-5103	SS capillary, 340 x 0.17 mm, ps-ns SW-M4	1
	SS capillary, 0.17 mm id, 700 mm, SW-1/16/M4	1
	SS capillary, 90 x 0.17 mm, SW-1/16/M4	2
	SS capillary, 90 x 0.17 mm, RF/M4	2
	SS capillary, 0.8 x 0.17 mm, 150 mm, lg RF/M4	2
	SS capillary, 0.8 x 0.17 mm, 280 mm, lg RF/M4	2
	SS capillary, 0.8 x 0.17 mm, 150 mm, large M4/M4	1
	SS capillary, 0.8 x 0.12 mm, 250 mm, large ps/M4	1
	PEEK tubing, 1/32 in od, 0.4 mm id, 450 mm	1
	Column clip set, eight colors	1

Detector Supplies

Agilent wavelength detectors combine exceptional flexibility with superior instrument control, data communication, and analytical capabilities. This section shows you how to maintain your detector's high level of selectivity and sensitivity.



Detector Maintenance Tips

Symptom	What To Do	Additional Information
Lamp does not ignite	Exchange the lamp	Perform a wavelength calibration test and an intensity test after lamp replacement
Noise exceeds application limit	Exchange the flow cell	Perform a wavelength calibration test after flow cell replacement
Drift exceeds application limit	Exchange the lamp	Perform a wavelength calibration test and a pressure tightness test after flow cell replacement
Leaky flow cell (For G4212 only)	Exchange the flow cell	Perform a wavelength calibration test after flow cell replacement
Leaky flow cell (For all G1314/G1315/G1365 detectors)	Clean or exchange the flow cell	Perform a wavelength calibration test and a pressure tightness test after flow cell replacement
Lower intensity (For G4212 only)	Exchange the flow cell	Perform a wavelength calibration test after flow cell replacement
Lower intensity (For all G1314/G1315/G1365 detectors)	Clean or exchange the flow cell	Perform a wavelength calibration test and a pressure tightness test after flow cell replacement



Deuterium lamp, G1314-60100



Long life HiS Deuterium lamp, 5190-0917



Deuterium longlife lamp, 2140-0813



Long life Deuterium lamp, 5182-1530



Deuterium lamp, 2140-0590



Tungsten lamp assembly, G1103-60001

Certified Lamps

- All lamps are tested for noise and drift specifications, correct operating voltage, light intensity and proper alignment
- Improved coating process increases Agilent lamp lifetimes up to 50%
- Agilent deuterium lamps are designed with a much narrower aperture providing increased light intensity and decreased noise – translating into an appreciably higher signal-to-noise ratio
- By providing higher sensitivity, Agilent lamps can extend detection capabilities and improve qualification at trace levels – for more than 2,000 hours of use

Agilent's lamps are manufactured in an ISO 9001 certified environment and are fully traceable throughout every step of the production process. Each lamp is then tested to ensure it meets Agilent's performance specifications. Test equipment is regularly calibrated using optical standards certified by NIST (National Institute of Standards and Technology) or PTB (Physikalisch-Technische Bundesanstalt).

Detector Lamps

Description	Comments	Part No.
Variable Wavelength Detector (VWD)		
Long life Deuterium lamp with RFID tag	For G1314D/E/F	G1314-60101
Long life Deuterium lamp	For G1314A/B/C, 1120 and 1220 Infinity LC	G1314-60100
Diode Array Detector (DAD)/Multiple Wavelength Detector (MWD)		
Long life HiS Deuterium lamp (8-pin) with RFID tag	For G4212A/B	5190-0917
Long life Deuterium lamp with RFID tag	For G1315C/D and G1365C/D	2140-0820
Long life Deuterium lamp	For G1315A/B and G1365A/B	2140-0813
Long life Deuterium lamp	For G1315A/B and G1365A/B	5182-1530
Deuterium lamp	For G1315A/B and G1365A/B	2140-0590*
Tungsten lamp	For G1315A/B/C/D and G1365A/B/C/D	G1103-60001

*Standard lamp for 1000 hours of use only

Variable Wavelength Detector (VWD)

VWD Flow Cell Selection

Typical Column Length (cm)	Typical Peak Width	Recommended Flow Cell				
< = 5	0.025	Micro Flow Cell				High Pressure Flow Cell For Pressure Above 100 bar
10	0.05	0.05-0.2 mL/min	Semi-micro Flow Cell			
20	0.1			Standard Flow Cell		
> = 40	0.2					
Typical Flow Rate		0.05-0.2 mL/min	0.2-0.4 mL/min	0.4-0.8 mL/min	1-2 mL/min	0.05-5 mL/min
Internal Column Diameter		1.0 mm	2.1 mm	3.0 mm	4.6 mm	

Flow Cell and Repair Kits for VWD*

Description	Use With	Specifications	Part No.	Repair Kit Part No.
Standard flow cell, RFID	G1314D/E/F	10 mm, 14 µL, 40 bar	G1314-60186	G1314-65061
Standard "D" type flow cell	G1314A/B/C	10 mm, 14 µL, 40 bar	G1314-60086	G1314-65061
Semi-micro flow cell, RFID	G1314D/E/F	6 mm, 5 µL, 40 bar	G1314-60183	G1315-68713
Semi-micro flow cell	G1314A/B/C	6 mm, 5 µL, 40 bar	G1314-60083	G1315-68713
Micro flow cell, 3 mm, RFID	G1314D/E/F	2 µL, 120 bar	G1314-60187	G1315-68713
Micro flow cell, 3 mm	G1314A/B/C	2 µL, 120 bar	G1314-60087	G1315-68713
Micro flow cell, 5 mm	G1314A/B/C	1 µL, 40 bar	G1314-60081	G1314-65052
High pressure flow cell, RFID	G1314D/E/F	10 mm, 14 µL, 400 bar	G1314-60182	G1314-65054
High pressure flow cell	G1314A/B/C	10 mm, 14 µL, 400 bar	G1314-60082	G1315-68713

*For more information about what is included in each kit, see page 97.



Variable wavelength detector

Capillaries for VWD Flow Cell

Flow Cell Description	Part No.	Inlet Capillary	Part No.	Outlet Capillary	Part No.
Standard flow cell, RFID	G1314-60186	Inlet capillary, 0.17 mm id, 600 mm long	5062-8522	Waste capillary, PEEK, 0.25 mm id	5062-8535
Standard "D" type flow cell	G1314-60086			1/16 in finger-tight PEEK fitting, 2/pk	0100-1516
Semi-micro flow cell, RFID	G1314-60183	Inlet capillary, 0.12 mm id, 400 mm long	5021-1823	Waste capillary, PEEK, 0.25 mm id	5062-8535
Semi-micro flow cell	G1314-60083			1/16 in finger-tight PEEK fitting, 2/pk	0100-1516
Micro flow cell, 3 mm, RFID	G1314-60187	Inlet capillary, 0.12 mm id, 310 mm long	G1314-87301	Outlet capillary, 0.17 mm id, 120 mm long	G1314-87302
Micro flow cell, 3 mm	G1314-60087				
Micro flow cell, 5 mm	G1314-60081	Inlet capillary, 0.12 mm id, 400 mm long	5021-1823	Outlet capillary, 0.17 mm id, 120 mm long	G1314-87302
High pressure flow cell, RFID	G1314-60182	Inlet capillary, 0.17 mm id, 380 mm long	G1315-87311	Outlet capillary, 0.17 mm id, 120 mm long	G1314-87302
High pressure flow cell	G1314-60082				

Diode Array Detector (DAD)/Multiple Wavelength Detector (MWD)



Diode array detector (DAD)/
Multiple wavelength detector (MWD)

Cleaning or Replacing DAD/MWD Flow Cells

- A decrease in detector performance or unusual noise levels may mean you have dirty flow cell windows
- Clean and reassemble one side of the flow cell before beginning the other side to prevent mixing the front and rear gaskets, which have different hole diameters
- While cleaning or replacing flow cell windows, if the washers fall out of the window assembly, they must be inserted in the correct order with a PTFE ring to prevent any leaks from the flow cell window
- Clean the cell body with water or isopropanol
- After opening the cell you should always use a new gasket

DAD/MWD Flow Cell Selection

Typical Column Length (cm)	Typical Peak Width	Recommended Flow Cell				
< = 5	0.025	80/500 nL Flow Cell				High Pressure Flow Cell
10	0.05		Semimicro Flow Cell			
20	0.1			Standard Flow Cell		
> = 40	0.2					
Typical Flow Rate		0.05-0.2 mL/min	0.2-0.4 mL/min	0.4-0.8 mL/min	1-2 mL/min	0.05-5 mL/min
Internal Column Diameter		0.3-1 mm	2.1 mm	3.0 mm	4.6 mm	

Flow Cell and Repair Kits for DAD/MWD*

Description	Use With	Specifications	Part No.	Repair Kit Part No.
Standard flow cell with RFID tag	G1315C/D, G1365C/D	10 mm, 13 µL, 120 bar	G1315-60022	G1315-68712
Standard flow cell	G1315A/B, G1365A/B	10 mm, 13 µL, 120 bar	G1315-60012	
Semi-micro flow cell, RFID	G1315C/D, G1365C/D	6 mm, 5 µL, 120 bar	G1315-60025	G1315-68713
Semi-micro flow cell	G1315A/B, G1365A/B	6 mm, 5 µL, 120 bar	G1315-60011	
Micro flow cell, RFID	G1315C/D, G1365C/D	3 mm, 2 µL, 120 bar	G1315-60024	G1315-68713
Micro high-pressure flow cell	G1315A/B, G1365A/B	6 mm, 1.7 µL, 400 bar	G1315-60015	
500 nL flow cell		10 mm, 50 bar	G1315-68724	
80 nL flow cell		6 mm, 50 bar	G1315-68716	
Preparative flow cell	G1315A/B, G1365A/B	3 mm, 120 bar, stainless steel	G1315-60016	G1315-68712
Preparative flow cell		0.3 mm, 20 bar, quartz	G1315-60017	
Preparative flow cell		0.06 mm, 20 bar, quartz	G1315-60018	
Max-Light cartridge cell	G4212A/B Infinity LC DAD	10 mm, 1.0 µL, 60 bar	G4212-60008	
Max-Light cartridge cell	G4212A/B Infinity LC DAD	60 mm, 4.0 µL, 60 bar	G4212-60007	
Max-Light cartridge test cell	Must be used to perform detector build-in tests		G4212-60011	
Max-Light ultra low dispersion flow cell	G4212A/B Infinity LC DAD	10 mm V(σ) = 0.6 µL	G4212-60038	
Max-Light High Dynamic Range (HDR) flow cell	G4212A/B Infinity LC DAD	3.7 mm, V(σ) = 0.9 µL	G4212-60032	

*For more information about what is included in this kit, see page 97.



Max-Light cartridge cell, G4212-60008



Ultra-low dispersion flow cell, G4212-60038

TIPS & TOOLS

Learn more about how different flow cells impact your chromatography, and the High Dynamic Range (HDR) Flow Cell. See application note 5991-0115EN at **www.agilent.com/chem/library**



Max-Light cartridge cell, interior view, 60 mm path for high concentrations, G4212-60007



Max-Light HDR flow cell, interior view, to show short 3.7 mm path length for high concentrations, G4212-60032

Capillaries for DAD/MWD Flow Cell

Flow Cell Description	Part No.	Inlet Capillary	Part No.	Outlet Capillary	Part No.
Standard flow cell with RFID tag	G1315-60022	Inlet capillary with heat exchanger, 0.17 mm id, 590 mm long	G1315-87321	Outlet capillary, 0.17 mm id, 200 mm long	G1315-87302
Standard flow cell	G1315-60012				
Semi-micro flow cell with RFID tag	G1315-60025	DAD heat exchanger capillary, 0.17 mm id, 310 mm long	G1315-87319	Outlet capillary, 0.12 mm id, 200 mm long	G1315-87306
				Outlet capillary, 0.17 mm id, 200 mm long	G1315-87302
Semi-micro flow cell	G1315-60011			Outlet capillary, 0.12 mm id, 200 mm long	G1315-87306
				Outlet capillary, 0.17 mm id, 200 mm long	G1315-87302
Micro flow cell with RFID tag	G1315-60024	DAD heat exchanger capillary, 0.12 mm id, 310 mm long	G1315-87339	Outlet capillary, 0.12 mm id, 200 mm long	G1315-87306
				Outlet capillary, 0.17 mm id, 200 mm long	G1315-87302
Micro high-pressure flow cell	G1315-60015	Inlet capillary with heat exchanger, 0.12 mm id, 290 mm long	G1315-87325	Outlet capillary, 0.12 mm id, 200 mm long	G1315-87306

80 nL and 500 nL Flow Cell Supplies

Description	Unit	Part No.
Fitting screw	10/pk	5063-6593
Double winged nuts and 1/32 in ferrules	10/pk	5065-4422
1/32 in ferrule and stainless steel lock ring, lite touch	10/pk	5063-6592
Union adjustment tool	2/pk	5022-2146
Universal ZDV union, stainless steel, no fittings	2/pk	5022-2184
Torque wrench adapter		G1315-45003
Open end wrench, 4 mm		8710-1534



Stainless steel fittings, male (G), 5063-6593



Double winged PEEK nut & ferrule (WPF), 5065-4422



ZDV universal union, 5022-2184



Wrench, open end, for use with PEEK-coated fused silica capillaries, 8710-1534

500 nL Flow Cell and Replacement Parts

Description	Comments	Part No.
500 nL flow cell	Contains quartz flow cell with 10 mm path length and 500 nL volume and connecting capillaries, max 50 bar pressure	G1315-68724
Sealing kit	Includes torque adapter, 2 cell seal assemblies, 5 LiteTouch front and back ferrules	G1315-68715
Quartz cell body, 10 mm		G1315-80001
Cell seal assembly, 500 nL		G1315-87101
Fused silica/PEEK capillary, 100 µm id, 30 cm long	Inlet	G1315-87333
Fused silica/PEEK capillary, 50 µm id, 40 cm long	Inlet	G1315-87323
Fused silica/PEEK capillary, 100 µm id, 12 cm long	Outlet	G1315-87338
Fused silica/PEEK capillary, 50 µm id, 12 cm long	Outlet	G1315-87328

80 nL Flow Cell and Replacement Parts

Description	Comments	Part No.
80 nL flow cell	Contains quartz flow cell with 6 mm path length and 80 nL volume and connecting capillaries, max 50 bar pressure	G1315-68716
Sealing kit for 80 nL flow cell	Includes torque adapter, 2 cell seal assemblies, 5 LiteTouch front and back ferrules and 5 sleeves for 360 µm od capillaries	G1315-68725
Quartz cell body, 80 nL, 6 mm path length		G1315-80002
Fused silica/PEEK capillary, 50 µm id, 40 cm long	Inlet	G1315-87323
Fused silica/PEEK capillary, 50 µm id, 12 cm long	Outlet	G1315-87328
Fused silica/PEEK capillary, 25 µm id, 20 cm long	Inlet	G1315-87313
Fused silica/PEEK capillary, 25 µm id, 60 cm long	Outlet	G1315-87318



Finger-tight PEEK fitting (SPF), 0100-1516

Preparative Flow Cells and Replacement Parts

Description	Part No.
Preparative flow cell, 0.3 mm, 20 bar, quartz	G1315-60017
Preparative flow cell, 0.06 mm, 20 bar, quartz	G1315-60018
PTFE tubing, 0.8 mm id, 2 m	G1315-67301
PTFE tubing, 0.5 mm id, 0.8 m	G1315-67302
Cell housing	G1315-27705
1/16 in finger-tight PEEK fitting, 2/pk	0100-1516
Quartz body, 0.3 mm	G1315-80004
Quartz body, 0.06 mm	G1315-80003
Prep flow cell, stainless steel, 3 mm, 120 bar	G1315-60016
Stainless steel connecting capillary, 0.5 mm, 250 mm	G1315-87305

Detector Maintenance Kits

Detector Maintenance Kits

Description	Kit Contents	Part No.
Variable Wavelength Detector (VWD)		
Standard "D" type flow cell kit	Includes 2 windows, 2 gaskets #1, 2 gaskets #2	G1314-65061
Semi-micro flow cell kit	Includes 2 windows, 4 gaskets: 2 standard #1, 1 semi-micro #1, 1 semi-micro #2	G1314-65056
Micro flow cell kit	Includes 2 windows, 2 gaskets #1, 2 gaskets #2	G1314-65052
Cell repair kit, semi-micro	Includes window screw kit, 4 mm hexagonal wrench and seal kits	G1315-68713
High-pressure flow cell kit	Includes 2 windows, 2 Kapton gaskets and 2 PEEK rings	G1314-65054
Diode Array Detector (DAD)/Multiple Wavelength Detector (MWD)		
Cell repair kit	Includes window screw kit, 4 mm hexagonal wrench and seal kit	G1315-68712
Cell repair kit, semi-micro	Includes window screw kit, 4 mm hexagonal wrench and seal kits	G1315-68713
Sealing kit for 500 nL flow cell	Includes torque adapter, 2 cell seal assemblies, 5 lite touch front and back ferrules	G1315-68715
Sealing kit for 80 nL flow cell	Includes torque adapter, 2 cell seal assemblies, 5 lite touch front and back ferrules and 5 sleeves for 360 µm od capillaries	G1315-68725



1200 Series Evaporative Light Scattering Detector



Standard flow nebulizer, G4218-20000



Cartridge for gas regulator, G4218-40150

Other Detectors

G4218A 1200 Series Evaporative Light Scattering Detector Supplies

Description	Part No.
Standard flow nebulizer	G4218-20000
Semi-micro flow nebulizer	G4218-20001
Large flow nebulizer	G4218-20002
Micro flow nebulizer	G4218-20003
RRLC nebulizer	G4218-20004
Nebulization chamber, glass	G4218-40000
Black plastic nut, 13 mm diameter, glassware	G4218-40010
Black plastic nut, 22 mm diameter, glassware	G4218-40011
Black exhaust tube, 2.5 m	G4218-40110
Bulkhead	G4218-40130
Cartridge, 0.01 µm for gas regulator	G4218-40150
Pneumatic tube with stainless steel fitting	G4218-40220
Drain tube with stainless steel fitting	G4218-40100
Gas regulator with 0.01 µm filter and manometer	G4218-60100
Seal kit for nebulization chamber	G4218-68010
Caffeine standard, 250 µg/mL	G4218-85000

G1362A 1100/1200 Series Refractive Index Detector (RID) Supplies

Description	Part No.
Tubing kit Includes 300 mm recycle valve to recycle port, 200 mm recycle valve to waste port, 120 mm purge valve to recycle valve, 270 mm purge valve to sample cell, 170 mm purge valve to reference cell	G1362-68709
Interface tubing kit Includes 1/8 in ferrule, 1/3 in nut, PTFE tubing	G1362-68706
Interface capillary, 400 mm, 0.17 mm id	G1362-87300
Restriction capillary, 0.17 mm id	G1362-87301

G1321A/B 1100/1200 Series Fluorescence Detector (FLD) Supplies

Description	Part No.
Detector lamp	2140-0600
Flow cell, 8 µL, 20 bar	G1321-60005
Flow cell, 4 µL	G1321-60015
Cuvette kit, 8 µL, 20 bar Includes tubing, stainless steel fitting, front and back ferrule, PEEK fitting, syringe needle and syringe	G1321-60007
Cut-off filter kit:	
389, 408, 450, 500, 550 nm	5061-3327
380, 399, 418, 470, 520 nm	5061-3328
280, 295, 305, 335, 345 nm	5061-3329
Corrugated tubing, polypropylene, 6.5 mm id, 5 m	5062-2463
PTFE tubing, FEP, 0.7 mm id, 5 m	5062-2462
1/16 in finger-tight PEEK fitting, 2/pk	0100-1516
Column connecting capillary with fittings, 380 x 0.17 mm	G1315-87311
1/16 in stainless steel front ferrule, 10/pk	5180-4108
1/16 in stainless steel back ferrule, 10/pk	5180-4114
1/16 in stainless steel fitting, 10/pk	5061-3303
Fluorescence detector calibration sample, 1 g glycogen	5063-6597
Open end wrench, 1/4 and 5/16 in	8710-0510
Glass syringe	9301-1446
Syringe needle	9301-0407



Flow cell for G1321A fluorescence detector, G1321-60005



Finger-tight PEEK fitting (SPF), 0100-1516



Stainless steel front ferrules, 5180-4108



Back ferrules 1/16 in, 5180-4114

1100/1200 Series Chip LC Supplies

1100/1200 Series Chip LC Supplies

Description	Part No.
Rotor, inner valve, 3 grooves, chip LC	G4240-23705
Rotor, outer valve, 5 grooves, chip LC	G4240-25206
PEEK fitting, special for chip LC	G4240-43200
Fused silica/PEEK capillary, 15 µm, 90 cm Nano pump to chip cube	G4240-87300
Fused silica/PEEK capillary, 25 µm, 105 cm Micro well plate sampler to chip cube	G4240-87301
Fused silica/PEEK capillary, 100 µm, 100 cm Chip cube to waste	G4240-87302
Fused silica/PEEK capillary, 75 µm, 100 cm Syringe pump to chip cube	G4240-87303
Fused Silica/PEEK capillary, 50 µm, 50 cm	G4240-87304
Inline micro filter kit, 0.5 µm, PEEK Use with chip cube LC system	5067-1582
Fitting with 0.5 µm PEEK frit, 10/pk	5067-1584
PEEK fitting for use with 1/32 in od, 10/pk	5067-1585
PEEK sample transfer capillary, 25 µm, 100 cm Micro inline filter to chip cube (Phospho-Chip application)	G4240-87309
PEEK capillary, 25 µm, 10 cm Micro well plate samper to micro inline filter (Phospho-Chip application)	G4240-87310

Bio-inert Supplies

Agilent 1260 Infinity Bio-inert Quaternary LC Supplies



For your challenging bio-molecule analyses, the new 1260 Infinity Bio-inert Quaternary LC System sets new standards in performance, reliability, and robustness. Analysis of proteins and biotherapeutics usually presents the most challenging solvent conditions for any LC instrument. In addition, bio-molecules tend to bind unspecifically to surfaces, requiring tedious procedures. To address these needs, Agilent designed this application-specific LC instrument for bio-molecular analysis – without any compromise in performance – built on the proven Agilent 1200 Infinity platform technology.

The Agilent 1260 Infinity Bio-inert Quaternary LC features bio-inertness for all components without exception. The sample flow path through autosampler, capillaries and a variety of detectors are completely metal-free, with only PEEK and ceramic components coming into contact with your bio-molecule. Thus, the uncertainty of secondary interaction for proteins and peptides with surfaces which can result in peak tailing, low recovery and decreased column lifetime is minimized – and your confidence maximized.

1260 Bio-inert Quaternary Pump Parts

Description	Part No.
Bio-inert purge valve	G5611-60061
Bio-inert active inlet valve	G5611-60025
Bio-inert cartridge for active inlet valve, 600 bar	G5611-60020
Bio-inert outlet ball valve	G5611-60067
Sapphire plunger	5067-4695
Bio-inert piston seal	G5611-21503
Bio-inert wash seal	0905-1731
Bio-inert seal keeper	G5611-26210
Bio-inert support ring	G5611-63010
Preventative maintenance kit for Bio-inert quaternary pump	G5611-68741

1260 Bio-inert High Performance Autosampler Parts

Description	Part No.
2 position/6 port valve head, 600 bar	5067-4131
Rotor seal, 3 grooves, max 600 bar	0101-1416
Bio-inert stator	5068-0060
Stator face, ceramic	0100-1851
Bio-inert needle, 600 bar	G5667-87200

(Continued)

TIPS & TOOLS

For information on the family of complementary Biocolumns, turn to page 350.



Stator face, ceramic, 0100-1851

1260 Bio-inert High Performance Autosampler Parts

Description	Part No.
Tool for needle adjustment	G5667-40500
Bio-inert needle seat assembly, 600 bar	G5667-87017
Sapphire plunger	5067-4695
Bio-inert piston seal	G5611-21503
Sample loop, 100 µL, Bio-inert	G5667-60320

1260 Bio-inert Valve Parts



Rotor seal, 2 position/6 port, 600 bar for G1316B, 0101-1409

Description	Use With	Part No.
Rotor seal, 3 grooves, max 600 bar	Bio-inert 2 position/6 port switching valve	0101-1409
Bio-inert stator	Bio-inert 2 position/6 port switching valve	5068-0060
Stator face, ceramic	Bio-inert 2 position/6 port switching valve	0100-1851
Bio-inert rotor, 2-position/10-port, 600 bar		5068-0041
Bio-inert stator, 2-position/10-port, 600 bar		5068-0040
Bio-inert rotor seal, 4 column PEEK	Bio-inert 4 column selection valve	5068-0045
Bio-inert PEEK tube from valve to needle		G5664-86703
Bio-inert PEEK tube valve to detector		G5664-86706
Bio inert 12 position/13 port, solvent selection valve	G4235A	5067-4159

1260 Bio-inert Detector Parts



Bio-inert union, 600 bar, 5067-4741

Description	Use With	Part No.
Bio-inert standard flow cell, with RFID tag	G1315C/D and G1365C/D	G5615-60022
Bio-inert max light cartridge cell	G4212A/B	G5615-60017
Bio-inert max light cartridge cell	G4212A/B	G5615-60018
Bio-inert FLD flow cell	G1321B	G5615-60005
PEEK tubing		0890-1763

1260 Bio-inert Fittings

Description	Part No.
Bio-inert union, stainless steel with PEEK insert 600 bar	5067-4741

1260 Bio-inert Column Compartment



Bio-inert low dispersion heat exchanger, G5616-60050

Description	Part No.
Bio-inert low dispersion heat exchanger	G5616-60050

LC/MS Supplies

Combined with Agilent's industry-leading LC systems, our single quadrupole, ion trap, triple quadrupole, TOF and Q-TOF LC/MS solutions combine world-class performance with legendary reliability and ease-of-use.

This section contains all of the mass spectrometry supplies you need to keep your LC mass spectrometer running at peak performance.

LC/MS Maintenance Schedule

Procedure	When to Perform
Flush the nebulizer	Daily or at the end of each shift to flush traces of samples and buffers out of the tubing, valves, and nebulizer.
Clean the electrospray spray chamber	Daily or anytime you suspect carryover contamination from one sample or analysis to another.
Replace the electrospray nebulizer needle	When the needle is plugged. Common symptoms of a plugged needle are increased LC backpressure, off-axis spraying, or dripping from the nebulizer.
Clean the APCI spray chamber	Daily or anytime you suspect carryover contamination from one sample or analysis to another.
Replace the APCI nebulizer needle	When the needle is plugged. Common symptoms of a plugged needle are increased LC backpressure or off-axis spray from the nebulizer.
Clean the multimode source	Daily or anytime you suspect carryover contamination from one sample or analysis to another, or when you must access the end cap and capillary cap for cleaning and inspection.
Check calibrant levels	Monthly or weekly if you tune the LC/MS frequently.





Agilent 6100 Series
Single Quadrupole LC/MS, G6140A

LC/MS Preventive Maintenance Kit

For your convenience, the LC/MS Preventive Maintenance Kit has the recommended common supplies needed for most Agilent LC/MS systems. Unique source parts should be ordered separately.

LC/MS Preventive Maintenance kit

Description	Part No.
LC/MS Preventive Maintenance kit	5190-1443
Foreline pump (rotary pump) oil, Inland 45, 1 L, for E1M18/E2M28	6040-0834
Oil mist filter element for E2M18	1535-4970
Filter element, 5 µm, 5/pk	0100-2051
Spring, canted coil, 4/pk	1460-2571
Big hydrocarbon trap, 1/4 in fittings	BHT-4
Rotor seal, Vespel, pH 0 to 10	0100-1855



Foreline pump oil, 6040-0834



Oil mist filter element for E2M18, 1535-4970

TIPS & TOOLS

Save ordering time and money with the LC/MS PM Kit! It contains the common supplies specified in Agilent service engineer preventive maintenance procedure for LC/MS platforms.

LC/MS Supplies

Description	6100 Series Single Quadrupole LC/MS	6200 Series TOF LC/MS	6300 Series Ion Trap LC/MS	6400 Series Triple Quadrupole LC/MS	6500 Series Accurate-Mass Q-TOF LC/MS	Part No.
ES nebulizer assembly, original	✓	✓	✓	✓	✓	G1946-60098
ES nebulizer needle (original) replacement kit	✓	✓	✓	✓	✓	G2427A
ES nebulizer assembly, new	✓	✓	✓	✓	✓	G1958-60098
ES nebulizer needle (new) replacement kit	✓	✓	✓	✓	✓	G1958-60136
APCI nebulizer assembly	✓	✓	✓	✓	✓	G1946-60037
APCI nebulizer needle replacement kit	✓	✓	✓	✓	✓	G2428A
Needle assembly APCI/Multimode	✓	✓	✓		✓	G1947-60103
Corona needle APCI/Multimode	✓	✓	✓	✓	✓	G1947-20029
Capillary cap, high temperature, 3.0 mm	✓	✓	✓	✓	✓	G1946-20301
Capillary, 0.5 mm id, dielectric*	✓		✓			G1946-80009
Capillary, 0.6 mm id, dielectric*	✓	✓	✓	✓	✓	59987-20040
Capillary, 0.6 mm id, resistive, fast polarity switching*				✓		G1960-80060
Spring, canted coil, 0.25 in id, 0.53 mm	✓	✓	✓	✓	✓	1460-2571
1/6 in tee, low dead volume, stainless steel		✓			✓	0100-0969

*Dielectric capillary supports standard polarity switching only. Resistive capillary supports fast polarity switching.

(Continued)



Corona needle APCI, G1947-20029

TIPS & TOOLS

ES nebulizer (original) is compatible with the following ion sources:

- ESI G1948A with Serial Number < US91801994
- ESI G1948B with Serial Number < US91201787
- Multimode G1978A with Serial Number < US90800804
- Multimode G1978B with Serial Number < US90700787
- Dual ESI G3251A with Serial Number < US91200355
- Dual ESI G3251B with Serial Number < US91200355

LC/MS Supplies

Description	6100 Series Single Quadrupole LC/MS	6200 Series TOF LC/MS	6300 Series Ion Trap LC/MS	6400 Series Triple Quadrupole LC/MS	6500 Series Accurate-Mass Q-TOF LC/MS	Part No.
Syringe adapter			✓			9301-1291
Syringe pump			✓			3162-0178
1/16 in finger-tight PEEK fitting		✓	✓		✓	0100-1516
Female luer to female 10/32 adapter		✓	✓		✓	0100-2304
PEEK tubing		✓	✓		✓	0890-1915
Gas-tight syringe, PTFE Luer lock		✓	✓		✓	5182-9710
High-throughput skimmer, 2 mm		✓		✓	✓	G1969-20302
Skimmer 1 (G1956A/B)	✓					G1956-20302
HED assembly	✓					G1946-80019
HED assembly (G6140A, G6460A, G6530A)				✓		G2571-80103
HED assembly		✓				G1956-80000
Electron multiplier replacement horn	✓	✓		✓		05971-80103
Replacement horn and dynode	✓		✓	✓		G2441-80010



Electron multiplier replacement horn, 05971-80103

LC/MS Foreline Pump Supplies

Description	Part No.
Oil mist filter kit for E1M18/E2M28	3162-1056
Oil mist cartridge filter for MS40+	G1960-80039
Oil return kit	3162-1057
Foreline pump (rotary pump) oil, Inland 45, 1 L, for E1M18/E2M28	6040-0834
Foreline pump (rotary pump) oil, 4 L, for E1M18/E2M28	6040-0798
Foreline exhaust adapter	59980-20134
Hose clamp	1400-0563
Oil mist filter element for E2M18	1535-4970
KF25 clamp, stainless steel	0100-0549
KF25 coseal (inside clamp)	0100-1597
Exhaust tubing	0890-1727
Pump oil drip pan	G1946-00034



Adding foreline pump (rotary pump) oil, 4 L

LC/MS Chemicals

Description	6100 Series Single Quadrupole LC/MS	6200 Series TOF LC/MS	6300 Series Ion Trap LC/MS	6400 Series Triple Quadropole LC/MS	6500 Series Accurate-Mass Q-TOF LC/MS	Part No.
ES/APCI positive ion performance standard, 5 x 1 mL ampoules	✓	✓		✓	✓	G2423A
Electrospray LC demo sample (Sulfamix)	✓			✓*		59987-20033
ESI+APCI LC demo sample	✓					G1978-85000
ES negative ion performance standard, 5 x 1 mL ampoules	✓			✓		G2424A
APCI negative ion performance standard, 5 x 1 mL ampoules	✓					G2425A
ES/APCI positive ion performance standard	✓					G1946-85004
Multiple-charge compound performance evaluation sample (horse heart myoglobin)	✓					G2426A
ES/APCI positive ion performance standard, 5 x 1 mL ampoules	✓					G2423A
ES-TOF reference mix, 6 x 2 mL ampoules		✓			✓	G1969-85001
ES-TOF biopolymer reference standard kit		✓				G1969-85003
Flushing solvent	✓	✓	✓	✓	✓	G1969-85026
High purity water, 4 L	✓	✓	✓	✓	✓	8500-2236
Methyl alcohol, 1 L	✓	✓	✓	✓	✓	8500-1867
Ammonium formate	✓	✓	✓	✓	✓	G1946-85021
Formic acid, 5 mL	✓	✓	✓	✓	✓	G2453-85060
Acetonitrile, 1 L	✓	✓	✓	✓	✓	G2453-85050

*Recommended item for familiarization

LC/MS Common Supplies*

Description	Part No.
Common Parts	
Filter element, 5 µm, 5/pk	0100-2051
Rotor seal, Tefzel, pH 0 to 14	0100-1854
Rotor seal, Vespel, pH 0 to 10	0100-1855
Inlet filter assembly	G1946-60180
SSV long drain tubing assembly	G1969-60086
Spring, canted coil	1460-2571
Cleaning Supplies	
Abrasive mesh, 4000 grit	8660-0827
Capillary cleaning wire for dip tube	G1946-80054
Cleaning powder, dielectric capillary, Alconox	5190-1401
Cloths, lint-free	05980-60051
Cotton swabs, 100/pk	5080-5400
Gas Purifiers	
Big hydrocarbon trap, 1/4 in fittings	BHT-4
Big moisture trap, 1/4 in fittings	BMT-4
Big universal trap, 1/4 in fittings	RMSN-4
Big universal trap, 1/8 in fittings, Nitrogen	RMSN-2
Tools	
LC/MS tool kit	G1946-60157
Nebulizer adjustment fixture	G1946-20215
Nebulizer 25X magnifier	G1946-80049
Plastic tubing cutter	8710-1930
Screwdriver, Torx T15	8710-1622
Screwdriver, Torx T20	8710-1615
Open end wrench, 1/4 and 5/16 in	8710-0510
Wrench, 1/2 and 7/16 in	8710-0806
Needle nose pliers, pointed serrated jaws	8710-0004
3 mm wrench for nebulizer needle adjustment	8710-2699

*These parts are common to all LC/MS systems

Quiet Cover

Agilent has a solution to the frequent maintenance of LC/MS and ICP-MS rough pumps (visual check of oil levels, oil changes, oil additions, clean-up of oil leaks, etc.), as well as the inherent noise produced by the pumps. Quiet Covers are designed for easy movement, maintenance, and better living with rough pumps used with Agilent and other LC/MS systems.

- Locking castors to move heavy pump for maintenance
- No tools necessary to remove sectioned cover for easy access to pump
- Built in lift-and-tilt lever raises end of pump to drain oil
- Removable drip pan with well and hand holds to collect and transport oil
- Sound absorbing cabinet with resistant foam insulation to reduce pump noise
- Pump mounted to minimize vibration
- 2 Integrated fans maintain temperature inside cover
- LEDs and audible alarm if temperature exceeds 35 °C limit
- Maximum ambient temperature of 35 °C when airflow is neither restricted nor recycled
- Standard one-year warranty; installation and familiarization included with new LC/MS or ICP-MS orders

Please check **www.agilent.com/chem/quietcover** for the most up-to-date instrument compatibility guide.

Please confirm rough pump used in your Agilent system to ensure compatibility.



Quiet Cover MS, G6011A



Quiet Cover DS, G6012A



Quiet Cover MS, G6011A

Quiet Cover

Description	Compatible Pump Models	Part No.
Quiet Cover	BOC Edwards Pumps, E2M28, E2M18, or E1M18	G3199B
Quiet Cover MS	Agilent MS40+	G6011A
Quiet Cover DS	Agilent DS202, DS302, DS402, and DS602	G6012A
Quiet Cover TS	Agilent TS300, TS300INV, TS600, TS600INV, and TS800	G6013A
Quiet Cover GC/MS*	Agilent DS42, Pfeiffer Duo 2.5	G6014A

*This model does not contain all features.

LC/MS Standards Kits

LC/MS Standards Kits

Description	Part No.
Caffeine standards kit for LC/MS OQ/PV	8500-6917
Caffeine standards kit for LC/MS-Trap OQ/PV	5065-9908
Sulfa drug standards kit for LC/MS OQ/PV	5188-6523

LC/MS Application Kit Standards

Description	Part No.
LC/MS pesticide checkout mixture	5190-0469
LC/MS pesticide comprehensive mixture	5190-0551
LC/MS toxicology checkout mixture	5190-0556
LC/MS toxicology comprehensive mixture	5190-0555
LC/MS vet drug checkout mixture	5190-0443
LC/MS vet drug comprehensive mixture	5190-0554

LC/MS Calibrant Mixes

Description	Part No.
Calibrant, ES	G2421-60001
APCI/APPI calibrant solution, 100 mL	G2432A
ESI tuning mix for ion trap, 100 mL	G2431A
ES-TOF tuning mix, 100 mL	G1969-85000
APCI-L low concentration tuning mix, 100 mL	G1969-85010
MMI-L low concentration tuning mix, 100 mL	G1969-85020

LC/MS Calibrant Mix and Source Compatibility Matrix

Source	6100 Series Single Quadrupole LC/MS*	6140A/6150B Single Quadrupole LC/MS	6200 Series TOF LC/MS	6300 Series Ion Trap LC/MS	6400 Series Triple Quadrupole LC/MS	6500 Series Accurate-Mass Q-TOF LC/MS
ESI	G2421-60001	G1969-85000	G1969-85000	G2431A	G1969-85000	G1969-85000
APCI	G2432A	G1969-85010	G1969-85010	G2432A	G1969-85010[2]	G1969-85010[2]
APPI	G2432A	G2432A	G1969-85010	G2432A	G2432A[2]	G1969-85010[2]
MMI	G2432A	G1969-85000	G1969-85020	G2432A	G1969-85020	G1969-85020
NanoESI			G1969-85000[4]	G2431A		G1969-85000[4]
HPLC-Chip Cube		G1969-85000[2]	G1969-85000[4]	G2431A[1]	G1969-85000[3]	G1969-85000[4]

*G6110A, G6120A/B, G6130A/B

[1]5X dilution suggested

[2]No autotune

[3]ESI positive tune only

[4]Calibration only



Agilent CrossLab

Agilent CrossLab offers a growing portfolio of HPLC supplies manufactured for seamless performance with a variety of non-Agilent analytical instruments in your lab. Look inside this selection guide to find a wide range of products for your applications.

We currently support:

- Waters
- Shimadzu
- Dionex*
- CTC Analytics
- And more to come

Our growing portfolio includes the following products:

- Autosampler syringes
- Capillaries, tubing, and fittings
- Detector lamps
- Performance Maintenance kits
- Pump supplies
- Sample loops
- Valve supplies
- Vials and closures
- Well plates and sealing mats

Agilent CrossLab is more than supplies:

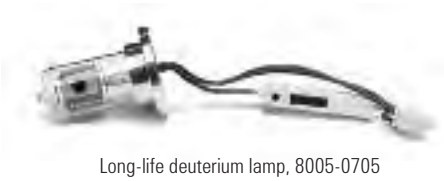
- Over 40 years of chromatography expertise
- The right supplies for both routine and challenging applications
- Hassle-free operations and reproducible results
- High-quality products manufactured to Agilent standards
- Technical and application support
- Dependable worldwide availability and delivery
- Convenience of consolidating purchasing
- 90-day risk free money back guarantee

*Dionex is now a part of Thermo Scientific

Agilent CrossLab works with WATERS | SHIMADZU | THERMO SCIENTIFIC | AND MORE

CrossLab Detector Lamps

Our detector lamps are designed for precise alignment and thermal stability



Long-life deuterium lamp, 8005-0705

Agilent CrossLab lamps are designed and built to be compatible with a wide variety of detectors, including Variable Wavelength Detectors (VWD), Multiple Wavelength Detectors (MWD), and Diode Array Detectors (DAD) or Photodiode Array Detectors (PDA). All the lamps adhere to the tightest specifications for consistent quality and reproducible performance over the entire lifetime of the lamps. Test equipment is regularly calibrated using optical standards certified by NIST (National Institute of Standards and Technology) or PTB (Physikalisch-Technische Bundesanstalt).

- Manufactured in an ISO 9001 certified environment
- Quartz glass bulbs for extended lifetime
- Individually tested for light intensity, noise and drift, correct operating voltage, and proper alignment for low lamp-to-lamp variability
- Tight QA/QC with traceability for each lamp throughout every step of the product process
- Both deuterium lamps and tungsten lamps available

Deuterium lamps

- High output stability and intensity for extended detection capabilities and improved qualification at trace level
- Guaranteed lifetime of 2,000 hours

Tungsten lamps

- Offer coverage in the visible wavelength range for high sensitivity detection
- Average lifetime range from 1,200 to 5,000 hours depending on operation conditions such as operation cycles, soft start, and operation voltage

TIPS & TOOLS

Each time after a replacement of a detector lamp, it is recommended to perform a wavelength calibration test and an intensity test after warm up.

TIPS & TOOLS

An Agilent CrossLab Supplies Selection Tool is available to help you choose the correct supplies for your non-Agilent instrument. For more information, visit **www.agilent.com/chem/SelectCrossLab**



Snap top vials with write-on spot, 8010-0025

CrossLab Vials and Closures

Agilent CrossLab vials and closures are thoroughly tested to ensure the highest level of quality. Additionally, CrossLab vials are designed for use in a wide range of non-Agilent GCs and LCs, including those from Bruker (formerly Varian), Dionex (now Thermo Scientific), PerkinElmer, Shimadzu, and Thermo Scientific. They are:

- Manufactured in an ISO 9001 certified facility
- Made from First Hydrolytic Type 1 Class A or Class B borosilicate glass, which conforms to US FDA, USP, and EU Pharmacopeia standards
- Protected by proprietary packaging with a crush barrier to reduce vial breakage
- Packaged in material that has been tested and selected for cleanliness
- Subjected to rigorous end-of-line sampling and quality control procedures to ensure all vials remain within specifications
- Compatible with a wide variety of autosamplers regardless of make and model

For Agilent CrossLab Vials and Closures ordering information please see the General Chromatography catalog (publication # 5991-1059EN)
www.agilent.com/chem/library

TIPS & TOOLS

Easy, Reliable pH Testing, Designed for Chromatographers

Agilent now offers a full line of pH meters and electrodes. Designed for chromatographers, these pH meters offer intuitive user design and exceptional ruggedness for your lab. Learn more at **www.agilent.com/chem/phmeters**



CrossLab Well Plates and Sealing Mats

Choose the cleanest well plates and sealing mats for your autosamplers



96-well plate, 8010-0534

Advantages of Agilent CrossLab well plates:

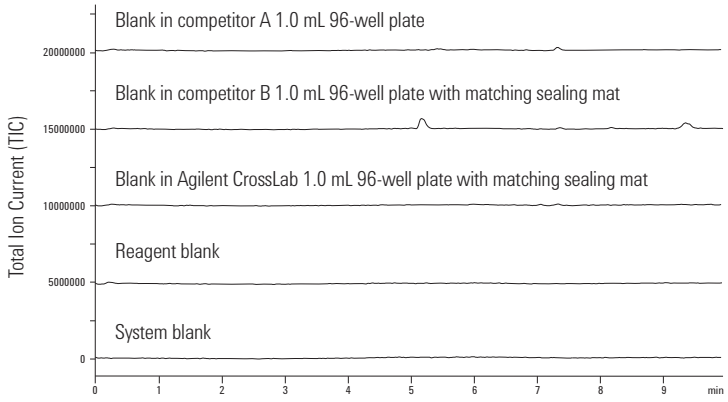
- Made from polypropylene
- Free from RNase, DNase, Endotoxins, and human DNA
- Chemically resistant to common solvents
- Autoclavable (121 °C/20 min)
- Alpha-numeric grid
- Compatible with pipetting workstations and multi-channel pipettes
- Raised rims are available with 0.5 mL and 1.0 mL deep well plates for efficient sealing and a reduced risk of cross-contamination during rigorous vortexing
- Available in 96- or 384-well plate format
- 96-well plates range from 0.2 mL to 2 mL
- 384-well plates available in 0.1 mL and 0.25 mL
- Stackable

Advantages of Agilent CrossLab sealing mats:

- Protect well contents during storage
- Free from RNase, DNase, Endotoxins, and human DNA
- Highly flexible for a tight seal and exact fit
- Insets in every well eliminate the need for glue during connection
- Pierceable with pipette tips (0.5 mL and 1.0 mL sealing mats)
- Prevent solvent evaporation
- Made from thermoplastic elastomer (TPE) or ethylene-vinyl acetate (EVA)
- Compatible with common solvents

For Agilent CrossLab Well Plates and Sealing Mats ordering information please see the General Chromatography catalog (publication # 5991-1059EN)
www.agilent.com/chem/library

Cleanliness of well plates and sealing mats: Agilent CrossLab vs. the competition



The chemical extraction experiments demonstrate the superior cleanliness of the Agilent CrossLab well plates and sealing mats compared to the competition, making them ideal for LC/MS applications.

LC/MS ESI positive chromatogram comparison. Reagent blank: 1:1 Acetonitrile/H_2O with 0.1% formic acid

CrossLab Autosampler Syringes and Manual Syringes

Agilent's CrossLab HPLC syringe portfolio contains a broad selection of syringe styles and volumes to provide what you need for accurate and effective sampling. From autosampler syringes in both large or small volume, to syringes for pump priming, CrossLab syringes meet all form, fit, and function criteria to support your HPLC systems.

- Accuracy to within ±1% of nominal volume with a precision of 1% at 80% of the total volume
- A chemically inert fluid path of stainless steel, borosilicate Type I glass, or PTFE
- Robust design for long lifetime

Agilent CrossLab Syringe Features



Syringe terminations at the end of the syringe barrel function as the interface between the syringe and its mating connection such as the needle. Terminations are offered in a number of different needle and connection configurations to accommodate a broad range of applications.



Fixed Needle

- Economical option for injections
- Preferred for applications requiring trace level samples
- Needle is cemented into the glass syringe barrel at a point corresponding to the zero graduation mark
- Dead volume is limited to the needle's internal volume
- Not autoclavable
- Recommended for use where probability of needle bending is minimal



Removable Needle

- Versatile option for injections
- Needle seats precisely at the zero graduation mark
- Needle can be replaced if damaged or clogged
- Allows for a removable needle without increasing dead volume
- Ideal for when there is a risk of needle clogging
- Autoclavable when disassembled (repeated autoclaving shortens syringe life)



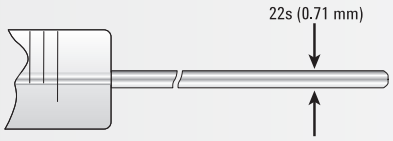
PTFE Luer Lock

- PTFE, male Luer taper with nickel-plated brass locking hub for use with Kel-F needles or metal hub needles, and universal connectors
- Autoclavable when disassembled, except on 25 mL or greater syringes (repeated autoclaving shortens syringe life)

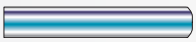


Chem

- ¼-28 UNF male fitting thread connection
- Used for low-volume applications where system dead volume must be minimized
- Can be screwed directly into injection valves



Needle Gauge 22



Needle Point Style 3

Note: Most manual HPLC injection valves are designed to be used with a 22-gauge, or a 22s-gauge blunt needle point style 3.

Gauge Selection Chart

	Nominal OD		Nominal ID		Wall Thickness		Volume
Gauge	**in**	**mm**	**in**	**mm**	**in**	**mm**	**µL/in**
22s*	0.0280 - 0.0285	0.718	0.0055 - 0.0077	0.168	0.022	0.55	0.563
22	0.0280 - 0.0285	0.718	0.0155 - 0.0170	0.413	0.012	0.30	3.403

***Note:** 22s needles have a smaller inner diameter and a thicker wall for better durability.

TIPS & TOOLS

Replace syringe if dirt is noticeable, syringes cannot be cleaned, or plunger does not slide easily.

TIPS & TOOLS

Follow manufacturer's recommendation for syringe cleaning and regularly inspect syringe barrel for sample build-up and needle tip for wear.

Autosampler Routine Maintenance

Routine autosampler maintenance should be performed on a regular basis to keep your HPLC system performing at its optimum level. You can perform all maintenance procedures at once or as needed. Some parts may need to be replaced more often than others depending upon your application and solvent preparation procedures.

Regular autosampler maintenance helps lower operating costs and generate precise results with the utmost confidence. By following a regular maintenance routine, you can count on maximum uptime during the life of your autosampler.

Waters Autosampler Routine Maintenance Procedures

- Replace the metering syringe
- Rebuild the injector seal pack and replace the needle
- Rebuild the high-pressure motorized valves
- Replace the in-line filter insert
- Adjust the seal pack seal valves

Waters Autosampler Routine Maintenance and Troubleshooting

Symptom	Cause	Solution
Poor injection reproducibility	Low sample level in vials	Confirm sample level in the vials is at minimum a quarter full
	Worn metering syringe	Replace the metering syringe assembly
	Worn high-pressure motorized valve seals	Rebuild the high-pressure motorized valves
	Leaking waste valve	Replace the waste valve
	Worn injector seals	Rebuild the injector seal pack, replace the needle, and adjust the seal pack seal valves
Leaking syringe	Worn metering syringe	Replace the metering syringe assembly
Sample carryover	Needlewash solvent exhausted	Refill the needlewash solvent reservoir
	Dirty needlewash seals	Rebuild the seal pack and adjust seal pack seal valves
	Faulty needlewash valve	Replace the needlewash valve
Sample vials filling during injection cycle	Worn high-pressure motorized valve seal	Rebuild the high-pressure motorized valves
Low peak response	Low sample level in vials	Confirm sample level in the vials is at minimum a quarter full
	Worn metering syringe	Replace the metering syringe assembly
	Worn high-pressure motorized valve seals	Rebuild the high-pressure motorized valves
	Leaking waste valve	Replace the waste valve
	Worn injector seals	Rebuild the injector seal pack, replace the needle, and adjust the seal pack seal valves

Shimadzu Autosampler Routine Maintenance Procedures

- Replace the sample metering drive plunger seal
- Replace the sample needle
- Replace the needle seat seal
- If equipped, replace the rinse port septum
- If equipped, clean the high-pressure valve and replace the high-pressure valve rotor seal
- If equipped, clean the low-pressure valve and replace the low-pressure valve rotor seal
- If equipped, clean the injection valve and replace the injection valve rotor seal
- Adjust the needle if necessary

Shimadzu Autosampler Routine Maintenance and Troubleshooting

Symptom	Cause	Solution
Poor injection reproducibility	Low sample level in vials	Confirm sample level in the vials is at minimum a quarter full
	Worn metering seal	Replace the metering plunger seal
	Damaged metering plunger	Replace the metering plunger
	Worn high-pressure valve seals	Rebuild the high-pressure valve
	Worn low-pressure valve seals	Rebuild the low-pressure valve
	Leaking waste valve	Replace the waste valve
	Damaged sample needle	Replace the sample needle and needle seat seal
Sample carryover	Needlewash solvent exhausted	Refill the needlewash solvent reservoir
	Dirty needlewash seals	Rebuild the seal pack and adjust seal pack seal values
	Contaminated rinse port	Clean and flush the rinse port
Low peak response	Low sample level in vials	Confirm sample level in the vials is at minimum a quarter full
	Worn metering plunger seal	Replace the metering plunger seal
	Damaged metering plunger	Replace the metering plunger
	Worn high-pressure valve seals	Rebuild the high-pressure valve
	Leaking waste valve	Replace the waste valve
	Damaged sample needle	Replace the sample needle and needle seat seal

Dionex* Autosampler Routine Maintenance Procedures

- Replace the sample metering syringe
- Replace the sample needle
- Replace the needle seat seal
- If equipped, clean the injection valve and replace the injection valve rotor seal
- Replace the buffer tubing
- Replace the capillary tubing
- Fill the syringe reservoir
- Adjust the needle if necessary

***Dionex is now a part of Thermo Scientific**

Dionex Autosampler Routine Maintenance and Troubleshooting

Symptom	Cause	Solution
Poor injection reproducibility	Low sample level in vials	Confirm sample level in the vials is at minimum a quarter full
	Worn metering syringe seal	Replace the metering syringe
	Worn syringe valve	Replace the syringe valve
	Worn injection valve seal	Rebuild the injection valve
	Leaking waste valve	Replace the waste valve
	Leaking fittings	Check all the fittings for leaks
	Damaged sample needle	Replace the sample needle and needle seat seal
Sample carryover	Needlewash solvent exhausted	Refill the needlewash solvent reservoir
	Dirty needlewash seals	Rebuild the seal pack and adjust seal pack seal valves
	Contaminated rinse port	Clean and flush the rinse port
Leaking syringe	Damaged syringe	Replace the syringe
	Worn syringe valve	Check for leaks and replace if necessary
Low peak response	Low sample level in vials	Confirm sample level in the vials is at minimum a quarter full
	Worn syringe valve	Replace the metering syringe
	Damaged syringe valve	Check the syringe valve for leaks and replace if necessary
	Worn injector valve seal	Rebuild the injection valve
	Leaking waste valve	Replace the waste valve
	Leaking fittings	Check all the fittings for leaks
	Damaged sample needle	Replace the sample needle and needle seat seal



Sapphire plunger assembly, 8005-0538



Plunger seal replacement kit, 8005-0541



Face seals replacement kit, 8005-0536

CrossLab Pump Supplies

Proper pump maintenance helps ensure precise, consistent results and lower operating costs

Regular pump maintenance helps lower operating costs and ensure precise and consistent results. By following a regular maintenance routine, you can count on maximum uptime, steady and accurate solvent flow, pressure stability throughout the life of a pump, and keep your HPLC system in its optimum condition.

CrossLab Plungers and Seals

Plungers (or pistons) and seals are two of the most important components of a pump. All Agilent CrossLab plungers combined with seals undergo extensive testing under temperature stress with common HPLC solvents for reproducible results.

Plungers:

- Available in sapphire or ceramic
- Sapphire plungers are made from high purity monocrystalline sapphire for optimal concentricity and resistance to wear
- Are meticulously cut and polished for great durability and long life

Seals:

- Manufactured from ultra-high-molecular-weight polyethylene (UHMWPE) or graphite-filled polytetrafluoroethylene (GFP)
- Designed to provide precise sealing around the plungers
- Engineered to deliver top performance over highly dynamic flow and pressure ranges

TIPS & TOOLS

Plungers (or pistons) should be exchanged on a regular basis in combination with seals to maintain the best sealing surface and durability for optimal instrument performance.

TIPS & TOOLS

Depending on your applications and solvent preparation protocols, some parts may need to be replaced more often than the others.

CrossLab Check Valves

Check valves are key components for a pump, and their lifetime is often related to the solvents used. A defective valve can lead to pressure fluctuation, inconsistent flow, and a noisy baseline.

Agilent CrossLab check valves and assembly components:

- Made to operate at different pressures (up to 16,000 psi, or 1,100 bar) per specifications from the Original Equipment Manufacturers (OEMs)
- Made from a variety of materials, such as stainless steel, titanium, ceramic, and PEEK, depending on OEM specifications
- Carefully assembled to ensure reliability and consistent performance
- Each ruby or ceramic ball and sapphire or ceramic seat is manufactured under extremely tight tolerances to ensure proper sealing within the operating pressure range

TIPS & TOOLS

Don't forget to check your check valve regularly and replace check valve cartridges to ensure proper pump operations.

HPLC Pump Routine Maintenance

TIPS & TOOLS

Pump seals should be replaced when there are leaks on the bottom of the pump head, when retention times are inconsistent, or when the pressure ripple is unstable.

Routine pump maintenance should be performed on a regular basis to keep your HPLC system performing at its optimum level. You can perform all maintenance procedures at once or as needed. Some parts may need to be replaced more often than others depending upon your application and solvent preparation procedures.

Regular pump maintenance helps lower operating costs and generate precise results with the utmost confidence. By following a regular maintenance routine, you can count on maximum uptime and a steady, accurate solvent flow for the life of the pump.



Sapphire plunger assembly, 8005-0523

Waters Pump Routine Maintenance Procedures

- Replace the seals and plungers (or pistons)
- Replace the in-line filter insert
- Replace the check valve cartridges
- Replace the seal wash seals and tube seals
- Replace the solvent inlet frits

Waters Pump Routine Maintenance Procedures

Symptom	Cause	Solution
Pressure ripple unstable	Dirty check valve cartridge(s)	Run static leak test to verify and exchange the check valve cartridge(s)
	Leak on pump head	Run static leak test to verify and exchange the in-line filter insert and plunger (or piston) seals
Gradient performance problems Intermittent pressure fluctuations	Blocked solvent filter(s)	Change the solvent filter(s)
A pressure drop of greater than 10 bar (150 psi) across the in-line filter (5 mL/min H_2O during wet priming)	Dirty in-line filter	Exchange the in-line filter insert
Leaks at lower pump head side Unstable retention time Pressure ripple unstable	High seal wear	Run leak test to verify and exchange the pump seals and in-line filter insert
Seal lifetime shorter than normally expected	Scratch on plunger	Check plungers while changing the seals
		Exchange the plungers if damaged or scratched
Loss of wash solvent	Leaky wash seals	Exchange the wash seals

Shimadzu Pump Routine Maintenance Procedures

- Replace the seals and plungers (or pistons)
- Replace the in-line filter cartridge
- Replace the check valve cartridges
- Replace the seal wash seals
- Replace the solvent inlet frits



Plunger seal, 8001-0502

Shimadzu Pump Routine Maintenance and Troubleshooting

Symptom	Cause	Solution
Pressure ripple unstable	Dirty check valve cartridge(s)	Run Pump Pressure test to verify and exchange the check valve cartridge(s)
	Leak on pump head	Run Pump Pressure test to verify and exchange the in-line filter insert and plunger (or piston) seal
		Check inlet and outlet fittings for leaks
		Tighten all fittings and re-run the Pump Pressure test
Gradient performance problems Intermittent pressure fluctuations	Solvent filter(s) is blocked	Change the solvent filter(s)
A pressure drop of greater than 10 bar (150 psi) across the in-line filter (5 mL/min H_2O during wet priming)	Dirty in-line filter	Exchange the in-line filter insert
Leaks at lower pump head side Unstable retention time Pressure ripple unstable Broad peaks or peak tailing	High seal wear	Run Pump Pressure test to verify and exchange the pump seals and in-line filter cartridge
Seal lifetime shorter than normally expected	Scratch on plunger	Check plungers while changing the seals
		Exchange the plungers if damaged or scratched
Loss of wash solvent	Leaky wash seals	Exchange the wash seals



Vespel rotor seal, 8002-0602

Dionex* Pump Routine Maintenance Procedures

- Replace the purge valve cap seal
- Replace the seals, seal rings, and plungers (or pistons)
- Replace the in-line filter cartridge
- Replace the check valve cartridges
- Replace the seal wash seals and seal wash tubing
- Replace the mixing chamber gasket
- Replace the solvent inlet filter frits

***Dionex is now a part of Thermo Scientific**

Dionex Pump Routine Maintenance and Troubleshooting

Symptom	Cause	Solution
Pressure ripple unstable	Dirty check valve cartridge(s)	Run Pump Pressure test to verify and exchange the check valve cartridge(s)
	Leak on pump head	Run Pump Pressure test to verify and exchange the in-line filter insert and plunger (or piston) seal
		Check inlet and outlet fittings for leaks
		Tighten all fittings and re-run the Pump Pressure test
Gradient performance problems, Intermittent pressure fluctuations	Solvent filter(s) is blocked	Change the solvent filter(s)
A pressure drop of greater than 10 bar (150 psi) across the in-line filter (5 mL/min H_2O during wet priming)	Dirty in-line filter	Exchange the in-line filter insert
Leaks at lower pump head side Unstable retention time Pressure ripple unstable Broad peaks or peak tailing	High seal wear	Run Pump Pressure test to verify and exchange the pump seals and in-line filter cartridge
Seal lifetime shorter than normally expected	Scratch on plunger	Check plungers while changing the seals
		Exchange the plungers if damaged or scratched
Loss of wash solvent	Leaky wash seals	Exchange the wash seals and seal wash tubing

CrossLab Valve Supplies

Agilent CrossLab valve supplies work seamlessly with your HPLC systems for reliable, accurate, and reproducible results.

Rotor seals:

A variety of materials for a wide range of applications

A rotor seal is a polymeric disk that creates a high-pressure seal against the stator or stator face seal. A variety of materials are available for different applications. It is important to replace rotor seals on a routine basis to prevent excessive wear. The recommended replacement interval for most rotor seals is once per year for preventive maintenance or as needed depending on stresses imposed by specific applications.

- Vespel: Vespel is a polyimide with low wear and high chemical resistance. Recommended for use with solutions under pH 10; because more basic solutions dissolve Vespel over time and damage the rotor seal
- PEEK (Polyetheretherketone): PEEK offers high resistance, versatility, and applicability for the entire pH range between 0 and 14
- Tefzel: Recommended for use in applications where PEEK cannot be used, such as higher concentrations of methylene chloride or dimethyl sulfoxide (DMSO)



Rotor, 6-port valve, 8001-0601

Recommended pH levels for rotor seal materials

pH Range	0-7	7-10	10-14
Vespel			
PEEK			
Tefzel			

TIPS & TOOLS

For any solution above pH 10, a PEEK rotor seal is recommended.

TIPS & TOOLS

PEEK rotor seals are incompatible with concentrated nitric and sulfuric acids.



Stator, 6-port valve, 8001-0604

Stators

- Available in 316 stainless steel, PEEK, and ceramic depending on the specifications of OEMs
- Typically require replacement only if the ports or sealing surfaces become damaged, which can be prevented by using proper injection needles.

Sample Loops

Stainless Steel Sample Loops:

- Have burr-free and square-cut ends to ensure a flush connection to valve ports
- Actual volumes might differ due to tolerance of metal tubing bore
- Accuracy of large metal loops (1.0 mm, 0.040 in bore) is ± 14%, intermediate loops (0.5 mm, 0.020 in bore) is ± 21%, and small loops (0.2 mm, 0.007 in bore) is ± 65%

PEEK Sample Loops

- Alternatives to stainless steel sample loops
- Clean, straight cuts for easy valve installation and low dead volume connections
- Inert to almost all organic solvents and biocompatible
- Actual volumes might differ due to tolerance of metal tubing bore
- Accuracy of large PEEK loops (0.8 mm, 0.030 in bore) is ± 5%, intermediate loops (0.5 mm, 0.020 in bore) is ± 10%, and small loops (0.2 mm, 0.007 in bore) is ± 30%
- Wall thickness, temperature, concentration of organic solvent, and solvent exposure time affect the durability of PEEK tubing

TIPS & TOOLS

Concentrated nitric acid and sulfuric acid weaken PEEK tubing while tetrahydrofuran (THF), methylene chloride, and DMSO cause swelling.

TIPS & TOOLS

Since both standards and unknowns are usually analyzed using the same sample loops, knowledge of the actual, accurate volume is rarely needed. If the sample loop volume must be known, it is best to calibrate the loop in place on the valve so the flow passages in the valve are taken into account.

CrossLab Performance Maintenance (PM) Kits

PM kits make it easier to keep your instruments running at peak performance



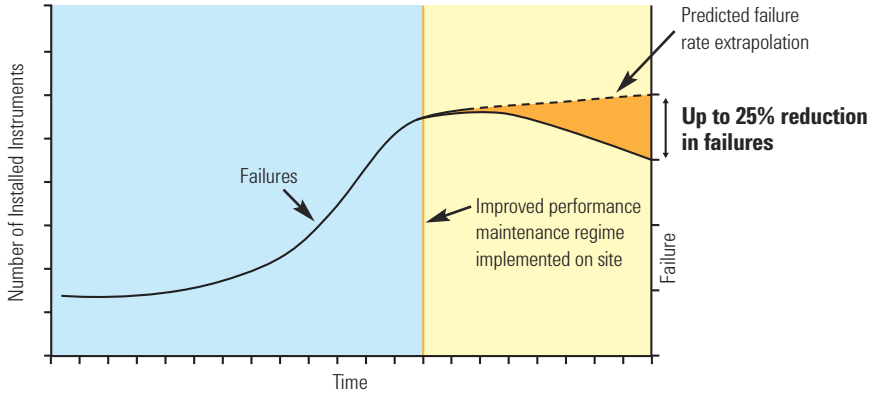
515 pump PM kit, 8005-0913



2960/2965 PM kit, 8005-0915

Many instrument failures are caused not by functional breakdowns, but by a lack of performance maintenance. As suggested by a recent study, a regular performance maintenance program can reduce instrument failure rates up to 25%, and is critical to ensure optimal overall system operations.

The Effect of Performance Maintenance



Agilent CrossLab PM kits contain the normal wear parts, tools for disassembly/reassembly, and instructions necessary to keep your systems operating at peak performance. The kits provide a convenient, cost-effective way to make sure your instruments are properly maintained. Each kit contains all the parts you need to:

- Boost system efficiency and reliability
- Reduce unplanned downtime and repair costs
- Increase accuracy by enhancing precision and sensitivity
- Comply with regulatory requirements, or meet quality accreditation standards
- Extend instrument useful life
- Eliminate individual part ordering
- PM kits available for pumps, valves, autosamplers, and HPLC systems

General HPLC Supplies

CrossLab LC Capillaries and Tubing

Your link to analytical success

Agilent CrossLab offers a range of capillaries and tubing made from stainless steel and PEEK. Used in combination with the right fittings, they are ideal for LC system plumbing, providing an inert surface, tight, leak-free connections, and zero dead volumes.

Stainless steel capillaries

- Made of ultra-clean stainless steel tubing
- Ideal for most standard applications, and the best choice for reliable high-pressure sealing
- Smooth inner surface for the lowest backpressure
- Precision cutting for burr-free, square-cut ends without inner-diameter distortion
- Both ends accept standard fittings
- Predefined lengths for specific path locations to avoid peak broadening
- Individually tested to ensure reproducibility
- Available in pre-swaged and non pre-swaged

PEEK tubing

- Flexible and easy to cut to desired lengths
- Ideal for frequently changed connections
- Resists mechanical and solvent damage, even at high temperatures
- Biocompatible and inert to almost all organic solvents
- A durable alternative to stainless steel connections
- Accepts both stainless steel and PEEK fittings

TIPS & TOOLS

Always use the smallest capillary internal diameter and the shortest length to keep sample dispersion as low as possible.

CrossLab Fittings

The right LC fittings make the best LC connections

To ensure leak-free connections, and to prevent the loss of peak shape and resolution, always use the recommended fitting style for columns, valves and unions.

With Agilent CrossLab fittings, you get the confidence and choice that come with:

- Robust design for long life and smooth, leak-free operation
- Stainless steel nuts and ferrules for high-pressure systems
- Polymer fittings for biocompatible applications



CrossLab HPLC In-Line Filters

Help stop time-wasting blockages

Column inlet frit contamination can increase backpressure and reduce efficiency. Microbore column blockages are of particular concern, due to the frit's small diameter.

To help prevent time-wasting contamination and blockages, the Agilent CrossLab portfolio offers two types of LC filters made from clean, high-quality stainless steel parts:

- In-line solvent filters, installed between the LC pump and injector, prevent blockages by removing particles from solvents before they reach the injector
- Column inlet filters, positioned immediately before an LC column, remove particles from both the injection system and sample

Troubleshooting Guide for HPLC Systems

The at-a-glance tables can help you pinpoint and solve the most common problems for your HPLC systems and ensure maximum instrument uptime and productivity.

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Baseline disturbance at void time	Positive/negative – Difference in refractive index of injection solvent	Use mobile phase for sample solvent
Detector leaks	Plugged inlet frit	Replace seals/gaskets
Drifting baseline	Positive direction – Contaminant buildup/elution	Flush column, clean up sample, use pure solvents
	Positive/negative – Difference in refractive index of injection solvent	Use mobile phase for sample solvent
	Negative direction (gradient) – Absorbance of "A" mobile phase solvent	Use non-absorbing or HPLC-grade or better solvent
	Positive direction (gradient) – Absorbance of "B" mobile phase solvent	Use non-absorbing or HPLC-grade or better solvent
	Random – Temperature changes	Insulate column and tubing
	Random – Temperature changes	Thermostat column and tubing
	Wavy or undulating – Temperature changes in room	Monitor room temperature and control
Ghost peaks	Peaks from previous injection	Flush column to remove contaminants
	Contamination	Sample cleanup or pre-fractionation
	Unknown interferences in samples	Sample cleanup or pre-fractionation
	Ion-pair – Upset equilibrium	Prepare sample in actual mobile phase to minimize disturbance
	Peptide mapping – Oxidation of TFA	Prepare fresh daily; use anti-oxidant
	Reversed-phase – Contaminated water	Check suitability of water by running different amount through reversed-phase column and measure peak height with elution; use HPLC grade solvents
	Spikes – Bubbles in solvent	De-gas solvents

(Continued)

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
High column backpressure	Column blockage, adsorbed sample	Better sample cleanup; use guard column
	Mobile phase viscosity too high	Use lower viscosity solvents or higher temperature
	Particle size too small	Use larger d_p packing
	Plugged inlet frit	Replace column
	Plugged inlet frit	Reverse solvent flow
Leaks	Subtle – White powder at fitting/loose fitting	Tighten fittings, cut tubing, or replace ferrules
Leaks, injection valve	Catastrophic – Worn valve rotor	Replace rotor in valve
Leaks, column or other fittings	Catastrophic – Loose fittings	Tighten or replace fittings
Leak, pump	Catastrophic – Pump seal failure	Replace pump seal
Negative peaks	RI detector – solute refractive index less than solvent	No problem; reverse polarity to make positive
	UV detector – solute absorbance less than mobile phase	Use mobile phase with lower UV absorbance; do not recycle solvent too long
Noisy baseline	Random – Contaminant buildup	Flush column; clean up sample; use HPLC-grade solvent
	Continuous – Detector lamp problem	Replace detector lamp
	Occasional – External electrical interference	Use voltage stabilizer for LC system
Peak doubling	Sample volume too large	Reduce the volume e.g. by half and re-inject
	Injection solvent too strong	Use weaker injection solvent or mobile phase
	Blocked frit	Replace and use 0.5 µm porosity in-line filter
	Column void or channeling	Replace column; for some columns, fill in void with packing
	Unswept injector flowpath	Replace injector rotor
	Void at head of column	Replace column, top off column with packing
	Column overloaded with sample	Use higher capacity stationary phase Increase column diameter Decrease sample size
	Single peak – interfering components	Sample cleanup; pre-fractionation

(Continued)

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Peak tailing	Beginning of peak doubling	See "peak doubling"
	Unswept dead volumes	Minimize number of connections Ensure injector seal is tight Ensure fittings are properly seated
	Basic compounds – Silanol interactions	Choose endcapped bonded phase Switch to polymeric phase
	Basic substances – Silanol interactions	Use stronger mobile phase or add competing base (e.g. TMA)
	Silica-based – Column degradation	Use specialty column; polymeric column or sterically protected
Peaks are broad	Injection volume too large	Decrease solvent strength of injection solvent to focus solute
	Peak dispersion in injector valve	Introduce air bubble in front/back of sample to decrease dispersion
	Sampling rate of data system too slow	Increase frequency of sampling
	Slow detector time constant	Adjust time constant to match peak width
	Mobile phase viscosity too high	Increase column temperature
	Detector cell volume too large	Use smallest possible cell volume with no heat exchanger in system
	Injector volume too large	Decrease injection volume
	Long retention times	Use gradient elution or stronger mobile phase
Pressure fluctuation	Leaky check valve	Replace check valve
	Pump seal leaks	Replace pump seals
	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
Pressure increasing	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
	Water/organic systems – buffer precipitation	Test buffer-organic mixtures; ensure compatibility
Retention beyond total permeation volume	Size exclusion – Specific interactions	Add mobile phase modifiers or change solvent

(Continued)

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Retention times changing	Column temperature varying	Thermostat column; insulate column; ensure lab temperature constant
	Equilibration time insufficient with gradient run or changes in isocratic mobile phase	Make sure at least 10 column volumes pass through column after solvent change or gradient conclusion
	Selective evaporation of mobile phase component	Less vigorous helium sparging; keep solvent reservoirs covered; prepare fresh mobile phase
	Buffer capacity insufficient	Use >20 mM concentration of buffer
	Inconsistent on-line mobile phase mixing	Ensure gradient system delivering constant composition; check vs. manual prep of mobile phase
	Contamination buildup	Occasionally flush column with strong solvent to remove contaminants
	First few injections – Adsorption on active sites	Condition column by initial injection of concentrated sample
Retention times decreasing	Flow rate increasing	Check pump to make sure correct; if not, reset
	Column overloaded with sample	Decrease sample size
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
Retention times increasing	Flow rate is slowing	Fix leaks in liquid lines, replace pump seals, check for pump cavitation or air bubbles
	Active sites on silica packing	Use mobile phase modifier
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
	Mobile phase composition changing	Make sure mobile phase container is covered
	Active sites on silica packing	Add competing base to mobile phase
	Active sites on silica packing	Use higher coverage packing for stationary phase
Sensitivity problem	Peaks are outside of linear range of detector	Dilute/concentrate to bring into linear region
	First few sample injections – Absorption of sample in loop or column	Condition loop/column with concentrated sample
	Autosampler flow lines blocked	Check flow and make sure there are no blockages
	Injector sample loop underfilled	Make sure that loop is overfilled with sample
	Sample-related losses during preparation	Use internal standard during sample prep; optimize sample prep method
Slow column equilibration times (ion-pairing)	Equilibration time slow for long-chain ion-pairing reagents	Use shorter alkyl chain ion-pair reagent

CrossLab Supplies for Waters HPLC Systems

Detector Lamps

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
2996 Photodiode Array Detector 996 Photodiode Array Detector ACQUITY UPLC 2996 Photodiode Array Detector	Long-life deuterium lamp, 2,000 hours	WAT052586	8005-0705
2487 Dual Wavelength Absorbance Detector 2488 Multichannel Absorbance Detector ACQUITY TUV Detector UPLC TUV Detector	Long-life deuterium lamp, 2,000 hours	WAS081142	8005-0704
486 Tunable UV/Visible Absorbance Detector LC Module 1	Long-life deuterium lamp, 2,000 hours	700000356 WAT052666	8005-0702

Autosampler Syringes, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/Tip	Similar to OEM Part No.	Agilent CrossLab Syringe	Agilent CrossLab Replacement Needle	Agilent CrossLab Replacement Plunger	Similar to OEM Part No.
2777 Compact Sample Manager 2777 Sample Manager	10	Fixed needle	22s/51/3	430000859	8010-0445*		8010-0457, 10/pk	700002212
	25	Fixed needle, gas tight	22s/51/3	430000861	8010-0441		8010-0458, 10/pk	700002213
	100	Fixed needle, gas tight	22s/51/3	430000864	8010-0442*		8010-0459, 10/pk	700002214
		Fixed needle, gas tight	22/51/3	430000863	8010-0446*		8010-0459, 10/pk	700002214
	250	Fixed needle, gas tight	22/51/3	430000865	8010-0467		8010-0456, 10/pk	700002215
	500	Fixed needle, gas tight	22/51/3	430000866	8010-0468		8010-0460, 10/pk	700002216
	1,000	Fixed needle, gas tight	22/51/3	430000867	8010-0443		8010-0455, 1/pk	700002217
	2,500	Fixed needle, gas tight	22/51/3	430000868	8010-0444		8010-0448, 1/pk	700002218

*Barrel od is 6.7 mm. All other 10, 25, and, 100 µL syringes have 7.9 mm od.

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(Continued)



Long-life deuterium lamp, 8005-0705



Long-life deuterium lamp, 8005-0704



Long-life deuterium lamp, 8005-0702

CrossLab Supplies for Waters HPLC Systems

Autosampler Syringes, 1/pk

Model	Volume (µL)	Description	Needle Gauge/ Length (mm)/Tip	Similar to OEM Part No.	Agilent CrossLab Syringe	Agilent CrossLab Replacement Needle	Agilent CrossLab Replacement Plunger	Similar to OEM Part No.
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System CapLC System CapLC XE System	10000	Luer Lock	No needle	WAT025559	8005-0414			
600 MultiSolvent Delivery System Rheodyne Injector	25	Removable needle, gas tight	22s/51/3	WAT033381	8005-0416		8005-0422	
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module LC Module 1 717/717plus Autosampler	25	Chem (1/4-28 UNF screw threads), gas tight	No needle	WAT077343	8005-0420			
	250	Chem (1/4-28 screw threads UNF), gas tight	No needle	WAT073109	8005-0419			
Rheodyne Injector	100	Removable needle, gas tight	22s/51/3	WAT033383	8005-0417	8005-0418, 6/pk	8005-0423	

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Autosampler syringe, gas tight, 8005-0417

CrossLab Supplies for Waters HPLC Systems

Pump Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Plungers and Seals				
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module 2796 Bioseparations Module	Sapphire plunger assembly, standard	1/pk	WAT270959	8005-0538
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module	Plunger seals, clear	2/pk	700001326	8005-0514
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module Alliance GPC/V 2000 Systems	Plunger seal replacement kit, standard, yellow	2/pk	WAT270938	8005-0535
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module	Plunger seal replacement kit, black	2/pk	WAT271066	8005-0541
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module Alliance GPC/V 2000 Systems	Face seals replacement kit	4/pk	WAT270939	8005-0536

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(Continued)



Plunger seal replacement kit, 8005-0535



Plunger seal replacement kit, 8005-0541



Face seals replacement kit, 8005-0536

CrossLab Supplies for Waters HPLC Systems

Pump Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Plungers and Seals				
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module Alliance GPC/V 2000 Systems	Seal wash face seal kit	1/pk	WAT271017	8005-0539
2796 Bioseparations Module	Seal wash, plunger seal	4/pk	700002258	8005-0516
2796 Bioseparations Module	Plunger seal, standard	2/pk	700002257	8005-0515
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module Alliance GPC/V 2000 Systems	Seal wash plunger seal replacement kit	2/pk	WAT271018	8005-0540
510 HPLC Pump	Sapphire plunger	1/pk	WAT025656	8005-0527
600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Oriented sapphire plunger	1/pk	WAT069511	8005-0533
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System LC Module 1	Plunger seal, graphite-filled PTFE (GFP), black	1/pk	WAT026613	8005-0529
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Plunger seal, black, 225 µL	1/pk	WAT026644	8005-0530
616 LC System 626 LC System	Sapphire plunger	1/pk	WAT031788	8005-0531
1515 HPLC Pump 1525 HPLC Pump 515 HPLC Pump	Sapphire plunger assembly	1/pk	WAS207069	8005-0523



Seal wash face seal kit, 8005-0539

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(Continued)

CrossLab Supplies for Waters HPLC Systems

Pump Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Plungers and Seals				
1515 HPLC Pump	Plunger seal, clear	1/pk	WAT022934	8005-0524
1525 HPLC Pump 510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Plunger seal, clear	4/pk	WAT022946	8005-0525
Check Valves and Cartridges				
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module Alliance GPC/V 2000 Systems	Check valve cartridge replacement kit	2/pk	WAT270941	8005-0537
626 LC System	Check valve cartridge	1/pk	WAT024120	8005-0526
1515 HPLC Pump 1525 HPLC Pump 2695 Separations Module 2695D Dissolution Separations Module 2795 Separations Module 510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Check valve cartridge	2/pk	700000254	8005-0513
1525 HPLC Pump 2695 Separations Module 2695D Dissolution Separations Module 2795 Separations Module 515 HPLC Pump 600 MultiSolvent Delivery System	Check valve cartridge	1/pk	700002399	8005-0508

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CrossLab Supplies for Waters HPLC Systems

Pump Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Check Valves and Cartridges				
1515 HPLC Pump 1525 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System LC Module 1	Cartridge check valve system	2/pk	700000253	8005-0512
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Outlet check valve rebuild kit, 225 µL	2/pk	WAT026014	8005-0528

Detector Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
2996 Photodiode Array Detector 996 Photodiode Array Detector	Cell gasket	2/pk	WAT057924	8005-0532

Valve Replacement Parts, 1/pk

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
2767/2747 Sample Manager Column/Fluidics Organizer	Stator, 6 port, stainless steel	700001560	8005-0601
Rheodyne 7725(i) Injector	Vespel rotor seal, for Rheodyne 7725(i)	WAT055946	8005-0604
626 LC System Rheodyne 9125 Injector	Tefzel rotor seal	WAT015781	8005-0603
2700 Sample Manager	Rotor seal	WAT272615	8005-0605
2707 Autosampler	Rotor seal	700003851	8005-0602

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CrossLab Supplies for Waters HPLC Systems

Sample Loops, 1/pk

Model	Volume (µL)	Material	Similar to OEM Part No.	Agilent CrossLab Part No.
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module	100	Stainless steel	430001194	8005-0840
2695 Separations Module 2695D Dissolution Separations Module	200	Stainless steel	430001630	8005-0841
2796 Bioseparations Module	20	PEEK	430000782	8005-0838
2796 Bioseparations Module	100	PEEK	430000783	8005-0839
2707 Autosampler CapLC System CapLC XE System	5	Stainless steel	700000683	8005-0843
2707 Autosampler	10	Stainless steel	700003872	8005-0845
2707 Autosampler CapLC System CapLC XE System	20	Stainless steel	700000680	8005-0842
2707 Autosampler	50	Stainless steel	700003928	8005-0846
2707 Autosampler CapLC System CapLC XE System	100	Stainless steel	700000685	8005-0844

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CrossLab Supplies for Waters HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Separation Modules				
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module	2690/95 Performance Maintenance Kit	Contains 2 sapphire plungers, 2 seal wash plunger seal kits, 2 plunger seals replacements kits (standard, yellow), 4 wash tube seal replacement kits, 1 battery, 1 diffuser assembly, 4 face seal replacement kits, 4 solvent reservoir filters (10 µm), 1 250 µL syringe, 1 precolumn filter insert assembly, 2 check valve cartridges, 1 seal pack rebuild kit with needle, 1 wash tube seal, 1 sealwash tube, 1 PTFE washer, 1 filter retainer, 1 lower wash seal frit, 1 needlewash frit, 1 TFE washer, 1 needle assembly, 2 injector seals, 1 stainless steel ferrule 1/16 in, 1 compression screw	WAT270944	8005-0915
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module	Seal Pack Rebuild Kit With Needle	Contains 1 wash tube seal, 1 sealwash tube, 1 PTFE washer, 1 filter retainer, 1 lower wash seal frit, 1 needlewash frit, 1 TFE washer, 1 needle assembly, 2 injector seals, 1 stainless steel ferrule 1/16 in, 1 compression screw	WAT271019	8005-0916
Performance Maintenance Kits for Pumps				
515 HPLC Pump	515 Pump Performance Maintenance Kit	Contains 2 sapphire plunger assemblies, 2 plunger seals, 1 solvent reservoir filter (10 µm), 1 sparge diffuser, 4 check valve cartridges	WAT052587	8005-0913
600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump	600 Pump Performance Maintenance Kit	Contains 2 sapphire plungers, 2 plunger seals, 4 solvent reservoir filters (10 µm), 4 check valve cartridges, 1 reference valve rebuild kit, 1 inlet manifold rebuild kit, 4 sparge diffusers	WAT052675	8005-0930
616 LC System	616 LC Performance Maintenance Kit	Contains 2 sapphire plungers, 1 plunger seal kit (ultra high molecular weight polyethylene, yellow), 4 check valve cartridges, 4 sparge diffusers, 4 solvent reservoir filters (10 µm)	WAT052672	8005-0928

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2960/2965 PM kit, 8005-0915



515 pump PM kit, 8005-0913

CrossLab Supplies for Waters HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
626 LC System	626 LC Performance Maintenance Kit	Contains 2 sapphire plungers, 2 ultra high molecular weight polyethylene plunger seals (yellow), 4 solvent reservoir filters (10 µm), 4 check valve cartridges, 4 sparge diffusers	WAT052673	8005-0929
1515 HPLC Pump	1515 Pump Performance Maintenance Kit	Contains 2 sapphire plungers, 2 plunger seals, 4 check valve cartridges, 1 reference valve rebuild kit, 1 solvent reservoir filter (10 µm)	201000113	8005-0925
1525 HPLC Pump	1525 Pump Performance Maintenance Kit	Contains 4 sapphire plungers, 4 plunger seals, 8 check valve cartridges, 1 reference valve rebuild kit, 2 solvent reservoir filters (10 µm)	201000114	8005-0926
616 LC System 626 LC System	Plunger and Wash Seal Rebuild Kit	Contains parts for both pump heads, 2 plunger seals, 2 plunger wash seals, 2 retainer seal O-rings, 6 plunger bearings	WAT031790	8005-0912
1515 HPLC Pump 1525 HPLC Pump 510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump	Reference Valve Rebuild Kit	Contains 1 diaphragm for check valve, 1 gasket for check valve, 1 reference valve button	WAT025746	8005-0911
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Outlet Check Valve Rebuild Kit	Contains 2 ball and seat for outlet check valves, 2 polychlorotrifluoroethylene (PCTFE) inserts, 2 stainless steel cup filters (2 µm), 4 large PTFE washers, 2 small PTFE washers	WAT026014	8005-0528

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CrossLab Supplies for Waters HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
510 HPLC Pump 515 HPLC Pump 600 MultiSolvent Delivery System 610 PowerLine Isocratic Pump LC Module 1	Inlet Check Valve Rebuild Kit	Contains 2 ball and seat for inlet check valves, 2 retainer gaskets, 2 TFE washers, 2 PTFE washers, 2 PCTFE inserts	WAT060495	8005-0914
Performance Maintenance Kits for Autosamplers				
717 Autosampler	717 Autosampler Performance Maintenance Kit	Contains 1 seal pack replacement kit, 1 250 µL syringe, 1 filter (2.3 x 11.5 in), 2 filters (2 x 7 in)	WAT052669	8005-0927
Performance Maintenance Kits for Rheodyne Valves				
Rheodyne Injector, 3725(i)	Performance Maintenance Kit for Rheodyne 3725(i) Injector Valves	Contains 1 rotor seal (PEEK), 1 stator face assembly (PEEK), 1 isolation seal, 1 needle guide, 1 needle port cleaner, 1 5/64 in hex key, 1 9/64 in hex key	201000116	8005-0901
Rheodyne Injector, 7010	Performance Maintenance Kit for Rheodyne 7010 Injector Valves	Contains 1 isolation seal, 1 rotor seal (Vespel), 1 5/64 in hex key, 1 9/64 in hex key	201000117	8005-0902
Rheodyne Injector, 7125 and 7126	Performance Maintenance Kit for Rheodyne 7125 and 7126 Injector Valves	Contains 1 rotor seal (Vespel), 1 stator face assembly (PEEK/ceramic), 1 isolation seal, 1 needle guide, 1 needle port cleaner, 1 5/64 in hex key, 1 9/64 in hex key, instructions	201000118	8005-0903
Rheodyne Injector, 7725(i)	Performance Maintenance Kit for Rheodyne 7725(i) Injector Valves	Contains 1 stator face assembly (PEEK/ceramic), 1 rotor seal (Vespel), 1 isolation seal, 1 needle guide, 1 needle port cleaner, 1 5/64 in hex key, 1 9/64 in hex key, instructions	201000119	8005-0904
Rheodyne Injector, 7750E	Performance Maintenance Kit for Rheodyne 7750 Injector Valves	Contains 1 stator face assembly (PEEK/ceramic), 1 rotor seal (Vespel), 1 isolation seal, 1 9/64 in hex key, instructions	201000122	8005-0907

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Rheodyne 7725(i) PM kit, 8005-0904

CrossLab Supplies for Waters HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Rheodyne Valves				
Rheodyne Injector, 7750E-075	Performance Maintenance Kit for Rheodyne 7750E-075 Valves	Contains 1 rotor seal (PEEK), 1 stator face seal (PEEK), 1 isolation seal, 1 9/64 in hex key, instructions	201000125	8005-0908
Rheodyne Injector, 8125 and 8126	Performance Maintenance Kit for Rheodyne 8125 and 8126 Injector Valve	Contains 1 stator face assembly (PEEK/ceramic), 1 rotor seal (PEEK), 1 isolation seal, 1 needle guide, 1 needle port cleaner, 1 5/64 in hex key, 1 9/64 in hex key, instructions	201000120	8005-0905
Rheodyne Injector, 9125 and 9126	Performance Maintenance Kit for Rheodyne 9125 and 9126 Injector Valves	Contains 1 stator face assembly (PEEK/ceramic), 1 rotor seal (Tefzel), 1 isolation seal, 1 needle guide, 1 needle port cleaner, 1 5/64 in hex key, 1 9/64 in hex key, instructions	201000121	8005-0906

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Rheodyne 9125 PM kit, 8005-0906

CrossLab Supplies for Waters HPLC Systems

HPLC Capillaries, 1/pk

Model	From	To	Material	OD (mm)	ID (mm)	Length (mm)	Fittings	Similar to OEM Part No.	Agilent CrossLab Part No.
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module	Pump	Autosampler	Stainless steel	1.6	0.23	760	With fittings, pre-swaged on both ends	WAT270975	8005-0824
2690 Separations Module 2690D Dissolution Separations Module 2695 Separations Module 2695D Dissolution Separations Module 2790 Separations Module 2795 Separations Module	Autosampler	Column Thermostat Valve	Stainless steel	1.6	0.23	760	With fittings, pre-swaged on both ends	WAT270979	8005-0825
2695 Separations Module 2695D Dissolution Separations Module	Autosampler	Column Thermostat Valve	PEEK	1.6	0.13	6000	With fittings, non pre-swaged	430000922	8005-0812
Alliance	Column Thermostat Valve	Column	Stainless steel	1.6	0.23	3000	No fittings	WAT026973	8005-0823
	Column	Detector							
Alliance	Column Thermostat Valve	Column	Stainless steel	1.6	0.508	3000	No fittings	WAT026804	8005-0826
	Column	Detector							
Alliance	Column Thermostat Valve	Column	Stainless steel	1.6	1.02	3000	No fittings	WAT026805	8005-0822
	Column	Detector							
Fittings									
Alliance	Compression screws and ferrules							WAT025604	8005-0835*

*This fitting is used with 8005-0823, 8005-0826, and 8005-0822

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CrossLab Supplies for Waters HPLC Systems

HPLC Fittings, Ferrules, and Unions

Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Compression screw, stainless steel, 1/16 in od	10/pk	WAT005070	8005-0837
Compression screws and ferrules	5/pk	WAT025604	8005-0835
Union, stainless steel, 1/16 in od	1/pk	WAT097332	8005-0836

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CrossLab Supplies for Shimadzu HPLC Systems



Long-life deuterium lamp, 8001-0701



Long-life deuterium lamp, 8001-0702



Long-life deuterium lamp, 8001-0704

Detector Lamps, 1/pk

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
SPD-M10Avp SPD-M20A	Long-life deuterium lamp, 2,000 hours	228-34016-00	8001-0701
	Tungsten lamp, 1,200 hours	228-34410-91 228-34410-00	8001-0703
SPD-20A/AV SPD-10A/AVvp SPD-10AV	Long-life deuterium lamp, 2,000 hours	228-34016-02	8001-0702
SPD-20AV SPD-10AVvp SPD-10AV	Tungsten lamp, 1,200 hours	670-14602-00	8001-0705
LC-2010 LC-2010HT	Long-life deuterium lamp, 2,000 hours	228-37401-00	8001-0704

Autosampler Syringes, 1/pk

Model	Volume (µL)	Description	Similar to OEM Part No.	Agilent CrossLab Syringe	Agilent CrossLab Replacement Plunger	Agilent CrossLab Replacement Barrel
SIL-10A SIL-10Ai	500	Chem (1/4-28 UNF screw threads), gas tight	228-25237-04	8001-0401	8001-0403	8001-0405
SIL-10A SIL-10Ai	2,500	Chem (1/4-28 UNF screw threads), gas tight	228-25237-06	8001-0402	8001-0406	

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Autosampler syringe, 8001-0401



Replacement syringe plunger, 500 µL, 8001-0403

CrossLab Supplies for Shimadzu HPLC Systems

Pump Supplies, 1/pk

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
Plungers and Seals			
LC-10ADvp LC-2010 (HT)	Sapphire plunger	228-35601-92 228-34498-91	8001-0503
LC-20AD LC-20ADXR LC-20AB	Sapphire plunger	228-35601-93	8001-0504
LC-20AT	Sapphire plunger assembly	228-35009-93	8001-0501
LC-2010	Sapphire plunger assembly	228-35281-93	8001-0514
LC-10ATvp	Ceramic plunger assembly	228-35009-92	8001-0533
LC-10ADvp	Ceramic plunger assembly	228-35601-91	8001-0534
LC-10ADvp LC-20AD/20ADxr/AB LC-30	Plunger holder	228-35602-91	8001-0515
LC-10AD/ADvp/LC-600/LC-9A LC-20AD/AB LC-2010 A/C (HT)	Plunger seal, graphite-filled PTFE (GFP)	228-35146-00	8001-0502
LC-10ATvp SIL-10ADvp SIL-20A/AC LC-20AT LC-2010 A/C LC-2010HT SIL-HT	Plunger seal, graphite-filled PTFE (GFP)	228-35145-00	8001-0522



Plunger seal, 8001-0502

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(Continued)

CrossLab Supplies for Shimadzu HPLC Systems

Pump Supplies, 1/pk

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
Plungers and Seals			
LC-20AD/20AB and LC-10ADvp	Plunger seal, polyethylene	228-32628-00	8001-0530
LC-10ATvp/10AT/10AS	Plunger seal, polyethylene	228-21975-00	8001-0527
LC-10AS/10AT/10ATvp	Plunger rinse seal, polyethylene	228-28499-00	8001-0615
LC-20AT	Rinse seal	228-35935	8001-0520
LC-20AT	Back-up ring for ring seal	228-35934	8001-0516
LC-20AT	Plunger seal spacer	228-42700	8001-0510
LC-10AD LC-10ADvp LC-2010 LC-20AD/AB	PTFE diaphragms, 2/pk	228-32784-91	8001-0513
Check Valves and Cartridges			
LC-10AT/ATvp	Check valve IN	228-32166-91	8001-0528
LC-10ADvp	Check valve IN	228-39093-92	8001-0535
LC-10ADvp/ATvp	Check valve OUT	228-34976-91	8001-0532
LC-10AD and LC-600 and LC-9A	Check valve IN	228-33492-91	8001-0531
LC-10AT/AD and LC-600 and LC-9A	Check valve OUT	228-32531-92	8001-0529
LC-20AD/AB $_{XR}$	Check valve IN	228-48249-91 228-45557-91	8001-0511
LC-20AD/AB LC-10ADvp/ATvp	Outlet check valve	228-45705-91 228-45563-95	8001-0521
LC-2010 LC-2010HT	Inlet valve cartridge	228-37149-92 228-37149-91	8001-0519
LC-2010 LC-2010HT	Outlet check valve	228-37147-93 228-37147-92	8001-0506
LC-20AT	Primary inlet check valve assembly	228-48249-93	8001-0512

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Looking for Performance Maintenance Kits for Rheodyne Valves?
Please see pages 144-147.

CrossLab Supplies for Shimadzu HPLC Systems

Valve Replacement Parts, 1/pk

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
SiL-10A/10Ai/10A$_{XL}$	Rotor, 6-port valve	228-21217-91	8001-0601
SIL-10ADvp	Rotor, 6V assembly, stainless steel surround	228-21217-97	8001-0603
SIL-10A/10Ai	Stator, 6-port valve	228-21220-91	8001-0604
SIL-20A/AC LC-2010	Stator, 5-port low pressure valve (LPV)	228-36917-01	8001-0607
SIL-20A/AC SIL-HT	Rotor, PEEK, high pressure valve (HPV)	228-41310-92 228-40750-92	8001-0612
LC-2010	Rotor, Vespel, high pressure valve (HPV)	228-38556-01	8001-0609
SIL-20A/AC	High pressure stator assembly for SIL-20A/AC	228-45408-91	8001-0613
LC-2010 LC-2010HT SIL-20 SIL-HT	Rotor, PEEK, low pressure valve (LPV)	228-36923-00	8001-0608
LC-10ADvp LC-10ATvp SIL-10ADvp LC-20AT LC-2010/HT	O-ring for drain valve, perfluoroelastomer	670-11518	8001-0614



Rotor, 6-port valve, 8001-0601



Stator, 6-port valve, 8001-0604



PEEK rotor, low pressure valve (LPV), 8001-0608

Sample Loops, 1/pk

Model	Volume (µL)	Material	Similar to OEM Part No.	Agilent CrossLab Part No.
SIL-20A/AC	100	Stainless steel	228-45402-91 228-45402-95	8001-0814
SIL-10ADvp	100	Stainless steel, extended for pre-treatment	228-39751-92	8001-0812
LC-2010 LD-2010HT SIL-HT	100	Stainless steel	228-41370-91 228-37549-91	8001-0809
	100	Stainless steel, 1/16 in	220-90800-20	8001-0801
	100	Stainless steel, 1/8 in	220-90800-30	8001-0802

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CrossLab Supplies for Shimadzu HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
LC-20AT	Rinse seal holder assembly	Contains 1 rinse seal, 1 stainless steel rinse seal holder, 1 back up ring, 1 perfluoroelastomer O-ring for drain valve	228-35946-92	8001-0517
Performance Maintenance Kits for Valves				
SIL-10ADvp	Stator assembly for SIL-10ADvp	Contains 1 ceramic rotor, 1 stator, 1 housing C manifold with intermediate plate	228-36730-91 228-39349-01 228-39755-91	8001-0610
LC-2010	Stator assembly for LC-2010	Contains 1 housing C manifold (stainless steel) packing, 1 stator, and pins	228-40254-91	8001-0509

HPLC Capillaries, 1/pk

Model	From	To	Material	OD (mm)	ID (mm)	Length (mm)	Fittings	Similar to OEM Part No.	Agilent CrossLab Part No.
LC-2010	Autosampler	Column	Flexible stainless steel	0.6	0.17	200	No fittings	228-38043-91	8001-0810
SIL-10ADvp	Injector	High pressure valve port #1	Flexible stainless steel	0.6	0.13	200	With fittings, non pre-swaged	228-39756-92	8001-8020
SIL-10ADvp SIL-20A/AC	Pump	Autosampler	Stainless steel	1.6	0.3	600	No fittings	228-22306-00	8001-0818
LC-20AP			Stainless steel	1.6	0.8	2000	No fittings	228-49820-00 228-50579-43	8001-0821
LC-20AT LC-20AD SIL-10ADvp			Stainless steel	1.6	0.3	2000	No fittings	228-36993-96 228-50579-91	8001-0822

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CrossLab Supplies for Shimadzu HPLC Systems

Tubing

Model	Description	OD (mm)	ID (mm)	Length (mm)	Fittings	Similar to OEM Part No.	Agilent CrossLab Part No.
LC-2010 LC-20AD	ETFE tubing for use between the inlet block and the check valve	1.6	0.8	3000	No fittings	228-18495-01	8001-0807
LC-2010 SII-20A/AC	FEP tubing	3	1.5	3000	No fittings	670-10321-05	8001-0823
SPD-20A/AV SPD-M20A	PEEK tubing	1.6	0.25	500	No fittings	670-10324-01 228-33376-50	8001-0824

HPLC Fittings, Ferrules, and Unions

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
LC-2010	PTFE ferrule, 3.0 F-T	1/pk	228-12493-00	8001-0803
LC-20AT LD-20AD	Stainless steel ferrule, 1.6 F	1/pk	228-16000-10	8001-0816
LC-2010	Flangeless nut, M6	1/pk	228-39999-05	8001-0813
SIL-20A/AC LC-20AT LC-20AD	Stainless steel male nut, 1.6 MN, for 1/16 in tubing	1/pk	228-16001-00	8001-0805
SIL-10ADvp SIL-20A/AC	Stainless steel male nut, 1.6 MN, W6 (taller hex portion)	1/pk	228-16001-03	8001-0806
LC-20AD/AB LC-10ADvp	PEEK male nut, 1.6 MN, for plumbing line between inlet block and check valve	1/pk	228-35403-00	8001-0819
	PEEK male nut, fingertight for 1/16 in tubing	1/pk	228-18565-84	8001-0817

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CrossLab Supplies for Shimadzu HPLC Systems

HPLC In-Line Filters

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
LC-2010 LC-20AD/AB/AT LC-10ADvp/ATvp	Stainless steel in-line filter	1/pk	228-35871-96 228-35871-94	8001-0808

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CrossLab Supplies for Dionex HPLC Systems

Detector Lamps, 1/pk

Model	Description	Similar to OEM Part No.	Agilent CrossLab Part No.
VWD-3000 Series MWD-3000 Series DAD-3000 Series	Long-life deuterium lamp, 2,000 hours	6074.1110	8002-0703
VWD-3000 Series MWD-3000 Series DAD-3000 Series	Tungsten lamp, 2,000 hours	6074.2000	8002-0705
UVD-3000	Long-life deuterium lamp, 2,000 hours	6073.2070	8002-0702
UVD 170/340 UVD 160/320	Long-life deuterium lamp, 2,000 hours	5053.1204	8002-0701
PDA-100 AD-25	Long-life deuterium lamp, 2,000 hours	939016T	8002-0704
PDA-100 AD-25	Tungsten lamp, 5,000 hours	056123T	8002-0706



Long-life deuterium lamp, 8002-0701

Autosampler Syringes, 1/pk

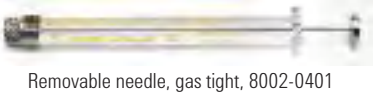
Model	Volume (µL)	Description	Similar to OEM Part No.	Agilent CrossLab Syringe	Agilent CrossLab Replacement Needle (Needle Gauge/ Length (mm)/Tip)	Agilent CrossLab Replacement Plunger
WPS-3000SL	25	Chem (1/4-28 UNF screw threads), gas tight	6822.0001	8002-0405		
	250	Chem (1/4-28 UNF screw threads), gas tight	6822.0003	8002-0407		
ASI-100	100	Removable needle, gas tight	5805.2920	8002-0401*	8002-0413, 22/51/3, 6/pk	8002-0402
					8002-0412, 22s/51/3, 6/pk	
	1,000	Removable needle, gas tight	5805.2940	8002-0403*	8002-0414, 22/51/3, 6/pk	8002-0406
					8002-0415, 22s/51/3, 6/pk	
	2,500	Removable needle, gas tight	5805.2950	8002-0404*	8002-0414, 22/51/3, 6/pk	8002-0408
					8002-0415, 22s/51/3, 6/pk	

*Needles are sold separately

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Chem (1/4-28 UNF screw threads), gas tight, 8002-0405



Removable needle, gas tight, 8002-0401

CrossLab Supplies for Dionex HPLC Systems

Autosampler Supplies

Model	Material	OD (mm)	ID (mm)	Length (mm)	Volume (µL)	Fittings	Similar to OEM Part No.	Part No.
Needle Seat Capillaries, 1/pk								
WPS-3000SL	Stainless steel	0.8	0.12	120	1.35	With fittings, non pre-swaged	6820.2407	8002-0808
WPS-3000SL	Stainless steel	0.8	0.18	120	3.1	With fittings, non pre-swaged	6820.2408	8002-0809
WPS-3000SL Semiprep	Stainless steel	0.8	0.5	120	24	With fittings, non pre-swaged	6820.2409	8002-0810

Pump Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Pistons and Seals				
ISO-3100A LPG-3400A LPG-3400AB LPG-3400M LPG-3400MB DGP-3600A DGP-3600AB DGP-3600M DGP-3600MB HPG-3x00A HPG-3x00M	Piston, sapphire	1/pk	6035.2240	8002-0515
ISO-3100SD LPG-3400SD LPG-3400RS DGP-3400SD DGP-3600RS HPG-3x00SD HPG-3x00RS	Piston seal, reversed-phase	2/pk	6040.0304	8002-0502
ISO-3100SD LPG-3400SD LPG-3400RS DGP-3400SD DGP-3600RS HPG-3x00SD HPG-3x00RS	Support ring for pistons seals	2/pk	6040.0012	8002-0501
UltiMate 3000 pump series	Ring seal, DR-8, PTFE	10/pk	2266.0082	8002-0601

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(Continued)

CrossLab Supplies for Dionex HPLC Systems

Pump Supplies

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
Check Valves and Cartridges				
UltiMate 3000 RS pumps, optional for SD and BM pumps	Check valve cartridge, ceramic	1/pk	6041.2301	8002-0517
ISO-3100A LPG-3400A LPG-3400M LPG-3400MB LPG-3400AB DGP-3600A DGP-3600M DGP-3600MB DGP-3600AB HPG-3x00A HPG-3x00M HPG-3200P	Check valve cartridge, sapphire, biocompatible	1/pk	6035.2300	8002-0516

Valve Replacement Parts

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
FLM-3x00	Rotor seal, proprietary inert polymer composite, 2-position 10-port C2 switching valve (standard)	1/pk	6720.0110	8002-0607
FLM-3x00	Rotor seal, polyaryletherketone/PTFE composite, 2-position 10-port C2 switching valve (biocompatible)	1/pk	6720.0092	8002-0605
FLM-3x00	Stator, stainless steel, 2-position 10-port C2 switching valve (standard)	1/pk	6720.0111	8002-0608
ASI-100	Tefzel rotor seal	1/pk	709.7010.071	8002-0604
ASI-100 Rheodyne injectors	Vespel rotor seal	1/pk	709.7010.039	8002-0602
ASI-100 Rheodyne injectors	Stainless steel stator	1/pk	709.7010.040	8002-0603

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Vespel rotor seal, 8002-0602



Stainless steel stator, 8002-0603

CrossLab Supplies for Dionex HPLC Systems

Sample Loops, 1/pk

Model	Description	Volume (µL)	Material	Similar to OEM Part No.	Agilent CrossLab Part No.
ASI-100 series	For 100 µL syringe	100	Stainless steel	5810.3012	8002-0859
ASI-100 ASI-100T	For 250 µL syringe	150	Stainless steel	5810.3003	8002-0856
ASI-100 series	For 1000 µL syringe	1000	Stainless steel	5810.3010	8002-0857
ASI-100P ASI-100PT	For 250 µL syringe	2500	Stainless steel	5810.3011	8002-0858

Buffer Loops, 1/pk

Model	Volume (µL)	Material	Similar to OEM Part No.	Agilent CrossLab Part No.
WPS-3000SL Analytical WPS-3000RS	100	Stainless steel	6820.2413	8002-0860
WPS-3000SL Semiprep	>250	Stainless steel	6820.2421	8002-0811

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Looking for Performance Maintenance Kits for Rheodyne Valves?
Please see pages 144-147.

CrossLab Supplies for Dionex HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
ISO-3100SD	Performance Maintenance Kit for ISO-3100SD pump	Contains 1 solvent line filter holder, 1 stainless steel solvent line filter frit (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 3 tube connectors for 1.0-2.0 mm id tubing, 4 piston seals (reversed-phase), 2 support rings, 1 PTFE O-ring seal (9 mm x 1.5 mm) for seal wash system, 1 PTFE O-ring seal (32 mm x 1.5 mm) for seal wash system, 1 check valve cartridge (sapphire), 1 cap seal for purge valve knob	6040.1950	8002-0907
ISO-3100BM	Performance Maintenance Kit for ISO-3100BM pump	Contains 1 solvent line filter holder, 1 PEEK solvent line filter frit (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 3 tube connectors for 1.0-2.0 mm id tubing, 4 piston seals (reversed-phase, biocompatible), 2 support rings, 1 PTFE O-ring seal (9 mm x 1.5 mm) for seal wash system, 1 PTFE O-ring seal (32 mm x 1.5 mm) for seal wash system, 1 check valve cartridge (sapphire), 1 cap seal for purge valve knob	6042.1950	8002-0917
LPG-3400SD	Performance Maintenance Kit for LPG-3400SD pump	Contains 4 solvent line filter holders, 4 stainless steel solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 3 tube connectors for 1.0-2.0 mm id tubing, 4 piston seals (reversed-phase), 2 support rings, 1 PTFE O-ring seal (9 mm x 1.5 mm) for seal wash system, 1 PTFE O-ring seal (32 mm x 1.5 mm) for seal wash system, 1 check valve cartridge (sapphire), 1 cap seal for purge valve knob	6040.1951	8002-0908
LPG-3400RS	Performance Maintenance Kit for LPG-3400RS pump	Contains 4 solvent line filter holders, 4 stainless steel solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 3 tube connectors for 1.0-2.0 mm id tubing, 4 piston seals (reversed-phase), 1 PTFE O-ring seal (9 mm x 1.5 mm) for seal wash system, 1 PTFE O-ring seal (32 mm x 1.5 mm) for seal wash system, 1 check valve cartridge (ceramic), 1 cap seal for purge valve knob	6040.1954	8002-0911

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(Continued)

CrossLab Supplies for Dionex HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
LPG-3400BM	Performance Maintenance Kit for LPG-3400BM pump	Contains 4 solvent line filter holders, 4 PEEK solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 3 tube connectors for 1.0-2.0 mm id tubing, 4 piston seals (reversed-phase, biocompatible), 2 support rings, 1 PTFE O-ring seal (9 mm x 1.5 mm) for seal wash system, 1 PTFE O-ring seal (32 mm x 1.5 mm) for seal wash system, 1 titanium inline filter frit (Porosity: 2 µm), 1 check valve cartridge (sapphire), 1 cap seal for purge valve knob	6042.1951	8002-0918
DGP-3600SD	Performance Maintenance Kit for DGP-3600SD pump	Contains 6 solvent line filter holders, 6 stainless steel solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 5 tube connectors for 1.0-2.0 mm id tubing, 8 piston seals (reversed-phase), 4 support rings, 2 PTFE O-ring seals (9 mm x 1.5 mm) for seal wash system, 2 PTFE O-ring seals (32 mm x 1.5 mm) for seal wash system, 2 check valve cartridges (sapphire), 2 cap seals for purge valve knob	6040.1952	8002-0909
DGP-3600RS	Performance Maintenance Kit for DGP-3600RS pump	Contains 6 solvent line filter holders, 6 stainless steel solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 5 tube connectors for 1.0-2.0 mm id tubing, 8 piston seals (reversed-phase), 2 PTFE O-ring seals (9 mm x 1.5 mm) for seal wash system, 2 PTFE O-ring seals (32 mm x 1.5 mm) for seal wash system, 2 check valve cartridges (ceramic), 2 cap seals for purge valve knob	6040.1955	8002-0912
DGP-3600BM	Performance Maintenance Kit for DGP-3600BM pump	Contains 6 solvent line filter holders, 6 PEEK solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.3 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 5 tube connectors for 1.0-2.0 mm id tubing, 8 piston seals (reversed-phase, biocompatible), 4 support rings, 2 PTFE O-ring seals (9 mm x 1.5 mm) for seal wash system, 2 PTFE O-ring seals (32 mm x 1.5 mm) for seal wash system, 2 titanium inline filter frits (Porosity: 2 µm), 2 check valve cartridges (sapphire), 2 cap seals for purge valve knob	6042.1952	8002-0919
HPG-3x00SD	Performance Maintenance Kit for HPG-3x00SD pump	Contains 4 solvent line filter holders, 4 stainless steel solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 5 tube connectors for 1.0-2.0 mm id tubing, 8 piston seals (reversed-phase), 4 support rings, 2 PTFE O-ring seals (9 mm x 1.5 mm) for seal wash system, 2 PTFE O-ring seals (32 mm x 1.5 mm) for seal wash system, 2 check valve cartridges (sapphire), 1 cap seal for purge valve knob	6040.1953	8002-0910

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(Continued)

CrossLab Supplies for Dionex HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
HPG-3x00RS	Performance Maintenance Kit for HPG-3x00RS pump	Contains 4 solvent line filter holders, 4 stainless steel solvent line filter frits (Porosity: 10 µm), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 5 tube connectors for 1.0-2.0 mm id tubing, 8 piston seals (reversed-phase), 2 PTFE O-ring seals (9 mm x 1.5 mm) for seal wash system, 2 PTFE O-ring seals (32 mm x 1.5 mm) for seal wash system, 2 check valve cartridges (ceramic), 1 cap seal for purge valve knob	6040.1956	8002-0913
ISO-3100A LPG-3400A and M DGP-3600A and M HPG-3x00 A and M	Performance Maintenance Kit for UltiMate 3000 pumps with floating pistons	Contains 2 solvent line filter holders, 1 stirrer, 1 ECTFE tubing (1.60 mm od x 0.75 mm id x 1 m L), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 2 fittings (for 1/8 in od tubing, PEEK), 2 solvent line locking rings (PEEK), 2 solvent line support flanges (PEEK), 2 knurled head screws (1/4 in-28 for ferrule 1/16 in, PEEK), 1 tube connector for 1.0-2.0 mm id tubing, 2 ferrules (1/16 in for 1/4 in-28 head screw, PEEK), 4 ring seals (DR-8), 8 piston seals (reversed-phase), 2 mixing chamber gaskets, 4 O-rings (22 mm x 2 mm, silicone), 4 pistons (sapphire), 4 inline filter frits (stainless steel; porosity: 0.5 µm), 4 inline filter frits (stainless steel; porosity: 10 µm), 8 solvent line filter frits (stainless steel; porosity: 10 µm), 2 piston support hemispheres, 4 support rings, 2 micro flow ring seals, and 4 check valve cartridges (sapphire)	6035.1961	8002-0904
LPG-3400AB and MB DGP-3600AB and MB	Performance Maintenance Kit for UltiMate 3000 pumps with floating pistons, Biocompatible	Contains 1 ECTFE tubing (1.6 mm od x 0.75 mm id x 1 m L), 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 2 PEEK fittings for 1/8 in od tubing, 2 solvent line locking rings (PEEK), 2 solvent line support flanges (PEEK), 2 knurled head screws (1/4 in-28 for ferrule 1/16 in, PEEK), 1 tube connector for 1.0-2.0 mm id tubing, 2 ferrules (1/16 in for 1/4 in-28 head screw, PEEK), 4 ring seals (DR-8), 8 piston seals (reversed-phase), 4 O-rings (22 mm x 2 mm, silicone), 4 pistons (sapphire), 4 inline filter frits (titanium; Porosity: 10 µm), 4 inline filer frits (PEEK; Porosity: 0.5 µm), 2 solvent line filter holders, 6 solvent line filter frits (titanium; Porosity: 10 µm), 2 piston support hemispheres, 4 support rings, 2 micro flow ring seals, 4 check valve cartridges (sapphire), and 2 mixing chamber gaskets	6035.1963	8002-0906

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(Continued)

CrossLab Supplies for Dionex HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
HPG-3200P	Performance Maintenance Kit for HPG-3200P pump	Contains 1 stirrer, 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 1 FEP tubing (4.5 mm od x 3.0 mm id x 2 m L), 1 tube connector for 1.0-2.0 mm id tubing, 2 tube adaptors (3.0 mm id 1/4 in-28), 4 ring seals (DR-8), 8 piston seals (reversed-phase, semipreparative), 2 mixing chamber gaskets, 4 ceramic pistons (semipreparative), 4 stainess steel inline filter frits (Porosity: 10 µm), 2 stainless steel solvent line filters (Porosity: 10 µm), 4 support rings (semipreparative), 4 check valve cartridges (sapphire)	6035.1962	8002-0905
ISO-3100A LPG-3400 A and M DGP-3600 A and M HPG-3x00 A and M	Piston seal/support ring kit, reversed-phase	Contains 1 support ring and 2 piston seals	6025.2010A	8002-0923
LPG-3400AB LPG-3400MB DGP-3600AB DGP-3600MB ISO-3100BM LPG-3400BM DPG-3600BM	Piston seal/support ring kit, reversed-phase, biocompatible	Contains 1 support ring and 2 piston seals	6025.2012	8002-0901
HPG-3200P P680	Piston seal/support ring kit, reversed-phase, semipreparative	Contains 1 support ring and 2 piston seals	6030.9010	8002-0902
HPG-3200P P680	Piston seal/support ring kit, normal phase, semipreparative	Contains 1 support ring and 2 piston seals	6030.9011	8002-0903
ISO-3100A LPG-3400A LPG-3400M DGP-3600A DGP-3600M HPG-3x00A HPG-3x00M ISO-3100SD LPG-3400SD DGP-3600SD HPG-3x00SD	Piston seal/support ring kit, normal phase	Contains 1 support ring and 2 piston seals	6025.2011A	8002-0924

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(Continued)

CrossLab Supplies for Dionex HPLC Systems

Performance Maintenance Kits

Model	Description	Kit Contents	Similar to OEM Part No.	Agilent CrossLab Part No.
Performance Maintenance Kits for Pumps				
ISO-3100SD ISO-3100BM LPG-3400SD LPG-3400BM LPG-3400RS DGP-3600SD DGP-3600BM DGP-3600RS HPG-3x00SD HPG-3x00RS HPG-3200BX	PTFE seal kit for rear seal wash system	Contains 5 PTFE O-ring seals 9 mm x 1.5 mm, 5 PTFE O-ring seals 32 mm x 1.5 mm	6040.2208	8002-0915
ISO-3100SD ISO-3100BM LGP-3400SD LGP-3400RS LGP-3400BM DGP-3600SD DGP-3600RS DGP-3600BM HPG-3x00SD HPG-3x00RS	Tubing Kit for Rear Seal Wash System	Contains 1 silicone tubing (2.80 mm od x 1.30 mm id x 1.5 m L), 1 PharMed tubing for peristaltic pump (3.2 mm od x 1.6 mm id x 180 mm L), 7 tube connectors for 1.0-2.0 mm id tubing	6040.9502	8002-0916
Performance Maintenance Kits for Autosamplers				
WPS-3000TBSL Autosampler	Rotor Seal and Stator Face Seal Kit	Contains 1 rotor seal and 1 stator face	6722.9014	8002-0611
WPS-3000SL WPS-3000RS	Rotor Seal Kit	Contains 2 PEEK rotor seals, 1 9/64 in hex key, instructions	6840.0012	8002-0610

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CrossLab Supplies for Dionex HPLC Systems

HPLC Capillaries, 1/pk

Model	From	To	Material	OD (mm)	ID (mm)	Length (mm)	Fittings	Similar to OEM Part No.	Agilent CrossLab Part No.
UltiMate 3000 RS	Pump	Autosampler	Flexible stainless steel	0.6	0.13	450	With fittings, non pre-swaged	6040.2345	8002-0822
UltiMate 3000 SD	Pump	Autosampler	Flexible stainless steel	0.6	0.18	450	With fittings, non pre-swaged	6040.2365	8002-0824
UltiMate 3000 RS	Autosampler	Column Thermostat Valve	Flexible stainless steel	0.6	0.13	350	With fittings, non pre-swaged	6040.2335	8002-0821
UltiMate 3000 SD	Autosampler	Column Thermostat Valve	Flexible stainless steel	0.6	0.18	350	With fittings, non pre-swaged	6040.2375	8002-0825
UltiMate 3000	Autosampler	Column Thermostat Valve	Stainless steel	1.6	0.23	340	With fittings, non pre-swaged	6820.2418	8002-0837
UltiMate 3000 RS	Column Thermostat Valve	Column	Flexible stainless steel	0.6	0.13	550	With fittings, non pre-swaged	6040.2305	8002-0818
UltiMate 3000 RS	Pump	Autosampler	Flexible stainless steel	0.6	0.18	550	With fittings, non pre-swaged	6040.2355	8002-0823
UltiMate 3000 SD	Column Thermostat Valve	Column							
UltiMate 3000 RS	Column	Detector	Flexible stainless steel	0.6	0.13	250	With fittings, non pre-swaged	6040.2325	8002-0820
UltiMate 3000 SD	Column	Detector	Flexible stainless steel	0.6	0.18	250	With fittings, non pre-swaged	6040.2385	8002-0826
UltiMate 3000	Column	Detector	Stainless steel	1.6	0.13	250	With fittings, non pre-swaged	6074.2410	8002-0833
UltiMate 3000	Column	Detector	PEEK	1.6	0.13	250	With fittings, non pre-swaged	6074.2415	8002-0834
UltiMate 3000	Column	Detector	Stainless steel	1.6	0.23	250	With fittings, non pre-swaged	6074.2400	8002-0831
UltiMate 3000	Column	Detector	PEEK	1.6	0.25	250	With fittings, non pre-swaged	6074.2405	8002-0832
UltiMate 3000 RS			Flexible stainless steel	0.6	0.13	150	With fittings, non pre-swaged	6040.2315	8002-0819

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(Continued)

CrossLab Supplies for Dionex HPLC Systems

HPLC Capillaries, 1/pk

Model	From	To	Material	OD (mm)	ID (mm)	Length (mm)	Fittings	Similar to OEM Part No.	Agilent CrossLab Part No.
VWD-3100 VWD-3100RS VWD-3400 VWD-3400RS DAD-3000 DAD-3000RS MWD-3000 MWD-3000RS ISO-3100BM LPG-3400AB LPG-3400MB LPG-3400BM DPG-3600AB DPG-3600MB DPG-3600BM			PEEK	1.6	0.25	2000	No fittings	6251.6001	8002-0835
Summit P680	Pump	Autosampler	Stainless steel	1.6	0.508	178	With fittings, non pre-swaged	5030.3020	8002-0816
Summit ASI-100	Autosampler	Column	Stainless steel				With fittings, non pre-swaged	6000.0020	8002-0817*
UVD 170U UVD 340U	Column	Detector	PEEK	1.6	0.5	1000	No fittings	2251.6002	8002-0815

*CrossLab capillary and fitting kit, for ASI-100 Autosampler, contains 1 stainless steel capillary (0.7 mm id x 1 m), 2 stainless steel capillaries (0.25 mm id x 2 m), 15 10-32UNF stainless steel fittings, 5 10-32UNF stainless steel long fittings, 3 10-32UNF stainless steel extra long fittings, 15 stainless steel ferrules 1/16 in, and 8 stainless steel long ferrules 1/16 in

The cross references to the original equipment manufacturer (OEM) part numbers listed here serve as a recommendation that the Agilent CrossLab products are viable alternatives to OEM products. CrossLab products are compatible with the corresponding OEM instruments, although in some cases, the CrossLab products may have slightly different designs as compared to the OEM counterparts. All CrossLab supplies are backed by Agilent's 90-day money-back warranty.

CrossLab Supplies for Dionex HPLC Systems

Tubing

Model	Description	OD (mm)	ID (mm)	Length (mm)	Fittings	Similar to OEM Part No.	Agilent CrossLab Part No.
LPG-3x00 peristaltic pump	PharMed biocompatible tubing	3.2	1.6	180	No fittings	6000.5000	8002-0803

HPLC Fittings, Ferrules, and Unions

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
UltiMate 3000 Series	Blind nut, FS-8 biocompatible	1/pk	6000.0144 6000.0044	8002-0802
WPS-3000(T)SL WPS-3000(T)SL Semiprep WPS-3000(T)RS	Ferrule and fitting kit, contains 6 ferrules and 6 long fitting screws		6822.0011	8002-0921

HPLC In-Line Filters

Model	Description	Unit	Similar to OEM Part No.	Agilent CrossLab Part No.
LPG-3400BM DGP-3600BM	In-line filter, 10 µL	1/pk	6042.5014	8002-0805
LPG-3400BM DGP-3600BM	Filter frit for titanium in-line filter, 2 µL	1/pk	6268.0036	8002-0806

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Please visit **www.agilent.com/chem/CrossLabHPLC** for up-to-date info for the growing portfolio of CrossLab LC Supplies for your non-Agilent HPLC systems.



For Agilent CrossLab Vials and Closures ordering information please see the General Chromatography catalog (publication # 5991-1059EN)
www.agilent.com/chem/library

For Agilent CrossLab Well Plates and Sealing Mats ordering information please see the General Chromatography catalog (publication # 5991-1059EN)
www.agilent.com/chem/library



CrossLab Supplies for CTC Analytics HPLC Autosamplers

Agilent's CrossLab portfolio includes a variety of syringes compatible with CTC Analytics HPLC HTS and HTC PAL systems.

Autosampler Syringes for CTC HTS and HTC PAL, 1/pk

Volume (µL)	Description	Needle Gauge/Length (mm)/Tip	Agilent CrossLab Syringe	Agilent CrossLab Replacement Plunger
10	Fixed needle	22s/51/3	8010-0440*	
	Fixed needle, gas tight	22s/51/3	8010-0445*	8010-0457, 10/pk
25	Fixed needle, gas tight	22s/51/3	8010-0441	8010-0458, 10/pk
	Fixed needle, gas tight	22s/51/3	8010-0449*	8010-0450, 10/pk
100	Fixed needle, gas tight	22s/51/3	8010-0442*	8010-0459, 10/pk
	Fixed needle, gas tight	22/51/3	8010-0446*	8010-0459, 10/pk
250	Fixed needle, gas tight	22/51/3	8010-0467	8010-0456, 10/pk
500	Fixed needle, gas tight	22/51/3	8010-0468	8010-0460, 10/pk
1.0 mL	Fixed needle, gas tight	22/51/3	8010-0443	8010-0455, 1/pk
2.5 mL	Fixed needle, gas tight	22/51/3	8010-0444	8010-0448, 1/pk

*Barrel od is 6.7 mm. All other 10, 25, and, 100 µL syringes have 7.9 mm od.

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CE and CE/MS

CE Solutions Kits

Agilent continues to introduce new CE solutions kits designed to simplify many of your applications:

- Inorganic anions
- Cations
- Organic acids
- Forensic anions
- µPage

These kits include all you need to begin your CE analyses, including buffers, capillaries, conditioning solutions, test samples, methods and detailed descriptions. Each kit is designed to take advantage of the automation of the Agilent CE system to make your time in the laboratory more efficient. All kits are prepared using the same quality procedures as our buffers and are thoroughly tested and supported.

While the kits have been optimized for use with the Agilent CE system, they may be used with virtually any commercial or home-built CE system.

Inorganic Anion Solutions Kit

The Inorganic Anion Solutions Kit contains all components needed for the analysis of common inorganic anions such as chloride, bromide, iodide, fluoride, sulfate, and phosphate. Applications include the analysis of inorganic ions in:

- Ultra pure water
- Waste water
- High purity chemicals
- Drug formulations
- Pulp and paper solutions
- Semiconductor solutions

Using an indirect UV detection system optimized for small anions, analyses are sensitive and rapid, and provide an alternative to traditional ion chromatography. The kit contains buffer, capillaries, test mixture, and instructions.



Inorganic anion solutions kit, 5063-6511



Inorganic anion solutions kit, 5063-6511



Ultra pure CE water, 5062-8578



0.1 N sodium hydroxide, 5062-8575

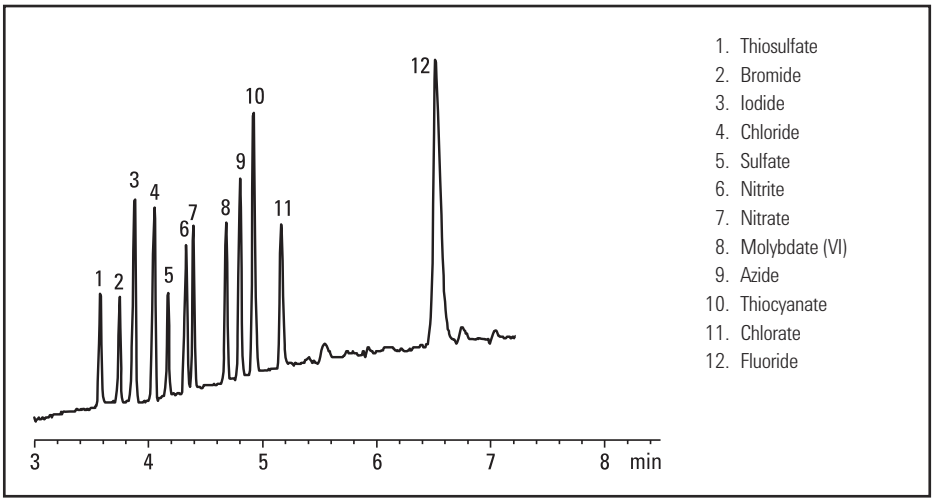


Inorganic anion test mixture, 5062-8524

Inorganic Anion Solutions Kit

Description	Unit	Part No.
Inorganic Anion Solutions Kit		5063-6511
Inorganic anion buffer	250 mL	8500-6797
Ultra pure CE water	500 mL	5062-8578
0.1 N sodium hydroxide	250 mL	5062-8575
1.0 N sodium hydroxide	250 mL	5062-8576
Bare fused-silica capillary, 50 µm id, 72 cm long	2/pk	G1600-62211
Inorganic anion test mixture Includes 1000 ppm each of fluoride, chloride, bromide, nitrite, sulfate and 2000 ppm phosphate	10 mL	5062-8524

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm id capillary (P/N G1600-60210) for 1600 HP^{3}D CE
Alignment interface for standard 50 µm id capillary (P/N G7100-60210) for 7100 CE



Separation of common anions

Cation Solutions Kit

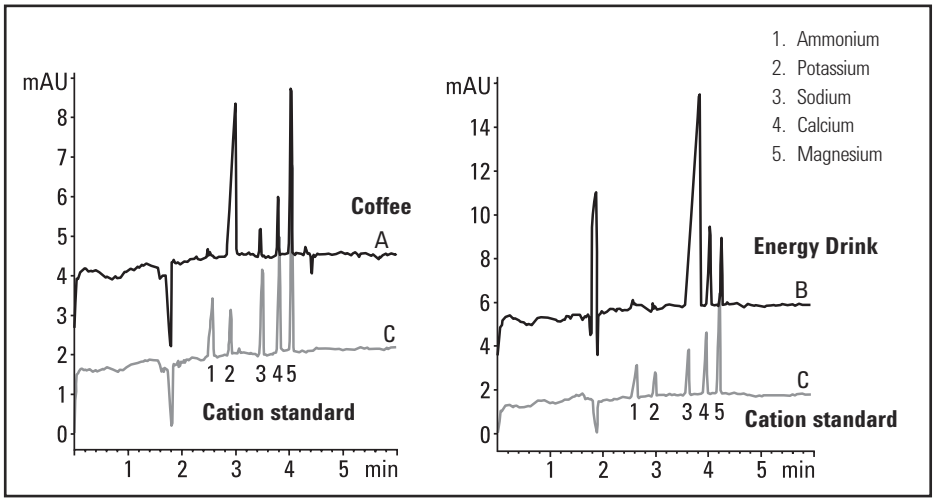
The Cation Solutions Kit provides everything you need for the analysis of inorganic and low-molecular-mass organic cations. It is specially designed for the separation of alkali metal ions, alkaline-earth metal ions and alkyl amines in a wide range of matrices.

Each kit contains a cation buffer, bare fused silica capillaries, cation standard, CE grade water and a detailed description of the analysis method and most common applications, including detection limits and reproducibility data. The Cation Solutions Kit and the separation methods were developed to fit perfectly with the Agilent CE system and to support its high automation capabilities. The methods are very easy to perform and provide accurate and quantitative analyses.

Cation Solutions Kit

Column Description	Unit	Part No.
Cation Solutions Kit		5064-8206
Cation buffer	250 mL	5064-8203
Ultra pure CE water	500 mL	5062-8578
Bare fused silica capillary, extended light path bubble factor (3), 50 µm id, 56 cm long	2/pk	G1600-61232
Cation test mixture	25 mL	5064-8205

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for 50 µm id extended light path capillary (P/N G1600-60230) for 1600 HP^{3}D CE
Alignment interface for 50 µm id extended light path capillary (P/N G7100-60230) for 7100 CE



Cations in coffee and energy drinks

Organic Acids Solutions Kit

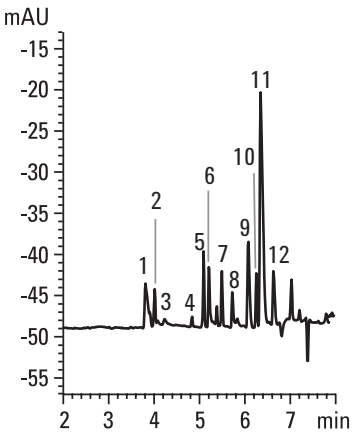
The Organic Acids Solutions Kit is ideal for the analysis of short alkyl chain carboxylic acids. Employing an indirect UV detection agent optimized for organic acids, the methodology is simple, sensitive, and provides accurate quantitative analysis. Suited for the analysis of organic acids in a wide range of matrices, it is especially useful for determination of organic acids in beverages and food.

Organic Acids Solutions Kit

Description	Unit	Part No.
Organic Acids Solutions Kit		5063-6510
Organic acids buffer	250 mL	8500-6785
Ultra pure CE water	500 mL	5062-8578
1.0 N sodium hydroxide	250 mL	5062-8576
Bare fused-silica capillary, 75 µm id, 72 cm long	2/pk	G1600-62311
Organic acids test mixture Includes 1000 ppm each of malate, succinate, and lactate	20 mL	8500-6900

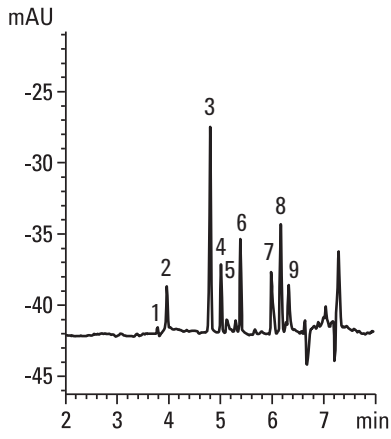
Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for 75 µm id capillary (P/N G1600-60310) for 1600 HP^{3}D CE
Alignment interface for 75 µm id capillary (P/N G7100-60310) for 7100 CE

Anions in beer



1. Chloride
2. Sulfate
3. Oxalate
4. Formate
5. Malate
6. Citrate
7. Succinate
8. Pyruvate
9. Acetate
10. Lactate
11. Phosphate
12. Pyroglutamate

Anions in red wine



1. Chloride
2. Sulfate
3. Tartarate
4. Malate
5. Citrate
6. Succinate
7. Pyruvate
8. Acetate
9. Lactate

Organic acids in beer and red wine

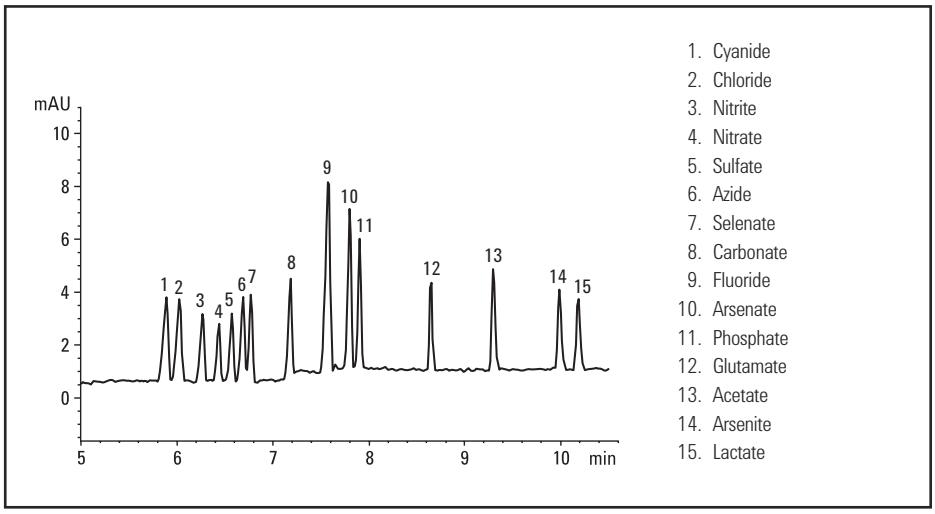
Forensic Anions Solutions Kit

This highly focused kit was developed specifically for the analysis of poisonous compounds, such as cyanide, azide, selenate, arsenate, and arsenite. In cases of poisoning, analytical tools are needed to determine the identity of toxins quickly and accurately. A rapid determination of anionic toxins in adulterated foods and beverages is possible using CE with indirect UV detection. Forensic and other anions can be detected within 15 minutes with minimal sample preparation.

Forensic Anions Solutions Kit

Description	Unit	Part No.
Forensic Anions Solutions Kit	5 x 50 mL	5064-8208
Basic anion buffer	50 mL	5064-8209
Ultra pure CE water	500 mL	5062-8578
Bare fused-silica capillary, 50 µm id, 104 cm long	2/pk	G1600-64211
Inorganic anion test mixture Includes 1000 ppm each of fluoride, chloride, bromide, nitrite, sulfate and 2000 ppm phosphate	10 mL	5062-8524

Note: The following part should be ordered separately for use with the Agilent CE System:
Alignment interface for standard 50 µm id capillary (P/N G1600-60210) for 1600 HP^{3}D CE
Alignment interface for standard 50 µm id capillary (P/N G7100-60210) for 7100 CE



Analysis of an anion standard with the Forensic Anions Solutions Kit

µPAGE Solution Kits

µPAGE poly-acrylamide gel-filled capillaries are the most direct vehicles to transfer all of your applications from slab gel to CE, utlizing the automation, high speed, high resolution, and quantitative advantages of CE. The capillaries are ideal for high resolution separations of oligonucleotides, single-stranded and double-stranded DNA fragments, polymerase chain reaction (PCR) products, sequencing reaction products and oligosaccharides.

µPAGE capillaries are available in three different pore sizes. The size of the molecular sieving pores is controlled by the monomer concentration (%T) and the degree of polymer cross-linking (%C). Gels with higher %T and %C values have smaller pores and are, therefore, more effective at resolving smaller molecules. µPAGE-10 (10%T, 0%C) capillaries provide high resolution capabilities for separation of antisense therapeutic agents, primers and probes, as well as nucleotides.

µPAGE-5 (5%T, 5%C) allows single base resolution of oligonucleotides [pd(A)] ranging from 20 to 150 bases.

For your convenience, µPAGE capillaries and µPAGE buffers can be purchased together or separately. To achieve the highest reproducibility and provide optimal longevity, use µPAGE buffer with µPAGE capillaries.

µPAGE Starter Kits

Includes 3 µPAGE capillaries, 75 cm total length, 50 cm effective length, oligonucleotide standard and µPAGE buffer

Kit as defined by type of µPAGE capillary	ID (µm)	Part No.
µPAGE-10 (10%T, 0%C) µPAGE pd(A)$_{25\text{-}30}$ oligonucleotide standard for µPAGE-10 kit µPAGE buffer, 2 x 237 mL	100	192-1311
µPAGE-5 (5%T, 5%C) µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits µPAGE buffer, 2 x 237 mL	75	192-5211
µPAGE-3 (3%T, 3%C) µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits µPAGE buffer, 2 x 237 mL	75	192-3211

µPAGE Basic Kits

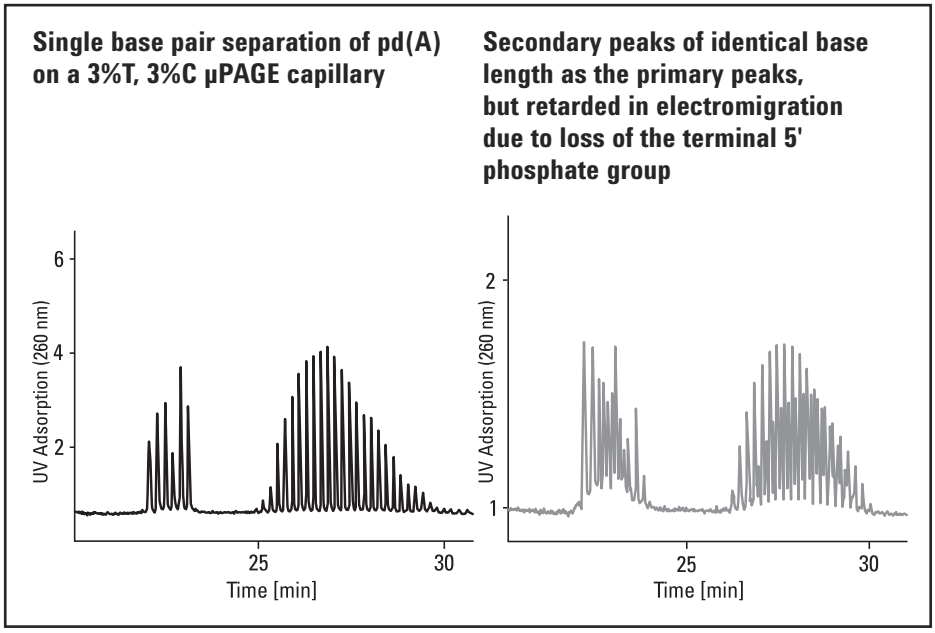
Includes 3 µPAGE capillaries, 75 cm total length, 50 cm effective length

Kit as defined by type of µPAGE capillary	ID (µm)	Part No.
µPAGE-10 (10%T, 0%C) µPAGE pd(A)$_{25\text{-}30}$ oligonucleotide standard for µPAGE-10 kit	100	191-1311
µPAGE-5 (5%T, 5%C) µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits	75	191-5211
µPAGE-3 (3%T, 3%C) µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5 kits	75	191-3211

Note: The µPAGE capillaries are not pre-aligned for the G1600A CE and G7100 CE systems. To cut them to the correct length, use the CE column cutter (P/N 5183-4669). To create detection window, use the Window Etching Tool (P/N 590-3003).

µPAGE Buffer Solutions and Oligo Standards

Kit as defined by type of µPAGE capillary	Part No.
µPAGE tris-borate and urea buffer for µPAGE-10, 4 x 237 mL	590-4005
µPAGE tris-borate and urea buffer for µPAGE-3 and µPAGE-5, 4 x 237 mL	590-4001
µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5, 3 x 50 µL	590-4000

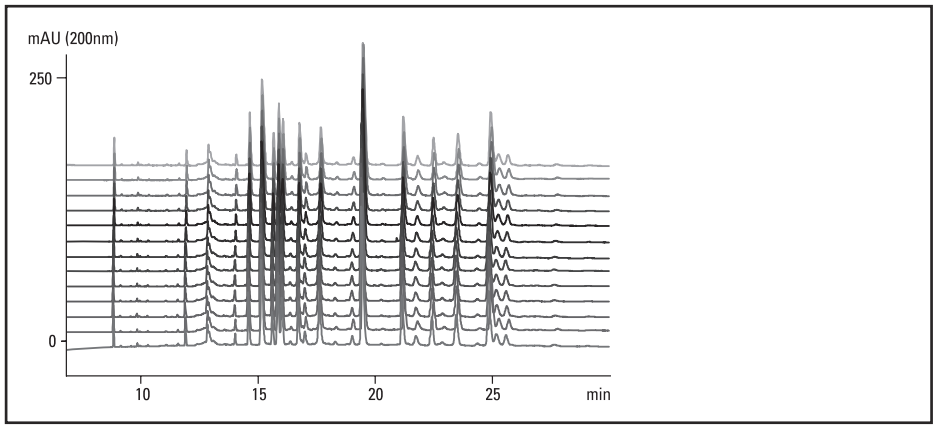


Oligonucleotide samples with or without terminal 5 phosphate group

CE and CE/MS Capillaries

Standard Bare Fused-Silica Capillaries

Fused-silica capillaries are the heart of CE. Pre-aligned capillaries from Agilent Technologies are designed and optimized for ease of use and reliability. All capillary ends are cut to a smooth, mirror-like finish. In addition, the polyimide outer coating is removed from the ends. These processes ensure minimal sample adsorption and help maintain sharp peak shapes. All capillaries have a pre-made detection "window" and a built-in alignment stopper that allows rapid and precise insertion in the alignment interface.



CZE of a tryptic digest of recombinant human growth hormone using a standard fused-silica capillary with 75 µm internal diameter

Standard Bare Fused-Silica Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Color Code	Part No.
50	33	24.5	Green	G1600-63211
	48.5	40	Green	G1600-60211
	64.5	56	Green	G1600-61211
	80.5	72	Green	G1600-62211
	112.5	104	Green	G1600-64211
75	33	24.5	Blue	G1600-63311
	48.5	40	Blue	G1600-60311
	64.5	56	Blue	G1600-61311
	80.5	72	Blue	G1600-62311
	112.5	104	Blue	G1600-64311
100	33	24.5	Gray	G1600-63411
	48.5	40	Gray	G1600-60411
	64.5	56	Gray	G1600-61411
	80.5	72	Gray	G1600-62411
	112.5	104	Gray	G1600-64411

TIPS & TOOLS

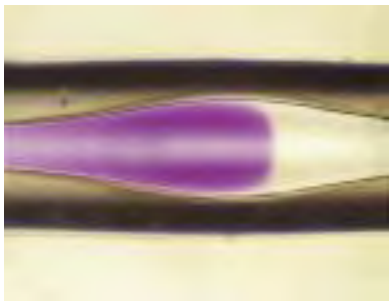
Different inner diameters of capillaries need to use different alignment interfaces to guarantee optimal detection. The color coding of the capillary and the alignment interface allow you to easily match the correct interface with the capillary.

Extended Light Path (Bubble Cell) Bare Fused-Silica Capillaries

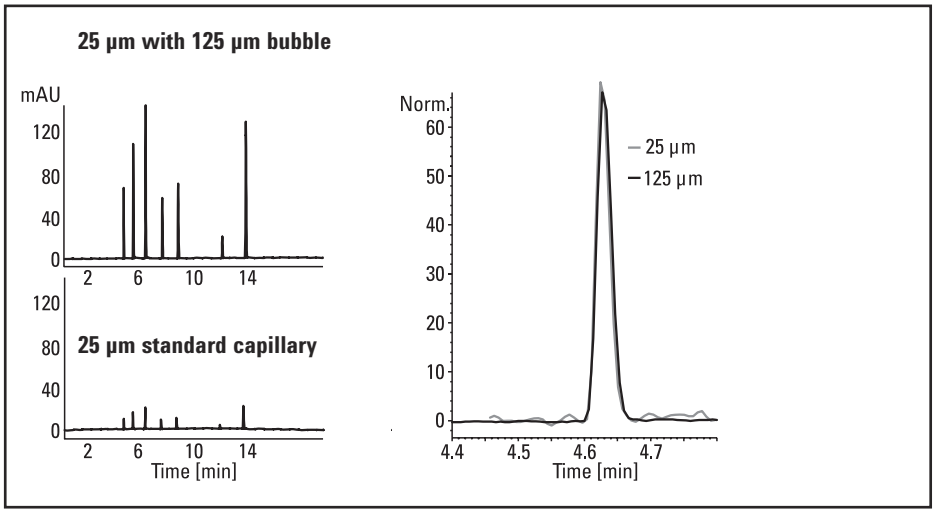
Use Agilent Technologies extended light path capillaries ("bubble" cell capillaries) to improve sensitivity 3- to 5-fold over standard capillaries. With extended light path capillaries, the inner diameter is increased only at the detection window, offering the sensitivity of a wide inner diameter capillary and the low current generation of a narrow one.

Resolution is not sacrificed when used with matching optical alignment interfaces from Agilent.

Through a computer-controlled proprietary process, the diameter is increased three to five times, with a manufacturing precision better than 3%. Take advantage of this process to extend the detection pathlength of 25 µm id capillaries to 125 µm, 50 µm to 150 µm, and 75 µm to 200 µm.



Electroosmotic flow maintains the "plug" flow in the bubble. Optical slits matched to the zone geometry maintain resolution.



Analysis of cold medicine ingredients in a standard capillary (25 µm id) and an Agilent Extended Light Path Capillary

TIPS & TOOLS

Use narrow 25 and 50 µm id "bubble" cell capillaries for highly conductive buffers without sacrificing sensitivity.

Extended Light Path (Bubble Cell) Bare Fused-Silica Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Color Code	Part No.
25	48.5	40	5	125	Black	G1600-60132
	64.5	56	5	125	Black	G1600-61132
	80.5	72	5	125	Black	G1600-62132
50	43.5	35	3	150	Red	G1600-60233
	48.5	40	3	150	Red	G1600-60232
	64.5	56	3	150	Red	G1600-61232
	80.5	72	3	150	Red	G1600-62232
	112.5	104	3	150	Red	G1600-64232
75	48.5	40	2.7	200	Yellow	G1600-60332
	64.5	56	2.7	200	Yellow	G1600-61332
	80.5	72	2.7	200	Yellow	G1600-62332
	112.5	104	2.7	200	Yellow	G1600-64332

Universal Bare Fused-Silica Capillaries

Universal Bare Fused-Silica Capillaries have a window, 75 cm effective length and 363 µm od, fitting into any CE instrument. To cut them to the correct length we recommend using the CE column cutter (P/N 5183-4669).

Universal Bare Fused-Silica Capillaries

ID (µm)	Total Length (cm)	Effective Length (cm)	Part No.
20	100	75	190-0431
50	100	75	190-0131
75	100	75	190-0231
100	100	75	190-0331

Bulk Fused-Silica Capillaries

ID (µm)	Total Length (m)	Part No.
20	5	160-2660-5
50	5	160-2650-5
75	5	160-2644-5

Polyvinyl Alcohol (PVA) Coated Capillaries

PVA coated capillaries contain a permanently adsorbed layer of polyvinyl alcohol. This coating minimizes hydrophobic and electrostatic solute/wall interactions and eliminates electroosmotic flow (EOF). Using a proprietary deposition process, the PVA coating is stable over a wide pH range, even under basic conditions, from pH 2.5 to 9.5. This stability allows the use of many common CE buffers. Because the silica surface is covered, many proteins and amines can be analyzed without the peak tailing found with uncoated capillaries. In addition, since EOF is eliminated, cumbersome washing procedures are unnecessary and migration time reproducibility may be improved.

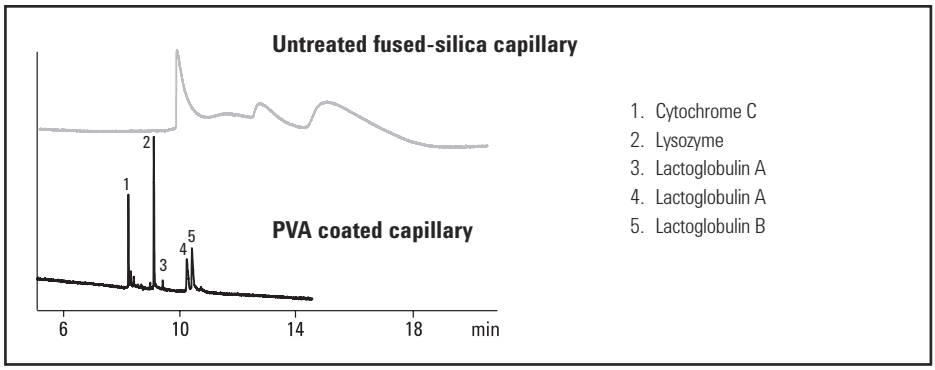
Each batch of PVA coated capillaries is rigorously tested by Agilent Technologies and includes a representative electropherogram to assure quality.

The color coding of the capillary (alignment stopper) and the alignment interfaces allow you to easily combine the correct interface with the capillary. Capillaries for non-Agilent CE systems have removable alignment stoppers without color code.

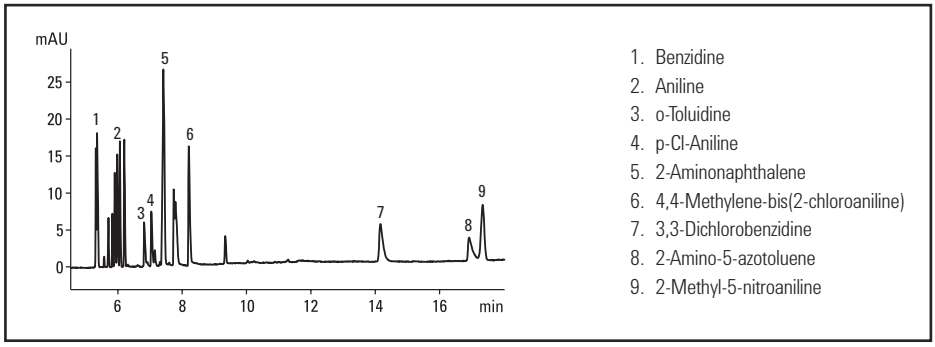
PVA coated capillaries can be used for a variety of applications, including protein analysis at physiological pH, isoelectric focusing, and small anion analysis without the need for flow-reversal agents in the buffer.

PVA coating is available in standard capillaries, or in Agilent Extended Light Path Capillaries ("bubble" cell capillaries) for high sensitivity applications. Both capillary types are available in longer lengths for use in non-Agilent systems.

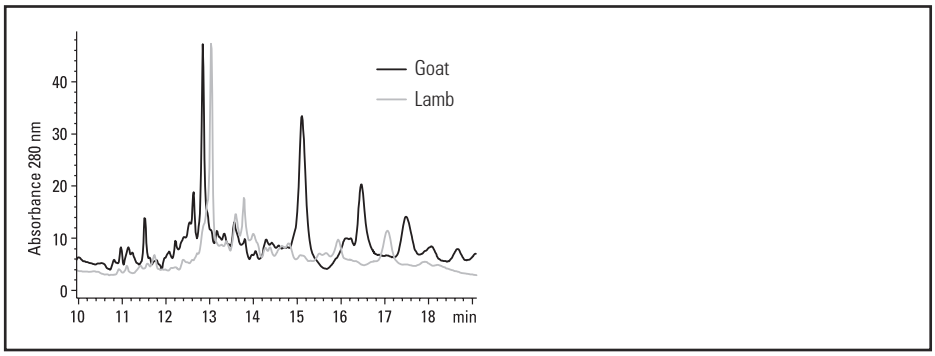
PVA is also available for use with the High Sensitivity Detection Cell for even further improved HPLC-like sensitivity. In addition, PVA coated capillaries are offered for CE-MS applications. The capillaries are provided with a normally positioned detection window to allow tandem UV-Vis and MS detection for improved sample identification.



Use of PVA coated capillaries to reduce protein adsorption



CZE analysis of basic amines using PVA coated capillaries (decomposition products of azo dyes)



Analysis of meat proteins by c-IEF using PVA capillaries

PVA Coated Capillaries for Agilent CE Systems*

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Color Code	Part No.
50	64.5	56	0	50	Green	G1600-61219
	64.5	56	3	150	Red	G1600-61239
	125	21.5	0	50	Green	G1600-67219
75	64.5	56	0	1200		G1600-68319
	125	21.5	0	75	Blue	G1600-67319
100	48.5	40	0	100	Gray	G1600-60419
	64.5	56	0	100	Gray	G1600-61419

*Not compatible with borate buffers

Note: PVA coated capillaries for CE/MS have a blue alignment stopper matching the blue color code of the alignment interface for MS-UV detection. The alignment stopper of the 50 µm id PVA capillary for CE/MS has a black dot for easy identification.

PVA Coated Capillaries for Non-Agilent CE Systems*

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Part No.
50	71	60	0	50	G160U-61219
	71	60	3	150	G160U-61239
100	56	45	0	100	G160U-60419
	71	60	0	100	G160U-61419

*Not compatible with borate buffers

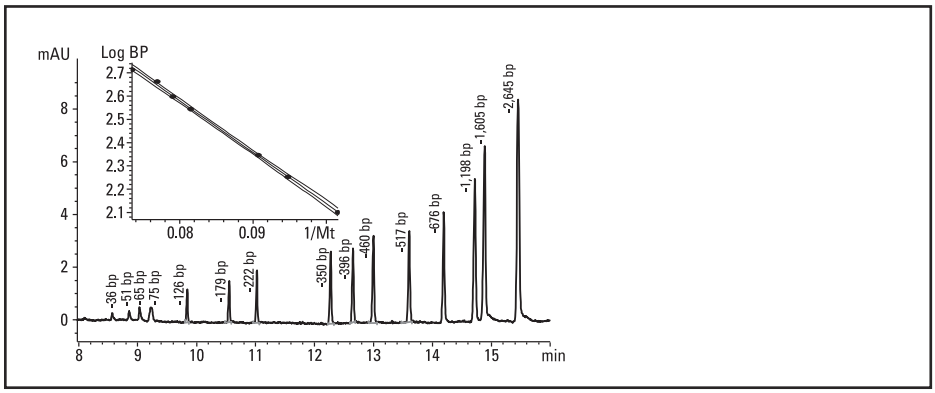
Note: When extended pathlength capillaries are used in non-Agilent systems, loss of resolution may be found if the axial slit width is not reduced. In Agilent systems, the alignment interface contains properly matched slits to maintain resolution.

CEP Coated Capillaries

CEP coated capillaries contain a permanently bonded polymer coating. This CEP coating shields the silanol functionality of the capillary surface and helps prevent sample adsorption. Additionally, EOF is nearly eliminated, making the capillary ideal for applications such as DNA separations with sieving polymer buffers.

Elimination of EOF also simplifies analysis of anions and organic acids by direct UV detection. Without EOF reduction, highly mobile ions such as nitrate can migrate in the opposite direction to the slower, longer chain acids.

The CEP coated capillary is stable from pH 2 to 8. It can be used with borate buffers, offering a different surface functionality to help alleviate sample adsorption. Each batch of CEP coated capillaries is rigidly tested by Agilent Technologies and each capillary includes a representative electropherogram to assure quality.



Restriction fragment separation (36–2645 bp)

CEP Coated Capillaries, 2/pk

ID (µm)	Total Length (cm)	Effective Length (cm)	Bubble Factor	Optical Path Length (µm)	Part No.
75	80.5	72	0	75	G1600-62318



Cross-linked and Bonded µSIL Capillaries

µSIL-FC and µSIL-DNA Capillaries with Windows

A series of coated capillaries specifically designed for CE, which are prepared by cross-linking and bonding a novel, proprietary fluorocarbon (FC) polymer. µSIL-FC capillaries are chemically inert, hydrophobic, and stable from pH 2.5-10.

These capillaries are a must-have for cIEF, protein, peptide and carbohydrate separations, as well as replaceable gel CE applications such as oligonucleotides, DNA fragments, and PCR product separations.

µSIL-DNA capillaries are also coated with an FC polymer but have a 75 µm id to accommodate the viscosity of entangled polymer solutions. All µSIL capillaries are batch tested to ensure the highest performance and reproducibility.



µSIL-DNA, 199-2602

µSIL-WAX Capillaries with Windows

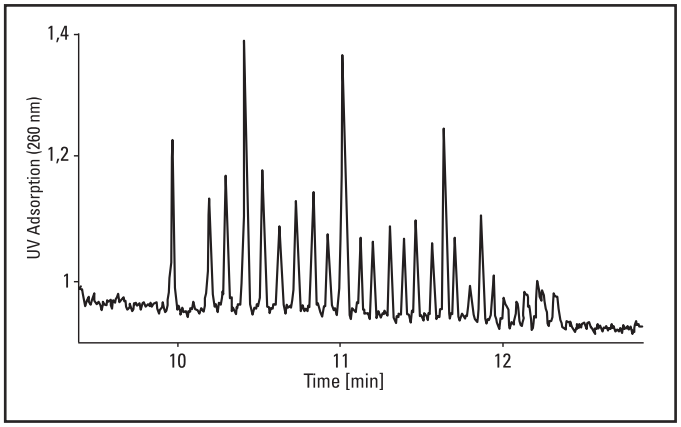
µSIL-WAX features a modified, polyethylene oxide, hydrophilic coating made through a special cross-linking and bonding process. The coating effectively masks active silanol sites, offering exceptional efficiency, resolution, peak shape and reproducibility. The highly stable coating and near-zero EOF of µSIL-WAX makes the capillary ideal for CE-MS, and protein and peptide separations from pH 2-5.

Capillary	ID (µm)	Total Length (cm)	Effective Length (cm)	Film Thickness (µm)	Unit	Part No.
µSIL-FC	50	80	50	0.075	3/pk	194-8111
µSIL-DNA	75	65	50	0.075	2/pk	199-2602
µSIL-WAX	50	100	75	0.1	2/pk	196-7203
µSIL-WAX	100	100	75	0.1	2/pk	197-7202

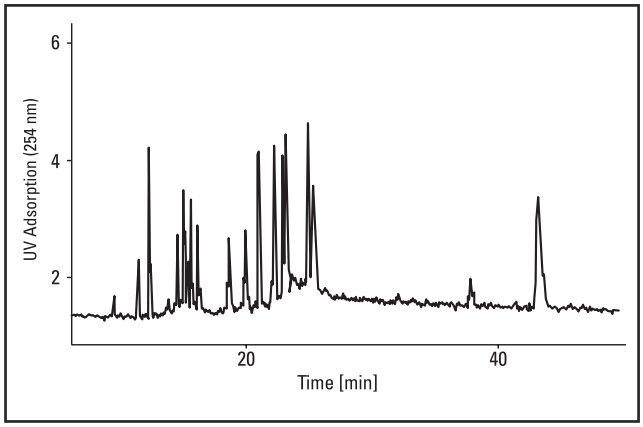
Bulk µSIL-DB Capillaries

µSIL-DB coated capillaries are available as µSIL-DB-1 and µSIL-DB-17. In combination with a cellulose based buffer system, µSIL-DB coated capillaries have been widely used in cIEF applications, PCR product and DNA fragment separation, and many other CE applications which require reduced EOF.

Capillary	ID (mm)	Length (m)	Film Thickness (µm)	Part No.
DB-1	0.05	10	0.05	126-1012
DB-1	0.20	10	0.05	126-1013
DB-1	0.10	10	0.10	127-1012
DB-17	0.10	10	0.05	126-1713
DB-17	0.10	10	0.10	127-1712
DB-17	0.20	10	0.10	127-1713



Analysis of Allelic ladder with µSIL-DNA



Analysis of Myoglobin tryptic digest using µSIL-WAX

Capillary Electrochromatography (CEC) Capillaries

Capillary electrochromatography is a hybrid of CE and LC and can be performed in the Agilent CE system. Using CE capillaries packed with LC stationary phases, CEC offers the loadability and selectivity of LC and the high efficiency of CE.

Using the high pressure capabilities of the Agilent CE system, both ends of the CEC capillary can be pressurized. This process prevents outgassing upon application of high voltage and significantly extends capillary lifetime.

Use CEC to improve resolution of solutes, which are difficult to resolve by HPLC, for hydrophobic solutes which cannot be solubilized in MEKC buffers, or for reduced sample and solvent consumption compared to HPLC.

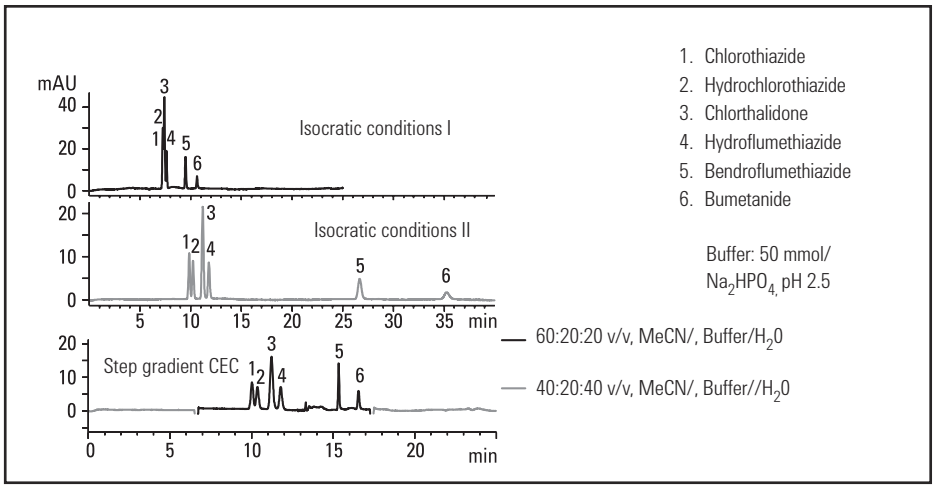
Standard Packed CEC Capillaries, 2/pk

Description	ID (µm)	Total Length (cm)	Effective Length (cm)	Color Code*	Part No.
C18, 3 µm	100	33.5	25	Gray	5063-6512
	100	48.5	40	Gray	5063-6513
C8, 3 µm	100	33.5	25	Gray	5063-6535
	100	48.5	40	Gray	5063-6540
Phenyl, 3 µm	100	33.5	25	Gray	5063-6536
	100	48.5	40	Gray	5063-6541
Hypersil/Phenyl, 3 µm	100	48.5	40	Gray	5063-6544

*The color coding of the capillary (alignment stopper) and the interface allows you to easily combine the correct alignment interface with the capillary.

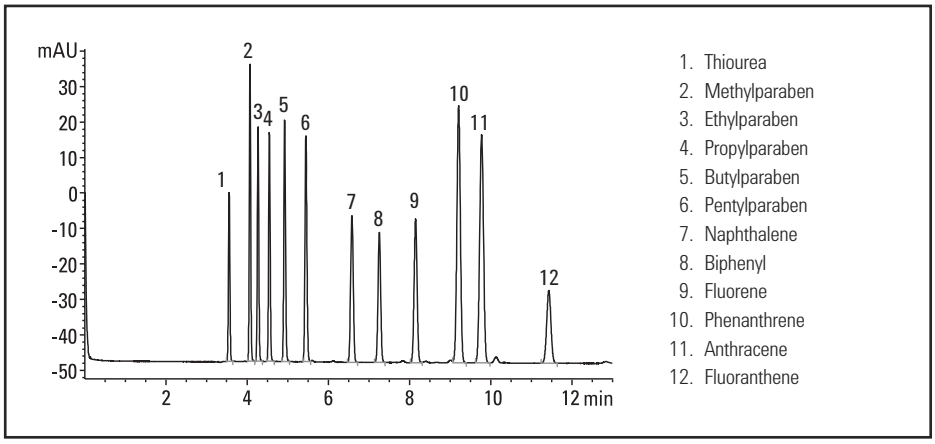


CEC C8 Capillaries, 2/pk, 5063-6535



Capillary Electrochromatography of diuretic test mixture

(courtesy of Dr. Melvin Euerby, Astra Charnwood, UK)



Capillary Electrochromatography of parabens and aromatics

TIPS & TOOLS

CEC capillaries require an Agilent CE system with external gas supply capabilities.

Alignment Interfaces and Capillary Cassette

Agilent Technologies alignment interfaces are an integral part of the Agilent diode-array detection (DAD) system. These interfaces contain optical slits which are precisely matched to the capillary inner diameter for optimized sensitivity and linear detection range.

In combination with the capillary cassette, alignment interfaces simplify capillary exchange, protect the fragile detection window and ensure exact alignment of the window in the detector. Quick-change cassette allows capillary exchange in less than one minute.

Note: The color code of the alignment interface must match the color code of the capillary's built-in alignment stopper.



Alignment interface for standard capillary, G1600-60310

Alignment Interfaces

Description	ID (µm)	Color Code	Corresponding Capillary	G7100 CE Part No.	G1600 CE Part No.
Alignment interface for standard capillary	50	Green	Green	G7100-60210	G1600-60210
	75 100 150	Blue Gray Brown	Blue Gray Brown	G7100-60310	G1600-60310
Alignment interface for Agilent Extended Light Path capillaries	25	Black	Black	G7100-60150	G1600-60150
	50	Red	Red	G7100-60230	G1600-60230
	75	Yellow	Yellow	G7100-60330	G1600-60330
CE/MS alignment interface for 360 µm od capillaries, nonmetallic		Blue	Blue Gray	G7100-60400	

Note: 75, 100 and 150 µm id standard capillaries use the same interface (color blue).
PVA coated 50 and 75 µm id capillary for CE/MS use the same nonmetallic interface with color code blue for use with standard and extended light path capillaries, and the high sensitivity detector cell.



Capillary cassette, G7100-60002

Capillary cassette

Description	G7100 CE Part No.	G1600 CE Part No.
Capillary cassette	G7100-60002	G1600-60002

Note: Only use G7100-60002 cassette in G7100 and G1600-60002 cassette in G1600. Never mix cassettes.

Optical filter for DAD

Description	G7100 CE Part No.	G1600 CE Part No.
Optical filter for DAD 260 nm, for DNA analysis with polyacrylamide filled capillaries and oligonucleotide analysis	G7100-62700	G1600-62700

TIPS & TOOLS

Cassette and interfaces accept all commercially available capillaries (~365 µm od).

Instrument Parts and Supplies

High Sensitivity Detection Cell

The Agilent high sensitivity detection cell – a technological leap which extends sensitivity by an order of magnitude – provides a solution to sensitivity limitations often encountered in CE. This improvement will substantially increase the utility of CE for impurity analysis of chiral drugs, biologicals, and compounds of environmental interest, among others.

The high linear range allows quantification of both <0.1% impurities and the main component in one run. This is useful for all impurity determinations and is especially useful for determining chiral excess.

The high sensitivity detection cell for the Agilent CE system not only improves detection sensitivity more than 10-fold over standard capillaries, but also extends linearity beyond 2000 mAU and provides unsurpassed spectral fidelity. These improvements are a result of a proprietary micromachined design which increases the detection pathlength from 75 µm to 1200 µm while dramatically reducing stray light.

The high sensitivity detection cell has a design comprised of a fused-silica cell body and removable capillaries. The light path through the cell is made from black fused-silica which significantly minimizes stray light and defines the aperture for the diode-array spectrometer. In addition, the reflective interior functions as a "lightpipe," ensuring almost 100% transmission of light which entered the cell. These properties result in enhanced linearity and unsurpassed spectral fidelity with the diode-array detector.



High Sensitivity Detection Cell

Characteristics of the Agilent High Sensitivity Detection Cell

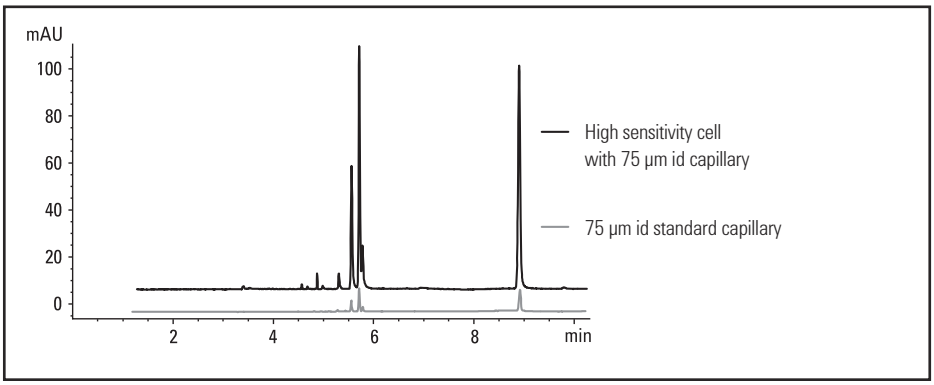
- Up to 10-fold increase in signal-to-noise
- Detector linearity beyond 2000 mAU for accurate quantitative analysis
- Decoupled design allows replaceable capillaries and reduced cost operation
- Special capillary geometry ensures maintenance of peak symmetry
- Full diode-array spectral capabilities
- Design fits all Agilent CE instruments

High Sensitivity Detection Cell

Description	G7100 CE Part No.	G1600 CE Part No.
High sensitivity cell kit Includes detection cell, 75 µm id inlet capillary (72 cm) and outlet capillary (8.5 cm) pair, capillary cassette, fittings (3 fitting screws with seals, 2 fitting caps), cleaning solution, CE Partner CD-ROM	G7100-68723	G1600-68723
CE cell fitting kit Includes 3 fitting screws, 2 fitting caps		G1600-63200
Replacement detection cell		G1600-60027
Cell cleaning fluid, 1 L		5062-8529

Capillary Kits for High Sensitivity Detection Cell

Description	Effective Length (cm)	G1600 CE Part No.
75 µm capillary kit with 8.5 cm outlet	56	G1600-68716
	72	G1600-68715
	88	G1600-68714
PVA coated 75 µm capillary kit with 8.5 cm outlet	56	G1600-68319



Agilent high sensitivity detection cell vs. 75 µm standard capillary for the CZE separation of naphthalene sulfonic acids

CE/MS Accessories

The CE/MS Adapter Kit simplifies coupling the Agilent CE system with MS systems equipped with an electrospray ionization (ESI) source. Integral to this kit is the CE/MS cassette, which completely thermostats the capillary until it exits the CE system. The cassette offers multiple capillary paths that vary the capillary length. A method development configuration uses online diode array detection and MS. For rapid or routine MS analysis, the detector can be bypassed to decrease the total capillary length and reduce analysis time. The CE/MS adapter kit can be used with the complete Agilent 6000 Series mass spectrometers, or virtually any electospray-MS platform.

The CE/MS cassette completely thermostats the capillary until it exits the CE system. Methods development configuration uses online diode array detection (DAD) and MS. For rapid or routine MS analysis the DAD can be by-passed to decrease the total capillary length and reduce analysis time.

The CE/MS Sprayer Kit includes the electrospray needle and splitter assembly, which allows the direct connection of the CE instrument with Agilent and other electrospray MS systems. The CE/MS Sprayer Kit needs the CE/MS Adapter Kit to fully support CE/MS coupling.

CE with tandem UV-Vis and MS detection allows the analysis of complex mixtures. Analyte mixtures are separated and the components detected via UV-Vis absorption, allowing preliminary identification based on peak elution time and UV-Vis spectra, or both, when compared to a standard. Online coupling to electrospray-ionization mass spectrometry (ESI-MS) then reveals unambiguous information on the solute's molecular weight, and possibly structure.

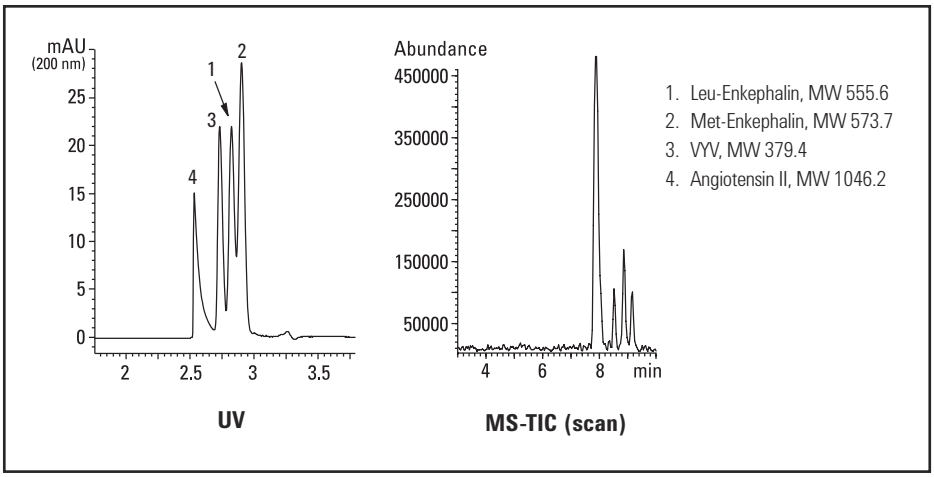


Interfacing the capillary requires an electospray needle which is not included in this kit but in the CE-ESI-MS Nebulizer Kit. For coupling with non-Agilent MS please contact the MS vendor.

CE/MS Adapter Kit

Description	Part No.
CE/MS Adapter Kit For interfacing the Agilent CE system with a mass spectrometer Includes parts below, which can be ordered separately*	G1603A
CE/MS interface cassette, metallic, for G1600 and G7100 CE	G1600-60013
CE/MS alignment interface for 360 µm od capillaries, nonmetallic, for G1600 CE	G1600-60400
CE/MS alignment interface for 360 µm od capillaries, nonmetallic, for G7100 CE	G7100-60400
Bare fused-silica, 50 µm id, 125 cm long, 2/pk	G1600-67311

*Interfacing the capillary requires an electrospray needle which is not included in this kit



CE/MS of 4-component peptide mixture (210 fmol)

CE/MS Sprayer Kit

Description	Unit	Part No.
CE/MS Sprayer Kit Includes CE/MS test sample (5 g quinine sulfate dihydrate) and the parts listed below		G1607A
ES needle assembly		G1607-60041
CE-ESI sprayer		G1607-60001
Splitter assembly		G1607-60000
PEEK ferrule, 360 µm for CE/MS Sprayer		5022-2141
Nut, finger-tight fitting and ferrule	2/pk	0100-1543
Flex loc element	2/pk	1520-0401
Gasket	1/pk	G1607-20030
Ion kit (ammonium acetate)	5 x 5 mL	8500-4410

CE/MS Capillaries

Description	Color Code	Unit	Part No.
Bare fused-silica, 50 µm id, 125 cm long	Green	2/pk	G1600-67311
Bare fused-silica, 50 µm id, 100 cm long	Green	2/pk	G1600-67312
PVA coated capillary, 50 µm id, 125 cm long	Green	1/pk	G1600-67219
PVA coated capillary, 50 µm id, 100 cm long	Green	1/pk	G1600-67220
PVA coated capillary, 75 µm id, 125 cm long	Blue	1/pk	G1600-67319

CE Standards & Reagents

Premade buffers help eliminate the time-consuming buffer preparation process. All Agilent buffers and reagents are designed to meet the stringent demands of CE. Manufactured under GLP/GMP conditions in ISO 9001 facilities, each is shipped with assay information and verification of purity. Chemicals are all electrophoresis grade, with nearly all ionic and organic impurities removed. Solutions are prepared under Class 10 clean room conditions and prefiltered through 0.2 µm filters to ensure removal of particulates. Superior quality control ensures reproducible results bottle-to-bottle and batch-to-batch.

In addition to a set of kit buffers, which are specially designed for dedicated applications, Agilent offers a series of basic CZE buffers covering a broad pH range. The product portfolio also includes special buffers for protein analysis and for Micellar Electrokinetic Chromatography (MEKC). Cleaning and conditioning solutions complete the offering.



Ultra pure CE water, 5062-8578



0.1 N sodium hydroxide, 5062-8575



50 mM sodium phosphate buffer, pH 2.5, 5062-8571

Ultra Pure CE Water

Description	Volume (mL)	Part No.
Ultra pure CE water	500	5062-8578

Capillary Conditioning Solutions

Description	Volume (mL)	Part No.
0.1 N sodium hydroxide	250	5062-8575
1.0 N sodium hydroxide	250	5062-8576
0.1 N phosphoric acid	250	5062-8577

CZE Buffers for Charged Analytes

Description	Volume (mL)	Part No.
50 mM sodium phosphate buffer, pH 2.5	250	5062-8571
50 mM sodium phosphate buffer, pH 7.0	250	5062-8572
50 mM sodium tetraborate buffer, pH 9.3	250	5062-8573
20 mM sodium tetraborate buffer, pH 9.3	100	8500-6782

CZE Buffers for Proteins

Description	Volume (mL)	Part No.
50 mM phosphate, 0.05% hydroxyethyl cellulose buffer, pH 2.5	250	8500-6786
150 mM phosphate, 200 mM ammonium sulfate buffer, pH 7.0	250	8500-6787

MEKC Buffers for Neutral and Charged Analytes

Description	Volume (mL)	Part No.
50 mM sodium tetraborate, 100 mM sodium dodecyl sulfate buffer, pH 9.3*	250	5062-8574

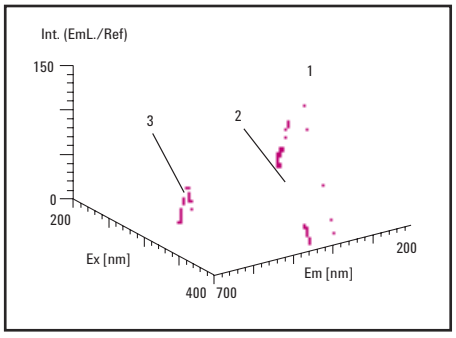
*Dilute with 50 mM sodium tetraborate, pH 9.3 (P/N 5062-8573) to reduce SDS concentration without affecting the tetraborate composition or pH

Plating Bath Analysis Buffer

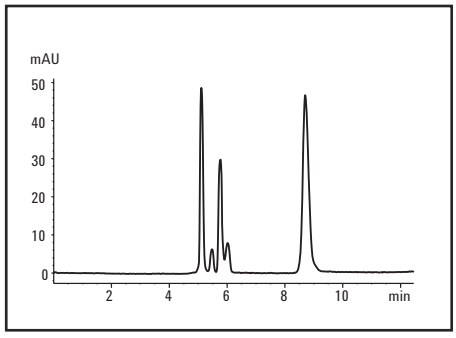
Description	Volume (mL)	Part No.
Plating bath analysis buffer	250	5064-8236

µPAGE Buffer Solutions and Oligo Standards

Description	Part No.
µPAGE tris-borate and urea buffer for µPAGE-10, 4 x 237 mL	590-4005
µPAGE tris-borate and urea buffer for µPAGE-3 and µPAGE-5, 4 x 237 mL	590-4001
µPAGE pd(A)$_{25\text{-}30,\ 40\text{-}60}$ oligonucleotide standard for µPAGE-3 and µPAGE-5, 3 x 50 µL	590-4000



The total fluorimetry spectrum of the 50 mM borate buffer pH 9.2 verifies that the solution is free of fluorescence-active impurities (1 and 2 = Rayleigh stray light of zero and first order, 3 = Raman stray light).



CZE analysis of a peptide mixture using pre-made 50 mM sodium phosphate buffer, pH 2.5



CE System Start-up and Test Kits

CE System Start-up and Test Kits

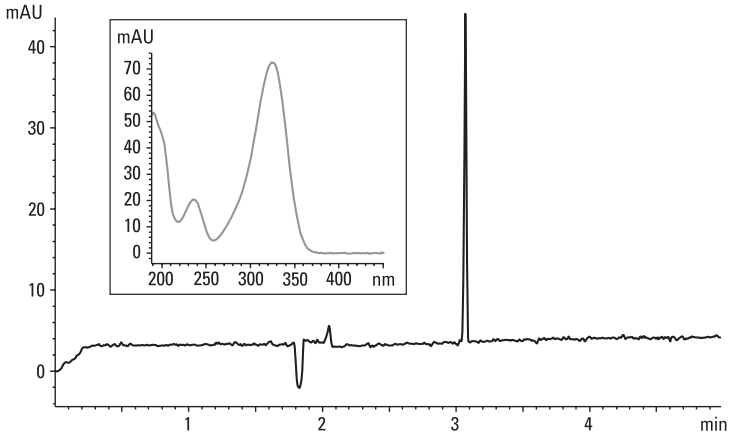
Chemical test kits and validation packages are available to help comply with regulatory and quality standards. The Installation Qualification (IQ) Chemical Kit and Hardware Start-Up Kits, which are shipped with new instruments, are useful for rapidly verifying system functionality. For rigorous testing, the Operational Qualification (OQ)/Performance Verification (PV) Kit can be used to verify DAD noise, drift, linearity, wavelength accuracy and replenishment functionality. The OQ/PV kit is only part of the validation services available from Agilent Technologies. When implemented by qualified Agilent personnel, our service packages can be used to help validate your Agilent CE system.

CE System Start-up and Test Kits

Description	Part No.
CE Installation Qualification (IQ) Kit Includes buffer (20 mM borate, pH 9.3, 100 mL), test sample (4-(hydroxy)-acetophenone, 2 mL), capillary conditioning solution (0.1 N sodium hydroxide, 100 mL)	5063-6514
CE Operational Qualification Performance Verification (OQ/PV) Chemical Kit Includes buffer (20 mM borate, pH 9.3, 100 mL), test samples (0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 mL ea.), capillary conditioning solution (0.1 N sodium hydroxide, 100 mL), test capillary (L 48.5 cm, I 40 cm, id 50 µm), diskette with methods, sequence, spectral library. **Note:** Method is supported for G1600 only.	5063-6515
CE OQ/PV Chemicals Only Kit Includes buffer (20 mM borate, pH 9.3, 100 mL), test samples (0.1, 0.5, 1.0, and 5.0 mM 4-(hydroxy)-acetophenone, 2 mL)	5063-6520

IQ and OQ/PV test method

Sample:	p-Hydroxyacetophenone
Buffer:	20 mM Borate pH 9.2
Capillary:	I = 40 cm, L = 48.5 cm, 50 µm id
Injection:	250 mbar*s
Voltage:	30 kV
Temperature:	20 °C
Detector:	192/4 nm



Vials and Caps for CE

Description	Unit	Part No.
Crimp/snap top vial, 1 mL, Polypropylene, crimp/snap top	100/pk	5182-0567
Clear, wide opening crimp/snap top vial, 2 mL	100/pk	5182-9697
Clear, wide opening crimp/snap top glass vial, 2 mL	500/pk	5183-4623
Amber, wide opening crimp/snap top vial, write-on spot, 2 mL	100/pk	5183-4619
Crimp/snap top vial, 250 µL	1000/pk	9301-0978
Snap caps PEO (polyethylene olefin for chemical resistance)	100/pk	5181-1507
Snap caps PEO (polyethylene olefin for chemical resistance)	500/pk	5181-1513
Snap caps PUR (polyurethane for resealing)*	100/pk	5181-1512
Snap caps PUR (polyurethane for resealing)*	500/pk	5042-6491

*PUR caps are recommended to help prevent sample or buffer evaporation even after multiple injections



Snap caps, polyurethane, 5181-1512, 5042-6491

Instrument Supplies

Description	Unit	Part No.
Long life HiS Deuterium lamp (8-pin) with RFID tag		5190-0917
Deuterium lamp		2140-0585
Electrode assembly, standard (for G1600 only)		G1600-60007
Electrode assembly, short (for G1600 only)		G1600-60033
Electrode assembly, standard (for G7100 only)		G7100-60007
Electrode assembly, short (for G7100 only)		G7100-60033
Electrode O-ring, silicone	5/pk	5062-8544
Electrolyte bottle, 500 mL		9300-1748
Electrolyte bottle, 100 mL		5042-6478
Electrolyte bottle cap		9300-1747
Bottle sealing O-ring		0905-1163
Glass filter, solvent inlet, 20 µm		5041-2168
Filter frit adapter, 3 mm	4/pk	5062-8517
Bottle cap plug		G1600-23223
Air filter, 5 µm		3150-0619
Pre-puncher		G1600-67201
Screws for pre-puncher/insulation plate holding	10/pk	G1600-62402



Electrode assembly, standard (for G1600 only), G1600-60007



Electrode O-ring, silicone, 5062-8544



Electrolyte bottle, 500 mL, 9300-1748



Filter frit adapters, 5062-8517



Air filter, 5 µm, 3150-0619



Screws for pre-puncher/insulation plate holding, G1600-62402



Pre-puncher, G1600-67201



Vial rack, 9301-0722

Accessories

Description	Part No.
CE accessory kit Includes electrode tool, screwdriver, fuses, air filter, glass frit, vials and caps alignment interfaces (red and green) standard and 50 µm id capillaries: L 64.5 cm, Standard: L 64.5 cm, Extended Light Path: L 48.5 cm	G7100-68705
Rack for 12 mm, 2 mL vials, holds 50 vials per rack, 5/pk	9301-0722
CE column cutter	5183-4669
Diamond blade replacement kit for CE column cutter	5183-4670
Capillary tubing cutter, 4/pk	5181-8836



CE column cutter, 5183-4669

Window Etching Tool

The window etching tool is designed for fast, convenient and reproducible preparation of detection windows on fused-silica capillaries. The polyimide coating is removed without destroying the inner polymeric coating. The tool contains three glass blocks with fine grooves, precisely controlling the size of the windows.

Description	Part No.
Window etching tool, 3/pk	590-3003



Window etching tool, 590-3003

Troubleshooting

Basic Capillary Electrophoresis Troubleshooting

Symptom	Possible Cause	Solution(s)
Unstable Current		
Variable or no current	Air bubble formed in capillary	Flush capillary, ramp voltage to limit initial heating, and/or degas buffers.
	Clogged capillary	Flush capillary with absorbing solution (such as NaOH). A "step" on the baseline should be observed when viewing the online signal at 200 nm. If still plugged, flush manually with syringe or high pressure gas.
	Broken capillary	Replace capillary.
	No or incorrect solution in buffer vials	Fill/change buffer vials.
	Large volume injection	Normal situation. Current should stabilize during analysis.
Unstable Baseline		
Spikes in baseline	Precipitates in buffer	Filter buffer through 0.2 or 0.45 µm filter.
	Micro air bubbles in buffer	Degas buffer by ultrasonication or vacuum.
	Precipitation of sample	Verify that sample components are sufficiently soluble in buffer.
Noisy baseline	Optical slit in capillary interface is occluded	Clean slit with methanol or water. View under magnifier.
	Aging deuterium lamp	Use DAD test to measure lamp output and time-on. Replace if necessary.
	Data acquisition rate too high	Determine peak width and decrease acquisition rate if appropriate.
	Improper reference wavelength	Acquire UV spectrum during analysis. Use lowest wavelength possible without impinging where sample absorbs. Also use wide bandwidth.
	Buffer absorbs at detection wavelength	Use minimally UV-absorbing buffers such as phosphate and borate, especially below 210 nm.
Drifting baseline	Improper capillary alignment	Re-seat capillary cartridge in detector block.
	Unequilibrated temperature	Allow 10-20 minutes for equilibration after opening top cover.
	Lamp recently ignited	Allow 15-30 minutes for equilibration after igniting lamp.

(Continued)

Basic Capillary Electrophoresis Troubleshooting

Symptom	Possible Cause	Solution(s)
Poor Peak Efficiency		
Broad peaks	Sample overloading	Decrease sample injection or concentration.
	Excessive Joule heating	Reduce voltage, buffer conductivity, or capillary id.
Skewed peaks	Mismatched sample buffer ion mobilities	Match mobilities or increase difference between buffer and sample conductivity.
	Sample overloading	Decrease sample injection or concentration.
Tailing peaks	Adsorption to capillary wall	Use pH extremes, high buffer concentrations, polymer additives, or coated capillary.
Poor Migration Time Reproducibility		
Adsorption to capillary walls	Changes in EOF caused by buffer (especially phosphates and detergents) or sample adsorption	Condition capillary and allow sufficient equilibration time. Replace capillary.
Hysteresis of wall charge	Caused by conditioning capillary at high (or low) pH and employing a low (or high) pH runnning buffer	Avoid pH differences. Allow sufficient equilibration time.
Changes in buffer composition	pH changes due to electrolysis	Replenish buffer.
	Buffer evaporation	Tightly cap buffer vials and reduce carousel temperature.
	Conditioning solution waste flushed into outlet reservoir	Use separate vial to collect waste.
	Conditioning solution carried over into buffer vial	First dip capillary in separate buffer or water vial.
Buffer reservoirs not level	Generation of laminar flow	Level liquid in reservoirs. If not replenishing buffer, do not use inlet vial for flushing capillary.
Different silanol content of capillary batches	Different wall charge and variations in EOF	Measure EOF and normalize.
Temperature changes	Changes in viscosity and EOF	Use system with capillary thermostatting.

(Continued)

Basic Capillary Electrophoresis Troubleshooting		
Symptom	**Possible Cause**	**Solution(s)**
Poor Peak Area Reproducibility		
Sudden application of high voltage	Heating, thermal expansion of buffer, and expulsion of sample	Ramp separation voltage or inject buffer plug after sample.
Sample evaporation	Increasing sample concentration and peak area	Cap vials and/or reduce temperature of sample carousel.
Instrumental limitations	System rise time significant proportion of injection time	Increase injection time.
Sample carry-over	Extraneous injection	Use capillary with flat, smooth injection end. Remove polyimide from end of capillary.
Zero-injection caused by simply dipping the capillary in the sample	Extraneous injection	Cannot be totally eliminated. Increase injection amount to minimize effect.
Sample adsorption to capillary walls	Distorted peak shape (tailing) Non-eluting sample	Change buffer pH. Increase buffer concentration. Use additive such as cellulose or coated capillary.
Low signal-to-noise ratio	Integration errors	Optimize integration parameters. Increase sample concentration. Use peak height.
Temperature changes of capillary environment	Changes in viscosity and injection amount	Use system with capillary thermostatting.

LC and LC/MS Columns

The largest portfolio of Fast LC columns, and a broad family of phases across all particle sizes for exceptional flexibility and scalability

Whether you are performing conventional or ultra-fast chromatography, separating biomolecules, or analyzing complex basic compounds, you can trust Agilent for the industry's highest-performing columns that deliver the fast, reproducible results you need – all engineered with Agilent's unparalleled quality and reliability.

- **Poroshell 120 columns** – high efficiency and high resolution with up to 50% less pressure than sub-2 µm columns.
- **ZORBAX Rapid Resolution High Definition (RRHD) columns** – 1.8 µm columns feature improved packing processes to achieve stability up to 1200 bar for use with the Agilent 1290 Infinity LC and other UHPLC instruments and are available in more than 14 phases, plus HILIC.
- **ZORBAX Eclipse Plus columns** – C18 and C8 columns deliver superior peak shape, while the phenyl-hexyl bonded phase and C18 bonded phase for PAH separations expand selectivity options for more applications. All Eclipse Plus phases are available in Fast LC/UHPLC RRHD and RRHT columns, 1.8 µm. For scalability, the Eclipse Plus C18 phase is very similar to the Poroshell 120 EC-C18 phase.
- In addition to Poroshell 120 and RRHD columns, **ZORBAX Rapid Resolution High Throughput (RRHT) columns** are a third Fast LC option with over 140 1.8 µm columns choices. RRHT columns are available in 2.1, 3.0 and 4.6 mm ids, all with 600 bar stability.

And remember, when you choose Agilent ZORBAX LC columns, you get more than just a dependable product. You also get over 40 years of expertise – along with unmatched technical support – from the world's largest chromatography supplier. On the web, by phone or in person, Agilent helps you solve the problems that can slow you down and get in the way of your results.



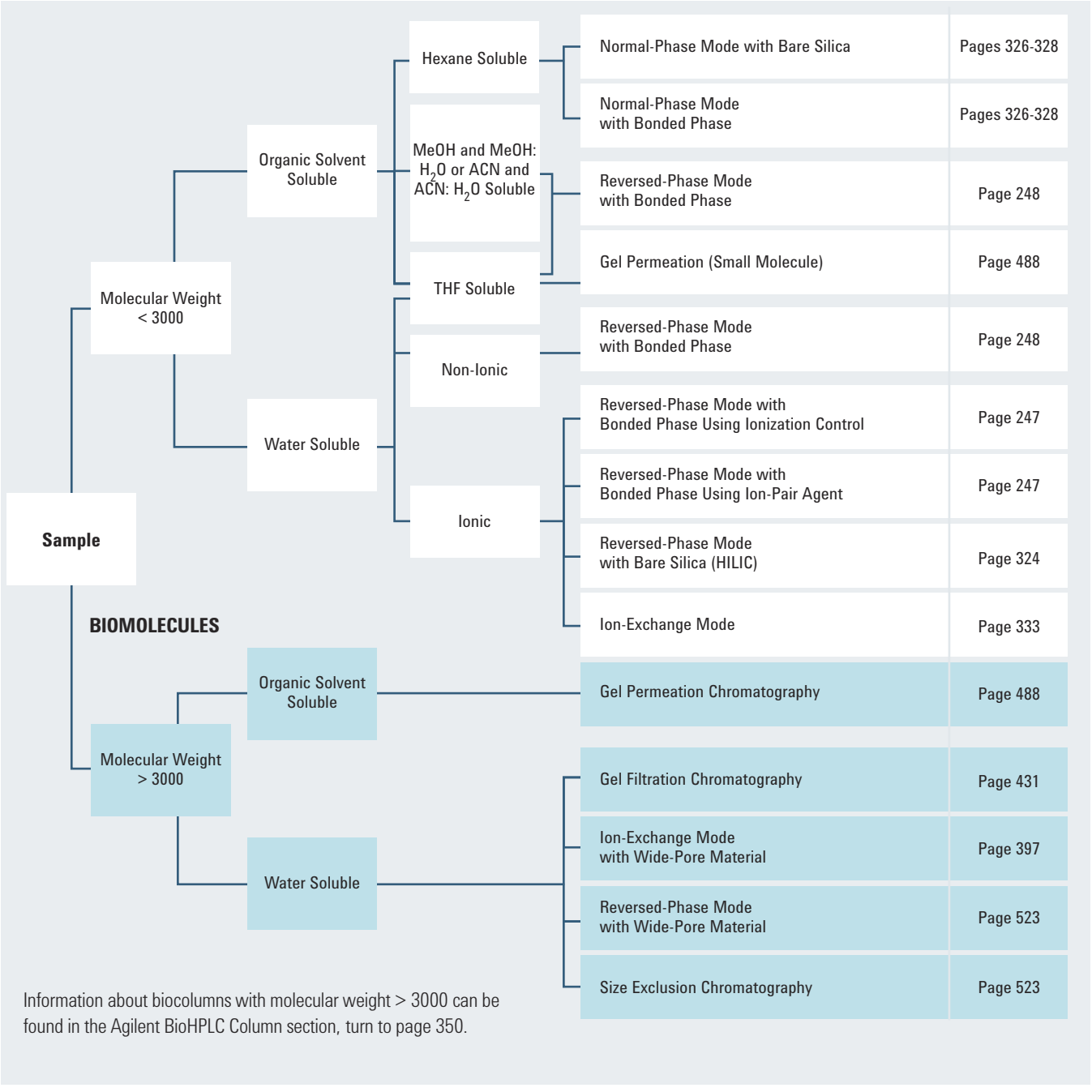
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HPLC Column Selection

To use the column selection guide diagram below, simply follow the path for your analyte and mobile phase. At the far right, follow your final column selection to the pages indicated.



Information about biocolumns with molecular weight > 3000 can be found in the Agilent BioHPLC Column section, turn to page 350.

Adapted with permission from "Practical HPLC Methodology and Applications," Brian A. Bidlingmeyer, John Wiley & Sons, Inc., New York, p. 109

Quick Guide to Agilent Reversed-Phase Bonded Phases		
ZORBAX RP-HPLC Columns	**Recommended Uses and Applications**	**Page No.**
Poroshell 120	• Superficially porous particles for high efficiency at low pressure • Sub-2 µm efficiency with a 2.7 µm particle • Endcapped and non-endcapped C18 and C8 phases, and a variety of other phases, for selectivity optimization • Compatible with 400 bar and 600 bar LC's	228
Eclipse Plus Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Excellent first choice for method development • Long life from pH 2-9 for reliable separations of basic, acidic and neutral compounds • Superior peak shape with basic compounds • High resolution and efficiency with 1.8, 3.5 and 5 µm columns • Rigorous QA/QC testing for greater long-term reproducibility	248
Eclipse XDB Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Four selectivity choices for flexible method development • High performance over a wide pH range (2-9) • Good peak shape for acids, bases and neutrals • Long lifetime with eXtra Dense Bonding and double endcapping • Fast, ultra-fast, and high resolution separations using 1.8 and 3.5 µm columns • Choices from capillary to prep	256
StableBond (SB) Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Basic, acidic, neutral compounds • Exceptional stability at low pH (1-2) • Use of high temperature (up to 90 °C for C18, 80 °C for C8, C3, Phenyl, CN, and Aq) and low pH as an added selectivity tool • Widest selection of bonded phases for different selectivity (C18, C8, C3, CN, Phenyl, Aq) • Uses mobile phases for LC/MS with formic acid, acetic acid, or TFA • Uses mobile phases with TFA for peptide and protein separation • Rapid separations using 1.8 and 3.5 µm columns	264

(Continued)

Information about biocolumns can be found in the section beginning on page 350

Quick Guide to Agilent Reversed-Phase Bonded Phases

ZORBAX RP-HPLC Columns	Recommended Uses and Applications	Page No.
ZORBAX Rx Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• General separation of basic, acidic and neutral compounds at low pH with different selectivity than SB columns • Rx-C8 is the same as SB-C8	272
Bonus-RP Available in Fast LC/UHPLC RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Separating basic compounds in higher aqueous mobile phases • General separation of basic, neutral, acidic compounds at mid-range pH or low pH; especially stable at low pH • Separating peptides for different selectivity • Rapid separations using 3.5 µm columns	278
Extend-C18 Available in Fast LC/UHPLC RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Separating basic compounds above their pKa in free base form; separation of basic, acidic, neutral compounds at high pH; up to pH 11.5 • Uses ammonium hydroxide as mobile phase additive with LC/MS with small molecules or peptides • Separating at high, mid-range and low pH for selectivity changes • Rapid separations using 3.5 µm columns	274
Original ZORBAX Columns	**Recommended Uses and Applications**	**Page No.**
ZORBAX	• General separation of basic, acidic, neutral compounds at low pH with different selectivity than SB columns; higher number of active silanols than SB • "Mixed mode" separation at more neutral pH values • Available in ODS, C8, CN and ODS "Classic" (non-endcapped)	283

TIPS & TOOLS

The LC Handbook: Guide to LC Columns and Method Development

This handy guide makes it easy to choose the right LC column, and contains plenty of tips and tricks to make your job easier and more productive (publication # 5990-7595EN).

Request a copy or download a mobile copy at www.agilent.com/chem/lchandbook



Quick Guide to Additional Agilent Reversed-Phase Columns

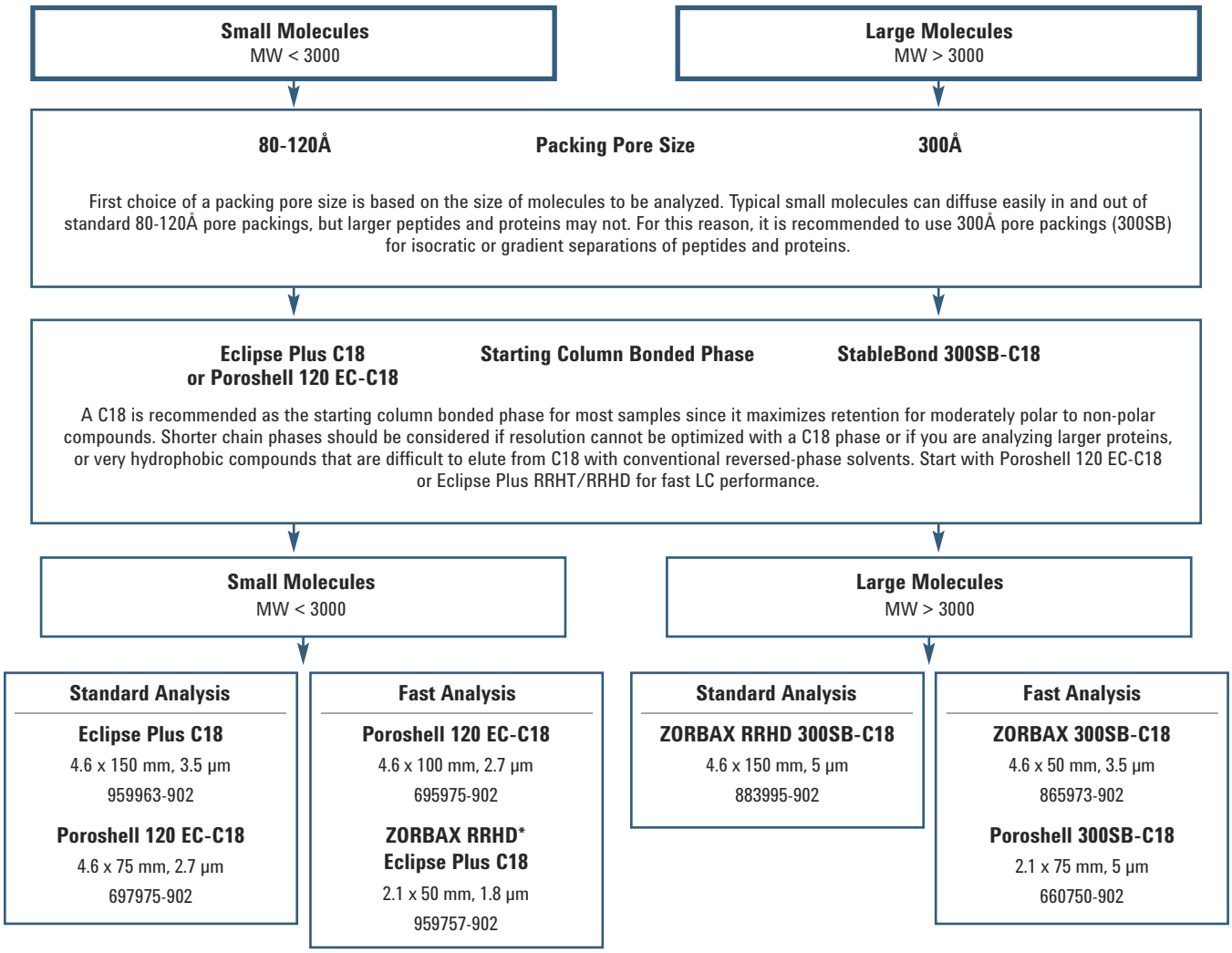
Pursuit Family	Recommended Uses and Applications	Page No.
Pursuit HPLC	• Full range of phases, including C18 and C8 • Diphenyl utilizes strong dipole-dipole hydrogen bonding and pi-pi mechanisms for different selectivity with aromatic compounds • PFP provides excellent separation of polar (halogenated) analytes and positional isomers under standard reversed-phase conditions	287
Pursuit XRs and Pursuit XRs Ultra	• Offer larger surface area and smaller pore size, in complementary phases to Pursuit family • Ultra offers stability to 600 bar, due to special hardware and loading	287
Polaris Family	**Recommended Uses and Applications**	**Page No.**
C18-A and C8-A Available in 3.0, 5.0, and 10 µm (C18-A only)	• C18-A and C8-A offer alternate selectivities for general polar applications • Designed with hydrogen-bond-accepting endcapping	298
Amide-C18 Available in 3.0 and 5.0 µm	• Subtle alternative selectivity due to the absence of steric protection • Utilize an embedded amide, similar to ZORBAX Bonus-RP	298
C18-Ether and C8-Ether Available in 3.0 and 5.0 µm	• Endcapped with an ether group to create a more polar surface for selectivity variation	298
Other Agilent Columns	**Recommended Uses and Applications**	**Page No.**
TC-C18(2) Available in 5 µm	• An excellent choice for mixtures of polar and non-polar compounds, including strong basic compounds	304
HC-C18(2) Available in 5 µm	• High-value, highly retentive option • Carbon load of 17% • Superior peak shape for basic compounds	304

ZORBAX Reversed-Phase HPLC Column Selection Flow Chart

For small and large molecules

Most chromatographers use reversed-phase HPLC as one of their key analysis techniques. Reversed-phase HPLC can be used to analyze ionic and nonionic analytes. Therefore this ZORBAX Column Selection Flow Chart will focus on reversed-phase columns. To more easily select a reversed-phase column for method development of small and large molecules, follow the outline on these pages.

This flow chart provides information on choosing an initial column for method development of small molecule and protein and peptide samples, and includes decisions on bonded phase and column configuration.



* First choice for use on the 1290 Infinity LC or other UHPLC instruments with 1000+ bar pressure limit.

Information about biocolumns can be found in the section beginning on page 350

Column and Mobile Phase Guidelines: Reversed-Phase

HPLC columns consist of two parts: the column chemistry and hardware. For the proper column chemistry, consult the catalog section for each type of bonded phase. For choosing column hardware and particle sizes, consult the section on column sizes and rapid separations, including Agilent ZORBAX Rapid Resolution HT, Solvent Saver, Capillary and PrepHT columns.



ZORBAX Rapid Resolution
High Throughput (RRHT) Columns

Pore Size Selection

Choose a column packing with small pore (60-120Å) if the solute molecular weight is less than about 3000. Otherwise, use column packing with the 300Å pore size.

Particle Size Selection

The typical particle size for HPLC columns is 5 µm with 3.5 µm and smaller, now common in method development. If high-speed analyses or higher resolution analyses are required, packing with 1.8 µm and 2-3 µm particles can be used. Shorter columns with these particles can produce faster high-resolution separations, with the 1.8 µm particle size providing the highest efficiency and 2.7 µm superficially porous providing similar results. With 1.8, 2.7, 3.5 and 5 µm particle sizes to choose from, start with the smallest particle size for your HPLC or UHPLC – 400 bar, 600 bar, or 1200 bar – to achieve the best results.

Column Configuration

Choosing the best column size for method development has changed dramatically in the past few years. Smaller 3.0 mm id or 2.1 mm id columns are now used more than 4.6 mm id to lower solvent use and achieve compatibility with MS detectors. And shorter 50, 75 and 100 mm long columns can be a great starting choice, with longer columns used only when more resolution is needed or when 3.5 and 5 µm particle sizes are used.

TIPS & TOOLS

Need help selecting the right LC column for your method?
Try the Navigator: A selection tool for LC columns and sample prep.
Look for it online and via your mobile device at **http://navigator.chem.agilent.com**



Silica, Polymers, and Bonded Phase

Base Material

The base material for an LC column is most often high purity silica material with totally porous particles such as that used in most Agilent columns, including ZORBAX, Pursuit, and Polaris. However, more choices are available, including polymer material with high pH stability used in PLRP-S columns and superficially porous silica particles such as those used in Poroshell 120 columns. The high purity Type B silicas, including the ZORBAX Rx-SIl used in ZORBAX Eclipse Plus, and superficially porous Poroshell 120, are an excellent first choice for most methods. Type A silicas, such as ZORBAX SIL, used in Original ZORBAX columns, are still manufactured and used in many methods.

Bonded Phase

A good first choice for bonded phase is C18 or C8, and the recommended starting column choices are Eclipse Plus C18 or Poroshell 120 EC-C18. These two choices provide excellent peak shape and can be used over the pH range 2-9, accommodating most typical LC and LC/MS mobile phases. If the sample solutes of interest are not adequately separated on these columns, CN and Phenyl columns – including Phenyl, Phenyl-Hexyl and Diphenyl – may offer significant differences in selectivity from straight-chain alkyl phases to effect the separation.

In general, larger solutes, such as proteins, are best separated on short-chain reversed-phase columns (C3, CN, C8) and peptides and small molecules are separated on longer-chain columns (C18). However, there are many cases where this conventional wisdom does not apply. For example, peptides can also be effectively separated using short-chain columns, and hydrophobic peptides can show better recovery on longer-chain phases. Therefore, it is best to initially select a phase in the middle of the hydrophobic spectrum (e.g., C8), then change to a more hydrophobic phase or more hydrophilic phase depending on initial results and solubility properties of your sample.

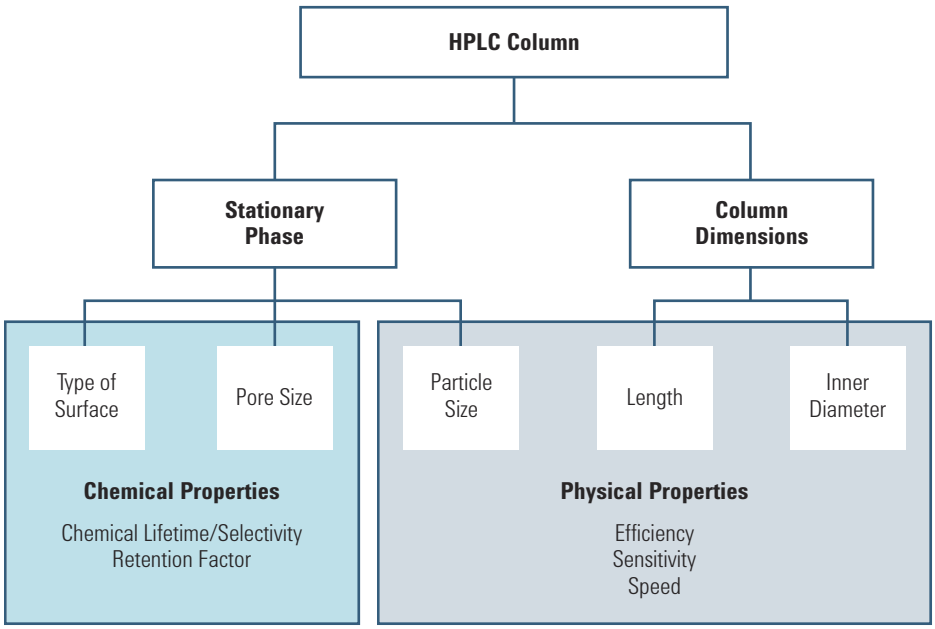
Polymers

When a column is needed that can operate at very low and very high pH, polymeric packings provide an alternative to silica-based materials. Polymeric particles are good for small-scale chromatography, particularly LC/MS, as they are chemically stable and do not leach soluble or particulate species. Reversed-phase spherical polymeric packings used in Agilent PLRP-S columns, for example, are based on a styrene/divinylbenzene copolymer with an inherently hydrophobic surface. No bonded phase is required for reversed-phase chromatography with polymeric particles. These rigid macroporous particles can be coated and derivatized to give a range of functionalities, including weak and strong cation and anion exchangers.

pH and Mobile Phase

The choice of mobile phase for a reversed-phase system starts with selecting the organic modifier. Acetonitrile is the most commonly used organic modifier. However, selectivity differences and sample retention will vary significantly among mobile phases containing acetonitrile, methanol, and tetrahydrofuran (THF). Sample solubility is likely to differ in such solvents and dictate use of a specific solvent or solvents. UV detection at certain wavelengths is not possible with certain modifiers (e.g., methanol at 200 nm).

Both pH and ionic strength of the aqueous portion of mobile phases are important parameters in developing rugged methods that are not sensitive to small variations in conditions. With ionic compounds, retention of typical species shows significant changes with pH. It is very important to control pH in such reversed-phase systems to stabilize retention and resolution. A pH between 2 and 4 generally provides the most stable conditions for retention vs. small changes in pH, and this pH is recommended for starting method development for most samples, including basic compounds and typical weak acids.



Working with LC/MS

When choosing HPLC columns for LC/MS, chromatographers often need to consider several aspects of their method and separation, typically including resolution, flow rate, and stationary phase choice. Often, for relatively simple analytes, shorter high resolution columns are the best choice. These columns allow for high throughput while maintaining high separation efficiency. Narrow bore Rapid Resolution High Definition (RRHD) for separations (> 600 bar) and Poroshell 120 columns (< 600 bar) offer high resolution even in shorter columns dimensions. For more difficult samples, users should seek longer column lengths.

Since many LC/MS analyses are run at lower flow rates (typically from µL/min flow rates up to 1 mL/min), moving to smaller internal diameter columns is the best choice for the user. Agilent's Solvent Saver (3.0 mm id) and narrow bore (2.1 mm id) will often result in lower solvent usage for the method, and are excellent options for high resolution and higher sensitivity than the larger id columns.

Most often, the best bonded phase choice is an endcapped C18 phase. Eclipse Plus C18 is a high performance endcapped C18 phase available in sub-2 µm RRHD and RRHT column formats. For fast high-throughput separations with LC/MS, Poroshell 120 EC-C18 is an excellent choice. Poroshell has a larger frit, so it's well suited for dirtier LC/MS samples, such as blood plasma, which may often clog columns with smaller porosity frits.

Both Eclipse Plus C18 and Poroshell 120 EC-C18 phases are stable over a wide pH range and are compatible with the volatile buffers such as acetic and formic acids.

TIPS & TOOLS

LC Flow Rate Calculator App

This FREE Smartphone app lets you quickly adjust your flow rate to accommodate other method changes.

Download at **www.agilent.com/chem/lcapp**



Transferring your method to a high efficiency column

High efficiency columns for UHPLC/Fast LC will help you increase your analytical speed and resolution. Depending on the instrument configuration you are using, you may need to make a few adjustments to get the most from these columns.

Because of their high efficiency, very narrow peaks elute from higher efficiency columns quickly. While modern HPLC instrumentation and data systems are able to capture the benefits of these particles, attention to instrumental configuration is important to get the best results.

Steps to transfer your method:

Check the specifications that came with your instrument – Your instrument may already be configured appropriately for high efficiency columns. If not, then continue.

Optimize the data collection rate for LC and LC/MS (at least 40 Hz detector with fast response time for UV) – Set the detector to the fastest setting, then to the second fastest setting and evaluate if the resolution is different.

Use a semi-micro or micro-flow cell – Smaller volume flow cells such as the semi-micro (6 mm/5 µL) or micro (3 mm/2 µL) are recommended for best performance. There are newer cartridge flow cells (e.g. the Ultra Low-Dispersion Max-Light Ultra Flow Cell, P/N G4212-60007) designed to optimize UHPLC instrument performance.

TIPS & TOOLS

For the Agilent 1290 Infinity LC, in situations requiring extremely low dead volumes, use the ultra-low dispersion kit, which includes an ultra-low dispersion flow cell and 0.08 mm id capillaries.

Minimize tubing volume in the instrument – Use Red (0.12 mm id) tubing instead of Green (0.17 mm id) as it has only half of the volume that the sample has to travel through. This cuts down extra column band broadening. Ensure that your connections are as short as possible. The key locations to check are:

- The autosampler needle seat
- The autosampler to the Thermostatted Column Compartment – or 'TCC'
- The TCC to the column
- The column to the flow cell, including the internal diameter of the integral flow cell inlet capillary

All of these specific capillaries can be ordered individually from Agilent, in the lengths you need, and for your instrument.

Turn to pages 36-39.

Scale your gradient profile and injection volume – If using gradient elution, scale the gradient profile and injection volume to the new smaller column to quickly transfer the method and avoid overloading. For isocratic and gradient elution, make sure that you scale the injection volume to match the overall column volume.

Minimize injection sample dispersion in the column – Use an injection solvent with solvent strength that is equivalent to or weaker than the mobile phase, especially when using an isocratic method. This is good practice in general for any column, and more important with high efficiency columns.

TIPS & TOOLS

See a video that takes you through these steps at
www.agilent.com/chem/poroshell120video

Also, check out the LC Method Translator Tool at
www.agilent.com/chem/lcmethodtranslator



Take care to make proper connections – Agilent recommends Swagelok fittings with front and back ferrules, which give best sealing performance throughout our LC system (use this on the instrument connections, i.e. valves, heaters, etc). Polyketone fittings are highly recommended for up to 600 bar. Use this fitting (P/N 5042-8957) on column connections with Poroshell 120. For RRHD columns, use Agilent's removable 1200 bar fitting (P/N 5067-4733).

Optimize your flow rate – For Poroshell 120, if you're using a 2.1 mm id, the suggested starting flow rate is 0.42 mL/min; for 3.0 mm id Poroshell 120 columns, we suggest starting at 0.85 mL/min, and for 4.6 mm id, we suggest starting at 1.5 - 2 mL/min.



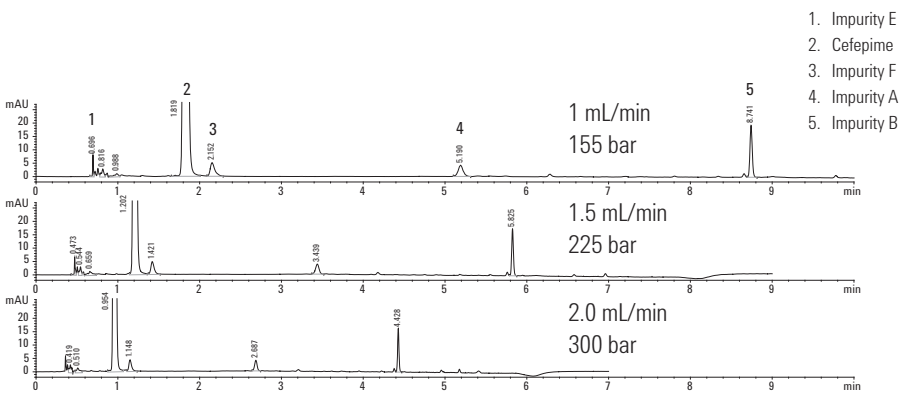
1200 bar removable fitting (SV), 5067-4733

Fast analysis of cefepime and related impurities

Column: **Poroshell 120 EC-C18 697975-902 4.6 x 75 mm, 2.7 µm**

Instrument: Agilent 1200 Infinity Series Rapid Resolution LC System

Detector: DAD, 254 nm



VHP FITTINGS

Agilent's 1200 bar removable fitting (for 1/16 in od capillaries) consists of a stainless steel screw, an internal stainless steel ferrule and a front ferrule in PEEK. The fitting can be used throughout the flow path, but because it can be re-used without losing tightness, it is especially suitable for the connection between the heat exchanger and the column. This new and improved fitting replaces the standard stainless steel Swagelok fitting which was not removable. The Very High Pressure (VHP) fitting is available in three sizes – short (P/N 5067-4733), long (P/N 5067-4738) and extra long (P/N 5067-4739). The short fitting is the one that is most commonly used, and will be appropriate 90% of the time. In some cases, if using columns with longer nuts, a longer fitting will be needed.



Agilent LC Columns Overview: Small Molecules

Start with Poroshell 120 for Fast LC performance on any HPLC – phases align with ZORBAX family.

Poroshell 120

Up to 50% less pressure than sub-2 µm; a total lab productivity enhancer

1.7 µm solid core; 0.5 µm porous outer layer for a 2.7 µm particle, id's: 4.6 mm, 3.0 mm, 2.1 mm, Lengths: 30-150 mm.

New phases coming soon! Check **www.agilent.com/chem/poroshell120**

Compatible with HPLC and UHPLC instruments. Suitable for analysis of acids, bases, and neutrals. Also great for peptide mapping.

Poroshell 120 is for any lab looking for increased analytical speed and resolution with less backpressure.



Poroshell 120 SB-C18 (USP L1), SB-C8
Carbon Load: SB-C18 - 7.5%, SB-C8 - 4.5%

Poroshell 120 EC-C18 (USP L1), EC-C8** (USP L1), Phenyl-Hexyl (USP L11)**
Carbon Load: Phenyl-Hexyl - 8%

Poroshell 120 EC-CN (USP L10)

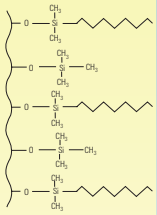
****Best Phase for Method Development**

ZORBAX Family

ZORBAX Eclipse Plus**

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 30-250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm; Prep

C18 (USP L1),
C8 (USP L7),
Phenyl-Hexyl (USP L11),
PAH (USP L1)



High performance and excellent peak shape with acids, bases and neutrals.

Sample Applications
Environmental: EPA Method 1694, Illicit and prescribed drugs in wastewater
Food Safety: Quinolone antibiotics
Pharmaceutical: Chloramphenicol, Simvastatin, Chrysophenol (TCM), amphetamine, ranitidine

Double Endcapped
(except PAH, which is not endcapped)
Temp limit: 60 °C
Pore size: 95Å
Surface area:
160 m^2/g

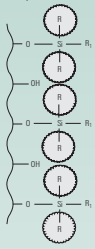
Particle sizes:
1.8, 3.5, 5 µm
pH: 2.0-9.0 for C18, C8; 2.0-8.0 for PAH, Phenyl-Hexyl
Carbon load:
C18: 9%; C8: 7%;
Phenyl-Hexyl: 9% ;
PAH: 14%

Best all around – exceptional peak shape, efficiency, resolution, and lifetime

ZORBAX StableBond

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 20-250 mm
IDs: 4.6 mm , 3.0 mm, 2.1 mm, 1.0 mm;
Prep, Capillary (C18)

SB-C18 (USP L1),
SB-C8 (USP L7),
SB-C3 (USP L56),
SB-Phenyl (USP L11),
SB-CN (USP L10),
SB-Aq



High performance with acids, bases, and neutrals with superior lifetime at low pH.

Sample Applications
Chemical/Industrial: Triton
Environmental: Organic acids, pesticides in drinking water
Food Safety: Anthocyanine, parabenes, melamine
Pharmaceutical: Analgesics, anesthetics, traditional Chinese medicine

Non-Endcapped
Temp limit: 80 °C
(90 °C for SB-C18)
Pore size: 80Å
Surface area:
180 m^2/g
Particle sizes:
1.8, 3.5, 5, 7 µm

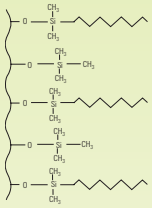
pH: 1.0-8.0
(0.8-8.0 for SB-C18)
Carbon Load:
C18: 10%; C8: 5.5%;
C3: 4%; Phenyl: 5.5%;
CN: 4%,
Aq: Proprietary

Best for low pH mobile phases – great for method development

ZORBAX Eclipse XDB

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 15-250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm;
Capillary and Prep

C18 (USP L1),
C8 (USP L7),
Phenyl (USP L11),
CN (USP L10)



Good peak shape for basic, acidic, and neutral compounds with high performance over a wide pH range (pH 2-9). eXtra Dense Bonding and double endcapping help give this column a long lifetime.

Sample Applications
Environmental: Herbicides/pesticides, steroids in water
Food Safety: Food colors, aromatic flavorings, mycotoxins, epoxyphenolic-based can coatings
Pharmaceutical: Goldenseal and related alkaloids, antidepressants, triamcinolone

Double Endcapped
Temp limit: 60 °C
Pore size: 80Å
Surface area:
180 m^2/g
Particle sizes:
1.8, 3.5, 5, 7 µm

pH: 2.0-9.0
(2.0-8.0 for CN)
Carbon load:
C18: 10%; C8: 7.6%;
Phenyl: 7.2%;
CN: 4.3%

High performance over a wide pH range

Pursuit/ Pursuit XRs

Lengths: 30-250 mm
IDs: 2.0 mm, 3.0 mm, 4.6 mm; Prep

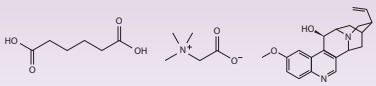
C18 (USP L1), **C8** (USP L7),
Diphenyl (USP L11), **PFP** (USP L43),
PAH (USP L1), **Si** (USP L3)

Pursuit XRs offers higher loadability and Pursuit XRs Ultra is loaded for higher pressure stability.

Endcapped
(except Pursuit XRs Si)
Pore Size: 200Å (Pursuit),
100Å (Pursuit XRs)
Surface area: 200 m^2/g (Pursuit); 440 m^2/g (Pursuit XRs)
Particle Sizes:
3, 5, 10 µm

pH: 2.0-9.0
Carbon Load:
Pursuit C18: 12.9%;
Pursuit C8: 7.4%;
Pursuit Diphenyl: 7.3%;
PFP: 6.3%; XRs C18: 22%; XRs Ultra C18: 23.3%; XRs Ultra C8: 15%; XRs Ultra Diphenyl: 14.6%

Reliable Selectivity Alternatives



Endcapped: EC-C18, EC-C8, Phenyl-Hexyl, Bonus-RP (triple), EC-CN
Non-endcapped: SB-C18, SB-C8 and SB-Aq
Temp Limit: 60 °C (EC-C18, EC-C8, Phenyl-Hexyl, Bonus-RP); 80 °C (SB-C8, SB-Aq); 90 °C (SB-C18)
Pore Size: 120Å ; Surface Area: 130 m^2/g; pH: 2.0-8.0 (EC-C18, EC-C8, Phenyl-Hexyl); 1.0-8.0 (SB-C18, SB-C8, SB-Aq); 2.0-9.0 (Bonus-RP); Carbon Load: 8% (EC-C18); 7% (EC-C8)

Poroshell 120 Bonus-RP (USP L60)
Carbon Load - 7.5%

Poroshell 120 SB-AQ
Carbon Load: Proprietary

POLAR Compounds

ZORBAX Extend-C18

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 20-250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm

C18 (USP L1)



High efficiency and long life at high pH – up to pH 11.5. Improve retention, resolution and peak shape of basic compounds. High sensitivity for LC/MS separations of peptides. Unique bidendate bonding and double endcapping provides high pH stability.

Sample Applications
Environmental: EPA 8330 (explosives)
Food Safety: Aflatoxins, mycotoxins
Pharmaceutical: Antihistamines, xanthines

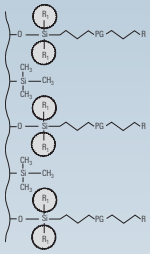
Double-Endcapped
Temp limit: 60 °C
Pore Size: 80Å
Surface area:
180 m^2/g
Particle sizes:
1.8, 3.5, 5 µm
pH: 2.0-11.5
Carbon load: 12.5%

A good option for separations at high pH

ZORBAX Bonus-RP

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 30-250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm; Prep

Bonus-RP (USP-L60)



Polar-embedded to improve peak shapes; for basic compounds at low and mid pH.

Sample Applications
Environmental: Triazine pesticides
Food Safety: Hydroxymethylfurfural
Pharmaceutical: Antifungal medications, anorectics, ulcer medications

Triple-Endcapped
Temp limit: 60 °C
Pore size: 80Å
Surface area:
180 m^2/g
Particle sizes:
1.8, 3.5, 5 µm
pH: 2.0-9.0
Carbon load: 9.5%

Alternative selectivity to alkyl, phenyl, cyano phases

SB-AQ

RRHD: 1.8 µm stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 20 - 250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm; Prep

ZORBAX SB-Aq

Proprietary phase ideal for polar compounds and high aqueous conditions.

Sample Applications
Environmental: Pesticides in drinking water
Food Safety: Pesticides in food
Pharmaceutical: Water-soluble vitamins

See ZORBAX StableBond for specification and structure.

Exceptional lifetime at low pH – no endcapping

Polaris

Lengths: 30-250 mm,
(available in
3 µm and 5 µm particles)
IDs: 2.0 mm, 3.0 mm, 4.6 mm; Prep

C18-A (USP L1), **C8-A** (USP L7),
C18-Ether (USP L1), **C8-Ether** (USP L7),
Amide-C18 (USP L60), **NH2** (USP L8),
Si-A (USP L3)

Hydrogen-bond accepting and ether group endcapping provide alternate selectivities.

Sample Applications
Environmental: Triazine pesticides
Food Safety: Hydroxymethylfurfural
Pharmaceutical: Antifungal medications, anorectics, ulcer medications

Endcapped
Pore size: 180Å
Surface Area:
200 m^2/g
Particle Sizes:
3, 5, 10 µm
pH: 2.0-9.0
Carbon load: Polaris C18-A: 13.8%; Polaris C8-A: 7.4%; Polaris C18-Ether: 12.1%; Polaris C8-Ether: 7.1%

More options for Polar Compounds

Information about biocolumns can be found in the section beginning on page 350

Looking for a HILIC column?

HILIC Plus is a HILIC column based on Eclipse Plus silica for excellent peak shapes

Poroshell 120 HILIC: 2.7 µm, stable to 600 bar

Non-bonded silica
Pore size: 95Å (120Å, Poroshell 120)
Surface Area: 160 m^2/g(130 m^2/g for Poroshell 120)
Particle Sizes: 1.8, 2.7, 3.5 µm
pH: 0-8.0

RRHD: 1.8 µm,
stable to 1200 bar
Lengths: 50, 100, 150 mm
IDs: 4.6 mm (3.5 µm only), 3.0 mm, 2.1 mm

High sensitivity for LC/MS applications and recommended for EPA 1694.

Method Development from pH 1-12

Start method development at low pH (pH 2-3)

With so many column choices available, how do you know where to start your method development? The recommended starting point for method development is using a buffered low pH mobile phase – around pH 2-3. Using a low pH mobile phase most often results in the best peak shape for basic compounds on silica-based columns. At low pH, the silanols on the silica are fully protonated so positively charged basic compounds do not interact strongly. The result is good peak shape. Many acidic compounds are non-charged, maximizing their retention at low pH. These observations are key advantages to method development at low pH.

For standard analytical work, start method development with acetonitrile as the mobile phase organic modifier and 20-50 mM phosphate buffer (pH 2-3) as the aqueous component for non-LC/MS applications. These conditions provide good pH control, necessary for the most reproducible analyses of ionizable compounds. For LC/MS applications formic acid or TFA are good mobile phase additives for low pH.

Optimize solvents and bonded phases at low pH

The initial method development steps may lead very quickly to a satisfactory separation. But if more optimization is needed, acetonitrile can be replaced with methanol or tetrahydrofuran and the separation re-optimized. This step may lead to a satisfactory solution, but if still more selectivity optimization is needed, the column bonded phase can be changed.

At low pH there are many bonded phase choices available for optimization. These include the Eclipse Plus phases as well as the Eclipse XDB family with C18, C8, Phenyl and CN. Alternate choices include five different StableBond bonded phases: SB-C18, SB-C8, SB-Phenyl, SB-CN, and SB-C3. For polar analytes, try Bonus-RP, SB-Aq or the Polaris family, including C18-A, C8-A, C18-Ether and Amide-C18 phases.

It may be necessary at low pH to improve the retention of acidic compounds. For these situations, lower the pH even further, down to pH 1-2, and use StableBond columns. These columns provide the greatest stability at very low pH and provide many selectivity options for achieving the highest resolution separations.

TIPS & TOOLS

LC Method Translator

Use this online tool to quickly factor in changes to column length, diameter, flow rate, and more – and to calculate method adjustments. This is particularly useful for gradient methods.

To download, go to **www.agilent.com/chem/lcmethodtranslator**



Choose Agilent ZORBAX Eclipse Plus or Poroshell 120 for method development at mid pH (pH 4-9)

There are some samples that may not be resolved at low pH or may have better solubility and stability at mid pH. The Eclipse Plus C18 and Poroshell 120 EC-C18 columns can be used at the mid pH range for method development. The Eclipse Plus column is stable to pH 9 so it is equally reliable at mid pH. These double endcapped columns have two key advantages – good peak shape at low and mid pH, as well as sufficient bonded phase density to protect the column from silica degradation from pH 6-9.

At mid pH, basic compounds (e.g., amines) may still have a positive charge and the silanols on the silica surface may have a negative charge. Therefore covering as many silanols as possible leads to the best peak shape at mid pH. This makes the Eclipse Plus C18 the best starting choice for a column at mid pH. Phosphate buffer is usually the first choice for mobile phase modifier at pH 7 because its buffer range is pH 6.1-8.1. A second choice for mid pH is acetate buffer since it buffers from pH 3.8-5.8 and its volatility makes it a good choice for LC/MS compatibility.

Choose Agilent ZORBAX Extend-C18 columns for method development at high pH (pH 9-12)

At low or mid pH, some separations of basic compounds may still not have enough retention or the desired selectivity. For these samples, high pH separations may be appropriate. Until recently, high pH separations on silica-based columns were avoided because of short column lifetimes, due to dissolution of the underlying silica gel. Special bonded phases such as the ZORBAX Extend-C18, can protect the silica from dissolution, so that a reasonable column lifetime can be achieved and the selectivity advantages of high pH can be explored.

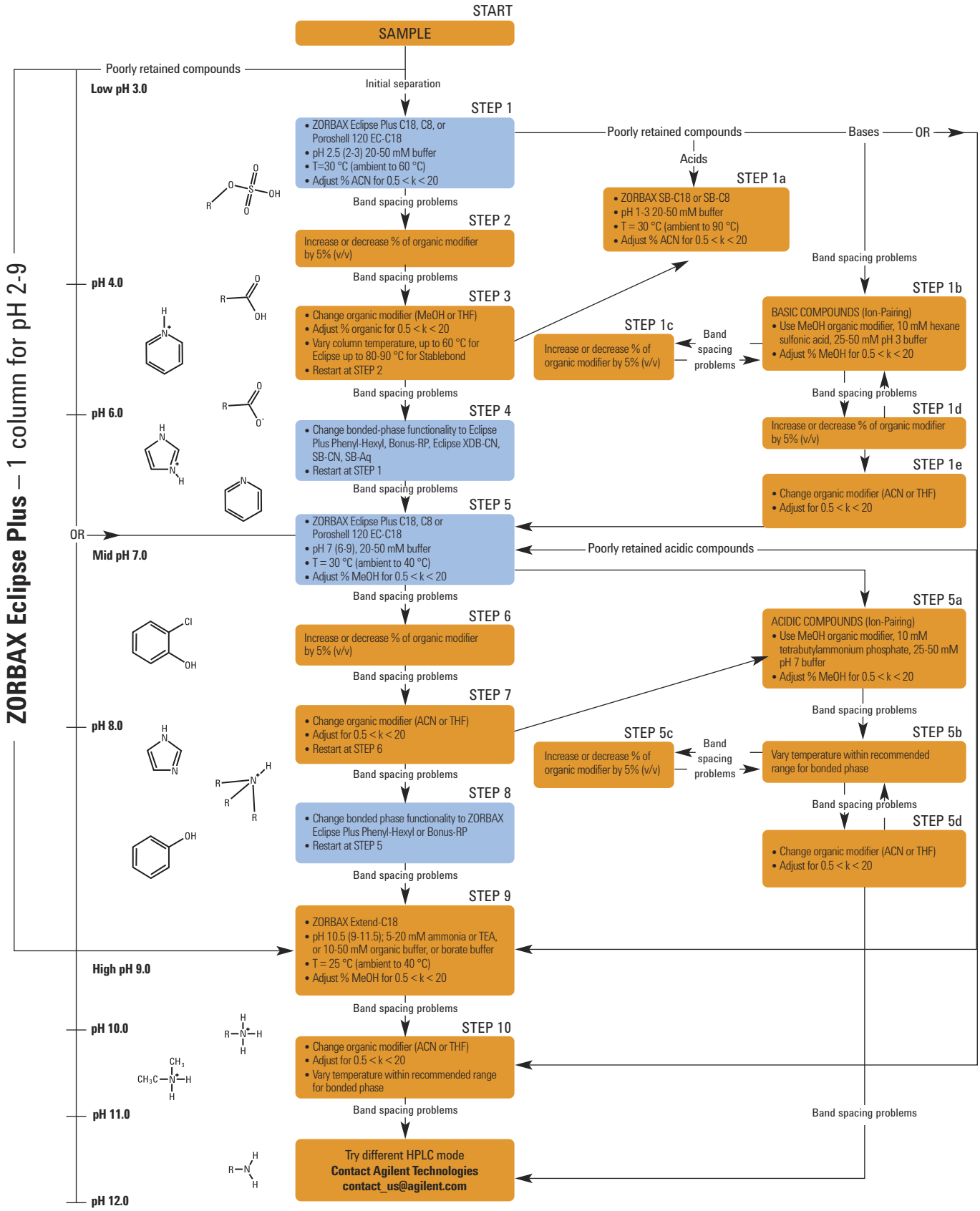
The mobile phase buffer choices at high pH with the Extend-C18 column are organic buffers like triethylamine and ammonium hydroxide. These buffers are best used with methanol as the organic modifier to extend the column lifetime at high pH. This is another good option to consider when working with high pH and PLRP-S columns, which are made from a polymeric material.

EASY, RELIABLE PH TESTING

Agilent offers a full line of pH meters and electrodes. Designed for chromatographers, these pH meters offer intuitive user design and exceptional ruggedness for your lab. Learn more at **www.agilent.com/chem/AgilentpH**



Method Development Guidelines from Low to High pH



Guard Columns

The Value of Guard Columns

Guard columns can help extend the life of your analytical column. Choosing to use guard columns can help reduce operating expenses, by reducing the frequency of analytical column replacement.

The guard column prevents damage caused by particulate matter and strongly adsorbed material. To maintain an adequate capacity for sample impurities, choose a guard column with an internal diameter similar to the column internal diameter. Ideally, the packing of the guard column should be the same as the analytical column so that the chromatography of the analytical column is not altered.

Guard columns contribute to the separation, so you should include a guard column in-line during method development.

Agilent UHPLC guards provide protection for high-efficiency Poroshell 120 and ZORBAX RRHD and RRHT columns, without reducing performance. Part numbers for all guard columns are incorporated into the different product family tables.

Judging when to replace a guard column can be difficult. As a rough guide, if plate number, pressure or resolution change by more than 10%, the guard column probably needs replacing. You will need to make a judgment call on how often to replace your guard columns based on your application type. It is always preferable to change the guard column sooner rather than later.



UHPLC Guard, 1200 bar, 821725-903

Cartridge Selection Guide

Icon*	Type of Cartridge	Features	Benefits
AC	Agilent HPLC Cartridge	Can reverse collets in the end fitting to add guard cartridges	Inexpensive Extends column lifetime Permits rapid column changes Can use 2, 3, 4 and 4.6 mm cartridges
		Cartridges have a unique filter and sieve at each end	Helps prevent blockage
ZGC	ZORBAX Guard Cartridge: Standalone system	High efficiency, standalone, low-dead-volume cartridge	Seals up to 5000 psi (340 bar) or 3000 psi with a PEEK fitting
		Polymeric cartridge designed for leak-tight seals against metal surfaces	No gaskets required More solvent-resistant than PEEK
		Reusable fittings	Adapt for connections to 1/16 in LC fittings
RR	ZORBAX Rapid Resolution and Rapid Resolution HT Cartridge Columns: 3.5 µm and 1.8 µm packings, Standalone system	For high throughput LC/MS, LC/MS/MS and combinatorial separations	
		Packed with Eclipse XDB for pH use from 2-9 Packed with StableBond for low pH use	For all analyte types Low bleed
		Sold individually or as three-packs	
P	ZORBAX Semi-Preparative Guard HPLC Hardware Kit: Standalone system	Easy, low-dead-volume assembly	Seals up to 2000 psi (135 bar, 13.5 MPa)
		Tubing (polyphenylene sulfone) designed for leak-tight seals against metal surfaces	No gaskets required
		Reusable fittings	Adapt for connections to 1/16 in LC fittings
PI	ZORBAX and Agilent Prep Preparative Cartridge Column and Guard HPLC System: Standalone and integral hardware options	Easy, low-dead-volume assembly	Extends column lifetime
		Reusable fittings	Permits rapid column changes
		Hardware options for integral and external guards	Can use with 21.2 and 30 mm id columns
PL	Polymeric Analytical Column and Guard Cartridge	High efficiency	Inexpensive
		Low dead volume	Rapid cartridge changes
		Reusable holder	Extends column lifetime
CS	ChromSep Column Hardware: Complete systems and replacement cartridges	Easy, no-dead-volume assembly	Economical format No tools required Modular flexibility
MG	MetaGuard Column Hardware: Complete systems and replacement cartridges	Easy, no-dead-volume assembly	Economical format No tools required Modular flexibility
UG	Agilent Fast Guards for UHPLC	Requires no special hardware – connects right to the analytical column	Extends column lifetime without impacting performance
		Available in matching phases for Poroshell 120, RRHD and RRHT columns	

*Look for these icons to help you select the proper guard cartridges and columns.

Cartridge/Guard Cartridge Systems Compatibility Guide*

Icon	Column Type	Guard Cartridge Holder	ID (mm)	Phases
AC	Cartridge column cartridge holder 5021-1845 	Guard cartridge (internal system) cartridge holder 5021-1845 	2.0 3.0 4.0 4.6	LiChrospher Nucleosil Purospher Superspher ZORBAX
ZGC	Standard fitting 	Column guard cartridge (standalone) cartridge holder 820999-901 	2.1 3.0 4.6	ZORBAX
RR	Rapid Resolution cartridge holder 820555-901 	No guard cartridge holder	4.6	ZORBAX
P	Semi-preparative column 	Semi-prep guard cartridge (standalone) cartridge holder 840140-901 	9.4	ZORBAX

(Continued)

Cartridge/Guard Cartridge Systems Compatibility Guide*

Icon	Column Type	Guard Cartridge Holder	ID (mm)	Phases
PT	PrepHT	Guard cartridge 820444-901 	21.2	ZORBAX Agilent Prep
PL	Analytical 	Guard cartridge holder (PL1310-0016) and PLRP-S guard cartridges, 2/pk (PL1612-1801) 	3.0	PLRP-S
MG	Single replacement column 	No guard cartridge holder	1.0 2.0 4.6	Pursuit Pursuit XRs Polaris phases
UG NEW!	Fast Guards for UHPLC: Single replacement guard column 	No guard cartridge holder	2.1 3.0 4.6	Poroshell 120: EC-C18 EC-C8 SB-C18 Phenyl-Hexyl Sub-2 µm: Eclipse Plus C18 Eclipse XDB-C18 SB-C18 SB-C8

*Standalone guard cartridges fit all cartridge and standard fitting columns available from Agilent. All columns without icons are standard fitting columns.

Fast Columns for Reversed-Phase HPLC/UHPLC



The past decade has seen a steady increase in the efficiency and speed of chromatography, starting with smaller particle sizes, that enable higher resolution, and continuing with new technological advances in particle design – superficially porous particles – that enable these same resolution enhancements with lower backpressure.

Designed especially for high-productivity analysis (Fast LC), Agilent ZORBAX and Poroshell columns are the best first choice for any analysis, because they give you:

- The productivity you need to stay ahead of your competition: technological advances like sub-2 µm particles and superficially porous Poroshell 120 columns deliver increased speed and resolution.
- Flexibility and method scalability from lab to lab and around the world – for small molecule and biomolecule analyses.
- Unbeatable chromatographic performance: ZORBAX silica – the base silica used for all ZORBAX and Poroshell 120 columns – is ultra-pure, very strong, and highly uniform for ultimate reliability.
- The broadest range of phases and column configurations to suit your specific application needs.

Recommendations for Fast LC Columns

Your Lab Situation	Agilent Recommends	Rationale
You're using both UHPLC (1000+ bar) and HPLC instruments (e.g. Agilent 1290 Infinity LC and 1260 Infinity LC – 600 bar)	1. Poroshell 120 2. ZORBAX RRHD 1.8 µm	Poroshell 120 is an easy column to use on both instrument types. ZORBAX RRHD will help you optimize the capabilities of the 1290 Infinity LC for UHPLC.
Only 400-600 bar HPLCs – Agilent 1200s, Agilent 1100s (400 bar) as well as the 1220 Infinity LC or 1260 Infinity LC (600 bar)	1. Poroshell 120 2. ZORBAX Eclipse Plus 3.5 µm and 5 µm	With Poroshell 120, you can enhance the performance of older 400-bar instruments, and also get even better performance from newer 600 bar UHPLC instruments. For established methods that you can't transfer, the ZORBAX Eclipse Plus column will provide exceptional peak shape and performance.
A mix of UHPLC instruments (Agilent 1290 Infinity LC, other 1000+ bar instruments) and some HPLC instruments (e.g. 1200 LC)	1. ZORBAX RRHD 1.8 µm 2. Poroshell 120	ZORBAX RRHD can deliver optimum performance on all these instruments. Poroshell 120 can be used on the 600 bar instruments to optimize their performance.

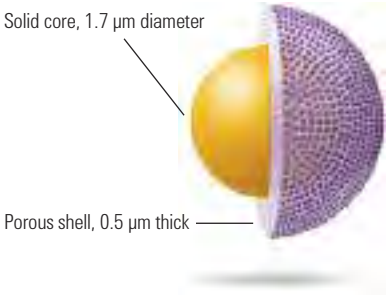
TIPS & TOOLS

Agilent CrossLab offers a range of PEEK capillaries and tubing. Used in combination with the right fittings, they provide an inert surface for the Fast LC of sensitive biomolecules. Turn to page 130.



Poroshell 120

- High efficiency and high resolution, with up to 50% less backpressure than sub-2 µm columns
- 2 µm frit, for rugged performance with dirty samples
- Compatible with 400 bar and 600 bar LCs, as well as UHPLC instruments
- An expanding family of bonded phases to align with the ZORBAX Family, for reliable scalability
- Excellent selectivity and peak shapes
- Designed for exceptional reproducibility



Agilent Poroshell 120 columns are a 2.7 µm particle with a 1.7 µm solid core and 0.5 µm porous outer layer. This small particle size provides high efficiency, similar to sub-2 µm columns, but with 40-50% less pressure. These high efficiency, high resolution columns can be used on any type of LC. The porous outer layer and solid core limit diffusion distance and improve separation speed while the narrow particle size distribution improves efficiency and resolution. The columns can support high pressure and multiple columns can be used for the highest resolution and efficiency possible. The same principles are used in Poroshell 300 columns, ideal for fast, high resolution separations of biomolecules.

Column Specifications

Bonded Phase	Pore Size	Temp Limits	pH Range	Endcapped	Carbon Load	Surface Area
EC-C18	120Å	60 °C	2.0-8.0	Double	10%	130 m^2/g
EC-C8	120Å	60 °C	2.0-8.0	Double	5%	130 m^2/g
Phenyl-Hexyl	120Å	60 °C	2.0-8.0	Double	9%	130 m^2/g
SB-C18	120Å	90 °C	1.0-8.0	No	8%	130 m^2/g
SB-C8	120Å	80 °C	1.0-8.0	No	5.5%	130 m^2/g
SB-Aq	120Å	80 °C	1.0-8.0	No	Proprietary	130 m^2/g
Bonus-RP	120Å	60 °C	2.0-9.0	Triple	9.5%	130 m^2/g
EC-CN	120Å	60 °C	2.0-8.0	Double	3.5%	130 m^2/g
HILIC	120Å	60 °C	0.0-8.0	No	N/A	130 m^2/g

Specifications represent typical values only

TIPS & TOOLS

Watch the Poroshell 120 Method Transfer Video to learn how easy it is to transfer existing methods to Poroshell 120 at **www.agilent.com/chem/poroshell120video**



Poroshell 120
(Maximum pressure: 600 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	EC-C18 USP L1	EC-C8 USP L7	Phenyl-Hexyl USP L11	SB-C18 USP L1	SB-C8 USP L7	SB-Aq	Bonus-RP USP L60
	Analytical	4.6 x 150	2.7	693975-902	693975-906	693975-912	683975-902	683975-906	683975-914	693968-901
	Analytical	4.6 x 100	2.7	695975-902	695975-906	695975-912	685975-902	685975-906	685975-914	695968-901
	Analytical	4.6 x 75	2.7	697975-902	697975-906		687975-902			
	Analytical	4.6 x 50	2.7	699975-902	699975-906	699975-912	689975-902	689975-906	689975-914	699968-901
	Analytical	4.6 x 30	2.7	691975-902	691975-906		681975-902			
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	2.7	820750-911	820750-913	820750-914	820750-912			
	Solvent Saver	3.0 x 150	2.7	693975-302	693975-306	693975-312	683975-302	683975-306	683975-314	693968-301
	Solvent Saver	3.0 x 100	2.7	695975-302	695975-306	695975-312	685975-302	685975-306	685975-314	695968-301
	Solvent Saver	3.0 x 75	2.7	697975-302	697975-306		687975-302			
	Solvent Saver	3.0 x 50	2.7	699975-302	699975-306	699975-312	689975-302	689975-306	689975-314	699968-301
	Solvent Saver	3.0 x 30	2.7	691975-302	691975-306		681975-302			
UG	UHPLC Guard, 600 bar, 3/pk	3.0 x 5	2.7	823750-911	823750-913	823750-914	823750-912			
	Narrow Bore	2.1 x 150	2.7	693775-902	693775-906	693775-912	683775-902	683775-906	683775-914	693768-901
	Narrow Bore	2.1 x 100	2.7	695775-902	695775-906	695775-912	685775-902	685775-906	685775-914	695768-901
	Narrow Bore	2.1 x 75	2.7	697775-902	697775-906		687775-902			
	Narrow Bore	2.1 x 50	2.7	699775-902	699775-906	699775-912	689775-902	689775-906	689775-914	699768-901
	Narrow Bore	2.1 x 30	2.7	691775-902	691775-906		681775-902			
UG	UHPLC Guard, 600 bar, 3/pk	2.1 x 5	2.7	821725-911	821725-913	821725-914	821725-912			



Poroshell 120 Columns

Environmental phenols on Poroshell 120

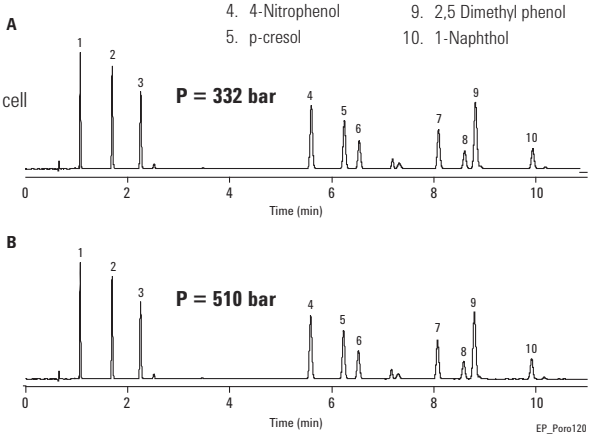
Column A: **Poroshell 120 EC-C18**
695975-902
4.6 x 100 mm, 2.7 µm

Column B: **Eclipse Plus C18**
959964-902
4.6 x 100 mm, 1.8 µm

Gradient: A: Water 0.1% formic acid
B: Acetonitrile 0.1% formic acid
2 mL/min
Initial: 8% B
10 min: 30% B

Detector: 275 nm, 2 mm flow cell
Injection: 10 µL
Agilent 1200 SL 40 °C
No pulse damper
No mixer 3 µL heater

1. Hydroquinone
2. Resorcinol
3. Catechol
4. 4-Nitrophenol
5. p-cresol
6. o-cresol
7. 2-Nitrophenol
8. 2,3 Dimethyl phenol
9. 2,5 Dimethyl phenol
10. 1-Naphthol



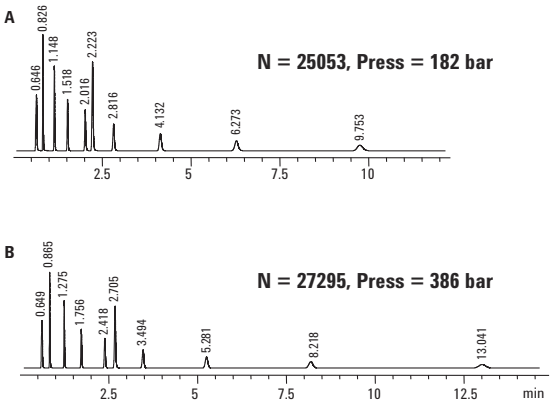
Poroshell 120 provides sub-2 µm like efficiency at lower pressure.

UHPLC efficiency at HPLC pressures

Column A: **Poroshell 120 EC-C18**
695975-302
3.0 x 100 mm, 2.7 µm

Column B: **Eclipse Plus C18**
959964-302
3.0 x 100 mm, 1.8 µm

Mobile Phase: 60% Acetonitrile:40% water
Flow Rate: 0.58 mL/min
Temperature: 26 °C
Injection Volume: 4 µL
Detector: DAD Sig = 254,4 nm
Ref = 360,100 nm
Sample: RRLC checkout sample (P/N 5188-6529) spiked w/50 µL 2 mg/mL thiourea in water/acetonitrile (65:35)



For this sample of neutral alkylphenones, the Poroshell 120 column delivered >90% of the efficiency attained by the 1.8 µm column. Also note that the pressure on the Poroshell 120 column is about 50% of the pressure on the 1.8 µm column.

HPLC separation of 12 phenols performed in just 5 minutes – and under 400 bar – using an Agilent Poroshell 120 EC-C18 column

Column: **Poroshell 120 EC-C18**
699975-902
4.6 x 50 mm, 2.7 µm

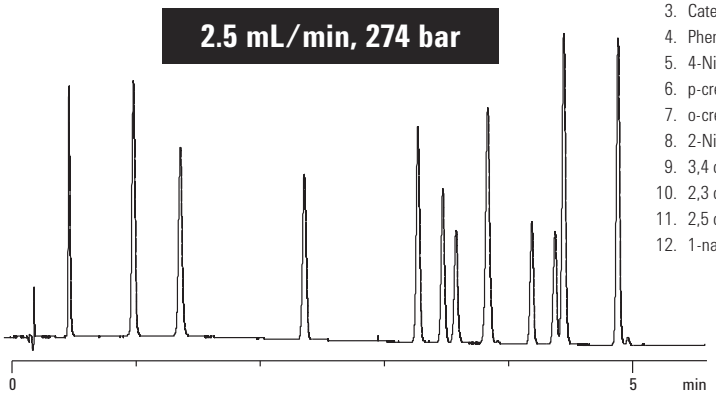
Mobile Phase: Solvent A: Water with 0.1% formic acid
Solvent B: Acetonitrile

Gradient: 5% B in 0.8 min
60% B in 6.8 min
1200 SL controlled temperature
at 25 °C 2 mm flow cell

Detector: DAD, 270 nm

Importantly, the flow rate was kept to 2.5 mL/min, reducing the amount of mobile phase consumed per analysis to about 15 mL.

Agilent Poroshell 120 gives high efficiency, high resolution separations quickly at HPLC pressures.



1. Hydroquinone
2. Resourcinol
3. Catechol
4. Phenol
5. 4-Nitrophenol
6. p-cresol
7. o-cresol
8. 2-Nitrophenol
9. 3,4 di methyl phenol
10. 2,3 di methyl phenol
11. 2,5 di methyl phenol
12. 1-napthol

12 phenols analyzed using a longer (4.6 x 100 mm) Agilent Poroshell 120 EC-C18 column

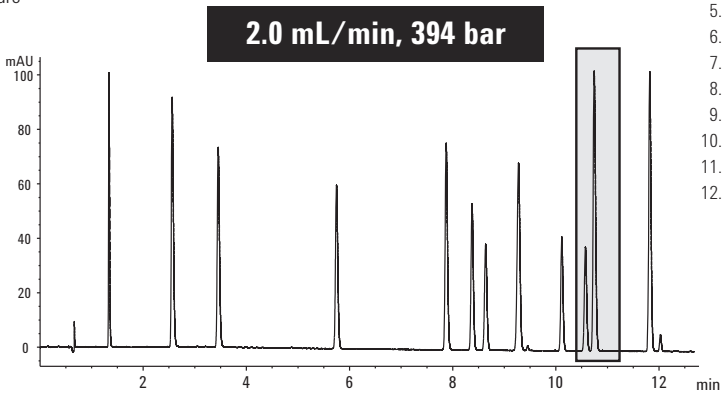
Column: **Poroshell 120 EC-C18**
695975-902
4.6 x 100 mm, 2.7 µm

Mobile Phase: Solvent A: Water with 0.1% formic acid
Solvent B: Acetonitrile

Gradient: 5% B in 2 min
60% B in 17 min
1200 RRLC SL controlled temperature
at 25 °C 2 mm flow cell

Detector: DAD, 270 nm

By reducing the flow rate to 2.0 mL/min, the pressure was kept to less than 400 bar improving the separation of a late-eluting peak pair (highlighted) with only a minor increase in analysis time. This separation can be achieved using HPLC or, if a higher flow rate is desired, a UHPLC.



1. Hydroquinone
2. Resourcinol
3. Catechol
4. Phenol
5. 4-Nitrophenol
6. p-cresol
7. o-cresol
8. 2-Nitrophenol
9. 3,4 di methyl phenol
10. 2,3 di methyl phenol
11. 2,5 di methyl phenol
12. 1-napthol

Poroshell 120 EC-C18 for fast UHPLC separations

Column: **Poroshell 120 EC-C18**
695975-302
3.0 x 100 mm, 2.7 µm

Mobile Phase: 65% A: 0.2% Formic acid
35% B: Methanol
Isocratic

Flow Rate: Varies

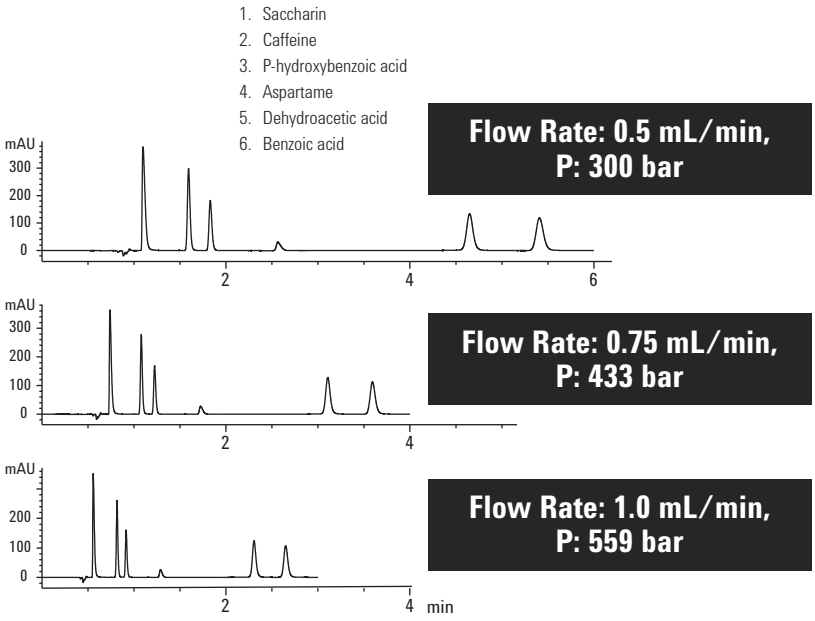
Temperature: 26 °C

Detector: Sig = 220, 4 nm, Ref = Off

This example shows a fast separation using a mobile phase that generates higher pressures. In the top chromatogram, a 3.0 mm id column was used, with a flow rate of 0.5 mL/min and a pressure below 400 bar – making this a typical LC separation.

Although the top separation was fast (just under 6 minutes), the middle and bottom chromatograms show that you can reduce run times to under 3 minutes by increasing the flow rate. These faster analyses will take your pressure to 400-560 bar; look to the Agilent 1200 Infinity Series flexible upgrade options to help you take advantage of UHPLC capabilities.

More viscous solvents like methanol can be used at HPLC or UHPLC pressures.



TIPS & TOOLS

For a full listing of our LC capillary portfolio, turn to pages 16-46.

ZORBAX Rapid Resolution High Definition (RRHD) 1.8 µm



- High pressure (1200 bar) columns for optimum results with the 1290 Infinity LC or other UHPLC instruments
- 1.8 µm particles deliver maximum resolution for the most defined separations
- Available in 12 ZORBAX phases, including Eclipse Plus C18 for superior peak shape, ZORBAX StableBond C18 for low pH stability, Bonus-RP, Eclipse PAH, Eclipse Plus Phenyl-Hexyl and Extend-C18
- Also available in HILIC Plus
- Achieve the same selectivity on 3.5 and 5 µm ZORBAX columns with the same bonded phase for compatibility with any LC

ZORBAX Rapid Resolution High Definition (RRHD) columns are an expansion of the ZORBAX 1.8 µm particle column line. The new RRHD columns use improved packing processes to achieve stability up to 1200 bar for use with the Agilent 1290 Infinity LC or other UHPLC instruments. RRHD 1.8 µm columns are available in 50, 100 and 150 mm lengths for fast or high resolution – truly high definition – separations of your most complex samples.

ZORBAX RRHD Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	Endcapped	Temp Limit
ZORBAX Eclipse Plus C18	95Å	160 m^2/g	2.0-9.0	Double	60 °C
ZORBAX Eclipse Plus C8	95Å	160 m^2/g	2.0-9.0	Double	60 °C
ZORBAX Eclipse Plus Phenyl-Hexyl	95Å	160 m^2/g	2.0-9.0	Double	60 °C
ZORBAX Eclipse XDB-C18	80Å	180 m^2/g	2.0-9.0	Double	60 °C
ZORBAX Extend-C18	80Å	180 m^2/g	2.0-11.5**	Double	60 °C
ZORBAX Bonus RP	80Å	180 m^2/g	2.0-9.0	Triple	60 °C
ZORBAX StableBond SB-C18	80Å	180 m^2/g	1.0-8.0*	No	80 °C
ZORBAX StableBond SB-C8	80Å	180 m^2/g	1.0-8.0*	No	80 °C
ZORBAX StableBond SB-Phenyl	80Å	180 m^2/g	1.0-8.0*	No	80 °C
ZORBAX StableBond SB-CN	80Å	180 m^2/g	1.0-8.0*	No	80 °C
ZORBAX StableBond SB-Aq	80Å	180 m^2/g	1.0-8.0*	No	80 °C
ZORBAX Eclipse PAH	95Å	160 m^2/g	2.0-8.0	No	60 °C
ZORBAX HILIC Plus	95Å	160 m^2/g	0.0-8.0	No	60 °C
ZORBAX StableBond 300SB-C8	300Å	45 m^2/g	1.0-8.0*	No	80 °C
ZORBAX StableBond 300SB-C18	300Å	45 m^2/g	1.0-8.0*	No	80 °C
ZORBAX StableBond 300SB-C3	300Å	45 m^2/g	1.0-8.0*	No	80 °C
ZORBAX 300-Diphenyl	300Å	45 m^2/g	1.0-8.0*	No	80 °C

* StableBond columns are designed for optimal use at low pH. At pH >6, highest column stability for all silica based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations – 10-20 mM or organic buffers. 300SB-C18 may be used up to 90 °C. For pH 6-8, select the Eclipse Plus C18 column.

** Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-11.5.



ZORBAX Rapid Resolution High Definition (RRHD) 1.8 µm Columns

Separation of licorice root on RRHD columns

Column A: **ZORBAX RRHD SB-C18**
857700-902
2.1 x 50 mm, 1.8 µm

Column B: **858700-902**
2.1 x 100 mm, 1.8 µm

Column C: **859700-902**
2.1 x 150 mm, 1.8 µm

Mobile Phase: 10-100% B/30 min
A: 0.1% Formic acid (fa)
B: Acetonitrile with 0.1% fa

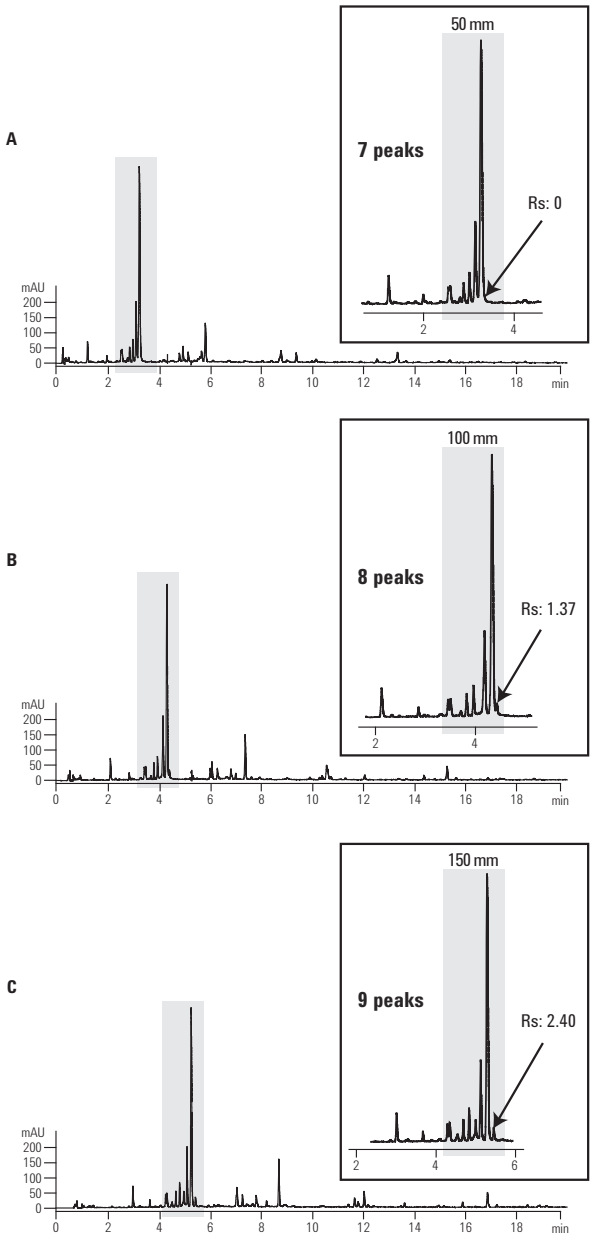
Flow Rate: F = 0.4 mL/min

Gradient: 30 minute gradient on each length

Temperature: Ambient

Detector: 280 nm UV

Instrument: 1290 Infinity LC



Sub 1 minute separations with RRHD columns

Column: **ZORBAX RRHD SB-C18**
857700-902
2.1 x 50 mm, 1.8 µm

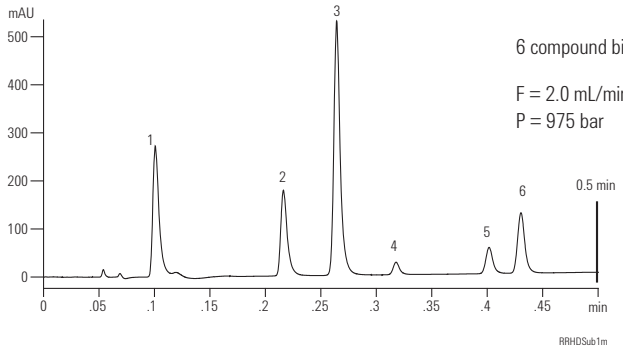
Gradient: H_2O (0.05% trifluoroacetic acid)/10-40% ACN/1 min

Temperature: 60 °C

Injection Volume: 0.5 µL x 100 ppm each

Detector: UV, 275 nm

Data Rate: 160 Hz



6 compound biocide mix in 0.5 min

F = 2.0 mL/min
P = 975 bar

1. 2-methyl-4-isothiazolin-3-one
2. 5-chloro-2-methyl-4-isothiazolin-3-one
3. Carbendazim
4. Benzisothiiazol-3(2H)-one
5. 2-phenoxyethanol
6. Methylparaben

New levels of sensitivity and resolution

Column A: **ZORBAX RRHD Eclipse Plus C18**
959758-302
3.0 x 100 mm, 1.8 µm

Column B: **ZORBAX RRHD Eclipse Plus C18**
959757-302
3.0 x 50 mm, 1.8 µm

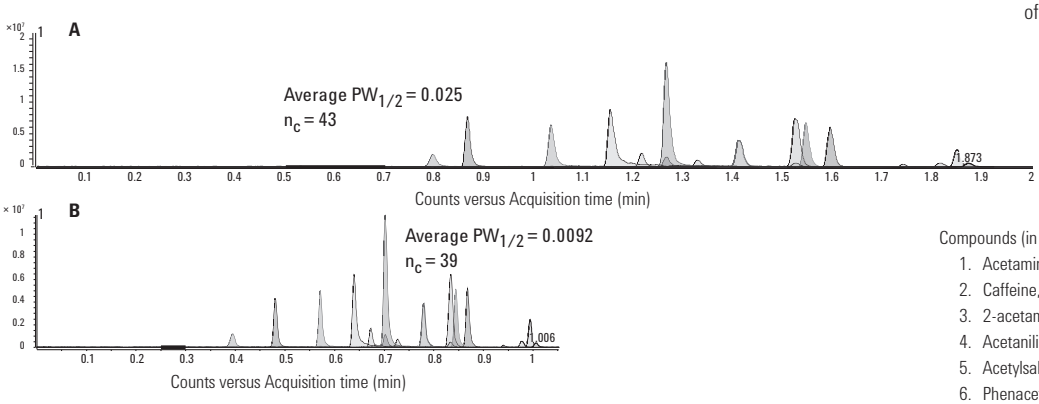
Ion Source: 360 °C, 12 L/min. 50 psi, 3500 V.

Mobile Phase: A: 0.2% Formic acid in water
B: ACN

Temperature: Ambient, no temperature control (approx 24 °C)

Detector: Agilent 1290 Infinity LC with 6410 MS/MS

Sample: 20 µL (10 µL for 50 mm column) of 1 µg/mL standard



By transferring your method to an Agilent RRHD column, you can enhance resolution for difficult analyses – allowing you to save time by using shorter columns without compromising performance.

The RRHD column saves analytical time without sacrificing performance.

Compounds (in elution order) with identifying mass:

1. Acetaminophen, m/z 109
2. Caffeine, m/z 194
3. 2-acetamidophenol, m/z 109
4. Acetanilide, m/z 135
5. Acetylsalicylic acid, m/z 120
6. Phenacetin, m/z 179
7. Salicylic acid, m/z 120
8. Sulindac, m/z 356
9. Piroxicam, m/z 332
10. Tolmetin, m/z 257
11. Ketoprofen, m/z 254
12. Diflunisal, m/z 332
13. Diclofenac, m/z 235
14. Celecoxib, m/z 351
15. Ibuprofen, m/z 160

Selectivity comparison: C18 columns

Column A: **ZORBAX RRHD Eclipse Plus C18**
959758-902
2.1 x 100 mm, 1.8 µm

Column B: **ZORBAX RRHD Eclipse XDB-C18**
981758-902
2.1 x 100 mm, 1.8 µm

Column C: **ZORBAX RRHD Extend-C18**
758700-902
2.1 x 100 mm, 1.8 µm

Column D: **ZORBAX RRHD SB-C18**
858700-902
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 0.1% HCOOH in H_2O (30%)
B: 0.1% HCOOH in CH_3CN (70%)

Flow Rate: 1 mL/min, isocratic

Temperature: 30 °C

Sample: 1 µL

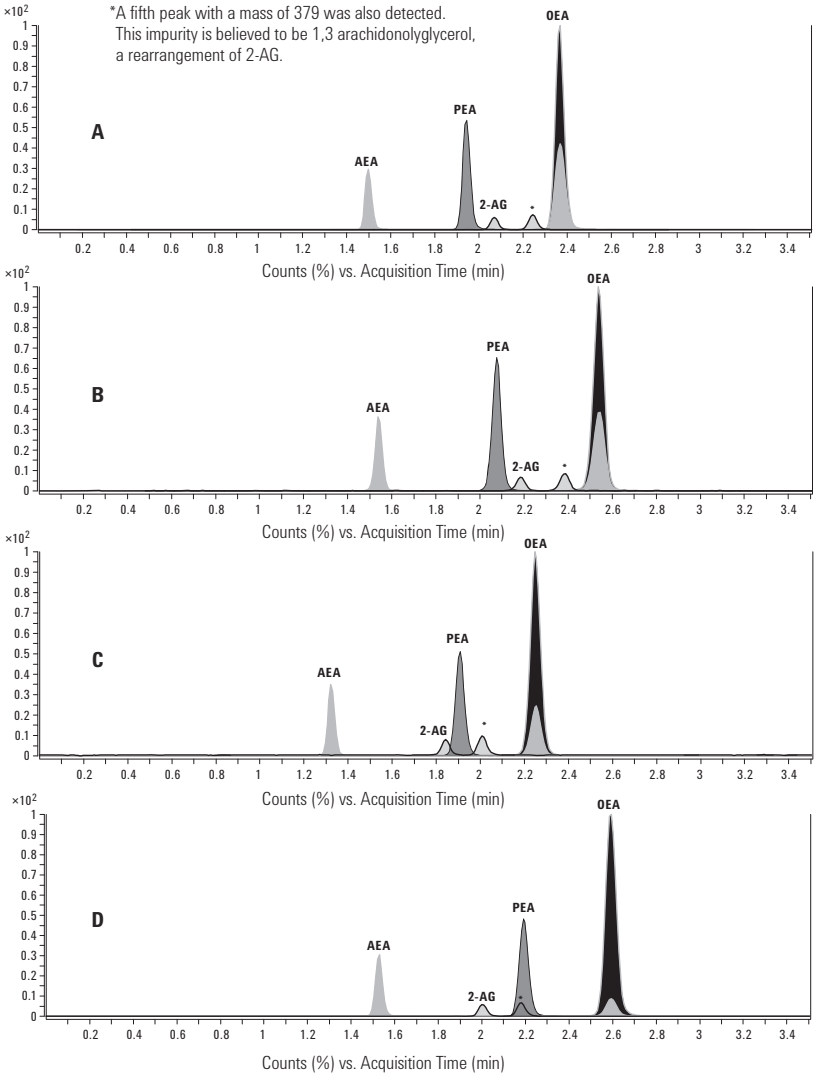
MS2 Scan: 290-390, ESI positive mode, scan time: 500, fragmentor: 135 V; drying gas: 12 L/min, 325 °C; nebulizer pressure: 35 psig; capillary voltage: 3000

Selectivity differences are due to subtle, yet important variations, such as bonding type, endcapping, or the amount and type of silanols on the silica. Other factors that influence selectivity include mobile phase composition, temperature, and pH. (Note that these factors are identical in the following example.)

Here we compared the selectivity of four Agilent ZORBAX RRHD C18 columns using an endocannabinoid analysis method.

1. Anadamine (AEA), m/z 348
2. Palmitoylethanolamide (PEA), m/z PEA
3. 2-arachinoylglycerol (2-AG), m/z 379*
4. Oleoylethanolamide (OEA), m/z 326

*A fifth peak with a mass of 379 was also detected. This impurity is believed to be 1,3 arachidonolyglycerol, a rearrangement of 2-AG.



TIPS & TOOLS

For full details, see Agilent publication 5990-7166EN, **www.agilent.com/chem/library**

Selectivity comparison: Phenyl and other columns

Column A: **ZORBAX RRHD Eclipse Plus C18**
959758-902
2.1 x 100 mm, 1.8 µm

Column B: **ZORBAX RRHD Eclipse Plus Phenyl-Hexyl**
959758-912
2.1 x 100 mm, 1.8 µm

Column C: **ZORBAX RRHD SB-Aq**
858700-914
2.1 x 100 mm, 1.8 µm

Column D: **ZORBAX RRHD SB-Phenyl**
858700-912
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 5% HCOOH in H_2O
B: CH_3CN

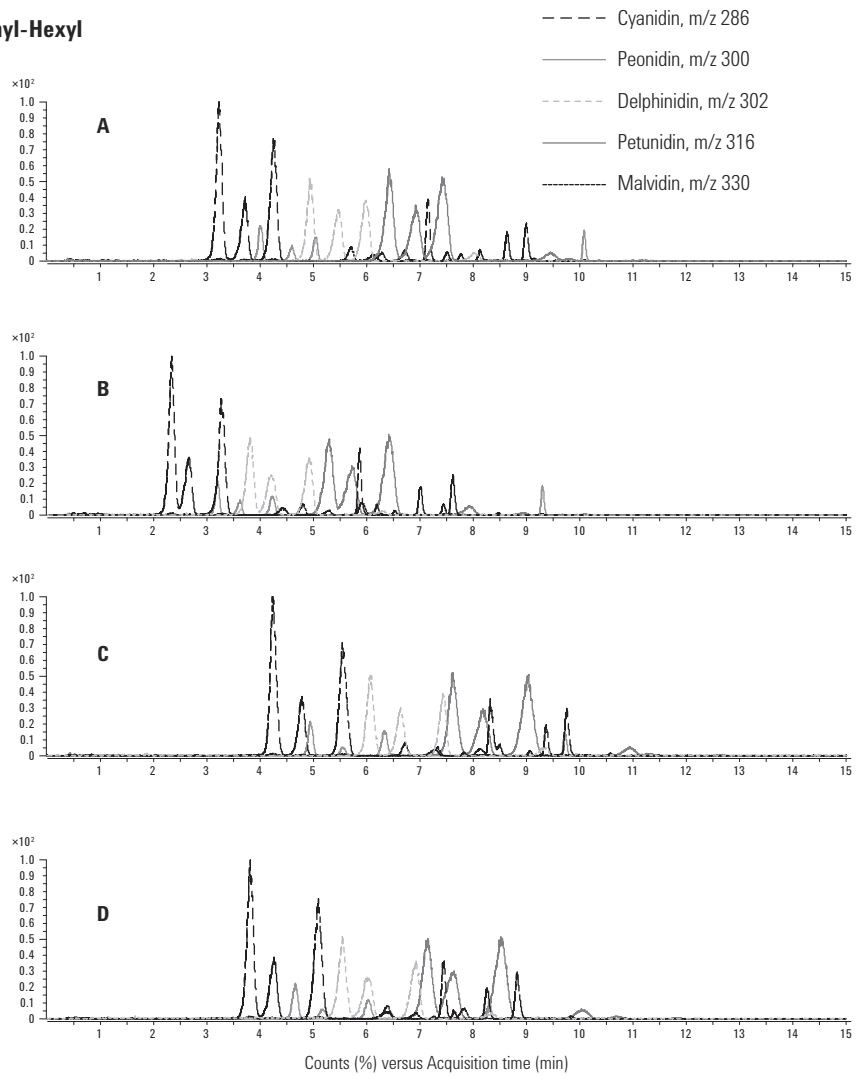
Flow Rate: 0.65 mL/min

Gradient: 10-50% B in 15 min

Temperature: 30 °C

MS2 Scan: ESI +, 200-1000

Extracted ion chromatograms from LC/MS scan data of blueberry anthocyanins.



TIPS & TOOLS

For full details, see Agilent publication 5990-8470EN, **www.agilent.com/chem/library**

Rapid Resolution High Definition (RRHD) Columns for High Pressure Use (Maximum Pressure: 1200 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	959759-302	959759-306		
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	959758-302	959758-306	959758-312	959758-318
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	959757-302	959757-306	959757-312	959757-318
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-901			
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	959759-902	959759-906	959759-912	959763-918
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	959758-902	959758-906	959758-912	959764-918
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	959757-902	959757-906	959757-912	959741-918
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-901			

Rapid Resolution High Definition (RRHD) Columns for High Pressure Use (Maximum Pressure: 1200 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-Phenyl USP L11	SB-Aq
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	859700-302	859700-306			
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	858700-302	858700-306	858700-305	858700-905	858700-314
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	857700-302	857700-306	857700-305	857700-312	857700-314
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-902	823750-904			
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	859700-902	859700-906	859700-905	859700-912	859700-914
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	858700-902	858700-906	858700-905	858700-912	858700-914
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	857700-902	857700-906	857700-905	857700-912	857700-914
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-902	821725-904			

Rapid Resolution High Definition (RRHD) Columns for High Pressure Use (Maximum Pressure: 1200 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	Extend-C18 USP L1	Eclipse XDB-C18 USP L1	Bonus-RP USP L60	HILIC Plus
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	759700-302	981759-302		
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	758700-302	981758-302		959758-301
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	757700-302	981757-302		959757-301
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8		823750-903		
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	759700-902	981759-902	859768-901	959759-901
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	758700-902	981758-902	858768-901	959758-901
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	757700-902	981757-902	857768-901	959757-901
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8		821725-903		

ZORBAX RRHD columns are also available in 300Å configurations for biomolecules. Turn to page 364.

ZORBAX RRHD 300-HILIC will be available in 2013.

ZORBAX Rapid Resolution High Throughput (RRHT) 1.8 µm

- High pressure (600 bar) columns for ultra high speed or maximum resolution analyses with Rapid Resolution HT columns packed with totally porous, 1.8 µm packings
- Carefully engineered particles deliver maximum resolution at 25% less pressure than other sub-2 µm materials
- Reduce analysis time by up to 95%
- Develop HPLC methods more quickly
- Securely transfer conventional methods with over 140 RRHT column choices
- Analyze complex samples on shorter columns faster and maximize peak capacity
- Matching selectivity in 3.5, 5 and 7 µm particle sizes for complete method scalability
- Short (50 mm long and less) column can be used on some conventional LCs



ZORBAX Rapid Resolution High Throughput (RRHT) 1.8 µm Columns

Agilent ZORBAX Rapid Resolution HT (1.8 µm) columns use a totally porous, 1.8 µm particle to provide maximum resolution in fast, ultra-fast and high resolution analyses. You can reduce analysis time by up to 95% in comparison to 250 mm length columns. With more than 140 RRHT column choices, including the high performance ZORBAX Eclipse Plus and many other ZORBAX column choices (Eclipse XDB, StableBond, Extend, Bonus-RP), methods can be developed quickly or securely transferred to a smaller particle size column with no loss in resolution. The small particle size provides double the efficiency of a 3.5 µm column in the same column length, providing the highest efficiency and resolution possible. This permits the analysis of complex samples on shorter columns with the highest resolution and peak capacity. The 1.8 µm Rapid Resolution HT columns take high-speed, high-resolution HPLC to a new level.

The 600 bar columns can be used with the Agilent1260 Infinity LC System up to this high pressure limit. In addition, the shorter columns can be used on many other LC's, including the Agilent 1200 Rapid Resolution LC System.

Rapid Resolution HT (RRHT) provides double the efficiency of Rapid Resolution columns

Column A: **ZORBAX Rapid Resolution SB-C18**
835975-902
4.6 x 50 mm, 3.5 µm

Column B: **ZORBAX RRHT SB-C18**
827975-902
4.6 x 50 mm, 1.8 µm

Mobile Phase: 25% Water, 75% MeOH

Flow Rate: 1.5 mL/min

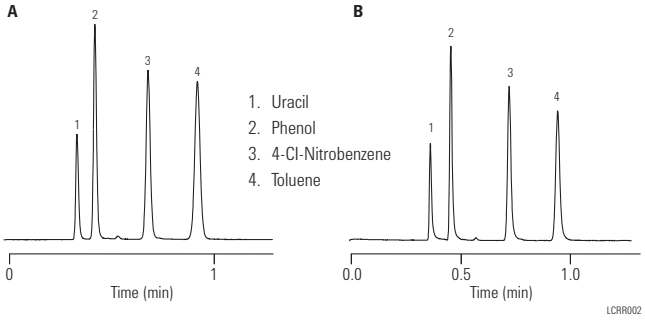
Temperature: Ambient

Detector: UV, 254 nm

This figure shows that Rapid Resolution HT columns can provide double the efficiency of a 3.5 µm column in the same column length. This high efficiency can be used for very high-resolution, high throughput analyses.

Plates (N)	
1.	3476
2.	4585
3.	5673
4.	6180

Plates (N)	
1.	6560
2.	8958
3.	11508
4.	12266



Increase peak capacity with RRHT columns

Column A: **Eclipse RRHT XDB-C8**
928700-906
2.1 x 100 mm, 1.8 µm

Column B: **Eclipse XDB-C18**
961753-902
2.1 x 100 mm, 3.5 µm

Mobile Phase: A: H_2O
B: ACN

Peak capacity: A: 461
B: 343

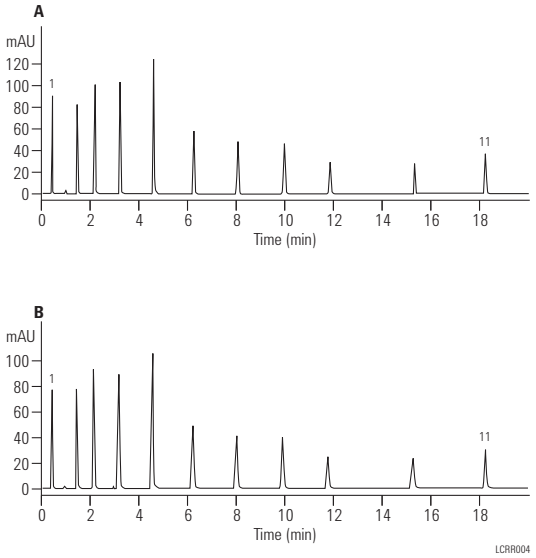
Flow Rate: 0.5 mL/min

Gradient: 0.0 min 50% B
20.0 min 100% B

Temperature: 40 °C

Detector: UV, 254 nm

Sample: Alkylphenones



Reduce analysis time dramatically with Rapid Resolution HT columns

Column A: **Eclipse XDB-C18**
990967-902
4.6 x 250 mm, 5 µm

Column B: **Eclipse XDB-C18**
963967-902
4.6 x 150 mm, 3.5 µm

Column C: **Eclipse XDB-C18**
966967-902
4.6 x 75 mm, 3.5 µm

Column D: **ZORBAX Eclipse XDB-C18**
935967-902
4.6 x 50 mm, 3.5 µm

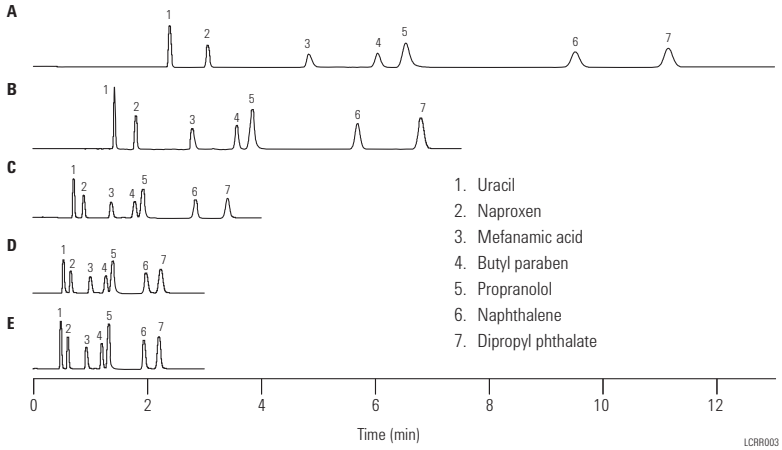
Column E: **Eclipse RRHT XDB-C18**
925975-902
4.6 x 50 mm, 1.8 µm

Mobile Phase: 73% MeOH:27% 20 mM Phosphate Buffer, pH 7.0

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: UV, 254 nm



This figure shows the dramatic reduction in analysis time made possible by using Rapid Resolution HT columns. Chromatogram A shows a separation that takes 11.5 minutes on a 25 cm, 5 µm column. Rapid Resolution (3.5 µm) columns, shown in chromatogram B and C, reduce analysis time substantially, but with a slight compromise in resolution. The Rapid Resolution HT column reduces analysis time to 2.2 minutes, an 80% reduction, while still maintaining baseline resolution.

Long lifetime of RRHT columns at elevated temperatures

Column: **ZORBAX RRHT SB-C18**
827700-902
2.1 x 50 mm, 1.8 µm

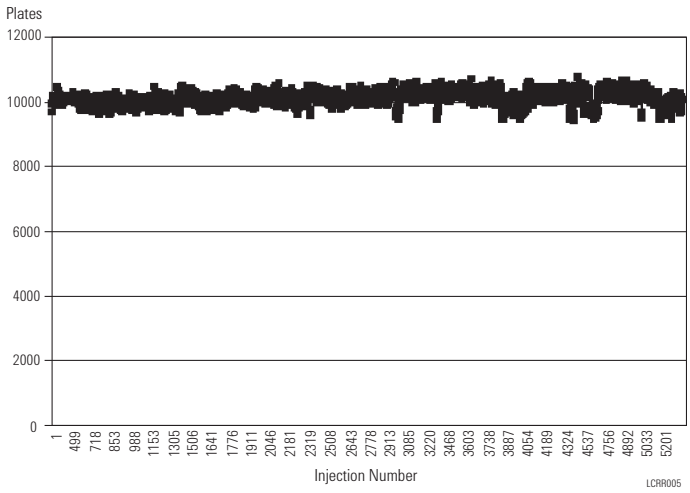
Mobile Phase: A: 60% H_2O
B: 40% ACN

Flow Rate: 1 mL/min

Temperature: 80 °C

Detector: UV, 254 nm

Sample: QC test mix



Comparison of efficiencies – Rapid Resolution High Definition (RRHD)/RRHT (1.8 µm) and Rapid Resolution (3.5 µm) columns

Column Length (mm)	Poroshell 120	Resolving Power N (3.5 µm)*	Resolving Power N (1.8 µm)
High Resolution			
150	32,000	21,000	32,500
100	21,000	14,000	24,000
75	16,000	10,500	17,000**
Ultra Fast			
50	11,000	7,000	12,000
30	5,500	4,200	6,000
20	—	—	3,500
15	—	2,100	2,500
Resolution α $N^{1/2}$			

*5 µm HPLC columns of the same length have 40% fewer plates (N-value); 4.6 mm id

**Available as a custom column

Data is based on 4.6 mm id columns

TIPS & TOOLS

The LC Rack from Agilent can help you reduce capillary lengths and minimize extra-column volume. It also protects your instrument and enables you to switch out modules as needed.



Agilent rack for LC systems, 5001-3726

Rapid Resolution HT Columns for High Pressure Use (Maximum Pressure: 600 bar, 9000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	Extend-C18 USP L1
	Rapid Resolution HT, 600 bar	4.6 x 150	1.8	959994-902						
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-902	959964-906	959964-912	959964-918	928975-902		728975-902
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8	959951-902						
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-902	959941-906	959941-912	959941-918	927975-902	927975-906	727975-902
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-902	959931-906	959931-912	959931-918	924975-902	924975-906	724975-902
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8					926975-902	926975-906	726975-902
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	1.8	820750-901				820750-903		
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	959964-302	959964-306	959964-312		928975-302		728975-302
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	959941-302	959941-306	959941-312		927975-302	927975-306	727975-302
	Solvent Saver HT, 600 bar	3.0 x 30	1.8					924975-302	924975-306	724975-302
	Solvent Saver HT, 600 bar	3.0 x 20	1.8					926975-302	926975-306	726975-302
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-901				823750-903		
	Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	959794-902						
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-902	959764-906	959764-912	959764-918	928700-902	928700-906	728700-902
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-902	959741-906	959741-912	959741-918	927700-902	927700-906	727700-902
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	959731-902	959731-906	959731-912		924700-902	924700-906	724700-902
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8					926700-902	926700-906	726700-902
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-901				821725-903		

Rapid Resolution HT Columns for High Pressure Use (Maximum Pressure: 600 bar, 9000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Phenyl USP L11	SB-CN USP L10	SB-Aq	Rx-SIL USP L3	Bonus-RP USP L60
	Rapid Resolution HT, 600 bar	4.6 x 150	1.8	829975-902	829975-906	829975-912	829975-905	829975-914		
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-902	828975-906	828975-912	828975-905	828975-914	828975-901	828668-901
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8		830975-906					830668-901
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	827975-906	827975-912	827975-905	827975-914	827975-901	827668-901
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	824975-902	824975-906	824975-912	824975-905	824975-914		
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	826975-902	826975-906					
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	1.8	820750-902	820750-904					
	Solvent Saver HT, 600 bar	3.0 x 150	1.8	829975-302	829975-306	829975-312	829975-305			
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	828975-302	828975-306	828975-312	828975-305	828975-314	828975-301	828668-301
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	827975-302	827975-306	827975-312	827975-305	827975-314	827975-301	827668-301
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	824975-302	824975-306		824975-305			
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	826975-302	826975-306					
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-902	823750-904					
	Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	820700-902	820700-906	820700-912	820700-905			
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828700-902	828700-906	828700-912	828700-905	828700-914	828700-901	828768-901
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827700-902	827700-906	827700-912	827700-905	827700-914	827700-901	827768-901
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	824700-902	824700-906	824700-912	824700-905	824700-914		
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	826700-902	826700-906					
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-902	821725-904					

Rapid Resolution HT Columns and Cartridges (Maximum Pressure: 400 bar, 6000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	SB-C18 USP L1	SB-C8 USP L7	Extend-C18 USP L1
	Rapid Resolution HT, 400 bar	4.6 x 50	1.8	922975-902	922975-906	922975-902	822975-906	722975-902
	Rapid Resolution HT, 3/pk, 400 bar	4.6 x 50	1.8	922975-932		922975-932		
	Narrow Bore RRHT, 400 bar	2.1 x 50	1.8	922700-902		922700-902		
	Narrow Bore RRHT, 3/pk, 400 bar	2.1 x 50	1.8	922700-932		922700-932		
Rapid Resolution HT Cartridges (require hardware kit 820555-901)								
RR	Rapid Resolution HT Cartridge	4.6 x 50	1.8	925975-902		825975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	925975-932		825975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 50	1.8	925700-902		825700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	925700-932		825700-932		
RR	Rapid Resolution HT Cartridge	4.6 x 30	1.8	923975-902		823975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	923975-932		823975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 30	1.8	923700-902		823700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	923700-932		823700-932		
RR	Rapid Resolution HT Cartridge	4.6 x 15	1.8	921975-902		821975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	921975-932		821975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 15	1.8	921700-902		821700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	921700-932		821700-932		
RR	Hardware Kit for RR and RRHT Cartridges			820555-901		820555-901		



UHPLC Guard, 1200 bar, 821725-903

Agilent Fast Guards for UHPLC

- High performance guard columns for Fast LC columns
- Two formats – one for Poroshell 120 columns, stable to 600 bar, RRHD columns, 1.8 µm (stable to 1200 bar), and RRHT columns, 1.8 µm (stable to 600 bar)

Agilent UHPLC Guards are high performance guards designed by Agilent for its Fast LC columns families. Agilent UHPLC Guards use easy-to-install hardware that fits directly on the end of the column; no extra hardware is needed. They are sold in packages of three.

Agilent UHPLC Guards extend the lifetime of analytical columns without diminishing performance.

Fast Guards for UHPLC

ZORBAX RRHD columns, 1.8 µm (1200 bar), and ZORBAX RRHT columns, 1.8 µm (600 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse XDB-C18 USP L1	SB-C18 USP L1	SB-C8 USP L7
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-901	821725-903	821725-902	821725-904
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-901	823750-903	823750-902	823750-904
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	1.8	820750-901	820750-903	820750-902	820750-904

Poroshell 120 columns, 2.7 µm (600 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	EC-C18 USP L1	EC-C8 USP L7	SB-C18 USP L1	Phenyl-Hexyl USP L11
UG	UHPLC Guard, 600 bar, 3/pk	2.1 x 5	2.7	821725-911	821725-913	821725-912	821725-914
UG	UHPLC Guard, 600 bar, 3/pk	3.0 x 5	2.7	823750-911	823750-913	823750-912	823750-914
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	2.7	820750-911	820750-913	820750-912	820750-914

TIPS & TOOLS

Learn about Fast Guards for UHPLC – an easy way to extend the life of your analytical Fast LC column without losing performance. **www.agilent.com/chem/fastguardsvideo**



Other Columns for Reversed-Phase Analytical HPLC

Achieve excellent peak shape and resolution every time – leveraging the industry's broadest selection of reversed-phase columns

Whether you are using Fast LC or working with more conventional HPLC applications, Agilent's LC family offers you a range of phases and selectivities to help you perfect your separation.

The ZORBAX Family of phases scales readily to Fast LC columns in the Rapid Resolution High Throughput (RRHT) and Rapid Resolution High Definition (RRHD) families and Poroshell 120 columns, see previous section, page 227.

In this section, we'll provide overviews of other key analytical columns from Agilent:

ZORBAX Rapid Resolution, 3.5 µm, configurations are an ideal choice for initial method development, providing increased sample throughput for any application when compared to 5 µm columns.

ZORBAX Solvent Saver 3.0 mm id column configurations provide 60% mobile phase reduction over 4.6 mm id columns.

ZORBAX Eclipse Plus HPLC columns are designed to reliably produce superior peak shapes for basic compounds, and are available across all ZORBAX column configurations.

More than 13 additional ZORBAX phases including StableBond, Eclipse PAH, Eclipse XDB, ZORBAX Rx, Extend-C18, Bonus-Rx and Original ZORBAX columns – in total, more than 1400 configurations for reliable scalability and method transfer.

ZORBAX Method Development kits contain three columns for the price of two! Each as a different bonded phase for optimizing selectivity.

ZORBAX Method Validation kits – choose as many columns as you need (or as few) to make method validation easier and less expensive.

Pursuit, Pursuit XRs and Pursuit XRs Ultra columns provide alternate selectivities to the ZORBAX family.

Polaris Columns provide polar-modified phases for routine polar applications.

Other Columns for Reversed-Phase Analytical HPLC.



ZORBAX Eclipse Plus Columns

ZORBAX Eclipse Plus

- The ideal column for method development – excellent results for a wide range of compounds
- High level of performance – peak shape, efficiency, resolution, and lifetime – with all sample types: acids, bases and neutrals
- Superior reproducibility with more rigorous QA/QC testing
- Improved, patented silica manufacturing with start-to-finish product control
- Available in 1.8, 3.5, and 5 µm particle sizes for all analytical, high resolution, and fast LC analyses

Agilent ZORBAX Eclipse Plus columns provide the ultimate in performance for silica-based columns. Peak shape is excellent for the most challenging basic compounds, improving efficiency and resolution with these sample types. These results are achieved by improvements in the silica manufacturing and bonding technology, which is completely controlled by Agilent.

Because of their high level of performance, Eclipse Plus columns are the ideal first choice for method development of all samples. If you need to achieve fast method development and superior productivity, then choose a column with high-resolution 1.8 µm particles. For standard methods, conventional 5 µm and Rapid Resolution 3.5 µm columns are your best choice. With all particle sizes, easy method transfer is possible.

With more rigorous QA and QC testing, column lot-to-lot reproducibility is also improved, resulting in long-term reliable results for all analyses.

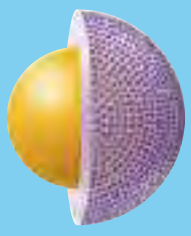
Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
ZORBAX Eclipse Plus C18	95Å	160 m^2/g	60 °C	2.0-9.0	Double	9%
ZORBAX Eclipse Plus C8	95Å	160 m^2/g	60 °C	2.0-9.0	Double	7%
ZORBAX Eclipse PAH	95Å	160 m^2/g	60 °C	2.0-8.0	No	14%
ZORBAX Eclipse Plus Phenyl-Hexyl	95Å	160 m^2/g	60 °C	2.0-8.0	Double	9%

Specifications represent typical values only.

*Column lifetime will be reduced significantly at pH >7 and temperature >40 °C. At pH 6-9, highest column stability for all silica based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations in range of 0.01-0.02 M, especially with phosphate and carbonate buffers.

TIPS & TOOLS



The EC-C18, EC-C8 and Phenyl-Hexyl phases on Poroshell 120 are very similar to Eclipse Plus C18, Eclipse Plus C8 and Eclipse Plus Phenyl-Hexyl phases.

Turn to page 228.

ZORBAX Eclipse Plus: Best peak shape in the industry without tailing

Column: **Eclipse Plus C18**
959996-902
4.6 x 100 mm, 5 µm

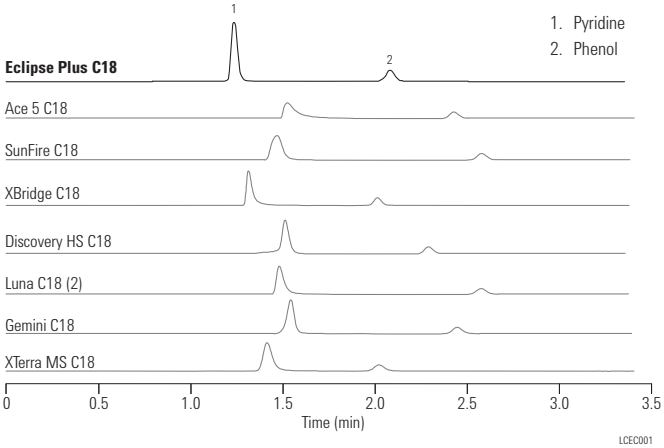
Mobile Phase: A: 60% Water
B: 40% Acetonitrile

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Pyridine, Phenol



Peak shape and efficiency are better with ZORBAX Eclipse Plus

Column A: **XBridge C18, 4.6 x 150 mm, 5 µm**

Column B: **Eclipse Plus C18**
959993-902
4.6 x 150 mm, 5 µm

Mobile Phase: A: 0.1% Formic acid
B: 0.1% Formic acid in ACN

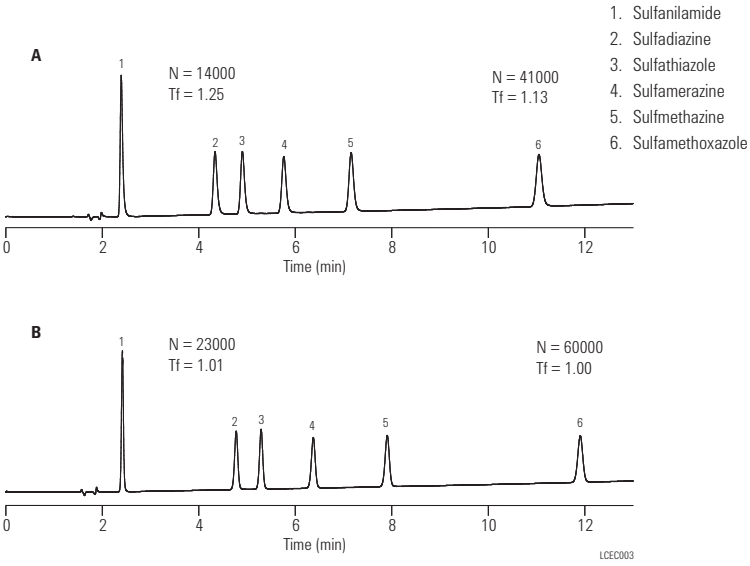
Flow Rate: 1.0 mL/min

Gradient: 0.0 min 10% B
15 min 30% B

Temperature: 40 °C

Detector: UV, 254 nm

Sample: Sulfonamides



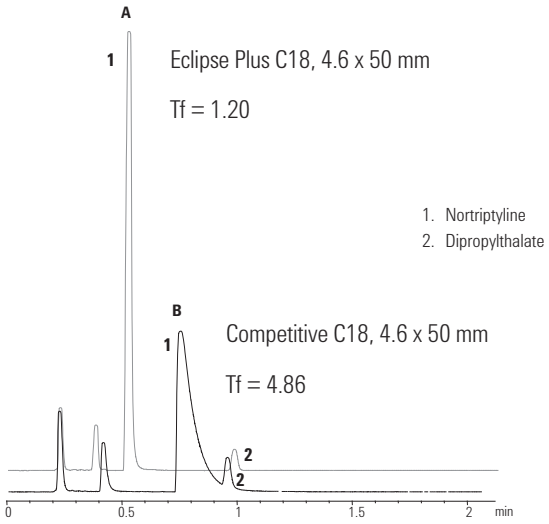
Eliminate tailing and maximize resolution with Eclipse Plus Columns

Column A: **Eclipse Plus C18, 4.6 x 50 mm**

Column B: **Competitive C18, 4.6 x 50 mm**

Mobile Phase: 65% ACN:35% 25 mM phosphate buffer (pH 7.4)

Superior peak shape and better selectivity with Eclipse Plus means more resolution, easier quantitation and better results in your separations.



Eclipse Plus C18 vs. C8

Column A: **Eclipse Plus C18 4.6 x 50 mm, 5 µm**

Column B: **Eclipse Plus C8 4.6 x 50 mm, 5 µm**

Mobile Phase: Water: acetonitrile (30:70)

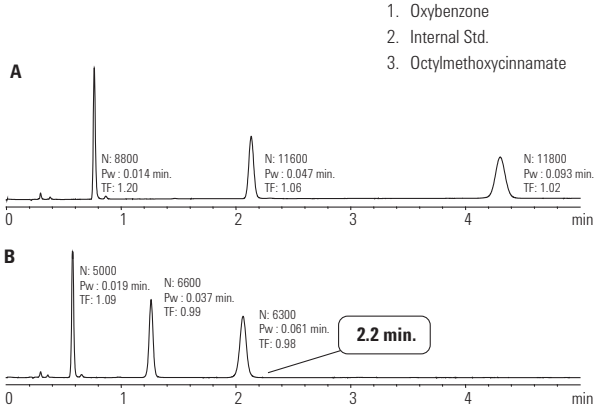
Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: UV, 230 nm

Sample: Lip balm extract in ACN (melted at 100 °C, cooled and 0.45 µm filtered)

Less retention can save significant time – the C8 is a good choice here.



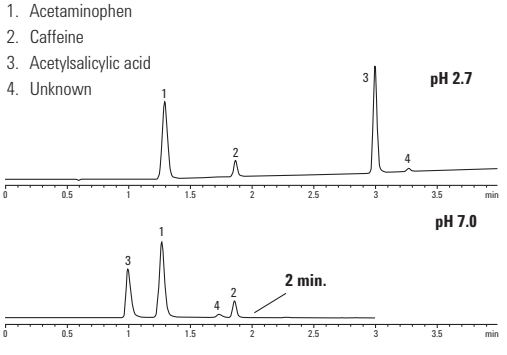
Rapid analysis of an analgesic tablet, selectivity differences at pH 2 and pH 7

Column: **Eclipse Plus C8 959946-906 4.6 x 50 mm, 5 µm**

Gradient: 10-60% B/3 min
pH 2.7: A: 0.1% Formic acid B: 0.1% fa in ACN
pH 7.0: A: 20 mM Na phosphate B: ACN

Sample: generic Excedrin tablet

Both Eclipse Plus C18 and C8 can be used over a wide pH range to optimize selectivity or analysis time.



Eclipse Plus C8 is less retentive than Eclipse Plus C18

Column A: **Eclipse Plus C8**
959996-906
4.6 x 100 mm, 5 µm

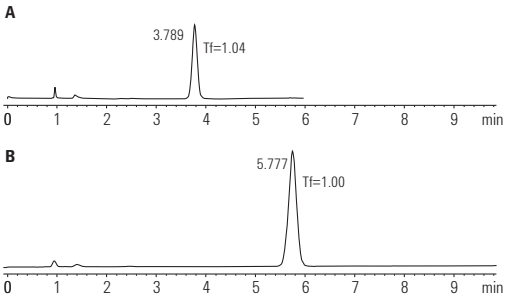
Column B: **Eclipse Plus C18**
959996-902
4.6 x 100 mm, 5 µm

Mobile Phase: 80% Methanol 8 mM (total) K_2HPO_4 pH 7

Flow Rate: 1.0 mL/min

Detector: UV, 215 nm

Sample: Amitriptyline 0.05 µg/µL (0.5 µL injection)



A C8 column is typically selected because it will retain less than a C18 column, reducing analysis time.

The Eclipse Plus C8 column shows the same behavior with excellent peak shape on difficult basic compounds.

Fast and ultra-fast analysis of basic compounds on Eclipse Plus

Column A: **Eclipse Plus C18**
959941-902
4.6 x 50 mm, 1.8 µm

Column B: **Eclipse Plus C18**
959993-902
4.6 x 150 mm, 5 µm

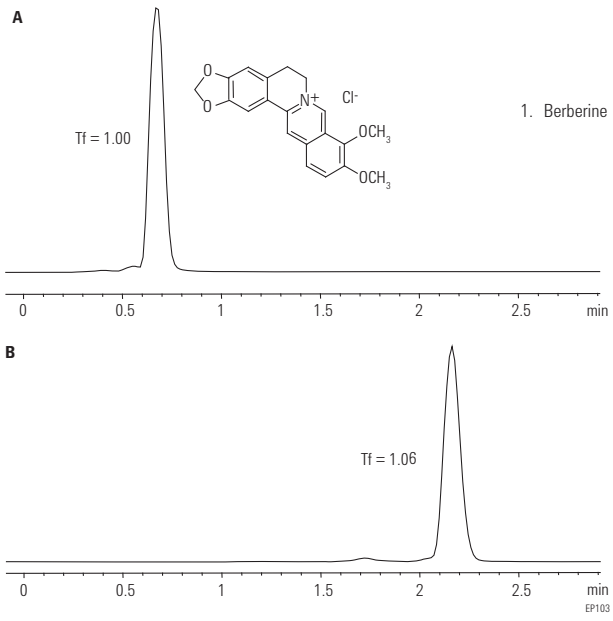
Mobile Phase: A: 50% 8 mM K_2HPO_4, pH 7
B: 50% ACN

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Berberine, 0.4 mg/mL, 2 µL





ZORBAX Eclipse Plus Columns

ZORBAX Eclipse Plus

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1
	Analytical	4.6 x 250	5	959990-902	959990-906	959990-912	959990-918
	Analytical	4.6 x 150	5	959993-902	959993-906	959993-912	959993-918
	Analytical	4.6 x 100	5	959996-902	959996-906	959996-912	959996-918
	Analytical	4.6 x 50	5	959946-902	959946-906		
	Rapid Resolution	4.6 x 150	3.5	959963-902	959963-906	959963-912	959963-918
	Rapid Resolution	4.6 x 100	3.5	959961-902	959961-906	959961-912	959961-918
	Rapid Resolution	4.6 x 75	3.5	959933-902	959933-906	959933-912	
	Rapid Resolution	4.6 x 50	3.5	959943-902	959943-906	959943-912	959943-918
	Rapid Resolution	4.6 x 30	3.5	959936-902	959936-906	959936-912	
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-902	959964-906	959964-912	959964-918
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8	959951-902			
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-902	959941-906	959941-912	959941-918
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-902	959931-906	959931-912	959931-918
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	1.8	820750-901			
	Solvent Saver	3.0 x 250	5				959990-318
	Solvent Saver	3.0 x 150	5	959993-302	959993-306		
	Solvent Saver Plus	3.0 x 150	3.5	959963-302	959963-306	959963-312	
	Solvent Saver Plus	3.0 x 100	3.5	959961-302	959961-306	959961-312	
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	959759-302	959759-306		
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	959758-302	959758-306		
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	959757-302	959757-306		
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	959964-302	959964-306	959964-312	
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	959941-302	959941-306	959941-312	

(Continued)

Agilent HILIC Plus uses the same manufacturing processes as the Eclipse Plus family.
See information about ZORBAX HILIC Plus on page 324.

ZORBAX Eclipse Plus

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-901			
	Narrow Bore	2.1 x 250	5				959790-918
	Narrow Bore	2.1 x 150	5	959701-902	959701-906	959701-912	959701-918
	Narrow Bore	2.1 x 50	5	959746-902	959746-906		
	Narrow Bore RR	2.1 x 150	3.5	959763-902	959763-906	959763-912	
	Narrow Bore RR	2.1 x 100	3.5	959793-902	959793-906	959793-912	959793-918
	Narrow Bore RR	2.1 x 50	3.5	959743-902	959743-906	959743-912	
	Narrow Bore RR	2.1 x 30	3.5	959733-902	959733-906	959733-912	
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	959759-902	959759-906		
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	959758-902	959758-906		
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	959757-902	959757-906		
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-902	959764-906	959764-912	959764-918
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-902	959741-906	959741-912	959741-918
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	959731-902	959731-906	959731-912	
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-901			
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-936	820950-937	820950-938	820950-939
ZGC	Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-936	821125-937	821125-938	821125-939
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901



ZORBAX Eclipse PAH Columns

ZORBAX Eclipse PAH

- High resolution separation of 16 PAHs in EPA Method 610
- Extensive range of particle sizes (1.8, 3.5 and 5 µm) and sizes for fast and high resolution separations
- Each batch of material is specifically tested with PAHs for maximum reproducibility under expected operating conditions
- Excellent performance using the high quality, improved silica of Eclipse Plus columns
- Good for applications requiring "shape selectivity" or the separation of geometric isomers

Agilent ZORBAX Eclipse PAH columns are recommended for the separation of polycyclic aromatic hydrocarbons. PAHs are considered priority pollutants and the analysis of these potentially carcinogenic compounds in water, soil and food is of major importance. Eclipse PAH columns separate all 16 PAHS in EPA method 610 quickly and with high resolution.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
ZORBAX Eclipse PAH	95Å	160 m^2/g	60 °C	2.0-8.0	No	14%

Specifications represent typical values only.

High resolution and fast analysis on RRHT Eclipse PAH column

Column: **Eclipse PAH 959941-918 4.6 x 50 mm, 1.8 µm**

Mobile Phase: A: Water; B: Acetonitrile

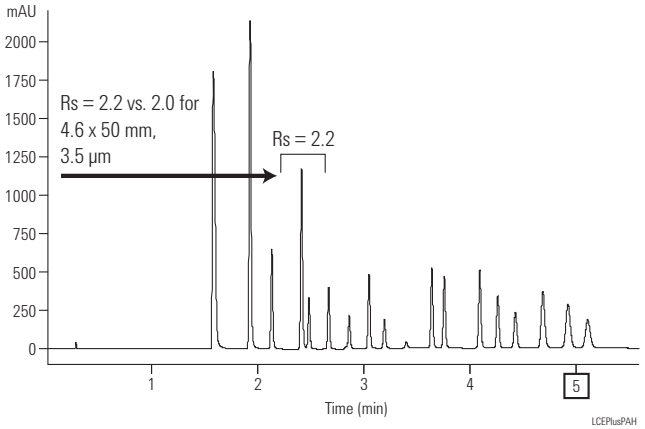
Gradient:

Time (Min)	% B
0.00	40
3.5	100
5.2	100
5.5	40
6.5	40

Flow Rate: 2.0 mL/min

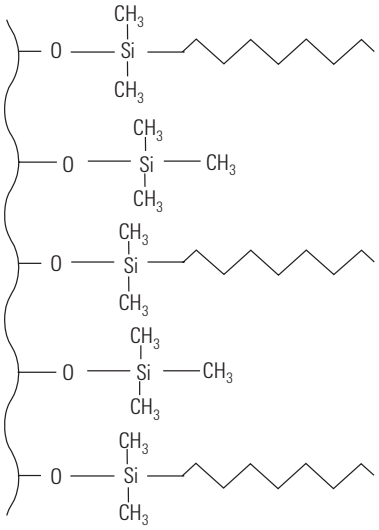
Temperature: 25 °C

Detector: DAD 220, 4 nm No Ref. DAD Stop Time = 6.0 min Stop Time = 7.0



ZORBAX Eclipse PAH

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse PAH USP L1
	Analytical	4.6 x 250	5	959990-918
	Analytical	4.6 x 150	5	959993-918
	Analytical	4.6 x 100	5	959996-918
	Rapid Resolution	4.6 x 150	3.5	959963-918
	Rapid Resolution	4.6 x 100	3.5	959961-918
	Rapid Resolution	4.6 x 50	3.5	959943-918
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-918
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-918
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-918
	Solvent Saver	3.0 x 250	5	959990-318
	Narrow Bore	2.1 x 250	5	959790-918
	Narrow Bore	2.1 x 150	5	959701-918
	Narrow Bore RR	2.1 x 100	3.5	959793-918
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-918
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-918
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-939
ZGC	Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-939
ZGC	Guard Hardware Kit			820999-901



eXtra Densely Bonded and Double Endcapped Eclipse XDB Bonded Phase

ZORBAX Eclipse XDB

- Four selectivity choices for method development optimization
- Good peak shape for basic, acidic and neutral compounds
- High performance over a wide pH range – pH 2-9
- Particle sizes from 1.8 to 7 µm
- Long lifetime with eXtra Dense Bonding and double endcapping

Agilent ZORBAX Eclipse XDB columns – C18, C8, Phenyl and CN – provide four bonded phase choices for method development optimization. These columns provide good peak shape over a wide pH range (2-9) for additional method development flexibility with one family of columns. Eclipse XDB columns can be used for method development at low pH (2-3) and the same column can be used for method development in the mid pH (6-8) region. In the mid pH region residual silanols are more active and tailing interactions are more likely. To overcome these interactions, Eclipse XDB columns are eXtra Densely Bonded and double endcapped through a proprietary process to cover as many active silanols as possible. The result is superior peak shape of basic compounds from pH 2-9. Eclipse XDB columns are available in 1.8, 3.5, 5 and 7 µm particle sizes for high speed, high resolution, analytical and prep scale separations.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
ZORBAX Eclipse XDB-C18	80Å	180 m^2/g	60 °C	2.0-9.0	Double	10%
ZORBAX Eclipse XDB-C8	80Å	180 m^2/g	60 °C	2.0-9.0	Double	7.6%
ZORBAX Eclipse XDB-Phenyl	80Å	180 m^2/g	60 °C	2.0-9.0	Double	7.2%
ZORBAX Eclipse XDB-CN	80Å	180 m^2/g	60 °C	2.0-8.0	Double	4.3%

Specifications represent typical values only

*Eclipse XDB columns are designed for operation over a wide pH range.At pH 6-9, highest columns stability for all silica based columns is achieved by operating at temperatures <40 °C and using low buffer concentrations in the range of 0.01-0.02 M.

TIPS & TOOLS

Poroshell 120 EC-CN is very similar to ZORBAX XDB-CN. Page 228

Good peak shape over a wide pH range with ZORBAX Eclipse XDB

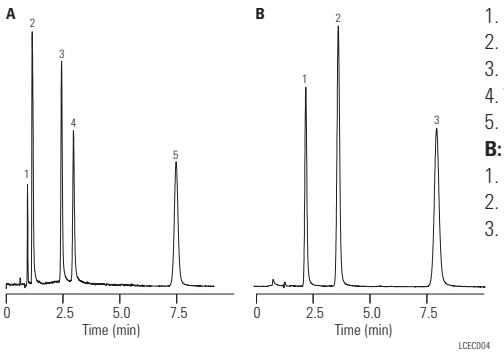
Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Mobile Phase: A: pH 3.0 75% 25 mM phosphate buffer 25% ACN
B: pH 7.0 90% 20 mM phosphate 10% ACN

Flow Rate: 1.5 mL/min

Temperature: 40 °C

ZORBAX Eclipse XDB columns provide good peak shape over a wide pH range and are an excellent choice for method development from pH 2-9.



Sample:
A:
1. Maleate
2. Doxylamine
3. Chlorpheniramine
4. Triprolidine
5. Diphenhydramine

B:
1. Procainamide
2. N-acetylprocainamide
3. N-propionylprocainamide

Column stability testing at pH 3 and 60 °C

Column: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

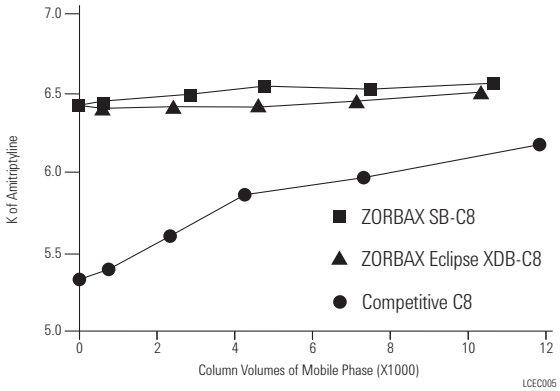
Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Mobile Phase: Purge Conditions:
70% 50 mM NaAc-HCl, pH 3.0
30% ACN
Retention Test Conditions:
65% Methanol
35% Water

Flow Rate: 1.0 mL/min

Temperature: 60 °C

Sample: Tricyclic antidepressants



Eclipse XDB columns are stable over a wide pH range. At low pH an Eclipse endcapped column is extremely stable and shows equivalent stability to a non-endcapped column, SB-C8, at pH 3. The columns were purged with a pH 3 mobile phase at 60 °C. Then they were tested with a strongly basic compound to determine if the endcapping or bonded phase had been hydrolyzed from the silica surface. The Eclipse XDB column was very stable, as shown by the consistency of the retention of amitriptyline over the 12,000 column volumes of the test. Another endcapped column shows less stability under these same conditions.

Column stability testing at pH 7.0

Column A: **Competitive C8**
SIL-type
After 1826 column volumes

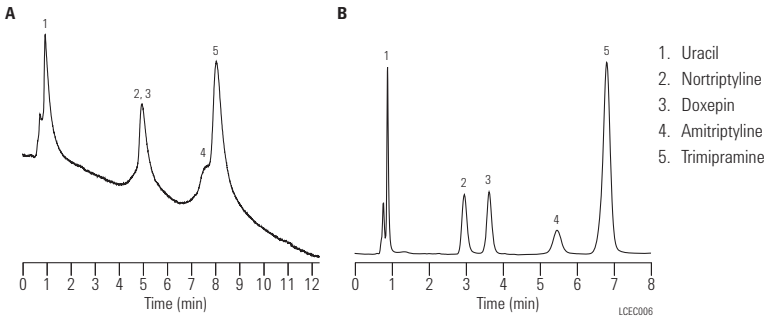
Column B: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm
Sol-type
After 1843 column volumes

Mobile Phase: 60% ACN
40% 250 mM Phosphate Buffer, pH 7.0

Flow Rate: 1.5 mL/min

Temperature: 60 °C

Sample: Tricyclic antidepressants



Double endcapping, dense bonding and the durable Rx-Sil particles (sol-type) combine to provide long lifetime at pH 7 when compared to single endcapped sil-gel columns used here. The conditions used for this test – high temperature (60 °C) and high salt concentration (250 mM), accelerate the dissolution of silica, causing premature failure of the sil-gel type column.

Selectivity changes for basic compounds with Eclipse XDB and StableBond

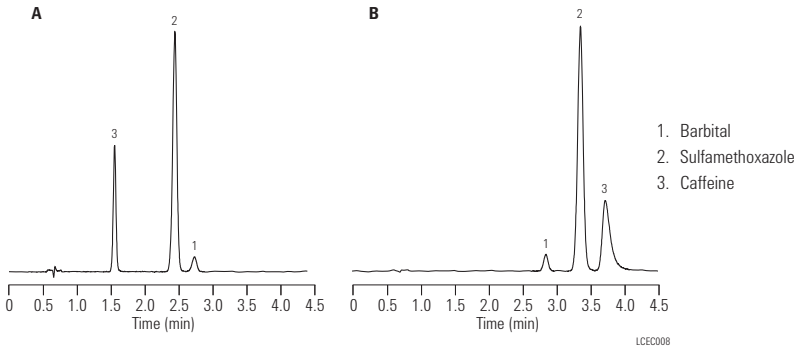
Column A: **Eclipse XDB-C8**
966967-906
4.6 x 75 mm, 3.5 µm

Column B: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

Mobile Phase: 70% 25 mM NaH_2PO_4, pH 3.0
30% Methanol

Flow Rate: 1.0 mL/min

Temperature: 35 °C



Eclipse XDB and StableBond columns are based on the same silica but have different bonding and endcapping. Therefore, they can have very different selectivity for the same sample under the same conditions, as this example shows.

Optimize separations with Eclipse XDB selectivity options

Column A: **Eclipse XDB-Phenyl 963967-912 4.6 x 150 mm, 3.5 µm**

Column B: **Eclipse XDB-C8 963967-906 4.6 x 150 mm, 3.5 µm**

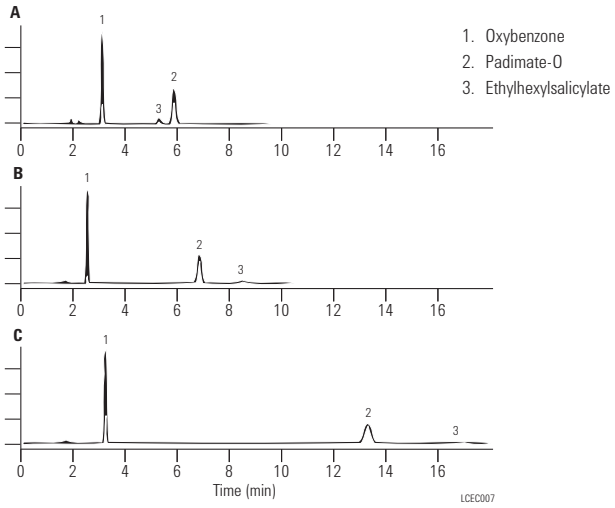
Column C: **Eclipse XDB-C18 963967-902 4.6 x 150 mm, 3.5 µm**

Mobile Phase: 15% H_2O:85% MeOH

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Sample: Sunscreens



1. Oxybenzone
2. Padimate-O
3. Ethylhexylsalicylate

This separation of sunscreens on all three Eclipse XDB bonded phases – C18, C8 and Phenyl – shows that different bonded phases can be used to optimize a separation. While all three bonded phases provide an adequate separation, the Eclipse XDB-Phenyl provides a different peak elution order and a much shorter overall analysis time. All three bonded phases also provide excellent peak shape with no mobile phase additives.

Selectivity for urea pesticides

Column A: **Eclipse XDB-C18 993967-902 4.6 x 150 mm, 5 µm**

Column B: **Eclipse XDB-CN 993967-905 4.6 x 150 mm, 5 µm**

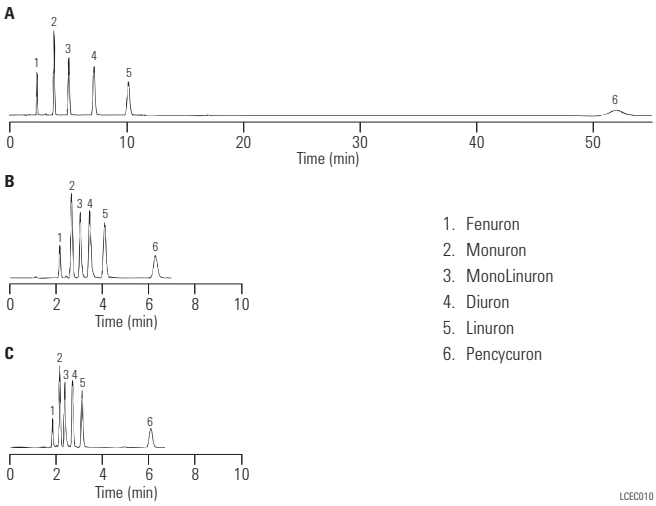
Column C: **Eclipse XDB-C18 993967-902 4.6 x 150 mm, 5 µm**

Mobile Phase: A. 60:40 MeOH:Water
B. 60:40 MeOH:Water
C. 77:23 MeOH:Water

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Sample: Urea pesticides



1. Fenuron
2. Monuron
3. MonoLinuron
4. Diuron
5. Linuron
6. Pencycuron

The Eclipse XDB-CN column reduces retention time and provides good selectivity for Urea pesticides when compared to an Eclipse XDB-C18 column.

ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	Eclipse XDB-Phenyl USP L11	Eclipse XDB-CN USP L10
Standard Columns (no special hardware required)							
	Semi-Preparative	9.4 x 250	5	990967-202	990967-206		
	Analytical	4.6 x 250	5	990967-902	990967-906	990967-912	990967-905
	Analytical	4.6 x 150	5	993967-902	993967-906	993967-912	993967-905
	Analytical	4.6 x 50	5	946975-902	946975-906		
	Rapid Resolution	4.6 x 150	3.5	963967-902	963967-906	963967-912	963967-905
	Rapid Resolution	4.6 x 100	3.5	961967-902	961967-906		961967-905
	Rapid Resolution	4.6 x 75	3.5	966967-902	966967-906	966967-912	966967-905
	Rapid Resolution	4.6 x 50	3.5	935967-902	935967-906	935967-912	
	Rapid Resolution	4.6 x 30	3.5	934967-902	934967-906		
	Rapid Resolution	4.6 x 20	3.5	932967-902	932967-906		
UG	UHPLC Guard, 1200 bar, 3/pk	4.6 x 5	1.8	820750-903			
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	928975-902	928975-906		
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	927975-902	927975-906		
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	924975-902	924975-906		
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	926975-902	926975-906		
	Solvent Saver	3.0 x 250	5	990967-302	990967-306	990967-312	990967-305
	Solvent Saver	3.0 x 150	5	993967-302	993967-306	993967-312	993967-305
	Solvent Saver Plus	3.0 x 150	3.5	963954-302	963954-306	963954-312	963954-305
	Solvent Saver Plus	3.0 x 100	3.5	961967-302	961967-306	961967-312	
	Solvent Saver Plus	3.0 x 75	3.5	966954-302			
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	981759-302			
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	981758-302			
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	981757-302			
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	928975-302	928975-306		
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	927975-302	927975-306		
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	924975-302	924975-306		
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	926975-302	926975-306		
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-903			
	Narrow Bore	2.1 x 150	5	993700-902	993700-906	993700-912	993700-905
	Narrow Bore	2.1 x 50	5	960967-902	960967-906	960967-912	960967-905
	Narrow Bore RR	2.1 x 150	3.5	930990-902	930990-906		

Unless indicated, column pressure limit is 400 bar.

*These columns are packed with Eclipse XDB-C18, 5 µm.

(Continued)

ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	Eclipse XDB-Phenyl USP L11	Eclipse XDB-CN USP L10
Standard Columns (no special hardware required)							
	Narrow Bore RR	2.1 x 100	3.5	961753-902	961753-906		961753-905
	Narrow Bore RR	2.1 x 75	3.5	966735-902			
	Narrow Bore RR	2.1 x 50	3.5	971700-902	971700-906		
	Narrow Bore RR	2.1 x 30	3.5	974700-902	974700-906		
	Narrow Bore RR	2.1 x 20	3.5	972700-902	972700-906		
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	981759-902			
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	981758-902			
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	981757-902			
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	928700-902	928700-906		
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	927700-902	927700-906		
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	924700-902	924700-906		
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	926700-902	926700-906		
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-903			
	MicroBore RR	1.0 x 150	3.5	963600-902	963600-906		
	MicroBore RR	1.0 x 50	3.5	965600-902	965600-906		
	MicroBore RR	1.0 x 30	3.5	961600-902	961600-906		
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5921	5185-5921		
P	Guard Cartridge	9.4 x 15	5	820675-112*	820675-112*	820675-112*	820675-112*
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-925	820950-926	820950-927	820950-935
ZGC	Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-926	821125-926	821125-926	821125-935
P	Guard Hardware Kit			840140-901	840140-901	840140-901	840140-901
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
PH	PrepHT Cartridge	21.2 x 250	7	977250-102	977250-106		
PH	PrepHT Cartridge	21.2 x 150	7	977150-102	977150-106		
PH	PrepHT Cartridge	21.2 x 150	5	970150-902	970150-906		
PH	PrepHT Cartridge	21.2 x 100	5	970100-902	970100-906		
PH	PrepHT Cartridge	21.2 x 50	5	970050-902	970050-906		
PH	PrepHT Guard Cartridge	17.0 x 7.5	5	820212-925	820212-926		
PH	Guard Cartridge Hardware			820444-901	820444-901		
PH	PrepHT Endfittings, 2/pk			820400-901	820400-901		

Unless indicated, column pressure limit is 400 bar.

*These columns are packed with Eclipse XDB-C18, 5 µm.

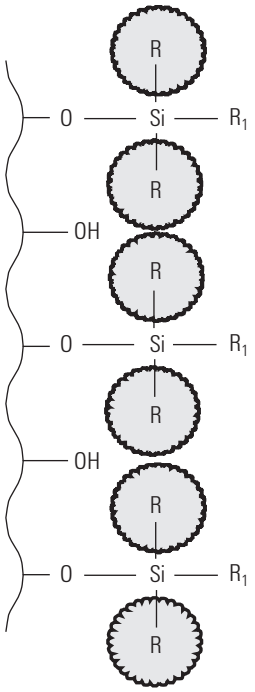
ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7
Agilent Cartridge Columns (require hardware kit 5021-1845)					
AC	Analytical	4.6 x 250	5	7995118-585	7995108-585
AC	Analytical	4.6 x 150	5	7995118-595	7995108-595
AC	Rapid Resolution	4.6 x 75	3.5	7995118-344	7995108-344
AC	Solvent Saver Plus	3.0 x 75	3.5	7995230-344	
AC	Guard Cartridges, 10/pk	4.0 x 4	5	7995118-504	7995118-504
AC	Cartridge Holder			5021-1845	5021-1845
Standard Columns (no special hardware required)					
	Rapid Resolution HT, 400 bar	4.6 x 50	1.8	922975-902	922975-906
	Rapid Resolution HT, 3/pk, 400 bar	4.6 x 50	1.8	922975-932	
	Narrow Bore RRHT, 400 bar	2.1 x 50	1.8	922700-902	
	Narrow Bore RRHT, 3/pk, 400 bar	2.1 x 50	1.8	922700-932	
Rapid Resolution HT Cartridges (require hardware kit 820555-901)					
RR	Rapid Resolution Cartridge	4.6 x 30	3.5	933975-902	933975-906
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 30	3.5	933975-932	933975-936
RR	Rapid Resolution Cartridge	4.6 x 15	3.5	931975-902	931975-906
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 15	3.5	931975-932	931975-936
RR	Rapid Resolution Cartridge	2.1 x 30	3.5	973700-902	973700-906
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 30	3.5	973700-932	973700-936
RR	Rapid Resolution Cartridge	2.1 x 15	3.5	975700-902	975700-906
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 15	3.5	975700-932	975700-936
RR	Rapid Resolution HT Cartridge, 400 bar	4.6 x 50	1.8	925975-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 400 bar	4.6 x 50	1.8	925975-932	
RR	Rapid Resolution HT Cartridge, 400 bar	4.6 x 30	1.8	923975-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 400 bar	4.6 x 30	1.8	923975-932	

(Continued)

ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7
Rapid Resolution HT Cartridges (require hardware kit 820555-901)					
RR	Rapid Resolution HT Cartridge, 400 bar	4.6 x 15	1.8	921975-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 400 bar	4.6 x 15	1.8	921975-932	
RR	Rapid Resolution HT Cartridge, 400 bar	2.1 x 50	1.8	925700-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 400 bar	2.1 x 50	1.8	925700-932	
RR	Rapid Resolution HT Cartridge, 400 bar	2.1 x 30	1.8	923700-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 400 bar	2.1 x 30	1.8	923700-932	
RR	Rapid Resolution HT Cartridge, 400 bar	2.1 x 15	1.8	921700-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 400 bar	2.1 x 15	1.8	921700-932	
RR	Hardware Kit for RR and RRHT Cartridges			820555-901	
Capillary Glass-lined Columns					
	Capillary	0.5 x 250	5	5064-8286	
	Capillary	0.5 x 150	5	5064-8287	
	Capillary RR	0.5 x 150	3.5	5064-8288	
	Capillary RR	0.5 x 35	3.5	5064-8298	
	Capillary	0.3 x 250	5	5064-8269	
	Capillary	0.3 x 150	5	5064-8291	
	Capillary RR	0.3 x 150	3.5	5064-8271	
	Capillary	0.5 x 35	5	5064-8296	
	Capillary	0.3 x 35	5	5064-8297	



Sterically Protected StableBond Bonded Phase

ZORBAX 80Å StableBond

- Longest column lifetime and best reproducibility for low pH separations – down to pH 1
- Patented stable column chemistry allows use at high temperature and low pH without degradation
- Six different bonded phases provide broad selectivity – SB-C18, SB-C8, SB-CN, SB-Phenyl, SB-C3, and SB-Aq
- High purity (Type B) silica for good peak shape

Agilent ZORBAX StableBond columns use patented, unique, nonfunctional silanes with bulky diisobutyl (SB-C18) or diisopropyl (SB-C8, SB-C3, SB-Phenyl, SB-CN, and SB-Aq) side chain groups that sterically protect the key siloxane bond to the silica surface from hydrolytic attack at low pH. StableBond packing materials are not endcapped in order to provide exceptional stability and to maximize lifetime and reproducibility under acidic mobile phase conditions. The high purity, low acidity silica provides excellent peak shape with acidic, basic and neutral compounds making StableBond columns an excellent choice for low pH method development. ZORBAX StableBond columns are compatible with all common mobile phases, including very high aqueous mobile phases.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range*	Endcapped	Carbon Load
ZORBAX SB-C18	80Å	180 m^2/g	90 °C	0.8-8.0	No	10%
ZORBAX SB-C8	80Å	180 m^2/g	80 °C	1.0-8.0	No	5.5%
ZORBAX SB-C3	80Å	180 m^2/g	80 °C	1.0-8.0	No	4%
ZORBAX SB-Phenyl	80Å	180 m^2/g	80 °C	1.0-8.0	No	5.5%
ZORBAX SB-CN	80Å	180 m^2/g	80 °C	1.0-8.0	No	4%
ZORBAX SB-Aq	80Å	180 m^2/g	80 °C	1.0-8.0	No	proprietary

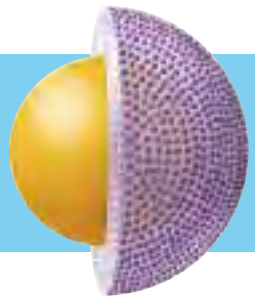
Specifications represent typical values only

*StableBond columns are designed for optimal use at low pH. At pH 6-8, highest column stability for all silica-based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations in the range of 0.01-0.02 M. At mid-range pH, Eclipse Plus, Eclipse XDB and Bonus-RP are recommended.

TIPS & TOOLS

ZORBAX StableBond SB-C18, SB-C8 and SB-Aq phases are also available on Poroshell 120.

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StableBond SB-C18 shows excellent stability at low pH and high temperature (pH 0.8, 90 °C)

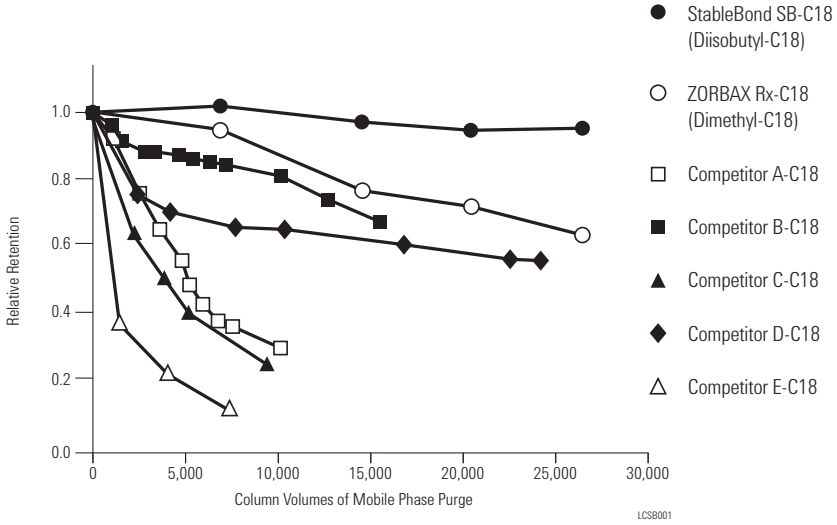
Column: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Column: **ZORBAX Rx-C18**
883967-902
4.6 x 150 mm, 5 µm

Mobile Phase: 50% Methanol/50% Water with 1.0% TFA
Test Solute: Toluene

Temperature: 90 °C

As an indicator of column breakdown, retention time of toluene was measured after purging the column with mobile phase. Only the StableBond SB-C18 is unchanged after three working months of use under these very low pH (0.8) and high temperature (90 °C) conditions. ZORBAX Rx-C18 also provides a stable matrix, and can be used as an alternative selectivity to StableBond SB-C18.



Shorter chain ZORBAX SB-CN is also stable at low pH (pH 2.0, 50 °C)

Column: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

Mobile Phase: 0.1% TFA, pH 2:ACN

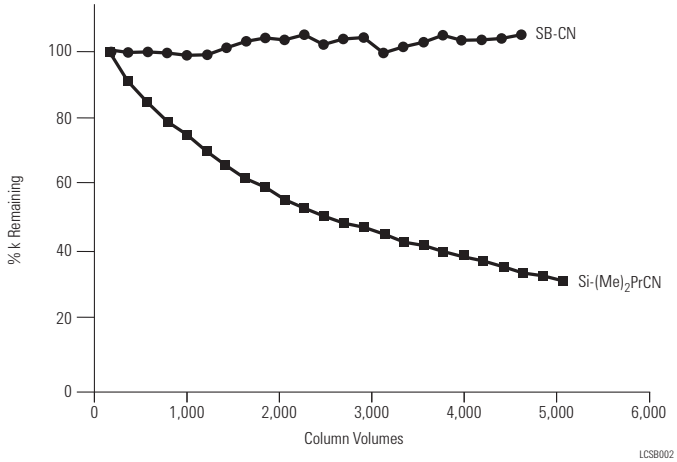
Flow Rate: 1 mL/min

Gradient: 0-100% ACN

Temperature: 50 °C

Sample: 1-phenylheptane @ 50% AC/50% water with 0.1% TFA

ZORBAX StableBond SB-CN and other short chain StableBond bonded phases are also exceptionally stable at low pH. Conventional dimethyl CN and similar bonded phases lack this stability.



SB-CN optimizes retention and resolution

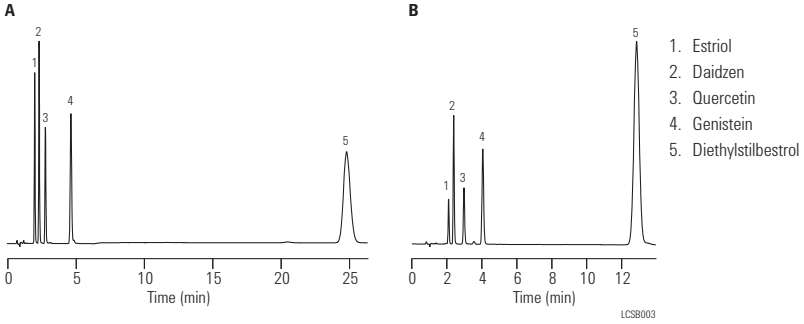
Column A: **ZORBAX SB-C18**
866953-902
4.6 x 75 mm, 3.5 µm

Column B: **ZORBAX SB-CN**
866953-905
4.6 x 75 mm, 3.5 µm

Mobile Phase: 30% ACN
70% 25mM NaH_2PO_4, pH 2.5

Flow Rate: 1.0 mL/min

Temperature: 35 °C



The SB-CN column is used here to reduce analysis time by 50%. The retention of the most hydrophobic analyte is cut in half. At the same time, retention of the more polar, early eluting peaks increases slightly.

Five different bonded phases provide selectivity options

Column A: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Column B: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

Column C: **ZORBAX SB-C3**
883975-909
4.6 x 150 mm, 5 µm

Column D: **ZORBAX SB-Phenyl**
883975-912
4.6 x 150 mm, 5 µm

Column E: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

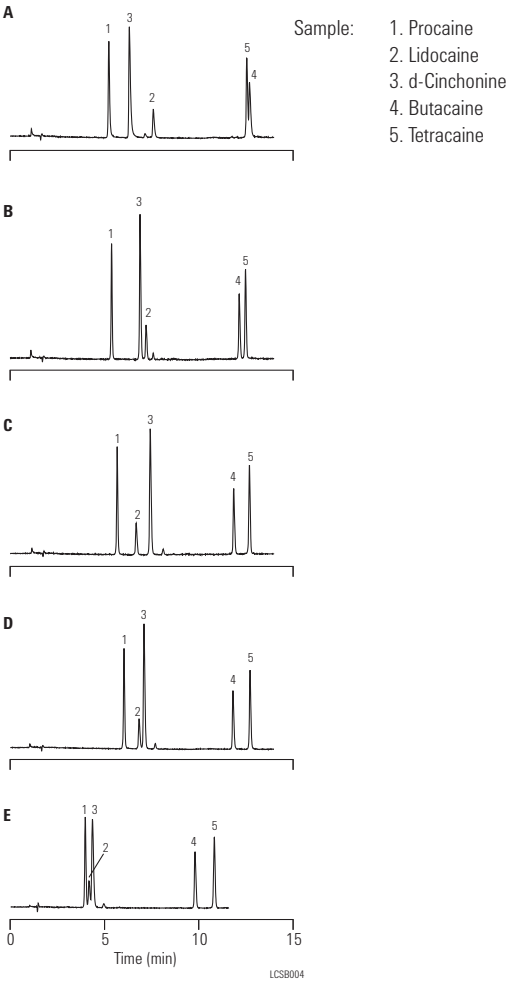
Mobile Phase: 0-100% B in 18.8 min
A: 50 mM NaH_2PO_4,
pH 2.5 in 95% H_2O / 5% ACN
B: 50 mM NaH_2PO_4,
pH 2.5 in 47% H_2O / 53% ACN

Flow Rate: 1.0 mL/min

Temperature: 26 °C

Detector: 254 nm

SB-C3 is just one of the five different StableBond selectivity choices. In this example, optimum resolution is obtained with SB-C3. All are based on the same high purity Rx-SIL. Selectivity changes are therefore dependent only on the bonded phases, making method development more reliable.



ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required)									
	Semi-Preparative	9.4 x 250	5	880975-202	880967-201	880975-205	880975-209	880975-212	
	Semi-Preparative	9.4 x 150	5	883975-202					
	Semi-Preparative	9.4 x 100	5	884975-202					
	Semi-Preparative	9.4 x 50	5	846975-202					
	Analytical	4.6 x 250	5	880975-902	880975-906	880975-905	880975-909	880975-912	880975-914
	Analytical	4.6 x 150	5	883975-902	883975-906	883975-905	883975-909	883975-912	883975-914
	Analytical	4.6 x 50	5	846975-902	846975-906				846975-914
	Rapid Resolution	4.6 x 250	3.5	884950-567					
	Rapid Resolution	4.6 x 150	3.5	863953-902	863953-906	863953-905		863953-912	863953-914
	Rapid Resolution	4.6 x 100	3.5	861953-902	861953-906	861953-905		861953-912	861953-914
	Rapid Resolution	4.6 x 75	3.5	866953-902	866953-906	866953-905		866953-912	866953-914
	Rapid Resolution	4.6 x 50	3.5	835975-902	835975-906	835975-905		835975-912	835975-914
	Rapid Resolution	4.6 x 30	3.5	834975-902	834975-906				
	Rapid Resolution	4.6 x 20	3.5	832975-902	832975-906				
	Rapid Resolution HT, 600 bar	4.6 x 150	1.8	829975-902	829975-906	829975-905		829975-912	829975-914
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-902	828975-906	828975-905		828975-912	828975-914
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8		830975-906				
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	827975-906	827975-905		827975-912	827975-914
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	824975-902	824975-906	824975-905		824975-912	824975-914
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	826975-902	826975-906				
UG	UHPLC Guard, 600 bar, 3/pk	4.6 x 5	1.8	820750-902	820750-904				
	Solvent Saver	3.0 x 250	5	880975-302	880975-306	880975-305	880975-309	880975-312	880975-314
	Solvent Saver	3.0 x 150	5	883975-302	883975-306	883975-305	883975-309	883975-312	883975-314
	Solvent Saver Plus	3.0 x 150	3.5	863954-302	863954-306	863954-305		863954-312	863954-314
	Solvent Saver Plus	3.0 x 100	3.5	861954-302	861954-306	861954-305	861954-309	861954-312	861954-314
	Solvent Saver Plus	3.0 x 75	3.5	866953-302					

Unless indicated, column pressure limit is 400 bar.

(Continued)

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required)									
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	859700-302	859700-306				
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	858700-302	858700-306	858700-305		858700-312	
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	857700-302	857700-306	857700-305		857700-312	
	Solvent Saver HT, 600 bar	3.0 x 150	1.8	829975-302	829975-306	829975-305		829975-312	
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	828975-302	828975-306	828975-305	828975-309	828975-312	828975-314
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	827975-302	827975-306	827975-305			
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	824975-302	824975-306	824975-305		827975-312	827975-314
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	826975-302	826975-306				
UG	UHPLC Guard, 1200 bar, 3/pk	3.0 x 5	1.8	823750-902	823750-904				
	Narrow Bore	2.1 x 150	5	883700-922	883700-906	883700-905	883700-909	883700-912	
	Narrow Bore	2.1 x 50	5	860975-902	860975-906	860975-905	860975-909	860975-912	860975-914
	Narrow Bore RR	2.1 x 150	3.5	830990-902	830990-906				830990-914
	Narrow Bore RR	2.1 x 100	3.5	861753-902	861753-906	861753-905		861753-912	861753-914
	Narrow Bore RR	2.1 x 75	3.5	866735-902					
	Narrow Bore RR	2.1 x 50	3.5	871700-902	871700-906				871700-914
	Narrow Bore RR	2.1 x 30	3.5	874700-902	874700-906				
	Narrow Bore RR	2.1 x 20	3.5	872700-902	872700-906				
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	859700-902	859700-906	859700-905		859700-912	
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	858700-902	858700-906	858700-905		858700-912	
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	857700-902	857700-906	857700-905		857700-912	

Unless indicated, column pressure limit is 400 bar.

(Continued)

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required)									
	Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	820700-902	820700-906	820700-905		820700-912	
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828700-902	828700-906	828700-905		828700-912	828700-914
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827700-902	827700-906	827700-905		827700-912	827700-914
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	824700-902	824700-906	824700-905		824700-912	824700-914
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	826700-902	826700-906				
UG	UHPLC Guard, 1200 bar, 3/pk	2.1 x 5	1.8	821725-902	821725-904				
	MicroBore RR	1.0 x 150	3.5	863600-902	863600-906	863600-905			
	MicroBore RR	1.0 x 50	3.5	865600-902	865600-906				
	MicroBore RR	1.0 x 30	3.5	861600-902	861600-906				
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5920	5185-5920				
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115	820675-124	820675-124	820675-115	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-920	820950-915	820950-916	820950-922	820950-917	820950-933
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-915	821125-915	821125-924	821125-924	821125-915	821125-933
P	Guard Hardware Kit	9.4 x 15	0	840140-901	840140-901	840140-901	840140-901	840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)									
PL	PrepHT Cartridge	21.2 x 250	7	877250-102	877250-106	877250-105		877250-112	877250-114
PL	PrepHT Cartridge	21.2 x 150	7	877150-102	877150-106				877150-114
PL	PrepHT Cartridge	21.2 x 150	5	870150-902	870150-906				870150-914
PL	PrepHT Cartridge	21.2 x 100	5	870100-902	870100-906				870100-914
PL	PrepHT Cartridge	21.2 x 50	5	870050-902	870050-906				870050-914
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-920	820212-915	820212-915		820212-915	820212-933
	Guard Cartridge Hardware			820444-901	820444-901	820444-901	820444-901	820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901	820400-901	820400-901

Unless indicated, column pressure limit is 400 bar.

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Phenyl USP L11
Agilent Cartridge Columns (require hardware kit 5021-1845)						
AC	Analytical	4.6 x 250	5	7995218-585	7995208-585	
AC	Analytical	4.6 x 150	5	7995218-595	7995208-595	
AC	Rapid Resolution	4.6 x 75	3.5	7995218-344	7995208-344	
AC	Guard Cartridges, 10/pk	4.0 x 4	5	7995118-504	7995118-504	
AC	Cartridge Holder			5021-1845	5021-1845	
Standard Columns (no special hardware required)						
	Rapid Resolution HT	4.6 x 50	1.8	822975-902	822975-906	
	Rapid Resolution HT, 3/pk	4.6 x 50	1.8	822975-932		
	Narrow Bore RRHT	2.1 x 50	1.8	822700-902		
	Narrow Bore RRHT, 3/pk	2.1 x 50	1.8	822700-932		
Rapid Resolution Cartridges (require hardware kit 820555-901)						
RR	Rapid Resolution Cartridge	4.6 x 30	3.5	833975-902	833975-906	833975-912
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 30	3.5	833975-932	833975-936	
RR	Rapid Resolution Cartridge	4.6 x 15	3.5	831975-902	831975-906	
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 15	3.5	831975-932	831975-936	
RR	Rapid Resolution Cartridge	2.1 x 30	3.5	873700-902	873700-906	
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 30	3.5	873700-932	873700-936	
RR	Rapid Resolution Cartridge	2.1 x 15	3.5	875700-902	875700-906	
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 15	3.5	875700-932	875700-936	
Rapid Resolution HT Cartridges (require hardware kit 820555-901)						
RR	Rapid Resolution HT Cartridge	4.6 x 50	1.8	825975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	825975-932		
RR	Rapid Resolution HT Cartridge	4.6 x 30	1.8	823975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	823975-932		
RR	Rapid Resolution HT Cartridge	4.6 x 15	1.8	821975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	821975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 50	1.8	825700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	825700-932		
RR	Rapid Resolution HT Cartridge	2.1 x 30	1.8	823700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	823700-932		
RR	Rapid Resolution HT Cartridge	2.1 x 15	1.8	821700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	821700-932		
RR	Hardware Kit for RR and RRHT Cartridges			820555-901		

ZORBAX 80Å StableBond

Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1
Capillary Glass-lined Columns			
Capillary	0.5 x 250	5	5064-8258
Capillary	0.5 x 150	5	5064-8256
Capillary	0.5 x 35	5	5064-8254
Capillary RR	0.5 x 150	3.5	5064-8262
Capillary RR	0.5 x 35	3.5	5064-8260
Capillary	0.3 x 250	5	5064-8257
Capillary	0.3 x 150	5	5064-8255
Capillary	0.3 x 35	5	5064-8253
Capillary RR	0.3 x 150	3.5	5064-8261

ZORBAX Rx

- Recommended for alternate selectivity at low pH relative to Eclipse Plus C18, Eclipse XDB-C18 and StableBond SB-C18; for higher temperature applications, StableBond is recommended
- Higher carbon load than SB-C18 columns (12% vs. 10%)
- High stability and good peak shape for low pH applications (up to pH 8)
- Manufactured using dimethyloctadecylsilane and non-endcapped
- ZORBAX Rx-C8 is the same product as SB-C8

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
ZORBAX Rx-C18	80Å	180 m^2/g	60 °C	2.0-8.0	No	12%
ZORBAX Rx-C8	80Å	180 m^2/g	80 °C	1.0-8.0	No	5.5%

Specifications represent typical values only

*At pH 6-9 highest column stability for all silica based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations in the range of 0.01-0.02 M.

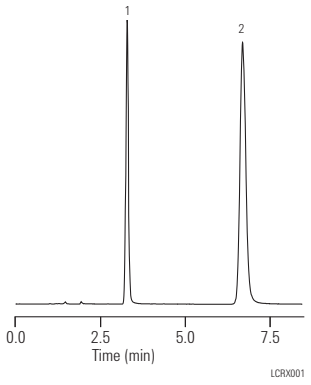
Analysis of diazepam on Rx-C18

Column: **ZORBAX Rx-C18**
880967-302
3.0 x 250 mm, 5 µm

Mobile Phase: 35% H_2O:65% MeOH

Flow Rate: 0.5 mL/min

An Rx-C18 column is used for this USP analysis of diazepam and the internal standard ethylparaben. The Solvent Saver 3.0 mm id Rx-C18 column reduces solvent usage by 60% over what would be used if the analysis was done on a 4.6 x 250 mm column.

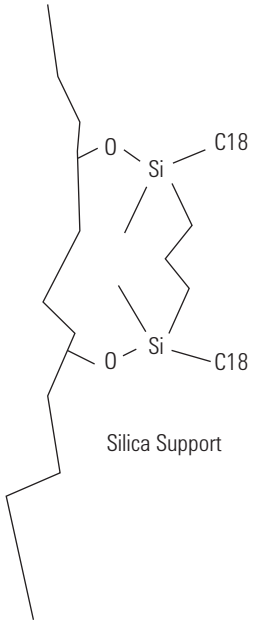


1. Ethylparaben
2. Diazepam

ZORBAX Rx

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-C18 USP L1	Rx-C8 USP L7*
	Semi-Preparative	9.4 x 250	5	880967-202	880967-201
	Analytical	4.6 x 250	5	880967-902	880967-901
	Analytical	4.6 x 150	5	883967-902	883967-901
	Rapid Resolution	4.6 x 150	3.5	863967-902	
	Rapid Resolution	4.6 x 100	3.5	861967-902	
	Rapid Resolution	4.6 x 75	3.5	866967-902	
	Solvent Saver	3.0 x 250	5	880967-302	
	Solvent Saver	3.0 x 150	5	883967-302	
	Solvent Saver Plus	3.0 x 150	3.5	863967-302	
	Solvent Saver Plus	3.0 x 100	3.5	861967-302	
	Narrow Bore	2.1 x 150	5	883700-902	
	Narrow Bore RR	2.1 x 100	3.5	861767-902	
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-914	820950-913
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-915	821125-915
P	Guard Hardware Kit	9.4 x 15		840140-901	840140-901
ZGC	Guard Hardware Kit			820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)					
PHT	PrepHT Cartridge	21.2 x 250	7	877967-102	877250-106
PHT	PrepHT Cartridge	21.2 x 150	7		877150-106
PHT	PrepHT Cartridge	21.2 x 150	5		870150-906
PHT	PrepHT Cartridge	21.2 x 100	5		870100-906
PHT	PrepHT Cartridge	21.2 x 50	5		870050-906
PHT	PrepHT Guard Cartridge, 2/pk		5	820212-914	820212-915
PHT	Guard Cartridge Hardware			820444-901	820444-901
PHT	PrepHT Endfittings, 2/pk			820400-901	820400-901

*Rx-C8 is the same product as SB-C8. For other sizes and configurations, see the ZORBAX StableBond section, page 264.



ZORBAX 80Å Extend-C18

- High efficiency and long life at high pH – up to pH 11.5
- Unique bidentate bonding and double endcapping provides high pH stability
- More efficiency and better peak shape than polymer-based columns
- Improve retention, resolution and peak shape of basic compounds
- High sensitivity for LC/MS separations of peptides

The Agilent ZORBAX Extend-C18 column uses a novel bidentate C18-C18 bonding technology to make it possible to develop high-resolution separations at high pH with a silica-based column. At high pH, non-charged basic compounds will not interact with the underlying silica. The result is high efficiency separations with superior peak shape and improved resolution. High pH separations are also the best choice for compounds that are more stable or more soluble in high pH solutions. Some of the mobile phase buffer options for high pH include triethylamine, pyrrolidine, glycine, borate and ammonium hydroxide. Ammonium hydroxide at pH 10.5 is an excellent mobile phase modifier for the LC/MS of peptides and small molecules with improved sensitivity compared with TFA containing mobile phase at low pH. The Extend-C18 column is stable from pH 2-11.5 with good peak shape for all types of compounds. Extend-C18 columns also provide an additional selectivity choice at low pH.

TIPS & TOOLS

Always use Agilent Certified Lamps for Best LC Performance

Agilent detector lamps are built to the tightest specifications and quality standards. They are designed to increase light intensity and decrease noise, which improves chromatographic results. Agilent rigorously tests its lamps for lowest lamp-to-lamp variability. Trust Agilent lamps for robust, long-lasting performance and lower cost of ownership. To learn more, visit **www.agilent.com/chem/lamps**



Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range**	Endcapped	Carbon Load
ZORBAX Extend-C18	80Å	180 m^2/g	60 °C	2.0-11.5	Double	12.5%

Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-11.5.

**Above pH 6 highest column stability for all silica based columns is obtained by reducing the operating temperature to 40 °C or below and using lower buffer concentrations (0.01-0.02 M) or organic buffers.

Basic antihistamines on Extend-C18 at high pH

Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: pH 7:
30% 20 mM Na_2HPO_4 70% MeOH
pH 11:
30% 20 mM TEA 70% MeOH

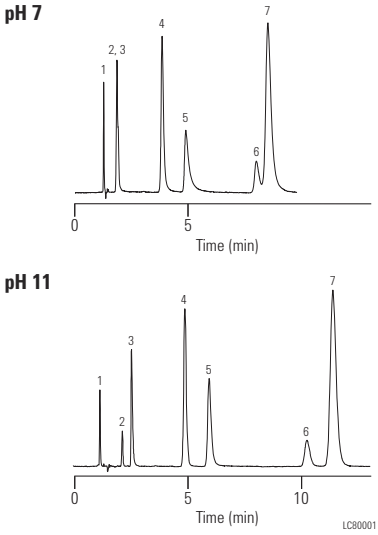
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: Antihistamines

Pseudoephedrine and scopolamine are difficult to retain at low and mid pH. Pseudoephedrine is often analyzed by ion exchange methods. The Extend-C18 column retains these compounds in a noncharged form at high pH and improves resolution.



1. Maleate
2. Scopolamine
3. Pseudoephedrine
4. Doxylamine
5. Chlorpheniramine
6. Triprolidine
7. Diphenhydramine

Long life at high pH with Extend-C18

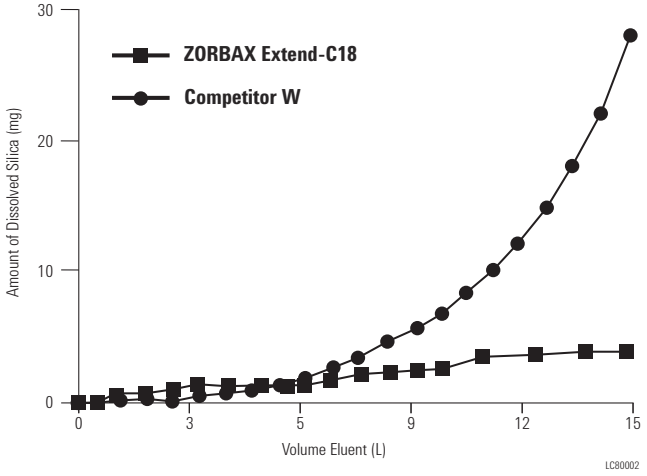
Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: 20% Methanol
80% 0.1 M Carbonate buffer, pH 10.0

Flow Rate: 1.0 mL/min

Temperature: Ambient

At high pH, columns will fail due to silica dissolution. The example here shows extended lifetime of ZORBAX Extend-C18 at high pH in comparison to competitor W. This was measured by the amount of dissolved silica.



Extend-C18 provides good peak shape at low pH

Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: 80% 25 mM NaH_2PO_4, pH 3.0
20% Methanol

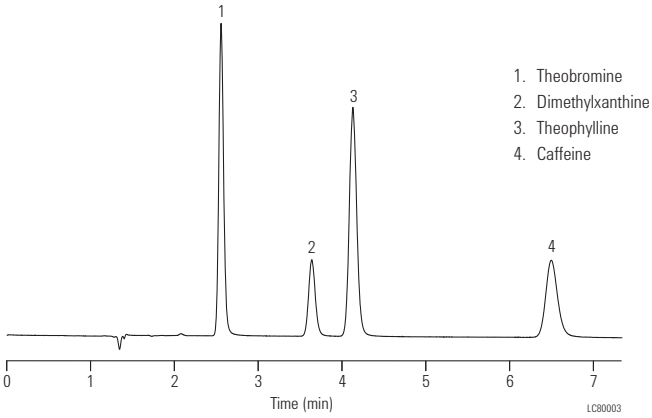
Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Basic compounds

These basic compounds are separated on the Extend-C18 at low pH with excellent peak shape. The Extend-C18 column can be used at high and low pH.



ZORBAX 80Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Extend-C18 USP L1
Standard Columns (no special hardware required)				
	Analytical	4.6 x 250	5	770450-902
	Analytical	4.6 x 150	5	773450-902
	Analytical	4.6 x 50	5	746450-902
	Rapid Resolution	4.6 x 150	3.5	763953-902
	Rapid Resolution	4.6 x 100	3.5	764953-902
	Rapid Resolution	4.6 x 75	3.5	766953-902
	Rapid Resolution	4.6 x 50	3.5	735953-902
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	728975-902
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	727975-902
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	724975-902
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	726975-902
	Solvent Saver	3.0 x 250	5	770450-302
	Solvent Saver	3.0 x 150	5	773450-302
	Solvent Saver Plus	3.0 x 150	3.5	763954-302
	Solvent Saver Plus	3.0 x 100	3.5	764953-302
	Solvent Saver Plus	3.0 x 50	3.5	735954-302

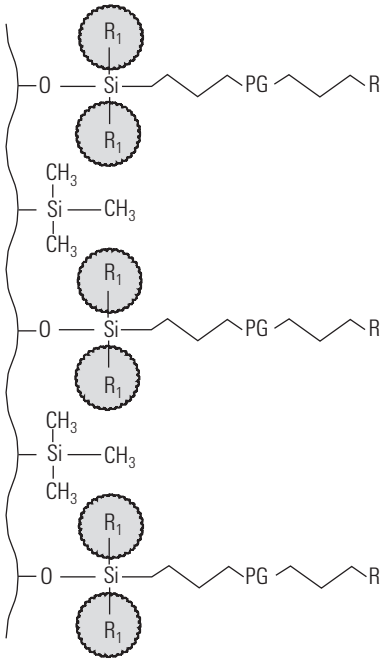
Unless indicated, column pressure limit is 400 bar.

(Continued)

ZORBAX 80Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Extend-C18 USP L1
Standard Columns (no special hardware required)				
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	758700-302
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	757700-302
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	728975-302
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	727975-302
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	724975-302
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	726975-302
	Narrow Bore	2.1 x 150	5	773700-902
	Narrow Bore	2.1 x 50	5	760450-902
	Narrow Bore RR	2.1 x 100	3.5	761753-902
	Narrow Bore RR	2.1 x 50	3.5	735700-902
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	759700-902
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	758700-902
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	757700-902
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	728700-902
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	727700-902
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	724700-902
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	726700-902
	MicroBore RR	1.0 x 150	3.5	763600-902
	MicroBore RR	1.0 x 50	3.5	765600-902
	MicroBore RR	1.0 x 30	3.5	761600-902
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5923
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-930
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-930
ZGC	Guard Hardware Kit			820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)				
PL	PrepHT Cartridge	21.2 x 150	5	770150-902
PL	PrepHT	21.2 x 100	5	770100-902
PL	PrepHT	21.2 x 50	5	770050-902
PL	PrepHT Endfittings, 2/pk			820400-901
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-930
PL	Guard Cartridge Hardware			820444-901

Unless indicated, column pressure limit is 400 bar.



Unique, Polar Alkyl Bonus-RP Bonded Phase

ZORBAX Bonus-RP

- Excellent peak shape for challenging basic compounds at low and mid pH
- Unique reversed-phase selectivity
- Novel bonding technology with embedded polar group and steric protection
- Usable in 100% aqueous mobile phases

The Agilent ZORBAX Bonus-RP column has a polar amide group embedded in a long alkyl chain. This novel bonding reduces interactions between basic compounds and the silica support, improving peak shape for the most difficult basic compounds. Peak shape and column lifetime are further improved by triple endcapping. In addition, diisopropyl side groups provide steric protection against acid hydrolysis for good lifetime at low pH. The Bonus-RP column provides an alternate selectivity to C18 and C8 alkyl bonded phases.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range	Endcapped	Carbon Load
ZORBAX Bonus-RP	80Å	180 m^2/g	60 °C	2.0-9.0	Triple	9.5%

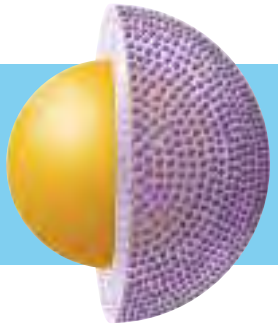
Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-9.

TIPS & TOOLS

ZORBAX Bonus-RP is also available on Poroshell 120.

Turn page 228



Improved peak shape of basic compounds using Bonus-RP

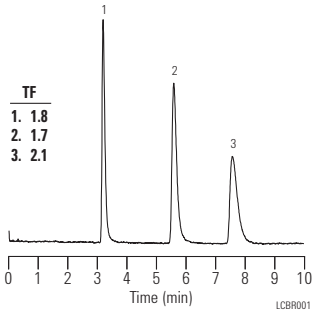
Column: **Alkyl-C8**
4.6 x 150 mm, 5 µm

Mobile Phase: 75% 25 mM NH_4OAc, pH 5.5
25% ACN

Flow Rate: 1.5 mL/min

Temperature: 40 °C

Detector: 254 nm



1. Doxylamine
2. Chlorpheniramine
3. Triprolidine

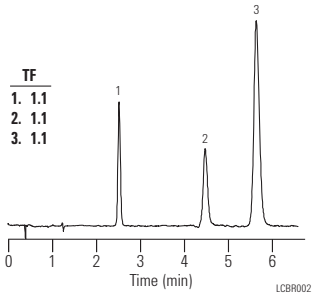
Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Mobile Phase: 80% 25 mM NH_4OAc, pH 5.5
20% ACN

Flow Rate: 1.5 mL/min

Temperature: 40 °C

Detector: 254 nm



1. Doxylamine
2. Chlorpheniramine
3. Triprolidine

Bonus-RP eliminates peak tailing of these basic compounds in comparison to a typical alkyl C8 bonded phase. In the mid-pH region, residual silanols can interact more strongly with basic compounds to cause peak tailing. The polar group in the Bonus-RP bonded phase eliminates peak tailing of these basic compounds by reducing interactions with residual silanols.

ZORBAX Bonus-RP is stable at low and mid pH

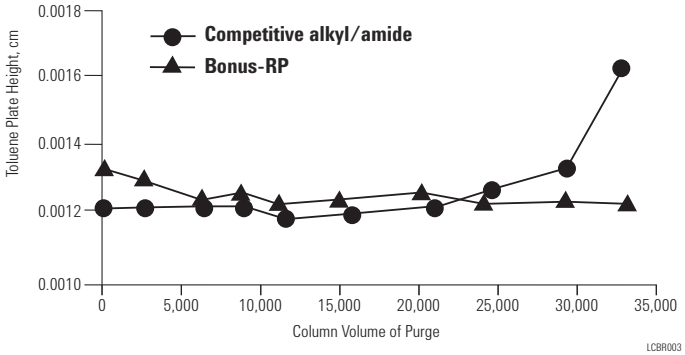
Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Mobile Phase: 60% 25 mM
Phosphate Buffer,
pH 7.0:40% ACN

Flow Rate: 1.5 mL/min

Temperature: 23 °C

Triple endcapping of Bonus-RP enhances stability at pH 7. Each 10,000 column volume is equivalent to approximately one working month.



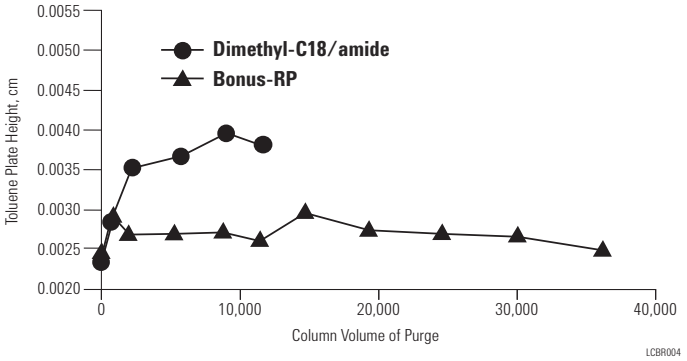
Dimethyl-C18/amide, Bonus-RP

Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Mobile Phase: Aging:
50% MeOH
50% 0.1% TFA
Test:
80% MeOH
20% H_2O

Flow Rate: 1.0 mL/min

Temperature: Aging:
60 °C
Test:
23 °C



Sterically protecting side groups provide good low pH stability and longer column lifetime than similar polar alkyl bonded phases.

ZORBAX Bonus-RP provides unique selectivity

Column A: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Column B: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Mobile Phase: 75% 25 mM Na Citrate, pH 6
25% MeOH

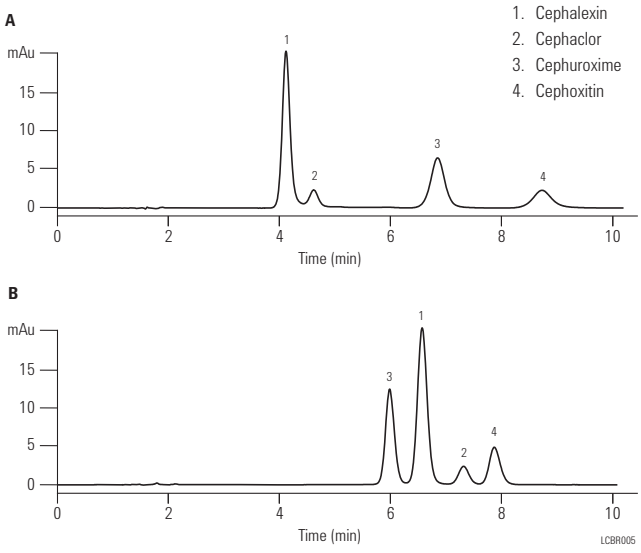
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: 3 µL
Cephalosporins

Peak elution order can change dramatically when using Bonus-RP.
In this example, the elution order of the first three peaks changes.



ZORBAX Bonus-RP

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP USP L60
Standard Columns (no special hardware required)				
	Analytical	4.6 x 250	5	880668-901
	Analytical	4.6 x 150	5	883668-901
	Rapid Resolution	4.6 x 250	3.5	884950-577
	Rapid Resolution	4.6 x 150	3.5	863668-901
	Rapid Resolution	4.6 x 100	3.5	864668-901
	Rapid Resolution	4.6 x 75	3.5	866668-901
	Rapid Resolution	4.6 x 50	3.5	835668-901
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828668-901
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8	830668-901
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827668-901
	Solvent Saver	3.0 x 250	5	880668-301
	Solvent Saver	3.0 x 150	5	883668-301
	Solvent Saver Plus	3.0 x 150	3.5	863668-301
	Solvent Saver Plus	3.0 x 100	3.5	864668-301
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	828668-301
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	827668-301
	Rapid Resolution HD, 1200 bar	2.1 x 150	1.8	859768-901
	Rapid Resolution HD, 1200 bar	2.1 x 100	1.8	858768-901
	Rapid Resolution HD, 1200 bar	2.1 x 50	1.8	857768-901
	Narrow Bore	2.1 x 150	5	883725-901
	Narrow Bore	2.1 x 50	5	861971-901

Unless indicated, column pressure limit is 400 bar.

(Continued)

ZORBAX Bonus-RP bonding is also available on Poroshell 120 columns. Turn to page 228.

ZORBAX Bonus-RP

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP USP L60
Standard Columns (no special hardware required)				
	Narrow Bore RR	2.1 x 150	3.5	863700-901
	Narrow Bore RR	2.1 x 100	3.5	861768-901
	Narrow Bore RR	2.1 x 50	3.5	861700-901
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828768-901
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827768-901
	MicroBore RR	1.0 x 150	3.5	863608-901
	MicroBore RR	1.0 x 50	3.5	865608-901
	MicroBore RR	1.0 x 30	3.5	861608-901
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5922
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-928
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-928
ZGC	Guard Hardware Kit			820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)				
PH	PrepHT Cartridge	21.2 x 250	7	878250-101
PH	PrepHT Cartridge	21.2 x 150	7	878150-101
PH	PrepHT Cartridge	21.2 x 150	5	868150-901
PH	PrepHT Cartridge	21.2 x 100	5	868100-901
PH	PrepHT Cartridge	21.2 x 50	5	868050-901
PH	PrepHT Endfittings, 2/pk			820400-901
PH	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-928
PH	Guard Cartridge Hardware			820444-901

Unless indicated, column pressure limit is 400 bar.

TIPS & TOOLS

Watch LC troubleshooting videos featuring Agilent chromatographic experts at **www.agilent.com/chem/lctroubleshooting**



ZORBAX Original Reversed-Phase Columns

Agilent Original ZORBAX columns are made with Type A silica and are useful for many applications of acidic or neutral compounds. These columns have a higher activity level and are therefore useful for separating isomers (e.g. cis-trans, geometric) or other compounds where silanol activity enhances selectivity. These columns are used in many established methods.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp Limit	pH Range	Endcapped	Carbon Load
ZORBAX C18	70Å	300 m^2/g	60 °C	2.0 - 8.0	Yes/No	20%
ZORBAX C8	70Å	300 m^2/g	60 °C	2.0 - 8.0	Yes	12%
ZORBAX-Phenyl	70Å	300 m^2/g	60 °C	2.0 - 8.0	Yes	12%
ZORBAX CN	70Å	300 m^2/g	60 °C	2.0 - 8.0	N/A	7%
ZORBAX-TMS	70Å	300 m^2/g	60 °C	2.0 - 7.0	N/A	4%

ZORBAX Original Reversed-Phase Columns

Hardware	Description	Size (mm)	Particle Size (µm)	ODS (C18) USP L1	C8 USP L7	Phenyl USP L11	CN USP L10	TMS USP L13
Standard Columns (no special hardware required)								
	Semi-Preparative	9.4 x 250	5	880952-202	880952-206			
	Analytical (Endcapped)	4.6 x 250	5	880952-702	880952-706	880952-712	884950-507	880952-710
	Analytical (Non-endcapped)	4.6 x 250	5	884950-543				
	Analytical	4.6 x 150	5	883952-702	883952-706	883952-712	884950-526	883952-710
	Solvent Saver	3.0 x 250	5	880952-302				
	Solvent Saver	3.0 x 150	5	883952-302				
Guard Columns (hardware required)								
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115	820675-115	820675-124	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-902	820950-906	820950-912	820950-905	820950-924
P	Guard Hardware Kit			840140-901	840140-901	840140-901	840140-901	840140-901
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)								
PHT	PrepHT Cartridge	21.2 x 250	7	877952-102	877952-106		877952-105	
PHT	PrepHT Endfittings, 2/pk			820400-901	820400-901		820400-901	



ZORBAX Method Development Kits

Kits for Analytical HPLC

ZORBAX Method Development Kits

Agilent offers a series of kits that allow for fast method development at an attractive price. Each kit contains 3 columns. Six new kits have been added and are recommended for use with the new Agilent Automated Method Development LC. Several of these kits contain Rapid Resolution HT (1.8 µm) columns in a variety of bonded phases for easy method optimization and several kits contain Rapid Resolution (3.5 µm) columns in the same variety of bonded phases. These kits contain some of the Eclipse Plus family of columns for excellent peak shape and optimum performance with a wide variety of compounds.

ZORBAX Method Development Kits
Recommended for use with the Agilent Automated Method Development LC System

Description	Part No.
Rapid Resolution HT (RRHT) Selectivity Method Development Kit, 2.1 mm id Includes 2.1 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, Eclipse Plus Phenyl-Hexyl and Bonus-RP	5190-1431
Rapid Resolution HT (RRHT) pH Method Development Kit, 2.1 mm id Includes 2.1 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, SB-C18 and Extend-C18	5190-1432
Rapid Resolution HT (RRHT) Selectivity Method Development Kit, 4.6 mm id Includes 4.6 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, Eclipse Plus Phenyl-Hexyl and Bonus-RP	5190-1433
Rapid Resolution HT (RRHT) pH Method Development Kit, 4.6 mm id Includes 4.6 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, SB-C18 and Extend-C18	5190-1434
Rapid Resolution Selectivity Method Development Kit, 4.6 mm id Includes 4.6 x 100 mm, 3.5 µm columns: one each Eclipse Plus C18, Eclipse Plus Phenyl-Hexyl and Bonus-RP	5190-1435
Rapid Resolution pH Method Development Kit, 4.6 mm id Includes 4.6 x 100 mm, 3.5 µm columns: one each Eclipse Plus C18, SB-C18 and Extend-C18	5190-1436

ZORBAX Method Development Kits

Description	Part No.
StableBond Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-C18, SB-CN and SB-Phenyl phases	5183-4624
Fast StableBond Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-C18, SB-CN and SB-Phenyl phases	5183-4625
Eclipse XDB Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: XDB-C18, XDB-C8, XDB-Phenyl phases	5183-4626
Fast Eclipse XDB Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: XDB-C18, XDB-C8 and XDB-Phenyl phases	5183-4627
pH Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-C18, XDB-C18 and Extend-C18 phases	5185-5807
Fast pH Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-C18, XDB-C18 and Extend-C18 phases	5185-5808
Aqueous Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-Aq, Bonus RP and SB-C18	5185-5809
Fast Aqueous Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-Aq, Bonus RP and SB-C18	5185-5810

ZORBAX Cartridge Column Starter Kits

Hardware	Description	Part No.
AC	ZORBAX C18 Kit Includes one 4.6 x 150 mm, 5 µm Eclipse XDB-C18 column; one 4.6 x 150 mm, 5 µm StableBond C18 column; cartridge holder; mounting tool; replacement filter (2/pk); and open-end wrench	5183-2021
AC	ZORBAX C8 Kit Includes one 4.6 x 150 mm, 5 µm Eclipse XDB-C8 column; one 4.6 x 150 mm, 5 µm StableBond C8 column; cartridge holder; mounting tool; replacement filter (2/pk); and open-end wrench	5183-2022

ZORBAX Method Validation Kits

ZORBAX Method Validation Kits are supplied to customers who need the same HPLC column type (bonded phase, particle size, configuration) but from different manufacturing lots. To request columns from different lots, contact Agilent Technologies or your local Agilent Authorized Distributor using the following procedure:

- Request Validation Kits (columns from different lots) by using Part Number 899999-888
- Indicate the Part Number of the current column you are using
- Indicate the Lot Number of the current column you are using
- Indicate the number of additional columns needed from different lots (example: you have a current column and may need two additional lots)
- Please fax your request to **(302) 993-5354** (United States and Canada) or email to **cag_sales-na@agilent.com**. You will receive a quote from your Customer Service Representative within 1-2 business days. Delivery of your method validation kit is usually 3 weeks or less from the time your order is placed, depending on lot availability.

Custom HPLC Column Ordering

Columns not listed can be easily ordered using the following procedure:

- Request a Special Products Quotation (SPQ) using Part Number 899999-999
- Indicate column dimensions (example: 4.6 x 50 mm); bonded phase type (example: StableBond C3); particle size (example: 5 µm); and pore size (example: 80Å)
- Please fax your request to **(302) 993-5354** (United States and Canada) or email to **cag_sales-na@agilent.com**. You will receive a quote from your Customer Service Representative within 1-2 business days. Delivery of your custom column is usually 3 weeks or less from the time your order is placed, depending on lot availability.

Custom columns are priced with a minimal surcharge over the price of stocked columns.

Pursuit HPLC Columns

Beginning in drug discovery and drug metabolism, Pursuit columns are ideal for analyzing lead compounds and biological samples. The column's performance is due to the unique combination of advanced bonding chemistry and ultra-high purity silica. These factors combine to provide rapid separations with excellent first time resolution and symmetrical peaks for polar compounds, whether at pH 1.5 or 10. Additionally, the need for ion-pairing agents such as TFA is often eliminated, thus maximizing the performance of single and parallel multi-channel LC/MS systems.

Culminating in QC, Pursuit is ideal for implementing dependable trouble-free analysis of raw materials and approved drugs. Rigorous control and validation of each step in the manufacturing process ensures column reproducibility. With Pursuit, your laboratory can spend its energy on producing results.

Special columns, such as Pursuit PFP (for very polar compounds) and Pursuit PAH (environmental), give you the extra selectivities you need for your most challenging applications.



Pursuit HPLC Columns

Pursuit

For LC/MS and high throughput applications, the Pursuit column is built on the larger 200Å pore size silica. High ligand density delivers up to 40% faster separations without sacrificing resolution. This is accomplished by optimizing mass transfer with the larger pore size.

Pursuit XRs

Pursuit XRs columns are for performance in analytical R&D, QC and preparative applications. Combining high ligand density with a 100Å pore size, high surface area silica, Pursuit XRs columns are designed to increase productivity, as they offer maximum loadability, excellent stability and easy scalability while maintaining superior resolution.

Pursuit XRs Ultra

For the ultimate in speed and good resolution on any instrument, we designed the Pursuit XRs Ultra around an optimized 2.8 µm particle and an advanced packing procedure. Now you can decrease your run time while maintaining resolution. Lower backpressure allows high flow rates to be used, and the 2.8 µm particles of ultra-pure silica delivers 10-15% higher efficiency than 3 µm columns.

Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	Endcapped	Carbon Load	Pore Volume	Ligand Coverage
Pursuit C18	200Å	200 m^2/g	1.5-10	Yes	12.9%	11 mL/g	3.5 $\mu mol/m^2$
Pursuit C8	200Å	200 m^2/g	1.5-10	Yes	7.4%	11 mL/g	3.8 $\mu mol/m^2$
Pursuit Diphenyl	200Å	200 m^2/g	1.5-8.0	Yes	7.3%	11 mL/g	2.8 $\mu mol/m^2$
Pursuit PFP	200Å	200 m^2/g	1.5-10	Yes	6.3%	11 mL/g	3.4 $\mu mol/m^2$
Pursuit PAH	200Å	200 m^2/g	1.5-10	Yes		11 mL/g	
Pursuit XRs C18	100Å	440 m^2/g	1.5-10	Yes	22%	11 mL/g	2.9 $\mu mol/m^2$
Pursuit XRs C8	100Å	440 m^2/g	1.5-10	Yes	15%	11 mL/g	3.7 $\mu mol/m^2$
Pursuit XRs Diphenyl	100Å	440 m^2/g	1.5-8.0	Yes	14.6%	11 mL/g	2.6 $\mu mol/m^2$
Pursuit XRs Si	100Å	440 m^2/g	1.5-10	Yes		11 mL/g	
Pursuit XRs Ultra C18	100Å	440 m^2/g	1.5-10	Yes	23.2%	11 mL/g	3.2 $\mu mol/m^2$
Pursuit XRs Ultra C8	100Å	440 m^2/g	1.5-10	Yes	15%	11 mL/g	3.7 $\mu mol/m^2$
Pursuit XRs Ultra Diphenyl	100Å	440 m^2/g	1.5-8.0	Yes	14.6%	11 mL/g	2.6 $\mu mol/m^2$

Specifications represent typical values only

TIPS & TOOLS

Request custom LC columns online at **www.agilent.com/chem/customlccol**

Tricyclic antidepressants and benzodiazepines

Column: **Pursuit XRs C18**
A6000150X046
4.6 x 150 mm, 5 µm

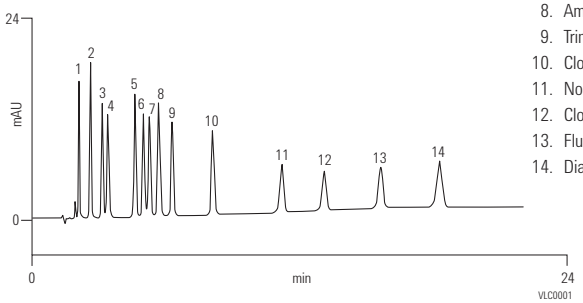
Mobile Phase: A: Water+0.1% HCOOH
B: MeCN+0.1% HCOOH

Gradient: 30-40% B in 15 min, hold at 40% B for 15 min

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. 7-Aminoclonazepam
2. 7-Aminoflunitrazepam
3. Nordoxepin
4. Doxepin
5. Desipramine
6. Imipramine
7. Nortriptyline
8. Amitriptyline
9. Trimipramine
10. Clomipramine
11. Nordiazepam
12. Clonazepam
13. Flunitrazepam
14. Diazepam

Mechanical stability of Pursuit XRs

Column: **Pursuit XRs C18**
A6000050X020
2.0 x 50 mm, 5 µm

Sample: DMSO mix

Mobile Phase: A: MeOH:water, 10:90 + 0.1% HCOOH
B: MeOH:water, 90:10 + 0.1% HCOOH

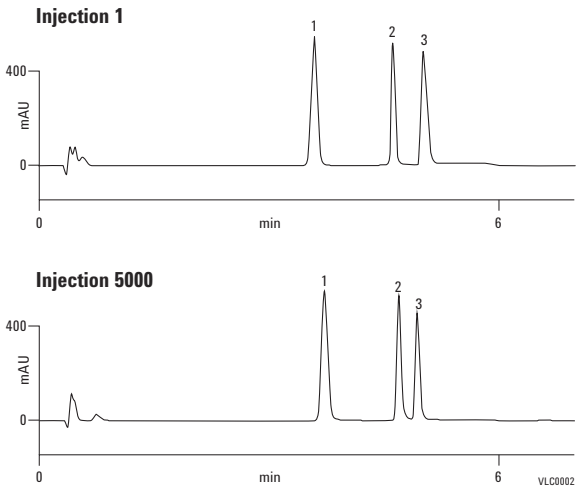
Gradient: 0-100% B in 3 min, back to 0% B in 0.5 min, hold at 0% B for 3.5 min

Flow Rate: 0.4 mL/min

Temperature: Ambient

Detector: UV, 254 nm

1. 4-Methoxybenzenesulfonamide
2. Methyl 3-aminothiophene-2-carboxylate
3. Trimipramine



Antifungals

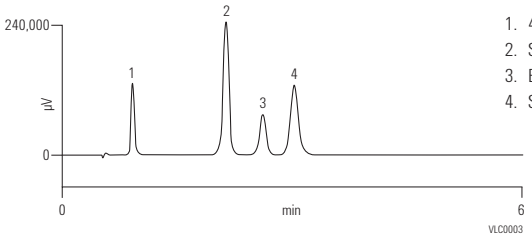
Column: **Pursuit XRs Ultra Diphenyl**
A7521050X020
2.0 x 50 mm, 2.8 µm

Mobile Phase: Water+0.1% HCOOH:MeCN+0.1% HCOOH, 80:20

Flow Rate: 0.4 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. 4-Aminobenzoic acid
2. Sorbic acid
3. Benzoic acid
4. Salicylic acid

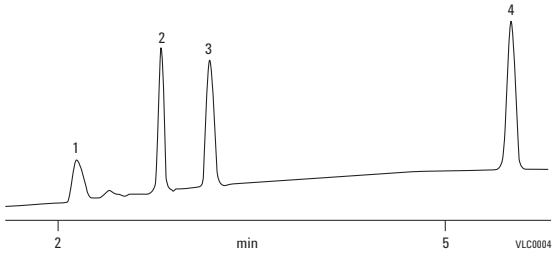
Liquid chromatography phase test mixture (LPTM) on Pursuit C8

Column: **Pursuit C8**
A3031050X020
2.0 x 50 mm, 3 µm

Mobile Phase: A: 0.05% HCOOH in water
B: 0.05% HCOOH in MeCN

Flow Rate: 0.6 mL/min

Detector: UV, 220 nm



1. Aspartame
2. Cortisone
3. Reserpine
4. Dioctyl phthalate

Adrenocorticosteroids on Pursuit PFP and C18

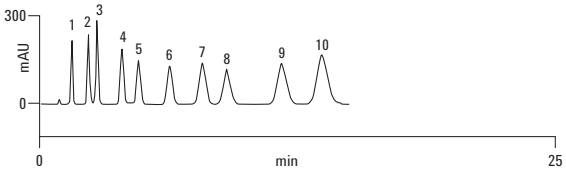
Mobile Phase: MeCN:water, 22.5:77.5

Flow Rate: 1.5 mL/min

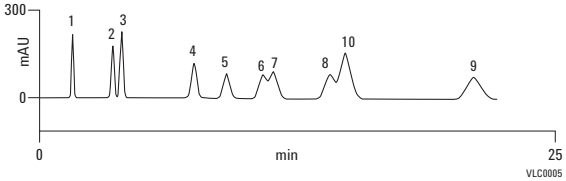
Temperature: Ambient

Detector: UV, 240 nm

Pursuit PFP



Pursuit C18



1. Triamcinolone
2. Prednisolone
3. Cortisone
4. Methylprednisolone
5. Corticosterone
6. Beclomethasone
7. Prednisolone acetate
8. Triamcinolone acetonide
9. Cortisone acetate
10. Fluocinolone acetonide

Pursuit HPLC Columns

Semi-Prep Scale

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP	Pursuit PAH USP L1
10.0 x 250	10	A3002250X100	A3032250X100			
10.0 x 150	5	A3000150X100			A3050150X100	
10.0 x 250	5	A3000250X100	A3030250X100		A3050250X100	

Pursuit HPLC Columns

Analytical Scale

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP	Pursuit PAH USP L1
4.6 x 250	10	A3002250X046	A3032250X046			
4.6 x 150	10	A3002150X046	A3032150X046			
4.6 x 100	10	A3002100X046	A3032100X046			
4.6 x 250	5	A3000250X046	A3030250X046	A3040250X046	A3050250X046	A7000250X046
4.6 x 150	5	A3000150X046	A3030150X046	A3040150X046	A3050150X046	A7000150X046
4.6 x 100	5	A3000100X046	A3030100X046	A3040100X046	A3050100X046	
4.6 x 50	5	A3000050X046	A3030150X046	A3040050X046	A3050050X046	
4.6 x 250	3	A3001250X046	A3031250X046	A3041250X046	A3051250X046	
4.6 x 150	3	A3001150X046	A3031150X046	A3041150X046	A3051150X046	
4.6 x 100	3	A3001100X046	A3031100X046	A3041100X046	A3051100X046	A7001100X046
4.6 x 50	3	A3001050X046		A3041050X046	A3051050X046	
4.6 x 30	3	A3001030X046				
4.0 x 250	5	A3000250X040				
4.0 x 125	5	A3000125X040				
3.9 x 300	10	A3002300X039				
3.9 x 300	5	A3000300X039				
3.9 x 150	5	A3000150X039				
3.0 x 250	5	A3000250X030		A3040250X030		
3.0 x 150	5	A3000150X030		A3040150X030	A3050150X030	
3.0 x 100	5	A3000100X030			A3050100X030	
3.0 x 250	3	A3001250X030				
3.0 x 150	3	A3001150X030		A3041150X030	A3051150X030	
3.0 x 100	3	A3001100X030		A3041100X030	A3051100X030	A7001100X030

(Continued)

Pursuit HPLC Columns

Analytical Scale

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP	Pursuit PAH USP L1
3.0 x 50	3	A3001050X030		A3041050X030	A3051050X030	
2.0 x 250	5	A3000250X020				
2.0 x 150	5	A3000150X020	A3030150X020	A3040150X020		
2.0 x 100	5	A3000100X020	A3030100X020	A3040100X020	A3050100X020	
2.0 x 50	5	A3000050X020	A3030050X020	A3040050X020	A3050050X020	
2.0 x 30	5	A3000030X020		A3040030X020	A3050030X020	
2.0 x 20	5	A3000020X020			A3050020X020	
2.0 x 250	3	A3001250X020		A3041250X020		
2.0 x 200	3			A3041200X020		
2.0 x 150	3	A3001150X020	A3031150X020	A3041150X020	A3051150X020	
2.0 x 100	3	A3001100X020	A3031100X020	A3041100X020	A3051100X020	A7001100X020
2.0 x 50	3	A3001050X020	A3031050X020	A3041050X020	A3051050X020	
2.0 x 30	3	A3001030X020	A3031030X020	A3041030X020	A3051030X020	
2.0 x 20	3	A3001020X020		A3041020X020	A3051020X020	

Pursuit HPLC Columns

Prep Scale

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP	Pursuit PAH USP L1
50.0 x 250	10	A3002250X500	A3032250X500			
21.2 x 250	10	A3002250X212	A3032250X212			
21.2 x 150	10	A3002150X212				
21.2 x 250	5	A3000250X212			A3050250X212	
21.2 x 150	5	A3000150X212			A3050150X212	
21.2 x 100	5			A3040100X212		

Pursuit ChromSep Complete Cartridge Systems

Hardware	Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit PAH USP L1
CS	4.6 x 250	5	A3000250C046	A3030250C046	A7000250C046
CS	4.6 x 250	3		A3031250C046	
CS	4.6 x 150	5	A3000150C046	A3030150C046	A7000150C046
CS	4.6 x 100	5	A3000100C046	A3030100C046	
CS	4.6 x 150	3	A3001150C046	A3031150C046	A7001150C046
CS	4.6 x 100	3	A3001100C046	A3031100C046	A7001100C046
CS	4.6 x 50	3	A3001050C046		
CS	3.0 x 250	5	A3000250C030		
CS	3.0 x 150	5	A3000150C030		
CS	3.0 x 100	5	A3000100C030		A7000100C030
CS	3.0 x 150	3	A3001150C030		
CS	3.0 x 100	3	A3001100C030		
CS	2.0 x 250	5	A3000250C020		
CS	2.0 x 150	5	A3000150C020	A3030150C020	
CS	2.0 x 100	5	A3000100C020		
CS	2.0 x 150	3	A3001150C020		
CS	2.0 x 100	3	A3001100C020		
CS	2.0 x 50	3	A3001050C020		

Pursuit ChromSep Replacement Cartridges

Hardware	Size (mm)	Particle Size (µm)	Unit	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit PAH USP L1
CS	4.6 x 250	5				A7000250R046
			3/pk			A7000250T046
CS	4.6 x 150	5		A3000150R046	A3030150R046	A7000150R046
			3/pk	A3000150T046	A3030150T046	A7000150T046
CS	4.6 x 150	3			A3031150R046	A7001150R046
			3/pk		A3031150T046	A7001150T046
CS	4.6 x 100	3				A7001100R046
			3/pk			A7001100T046
CS	4.6 x 50	3		A3001050R046		
			3/pk	A3001050T046		
CS	3.0 x 150	5		A3000150R030		
			3/pk	A3000150T030		
CS	3.0 x 100	5		A3000100R030		A7000100R030
			3/pk	A3000100T030		A7000100T030
CS	3.0 x 150	3		A3001150R030		
			3/pk	A3001150T030		
CS	3.0 x 100	3		A3001100R030		A7001100R030
			3/pk	A3001100T030		A7001100T030
CS	2.0 x 50	3			A3031050R020	
			3/pk		A3031050T020	

MetaGuard Columns, 3/pk

Hardware	ID (mm)	Particle Size (µm)	Pursuit C18	Pursuit C8	Pursuit DP	Pursuit PFP
MG	4.6	10	A3002MG			
MG	2.0	10	A3002MG2			
MG	4.6	5	A3000MG	A3030MG	A3040MG	A3050MG
MG	2.0	5	A3000MG2	A3030MG2	A3040MG2	A3050MG2
MG	1.0	5	A3000MG1		A3040MG1	
MG	4.6	3	A3001MG	A3031MG	A3041MG	A3051MG
MG	2.0	3	A3001MG2	A3031MG2	A3041MG2	A3051MG2
MG	1.0	3			A3041MG1	

Pursuit XRs HPLC Columns

Semi-Prep Scale

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl USP L11	Pursuit XRs Si* USP L3
10.0 x 250	10	A6002250X100			A6004250X100
10.0 x 250	5	A6000250X100		A6020250X100	
10.0 x 150	5	A6000150X100			
10.0 x 50	5	A6000050X100			
10.0 x 150	3			A6021150X100	

*Pursuit XRs Si is a normal phase column.

Pursuit XRs HPLC Columns

Analytical Scale

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl USP L11	Pursuit XRs Si* USP L3
4.6 x 250	10	A6002250X046			A6004250X046
4.6 x 50	10	A6002050X046S			
4.6 x 250	5	A6000250X046	A6010250X046	A6020250X046	
4.6 x 150	5	A6000150X046	A6010150X046	A6020150X046	
4.6 x 100	5	A6000100X046	A6010100X046	A6020100X046	A6006100X046
4.6 x 50	5	A6000050X046		A6020050X046	A6006050X046
4.6 x 250	3	A6001250X046		A6021250X046	
4.6 x 150	3	A6001150X046	A6010150X046	A6021150X046	
4.6 x 100	3	A6001100X046	A6011100X046	A6021100X046	A6005100X046
4.6 x 50	3	A6001050X046	A6011050X046	A6021050X046	A6005050X046
4.6 x 30	3	A6001030X046		A6021030X046	
4.0 x 250	5	A6000250X040	A6010250X040		
4.0 x 150	5	A6000150X040	A6010150X040		
3.0 x 250	5	A6000250X030	A6010250X030	A6020250X030	
3.0 x 150	5	A6000150X030	A6010150X030	A6020150X030	
3.0 x 100	5	A6000100X030	A6010100X030	A6020100X030	
3.0 x 150	3	A6001150X030	A6011150X030	A6021150X030	
3.0 x 100	3	A6001100X030	A6011100X030	A6021100X030	
3.0 x 50	3	A6001050X030	A6011050X030	A6021050X030	
3.0 x 30	3	A6001030X030			

*Pursuit XRs Si is a normal phase column.

(Continued)

Pursuit XRs HPLC Columns

Analytical Scale

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl USP L11	Pursuit XRs Si* USP L3
2.1 x 100	5				A6006100X021
2.0 x 250	5	A6000250X020		A6020250X020	
2.0 x 150	5	A6000150X020	A6010150X020	A6020150X020	
2.0 x 100	5	A6000100X020	A6010100X020		
2.0 x 50	5	A6000050X020	A6010050X020	A6020050X020	
2.0 x 30	5	A6000030X020			
2.0 x 250	3	A6001250X020		A6021250X020	
2.0 x 150	3	A6001150X020	A6011150X020	A6021150X020	
2.0 x 100	3	A6001100X020	A6011100X020	A6021100X020	
2.0 x 50	3	A6001050X020	A6011050X020	A6021050X020	A6005050X020
2.0 x 30	3			A6021030X020	
2.0 x 20	3	A6001020X020			
1.0 x 150	3	A6001150X010			
1.0 x 100	3	A6001100X010		A6021100X010	

*Pursuit XRs Si is a normal phase column.

Pursuit XRs HPLC Columns

Prep Scale

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl USP L11	Pursuit XRs Si* USP L3
50.0 x 250	10	A6002250X500		A6002250X500	A6004250X500
30.0 x 250	5	A6000250X300			A6004250X300
30.0 x 150	5	A6000150X300		A6020150X300	
30.0 x 100	5	A6000100X300			
30.0 x 50	5	A6000050X300			
21.2 x 250	10	A6002250X212	A6012250X212		A6004250X212
21.2 x 250	5	A6000250X212		A6020250X212	
21.2 x 150	5	A6000150X212			
21.2 x 100	5	A6000100X212		A6020100X212	
21.2 x 50	5	A6000050X212			
21.2 x 30	5	A6000030X212			

*Pursuit XRs Si is a normal phase column.

MetaGuard Columns, 3/pk

Hardware	ID (mm)	Particle Size (µm)	Pursuit XRs C18	Pursuit XRs Si	Pursuit XRs C8	Pursuit XRs Diphenyl	Pursuit PAH
MG	4.6	10	A6002MG	A6004MG			
MG	4.6	5	A6000MG		A6010MG	A6020MG	
MG	3.0	5					A7000MG3
MG	2.0	5	A6000MG2		A6010MG2	A6020MG2	
MG	4.6	3	A6001MG		A6011MG	A6021MG	
MG	3.0	3					A7001MG3
MG	2.0	3	A6001MG2		A6011MG2	A6021MG2	A6001MG2

Pursuit XRs Ultra HPLC Columns

Size (mm)	Particle Size (µm)	Pursuit XRs Ultra C18	Pursuit XRs Ultra C8	Pursuit XRs Ultra Diphenyl
3.0 x 150	2.8	A7501150X030	A7511150X030	
3.0 x 100	2.8	A7501100X030		
2.0 x 150	2.8	A7501150X020		
2.0 x 100	2.8	A7501100X020	A7511100X020	A7521100X020
2.0 x 50	2.8	A7501050X020	A7511050X020	A7521050X020
2.0 x 30	2.8	A7501030X020	A7511030X020	A7521030X020



Polaris HPLC Columns

Polaris HPLC Columns

In areas like drug discovery where target compounds are increasingly polar, it is critical to have a reversed-phase column that performs well under aqueous conditions. Retention is critical, but cannot come with troublesome secondary interactions. Likewise, phase collapse and shifting retention times need to be avoided. The answer is our Polaris line of polar-modified columns.

From the collapse-resistant pore structure of our base silica, to the "wettability" engineered into the bonded phases, Polaris columns have been designed for high aqueous conditions. The combination of high phase density bonding, ultra pure silica, and silanol shielding leads to excellent peak shape among polar-modified columns.

As a family, Polaris offers a variety of polar modifications in both C18 and C8 chemistries.

Polaris C18-A

Polaris C18-A is the best starting place for separations where the benefits of polar-modified columns are desired. The polar modifications of C18-A help it avoid poor peak shape and retention issues in low organic conditions.

Polaris C8-A

Polaris C8-A offers an alternative selectivity to standard C8 phases and has a lower hydrophobicity than Polaris C18-A, making it ideal for polar samples, or faster overall analysis times.

Polaris C18-Ether

Polaris C18-Ether offers an alternative selectivity to Polaris C18-A and standard C18 phases, and typically delivers increased retention of polar compounds away from the void volume.

Polaris C8-Ether

Polaris C8-Ether offers an alternative selectivity to Polaris C8-A with particular utility for hydrogen bonding compounds.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Carbon Load	Endcapped	Pore Volume	Ligand Coverage
Polaris C18-A	180Å	200 m^2/g	13.8%	Yes	1.1 cm^3/g	3.9 µmol/m^2
Polaris C8-A	180Å	200 m^2/g	7.4%	Yes	1.1 cm^3/g	4.8 µmol/m^2
Polaris C18-Ether	180Å	200 m^2/g	12.1%	Yes	1.1 cm^3/g	3.3 µmol/m^2
Polaris C8-Ether	180Å	200 m^2/g	7.1%	Yes	1.1 cm^3/g	4.5 µmol/m^2
Polaris Amide C18	180Å	200 m^2/g	15%	Yes	1.1 cm^3/g	4.4 µmol/m^2
Polaris NH2	180Å	200 m^2/g	5.5%	Amide	1.1 cm^3/g	3.8 µmol/m^2
Polaris Si-A	180Å	200 m^2/g	N/A	N/A	1.1 cm^3/g	N/A

Specifications represent typical values only.

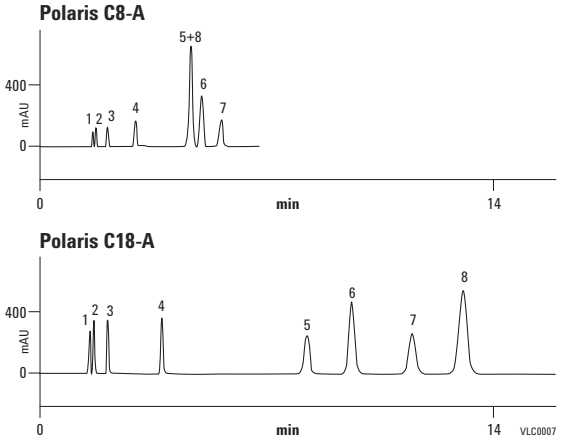
Selectivity test mix for Polaris columns

Mobile Phase: MeCN:water 70:30

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. Uracil
2. Caffeine
3. Phenol
4. Toluene
5. Butylbenzene
6. o-Terphenyl
7. Amylbenzene
8. Triphenylene

LC/MS performance test mix for Polaris C8-A

Column: Polaris C8-A
A2011030X030
3.0 x 30 mm, 3 µm

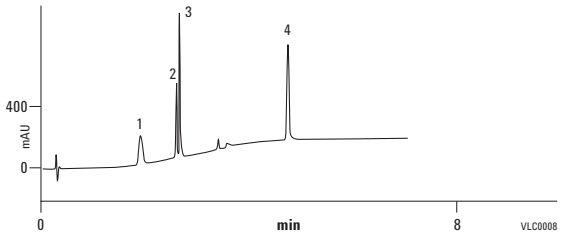
Mobile Phase: A: Water+0.05% HCOOH
B: MeCN+0.05% HCOOH

Gradient: 5-90% B in 3 min and hold for 4 min

Flow Rate: 0.6 mL/min

Temperature: Ambient

Detector: UV, 220 nm



1. Aspartame
2. Cortisone
3. Reserpine
4. Dioctyl phthalate

Polaris HPLC Columns

Size (mm)	Particle Size (µm)	Polaris C18-A	Polaris C8-A	Polaris C18-Ether	Polaris C8-Ether	Polaris Amide C18	Polaris NH2*	Polaris Si-A*
50.0 x 250	10	A2002250X500						A2004250X500
30.0 x 100	5	A2000100X300						
30.0 x 3.0	3					A2007030X030		
21.2 x 250	10	A2002250X212				A2008250X212		A2004250X212
21.2 x 250	5	A2000250X212	A2010250X212	A2020250X212	A2030250X212	A2006250X212	A2013250X212	A2003250X212
21.2 x 150	5	A2000150X212						A2003150X046
21.2 x 100	5	A2000100X212						
21.2 x 50	5							A2003050X212
10.0 x 250	10					A2008250X100		
10.0 x 250	5	A2000250X100		A2020250X100	A2030250X100	A2006250X100	A2013250X100	
10.0 x 50	3			A2021050X100				
4.6 x 250	10	A2002250X046						A2003250X046
4.6 x 250	5	A2000250X046	A2010250X046	A2020250X046	A2030250X046	A2006250X046	A2013250X046	
4.6 x 200	5	A2000200X046						
4.6 x 150	5	A2000150X046	A2010150X046	A2020150X046	A2030150X046	A2006150X046	A2013150X046	A2003150X046
4.6 x 100	5	A2000100X046	A2010100X046			A2006100X046	A2013100X046	A2003100X046
4.6 x 50	5	A2000050X046		A2020050X046		A2006050X046	A2013050X046	A2003050X046
4.6 x 30	5	A2000030X046						
4.6 x 250	3	A2001250X046		A2021250X046	A2031250X046	A2007250X046	A2014250X046	A2005250X046
4.6 x 150	3	A2001150X046	A2011150X046			A2007150X046	A2014150X046	A2005150X046
4.6 x 100	3	A2001100X046	A2011100X046			A2007100X046	A2014100X046	A2005100X046
4.6 x 75	3	A2001075X046	A2011075X046					

*Normal phase columns.

(Continued)

Polaris HPLC Columns

Size (mm)	Particle Size (µm)	Polaris C18-A	Polaris C8-A	Polaris C18-Ether	Polaris C8-Ether	Polaris Amide C18	Polaris NH2*	Polaris Si-A*
4.6 x 50	3	A2001050X046		A2021050X046	A2031050X046	A2007050X046	A2014050X046	A2005050X046
4.6 x 30	3	A2001030X046						
4.0 x 250	5	A2000250X040	A2010250X040	A2020250X040	A2030250X040		A2013250X040	A2003250X040
4.0 x 150	5	A2000150X040	A2010150X040	A2020150X040	A2030150X040		A2013150X040	A2003150X040
4.0 x 125	5	A2000125X040	A2010125X040	A2020125X040	A2030125X040		A2013125X040	A2003125X040
3.0 x 250	5	A2000250X030	A2010250X030	A2020250X030	A2030250X030	A2006250X030	A2013250X030	A2005250X046
3.0 x 150	5	A2000150X030	A2010150X030	A2020150X030	A2030150X030	A2006150X030	A2013150X030	A2003150X030
3.0 x 100	5	A2000100X030	A2010100X030	A2020100X030	A2030100X030	A2006100X030	A2013100X030	A2003100X030
3.0 x 50	5	A2000050X030						A2003050X030
3.0 x 250	3	A2001250X030				A2007250X030	A2014250X030	A2003250X030
3.0 x 200	3	A2001200X030						
3.0 x 150	3	A2001150X030		A2021150X030		A2007150X030	A2014150X030	A2005150X030
3.0 x 100	3	A2001100X030				A2007100X030	A2014100X030	A2005100X030
3.0 x 50	3	A2001050X030		A2021050X030	A2031050X030	A2007050X030	A2014050X030	A2005050X030
3.0 x 30	3	A2001030X030	A2011030X030					
2.0 x 250	5	A2000250X020		A2020250X020	A2030250X020	A2006250X020	A2013250X020	A2003250X020
2.0 x 150	5	A2000150X020	A2010150X020	A2020150X020	A2030150X020	A2006150X020	A2013150X020	A2003150X020
2.0 x 100	5	A2000100X020				A2006100X020	A2013100X020	A2003100X020
2.0 x 50	5	A2000050X020	A2010050X020	A2020050X020	A2030050X020	A2006050X020	A2013050X020	A2003050X020
2.0 x 30	5	A2000030X020				A2006030X020	A2013030X020	A2003030X020
2.0 x 20	5	A2000020X020					A2013020X020	A2003020X020
2.0 x 250	3	A2001250X020	A2011250X020	A2021250X020	A2031250X020	A2007250X020	A2014250X020	A2005250X020
2.0 x 150	3	A2001150X020	A2011150X020	A2021150X020	A2031150X020	A2007150X020	A2014150X020	A2005150X020
2.0 x 100	3	A2001100X020		A2021100X020	A2031100X020	A2007100X020	A2014100X020	A2005100X020
2.0 x 75	3			A2021075X020				
2.0 x 50	3	A2001050X020	A2011050X020	A2021050X020	A2031050X020	A2007050X020	A2014050X020	A2005050X020
2.0 x 30	3	A2001030X020		A2021050X020		A2007030X020	A2014030X020	A2005030X020
2.0 x 20	3	A2001020X020					A2014020X020	A2005020X020

*Normal phase columns.

Polaris ChromSep Complete Cartridge Systems

Hardware	Size (mm)	Particle Size (µm)	Polaris C18-A
CS	4.6 x 250	5	A2000250C046
CS	4.6 x 150	5	A2000150C046
CS	4.6 x 100	5	A2000100C046
CS	4.6 x 250	3	A2001250C046
CS	4.6 x 150	3	A2001150C046
CS	3.0 x 250	5	A2000250C030
CS	3.0 x 100	5	A2000100C030
CS	2.0 x 100	5	A2000100C020
CS	2.0 x 150	3	A2001150C020
CS	2.0 x 100	3	A2001100C020
CS	2.0 x 50	3	A2001050C020

Polaris ChromSep Replacement Cartridges

Hardware	Size (mm)	Particle Size (µm)	Unit	Polaris C18-A
CS	4.6 x 250	5		A2000250R046
			3/pk	A2000250T046
CS	4.6 x 150	5		A2000150R046
			3/pk	A2000150T046
CS	4.6 x 100	5		A2000100R046
			3/pk	A2000100T046
CS	4.6 x 150	3		A2001150R046
			3/pk	A2001150T046
CS	4.6 x 100	3		A2001100R046
			3/pk	A2001100T046
CS	3.0 x 150	5		A2000150R030
			3/pk	A2000150T030
CS	3.0 x 100	5		A2000100R030
			3/pk	A2000100T030
CS	3.0 x 100	3		A2001100R030
			3/pk	A2001100T030
CS	2.0 x 150	3		A2001150R020
			3/pk	A2001150T020
CS	2.0 x 50	3		A2001050R020
			3/pk	A2001050T020

MetaGuard Columns

Hardware	Dimensions	Particle Size (µm)	Polaris C18-A	Polaris C8-A	Polaris C18-Ether	Polaris C8-Ether	Polaris Amide C18	Polaris NH2*	Polaris Si-A*
MG	4.6	10	A2002MG						A2004MG
MG	2.0	10					A2008MG2		A2004MG2
MG	4.6	5	A2000MG	A2010MG	A2020MG	A2030MG	A2006MG	A2013MG	A2003MG
MG	2.0	5	A2000MG2	A2010MG2	A2020MG2		A2006MG2	A2013MG2	A2003MG2
MG	4.6	3	A2001MG	A2011MG	A2021MG		A2007MG	A2014MG	A2005MG
MG	2.0	3	A2011MG2	A2011MG2	A2021MG2	A2031MG2	A2007MG2	A2014MG2	A2005MG2
MG	1.0	3	A2001MG1						

*Normal phase columns.

Agilent TC-C18(2) and HC-C18(2)

For cost-conscious chromatographers who need traditional LC columns and don't need the individual testing of ZORBAX, Pursuit or Polaris columns, the Agilent TC(2)/HC(2) columns provide an alternative.

TC-C18(2)

Agilent TC-C18(2) is the ideal choice for complex natural product extract samples, traditional medicines and environmental samples or any sample where you need to analyze mixtures of polar and non-polar compounds, including strong basic compounds.

- Lower carbon load – 12%
- Ideal for polar compounds and gradient separations that start at low % organic or cover a wide organic range
- Good choice for samples dissolved in water, or mostly water
- Use with most common mobile phases, including formic acid, acetic acid, trifluoroacetic acid (TFA) and phosphate buffers with acetonitrile and methanol as the organic modifiers
- Excellent performance from pH 2-8

HC-C18(2)

Agilent HC-C18(2) is a more retentive C18 with a higher carbon load. An excellent value alternative to other high carbon load columns, it also provides superior peak shape for basic compounds.

- Higher carbon load – 17% – provides greater retention for moderately polar and non-polar compounds
- Ideal for non-polar compounds and separations that start at mid-level % organic (at least greater than 10% organic)
- Good choice for industrial samples or samples dissolved in organic/mostly organic solvents
- Stable over a very wide pH range (2-9) for maximum flexibility

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
TC-C18(2)	170Å	290 m^2/g	60 °C	2.0-8.0	Yes	12%
HC-C18(2)	170Å	290 m^2/g	60 °C	2.0-9.0	Yes	17%

Specifications represent typical values only.

Agilent HC-C18(2) and TC-C18(2)

Description	Size (mm)	Particle Size (µm)	Part No.
Agilent HC-C18(2)	4.6 x 250	5	588905-902
Agilent HC-C18(2)	4.6 x 150	5	588915-902
Agilent TC-C18(2)	4.6 x 250	5	588925-902
Agilent TC-C18(2)	4.6 x 150	5	588935-902
Agilent HC-C18(2) guards, 2/pk	4.6 x 12.5	5	520518-904
Agilent TC-C18(2) guards, 2/pk	4.6 x 12.5	5	520518-905
Guard Hardware Kit			820999-901

TIPS & TOOLS

Don't forget, we have special offers throughout the year.

To learn more, visit **www.agilent.com/chem/specialoffers**

PLRP-S HPLC Columns

- Contain durable and resilient polymer particles that deliver reproducible results over longer lifetimes
- Thermally and chemically stable
- Comply with USP L21 designation
- Used in bioscience, chemical, clinical research, energy, environmental, food and agriculture, material science and pharmaceutical industries
- Pore sizes (100Å-4000Å) for separations of small molecules to large complexes and polynucleotides

The PLRP-S family of columns consists of a range of pore sizes and particle sizes, all with identical chemistry and fundamental adsorptive characteristics. The particles are inherently hydrophobic, therefore no bonded phase, alkyl ligand is required for reversed-phase separations. This gives a highly reproducible material that is free from silanols and heavy metal ions. Columns within the extensive product range are suitable for micro separations, including both bottom-up and top-down proteomics, analytical separations, and preparative purifications. In addition, process columns can be packed with bulk media.

Column Specifications	
pH Range	1-14
Buffer Content	Unlimited
Organic Modifier	1-100%
Temperature Limits	200 °C
Maximum Pressure	5-8 µm: 3000 psi (210 bar)
	3 µm: 4000 psi (300 bar)

PLRP-S Applications	
Pore Size	**Application**
100Å	Small molecules/synthetic biomolecules
300Å	Recombinant peptides/proteins
1000Å	Large proteins
4000Å	DNA/high speed

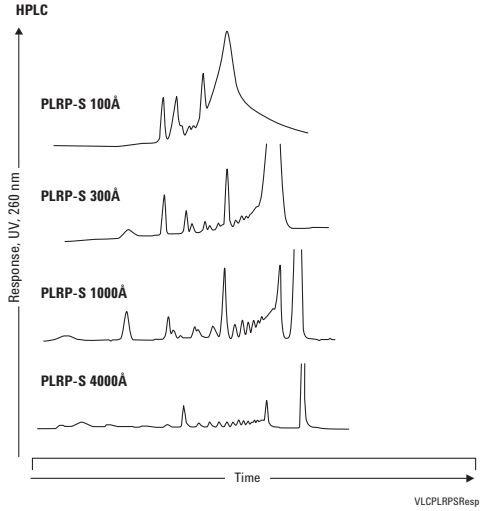
HPLC of 25 bp DNA ladder

Column: **PLRP-S, 2.1 x 150 mm**

Mobile Phase: A: 0.1 M TEAA
B: 0.1 M TEAA in 50% water:50% ACN

Flow Rate: 200 µL/min

Gradient: 12.5-50% B in 150 min



Polyethylene glycols

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water
B: ACN

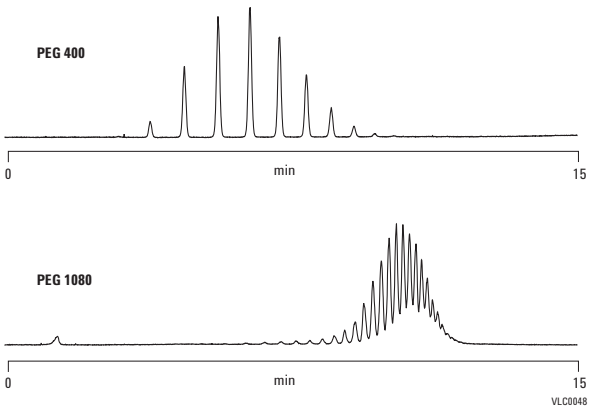
Gradient: 10-30% B in 12 min, held at 30% B for 3 min

Flow Rate: 1.0 mL/min

Injection Volume: 10 µL

Sample Conc: 1 mg/mL

Detector: ELS (neb=50 °C, evap=70 °C, gas=1.6 SLM)



Exploiting chemical stability – NH_4OH concentration

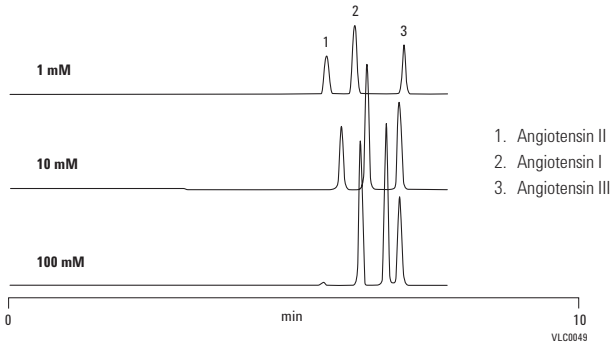
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: NH_4OH (various mM) in water
B: NH_4OH (various mM) in ACN

Gradient: Linear 10-100% B in 15 min

Flow Rate: 1.0 mL/min

Detector: ELS (neb=80 °C, evap=85 °C, gas=1.0 SLM)



1. Angiotensin II
2. Angiotensin I
3. Angiotensin III

Alberta Peptide Institute test mix

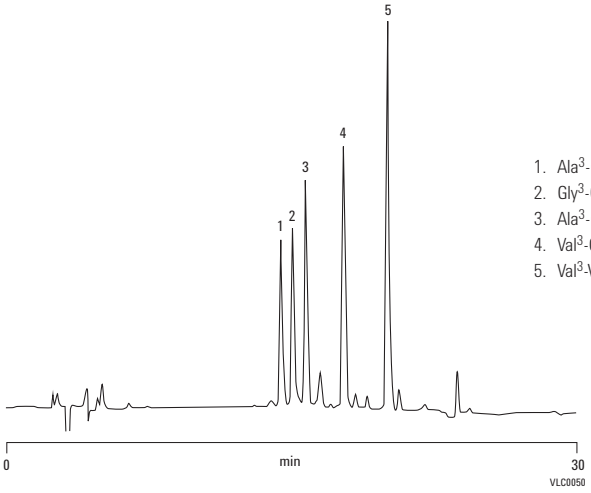
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: 0.1% TFA in 99% water:1% ACN
B: 0.1% TFA in 70% water:30% ACN

Gradient: 0-100% B in 30 min

Flow Rate: 1.0 mL/min

Detector: UV, 220 nm



1. Ala^3-Gly^4 (free amino)
2. Gly^3-Gly^4 (Nα-acetylated)
3. Ala^3-Gly^4 (Nα-acetylated)
4. Val^3-Gly^4 (Nα-acetylated)
5. Val^3-Val^4 (Nα-acetylated)

Large fibrous proteins

Column: **PLRP-S 300Å**
PL1512-3801
4.6 x 150 mm, 8 µm

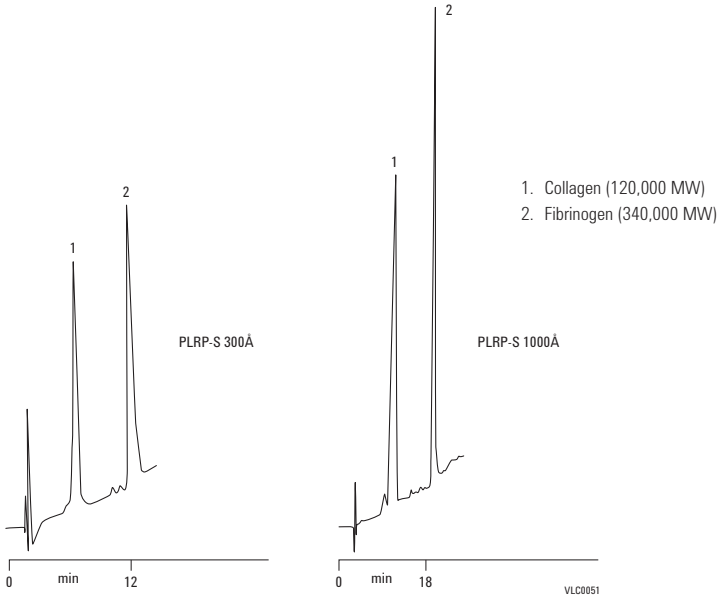
Column: **PLRP-S 1000Å**
PL1512-3802
4.6 x 150 mm, 8 µm

Mobile Phase: A: 0.25% TFA in water
B: 0.25% TFA in 5% water:95% ACN

Flow Rate: 1.0 mL/min

Gradient: 20-60% B in 15 min

Detector: UV, 220 nm



1. Collagen (120,000 MW)
2. Fibrinogen (340,000 MW)

PLRP-S HPLC Columns

Hardware	Size (mm)	Particle Size (µm)	PLRP-S 100Å USP L21	PLRP-S 300Å USP L21	PLRP-S 1000Å USP L21	PLRP-S 4000Å USP L21
	4.6 x 250	8	PL1512-5800	PL1512-5801	PL1512-5802	
	4.6 x 150	8	PL1512-3800	PL1512-3801	PL1512-3802	PL1512-3803
	4.6 x 50	8		PL1512-1801	PL1512-1802	PL1512-1803
	4.6 x 250	5	PL1512-5500	PL1512-5501		
	4.6 x 150	5	PL1111-3500	PL1512-3501		
	4.6 x 50	5	PL1512-1500	PL1512-1501	PL1512-1502	PL1512-1503
	4.6 x 150	3	PL1512-3300	PL1512-3301		
	4.6 x 50	3	PL1512-1300	PL1512-1301		
	2.1 x 250	8		PL1912-5801		
	2.1 x 150	8		PL1912-3801	PL1912-3802	PL1912-3803
	2.1 x 50	8		PL1912-1801	PL1912-1802	PL1912-1803
	2.1 x 250	5	PL1912-5500	PL1912-5501		
	2.1 x 150	5	PL1912-3500	PL1912-3501		
	2.1 x 50	5	PL1912-1500	PL1912-1501	PL1912-1502	PL1912-1503
	2.1 x 150	3	PL1912-3300	PL1912-3301		
	2.1 x 50	3	PL1912-1300	PL1912-1301		
PL	PLRP-S Guard Cartridges for 5 x 3 mm, 2/pk		PL1612-1801	PL1612-1801	PL1612-1801	PL1612-1801
PL	Guard Cartridge holder for 3.0 x 5.0 mm cartridges		PL1310-0016	PL1310-0016	PL1310-0016	PL1310-0016

*Prep columns are also available for the PLRP-S family. Turn to pages 467-471

Preparative HPLC Columns

Flexible, cost-effective options for scaling and prep

Whether you are scaling up a routine analytical method, or maintaining precise separations throughout every phase of production, Agilent can help you rise to the challenge.

- Agilent Prep LC columns are a cost-effective prep solution designed for high loadability to purify milligram to gram quantities of product
- ZORBAX PrepHT columns are designed for rapid scale-up from the ZORBAX family of phases
- Scalable prep columns are also available for Pursuit and Polaris columns
- Bulk materials are available for all phases and can be ordered through Agilent's Custom Ordering Process, **www.agilent.com/chem/customlc**



Prep LC Columns

Agilent Prep LC Columns

- High loadability for maximum sample purification
- Easy scalability from 4.6 up to 50 mm id for rapid method development
- High throughput 21.2 mm id cartridges for fast purification
- Exceptional column stability and loadability up to pH 10

Agilent Prep LC columns are designed for high loadability to purify milligram to gram quantities of products. Preparative sized columns are available in 21.2, 30, and 50 mm internal diameters with lengths ranging from 50-250 mm. Columns are available in 5 and 10 µm particle sizes with very high efficiency in every dimension. These column choices accommodate almost every preparative sample.

Agilent Prep 21.2 mm id columns are available with Agilent's Preparative Cartridge Hardware. This reliable cartridge hardware makes it simple to use columns with different lengths to increase sample load. Guard columns are easily integrated onto these columns, providing superior protection of the analysis column. Analytical size 4.6 mm id scalar columns are available for method development and optimization prior to scaling up to larger columns. Bulk material is also available.

Agilent Prep columns are available in a C18 bonded phase suitable for purification of a wide variety of non-polar and polar compounds. Unbonded silica columns are also available.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
C18	100Å	400 m^2/g	60 °C*	2.0-10.0	Single	24%
Silica	100Å	400 m^2/g	**	1.0-8.0	N/A	N/A

Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-10.

**Temperature limits for bare silica are determined by the pH of the mobile phase.

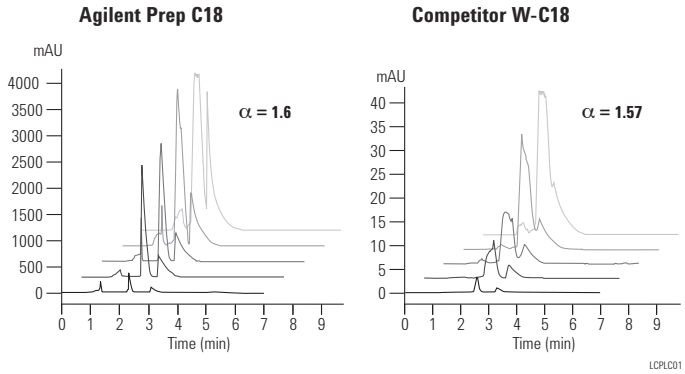
Superior loadability on Agilent Prep C18 with basic compounds

Column: **Agilent Prep C18 443905-902 4.6 x 150 mm, 5 µm**

Mobile Phase: 50% 0.1%TFA:50% ACN

Flow Rate: 1 mL/min

Sample: 10 µL
Doxepin/Amitriptyline
0.5-50 mg/mL



Agilent Prep columns show better resolution and loadability than competitor columns.

Steroids: Easy scalability using Agilent Prep columns

Column A: **Agilent Prep C18 443905-902 4.6 x 150 mm, 5 µm**

Column B: **Agilent Prep C18 443905-102 21.2 x 150 mm, 5 µm**

Column C: **Agilent Prep C18 413910-302 30.0 x 150 mm, 10 µm**

Column D: **Agilent Prep C18 413910-502 50.0 x 150 mm, 10 µm**

Mobile Phase: 55% Water:45% ACN

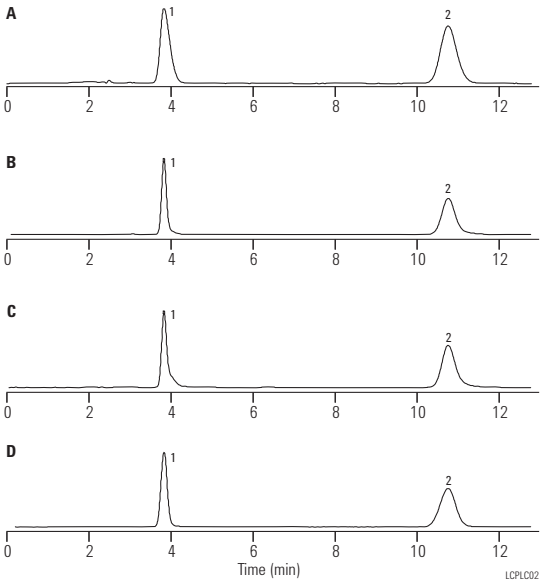
Flow Rate: 0.7 mL/min
14.87 mL/min
29.77 mL/min
85.37 mL/min

Temperature: Ambient

Detector: 240 nm

Sample: 2 µL
42.4 µL
170 µL
488 µL

1. Hydrocortisone
2. Testosterone (in MeOH @ 1mg/mL)



Agilent Prep C18 shows excellent scalability, making method transfer simple and predictable.

Agilent Prep LC Columns

Hardware	Description	Size (mm)	Particle Size (µm)	C18	Silica
Standard Columns (no special hardware required)					
	Scalar	4.6 x 250	10	440910-902	440910-901
	Scalar	4.6 x 150	10	443910-902	443910-901
	Scalar	4.6 x 100	10	449910-902	
	Scalar	4.6 x 250	5	440905-902	440905-901
	Scalar	4.6 x 150	5	443905-902	443905-901
	Scalar	4.6 x 100	5	449905-902	449905-901
	Scalar	4.6 x 50	5	446905-902	446905-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)*					
	PrepHT	21.2 x 250	10	410910-102	410910-101
	PrepHT	21.2 x 150	10	413910-102	413910-101
	PrepHT	21.2 x 50	10	446910-102	
	PrepHT	21.2 x 150	5	443905-102	443905-101
	PrepHT	21.2 x 100	5	449905-102	449905-101
	PrepHT	21.2 x 50	5	446905-102	446905-101
	PrepHT Endfittings, 2/pk			820400-901	820400-901
Standard Columns (no special hardware required)					
	Prep 30	30.0 x 250	10	410910-302	410910-301
	Prep 30	30.0 x 150	10	413910-302	413910-301
	Prep 30	30.0 x 100	10	419910-302	419910-301
	Prep 30	30.0 x 100	5	449905-302	449905-301
	Prep 30	30.0 x 50	5	446905-302	446905-301
	Prep 50	50.0 x 250	10	410910-502	410910-501
	Prep 50	50.0 x 150	10	413910-502	413910-501
	Prep 50	50.0 x 100	10	419910-502	419910-501
	Prep 50	50.0 x 100	5	449905-502	449905-501
Guard Columns (hardware required)					
	PrepHT Guard Cartridges, 2/pk	21.2 x 10	10	420212-902	420212-901
	Guard Cartridge Hardware			820444-901	820444-901
	PrepHT External Guard Hardware Kit			420420-901	420420-901
	Bulk Packing (1 kg)		10	420910-902	420910-901

*All PrepHT cartridge columns require hardware kit P/N 820400-901. If a guard column is desired for the 21.2 mm id columns, the PrepHT Guard Hardware Kit, P/N 820444-901, is also required. If the guard column is used on a 30 mm id column then the external guard column hardware kit, P/N 420420-901, is required.



ZORBAX PrepHT Columns

ZORBAX PrepHT

- Easy scale-up from analytical to preparative scale with ZORBAX phases
- Fast preparative separations, up to 2000 mg
- 5 to 7 µm particles for high efficiency and high yield
- Easy to install finger-tight connections seal up to 5000 psi/350 bar
- Use to maintain selectivity of the analytical phase in your prep separations

High purity, high recovery and high throughput can be easily achieved with Agilent ZORBAX PrepHT columns. These are available in a variety of bonded phases – Eclipse XDB, StableBond, Bonus-RP, and Extend-C18 – for optimized resolution and loadability under any conditions.

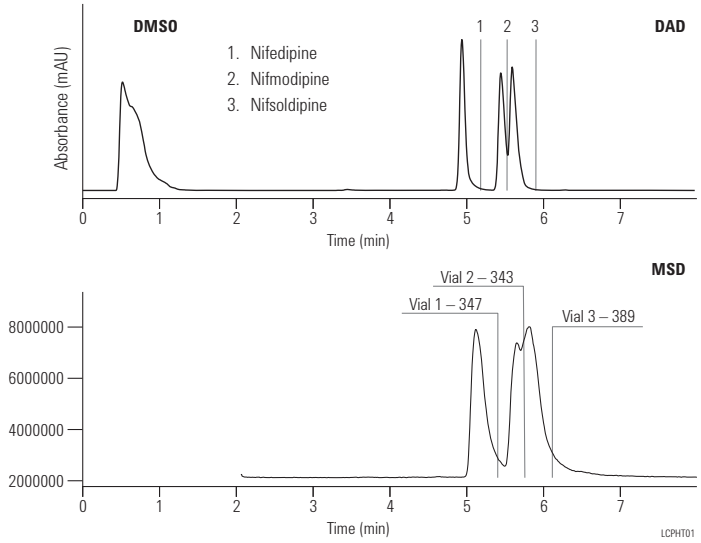
ZORBAX PrepHT columns are packed with 5 and 7 µm particle sizes for very high resolution. The high resolution allows high loadability, high yield, and high purity of compounds. The larger diameter columns and mechanically stronger ZORBAX particles allow for flow rates up to 100 mL/min, thus increasing throughput.

ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations on larger columns (21.2 mm id, 150 mm length and longer), Agilent has carefully chosen the 7 µm particle size to achieve a balance between high efficiency and high loadability.

High purity and high recovery with ZORBAX PrepHT columns

Sample: Antianginal drugs

Mass-based fraction collection using ZORBAX SB-C18 column shows high purity and high recovery of each compound (Application Note publication number 5988-7113EN). The separation of the three antianginal drugs was successfully done in a single run with high recovery and >90% purity. Separations up to 2000 mg are possible depending on the complexity of separation.



	Amount Nifedipine [mg]	Amount Nifmodipine [mg]	Amount Nifsoldipine [mg]		
Fraction 1	18.90	0.11	0.16	Purity Nifedipine	98.6%
Fraction 2	0.29	17.66	0.77	Purity Nifmodipine	94.4%
Fraction 3	0.49	1.66	18.36	Purity Nifsoldipine	89.5%
Recovery [mg]	19.68	19.43	19.29		
Recovery [%]	101.3	102.0	101.9		

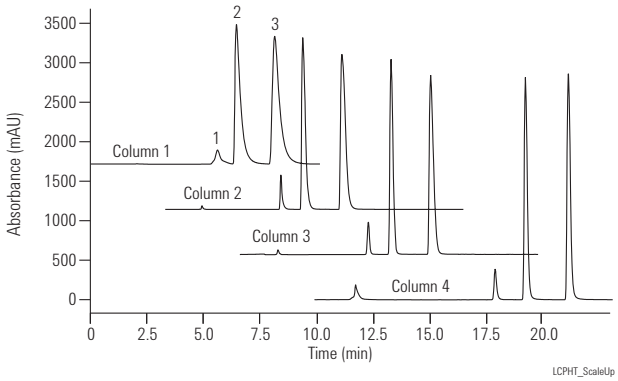
ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations for larger columns (21.2 mm id and higher, 150 mm length and higher), Agilent has carefully chosen the 7 µm particle size to achieve a balance between high efficiency and high loadability.

Scale-up from analytical to prep ZORBAX SB-C18 columns using the same pump

Column	Size	Flow (mL/min)	Injection (µL)	Detector Cell	Part No.
Column 1	50 x 150 mm	100	2200	0.3 mm quartz	Custom Column
Column 2	21.2 x 150 mm	18	400	0.3 mm quartz	877150-102
Column 3	9.4 x 150 mm	3.5	80	0.3 mm quartz	883975-202
Column 4	4.6 x 150 mm	0.85	2.0	3 mm SS	883975-902

Using the same 1100 pump, a scale-up from 4.6 mm to 50 mm id was possible without any loss of resolution. This increases throughput by reducing the time required for redeveloping and adjusting the method.

Scale-up to PrepHT



1. Theobromine
2. Theophylline
3. Caffeine

ZORBAX PrepHT 80StableBond (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Aq	SB-CN USP L10	SB-Phenyl USP L11
	PrepHT Cartridge	21.2 x 250	7	877250-102	877250-106	877250-114	877250-105	877250-112
	PrepHT Cartridge	21.2 x 150	7	877150-102	877150-106	877150-114		
	PrepHT Cartridge	21.2 x 150	5	870150-902	870150-906	870150-914		
	PrepHT Cartridge	21.2 x 100	5	870100-902	870100-906	870100-914		
	PrepHT Cartridge	21.2 x 50	5	870050-902	870050-906	870050-914		
	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-920	820212-915	820212-933	820212-933	820212-915

ZORBAX PrepHT 300StableBond (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-C3 USP L56	300SB-CN USP L10
	PrepHT Cartridge	21.2 x 250	7	897250-102	897250-106	897250-109	897250-105
	PrepHT Cartridge	21.2 x 150	7	897150-102	897150-106	897150-109	
	PrepHT Cartridge	21.2 x 150	5	895150-902	895150-906	895150-909	
	PrepHT Cartridge	21.2 x 100	5	895100-902	895100-906	895100-909	
	PrepHT Cartridge	21.2 x 50	5	895050-902	895050-906	895050-909	
	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-921	820212-918	820212-924	820212-924
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901	820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901

ZORBAX PrepHT Original (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	ODS (C18) USP L1	C8 USP L7	CN USP L10	NH2 USP L8	SIL USP L3
	PrepHT Cartridge	21.2 x 250	7	877952-102	877952-106	877952-105	877952-108	877952-101
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901	820400-901

ZORBAX PrepHT Eclipse XDB (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7
PL	PrepHT Cartridge	21.2 x 250	7	977250-102	977250-106
PL	PrepHT Cartridge	21.2 x 150	7	977150-102	977150-106
PL	PrepHT Cartridge	21.2 x 150	5	970150-902	970150-906
PL	PrepHT Cartridge	21.2 x 100	5	970100-902	970100-906
PL	PrepHT Cartridge	21.2 x 50	5	970050-902	970050-906
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-925	820212-926
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

ZORBAX PrepHT Bonus-RP and Extend-C18 (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP USP L60	Extend-C18 USP L1
PL	PrepHT Cartridge	21.2 x 250	7	878250-101	
PL	PrepHT Cartridge	21.2 x 150	7	878150-101	
PL	PrepHT Cartridge	21.2 x 150	5	868150-901	770150-902
PL	PrepHT Cartridge	21.2 x 100	5	868100-901	770100-902
PL	PrepHT Cartridge	21.2 x 50	5	868050-901	770050-902
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-928	820212-930
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

ZORBAX PrepHT Rx-SIL (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-SIL USP L3	Rx-C18 USP L1
PL	PrepHT Cartridge	21.2 x 250	7	877250-101	
PL	PrepHT Cartridge	21.2 x 250	7		877967-102
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-919	820212-914
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

ZORBAX PrepHT Accessories

Hardware	Description	Part No.
PL	Guard Cartridge Hardware	820444-901
PL	PrepHT Endfittings, 2/pk	820400-901
PL	Replacement Seals	820385-901

Pursuit and Pursuit XRs Prep

- Prep-scalable columns for Pursuit and Pursuit XRs columns
- Particle sizes to 10 µm and column diameters up to 50 mm
- High surface area silica

Pursuit and Pursuit XRs Prep columns are designed for high loadability with a high surface area.

Natural products – capsaicin and dihydrocapsaicin on Pursuit XRs C18

Column A: **Pursuit XRs C18**
A6001150X046
4.6 x 150 mm, 3 µm

Column B: **Pursuit XRs C18**
A6000150X046
4.6 x 150 mm, 5 µm

Column C: **Pursuit XRs C18**
A3002150X046
4.6 x 150 mm, 10 µm

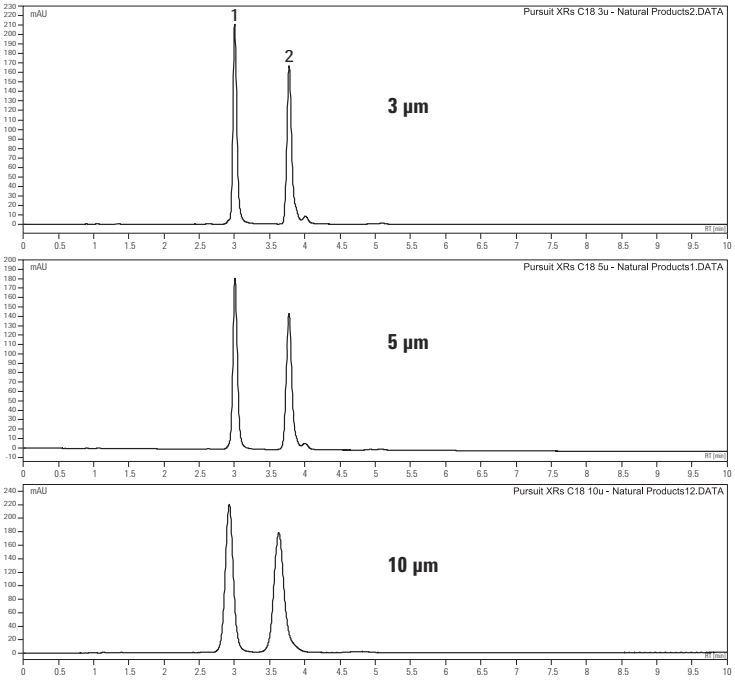
Mobile Phase: $CH_3CH:H_20$ - 70:30

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 220 nm

Sample: 1. Capsaicin
2. Dihydrocapsaicin



Demonstrating an easy, linear scale-up of natural products from Pursuit XRs C18 3 µm and 5 µm analytical columns to a 10 µm preparative column.

Agilent Pursuit Prep Columns

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP
10.0 x 250	5	A3000250X100	A3030250X100	A3040250X100	A3050250X100
10.0 x 250	10	A6002250X100	A3032250X100		
21.2 x 250	10	A6002250X212			
21.2 x 250	10	A6002250X212	A3032250X212		

Agilent Pursuit XRs Prep Columns

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl	Pursuit XRs Si USP L3
21.2 x 250	10	A6002250X212			A6004250X212
21.2 x 250	5	A6000250X212		A6020250X212	
21.2 x 150	5	A6000150X212	A6010150X212		
21.2 x 100	5	A6000100X212	A6010100X212	A6020100X212	
21.2 x 50	5	A6000050X212			
30.0 x 250	10	A6002250X300			A6004250X300
30.0 x 150	10	A6002150X300			
30.0 x 250	5	A6000250X300	A6010250X300		
30.0 x 150	5	A6000150X300			
30.0 x 100	5	A6000100X300			
50.0 x 250	10	A6002250X500		A6022250X500	A6004250X500

Polaris Prep Columns

- Prep-scalable columns for Polaris phases
- 10.0 and 21.2 mm ids available, with particles up to 10 µm

Scale-up from analytical to prep

Column A: **Polaris C18-A**
A2001050X046
4.6 x 50 mm, 3 µm

Column B: **Polaris C18-A**
A2000050X046
4.6 x 50 mm, 5 µm

Column C: **Custom column**

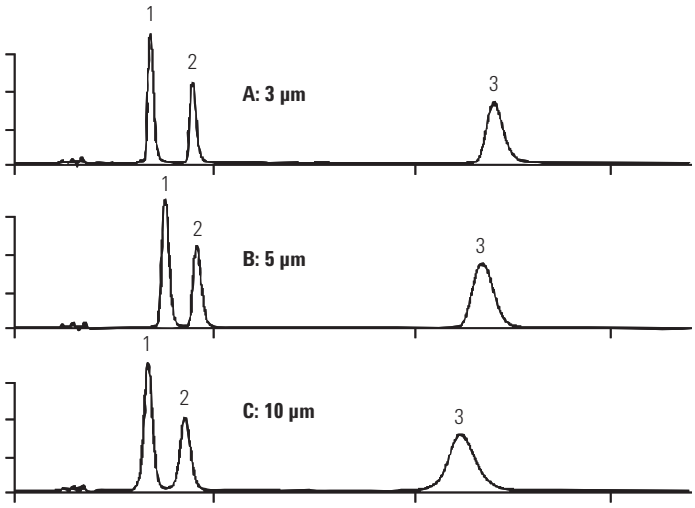
Mobile Phase: A: H_20 + 0.1% NH_40H, pH 10.0 (25 mM)
B: CH_3CN
A:B 65:35

Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: 215 nm

Sample: 1. Pindolol
2. Metoprolol
3. Propranolol



Polaris Prep Columns

Size (mm)	Particle Size (µm)	Polaris C18-A	Polaris C18-Ether	Polaris Amide C18	Polaris Si-A	Polaris C8-A	Polaris C8-Ether	Polaris NH2
10.0 x 250	5	A2000250X100	A2020250X100	A2006250X100		A2010250X100	A2030250X100	A2013250X100
21.2 x 250	5	A2000250X212	A2030250X212		A2003250X212	A2010250X212		A2013250X212
21.2 x 250	10	A2002250X212			A2004250X212			

Bulk materials for prep

Agilent has bulk materials available for all phases. Most materials and quantities can be ordered through the Custom Column and Bulk Ordering process, and can be produced in multiple kg. quantities. Quotes are able to be delivered within 48 hours. Contact your Agilent product specialist for support in placing a custom order.



Load & Lock Columns

Load & Lock Preparative HPLC Column Packing Systems

Agilent offers a complete range of Load & Lock column systems for laboratory and process preparative LC. They are designed to let you easily and quickly pack your own preparative high efficiency columns. This is the right solution for applications ranging in scale from development (multigrams) to production (multi-kilo) of pharmaceutical compounds, peptides, and natural products. Our Load & Lock columns have a unique fluid/sample distribution system to maximize productivity. The system provides dynamic axial compression (DAC) and static "locked" axial compression (SAC) and is designed for easy operation to deliver greater convenience.

Laboratory Load & Lock Columns

- Mobile packing station supports three different column sizes
- Runs on compressed air with no need for a power supply
- Quick and easy packing and unpacking within minutes

Agilent's laboratory scale Load & Lock columns combine excellent packed-bed stability with enhanced flow distribution to deliver the highest quality purification possible with maximum speed, flexibility, and ease of operation. Three different column sizes are supported: 1 in, 2 in and 3 in id. Because the station is powered by compressed air, it is the perfect solution for hazardous environments. The quick-release single bolt clamp offers speedy and easy packing and unpacking within minutes.

Load & Lock Preparative HPLC Column Packing Systems

Description	Water Jacket	Size (mm)	Part No.
Load & Lock 4001 Column	No	25.0 x 500	PCG93LL500X25
	Yes	25.0 x 500	PCG93LL500X25WJ
	Spare parts kit		PCG931AAKIT
Load & Lock 4002 Column	No	50.0 x 500	PCG93LL500X50
	Yes	50.0 x 500	PCG93LL500X50WJ
	Spare parts kit		PCG932AAKIT
Load & Lock 4003 Column	No	75.0 x 500	PCG93LL500X75
	Yes	75.0 x 500	PCG93LL500X75WJ
	Spare parts kit		PCG933AAKIT
Mobile packing station (air driven hydraulic)			PCG93LLSTAND123

Columns for Other HPLC Techniques



Reproducible results for Normal Phase and beyond

Agilent's extended family of HPLC columns support every technique, providing you with the Agilent quality you depend on for every application.

- ZORBAX HILIC Plus – good retention of small, polar analytes and high sensitivity for LC/MS – in Fast LC 1.8 µm options
- ZORBAX normal phase columns – bonded and non-bonded silica packings
- ZORBAX ion-exchange columns – based on rugged ZORBAX Silica, stable from pH 2-7
- Hi-Plex columns for carbohydrate analysis – ligand-exchange columns
- Ultron ES Chiral columns – with two complimentary protein-based chiral stationary phases – are an excellent choice for enantiomeric separations. Ideal for many pharmacological applications.







ZORBAX HILIC Plus

- HILIC column for good retention of small, polar analytes
- Based on Eclipse Plus silica for excellent peak shape
- High sensitivity for LC/MS applications
- Recommended for EPA Method 1694

Agilent ZORBAX HILIC Plus columns are for use in hydrophilic interaction chromatography (HILIC) applications, which are typically used for the retention and resolution of small polar compounds. HILIC Plus columns are non-bonded silica columns based on the high performance silica used in ZORBAX Eclipse Plus columns. This silica provides excellent peak shape, critical for many polar, basic analytes. These columns ship prepared for use in HILIC mode – containing acetonitrile:water – in order to reduce the extensive equilibration typically required for HILIC separations. HILIC Plus columns are available in a 3.5 µm particle size for high resolution and in 2.1 and 4.6 mm id for compatibility with mass spectrometers or with standard UV detectors.

Column Specifications

Phase	Pore Size	Surface Area	pH Range
Non-bonded silica	95Å	160 m^2/g	0-8.0

Specifications represent typical values only.

TIPS & TOOLS

Poroshell 120 HILIC is very similar to ZORBAX HILIC Plus.

Turn to page 228

Separation of group 4 analytes in EPA 1694 on ZORBAX HILIC Plus column

Column: **ZORBAX HILIC Plus**
959793-901
2.1 x 100 mm, 3.5 µm

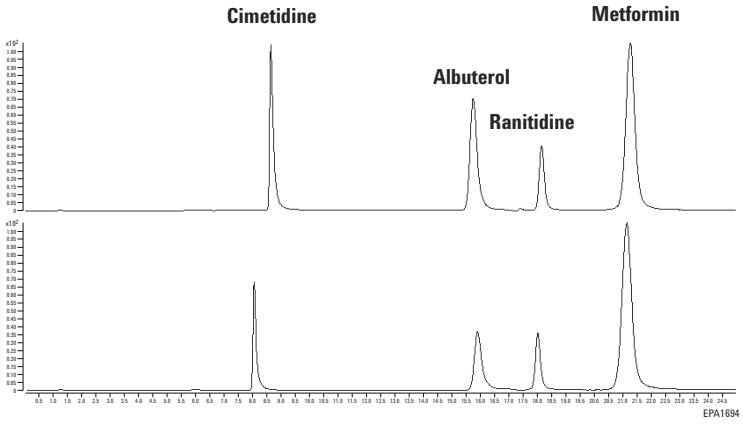
Mobile Phase: 90% Acetontrile:10% Water

Flow Rate: 0.25 mL/min

Gradient: Linear gradient to 55% acetonitrile in 7 min
Held at 55%

Temperature: 25 °C

Duplicate runs for column USCJP0004;
10 min equilibration between two runs



ZORBAX HILIC Plus

Description	Size (mm)	Particle Size (µm)	Part No.
Analytical	4.6 x 100	3.5	959961-901
Analytical	4.6 x 50	3.5	959943-901
Narrow Bore	2.1 x 100	3.5	959793-901
Narrow Bore	2.1 x 50	3.5	959743-901

ZORBAX HILIC Plus RRHD, stable to 1200 bar

Size (mm)	Particle Size (µm)	Part No.
3.0 x 100	1.8	959758-301
3.0 x 50	1.8	959757-301
2.1 x 150	1.8	959759-901
2.1 x 100	1.8	959758-901
2.1 x 50	1.8	959757-901

Poroshell 120 HILIC Plus

Size (mm)	Particle Size (µm)	Part No.
2.1 x 50	2.7	699775-901
2.1 x 100	2.7	695775-901
2.1 x 150	2.7	693775-901
3 x 50	2.7	699975-301
3 x 150	2.7	693975-301
4.6 x 50	2.7	699975-901
4.6 x 100	2.7	695975-901
4.6 x 150	2.7	693975-901

ZORBAX Normal-Phase Columns

For normal-phase chromatography, the Agilent ZORBAX product line offers a choice of bonded and non-bonded silica packings.

ZORBAX Rx-SIL

- Made from highly pure (> 99.995%) porous silica microspheres (pore size is the space between the solid silica microparticles)
- Available in 1.8 and 5 µm particle sizes
- Stronger than other silica types
- Less acidic than ZORBAX SIL, lower metal content
- Low acidity and low metal content make ZORBAX Rx-SIL ideal for normal-phase separation of polar compounds that exhibit poor peak symmetry on more acidic silica
- Useful for very hydrophilic compounds with high organic mobile phases in HILIC mode

ZORBAX Eclipse XDB-CN

- Made from highly pure Rx-SIL
- Excellent choice for normal-phase applications with basic compounds
- Equilibrates more rapidly than ZORBAX Rx-SIL and is used for many of the same normal-phase applications

ZORBAX CN

- Cyanopropyldimethylsilane monolayer bonded to ZORBAX SIL
- Equilibrates more rapidly than ZORBAX SIL, and used for many of the same normal-phase applications
- Less prone to fouling and less water sensitive than silica

Pursuit XRs Si

- 100Å silica for higher surface area and good loadability
- 14.6% carbon load
- Available in 3 µm, 5 µm and 10 µm

Polaris NH2

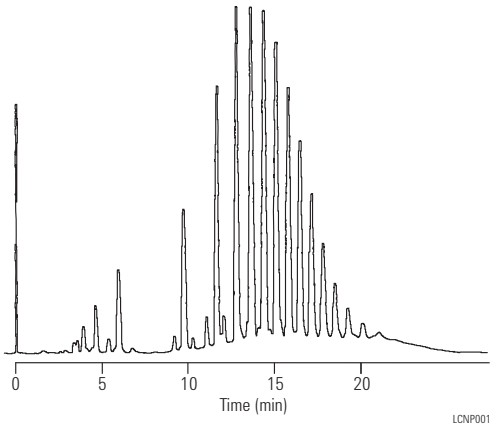
- 180Å silica for high surface area and loadability
- 5.5% carbon load
- Available in 3 µm, 5 µm, and 10 µm sizes
- Polar-modified with silanol shielding
- Designed for high-aqueous conditions

Polaris Si-A

- 180Å silica with highest surface area and loadability
- Available in 3 µm, 5 µm, and 10 µm

High resolution normal-phase separation of octylphenoxy ethanol surfactant on ZORBAX CN

Column:	**ZORBAX CN 880952-705 4.6 x 250 mm, 5 µm**
Mobile Phase:	Primary: Heptane Secondary: 2-Methoxyethanol/Isopropanol (50/50)
Flow Rate:	2 mL/min
Gradient:	2-20% Secondary in 10 min, Linear Hold at 20%
Temperature:	50 °C
Detector:	278 nm
Sample:	Octylphenoxy (polyethylene oxy) Ethanol Surfactant (n=10)



Polaris ordering information can be found on pages 300-303

Pursuit ordering information can be found on pages 291-297

ZORBAX NH2

- Amino-propyl silane phase bonded to ZORBAX SIL
- Used for normal-phase and weak anion-exchange, and reversed-phase HPLC of polar compounds
- Vitamins A and D are separated in the normal-phase mode
- Carbohydrates and sugars are separated in the reversed-phase mode

Column Specifications

Phase	Pore Size	Surface Area	pH Range	Endcapped	Carbon Load
ZORBAX Rx-SIL	80Å	180 m^2/g	0-8.0	No	
ZORBAX Eclipse XDB-CN	80Å	180 m^2/g	2.0-8.0	Yes	4.3%
ZORBAX SIL	70Å	300 m^2/g	0-8.0	No	
ZORBAX CN	70Å	300 m^2/g	2.0-7.0	Yes	7%
ZORBAX NH2	70Å	300 m^2/g	2.0-7.0	Yes	4%

TIPS & TOOLS

Pursuit XRs Silica is another choice for normal-phase chromatography. For more information, see pages 295-296.

Normal-Phase Columns Based on ZORBAX Rx-SIL

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-SIL** USP L3	Eclipse XDB-CN USP L10
Standard Columns (no special hardware required)					
	Semi-Prep	9.4 x 250	5	880975-201	
	Analytical	4.6 x 250	5	880975-901	990967-905*
	Analytical	4.6 x 150	5	883975-901	993967-905*
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-901	
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	
	Rapid Resolution HT, 600 bar	3.0 x 100	1.8	828975-301	
	Rapid Resolution HT, 600 bar	3.0 x 50	1.8	827975-301	
	Narrow Bore	2.1 x 150	5	883700-901	993700-905*
	Rapid Resolution HT, 600 bar	2.1 x 100	1.8	828700-901	
	Rapid Resolution HT, 600 bar	2.1 x 50	1.8	827700-901	
Guard Columns (hardware required)					
P	Guard Cartridge, 2/pk	9.4 x 15	5	820675-119	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-919	820950-935
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-919	821125-935
P	Guard Hardware Kit	9.4 x 15		840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)					
PH	PrepHT Cartridge	21.2 x 250	7	877250-101	
PH	PrepHT Endfittings, 2/pk			820400-901	
PH	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-919	
PH	Guard Cartridge Hardware			820444-901	

*These columns ship containing reversed-phase solvents. Flush with isopropanol before using normal-phase solvents.

**These columns can also be used in HILIC mode.

Normal-Phase Columns Based on ZORBAX Original SIL

Hardware	Description	Size (mm)	Particle Size (µm)	SIL USP L3	CN USP L10	NH2 USP L8	Carbohydrate Analysis*
Standard Columns (no special hardware required)							
	Semi-Prep	9.4 x 250	5	880952-201	880952-205	880952-208	
	Analytical	4.6 x 250	5	880952-701	880952-705	880952-708	840300-908
	Analytical	4.6 x 150	5	883952-701	883952-705	883952-708	843300-908
	Narrow Bore	2.1 x 50	5			860700-708	
Guard Columns (hardware required)							
P	Guard Cartridge, 2/pk	9.4 x 15	5	820675-119	820675-111	820675-111	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-901	820950-905	820950-908	820950-908
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5				
P	Guard Hardware Kit	9.4 x 15		840140-901	840140-901	840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
PI	PrepHT Cartridge	21.2 x 250	7	877952-101	877952-105	877952-108	
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	
PI	Guard Cartridge Hardware			820444-901			

*Columns ship in acetonitrile:water and are tested with a mix of sugars.

Pursuit XRs Si, USP L3

Size (mm)	Particle Size (µm)	Part No.
Semi-Prep Scale		
10.0 x 250	10	A6004250X100
Analytical Scale		
4.6 x 250	10	A6004250X046
4.6 x 100	5	A6006100X046
4.6 x 50	5	A6006050X046
4.6 x 100	3	A6005100X046
4.6 x 50	3	A6005050X046
2.1 x 100	5	A6006100X021
2.0 x 50	3	A6005050X020
Prep Scale		
50.0 x 250	10	A6004250X500
30.0 x 250	10	A6004250X300
21.2 x 250	10	A6004250X212

Polaris HPLC Columns

Size (mm)	Particle Size (µm)	Polaris NH2	Polaris Si-A
50.0 x 250	10		A2004250X500
21.2 x 250	10		A2004250X212
21.2 x 250	5	A2013250X212	A2003250X212
21.2 x 150	5		A2003150X046
21.2 x 50	5		A2003050X212
10.0 x 250	5	A2013250X100	

(Continued)

Polaris HPLC Columns

Size (mm)	Particle Size (µm)	Polaris NH2	Polaris Si-A
4.6 x 250	10		A2003250X046
4.6 x 250	5	A2013250X046	
4.6 x 150	5	A2013150X046	A2003150X046
4.6 x 100	5	A2013100X046	A2003100X046
4.6 x 50	5	A2013050X046	A2003050X046
4.6 x 250	3	A2014250X046	A2005250X046
4.6 x 150	3	A2014150X046	A2005150X046
4.6 x 100	3	A2014100X046	A2005100X046
4.6 x 50	3	A2014050X046	A2005050X046
4.0 x 250	5	A2013250X040	A2003250X040
4.0 x 150	5	A2013150X040	A2003150X040
4.0 x 125	5	A2013125X040	A2003125X040
3.0 x 250	5	A2013250X030	A2005250X046
3.0 x 150	5	A2013150X030	A2003150X030
3.0 x 100	5	A2013100X030	A2003100X030
3.0 x 50	5		A2003050X030
3.0 x 250	3	A2014250X030	A2003250X030
3.0 x 150	3	A2014150X030	A2005150X030
3.0 x 100	3	A2014100X030	A2005100X030
3.0 x 50	3	A2014050X030	A2005050X030
2.0 x 250	5	A2013250X020	A2003250X020
2.0 x 150	5	A2013150X020	A2003150X020
2.0 x 100	5	A2013100X020	A2003100X020
2.0 x 50	5	A2013050X020	A2003050X020
2.0 x 30	5	A2013030X020	A2003030X020
2.0 x 20	5	A2013020X020	A2003020X020
2.0 x 250	3	A2014250X020	A2005250X020
2.0 x 150	3	A2014150X020	A2005150X020
2.0 x 100	3	A2014100X020	A2005100X020
2.0 x 50	3	A2014050X020	A2005050X020
2.0 x 30	3	A2014030X020	A2005030X020
2.0 x 20	3	A2014020X020	A2005020X020

MetaGuard Columns

Hardware	Dimensions	Particle Size (µm)	Polaris NH2	Polaris Si-A
MG	4.6	10		A2004MG
MG	2.0	10		A2004MG2
MG	4.6	5	A2013MG	A2003MG
MG	2.0	5	A2013MG2	A2003MG2
MG	4.6	3	A2014MG	A2005MG
MG	2.0	3	A2014MG2	A2005MG2

Ion-Exchange Columns

ZORBAX Ion-Exchange Columns – SAX and SCX

- ZORBAX SAX and 300SCX columns are based on rugged ZORBAX silica
- Stable from pH 2-7
- Provide high efficiency, rapid separations
- Compatible with organic mobile phase modifiers

Agilent ZORBAX Strong Ion-Exchange columns are available as both Strong Anion-Exchange (SAX) and Strong Cation-Exchange (300SCX) columns. Each column is packed with bonded, 5 µm, spherical silica particles for optimum efficiency.

ZORBAX SAX packing has a permanently bonded quaternary amine. A trifunctional organo-silane reagent is used in producing this packing to maximize its stability with aqueous mobile phases. This column is ideal for separation of water-soluble compounds such as aromatic and aliphatic carboxylic acids and sulfonic acids.

ZORBAX SCX packing has 300Å pore size silica particles chemically bonded to an aromatic sulfonic acid group. This column is used for separations of basic, water-soluble compounds and bio-molecules.

Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	Functionality	Max Pressure
ZORBAX SAX	70Å	300 m^2/g	2.0-7.0	Quaternary amine	350 bar
ZORBAX 300SCX	300Å	50 m^2/g	2.0-7.0	Sulfonic acid	350 bar

Specifications represent typical values only.

Cough/cold remedies on ZORBAX 300SCX

Column: **ZORBAX 300SCX**
880952-704
4.6 x 250 mm, 5 µm

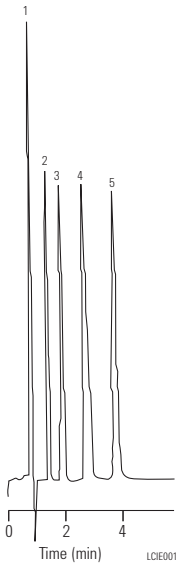
Mobile Phase: 100 mM NaH_2PO_4 (pH 6.5)

Flow Rate: 3 mL/min

Temperature: 20 °C

Detector: 210 nm

Sample: Cold remedies



1. Pyrilamine
2. Theophylline
3. Glyceryl Guaicolate
4. Caffeine
5. Phenylephrine

ZORBAX Ion-Exchange Columns – SAX and SCX

Description	Size (mm)	Particle Size (µm)	SAX	300SCX
Semi-preparative	9.4 x 250	5	880952-203	880952-204
Analytical	4.6 x 250	5	880952-703	880952-704
Analytical	4.6 x 250	5		880952-714*
Analytical	4.6 x 150	5	883952-703	883952-704
Analytical	4.6 x 150	5		883952-714*
Analytical	4.6 x 50	5		846952-704
Solvent Saver	3.0 x 50	5		860700-304
Narrow Bore	2.1 x 150	5		883700-704
Narrow Bore	2.1 x 150	5		883700-714*
Narrow Bore	2.1 x 50	5		860700-704
Guard Hardware Kit			820999-901	820999-901

*These columns have been modified to provide less retention, for those who desire that in their application.

Hi-Plex Columns for Carbohydrate Analysis



- Agilent's recommended column for accurate, low-pressure analysis of typical carbohydrates, providing leading-edge features for reliable quantitative and qualitative analysis
- Enable reduced column operating pressures for repeatable performance and longer column life
- Wide range of ligand counter ions and column configurations meet requirements of challenging organic applications
- Simplified HPLC system requirements through isocratic separation capabilities; excellent batch-to-batch reproducibility for ultimate confidence in your results
- Can be used with water or diluted acid as an eluent
- Available in 8 µm and 10 µm particle sizes in a range of choices for USP media types – L17, L19, L34 and L58

The least complicated LC methods for detecting sugars, sugar alcohols and organic acids call for ligand-exhange columns with a simple mobile phase. However, the wide particle size distribution of conventional resins can lead to high backpressures and reduced productivity.

Hi-Plex columns are engineered with monodisperse sulfonated particles, creating a high-performance media uniquely suited to stringent USP methods for analyzing carbohydrates, alcohols and organic acids. Unlike the ZORBAX NH2 column used for carbohydrate analysis with an acetonitrile:water mobile phase, Hi-Plex ligand-exchange columns provide more resolution for mono- and disaccharides due to the interaction of the hydroxyl groups with the metal ion associated with the cation-exchange functionality of the sulfonic acid group.

Column Specifications

Bonded Phase	Temperature Range	Flow Rate (mL/min)	Eluent
Hi-Plex Ca	80-90 °C	0.6	Water
Hi-Plex Ca USP L19	80-90 °C	0.3	Water
Hi-Plex Pb	70-90 °C	0.6	Water
Hi-Plex H for carbohydrates	60-70 °C	0.6	Water
Hi-Plex H for organic acids	40-60 °C	0.6	Dilute Acid
Hi-Plex Ca (Duo)	80-90 °C	0.6	Water
Hi-Plex K	80-90 °C	0.6	Water
Hi-Plex Na (Octo)	80-90 °C	0.6	Water, Sodium Hydroxide
Hi-Plex Na	80-90 °C	0.3	Water

Hi-Plex Column Selection

USP methods specify the type of HPLC media and column dimensions which should be used for the analysis. The Hi-Plex product range has four materials that comply with USP definitions.

Media Type L17

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 7 to 11 µm in diameter – Hi-Plex H.

Media Type L19

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the calcium form, 9 µm in diameter – Hi-Plex Ca and Hi-Plex Ca (Duo).

Media Type L34

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the lead form, about 9 µm in diameter – Hi-Plex Pb.

Media Type L58

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the sodium form, 6 to 30 µm diameter – Hi-Plex Na and Hi-Plex Na (Octo).

In addition to the standard column sizes, the media is also packed in specific column dimensions for different USP methods, including sugar alcohol analysis.

For some application areas there are several column options, and the choice of the most appropriate Hi-Plex media will depend on sample matrix and exact carbohydrate composition.

Hi-Plex Column Selection	
Application Area	**Recommended Column**
USP Methods Specifying L17 Media	Hi-Plex H
USP Methods Specifying L19 Media	Hi-Plex Ca and Hi-Plex Ca (Duo)
USP Methods Specifying L34 Media	Hi-Plex Pb
USP Methods Specifying L58 Media	Hi-Plex Na and Hi-Plex Na (Octo)
Mono- and Disaccharides	Hi-Plex Ca
	Hi-Plex Pb
	Hi-Plex H
	Hi-Plex Na (Octo)
Anomer Separations	Hi-Plex Ca
Organic Acids	Hi-Plex H
Alcohols	Hi-Plex Ca
	Hi-Plex K
	Hi-Plex H
	Hi-Plex Pb
Adulteration of Food and Beverages	Hi-Plex Ca and Hi-Plex Pb
Food Additives	Hi-Plex Ca and Hi-Plex Pb
Dairy Products	Hi-Plex Ca and Hi-Plex H
Sweetened Dairy Products	Hi-Plex Pb
Confectionery	Hi-Plex Ca and Hi-Plex Pb
Fruit Juice	Hi-Plex Ca
Wine	Hi-Plex H
Wood Pulp Hydrolysates (cellulose/hemi-cellulose)	Hi-Plex Pb
Fermentation Monitoring	Hi-Plex H
Oligosaccharides	Hi-Plex Na
Samples with High Salt Content (molasses)	Hi-Plex Na (Octo)
Oligosaccharides <Dp5 with Monosaccharides	Hi-Plex Ca (Duo)
Corn Syrups	Hi-Plex Na

Analysis of fruit juice

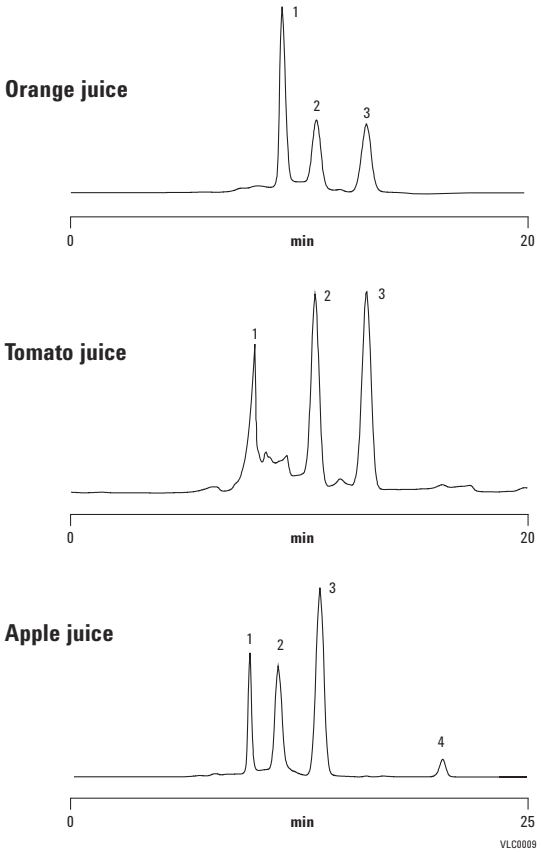
Column: **Hi-Plex Ca**
PL1170-6810
7.7 x 300 mm, 8 µm

Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 85 °C

Detector: RI



1. Sucrose
2. Glucose
3. Fructose
4. Sorbitol

Organic acid analysis

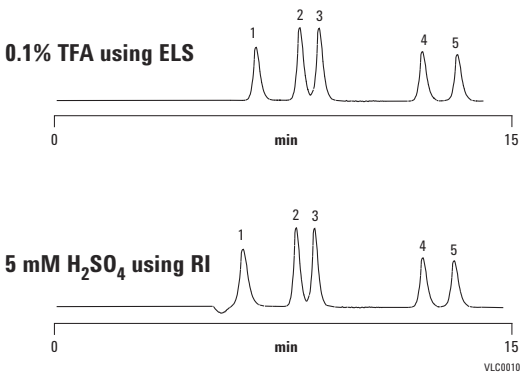
Column: **Hi-Plex H**
PL1170-6830
7.7 x 300 mm, 8 µm

Mobile Phase: Water with acid as specified

Flow Rate: 0.6 mL/min

Temperature: 60 °C

Detector: ELS (neb=80 °C, evap=90 °C, gas=0.7 SLM), RI

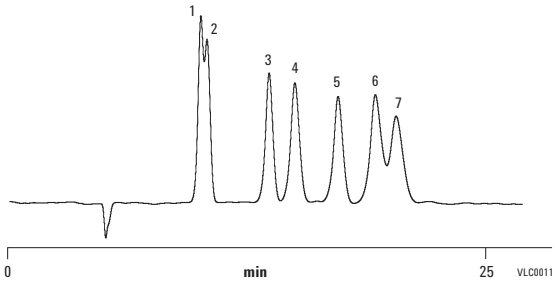


1. Oxalic acid
2. Citric acid
3. Tartaric acid
4. Succinic acid
5. Lactic acid

USP methods for sugar alcohols

Column: **Hi-Plex Ca USP L19**
PL1570-5810
4.0 x 250 mm, 8 µm

Mobile Phase: Water
Flow Rate: 0.3 mL/min
Temperature: 60 °C
Detector: RI

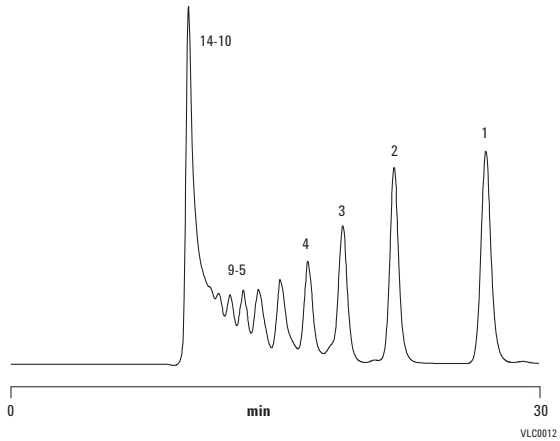


1. Iso-erythritol
2. Adonitol
3. Arabitol
4. Mannitol
5. Xylitol
6. Dulcitol
7. Sorbitol

Corn syrup, Hi-Plex

Column: **Hi-Plex Na**
PL1171-6140
7.7 x 300 mm, 10 µm

Mobile Phase: Water
Pressure: 11 bar
Flow Rate: 0.3 mL/min
Temperature: 80 °C
Detector: RI



1. Dp1
2. Dp2
3. Dp3
4. Dp4
5. Dp5
6. Dp6
7. Dp7
8. Dp8
9. Dp9
10. Dp10
11. Dp11
12. Dp12
13. Dp13
14. Dp14

Analysis of sweeteners on Hi-Plex Ca columns

Column: **Hi-Plex Ca**
PL1170-6810
7.7 x 300 mm, 8 µm

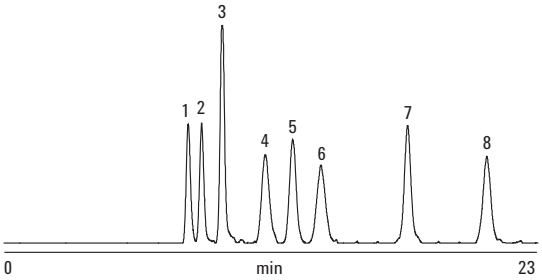
Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 85 °C

Detector: ELSD

Hi-Plex Ca columns are ideal for analyzing most sweeteners, including glucose and fructose (monosaccharides), sucrose (disaccharide), and mannitol and sorbitol (sugar alcohols).



1. Stachyose
2. Raffinose
3. Sucrose
4. Glucose
5. Galactose
6. Fructose
7. Mannitol
8. Sorbitol

Analysis of carbohydates on Hi-Plex H columns

Column: **Hi-Plex H**
PL1170-6830
7.7 x 300 mm, 8 µm

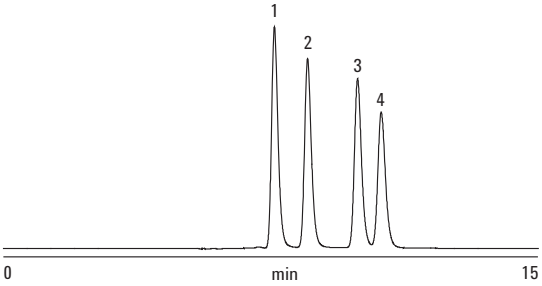
Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 70 °C

Detector: RI

For carbohydrate analysis of samples containing high levels of organic acids, Hi-Plex H columns deliver sharp, reproducible peaks. Note, however, that some sugars (such as raffinose) can undergo acid hydrolysis even when water is used as the eluent.



1. Maltotriose
2. Lactose
3. Glucose
4. Fructose

Analysis of sugars with high sodium matrix

Column: **Hi-Plex Na (Octo)**
PL1170-6840
7.7 x 300 mm, 8 µm

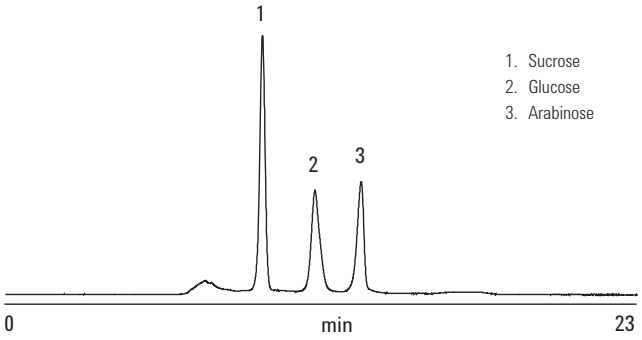
Mobile Phase: 0.015 M NaOH

Flow Rate: 0.6 mL/min

Temperature: 85 °C

Detector: RI

Food products containing high levels of sodium ions are best analyzed with Hi-Plex Na (Octo) columns. This saves time when sodium hydroxide is used as the eluent with PAD, because it eliminates the need for the post-column addition of sodium hydroxide.



USP method for sorbitol

Column: **Hi-Plex Pb USP L34**
PL1170-2820
7.7 x 100 mm, 8 µm

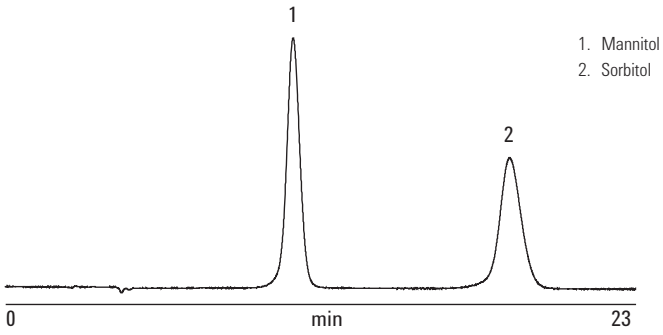
Mobile Phase: Water

Flow Rate: 0.7 mL/min

Temperature: 50 °C

Detector: RI

USP method for sorbitol – a sugar alcohol and alternative sweetener – using mannitol as the internal standard. Hi-Plex Pb columns are recommended for alcoholic drinks that also contain glycerol, as well as sweetened dairy-based food products.



Hi-Plex Columns for Carbohydrate Analysis

Description	Size (mm)	Particle Size (µm)	Crosslink Content (%)	Counter Ion	Part No.
Hi-Plex Ca USP L19	4.0 x 250	8	8	Ca^{2+}	PL1570-5810
Hi-Plex Ca (Duo)	6.5 x 300	8	8	Ca^{2+}	PL1F70-6850
Hi-Plex Ca	7.7 x 300	8	8	Ca^{2+}	PL1170-6810
Hi-Plex Pb USP L34	7.7 x 100	8	8	Pb^{2+}	PL1170-2820
Hi-Plex Pb	7.7 x 300	8	8	Pb^{2+}	PL1170-6820
Hi-Plex K	7.7 x 300	8	8	K^{+}	PL1170-6860
Hi-Plex H	6.5 x 300	8	8	H^{+}	PL1F70-6830
Hi-Plex H	7.7 x 300	8	8	H^{+}	PL1170-6830
Hi-Plex H USP L17	7.7 x 100	8	8	H^{+}	PL1170-2823
Hi-Plex Na	7.7 x 300	10	4	Na^{+}	PL1171-6140
Hi-Plex Na (Octo)	7.7 x 300	8	8	Na^{+}	PL1170-6840

Hi-Plex Guard Columns

Description	Size (mm)	Particle Size (µm)	Crosslink Content (%)	Counter Ion	Part No.
Hi-Plex Ca	7.7 x 50	8	8	Ca^{2+}	PL1170-1810
Hi-Plex Ca (Duo)	7.7 x 50	8	8	Ca^{2+}	PL1170-1850
Hi-Plex Pb	7.7 x 50	8	8	Pb^{2+}	PL1170-1820
Hi-Plex K	7.7 x 50	8	8	K^{+}	PL1170-1860
Hi-Plex H	7.7 x 50	8	8	H^{+}	PL1170-1830
Hi-Plex Na	7.7 x 50	10	4	Na^{+}	PL1171-1140
Hi-Plex Na (Octo)	7.5 x 50	8	8	Na^{+}	PL1170-1840

Hi-Plex Guard Cartridges, 2/pk

Description	Size (mm)	Particle Size (µm)	Crosslink Content (%)	Counter Ion	Part No.
Hi-Plex Ca	3.0 x 5.0	8	8	Ca^{2+}	PL1670-0810
Hi-Plex Ca (Duo)	3.0 x 5.0	8	8	Ca^{2+}	PL1670-0850
Hi-Plex Pb	3.0 x 5.0	8	8	Pb^{2+}	PL1670-0820
Hi-Plex K	3.0 x 5.0	8	8	K^{+}	PL1670-0860
Hi-Plex H	3.0 x 5.0	8	8	H^{+}	PL1670-0830
Hi-Plex Na	3.0 x 5.0	10	4	Na^{+}	PL1671-0140
Hi-Plex Na (Octo)	3.0 x 5.0	8	8	Na^{+}	PL1670-0840
Guard Cartridge holder for 3.0 x 5.0 mm cartridges					PL1310-0016

Quick Guide to USP Designations for HPLC Columns

The US Pharmacopeia (USP) is a standard source for many pharmaceutical methods. The USP specifies columns by packing materials rather than by manufacturer. The USP has updated its L1 definitions, listed below you will see the most recent definitions and columns that apply. Rapid Resolution High Throughput (RRHT) columns are now choices in the L1, L7, and L11 categories.

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles, 1.5 to 10 µm in diameter, or a monolithic rod	Poroshell 120 EC-C18	2.7	120
		Poroshell 120 SB-C18	2.7	120
		Poroshell 300SB-C18	5	300
		Poroshell 300 Extend-C18	5	300
		ZORBAX Eclipse Plus C18	1.8, 3.5, 5	95
		ZORBAX Eclipse XDB-C18	1.8, 3.5, 5, 7	80
		ZORBAX StableBond SB-C18	1.8, 3.5, 5, 7	80, 300
		ZORBAX Rx-C18	3.5, 5	80
		ZORBAX Extend-C18	1.8, 3.5, 5, 7	80, 300
		ZORBAX ODS	3, 5, 7	70
		ZORBAX ODS classic	5	70
		Pursuit XRs C18	3, 5, 10	100
		Pursuit C18	3, 5, 10	200
		Pursuit C18-A	3, 5, 10	180
		Polaris C18-Ether	3, 5	200
		SepTech ST60 C18	10	60
		SepTech ST150 C18	10	150
		Agilent Prep C18	5, 10	100
L3	Porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod	ZORBAX HILIC Plus	1.8, 3.5	95
		ZORBAX SIL	5	70
		ZORBAX Rx-SIL	3.5, 5, 7	80, 300
		Pursuit XRs Si	3, 5, 10	100
		Polaris Si-A	5, 10	180
		Agilent Prep	5, 10	100
L7	Octylsilane chemically bonded to totally porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod	Poroshell 120 EC-C8	2.7	120
		Poroshell 120 SB-C8	2.7	120
		Poroshell 300SB-C8	5	300
		ZORBAX Eclipse Plus C8	1.8, 3.5, 5	95
		ZORBAX Eclipse XDB-C8	1.8, 3.5, 5, 7	80
		ZORBAX SB-C8	1.8, 3.5, 5, 7	80, 300
		ZORBAX Rx-C8	1.8, 3.5, 5, 7	80
		ZORBAX C8	5	70
		Pursuit XRs C8	3, 5, 10	100
		Pursuit C8	3, 5, 10	200
		Polaris C8-A	3, 5	180
		Polaris C8-Ether	3, 5	200

(Continued)

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10 µm in diameter	ZORBAX NH2	5	70
		Polaris NH2	5	180
L9	Irregular or spherical, totally porous silica gel having a chemically bonded, strongly acidic cation-exchange coating, 3 to 10 µm in diameter	ZORBAX SCX	5 spherical	300
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10 µm in diameter	ZORBAX CN	5	70
		ZORBAX SB-CN	3.5, 5	80, 300
		ZORBAX Eclipse XDB-CN	3.5, 5	80
L11	Phenyl groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter	ZORBAX Eclipse XDB Phenyl	5	70
		ZORBAX Eclipse Plus Phenyl-Hexyl	1.8, 3.5, 5	95
		ZORBAX Phenyl	3.5	80
		Poroshell 120 Phenyl-Hexyl	2.7	120
		Pursuit XRs DiPhenyl	3, 5, 10	100
		Pursuit DiPhenyl	3, 5, 10	200
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10 µm in diameter	ZORBAX TMS	5	70
L14	Silica gel having a chemically bonded, strongly basic quaternary ammonium anion-exchange coating, 5 to 10 µm in diameter	ZORBAX SAX	5	70
		IonoSpher A	5	120
L17	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 7 to 11 µm in diameter	Hi-Plex H	8	N/A
L19	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 9 µm in diameter	Hi-Plex Ca	8	N/A
		Hi-Plex Ca (Duo)	8	N/A
L20	Dihydroxypropane groups chemically bonded to porous silica particles, 3 to 10 µm in diameter	LiChrospher Diol	5	N/A

(Continued)

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L21	A rigid spherical styrenedivinylbenzene copolymer, 5 to 10 µm in diameter	PLRP-S	3, 5, 8, 10, 10-15, 15-20, 50	100
		PLRP-S	3, 5, 8, 10, 10-15, 15-20, 50	300
		PLRP-S	5, 8, 10, 30, 50	1000
		PLRP-S	5, 8, 10, 30, 50	4000
		PLgel	3, 5, 10, 20	50, 100, 500, 10^3, 10^5, 10^5, 10^6, MIXED
L22	A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, about 10 µm in size	Hi-Plex H	8	N/A
L25	Packing having the capacity to separate compounds with a MW range from 1,000 to 5,000 da (as determined by the polyethylene oxide), applied to neutral, anionic and cationic water-soluble polymers. A polymethacrylate resin base, crosslinked with polyhydroxylated ether (surface contained some residual carboxyl functional gruops) was found suitable	PL aquagel-OH	5, 8	30
L33	Packing having the capacity to separate dextrons by molecular size over a range of 4,000 to 500,000 da. It is spherical, silica-based, and processed to provide pH stability	ZORBAX GF-250	4	150
		Bio SEC-3	3	100, 150, 300
		Bio SEC-5	5	100, 150, 300, 500, 1000, 2000
		ProSEC	5	300

(Continued)

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L34	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, about 9 µm in diameter	Hi-Plex Pb	8	N/A
L35	A zirconium-stabilized spherical silica packing with a hydrophilic (diol-type) molecular monolayer bonded phase having a pore size of 150Å	ZORBAX GF-250 ZORBAX GF-450	4 6	150, 300
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10 µm in diameter	Pursuit PFP	3, 5	200
L45	Beta cyclodextrin bonded to porous silica particles, 5 to 10 µm in diameter	ChiraDex Chiral	5	100
L50	Multifunction resin with reversed-phase retention and strong anion-exhange functionalities. The resin consists of ethylvinylbenzene, 55% cross-linked with divinylbenzene copolymer, 3 to 15 µm in diameter, and a surface area of not less than 350 m^2 per g. Substrate is coated with quarternary ammonium functionalized latex particles consisting of styrene cross-linked with divinylbenzene	ZORBAX 300SCX	5	300
L52	Weak cation-exchange resin made of porous silica with sulfopropyl groups, 5 to 10 µm in diameter	IonoSpher C	5	120
L53	Weak cation-exchange resin consisting of ethylvinylbenzene, 55% crosslinked with divinylbenzene copolymer, 3 to 15 µm diameter. Substrate is surface grafted with carboxylic acid and/or phosphoric acid functionalized monomers. Capacity not less than 400 µEq/column	Bio SAX	3, 5, 10	300
L56	Propyl silane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter	ZORBAX SB-C3	3, 5	80
L57	A chiral-recognition protein, ovomucoid, chemically bonded to silica particles, about 5 µm in diameter, with a pore size of 120Å	Ultron ES-OVM	5	120
L58	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 6 to 30 µm in diameter	Hi-Plex Na Hi-Plex Na (Octo)	10 8	N/A N/A
L60	Spherical, porous silica gel, 10 µm in diameter, the surface has been covalently modified with alkyl amide groups and endcapped	ZORBAX Bonus-RP Poroshell 120 Bonus-RP Polaris Amide-C18	1.8, 3.5, 5 2.7 3, 5	80 120 180

Oligo Solutions

StratoSpheres DNA Cartridges



StratoSpheres DNA Cartridges

- Greater yields of full length products than controlled-pore glass
- Inert support prevents side reactions and improves quality of the end product
- 1000Å pore size permits synthesis of longer oligonucleotide sequences, up to 70-mer
- Certificate of Analysis offered for every batch

StratoSpheres DNA Synthesis Cartridges make it easy to obtain high-quality synthetic DNA oligonucleotides. The high-yielding polystyrene packing delivers more full-length product than conventional controlled-pore glass supports. In addition, the hydrophobic nature of the polystyrene promotes coupling and minimizes non-specific binding to maximize production efficiency. These high-throughput cartridges deliver very economical oligonucleotide synthesis, and provide the high performance expected from macroporous polystyrene supports. StratoSpheres DNA synthesis cartridges deliver maximum flexibility in high-throughput environments.

StratoSpheres DNA Cartridges

Description	Size (nmol)	Part No.
StratoSpheres DNA DMT bz dA	40	PL3554-1602dAbz
	200	PL3554-4602dAbz
StratoSpheres DNA DMT bz dC	40	PL3554-1602dCbz
	200	PL3554-4602dCbz
StratoSpheres DNA DMT ac dC	40	PL3554-1602dCac
	200	PL3554-4602dCac
StratoSpheres DNA DMT ibu dG	40	PL3554-1602dGibu
	200	PL3554-4602dGibu
StratoSpheres DNA DMT dmf dG	40	PL3554-1602dGdmf
	200	PL3554-4602dGdmf
StratoSpheres DNA DMT dT	40	PL3554-1602dT
	200	PL3554-4602dT



TOP, TOP-DNA and TOP-RNA Cartridges

TOP, TOP-DNA and TOP-RNA Cartridges

- Superior yield and purity come from proprietary polymeric resins and optimized buffers
- Typical yield is more than 85% and typical purity is over 90%, eliminating the need for multiple sample-loading steps
- Agilent TOP cartridges use up to two thirds less reagent than products from other vendors

TOP, TOP-DNA and TOP-RNA cartridges provide a high-throughput, simple, cost-effective solution for DNA and RNA oligonucleotide purification. The TOP product range incorporates a unique 96-well plate with removable tubes, streamlined gravity flow or vacuum procedure, and proprietary polymeric resin. Agilent's innovative technology delivers superior yield and purity for standard oligos up to 1 µmol synthesis scale and up to 150-mer in length. Flexibility is assured from a choice of simple gravity flow (for walk-away and low initial setup cost) or vacuum procedure (for fast turnaround – less than 15 minutes for the entire purification process). Up to 10 minutes drying time between each step is permissible with no effect on purification results (drying time after the acetonitrile conditioning step should be kept to a minimum).

TOP and TOP-DNA Cartridges

- Fast throughput improves production efficiency
- Pre-HPLC "sample prep" ability maximizes utility
- Gravity (TOP) or vacuum flow (TOP-DNA) ensures flexibility

TOP-DNA is a high-throughput, simple, fast, cost-effective solution that purifies oligos up to 150-mer in length. Its high binding capacity can purify DNA oligos from 200 nmol to 1 µmol synthesis scales. TOP-DNA can also be used for sample preparation before HPLC purification for very high quality oligos in large-scale analysis. The proprietary polymeric resin is compatible with direct loading of AMA deprotected oligo solutions.

TIPS & TOOLS

For more information on TOP RNA, view this Application Note on-line: High Performance RNA oligonucleotide purification using Agilent TOP-RNA (publication # 5990-8974EN), **www.agilent.com/chem/library**

TOP-RNA Cartridges

- A complete solution for RNA oligo purification to enhance productivity
- High throughput and automation friendly, freeing up operator time
- Less reagent use reduces operating costs

With TOP-RNA you can purify short and long RNA oligos, siRNA to 21-mer and long RNA to 60-80-mer. The high binding capacity purifies RNA oligos up to 1 µmol. The proprietary polymeric resin and validated protocol allow deprotection of 2'hydroxyl group without removal of the 5'trityl group.

TOP, TOP-DNA and TOP-RNA Cartridges

Description	Sorbent Mass (mg)	Volume (mL)	Unit	Part No.
TOP-RNA well plate tubes for 1 µmol scale	100	1.8	96/pk	7573915C
TOP-RNA well plate tubes for 1 µmol scale	100	1.8	20 x 96/pk	7573915B
TOP-DNA well plate tubes for 1 µmol scale	150	1.8	96/pk	7572915C
TOP cartridge	500	6	30/pk	12102301
TOP cartridge	300	6	30/pk	12102300
Mega Bond Elut TOP	3 g	20	20/pk	14251921
TOP-DNA well plate tubes for 1 µmol scale	150	1.8	20 x 96/pk	7572915B
TOP well plate tubes for 50 nmol scale	25	1.8	96/pk	75719025
TOP well plate tubes for 200 nmol scale	50	1.8	96/pk	75719050
TOP well plate tubes for 200 nmol scale, high capacity	100	1.8	96/pk	7571901C
96-well plate sealing mat			50/pk	5133005
Disposable waste tray			25/pk	5133001
TOP reusable base plate				75400001
VersPlate Base Plate			100/pk	75700001

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From sample purification to analysis, Agilent's biomolecule columns and supplies are easy to integrate into your workflow for a complete, reproducible, and high-quality solution.

In this section of the catalog you will also find advice and tips on solvent choice, mobile phase modification, optimization, and example separations to assist you in column selection and method development.

Agilent has complete solutions for your needs. These include the Agilent 1260 Infinity Bio-inert LC system with a metal-free sample path and the Agilent 1290 Infinity LC, designed to provide highest speed, resolution, and ultra-sensitivity for UHPLC applications, including those utilizing Agilent wide-pore 300Å ZORBAX StableBond columns. Biomolecules may be complex in structure, but their analysis is simplified by using Agilent HPLC columns, systems, and supplies.



What is a biomolecule?

Biomolecules are compounds made by living organisms. They can range in size from amino acids and small lipids to large polynucleotides such as DNA or RNA.

In this section, we deal with the separation of:

Proteins – separation based on size with size exclusion chromatography, charge with ion-exchange chromatography, and hydrophobicity with reversed-phase chromatography.

Peptides – biocolumns for the analysis and purification of the full range of peptides, including hydrophobic, hydrophilic, basic and acidic peptides across the full size range. Also, columns for peptide mapping by HPLC and UHPLC.

DNA/RNA oligonucleotides – reversed-phase and ion-exchange options for DNA and RNA oligos, and with particle pore sizes to cover the full range of oligonucleotide sizes, from small synthetic oligos to large plasmids.

Amino acids – the ZORBAX Eclipse Amino Acid Analysis HPLC columns provide a high efficiency solution for rapid analysis of 24 amino acids. Typical analysis times range from 14 minutes, with a 75 mm column, to 24 minutes with a 150 mm column.

Broad-distribution polymers – analysis of lipids, polysaccharides and drug delivery compounds using polymeric columns and standards to determine their molecular weight distribution and composition. These compounds tend to exhibit broad MW distributions, in contrast to other biomolecules that have narrow MW distributions or a defined molecular weight.

What is a biocolumn?

Biochromatography columns, or biocolumns, are liquid chromatography columns used for the separation of biological compounds such as peptides and proteins, oligonucleotides and polynucleotides, and other biomolecules and complexes. Biocolumns are specifically designed for biomolecule analysis with larger pore sizes to accommodate the larger molecule sizes. Media is designed to minimize non-specific binding of analytes for improved recovery. Separation mechanisms are chosen to either retain biological function so bioactivity is not lost during analysis, or to deliberately denature for primary structure characterization.

Typically, HPLC has been used to separate biomolecules. Now, advanced techniques such as UHPLC are becoming a popular choice because multiple separation mechanisms are needed in the characterization of biomolecules. Therefore, Agilent offers advanced chemistries developed specifically for the separation of biomolecules using size exclusion, reversed-phase, ion-exchange, and affinity functionalities, all of which are covered in this section of the catalog.



Protein Separations

Proteins are complex molecules that require multiple techniques to provide full characterization. They exist as three-dimensional structures and it is this structure that confers their biological activity.

The sequence of the amino acid chains defines the primary structure of the protein. Hydrogen bonding between amino acids of the primary structure then confers a secondary structure typically in the form of alpha helices and pleated sheets. A further series of interactions, hydrogen bonding, ionic, hydrophobic and disulphide bridges, between regions of the secondary structure, then provides the tertiary protein structure, or three-dimensional conformation. If the protein is composed of a number of amino acid chains, the interaction between these chains gives the quaternary structure.

When looking at methods for protein characterization, it is therefore clear from Figure 1 that techniques will be required that characterize the protein in its native state, without disrupting the tertiary and quaternary structures. We also need techniques for assessing the primary amino acid sequence, in the fully denatured state with the three-dimensional structure stripped away.

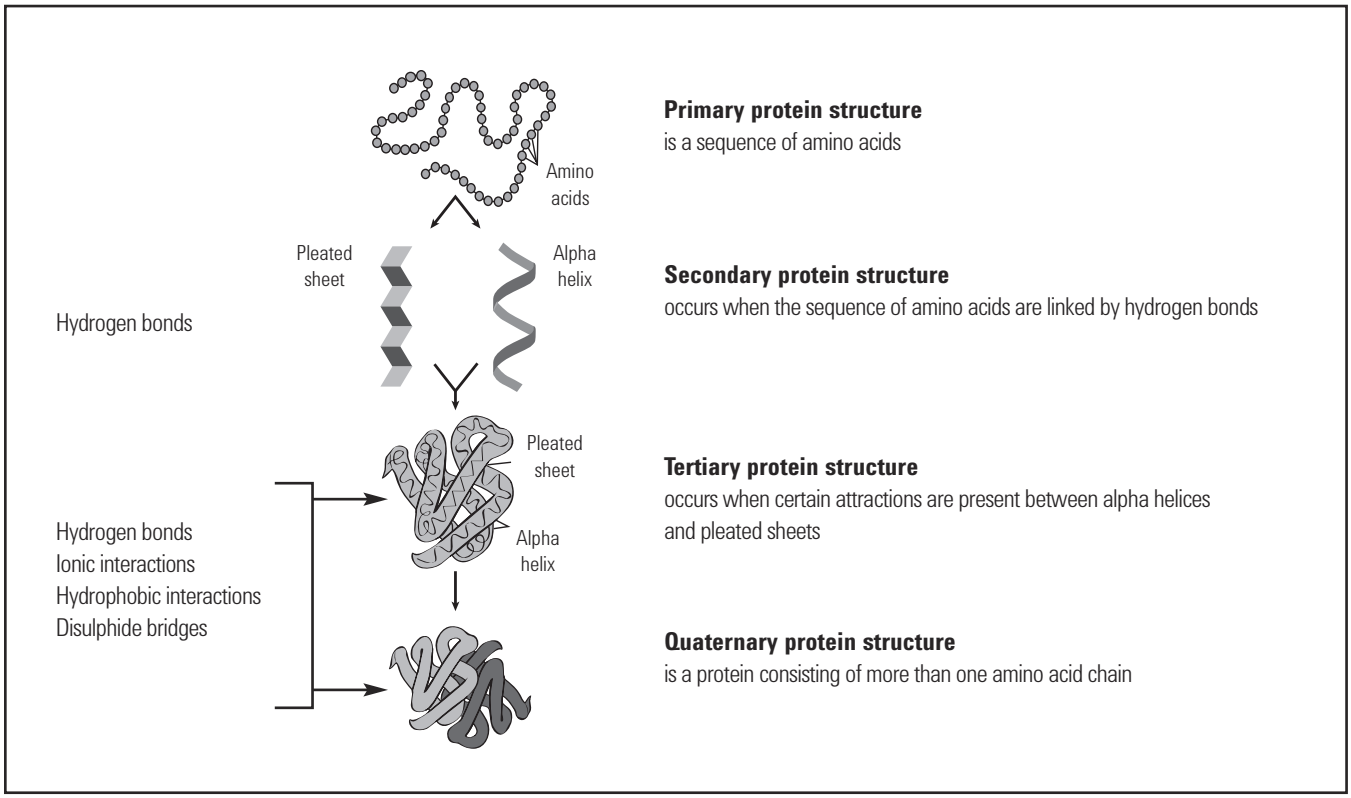


Figure 1. Schematic showing the various levels of protein structure.

The environment of the protein can influence, stabilize, or disrupt the structure of the protein. Factors to consider include pH, temperature, salt concentrations, aqueous or organic solvent content, and for some proteins, the presence of a stabilizing small molecule or metal ion. Protein structure can also be disrupted by the use of sulfhydryl reducing agents to break -S-S- bonds or chaotropic agent, like urea or guanidine HCl. With the complexity of proteins and the intramolecular interactions that determine the three-dimensional structure, you can also expect that there will be intermolecular associations between protein molecules and other molecular entities and the surfaces with which they come into contact. This can result in protein complexes, aggregation (with possible precipitation), and deposition on surfaces, including those of the HPLC column and system. Therefore, you should consider the handling and environment in which the protein is maintained.

Protein Column Selection Guide

Application	Technique	Agilent Columns	Notes
Primary structure analysis	UHPLC/HPLC reversed-phase separations	ZORBAX 300SB Poroshell 300SB PLRP-S	Reversed-phase separations require (or cause) denaturing of the protein to obtain detailed information about the amino acid sequence and/or amino acid modifications (including post-translational modifications).
Aggregation analysis	Size exclusion separations	Bio SEC-3 Bio SEC-5 ProSEC 300S ZORBAX GF	Aggregates in protein biopharmaceuticals are of major concern as they can induce an immunogenic response and can influence the composition of the final formulation.
Charge variant analysis	Ion-exchange separations	Agilent Bio IEX Agilent Bio MAb PL-SAX PL-SCX	The ratio of individual amino acids determines the net charge of the protein molecule. The pH at which the net charge is zero is called the isoelectric point (pI). When the solution pH is less than the pI, the protein will be positively charged (acidic), and when the solution pH is greater than the pI, the protein is negatively charged (basic). For ion-exchange analysis, we recommend the eluent pH be at least one pH unit away from its pI. Protein analysis using ion-exchange columns requires buffered mobile phase and either salt gradients or pH gradients for elution.

Higher resolution of oxidation study

Column: **ZORBAX RRHD 300SB-C18 857750-902 2.1 x 50 mm, 1.8 µm**

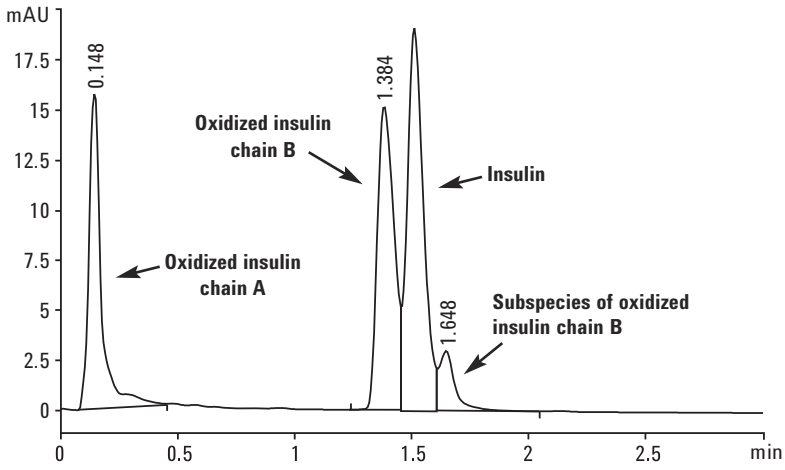
Mobile Phase: A: 0.1% TFA
B: 0.01% TFA + 80% ACN

Flow Rate: 1.0 mL/min

Gradient: 33 to 50% B, 0 to 4 min

Detector: 1290 Infinity LC with diode array detector at 280 nm

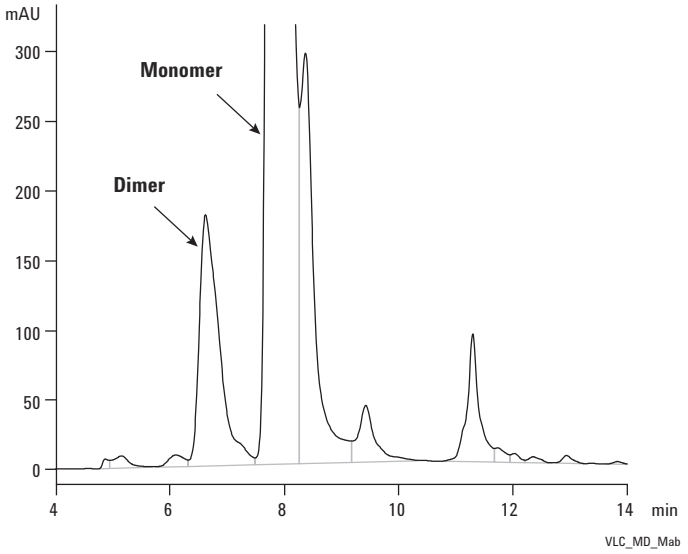
Sample: Insulin, insulin chain A and chain B, oxidized (bovinesigma, 1 mg/mL)



It is evident that the oxidized insulin chains are resolved from insulin in under 2 minutes using the Agilent ZORBAX RRHD 300SB-C18 2.1 x 50 mm, 1.8 µm column.

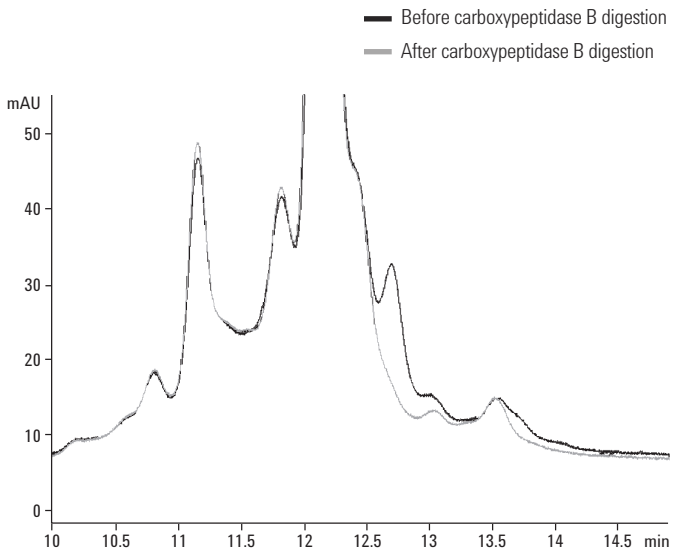
Intact MAb monomer and dimer separation

Column:	**Bio SEC-3, 300Å 5190-2511 7.8 x 300 mm, 3 µm**
Buffer:	Sodium phosphate buffer, pH 7.0, 150 mM
Isocratic:	0-100% Buffer A from 0-30 min
Flow Rate:	1.0 mL/min
Sample:	CHO-humanized MAb, 5 mg/mL – intact
Injection:	5 µL
Detector:	UV 220 nm
Temperature:	Ambient



Separation of charge variants of human IgG1 with pH gradient

Column:	**Agilent Bio MAb 5190-2411 2.1 x 250 mm, 5 µm**
Mobile Phase:	A: 10 mM Na_2HPO_4, pH 6.0 B: A + 0.5 M NaCl or just 0.5 M Na_2HPO_4, pH 6.0
Flow Rate:	2 mL/min
Gradient:	0.5 min hold with mobile phase A followed by a linear gradient to 45% B in 15 min (elapsed time 15.5 min); then 60% B at 15.6 min continued to 20 min. Column flushed with 100% B for 15 min before re-equilibration for the next run. pH Gradient: A: 5 mM Na_2HPO_4, buffer pH 5.5 and B: 40 mM NA_2HPO_4 (not buffered, pH 8.9). 2% B/min at 1 mL/min for 15 min, followed by a column wash with 90% B for 5 min.
Detector:	UV at 220 nm
Sample:	One mg each/mL in mobile phase A Monoclonal antibodies (MAb) -human IgG1 (5 mg/mL stock solution) derived from CHO cells
Instrument:	Agilent 1200 SL system with diode array detector



MAb c-terminal cleavage: Human IgG1 MAb, 1 mg/mL in 25 mM Na_2HPO_4 buffer, pH 7.5, was incubated with approximately 25 units of the carboxypeptidase B for 18 hours and 10 µL samples were injected.

Peptide Separations

Peptide Mapping

Peptide mapping is required for the characterization of proteins. It is used to confirm the identity of a protein and to identify and quantify post-translational modifications.

The purified protein is first digested using an enzyme, such as trypsin, yielding a range of peptide fragments. The specificity of the enzyme cleavage produces a fingerprint of peptides which is characteristic of that protein. Identification of the peptide fragments confirms the identity of the protein, and changes in the profile of the peptide digest can be used to identify post-translational modifications to that protein that may have occurred during the manufacturing or purification processes.

Reversed-phase UHPLC/HPLC is the preferred technique for the analysis of peptide digests with either MS or UV detection. LC/MS is used for the identification of the peptide fragments and determination of sequence coverage whereas LC/UV is more commonly used for peptide map comparisons in the monitoring/QC segments. To achieve sufficient resolution for quantification and identification, longer column lengths or higher efficiency particles such as the sub-2 µm ZORBAX RRHD, or superficially porous Poroshell are recommended.

Peptide digests are complex mixtures, and for complete coverage, i.e. resolution of the individual peptides, a high efficiency/high resolution column is required. The peptide fragments can range in size and hydrophobicity, so Agilent offers several columns for peptide mapping. There are three options: pore sizes, particle sizes, and superficially porous and fully porous for UHPLC separations.

TIPS & TOOLS

Capillary electrophoresis is an alternative technique to liquid chromatography for the separation of complex peptide mixtures. Further information can be found in the following Case Study:

An orthogonal view of peptide mapping – analysis of bovine serum albumin digest using capillary electrophoresis and quadrupole time-of-flight mass spectrometry (publication # 5990-7631EN)

www.agilent.com/chem/library

Peptide Mapping Column Selection

Recommended column choices determined by system/column pressure maximum and peptide size/hydrophobicity.

Application	Technique	Agilent Columns	Notes
Large peptide fragments/hydrophobic peptide core	400 bar HPLC	Poroshell 300 SB-C18 ZORBAX 300SB-C18, 3.5 µm	Agilent 1200 Infinity LC
	600 bar UHPLC	Poroshell 300 SB-C18	Agilent 1260 Infinity LC and 1260 Infinity Bio-inert Quaternary LC
	1200 bar UHPLC	ZORBAX RRHD 300SB-C18, 1.8 µm Poroshell 300 SB-C18	Agilent 1290 Infinity LC
Small hydrophobic peptides	400 bar HPLC	Poroshell 120 EC-C18 Poroshell 120 SB-C18	Agilent 1200 Infinity LC
	600 bar UHPLC	Poroshell 120 EC-C18 Poroshell 120 SB-C18	Agilent 1260 Infinity LC and 1260 Infinity Bio-inert Quaternary LC
	1200 bar UHPLC	Poroshell 120 EC-C18 Poroshell 120 SB-C18	Agilent 1290 Infinity LC

If you have an Agilent 1290 Infinity LC in your lab, we recommend starting with a ZORBAX RRHD 300SB-C18 column to screen your peptide map.

Increased resolution for peptide mapping

Column: **ZORBAX 300SB-C18**
858750-902
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA
B: 0.01% TFA + 80% ACN

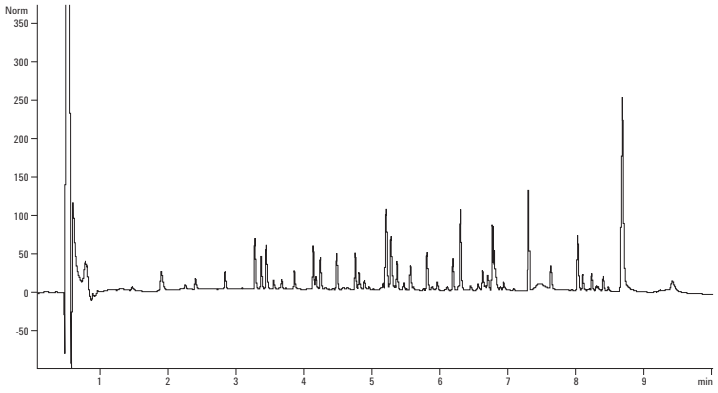
Flow Rate: 0.5 mL/min

Gradient: 2% B for 1 min, 2 to 45% B for 8.8 min, 45 to 95% B for 0.2 min, 95% B for 2 min, 95 to 2% B for 0.2 min

Temperature: 50 °C

Detector: 1290 Infinity LC with diode array detector at 280 nm

Sample: Enzymatic protein digest (MAb)



The longer 100 mm Agilent ZORBAX RRHD 300SB-C18 column provides maximum resolution for protein digests – in this sample the total run time, including washing and equilibration, is under fifteen minutes.

Separation of Natural and Synthetic Peptides

Purification columns and media are required for the isolation and analysis of natural and synthetic peptides. Purity and recovery determination of the isolated or purified peptide requires the use of high efficiency columns. The primary technique used for the isolation and purification, and analysis, is reversed-phase HPLC.

The fractions from a purification or isolation workflow and the final peptide product are analyzed for purity using high efficiency columns. The peptides will vary in size, charge and hydrophobicity and so, as with peptide mapping applications, Agilent offers a range of columns to provide optimum separations of the full range of peptides. For small peptides, typically less than 10 amino acid residues, the smaller pore UHPLC materials are used, but if the peptide is larger, contains more amino acid residues, or exists in a dimeric or multimeric form, then the larger pore size 300Å columns provide better separations due to improved mass transfer.



Natural and Synthetic Peptides Column Selection

Recommended column choices as determined by system/column pressure maximum for the analysis of natural and synthetic peptides.

Application	Technique	Agilent Columns	Notes
Larger peptides with more than 10 amino acid residues	400 bar HPLC	Poroshell 300 SB-C18 ZORBAX 300SB-C18, 3.5 µm PLRP-S	Agilent 1200 Infinity LC
	600 bar UHPLC	Poroshell 300 SB-C18	Agilent 1260 Infinity LC and 1260 Infinity Bio-inert Quaternary LC
	1200 bar UHPLC	ZORBAX RRHD 300SB-C18, 1.8 µm	Agilent 1290 Infinity LC
Peptides with typically less than 10 amino acid residues	400 bar HPLC	Poroshell 120 EC-C18 Poroshell 120 SB-C18 PLRP-S	Agilent 1200 Infinity LC
	600 bar UHPLC	Poroshell 120 EC-C18 Poroshell 120 SB-C18	Agilent 1260 Infinity LC and 1260 Infinity Bio-inert Quaternary LC

Reversed-phase columns are also the first choice for purifying large numbers of individual peptides or larger amounts of a particular peptide. High efficiency, small particle pre-packed prep columns are available for the high efficiency purification of small amounts of peptides, and larger particle columns and bulk media for the larger scale purifications, as shown in Table 1.

Table 1. Agilent columns for small- to large-scale peptide purifications.

	Amount of Peptide Required		
Agilent Column	**mg**	**g**	**kg**
ZORBAX Prep HT 300StableBond	→		
VariTide RPC	→	→	
PLRP-S	→	→	→

After solid phase synthesis (SPS) using a polystyrene resin such as one of the Agilent StratoSpheres products, the peptide is cleaved from the support and the resultant mixture is separated to obtain the target peptide. A high efficiency column is needed for the purification as the candidate peptide must be resolved from peptides that are very similar in structure. Check **www.agilent.com** for further information.

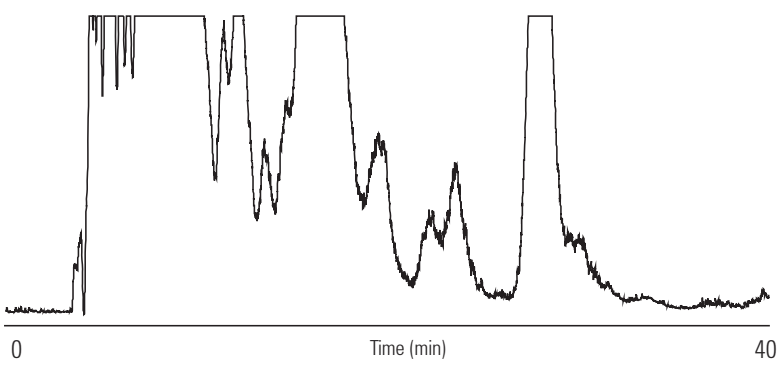
Preparative scale purification of Leuprolide by concentration overload

Column: **PLRP-S 100Å, 10 µm PL1412-4100**

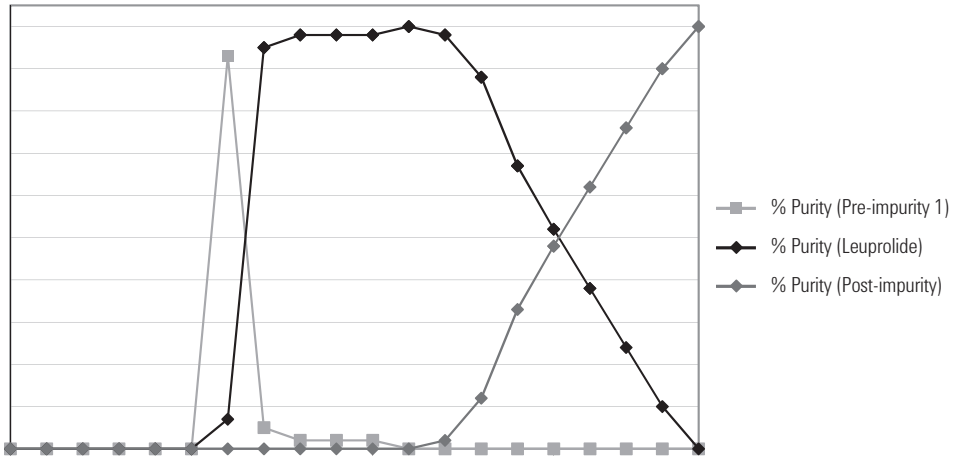
Bulk Media: **Load & Lock 4001 Column PCG93LL500X25**

Mobile Phase: Isocratic separation using 0.1% TFA in 28% ACN:72% water

Flow Rate: Linear velocity 360 cm/hr



Crude leuprolide separation of 30 mg on-column load.



Fraction analysis – the concentration overload purification.



DNA and RNA Oligonucleotide Separations

There is a renewed interest in oligonucleotides (oligos) as they are used in more and more applications, including potential therapeutics. The synthesis workflow is similar to that used for the more established synthetic peptide production, i.e. an activated solid phase synthesis resin is used with sequential addition of specific nucleotides to build the desired sequence.

The nucleotide building blocks are protected at the 5′ hydroxyl end with a dimethoxytrityl (DMT) group and the cleaved target oligo will have this protected group still attached. As DMT is hydrophobic, it is a useful handle that can be used for the first stage step. To increase the stability of the oligonucleotide, particularly to enzyme degradation, it may be chemically modified, for example by replacing oxygen with sulfur to produce phosphorothioates.

When using chemical synthesis to produce biomolecules, the coupling efficiency of each additional cycle is never 100%. The sample, after cleavage from the solid phase synthesis support, will contain deletion sequences, oligos where one or more residues are missing, and some amount of larger oligos produced by double coupling or branching. The sample mixture is complex and high efficiency techniques are required for analysis.

There are three UHPLC/HPLC techniques that are routinely used for oligonucleotide separations:

Trityl-on: This procedure is relatively simple to perform and separates the full-length target oligo, which still has the DMT group attached, from the deprotected failure sequences. The analytical information obtained is limited and this is generally considered to be a purification method.

Ion-exchange separations of the trityl-off, deprotected oligos: This method uses the negative charge on the backbone of the oligo to facilitate the separation. Resolution is good for the shorter oligos but decreases with increasing chain length. Aqueous eluents are used but oligos are highly charged, and high concentrations of salt are needed to achieve elution from the column.

Ion-pair reversed-phase separation of the trityl-off, deprotected oligos: This technique uses organic solvents and volatile ion-pairing agents and is suitable for LC/MS. The technique is best performed with high efficiency particles. Conditions that fully denature the oligos and prevent association with complimentary sequences are required. Thus, the separation is best performed at elevated temperatures.

DNA and RNA Oligonucleotide Column Selection

Application	Technique	Agilent Columns	Notes
Trityl-on/trityl-off oligonucleotides	Trityl-on	PLRP-S 50 µm media	Separates due to differences in hydrophobicity. Ideal for the separation of trityl-on from trityl-off oligos and is also used for ion-pair reversed-phase separations of deprotected oligos.
Deprotected oligonucleotides	Ion-pair reversed-phase separation of the trityl-off, deprotected oligos	PLRP-S 3 µm to 50 µm	
Deprotected oligonucleotides	Ion-exchange separations of the trityl-off, deprotected oligos	PL-SAX 1000Å	Separates deprotected oligos under denaturing high pH conditions. The quaternary amine functionality on the polymeric particles enables ion-exchange separations at high pH, improving chromatography for self-complementary sequences.

TIPS & TOOLS

Further information can be found in the following publications:
Agilent PLRP-S 100Å HPLC Columns and Media (publication # 5990-8187EN)
Agilent PL-SAX 1000Å HPLC Columns and Media (publication # 5990-8200EN)
www.agilent.com/chem/library



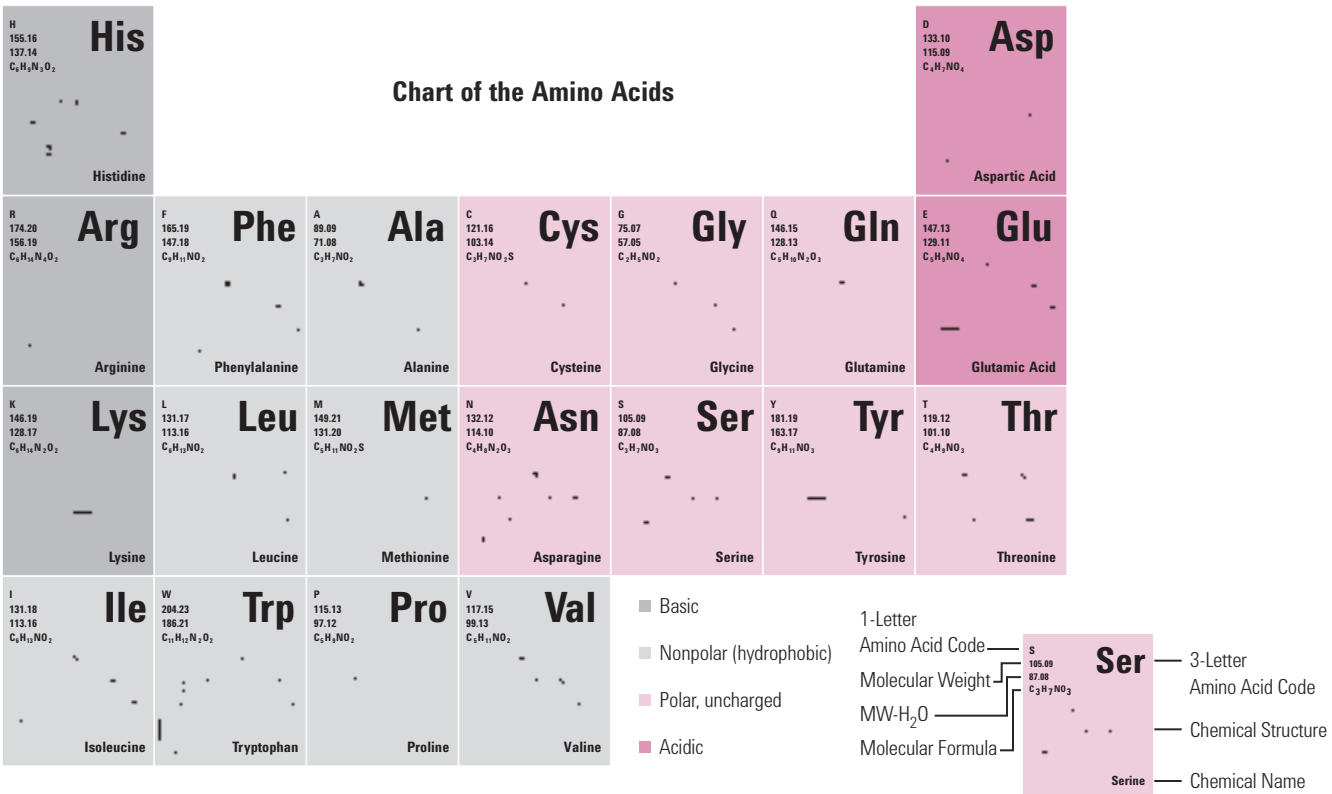
Amino Acid Analysis

Agilent offers several good options for separation of amino acids, including the Agilent ZORBAX Eclipse AAA column which uses an updated protocol and is specially tested using amino acids. The ZORBAX Eclipse AAA high efficiency column rapidly separates amino acids following an updated and improved protocol. Total analysis from injection to injection can be achieved in as little as 14 min (9 min analysis time) on shorter, 7.5 cm columns and 24 min (18 min analysis time) on the 15 cm column. Exceptional sensitivity (5 to 50 pmol with diode array or fluorescence detectors) and reliability are achieved using both OPA- and FMOC-derivatization chemistries in one fully automated procedure using the Agilent 1200 Infinity LC. The newer ZORBAX Eclipse Plus C18 column is also an excellent choice for amino acid separations.

ZORBAX Eclipse AAA Column Selection

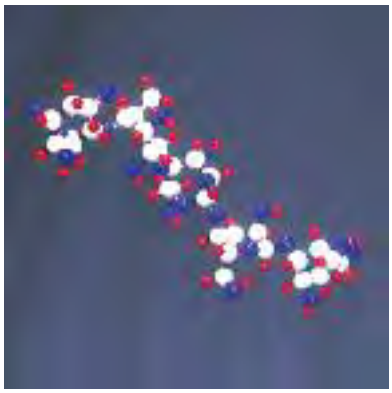
Application	Diameter x Length (mm)	Particle Size (µm)
Analytical routine sensitivity	4.6 x 150	5.0
Analytical routine sensitivity, high-resolution using FLD	4.6 x 150	3.5
Analytical routine sensitivity, high-throughput	4.6 x 75	3.5
Solvent Saver high sensitivity, high-resolution	3.0 x 150	3.5

For more information on the ZORBAX Eclipse Plus C18 column, turn to page 248.



Broad Distribution Biomolecules

Carbohydrates, Lipids and PEGs



Aqueous size exclusion chromatography employing columns packed with polymeric media can be extremely useful when investigating biomolecules and their derived species with broad molecular weight distributions. Examples include PEGylated proteins and complex polysaccharides which find use in biopharma applications. The wide pore size distribution of polymeric SEC columns compared to silica-based material are excellent for samples with polydispersities greater than one.

Broad Distribution Biomolecule Column Selection		
Low MW polymers and oligomers, oligosaccharides, PEGs, lignosulfonates	2 or 3 PL aquagel-OH columns • PL aquagel-OH 8 µm • PL aquagel-OH 20 5 µm • PL aquagel-OH MIXED-M 8 µm	The PL aquagel-OH analytical series has a pH range of 2-10, compatible with organic solvents (up to 50% methanol), mechanical stability up to 140 bar (2030 psi) and low column operating pressures.
Polydisperse biopolymers, polysaccharides, cellulose derivatives	2 or 3 PL aquagel-OH columns • PL aquagel-OH MIXED-H 8 µm • PL aquagel-OH 60/50/40 8 µm	
Very high MW polymers, hyaluronic acids, starches, gums	PL aquagel-OH 60/50/40 15 µm in series	



UHPLC/HPLC Techniques

High-performance liquid chromatography, HPLC, is a chromatographic technique that can separate a mixture of compounds and is used in biochemistry and analytical chemistry to identify, quantify and purify the individual components of the mixture. There has been an evolution toward ultra high-performance liquid chromatography (UHPLC) which is widely accepted for high-efficiency separations of small- to medium-sized molecules, and has been used to reduce analysis time and/or to increase resolution. The use of UHPLC has been extended to large biomolecules with the introduction of wide pore chromatographic media in columns that can withstand pressures of 600 to 1200 bar.

On the following pages you will see the wide range of columns that Agilent offers for the HPLC and UHPLC separation of proteins and other biomolecules.

UHPLC/HPLC Techniques for Biomolecule Analysis

Technique	Advantages	Disadvantages
Reversed-Phase	• High resolution • High capacity • Relatively simple • Sample concentrated on-column • Small particle, 1.8 µm, for UHPLC separations • Polymeric media for unsurpassed chemically and thermally stable	• Denaturing conditions • High efficiency silica columns cannot be cleaned using aggressive solvents when performing purifications
Ion-Exchange	• Good recovery of biological activity • High capacity • Sample concentrated on-column	• Limited MS compatibility due to presence of salts
Size Exclusion	• Good recovery of biological activity • Non-interactive technique with good sample recovery	• No sample concentration • Limited capacity
Affinity	• Highly selective • Good recovery of biological activity • Sample concentrated on-column • Often single step isolation	• No sample concentration • Limited capacity

Reversed-Phase HPLC

Confidently perform high-resolution separations



Reversed-phase UHPLC/HPLC separates solutes based on differences in hydrophobicity, with the least hydrophobic peak eluting first. This high-resolution technique is capable of separating peptides, proteins and oligonucleotides that differ by only one amino acid or nucleotide residue.

Because HPLC uses organic solvents (such as acetonitrile, methanol, ethanol and propanol) it is also a denaturing technique that disrupts a biomolecule's three-dimensional structure. This allows you to obtain information about a molecule's primary structure and sequence, as well as variations in the sequence to be identified.

Agilent offers the industry's broadest range of wide-pore reversed-phase columns, all backed by technical support experts and application chemists around the globe. This section features the following column innovations:

- **ZORBAX 300Å pore silica columns** – an industry first for reversed-phase protein and biomolecule separations – are available in 6 phases, along with a broad array of sizes. For fast UHPLC separations, we also offer a 1.8 µm particle size option that withstands pressures up to 1200 bar, and can be used with high-pressure instruments, such as Agilent's 1290 Infinity LC.
- **Agilent Poroshell columns** feature the industry's first solid core/porous shell particle. Our wide-pore Poroshell 300 columns are ideal for fast chromatography, and are available in a variety of phases.
- **Agilent PLRP-S columns** contain polymer particles, and can be used to separate peptides and proteins of various sizes and DNA/macromolecular complexes. These columns are unique in that they are 100% organic, can withstand temperatures as high as 200 °C, and can be used under conditions from pH 1 to pH 14.
- Choose from a range of column sizes, particle sizes (3-8 µm for analytical separations) and pore sizes (100Å to 4000Å). Preparative columns (10-50 µm) are also available, either prepacked in columns or as bulk material.

Reversed-Phase Column Selection

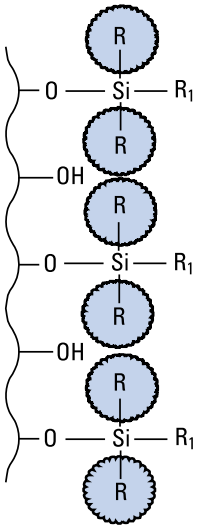
Application	Agilent Columns	Notes
Proteins and polypeptides	ZORBAX 300Å, 1.8 µm • RRHD 300SB-C18 • RRHD 300SB-C8 • RRHD 300SB-C3 • RRHD 300-Diphenyl • RRHD 300-HILIC	Improved packing processes achieve stability up to 1200 bar for use with the Agilent 1290 Infinity LC. RRHD 1.8 µm columns are available in 50 and 100 mm lengths for fast or high resolution – truly high definition – separations of the most complex samples.
	ZORBAX 300Å StableBond • 300SB-C18 • 300SB-C8 • 300SB-C3 • 300SB-CN	Wide-pore, 300Å columns are necessary for an efficient separation of proteins and peptides, or other large molecules, to allow these analytes to completely access the bonded phase. C18 and C8 are ideal for complex protein and protein digest separations. StableBond provides enhanced stability for low pH.
	ZORBAX 300Å Extend-C18	Incorporate a unique patented bidentate silane, combined with a double-endcapping process that protects the silica from dissolution at high pH – up to pH 11.5.
Peptides and proteins up to 1,000 kDA, monoclonal antibodies and intact proteins	Poroshell 300 • 300SB-C18 • 300SB-C8 • 300SB-C3 • 300Extend-C18	Poroshell columns use a unique particle made with a layer of porous silica on a solid core of silica. This reduces the diffusion distance for proteins making practical, rapid HPLC separations of peptides and proteins.
Small hydrophilic peptides in protein digests	Poroshell 120	The 120Å pore size is ideal for the fast high resolution analysis of small hydrophilic peptides and peptide fragments in protein digests.
Peptides to DNA	PLRP-S • 100Å • 300Å • 1000Å • 4000Å	Particles are inherently hydrophobic so an alkyl ligand bonded phase is not required for reversed-phase separations. This gives a highly reproducible material that is free from silanols and heavy metal ions.
Small molecules/peptides/oligonucleotides	PLRP-S 100Å	
Recombinant peptides/proteins	PLRP-S 300Å	
Large proteins	PLRP-S 1000Å	
DNA/high speed separation	PLRP-S 4000Å	

ZORBAX 300Å StableBond



Agilent ZORBAX 300Å StableBond columns are an ideal choice for the reproducible separations of proteins and peptides for two key reasons. First, wide-pore, 300Å columns are necessary for an efficient separation of proteins and peptides, or other large molecules, in order to allow these analytes to completely access the bonded phase. Second, 300StableBond columns are unmatched in their durability at low pH, such as with TFA-containing mobile phases typically used for protein and peptide separations. For LC/MS separations at low pH, 300StableBond columns can also be used with formic acid and acetic acid mobile phase modifiers. These columns are available in five different bonded phases (C18, C8, C3, CN, and Diphenyl*) for selectivity and recovery optimization of proteins and polypeptides. To further increase sample recovery and improve efficiency for difficult proteins, 300StableBond columns can be used up to 80 °C. 300SB-C18 and 300SB-C8 columns are an ideal choice for complex protein and protein digest separations. These columns are also available in capillary (0.3 and 0.5 mm id) and nano (0.075 and 0.10 mm id) dimensions for reversed-phase LC/MS separations of protein digests. Capillary and nano columns can be used for either 1-D or 2-D proteomics separations.

*Diphenyl is available in a 1.8 µm particle size only.



Sterically Protected 300StableBond Bonded Phase

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp Limits*	pH Range*	Endcapped	Carbon Load
ZORBAX 300SB-C18	300Å	45 m^2/g	90 °C	1.0-8.0	No	2.8%
ZORBAX 300SB-C8	300Å	45 m^2/g	80 °C	1.0-8.0	No	1.5%
ZORBAX 300SB-C3	300Å	45 m^2/g	80 °C	1.0-8.0	No	1.1%
ZORBAX 300SB-CN	300Å	45 m^2/g	80 °C	1.0-8.0	No	1.2%
ZORBAX 300-Diphenyl	300Å	45 m^2/g	80 °C	1.0-8.0	Yes	1.9%

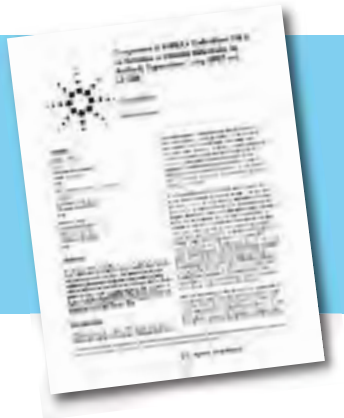
Specifications represent typical values only

*300StableBond columns are designed for optimal use at low pH. At pH 6-8, highest column stability for all silica-based columns is obtained by operating at temperatures <40 °C and using low buffer concentrations in the range of 0.01-0.02 M. At mid or high pH, 300Extend-C18 is recommended.

TIPS & TOOLS

Further information can be found in the following publication:

Comparison of ZORBAX StableBond 300Å LC Columns to Optimize Selectivity for Antibody Separations Using HPLC and LC/MS (publication # 5989-6840EN)
www.agilent.com/chem/library



Higher resolution of intact monoclonal antibody

Column: **ZORBAX RRHD 300SB-C8**
857750-906
2.1 x 50 mm, 1.8 µm

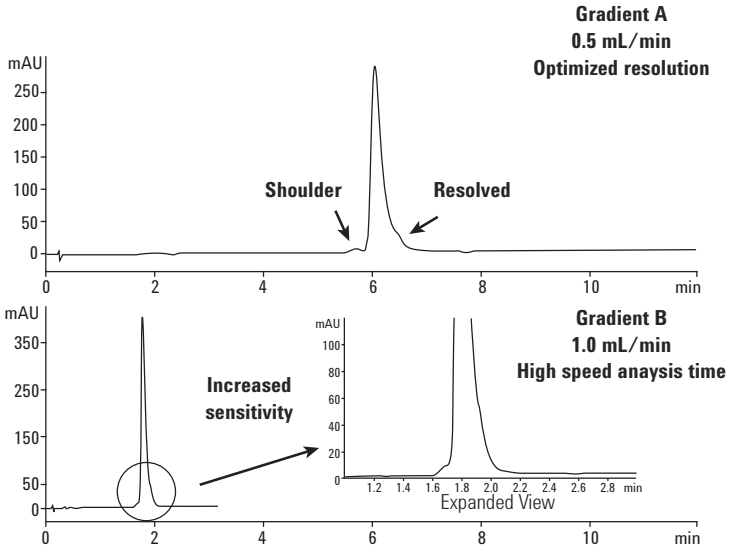
Mobile Phase: A: H_2O:IPA (98:2) + 0.1% TFA (v/v)
B: IPA:ACN:H_2O (70:20:10) + 0.1% TFA (v/v)

Flow Rate: Between 0.5 mL/min and 1.0 mL/min

Gradient: Multi-segmented and linear elution

Temperature: 80 °C

Detector: Agilent 1290 Infinity LC with auto injector (ALS), binary pump and thermostatted oven and diode array detector (DAD), UV, 225 nm



Higher resolution of oxidation study

Column: **ZORBAX RRHD 300SB-C18**
857750-902
2.1 x 50 mm, 1.8 µm

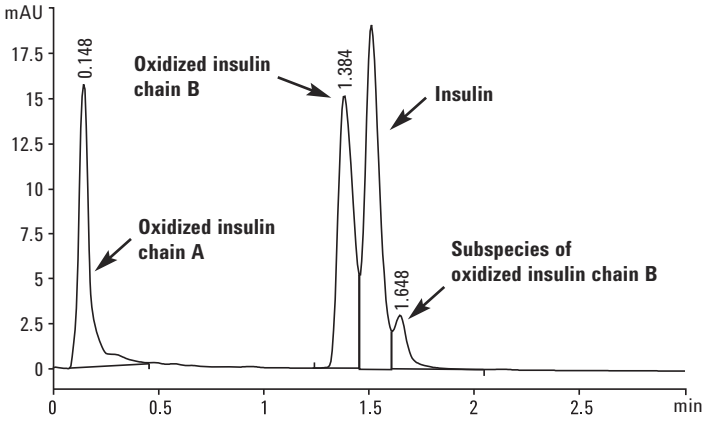
Mobile Phase: A: 0.1% TFA
B: 0.01% TFA + 80% ACN

Flow Rate: 1.0 mL/min

Gradient: 33 to 50% B, 0 to 4 min

Detector: 1290 Infinity LC with diode array detector at 280 nm

Sample: Insulin, insulin chain A and chain B, oxidized (bovinesigma, 1 mg/mL)



It is evident that the oxidized insulin chains are resolved from insulin in under 2 minutes using the Agilent ZORBAX RRHD 300SB-C18 2.1 x 50 mm, 1.8 µm column.

TIPS & TOOLS

Typical mobile phases for protein and peptide separations combine a very low pH with TFA (or other acids) to solubilize proteins. StableBond columns have extremely long lifetimes under these conditions. They are available in 300Å pore size for proteins up to 100-500 kDa.

Improved reproducibility of monoclonal antibodies

Column: **ZORBAX RRHD 300SB-C8**
857750-906
2.1 x 50 mm, 1.8 µm

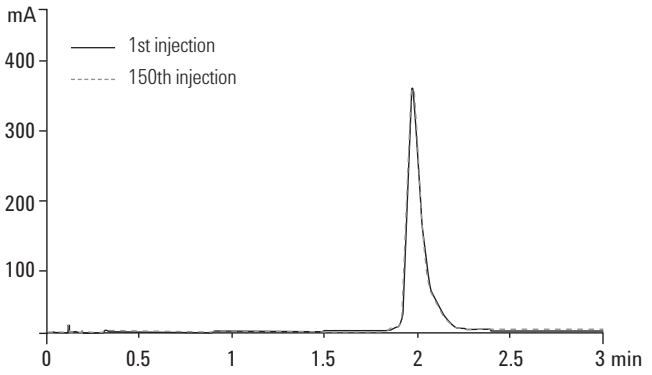
Mobile Phase: A: H_2O:IPA (98.2), 0.1% TFA
B: IPA:ACN:H_2O (70:20:10), 0.1% TFA

Flow Rate: 1.0 mL/min

Temperature: 80 °C

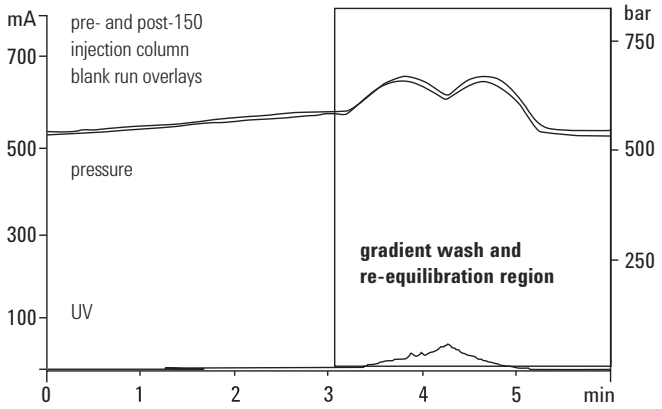
Detector: 1290 Infinity LC with diode array detector at 225 nm

Sample: MAb



Gradient timescale

Time (min)	% Solvent B
0.00	25
3.00	35
4.00	90
5.00	25



Excellent column reproducibility and protein recovery using Agilent ZORBAX 300SB-C8.

Increased resolution for peptide mapping

Column: **ZORBAX 300SB-C18**
858750-902
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA
B: 0.01% TFA + 80% ACN

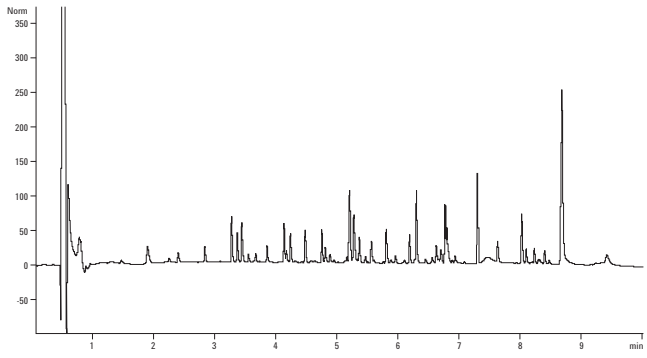
Flow Rate: 0.5 mL/min

Gradient: 2% B for 1 min, 2 to 45% B for 8.8 min, 45 to 95% B for 0.2 min, 95% B for 2 min, 95 to 2% B for 0.2 min

Temperature: 50 °C

Detector: 1290 Infinity LC with diode array detector at 280 nm

Sample: Enzymatic protein digest (MAb)



The longer 100 mm Agilent ZORBAX RRHD 300SB-C18 column provides maximum resolution for protein digests – in this sample the total run time, including washing and equilibration, is under fifteen minutes.

Peptides: Effect of TFA concentration

Column: **ZORBAX 300SB-C8**
883995-906
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water and TFA
B: ACN and TFA

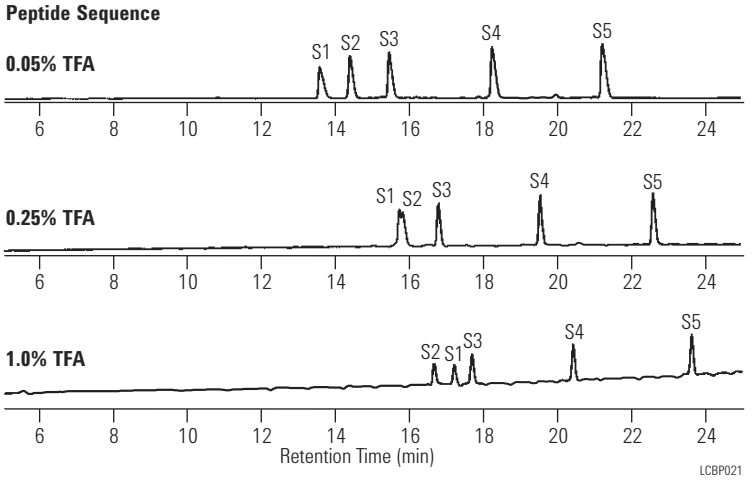
Flow Rate: 1.0 mL/min

Gradient: 0 min 0% B
30 min 30% B

Temperature: 40 °C

Detector: UV 254 nm

Sample: Peptide Standards S1-S5, decapeptides differing slightly in hydrophobicity, 6 µL



Peptides/proteins: Effect of elevated temperature

Column: **ZORBAX 300SB-C3**
883995-909
4.6 x 150 mm, 5 µm

Mobile Phase: A: 5:95
ACN:Water with 0.10% TFA (v/v%)
B: 95:5
ACN:Water with 0.085% TFA (v/v%)

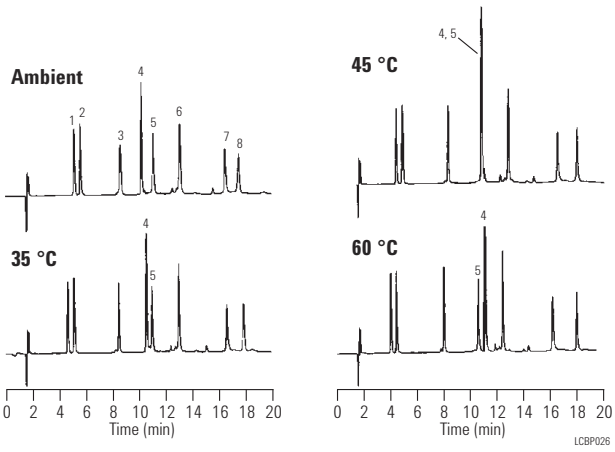
Flow Rate: 1.0 mL/min

Gradient: 15-53% in 20 min, posttime 12 min

Temperature: Ambient – 60 °C

Detector: UV 215 nm

Sample: Polypeptides



1. Leucine Enkephalin
2. Angiotensin II
3. RNase A
4. Insulin (BOV)
5. Cytochrome c
6. Lysozyme
7. Myoglobin
8. Carbonic anhydrase

TIPS & TOOLS

The Agilent 1290 Infinity LC delivers significantly faster results and higher data quality – enabling more informed decisions in shorter time. This higher productivity gives you competitive advantages and provides you a higher return on investment. Calculate for yourself how much you can save by deploying the 1290 Infinity technology. The online method translator and cost savings calculator helps you to transfer your HPLC methods and calculate your cost savings, at **www.agilent.com/chem/hplc2uhplc**

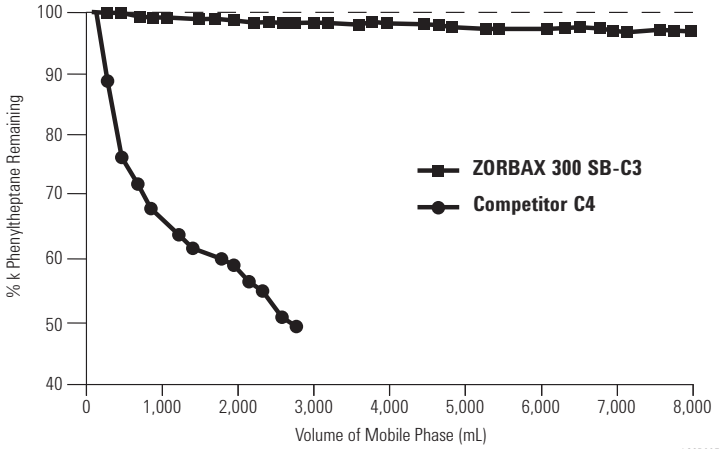
Short-chain ZORBAX 300SB-C3 is stable at low pH, high temperature

Column: **ZORBAX 300SB-C3**
883995-909
4.6 x 150 mm, 5 µm

Mobile Phase: Gradients 0-100% B in 80 min
A: 0.5% TFA in Water
B: 0.5% TFA in Acetonitrile
Isocratic Retention Test Conditions:
1-phenylheptane 50% A, 50% B

Flow Rate: 1.0 mL/min

Temperature: 60 °C



Four different 300SB bonded phases optimize separation of large polypeptides

Column A: **ZORBAX RRHD 300SB-C18**
883995-902
4.6 x 150 mm, 5 µm

Column B: **ZORBAX 300SB-C8**
883995-906
4.6 x 150 mm, 5 µm

Column C: **ZORBAX 300SB-C3**
883995-909
4.6 x 150 mm, 5 µm

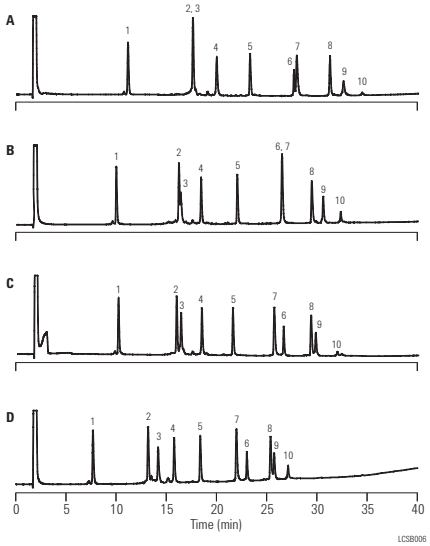
Column D: **ZORBAX 300SB-CN**
883995-905
4.6 x 150 mm, 5 µm

Mobile Phase: Linear Gradient, 25-70% B in 40 min
A: 0.1% TFA in Water
B: 0.09% TFA in 80% Acetonitrile/20% Water

Flow Rate: 1.0 mL/min

Temperature: 60 °C

Sample: 3 µg each protein



1. RNase
2. Insulin
3. Cytochrome c
4. Lysozyme
5. Parvalbumin
6. CDR
7. Myoglobin
8. Carbonic Anhydrase
9. S-100β
10. S-100α

The 300SB-C18, C8, C3, and CN bonded phases all provide a different separation of this group of polypeptides. This adds an important parameter for quickly optimizing protein separations. The 300SB-CN column offers unique selectivity for more hydrophilic polypeptides.

ZORBAX 300Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56	300-Diphenyl USP L11
Standard Columns (no special hardware required)								
	Semi-Preparative	9.4 x 250	5	880995-202	880995-206	880995-205	880995-209	
	Analytical	4.6 x 250	5	880995-902	880995-906	880995-905	880995-909	
	Analytical	4.6 x 150	5	883995-902	883995-906	883995-905	883995-909	
	Analytical	4.6 x 50	5	860950-902	860950-906	860950-905	860950-909	
	Rapid Resolution	4.6 x 150	3.5	863973-902	863973-906	863973-905	863973-909	
	Rapid Resolution	4.6 x 100	3.5	861973-902	861973-906			
	Rapid Resolution	4.6 x 50	3.5	865973-902	865973-906	865973-905	865973-909	
	Solvent Saver Plus	3.0 x 150	3.5	863974-302	863974-306		863974-309	
	Solvent Saver Plus	3.0 x 100	3.5		861973-306			
	Narrow Bore	2.1 x 250	5	881750-902				
	Narrow Bore	2.1 x 150	5	883750-902	883750-906	883750-905	883750-909	
	Narrow Bore RR	2.1 x 150	3.5		863750-906			
	Narrow Bore RR	2.1 x 100	3.5	861775-902	861775-906			
	Narrow Bore RR	2.1 x 50	3.5	865750-902	865750-906			
	Narrow Bore RRHD	2.1 x 100	1.8	858750-902	858750-906		858750-909	858750-944
	Narrow Bore RRHD	2.1 x 50	1.8	857750-902	857750-906		857750-909	857750-944
	MicroBore	1.0 x 250	5	861630-902				
	MicroBore RR	1.0 x 150	3.5	863630-902	863630-906			
	MicroBore RR	1.0 x 50	3.5	865630-902	865630-906			
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5920	5185-5920			
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-124	820675-124	820675-124	820675-124	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-921	820950-918	820950-923	820950-924	
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-918	821125-918	821125-924	821125-924	
P	Guard Hardware Kit			840140-901	840140-901	840140-901	840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901	

(Continued)



ZORBAX 300Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56	300-Diphenyl USP L11
PrepHT Cartridge Columns (require endfittings kit 820400-901)								
PL	PrepHT Cartridge	21.2 x 250	7	897250-102	897250-106	897250-105	897250-109	
PL	PrepHT Cartridge	21.2 x 150	7	897150-102	897150-106		897150-109	
PL	PrepHT Cartridge	21.2 x 150	5	895150-902	895150-906		895150-909	
PL	PrepHT Cartridge	21.2 x 100	5	895100-902	895100-906		895100-909	
PL	PrepHT Cartridge	21.2 x 50	5	895050-902	895050-906		895050-909	
PL	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901	
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-921	820212-918	820212-924	820212-924	
PL	Guard Cartridge Hardware			820444-901	820444-901	820444-901	820444-901	
Capillary Glass-lined Columns								
	Capillary	0.5 x 250	5	5064-8266				
	Capillary	0.5 x 150	5	5064-8264				
	Capillary	0.5 x 35	5	5064-8294				
	Capillary RR	0.5 x 150	3.5	5064-8268				
	Capillary RR	0.5 x 35	3.5	5065-4459				
	Capillary	0.3 x 250	5	5064-8265				
	Capillary	0.3 x 150	5	5064-8263				
	Capillary	0.3 x 35	5	5064-8295				
	Capillary RR	0.3 x 150	3.5	5064-8267	5065-4460			
	Capillary RR	0.3 x 100	3.5	5064-8259	5065-4461			
	Capillary RR	0.3 x 35	3.5	5064-8270	5065-4462			
	Capillary RR	0.3 x 50	3.5	5064-8300	5065-4463			
Nano Columns (PEEK fused silica)								
	Nano RR	0.1 x 150	3.5	5065-9910				
	Nano RR	0.075 x 150	3.5	5065-9911				
	Nano RR	0.075 x 50	3.5	5065-9924	5065-9923			
	Trap/Guard, 5/pk	0.3 x 5	5	5065-9913	5065-9914			
	Trap/Guard Hardware kit			5065-9915	5065-9915			

ZORBAX RRHD 300-Diphenyl

Utilizing the same unique chemistry as the Pursuit 3.5 µm and 5 µm Diphenyl columns, the unique wide pore 300Å Diphenyl phase offers additional selectivity through pi-pi interactions with aromatic amino acids in the primary sequence. Agilent ZORBAX 1.8 µm 300Å Rapid Resolution High Definition (RRHD) columns bring UHPLC performance to the reversed-phase separation of intact proteins and protein digests.

The diphenyl column can be used for:

- Analysis of intact and modified proteins and polypeptides including protein structural analysis
- Detection of post-translational modifications
- Impurity analysis
- Confirming protein identity

The ZORBAX RRHD 300-Diphenyl provides:

- Stability at low pH – allowing you to run your protein and peptide separations down to pH 1 using trifluoroacetic acid (TFA), and formic acid eluents with complete confidence
- Temperature stability – you can run your separations up to 80 °C to improve efficiency and reduce eluent viscosity, without compromising column lifetime
- UHPLC compatible – enabling higher order characterization with reduced analysis time

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp Limits	pH Range	Endcapped	Carbon Load
ZORBAX RRHD 300-Diphenyl	300Å	45 m^2/g	80 °C	1.0-8.0	Yes	1.9%

Specifications represent typical values only

Fast separation of reduced monoclonal antibody

Column: **Agilent ZORBAX RRHD 300-Diphenyl 858750-944 2.1 x 100 mm, 1.8 µm**

Mobile Phase: A: 0.1% TFA in water
B: 80% n-propyl alcohol, 10% ACN, 9.9% water, and 0.1% TFA

Sample: Reduced monoclonal antibody (IgG1) (1.0 mg/mL)

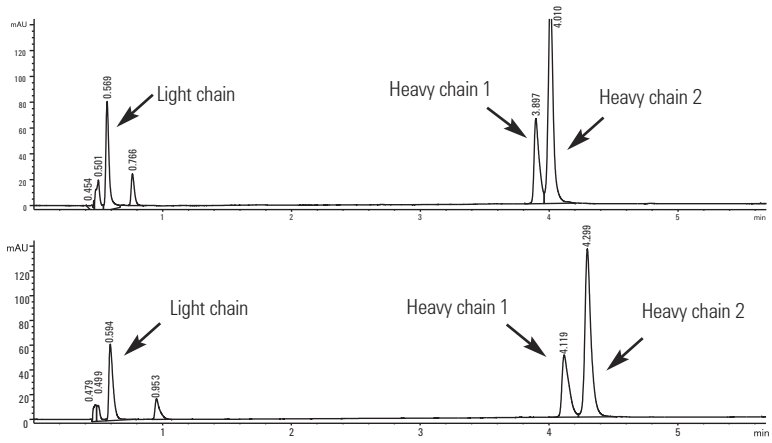
Sample Injection: 2 µL

Flow Rate: 0.5 mL/min

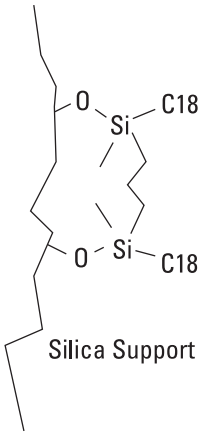
Gradient: 0 min-1%B, 2 min-20% B, 5 min-50% B

Temperature: 74 °C

Detector: UV, 280



Description	Dimensions	Particle Size (µm)	Part No.
ZORBAX RRHD 300-Diphenyl	2.1 x 50	1.8	857750-944
ZORBAX RRHD 300-Diphenyl	2.1 x 100	1.8	858750-944



Novel Bidentate C18-C18 Bonding for Extend-C18 Bonded Phase

ZORBAX 300Å Extend-C18

- Rugged, high and low pH separations of polypeptides and peptides from pH 2-11.5
- Different selectivity possible at high and low pH
- High efficiency and good recovery of hydrophobic peptides at high pH
- Ideal for LC/MS with ammonium-hydroxide-modified mobile phase

Agilent ZORBAX 300Å Extend-C18 is a wide-pore HPLC column for high efficiency separations of peptides from pH 2-11.5. The unique, bidentate bonded phase provides excellent lifetime and reproducibility at high and low pH. At high pH, retention and selectivity of peptides and polypeptides can change dramatically as a result of changes in charge on molecules. Excellent recoveries of hydrophobic polypeptides have been achieved at room temperature and high pH. LC/MS sensitivity of peptides and polypeptides can also be improved at high pH using a simple ammonium-hydroxide-containing mobile phase.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range	Endcapped	Carbon Load
ZORBAX 300Å Extend-C18	300Å	45 m^2/g	60 °C	2.0-11.5	Double	4%

Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-11.5.

TIPS & TOOLS

Selecting the right column is only part of the total solution. Don't forget key supplies such as our wide range of LC lamps. Turn to page 90.

LC/MS analysis of angiotensin on Extend-C18

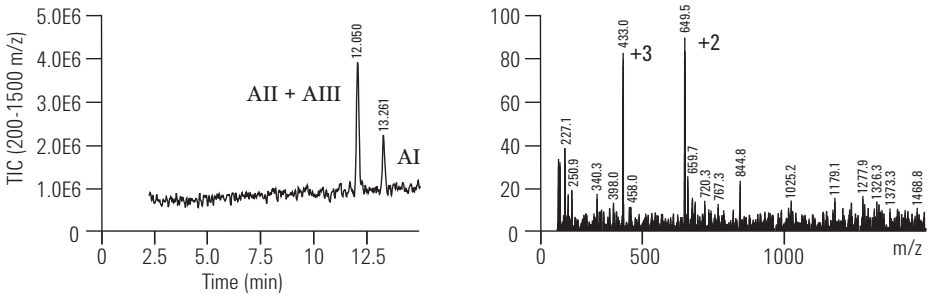
Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

Mobile Phase: Acidic Conditions:
A: 0.1% TFA in water
B: 0.085% TFA in 80% acetonitrile (ACN)
Basic Conditions:
A: 10 mM NH_4OH in water
B: 10 mM NH_4OH in 80% ACN

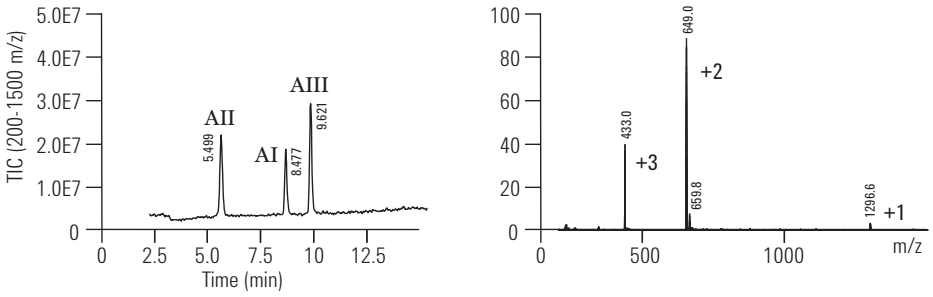
Flow Rate: 0.2 mL/min
Gradient: 15-50% B in 15 min
Temperature: 35 °C

MS Conditions: Pos. Ion ESI- Vf 70 V, Vcap 4.5 kV, N2- 35 psi, 12 L/min., 325 °C
Sample: 2.5 µL sample (50 pmol each) Angiotensin I, II, III

A
Angiotensin I
Max: 10889
Low pH



B
Angiotensin I
Max: 367225
High pH



LC30003

Both small and large peptides demonstrate selectivity changes at high and low pH. At high pH, due to a change in charge, all three Angiotensins can be resolved. In addition, the spectral clarity of Angiotensin I is dramatically improved at high pH with the ammonium hydroxide mobile phase. The Extend-C18 column can be used for the analysis of small peptides at high pH as well.

Reference: B.E. Boyes. Separation and Analysis of Peptides at High pH Using RP-HPLC/ESI-MS, 4th WCBP, San Francisco, CA, Jan. 2000.

Long life at high pH with 300Extend-C18

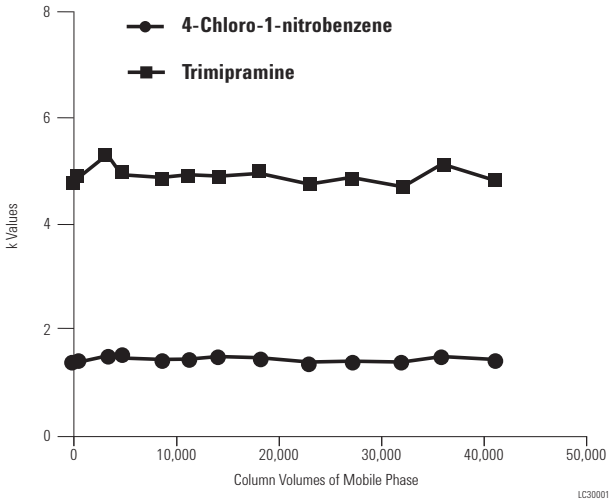
Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: 20% 20 mM NH_4OH, pH 10.5
80% Methanol

Flow Rate: 1.5 mL/min

Temperature: Aging 24 °C
Tests 40 °C

Each 10,000 column volume is approximately one working month.



Use ZORBAX Extend-C18 for alternate selectivity at high pH

Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in Water
B: 0.085% TFA in 80% ACN

A: 20 mM NH_4OH in Water
B: 20 mM NH_4OH in 80% ACN

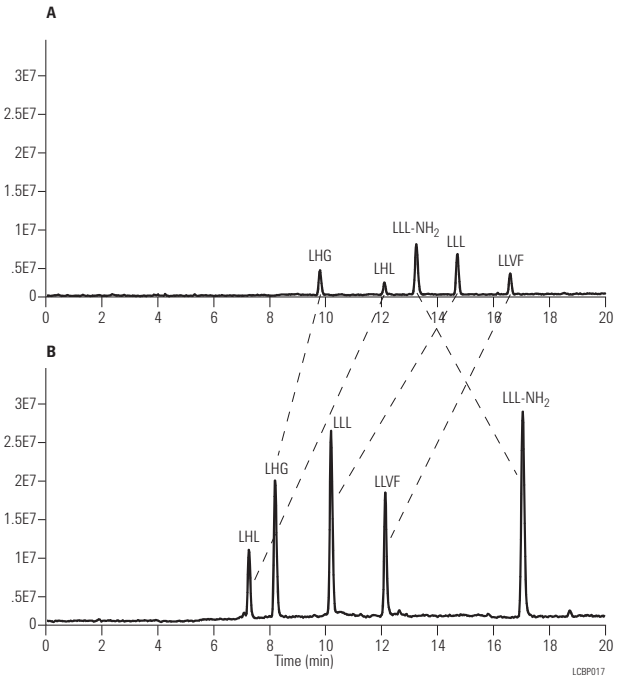
Flow Rate: 0.25 mL/min

Gradient: 5-60% B in 20 min

Temperature: 25 °C

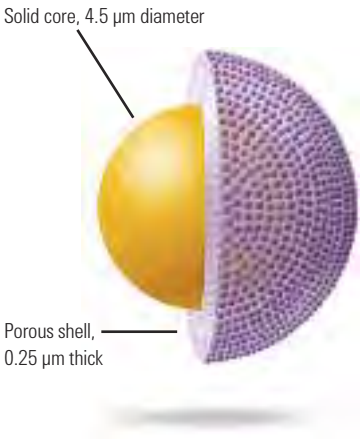
MS Conditions: Pos. Ion ESI-Vf 70V, Vcap 4.5 kV
N_2 – 35 psi, 12 L/min, 300 °C
4 µL (50 ng each peptide)

The Extend column can be used for high pH separations of peptides. At high and low pH, very different selectivity can result. Just by changing pH, a complimentary method can be developed and it is possible to determine if all peaks are resolved. The Extend column can be used at high and low pH, so the complimentary separation can be investigated with one column. Better MS sensitivity for this sample is also achieved at high pH.



ZORBAX 300Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	Analytical	4.6 x 250	5	770995-902
	Analytical	4.6 x 150	5	773995-902
	Rapid Resolution	4.6 x 150	3.5	763973-902
	Rapid Resolution	4.6 x 100	3.5	761973-902
	Rapid Resolution	4.6 x 50	3.5	765973-902
	Narrow Bore RR	2.1 x 150	3.5	763750-902
	Narrow Bore RR	2.1 x 100	3.5	761775-902
	Narrow Bore RR	2.1 x 50	3.5	765750-902
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-932
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-932
ZGC	Guard Hardware Kit			820999-901
Capillary Glass-lined Columns				
	Capillary RR	0.3 x 150	3.5	5065-4464
	Capillary RR	0.3 x 100	3.5	5065-4465
	Capillary RR	0.3 x 75	3.5	5065-4466
	Capillary RR	0.3 x 50	3.5	5065-4467



Poroshell 300

- UHPLC separations of biomolecules with superficially porous particles
- 300Å pore provide high efficiency and recovery with proteins (up to 1,000 kDa) and monoclonal antibodies
- Achieve long lifetime at low pH with Poroshell 300SB; at high pH with 300Extend-C18
- Optimize recovery and selectivity with four different bonded phases – 300SB-C18, 300SB-C8, 300SB-C3, and 300Extend-C18

Agilent Poroshell 300 columns are ideal for fast separations of proteins and peptides because the superficially porous particle allows for fast flow rates to be used while maintaining sharp, efficient peaks. Peptides and proteins are typically separated slowly to reduce the potential peak broadening of these slow diffusing analytes. However, Poroshell columns use a superficially porous particle made with a thin layer of porous silica, 0.25 µm thick, on a solid core of silica. This reduces the diffusion distance for proteins making practical rapid HPLC separations of peptides and proteins up to 500-1,000 kDA possible with 400/600 bar HPLC systems, including the Agilent 1260 Infinity Bio-inert. Poroshell columns bonded with StableBond bonded phases provide excellent stability and selectivity choices with TFA and formic acid mobile phases. The Poroshell 300Extend-C18 column can be used from pH 2-11 for unique separations. These columns can be used for analytical protein separations as well as LC/MS separations.



Poroshell 300 Columns

Column Specifications

Bonded Phase	Pore Size	Temp. Limits*	pH Range	Endcapped
Poroshell 300SB-C18, C8, C3	300Å	90 °C	1.0-8.0	No
Poroshell 300Extend-C18	300Å	40 °C above pH 8 60 °C below pH 8	2.0-11.0	Yes

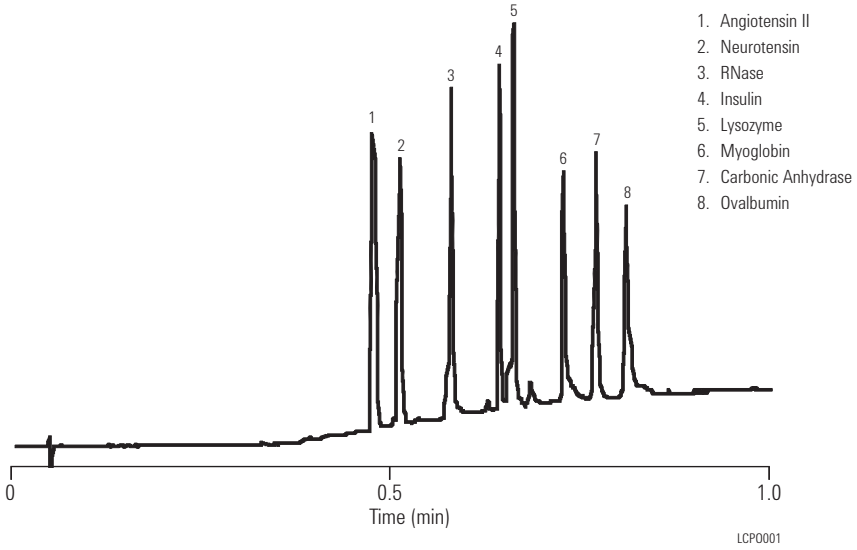
Specifications represent typical values only.

*300StableBond columns are designed for optimal use at low pH. At pH 6-8, highest column stability for all silica-based columns is obtained by operating at temperatures <40 °C and using low buffer concentrations in the range of 0.01-0.02 M. At mid or high pH, 300Extend-C18 is recommended.

Poroshell 300 columns separate proteins and peptides in seconds

Column:	**Poroshell 300SB-C18 660750-902 2.1 x 75 mm, 5 µm**
Mobile Phase:	A: 0.1% TFA in H_20 B: 0.07% TFA in ACN
Flow Rate:	3.0 mL/min
Gradient:	5-100% B in 1.0 min
Temperature:	70 °C, 260 bar pressure
Detector:	215 nm
Sample:	Proteins and Peptides

This separation of eight polypeptides and proteins is completed in less than 60 seconds. Each peak is sharp and efficient.



1. Angiotensin II
2. Neurotensin
3. RNase
4. Insulin
5. Lysozyme
6. Myoglobin
7. Carbonic Anhydrase
8. Ovalbumin

TIPS & TOOLS

Further information can be found in the following publications:

Poroshell 300SB-C18 (publication # 5988-2100ENUS)

Rapid HPLC Analysis of Monoclonal Antibody IgG_1 Heavy Chains Using ZORBAX Poroshell 300SB-C8 (publication # 5989-0070EN)

Use of Temperature to Increase Resolution in the Ultrafast HPLC Separation of Proteins with ZORBAX Poroshell 300SB-C8 HPLC Columns (publication # 5989-0589EN)

Using the High-pH Stability of ZORBAX Poroshell 300Extend-C18 to Increase Signal-to-Noise in LC/MS (publication # 5989-0683EN)

www.agilent.com/chem/library

Reduce peptide map analysis time by 90% with Poroshell 300SB

Column A: **Poroshell 300SB-C18**
660750-902
2.1 x 75 mm, 5 µm

Column B: **ZORBAX 300SB-C18**
883750-902
2.1 x 150 mm, 5 µm

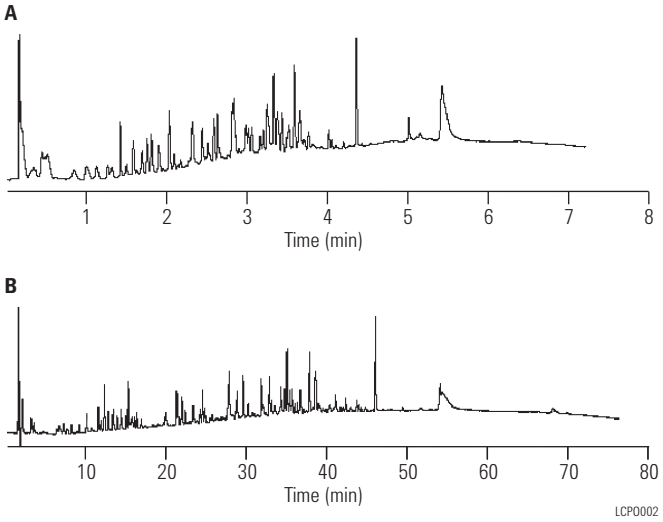
Mobile Phase: A: 95% H_2O, 5% ACN, 0.1% TFA
B: 5% H_2O, 95% ACN, 0.07% TFA

Flow Rate: 1 mL/min
0.208 mL/min

Gradient: 0-100% B = 12 min
0-100% B = 120 min

Temperature: 70 °C

Sample: 20 µL (0.22 µg/1 µL)
BSA Tryptic Digest
(15 hours, 70 pmol)



A single chromatographic run of a protein tryptic digest can require one hour or more to complete. With Poroshell columns, the same complex separation can be completed in 1/10th the time.

MicroBore Poroshell 300 columns provide maximum sensitivity for LC/MS

Column: **Poroshell 300SB-C18**
661750-902
1.0 x 75 mm, 5 µm

Mobile Phase: A: Water + 0.1% Formic Acid
B: ACN + 0.1% Formic Acid

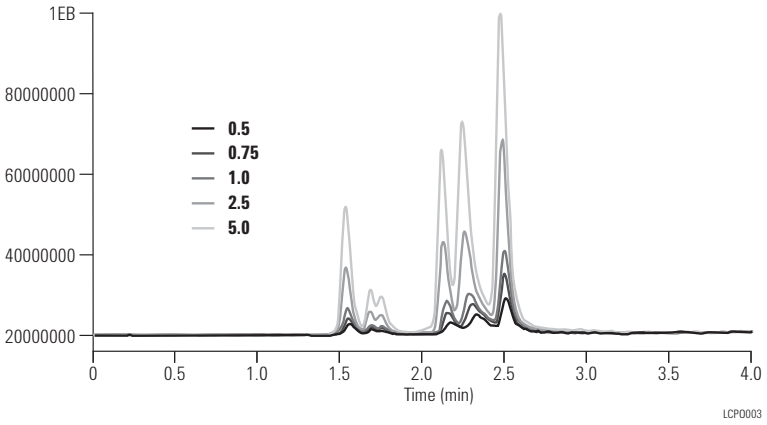
Flow Rate: 600 µL/min

Gradient: 20-100% B in 5.5 min

Temperature: 80 °C

MS Conditions: LC/MS: Pos. Ion ESI – Vcap 6000 V
Drying Gas Flow: 12 L/min
Drying Gas Temperature: 350 °C
Nebulizer: 45 psi
Fragmentor Volatage: 140 V
Scan: 600-2500
Stepsize: 0.15 amu
Peak width: 0.06 min

Sample: 1 µL



With narrow bore diameters of 2.1 mm, 1.0 mm, and 0.5 mm, Poroshell columns make an ideal LC/MS partner. When the sample is very limited, the 1.0 mm or 0.5 mm id Poroshell columns are an excellent choice for high sensitivity LC/MS analyses. Sensitive MS molecular weight determinations are possible with as little as 0.5 to 5 pmole of protein on Poroshell columns. Poroshell columns have also been used for rapid MS identification of intact proteins, even in the presence of stabilizers and tissue culture media.

Monoclonal IgG1 chains: Separation on Poroshell 300SB-C8

Column: **Poroshell 300SB-C8**
660750-906
2.1 x 75 mm, 5 µm

Mobile Phase: A: 90% water:
10% ACN + 3 mL/L of MW 300 PEG
B: 10% water:
90% ACN + 3 mL/L of MW 300 PEG

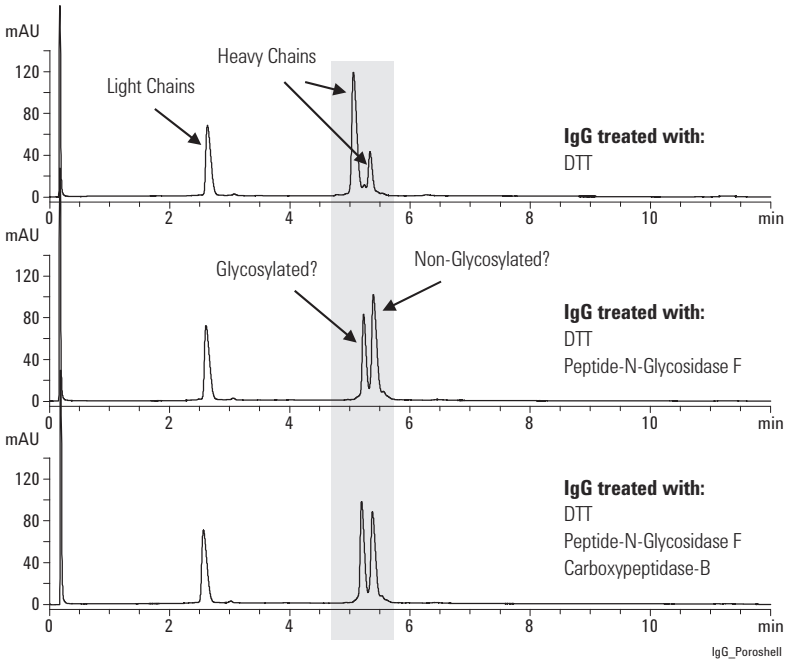
Flow Rate: 1.0 mL/min

Gradient: 0 min 25% B
10 min 40% B
10.1 min 25% B
12 min 25% B

Temperature: 70 °C

Sample: Monoclonal IgG1

Courtesy of:
Novartis Pharma,
Biotechnology, Basel
Dr. Kurt Forrer
Patrik Roethlisberger





TIPS & TOOLS

Agilent offers an extensive selection of certified chromatography sample vials including polypropylene and deactivated and siliconized glass.
For more information see (publication # 5990-9022EN).

www.agilent.com/chem/library

Protein elution pattern on ZORBAX Poroshell 300SB-C8

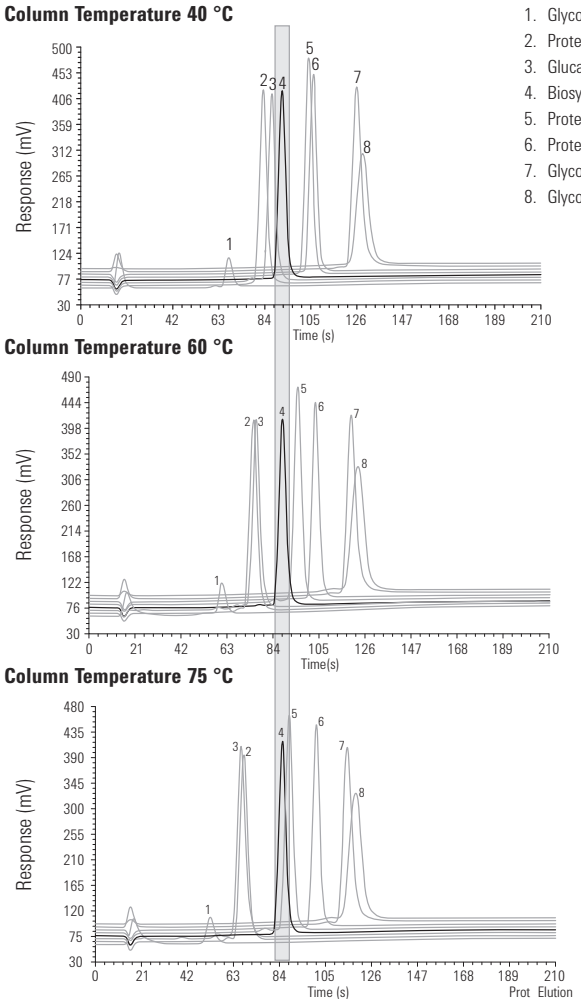
Column: **Poroshell 300SB-C8 660750-906 2.1 x 75 mm, 5 µm**

Mobile Phase: A: 0.1% TFA in H_20
B: 0.1% TFA in ACN

Flow Rate: 1.0 mL/min

Gradient: B: 20 to 70% in 3 min

Detector: UV (214 nm)



1. Glycoprotein X, MW ~ 22 kDa
2. Protein I, MW ~ 4 kDa
3. Glucagon, MW ~ 3.5 kDa
4. Biosynthetic human insulin, MW ~ 6 kDa
5. Protein J, MW ~ 3 kDa
6. Protein K, MW ~ 6 kDa
7. Glycoprotein Y, MW ~ 45 kDa
8. Glycoprotein Z, MW ~ 30 kDa

Poroshell 300

Hardware	Description	Size (mm)	Particle Size (µm)	Poroshell 300SB-C18	Poroshell 300SB-C8	Poroshell 300SB-C3	Poroshell 300Extend-C18
	Narrow Bore	2.1 x 75	5	660750-902	660750-906	660750-909	670750-902
	MicroBore	1.0 x 75	5	661750-902	661750-906	661750-909	671750-902
	Capillary	0.5 x 75	5		5065-4468		
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821075-920	821075-918	821075-924	
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5968	5185-5968	5185-5968	5185-5968

Poroshell 120



- 120Å pore size for shorter chain peptide mapping
- UHPLC performance on 600 bar systems
- Up to 90% of the efficiency of sub-2 µm
- 2X the efficiency of 3.5 µm
- Up to 50% less pressure than sub-2 µm columns

Agilent Poroshell 120 columns are a 2.7 µm particle with a 1.7 µm solid core and 0.5 µm porous outer layer. This small particle size provides high efficiency, similar to sub-2 µm columns, but with 40-50% less pressure. These high efficiency, high resolution columns can be used on any type of LC. The porous outer layer and solid core limit diffusion distance and improve separation speed while the narrow particle size distribution improves efficiency and resolution. The columns can support high pressure and multiple columns can be used for the highest resolution and efficiency possible. The smaller 120Å pore size is ideal for fast high resolution analysis of small hydrophilic peptides in protein digests.

Column Specifications

Bonded Phase	Pore Size	Temp Limits	pH Range	Endcapped	Carbon Load
EC-C18	120Å	60 °C	2.0-8.0	Double	10%
SB-C18	120Å	90 °C	1.0-8.0	No	8%

Specifications represent typical values only

For information on the full family of Poroshell 120 phases, see page 228.



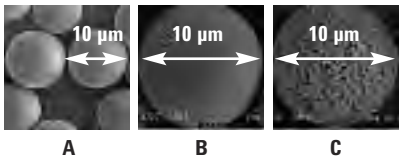
Poroshell 120

Description	Size (mm)	Particle Size (µm)	EC-C18 USP L1	SB-C18 USP L1
Analytical	4.6 x 150	2.7	693975-902	683975-902
Analytical	4.6 x 100	2.7	695975-902	685975-902
Solvent Saver	3.0 x 150	2.7	693975-302	683975-302
Solvent Saver	3.0 x 100	2.7	695975-302	685975-302
Narrow Bore	2.1 x 150	2.7	693775-902	683775-902
Narrow Bore	2.1 x 100	2.7	695775-902	685775-902

PLRP-S

- Contain durable and resilient polymer particles that deliver reproducible results over longer lifetimes
- Thermally and chemically stable
- Comply with USP L21 designation
- Used in bioscience, chemical, clinical research, energy, environmental, food and agriculture, material science and pharmaceutical industries
- Pore sizes (100Å-4000Å) for separations of small molecules to large complexes and polynucleotides

The PLRP-S family of columns consists of a range of pore sizes and particle sizes, all with identical chemistry and fundamental adsorptive characteristics. The particles are inherently hydrophobic, therefore no bonded phase, alkyl ligand is required for reversed-phase separations. This gives a highly reproducible material that is free from silanols and heavy metal ions. Columns within the extensive product range are suitable for nano/capillary separations, including both bottom-up and top-down proteomics, analytical separations, and preparative purifications. In addition, process columns can be packed with bulk media.



Scanning electron micrographs (SEM) of PLRP-S 10 µm particles.
The difference in pore size is clearly seen.
A is the small pore 100Å
B the larger pore 300Å
C the gigaporous 4000Å

Column Specifications	
pH Range	1-14
Buffer Content	Unlimited
Organic Modifier	1-100%
Temperature Limits	200 °C
Maximum Pressure	5-8 µm: 3000 psi (210 bar)
	3 µm: 4000 psi (300 bar)

PLRP-S Applications	
Pore Size	**Application**
100Å	Small molecules/peptides/oligonucleotides
300Å	Recombinant peptides/proteins
1000Å	Large proteins
4000Å	DNA/high speed

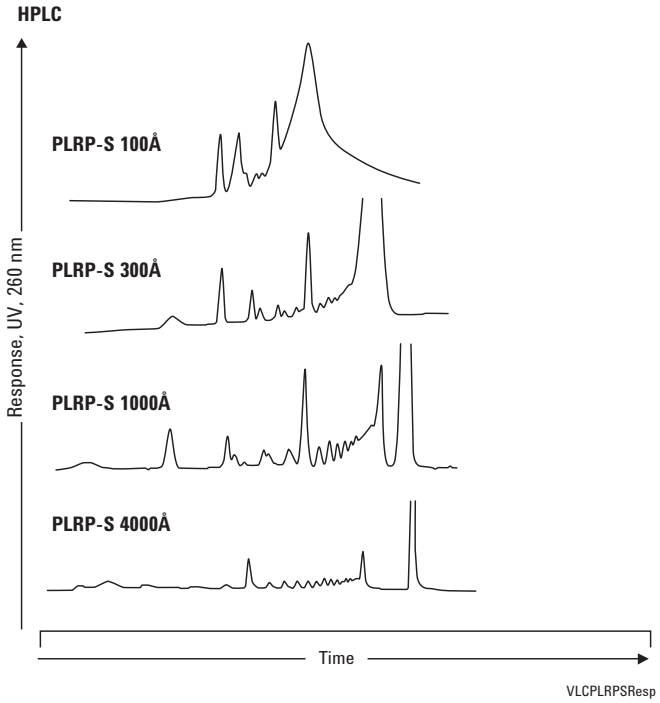
HPLC of 25 bp DNA ladder

Column: **PLRP-S, 2.1 x 150 mm**

Mobile Phase: A: 0.1 M TEAA
B: 0.1 M TEAA in 50% water:50% ACN

Flow Rate: 200 µL/min

Gradient: 12.5-50% B in 150 min



Polyethylene glycols

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water
B: ACN

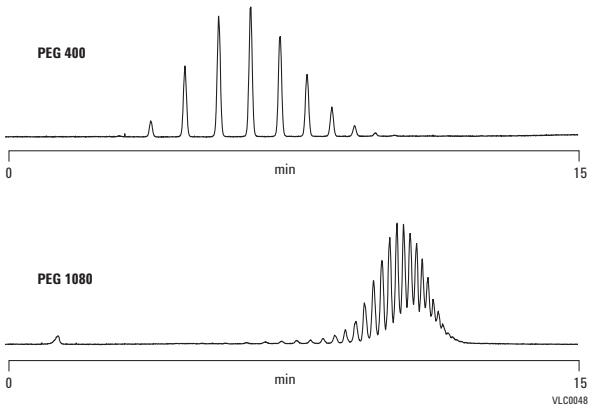
Gradient: 10-30% B in 12 min, held at 30% B for 3 min

Flow Rate: 1.0 mL/min

Injection Volume: 10 µL

Sample Conc: 1 mg/mL

Detector: ELS (neb=50 °C, evap=70 °C, gas=1.6 SLM)



Exploiting chemical stability – TFA concentration

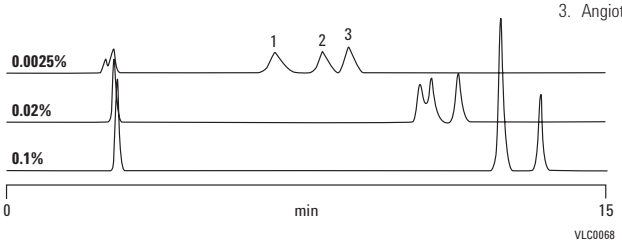
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: TFA (various %) in water
B: TFA (various %) in ACN

Gradient: Linear 12-40% B in 15 min

Flow Rate: 1.0 mL/min

Detector: ELS (neb=75 °C, evap=85 °C, gas=1.0 SLM)



1. Angiotensin III
2. Angiotensin II
3. Angiotensin I

Selectivity in peptide RP-LC

Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

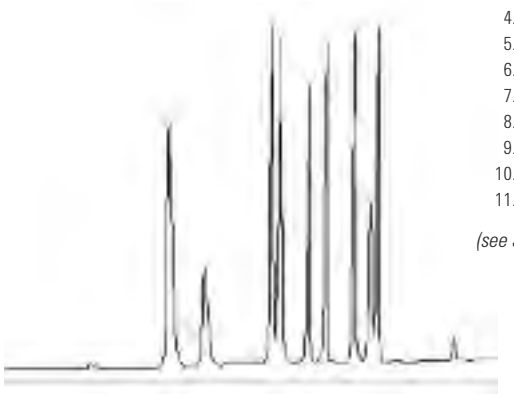
Mobile Phase: A: 0.1% TFA/1% 2-Propanol/Water
B: 0.1% TFA/1% 2-Propanol/ACN

Flow Rate: 1.0 mL/min

Gradient: 95% A (0-3 min) to 50% A (13 min)

Detector: UV, 220 nm

Good separation of peptide standards on Agilent PLRP-S



1. YG
2. GYG
3. PY
4. YV
5. YY
6. GLY
7. YF
8. GFL
9. YGGFM
10. Oxalic acid (marker)
11. Benzoic acid (marker)

(see J.Chromatography 512 (1990) 315-23)

Exploiting chemical stability – NH_4OH concentration

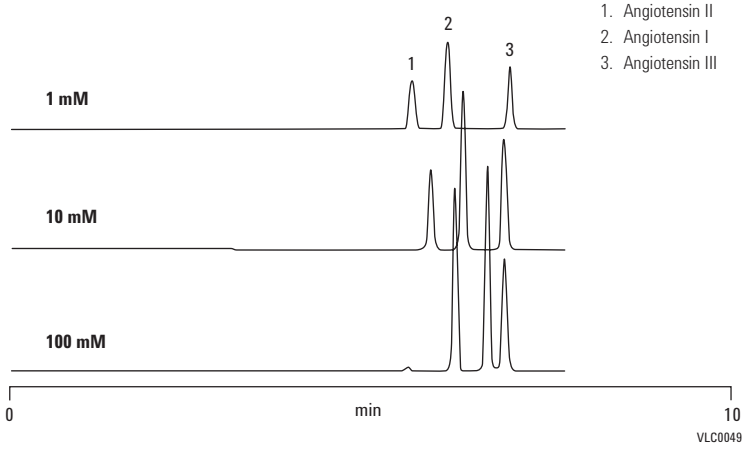
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: NH_4OH (various mM) in water
B: NH_4OH (various mM) in ACN

Gradient: Linear 10-100% B in 15 min

Flow Rate: 1.0 mL/min

Detector: ELS (neb=80 °C, evap=85 °C, gas=1.0 SLM)



Alberta Peptide Institute test mix

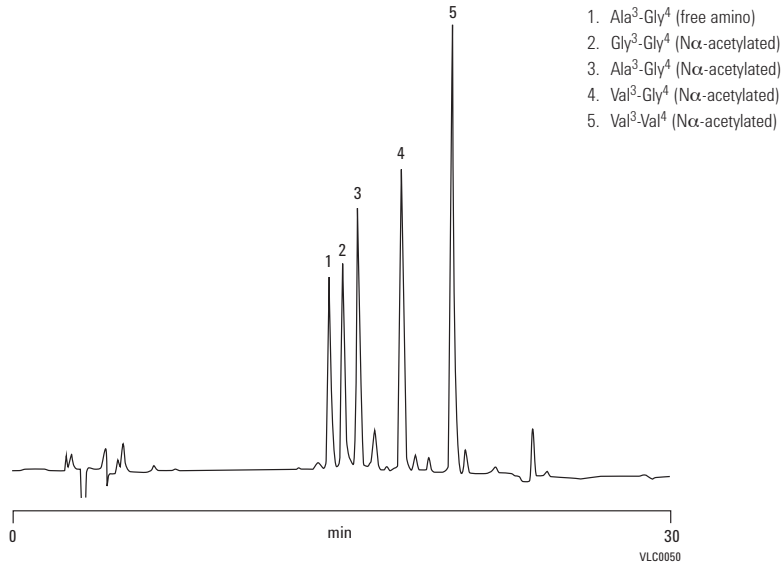
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: 0.1% TFA in 99% water:1% ACN
B: 0.1% TFA in 70% water:30% ACN

Gradient: 0-100% B in 30 min

Flow Rate: 1.0 mL/min

Detector: UV, 220 nm



Whey proteins in dairy samples – milk

Column: **PLRP-S 300Å**
PL1512-3801
4.6 x 150 mm, 8 µm

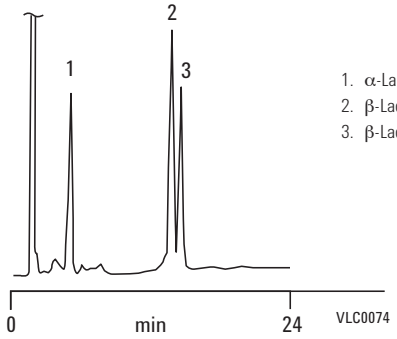
Mobile Phase: A: 0.1% TFA in 99% water:1% ACN
B: 0.1% TFA in 1% water:99% ACN

Gradient: 36-48% B, 0-24 min, 48-100% B, 24-30 min
100% B, 30-35 min, 100-36% B, 35-40 min

Flow Rate: 1.0 mL/min

Injection Volume: 10 µL

Detector: UV, 220 nm



1. α-Lactalbumin
2. β-Lactoglobulin (B chain)
3. β-Lactoglobulin (A chain)

Temperature as a tool to enhance mass transfer and improve resolution of oligonucleotides in ion-pair reversed-phase HPLC

Column: **PLRP-S 100Å**
PL1512-1300
4.6 x 50 mm, 3 µm

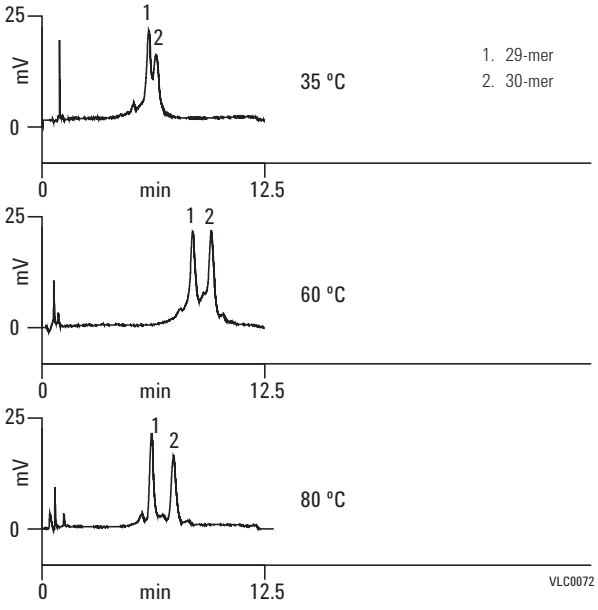
Mobile Phase: A: 100 mM TEAA
B: 100 mM TEAA in 25% ACN

Gradient: 5% change in buffer B over 5 min

Flow Rate: 1.0 mL/min

Temperature: 35 °C, 60 °C, or 80 °C

Detector: UV, 254 nm



1. 29-mer
2. 30-mer

Large fibrous proteins

Column: **PLRP-S 300Å**
PL1512-3801
4.6 x 150 mm, 8 µm

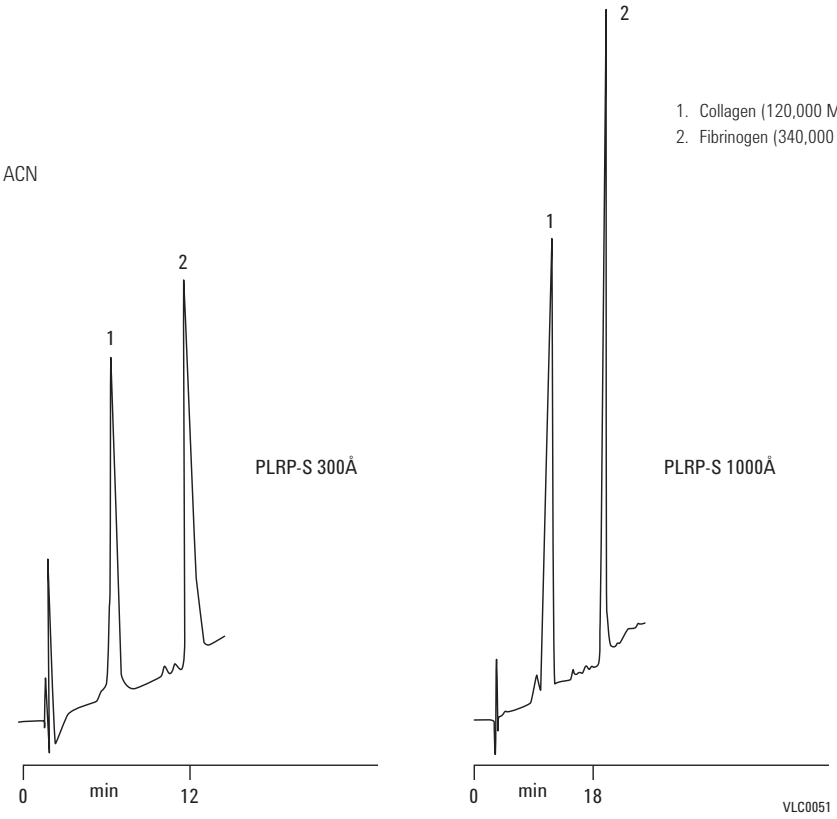
Column: **PLRP-S 1000Å**
PL1512-3802
4.6 x 150 mm, 8 µm

Mobile Phase: A: 0.25% TFA in water
B: 0.25% TFA in 5% water:95% ACN

Flow Rate: 1.0 mL/min

Gradient: 20-60% B in 15 min

Detector: UV, 220 nm



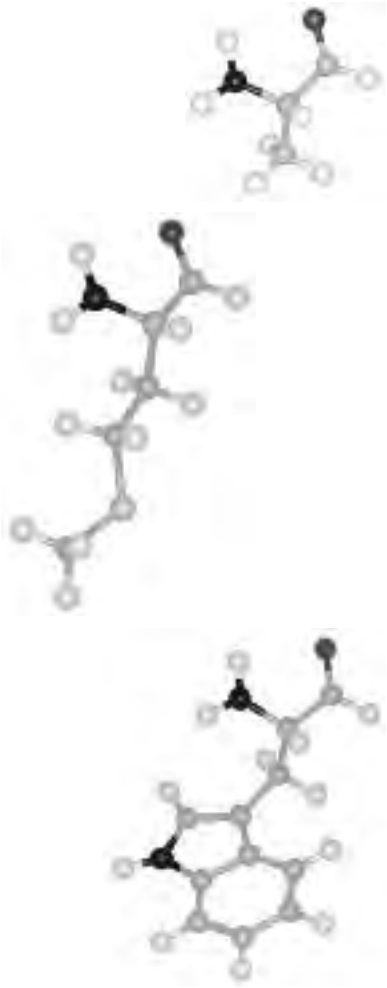
PLRP-S HPLC Columns

Hardware	Size (mm)	Particle Size (µm)	PLRP-S 100Å USP L21	PLRP-S 300Å USP L21	PLRP-S 1000Å USP L21	PLRP-S 4000Å USP L21
	4.6 x 250	8	PL1512-5800	PL1512-5801	PL1512-5802	
	4.6 x 150	8	PL1512-3800	PL1512-3801	PL1512-3802	PL1512-3803
	4.6 x 50	8		PL1512-1801	PL1512-1802	PL1512-1803
	4.6 x 250	5	PL1512-5500	PL1512-5501		
	4.6 x 150	5	PL1111-3500	PL1512-3501		
	4.6 x 50	5	PL1512-1500	PL1512-1501	PL1512-1502	PL1512-1503
	4.6 x 150	3	PL1512-3300	PL1512-3301		
	4.6 x 50	3	PL1512-1300	PL1512-1301		
	2.1 x 250	8		PL1912-5801		
	2.1 x 150	8		PL1912-3801	PL1912-3802	PL1912-3803
	2.1 x 50	8		PL1912-1801	PL1912-1802	PL1912-1803
	2.1 x 250	5	PL1912-5500	PL1912-5501		
	2.1 x 150	5	PL1912-3500	PL1912-3501		
	2.1 x 50	5	PL1912-1500	PL1912-1501	PL1912-1502	PL1912-1503
	2.1 x 150	3	PL1912-3300	PL1912-3301		
	2.1 x 50	3	PL1912-1300	PL1912-1301		
	1.0 x 50	8			PL1312-1802	
	1.0 x 50	5	PL1312-1500		PL1312-1502	
	1.0 x 10	5			PL1C12-2502	
	1.0 x 150	3	PL1312-3300			
	1.0 x 50	3	PL1312-1300			
PL	PLRP-S Guard Cartridges for 5 x 3 mm, 2/pk		PL1612-1801	PL1612-1801	PL1612-1801	PL1612-1801
PL	Guard Cartridge holder for 3.0 x 5.0 mm cartridges		PL1310-0016	PL1310-0016	PL1310-0016	PL1310-0016

TIPS & TOOLS

For prep columns and media ordering information, turn to pages 470-471.

For microbore columns ordering information, turn to page 463.



Amino Acid Analysis (AAA) Columns and Supplies

ZORBAX Eclipse Amino Acid Analysis (AAA) Columns

- High resolution and rapid analysis of 24 amino acids
- Tested for amino acid analysis
- Uses well-known OPA and FMOC precolumn derivatization chemistry
- Easily automated using a detailed online, derivatization protocol available for use with Agilent 1100/1200 autosampler

The Agilent ZORBAX Eclipse AAA high efficiency column rapidly separates amino acids following an updated and improved protocol. Total analysis from injection-to-injection can be achieved in as little as 8 min (7 min analysis time) on a 50 mm 1.8 µm column, 14 min (9 min analysis time) on shorter, 75 mm length columns and 24 min (18 min analysis time) on the 150 mm column length. Exceptional sensitivity (5-50 pmol with DAD, FLD) and reliability are achieved using both OPA and FMOC derivatization chemistries in one fully automated procedure using the Agilent 1100/1200 HPLC instrument.

ZORBAX Eclipse Plus C18 columns are another excellent choice for Amino Acid Analysis. For more information about ZORBAX Eclipse Plus Columns, see page 248.

ZORBAX Eclipse Amino Acid Analysis (AAA) Columns

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	Analytical routine sensitivity	4.6 x 150	5	993400-902
	Analytical routine sensitivity, high-resolution using FLD	4.6 x 150	3.5	963400-902
	Analytical routine sensitivity, high-throughput	4.6 x 75	3.5	966400-902
	Solvent Saver high sensitivity, high-resolution	3.0 x 150	3.5	961400-302
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-931
ZGC	Guard Hardware Kit			820999-901

TIPS & TOOLS

Further information can be found in the following publication:

High-Speed Amino Acid Analysis (AAA) on 1.8 µm Reversed-Phase (RP) Columns (publication # 5989-6297EN)

www.agilent.com/chem/library

Amino Acid Standards

Each amino acid standard contains the following amino acids:

- Glycine
- L-cysteine
- L-histidine
- L-tyrosine
- L-leucine
- L-methionine
- L-serine
- L-alanine
- L-phenylalanine
- L-glutamic acid
- L-proline
- L-isoleucine
- L-arginine
- L-threonine
- L-valine
- L-lysine
- L-aspartic acid

Amino Acid Standards, 10 x 1 mL ampoules*

Description	Part No.
1 nmol/µL	5061-3330
250 pmol/µL	5061-3331
100 pmol/µL	5061-3332
25 pmol/µL	5061-3333
10 pmol/µL	5061-3334
Amino acids supplement kit Includes 1 g each of norvaline, sarcosine, asparagine, glutamine, tryptophan, and 4-hydroxyproline	5062-2478

*Consider shelf-life and buy limited quantities, P/N 5062-2478 ships as 1 g vials

Amino Acid Separations Reagents

Description	Part No.
OPA reagent, 10 mg/mL each in 0.4 M borate buffer o-phthalaldehyde (OPA) and 3-mercaptopropionic acid, 6 x 1 mL ampoules	5061-3335
FMOC reagent, 2.5 mg/mL in acetonitrile, 9-fluorenylmethylchloroformate, 1 mL, 10 ampoules	5061-3337
Borate buffer, 100 mL	5061-3339
DTDPA (Dithiodiproprionic) reagent, for analysis of cysteine, 5 g	5062-2479

High resolution of 24 amino acids using ZORBAX Eclipse-AAA protocol

Column: **ZORBAX Eclipse AAA**
963400-902
4.6 x 150 mm, 3.5 µm

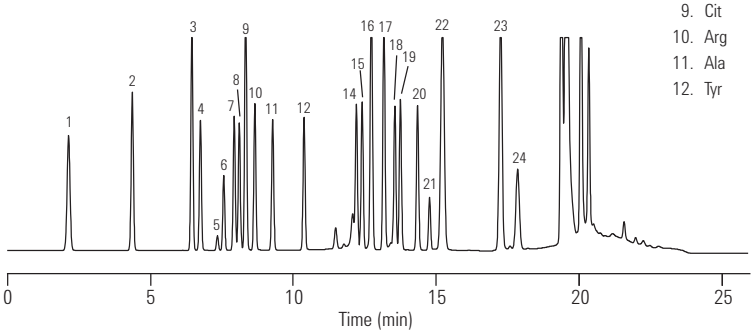
Mobile Phase: A: 40 mM Na_2HPO_4, pH 7.8
B: ACN:MeOH:Water, 45:45:10 v/v

Flow Rate: 2 mL/min

Temperature: 40 °C

Detector: Fluorescence

Sample: 24 Amino Acids



LCPAH01

1. Asp
2. Glu
3. Asn
4. Ser
5. Gln
6. His
7. Gly
8. Thr
9. Cit
10. Arg
11. Ala
12. Tyr
13. Cys
14. Val
15. Met
16. Nva
17. Trp
18. Phe
19. Ile
20. Leu
21. Lys
22. Hyp
23. Sar
24. Pro

This high resolution separation of 24 amino acids is done in 18 minutes. If the Rapid Resolution 4.6 x 75 mm Eclipse AAA column is selected, these amino acids are resolved in 9 minutes.

Ion-Exchange Chromatography

Purify proteins and other charged molecules



Ion-exchange chromatography (IEX) is a highly sensitive technique that allows you to separate ions and polar molecules based on their charge. Like SEC, IEX can be used to separate proteins in their native state.

Applying IEX to charge variant analysis

During production and purification, antibodies can exhibit changes in charge heterogeneity as a result of amino acid substitutions, glycosylation, phosphorylation, and other post-translational or chemical modifications. Because these changes can impact stability and activity – or cause immunologically adverse reactions – the analysis of charge heterogeneity in monoclonal antibody (MAb) preparations is critical to biopharmaceuticals.

In protein analysis, charge variations at a given pH indicate a change in the primary molecular structure – resulting in additional forms of the protein in question. These are called isoforms (or charge variants), and can be resolved by IEX chromatography. IEX is also useful as a preparative technique.

The pages that follow describe Agilent's family of weak and strong ion-exchangers – both anionic and cationic.

- **Agilent non-porous Bio IEX columns** are designed for high-resolution, high-efficiency, and high-recovery separations.
- **Agilent Bio MAb columns** are optimized for separating charge isoforms of monoclonal antibodies.
- **Agilent porous IEX columns (PL-SAX and PL-SCX)** are chemically stable, and are available in two pore sizes – allowing you to separate peptides, oligonucleotides, and very large proteins.
- **Bio-Monolith IEX columns** are uniquely suited to separating antibodies, viruses, and DNA.



Ion-Exchange Column Selection

Application	Agilent Columns	Notes
Monoclonal antibodies	Agilent Bio MAb	Thorough characterization of monoclonal antibodies includes the identification and monitoring of acidic and basic isoforms. Agilent Bio MAb HPLC columns feature a unique resin specifically designed for high-resolution charge-based separations of monoclonal antibodies.
Peptides and proteins	Agilent Bio IEX	Agilent Bio Ion-Exchange columns are packed with polymeric, nonporous, ion-exchange particles. Bio IEX columns are designed for high resolution, high recovery and highly efficient separations.
Proteins, peptides and deprotected synthetic oligonucleotides	PL-SAX • 1000Å • 4000Å	The strong anion-exchange functionality, covalently linked to a fully porous chemically stable polymer, extends the operating pH range. In addition, the anion-exchange capacity is independent of pH. For synthetic oligonucleotides, separations using denaturing conditions of temperature, organic solvent, and high pH are all possible. The 5 µm media delivers separations at high resolution with the 30 µm media used for medium pressure liquid chromatography.
Globular proteins and peptides	PL-SAX 1000Å	
Very large biomolecules/high speed	PL-SAX 4000Å	
Small peptides to large proteins	PL-SCX • 1000Å • 4000Å	PL-SCX is a macroporous PS/DVB matrix with a very hydrophilic coating and strong cation-exchange functionality. This process is controlled to provide the optimum density of strong cation-exchange moieties for the analysis, separation and purification of a wide range of biomolecules. The 5 µm media delivers separations at higher resolution with the 30 µm media used for medium pressure liquid chromatography.
Globular proteins	PL-SCX 1000Å	
Very large biomolecules/high speed	PL-SCX 4000Å	
Antibodies (IgG, IgM), plasmid DNA, viruses, phages and other macro biomolecules	Bio-Monolith • Bio-Monolith QA • Bio-Monolith DEAE • Bio-Monolith SO_3 • Bio-Monolith Protein A	Strong cation-exchange, strong and weak anion-exchange, and Protein A phases. Bio-Monolith HPLC columns are compatible with preparative LC systems, including Agilent 1100 and 1200 HPLC systems.
Viruses, DNA, large proteins	Bio-Monolith QA	
Plasmid DNS, bacteriophages	Bio-Monolith DEAE	
Proteins, antibodies	Bio-Monolith SO_3	

Agilent Bio MAb HPLC Columns



- A packing support composed of a rigid, spherical, highly cross-linked polystyrene divinylbenzene (PS/DVB) non-porous bead
- Particles grafted with a hydrophilic, polymeric layer, virtually eliminating non-specific binding of antibody proteins
- A different process is used to layer the weak cation-exchange phase to the particle making it a higher density than the Agilent Bio WCX column particles
- Specifically designed for the separation of charge isoforms of monoclonal antibodies

Thorough characterization of monoclonal antibodies includes the identification and monitoring of acidic and basic isoforms. Agilent Bio MAb HPLC columns feature a unique resin specifically designed for high-resolution, charge-based separations of monoclonal antibodies. Compatible with aqueous solution buffers, acetonitrile/acetone/methanol and water mixtures. Commonly used buffers: phosphate, tris, MES and acetate.

Bio MAb columns are available in 1.7, 3, 5 and 10 µm sizes, providing higher resolution with smaller particles.

Column Specifications

Bonded Phase	ID	Particle Size	pH Stability	Operating Temperature Limit	Flow Rate
Weak Cation-Exchange (carboxylate)	2.1 and 4.6 mm	1.7, 3, 5 and 10 µm	2-12	80 °C	0.1-1.0 mL/min

TIPS & TOOLS

Capillary electrophoresis is an alternative technique to liquid chromatography for the separation of charged isoforms. Further information can be found in the following Technical Note:

Capillary electrophoreseis focusing on the Agilent Capillary Electrophoresis system (publication # 5989-9852EN)

www.agilent.com/chem/library

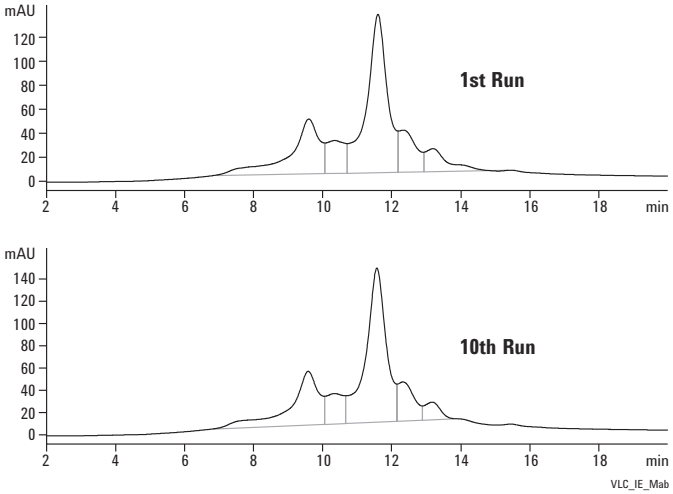


Consistent ion-exchange MAb separation

Column: **Bio MAb, PEEK**
5190-2411
2.1 x 250 mm, 5 µm

Buffer:	A: Sodium phosphate buffer, 20 mM B: Buffer A + 400 mM NaCl
Gradient:	15-35% Buffer B from 0-30 min
Flow Rate:	0.65 mL/min
Sample:	CHO-humanized MAb, 1 mg/mL
Injection:	2.5 µL
Detector:	UV 220 nm
Temperature:	Ambient

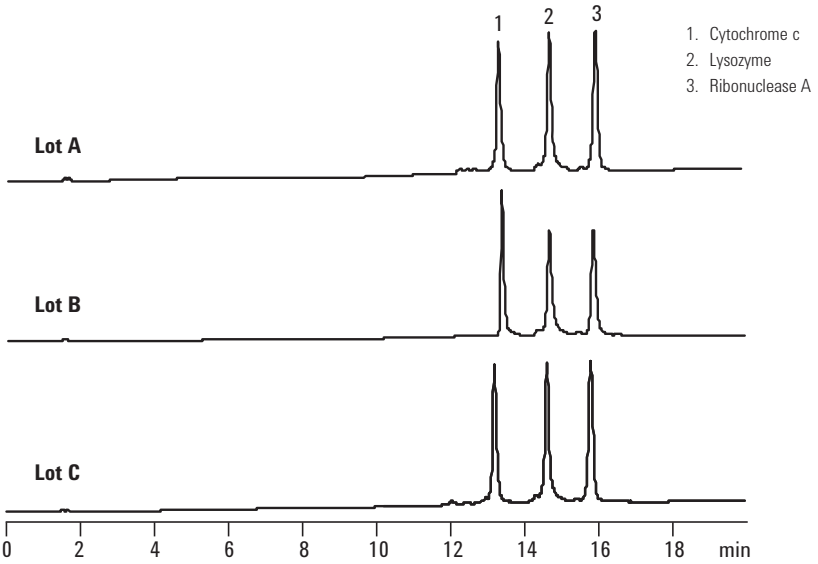
To provide a metal free flow path, Bio MAb PEEK columns are available.



Virtually eliminate retention time variations

Column: **Bio MAb, stainless steel**
5190-2413
4.6 x 250 mm, 10 µm

Mobile Phase:	A: 10 mM phosphate, pH 6.0 B: A + 1.0 M NaCl
Flow Rate:	1.0 mL/min
Gradient:	0-100% B in 42 min
Temperature:	25 °C
Detector:	UV 214 nm



The combination of well-controlled resin production, column surface chemistry, and column packing virtually eliminates retention time variations from column-to-column and lot-to-lot.

Charge isoform analysis of monoclonal antibodies

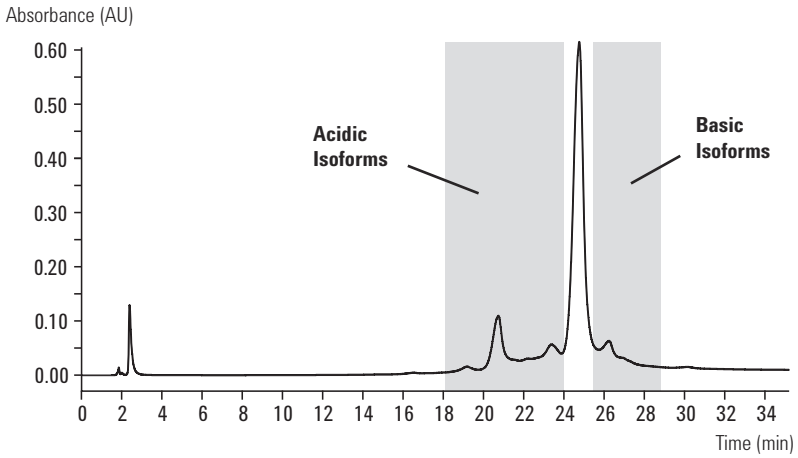
Column: **Bio MAb, PEEK 5190-2407 4.6 x 250 mm, 5 µm**

Mobile Phase: A: 10 mM Sodium Phosphate, pH 7.50
B: A + 100 mM NaCl, pH 7.50

Flow Rate: 0.8 mL/min

Gradient: 15-95% B in 60 min

Sample: 5 µL, 5 mg/mL, MAb



High resolution separation of acidic and basic charge variants using the Agilent Bio MAb NP5 column

Agilent Bio MAb HPLC Columns

Size (mm)	Particle Size (µm)	Bio MAb PEEK	Pressure Limit	Bio MAb Stainless Steel	Pressure Limit
4.6 x 250	10	5190-2415	275 bar, 4000 psi	5190-2413	275 bar, 4000 psi
4.6 x 50, Guard	10	5190-2416	275 bar, 4000 psi		
4.6 x 250	5	5190-2407	400 bar, 5800 psi	5190-2405	413 bar, 6000 psi
4.6 x 50, Guard	5	5190-2408	400 bar, 5800 psi		
4.6 x 50	3			5190-2403	551 bar, 8000 psi
4.6 x 50	1.7			5190-2401	600 bar, 8700 psi
4.0 x 10, Guard	10			5190-2414	275 bar, 4000 psi
4.0 x 10, Guard	5			5190-2406	413 bar, 6000 psi
4.0 x 10, Guard	3			5190-2404	551 bar, 8000 psi
4.0 x 10, Guard	1.7			5190-2402	600 bar, 8700 psi
2.1 x 250	10	5190-2419	275 bar, 4000 psi		
2.1 x 50, Guard	10	5190-2420	275 bar, 4000 psi		
2.1 x 250	5	5190-2411	400 bar, 5800 psi		
2.1 x 50, Guard	5	5190-2412	400 bar, 5800 psi		



Agilent Bio IEX HPLC Columns

- Highly cross-linked and rigid nonporous poly(styrene divinylbenzene) (PS/DVB) particles are grafted with a hydrophilic, polymeric layer, eliminating nonspecific binding
- Uniform, densely packed ion-exchange functional groups are chemically bonded to the hydrophilic layer (multiple ion-exchange groups per anchoring) to increase column capacity
- Particles, coating and bonding are resistant to high pressures, promoting higher resolution and faster separations
- Multiple ion-exchange groups are captured on one anchoring to increase capacity

Agilent Bio IEX HPLC columns are packed with polymeric, nonporous, ion-exchange particles and are designed for high resolution, high recovery and highly efficient separations of peptides, oligonucleotides and proteins.

The Bio IEX family offers strong cation-exchange (SCX), weak cation-exchange (WCX), strong anion-exchange (SAX) and weak anion-exchange (WAX) phases. All phases are available in 1.7, 3, 5 and 10 µm non-porous particles sizes.

Column Specifications

Bonded Phase	ID	Particle Size	pH Stability	Operating Temperature Limit	Flow Rate
SCX (Strong cation-exchange) - SO_3H	2.1 and 4.6 mm	1.7, 3, 5 and 10 µm	2-12	80 °C	0.1-1.0 mL/min
WCX (Weak cation-exchange) - COOH					
SAX (Strong anion-exchange) - $N(CH_3)_3$					
WAX (Weak cation-exchange) - $N(C_2H_5)_2$					

TIPS & TOOLS

More information is a click away. We have a variety of educational primers, application notes, maintenance guides, and literature available from Agilent for free.

To learn more, visit **www.agilent.com/chem/library**

Exceptional separating power

Column: **Agilent Bio SCX, stainless steel**
5190-2423
4.6 x 50 mm, 3 µm

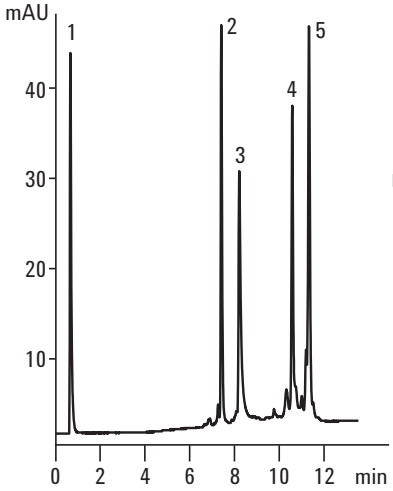
Buffer: 10 mM Phosphate, pH 6.0

Flow Rate: 0.5 mL/min

Gradient: 0-1.0 M NaCl, 15 min

Detector: 280 nm

The hydrophilic, polymeric layer and densely packed ion-exchange functional groups provide extremely sharp peak shapes and high resolution of a mixture of proteins with a broad range of isoelectric points (pI).



1. Ovalbumin, 4.6 pI
2. Ribonuclease A, 8.7 pI
3. Cytochrome c, 9.6 pI
4. Aprotinin, 10.0 pI
5. Lysozyme, 11.0 pI

N > 100,000/50 mm for Lysozyme

Separation of protein standards on Agilent 3 µm ion-exchange columns by cation-exchange chromatography

Column A: **Agilent Bio SCX, NP 3, 4.6 x 50 mm, SS**

Column B: **Agilent Bio WCX, NP 3, 4.6 x 50 mm, SS**

Column C: **Agilent Bio MAb, NP 3, 4.6 x 50 mm, SS**

Mobile Phase: A: 10 mM $NaH_2PO4.2H_2O$, pH 5.70
B: A + 1 M NaCl

Flow Rate: 0.5 mL/min

Gradient: 0 min - 100% A : 0% B
25 min - 0% A : 100% B

Temperature: Ambient

Detector: Agilent 1260 Infinity Bio-inert Quaternary LC with diode array detector at 220 nm

Sample: Cytochrome c, ribonuclease A, lysozyme and protein mix

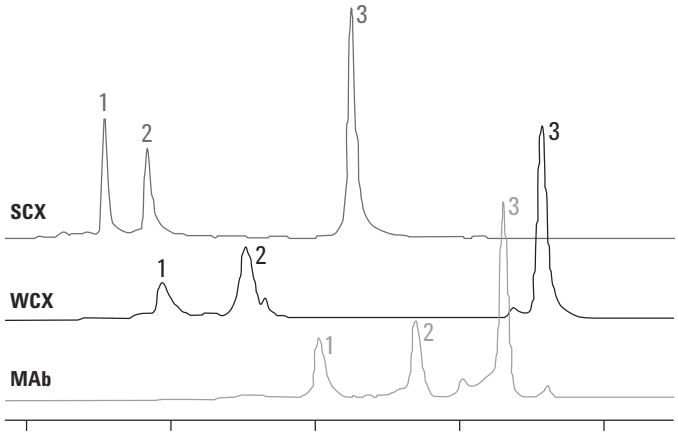


Illustration that Bio WCX, SCX and MAb columns are capable of producing protein separations

Agilent column	Peak number	Peak name	RT [min]	Height [mAU]	Area [mAU*s]	Plates	Width [min]	Resolution
Bio WCX NP, 3 µm	1	Cytochrome c	7.86	124	1833	7844	0.2089	-
	2	RNase A	9.03	241	3358	10800	0.2044	3.32
	3	Lysozyme	13.13	636	7274	44488	0.1466	13.73
Bio SCX NP, 3 µm	1	RNase A	7.06	396	2616	39847	0.0832	-
	2	Cytochrome c	7.66	297	2778	28920	0.1060	1.08
	3	Lysozyme	10.49	763	7186	44828	0.1167	1.37
Bio MAb NP, 3 µm	1	Cytochrome c	10.04	203	2369	21814	0.1600	-
	2	RNase A	11.37	256	2690	33314	0.1467	3.11
	3	Lysozyme	12.59	652	6616	56734	0.1244	5.28

Weak cation-exchange chromatography for P128 therapeutic protein sample on the Agilent 1260 Bio-inert Quaternary LC system using different cation-exchange columns

Column A: **Bio MAb, PEEK**
5190-2407
4.6 x 250 mm, 5 µm

Column B: **Bio MAb, PEEK**
5190-2415
4.6 x 250 mm, 10 µm

Column C: **Brand B WCX-10**
4.0 x 250 mm, 10 µm

Mobile Phase: A: 20 mM sodium phosphate (pH = 6.0)
B:20 mM sodium phosphate (pH = 6.0) containing 1.0 M sodium chloride

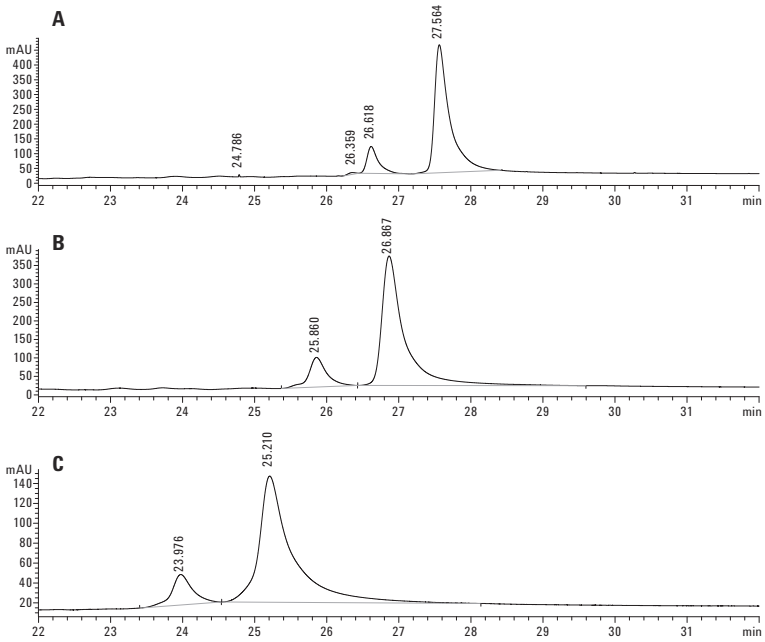
Flow Rate: 0.5 mL/min

Gradient: 10% B 0 min, 35% B 35 min, 10% B 36 min, 10% B 45 min

Detector: UV, 220 nm/4 nm, Reference: Off (data also acquired at 220, 230, 240, and 280 nm)

Sample: P128

Sample was desalted by ultrafiltration and extracted into 20 mM sodium phosphate.



Agilent Bio IEX HPLC Columns, PEEK

Size (mm)	Particle Size (µm)	Pressure Limit	Bio SCX Part No.	Bio WCX Part No.	Bio SAX Part No.	Bio WAX Part No.
4.6 x 250	10	275 bar, 4000 psi	5190-2435	5190-2455	5190-2475	5190-2495
4.6 x 50, Guard	10	275 bar, 4000 psi	5190-2436	5190-2456	5190-2476	5190-2496
4.6 x 250	5	400 bar, 5800 psi	5190-2427	5190-2447	5190-2467	5190-2487
4.6 x 50, Guard	5	400 bar, 5800 psi	5190-2428	5190-2448	5190-2468	5190-2488
2.1 x 250	10	275 bar, 4000 psi	5190-2439	5190-2459	5190-2479	5190-2499
2.1 x 50, Guard	10	275 bar, 4000 psi	5190-2440	5190-2460	5190-2480	5190-2500
2.1 x 250	5	400 bar, 5800 psi	5190-2431	5190-2451	5190-2471	5190-2491
2.1 x 50, Guard	5	400 bar, 5800 psi	5190-2432	5190-2452	5190-2472	5190-2492

Agilent Bio IEX HPLC Columns, Stainless Steel

Size (mm)	Particle Size (µm)	Pressure Limit	Bio SCX Part No.	Bio WCX Part No.	Bio SAX Part No.	Bio WAX Part No.
4.6 x 250	10	275 bar, 4000 psi	5190-2433	5190-2453	5190-2473	5190-2493
4.6 x 250	5	413 bar, 6000 psi	5190-2425	5190-2445	5190-2465	5190-2485
4.6 x 50	3	551 bar, 8000 psi	5190-2423	5190-2443	5190-2463	5190-2483
4.6 x 50	1.7	600 bar, 8700 psi	5190-2421	5190-2441	5190-2461	5190-2481
4.0 x 10, Guard	10	275 bar, 4000 psi	5190-2434	5190-2454	5190-2474	5190-2494
4.0 x 10, Guard	5	413 bar, 6000 psi	5190-2426	5190-2446	5190-2466	5190-2486
4.0 x 10, Guard	3	551 bar, 8000 psi	5190-2424	5190-2444	5190-2464	5190-2484
4.0 x 10, Guard	1.7	275 bar, 4000 psi	5190-2422	5190-2442	5190-2462	5190-2482



PL-SAX Strong Anion-Exchange Columns

- Small particles deliver excellent chromatographic performance
- Wide range of particle sizes and 2 pore sizes for flexible analysis to scale-up purification
- Exceptional stability for long column lifetime

PL-SAX -$N(CH_3)_3^+$ is ideal for the anion-exchange HPLC separations of proteins, peptides and deprotected synthetic oligonucleotides under denaturing conditions. The strong anion-exchange functionality, covalently linked to a chemically stable fully porous polymer, extends the operating pH range. In addition, the anion-exchange capacity is independent of pH. For synthetic oligonucleotides, separations using denaturing conditions of temperature, organic solvent, and high pH are all possible. PL-SAX delivers improved chromatography for self-complementary or G-rich sequences that may associate to form aggregates or hairpin structures. The 5 µm material provides high efficiency separations of n and n-1 sequences. A wide range of particle sizes and column geometries permits analysis scale-up to purification. The strong anion-exchange functionality provides a material with exceptional chemical and thermal stability, even with sodium hydroxide eluents, leading to long column lifetime.

Column Specifications

Bonded Phase	ID (mm)	Particle Size (µm)	Pore Size	pH Stability	Operating Temperature Limit
Strong Anion-Exchange	2.1, 4.6, 7.5, 25, 50 and 100	5, 8, 10 and 30	1000Å and 4000Å	1-14	80 °C

Standard ion-exchange protein separation

Column: **PL-SAX 1000Å**
PL1551-1502
4.6 x 50 mm, 5 µm

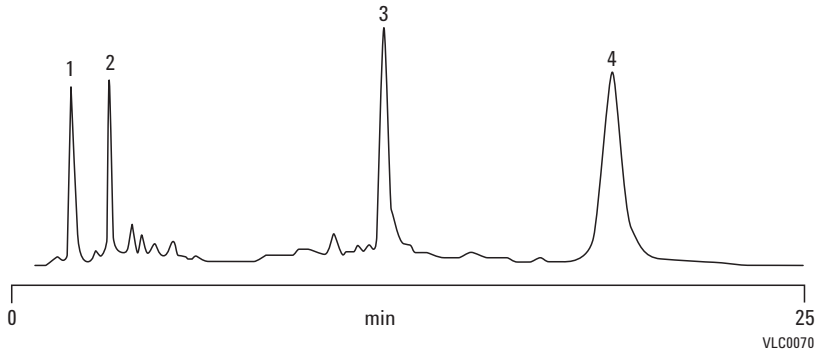
Mobile Phase: A: 10 mM Tris HCl pH 8
B: A+0.35 M NaCl pH 8

Gradient: 0-100% B in 20 min

Flow Rate: 1.0 mL/min

Detector: UV, 220 nm

1. Myoglobin
2. Bovine carbonic anhydrase
3. Ovalbumin
4. Soybean trypsin inhibitor



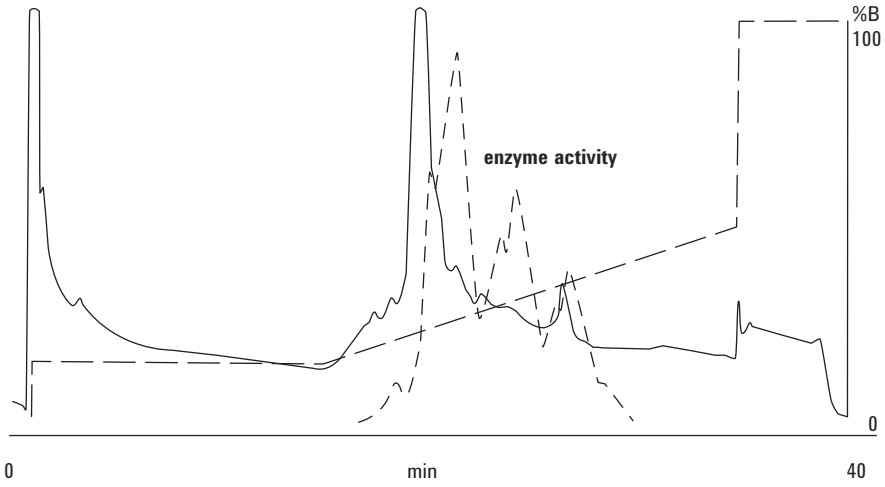
Analysis of choline kinase on PL-SAX 4000Å

Column: **PL-SAX**
PL1551-1803
4.6 x 50 mm, 8 µm

Mobile Phase: A: 20 mM Tris 5% ethylene glycol, pH 7.5
(The following are required to retain enzyme activity)
1.0 mM Ethylene glycol tetraacetic acid
2.0 mM ß-Mercaptoethanol
0.2 mM Phenylmethylsulfonyl fluoride
B: A + 1 M KCl

Flow Rate: 3.0 mL/min

Detector: UV, 280 nm



Separation courtesy of T Porter, Purdue University, USA

Analysis of representative whey proteins

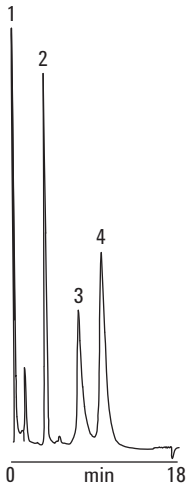
Column: **PL-SAX 1000Å**
PL1551-1802
4.6 x 50 mm, 8 µm

Mobile Phase: A: 0.02 M Tris HCl, pH 7
B: A + 0.5 M CH_3COONa, pH 7

Flow Rate: 1.0 mL/min

Gradient: Linear 0-50% B in 10 min

Detector: UV, 280 nm



1. Carbonic anhydrase
2. α-lactalbumin
3. β-lactoglobulin B
4. β-lactoglobulin A

High resolution separation of a Poly-T-Oligonucleotide size standard spiked with 10-mer, 15-mer, 30-mer and 50-mer (main peaks)

Column: **PL-SAX 1000Å**
PL1551-1802
4.6 x 50 mm, 8 µm

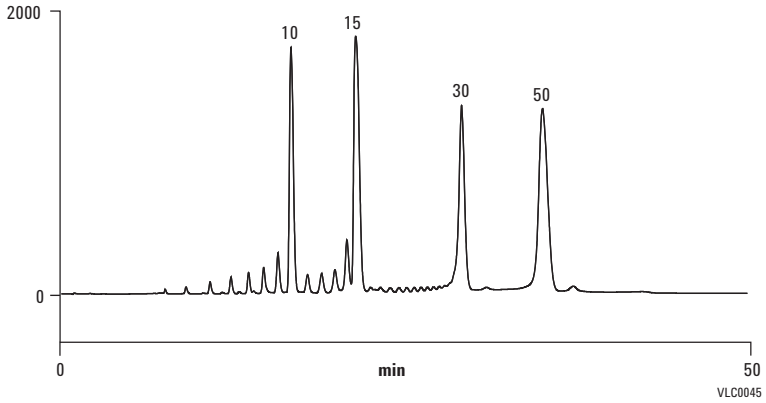
Mobile Phase: A: 7:93 v/v ACN: 0.1 M TEAA, pH 8.5
B: 7:93 v/v ACN: 0.1 M TEAA,
1 M ammonium chloride, pH 8.5

Gradient: 0-40% B in 10 min, followed by
40-70% B in 14 min and
70-100% B in 25 min

Flow Rate: 1.5 mL/min

Temperature: 60 °C

Detector: UV, 220 nm

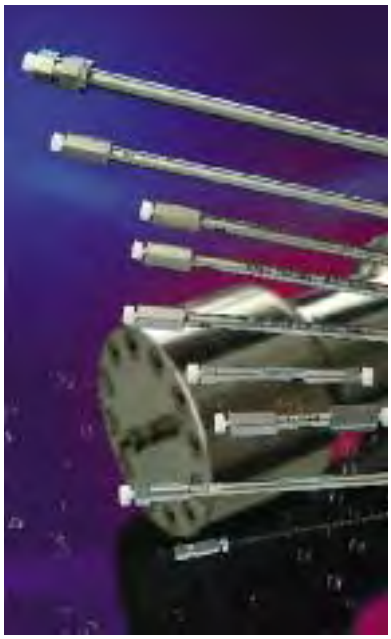


PL-SAX Strong Anion-Exchange Columns

Size (mm)	Particle Size (µm)	Pressure Limit	PL-SAX 1000Å	PL-SAX 4000Å
1.0 x 50	5	207 bar, 3000 psi	PL1351-1502	PL1351-1503
2.1 x 50	5	207 bar, 3000 psi	PL1951-1502	PL1951-1503
4.6 x 50	5	207 bar, 3000 psi	PL1551-1502	PL1551-1503
2.1 x 50	8	207 bar, 3000 psi	PL1951-1802	PL1951-1803
2.1 x 150	8	207 bar, 3000 psi	PL1951-3802	PL1951-3803
4.6 x 50	8	207 bar, 3000 psi	PL1551-1802	PL1551-1803
4.6 x 150	8	207 bar, 3000 psi	PL1551-3802	PL1551-3803
4.6 x 250	10	207 bar, 3000 psi	PL1551-5102	PL1551-5103
4.6 x 150	10	207 bar, 3000 psi	PL1551-3102	PL1551-3103
25 x 50	10	207 bar, 3000 psi	PL1251-1102	PL1251-1103
25 x 150	10	207 bar, 3000 psi	PL1251-3102	PL1251-3103
50 x 150	10	207 bar, 3000 psi	PL1751-3102	PL1751-3103
100 x 300	10	207 bar, 3000 psi	PL1851-2102	PL1851-2103
4.6 x 250	30	207 bar, 3000 psi	PL1551-5702	PL1551-5703
4.6 x 150	30	207 bar, 3000 psi	PL1551-3702	PL1551-3703
25 x 150	30	207 bar, 3000 psi	PL1251-3702	PL1251-3703
50 x 150	30	207 bar, 3000 psi	PL1751-3702	PL1751-3703
100 x 300	30	207 bar, 3000 psi	PL1851-3102	PL1851-3103

PL-SAX Strong Anion-Exchange Bulk Media

Size	Particle Size (µm)	PL-SAX 1000Å	PL-SAX 4000Å
100 g	10	PL1451-4102	PL1451-4103
1 kg	10	PL1451-6102	PL1451-6103
100 g	30	PL1451-4702	PL1451-4703
1 kg	30	PL1451-6702	PL1451-6703



PL-SCX Strong Cation-Exchange Columns

- Optimal design for effective separation of biomolecules
- Pore sizes allow use of a range of solute sizes
- Exceptional stability for long column lifetime

PL-SCX -SO_3^- is a macroporous PS/DVB matrix with a very hydrophilic coating and strong cation-exchange functionality. This process is controlled to provide the optimum density of strong cation-exchange moieties for the analysis, separation and purification of a wide range of biomolecules, from small peptides to large proteins. Two pore sizes are available, 1000Å and 4000Å, to provide good mass transfer characteristics for a range of solute sizes. The 5 µm media delivers separations at higher resolution with the 30 µm media used for medium pressure liquid chromatography.

Column Specifications

Bonded Phase	ID (mm)	Particle Size (µm)	Pore Size	pH Stability	Operating Temperature Limit
Strong Cation-Exchange	2.1, 4.6, 7.5, 25, 50 and 100	5, 8, 10 and 30	1000Å and 4000Å	1-14	80 °C

Standard protein separation

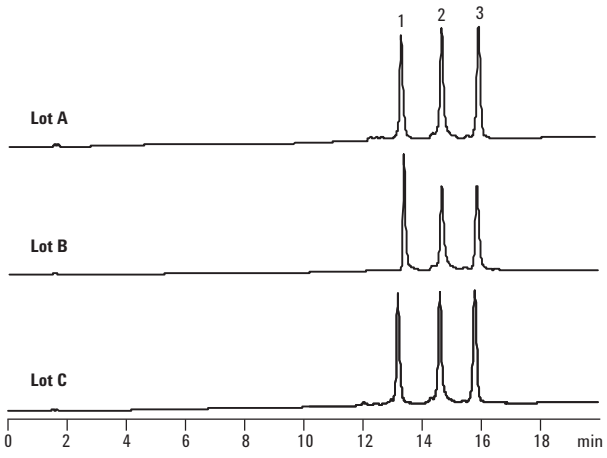
Column: **PL-SCX 1000Å**
PL1545-1502
4.6 x 50 mm, 5 µm

Mobile Phase: A: 20 mM KH_2PO_4, pH 6.0
B: A + 1 M NaCl

Gradient: 0-100% B in 20 min

Flow Rate: 1.0 mL/min

Detector: UV, 280 nm



1. Myoglobin
2. Chymotrypsinogen A
3. Cytochrome c
4. Lysozyme

PL-SCX Strong Cation-Exchange Columns

Size (mm)	Particle Size (µm)	Pressure Limit	PL-SCX 1000Å	PL-SCX 4000Å
1.0 x 50	5	207 bar, 3000 psi	PL1345-1502	PL1345-1503
2.1 x 50	5	207 bar, 3000 psi	PL1945-1502	PL1945-1503
4.6 x 50	5	207 bar, 3000 psi	PL1545-1502	PL1545-1503
2.1 x 50	8	207 bar, 3000 psi	PL1945-1802	PL1945-1803
2.1 x 150	8	207 bar, 3000 psi	PL1945-3802	PL1945-3803
4.6 x 50	8	207 bar, 3000 psi	PL1545-1802	PL1545-1803
4.6 x 150	8	207 bar, 3000 psi	PL1545-3802	PL1545-3803
4.6 x 150	10	207 bar, 3000 psi	PL1545-3102	PL1545-3103
4.6 x 250	10	207 bar, 3000 psi	PL1545-5102	PL1545-5103
25 x 50	10	207 bar, 3000 psi	PL1245-1103	PL1245-1103
25 x 150	10	207 bar, 3000 psi	PL1245-3103	PL1245-3103
50 x 150	10	207 bar, 3000 psi	PL1745-3103	PL1745-3103
100 x 300	10	207 bar, 3000 psi	PL1845-2103	PL1845-2103
4.6 x 150	30	207 bar, 3000 psi	PL1545-3702	PL1545-3703
4.6 x 250	30	207 bar, 3000 psi	PL1545-5703	PL1545-5703
25 x 150	30	207 bar, 3000 psi	PL1245-3702	PL1245-3703
50 x 150	30	207 bar, 3000 psi	PL1745-3703	PL1745-3703
100 x 300	30	207 bar, 3000 psi	PL1845-3102	PL1845-3103

PL-SCX Strong Cation-Exchange Bulk Media

Size	Particle Size (µm)	PL-SCX 1000Å	PL-SCX 4000Å
100 g	10	PL1445-4102	PL1445-4102
1 kg	10	PL1445-6102	PL1445-6103
100 g	30	PL1445-4702	PL1445-4703
1 kg	30	PL1445-6702	PL1445-6703



Bio-Monolith Ion-Exchange HPLC Column

Agilent Bio-Monolith Ion-Exchange HPLC Columns

- Polymer-based, monolith HPLC columns designed for macro biomolecule separations
- Flow-rate independent separations; no diffusion, no pores and no void volume make transport between mobile and stationary phase very rapid
- Monolith disk is 5.2 mm x 4.95 mm (100 µL column volume) with continuous channels, eliminating diffusion mass transfer
- Extremely fast separations speed up method development time and decrease costs; locking in method parameters takes significantly less time and buffer

Agilent Bio-Monolith Ion-Exchange HPLC columns provide high resolution and rapid separations of antibodies (IgG, IgM), plasmid DNA, viruses, phages and other macro biomolecules. The product family offers strong cation-exchange, strong and weak anion-exchange and Protein A phases. Bio-Monolith HPLC columns are compatible with HPLC and preparative LC systems, including Agilent 1100 and 1200 HPLC systems.

Agilent Bio-Monolith HPLC Column Selection Guide

Column	Description	Key Applications	Part No.
Bio-Monolith QA	The quaternary amine bonded phase (Strong Anion-Exchange) is fully charged over a working pH range of 2-13, binding negatively charged biomolecules.	• Adenovirus process monitoring and quality control • IgM purification monitoring and quality control • Monitoring DNA impurity removal • Monitoring endotoxin removal • HSA Purity	5069-3635
Bio-Monolith DEAE	The diethylaminoethyl bonded phase (Weak Anion-Exchange) offers increased selectivity of biomolecules with negative charge over a working pH range of 3-9.	• Process monitoring and quality control of bacteriophage manufacturing and purification • Process monitoring and quality control of plasmid DNA purification	5069-3636
Bio-Monolith SO_3	The sulfonyl bonded phase (Strong Cation-Exchange) is fully charged over a working pH range of 2-13, binding positively charged biomolecules.	• Fast and high resolution analytical separations of large molecules such as proteins and antibodies • Hemoglobin A1c fast analytics	5069-3637

TIPS & TOOLS

Agilent also offers a Protein A Bio-Monolith column for affinity chromatography. For more information, see pages 434-436.

Column Specifications	
Dimensions	5.2 mm x 4.95 mm
Column volume	100 µL
Maximum pressure	150 bar (15 MPa, 2200 psi)
Temperature min/max	Working: 4-40 °C
	Storage: 4-30 °C
Recommended pH	Working range: 2-13
	Cleaning-in-place: 1-14
Materials of construction	Hardware: Stainless steel
	Packing: poly(glycidyl methacrylate-co-ethylene dimethacrylate) highly porous monolith
Color ring identifier	Bio-Monolith QA: Blue
	Bio-Monolith DEAE: Green
	Bio-Monolith SO_3: Red
Shelf life/expiration date	SO_3, QA, DEAE: 24-36 months

Baseline expansion of a separation of protein standards

Column: **Agilent Bio-Monolith CM15, 5.5 x 15 mm**

Mobile Phase: A: 10 mM Na_2HPO_4, pH 6.0
B: A + 0.5 M NaCl or just 0.5 M Na_2HPO_4, pH 6.0

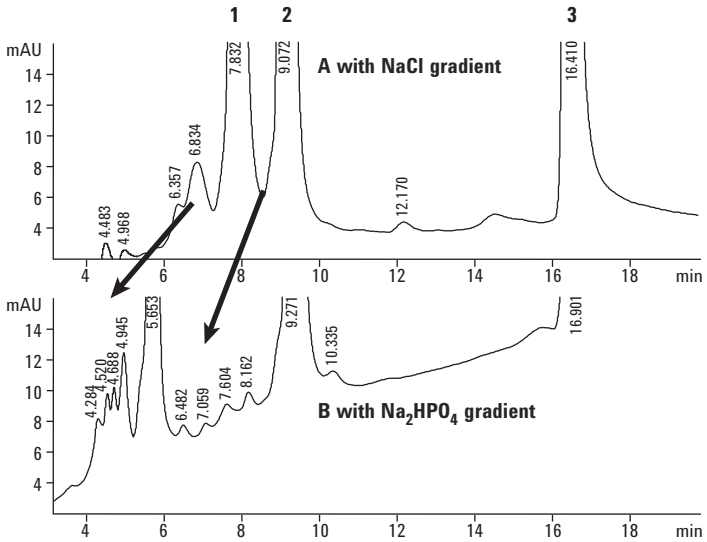
Flow Rate: 2 mL/min

Gradient: 0.5 min hold with mobile phase A followed by a linear gradient to 45% B in 15 min (elapsed time 15.5 min); then 60% B at 15.6 min continued to 20 min. Column flushed with 100% B for 15 min before re-equilibration for the next run.
pH Gradient: A: 5 mM Na_2HPO_4, buffer pH 5.5 and B: 40 mM NA_2HPO_4 (not buffered, pH 8.9). 2% B/min at 1 mL/min for 15 min, followed by a column wash with 90% B for 5 min.

Detector: UV at 220 nm

Sample: One mg each/mL in mobile phase A.
1. RNAse from bovine pancreas (pI 9.6)
2. Cytochrome c from bovine heart (pI 10.37-10.8)
3. Lysozyme from chicken egg (pI 11.35) (0.5 mg)

Instrument: Agilent 1200 SL with diode array detector



B shows a better resolution of protein contaminants.

Bio-Monolith DEAE column monitors phage production during fermentation

Column: **DEAE**
5069-3636
5.2 x 4.95 mm

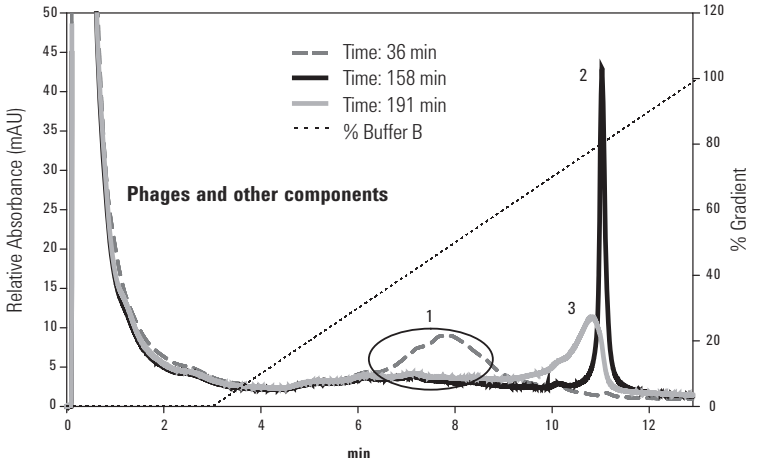
Mobile Phase: A: 125 mM Phosphate buffer, pH 7.0
B: 125 mM Phosphate buffer + 1 M NaCl, pH 7.0

Flow Rate: 1 mL/min

Gradient: 100% buffer A (2.5 min)
0-100% buffer B (10 min)
100% buffer A (2 min)

Detector: UV at 280 nm

Instrument: High pressure gradient HPLC system, Agilent 1200 Infinity LC



As phage proliferation progresses, the genomic DNA (gDNA) concentration increases as the host cells are being lysed. In the late stages of fermentation, gDNA begins to degrade into fragments. These gDNA fragments cannot be easily removed by purification media, therefore it is critical to stop the fermentation cycle prior to the degradation of the genomic DNA. The chromatogram above represents three samples taken from the bioreactor at 36, 158 and 191 minutes. Peak 1 represents phage, media and host cells, peak 2 the intact gDNA and peak 3 the fragmented gDNA.





Size Exclusion Chromatography (SEC)

Accurately determine biomolecule aggregation, fragmentation, and chemical ligation/modification

Size exclusion chromatography (SEC) is a technique for separating proteins, oligonucleotides, and other complex biopolymers by size using aqueous eluents.

Applying SEC to aggregation studies

The size, type, and content of aggregates present in protein biopharmaceuticals can affect both efficacy and formulation – or worse, induce an immunogenic response. Aggregation formations occur through a variety of mechanisms, including disulfide bond formation and non-covalent interactions.

Because the size of protein aggregates, including dimers, is sufficiently different from the protein monomer, you can separate the various forms using SEC. In fact, SEC with UV or light scattering is a standard technique for quantifying protein aggregation.

Applying SEC to quantitation and molecular weight determination

For proteins and other molecules of discreet molecular weight, SEC can be used to detect and quantitate monomers, dimers, aggregates and fragments. SEC can also separate oligonucleotide mixtures.

For biopolymers of varying sizes, like starches and other polysaccharides, SEC can provide data on molecular weight distribution and branching (with the proper detectors).

As a leading manufacturer of SEC columns and instruments for over 30 years, Agilent is continually developing new SEC products that will provide even higher resolution and quicker separations. This section highlights Agilent's broad family of SEC columns for protein biopolymer analysis:

- **Bio SEC-3 and Bio SEC-5 columns** are available in a variety of pore sizes, and are well suited for protein analysis – especially when determining the presence of dimers and aggregates in therapeutic biologicals. Note that 3 µm Bio SEC-3 columns provide higher resolution than our industry-standard 5 µm Bio SEC-5 columns.
- **ProSec 300S columns** work well with globular proteins under high salt conditions.
- **ZORBAX GF-250 and GF-450 columns** are best for preparative SEC of proteins, because of their larger column size and higher flow rates.
- **PL aquagel-OH columns** can be used to analyze biopolymers of broad molecular weights, such as PEGs, oligo- and polysaccharides, starches, and gums.

Size Exclusion Chromatography (SEC)

Application	Agilent Columns	Notes
Peptides, proteins	Agilent Bio SEC-3	Higher resolution and faster separations from 3 µm particles, with 100Å, 150Å, and 300Å pore sizes.
Large biomolecules and samples with multiple molecular weight components	Agilent Bio SEC-5	More pore size options (100Å, 150Å, 300Å, 500Å, 1000Å, and 2000Å) to cover a wider range of analytes.
Globular proteins, antibodies	ProSEC 300S	Single column option for protein analysis in high salt conditions.
Proteins, globular proteins	ZORBAX GF-250/450	Higher flow rate capabilities and larger column size for SEC semi-prep and prep.
Low MW polymers and oligomers, oligosaccharides, PEGs, lignosulfonates	2 or 3 PL aquagel-OH • PL aquagel-OH 8 µm • PL aquagel-OH 20 5 µm • PL aquagel-OH MIXED-M 8 µm	The PL aquagel-OH analytical series has a pH range of 2-10, compatibility with organic solvent (up to 50% methanol), mechanical stability up to 140 bar (2030 psi), and low column operating pressures.
Polydisperse biopolymers, polysaccharides, cellulose derivatives	2 or 3 PL aquagel-OH • PL aquagel-OH MIXED-H 8 µm • PL aquagel-OH 60/50/40 8 µm	
Very high MW polymers, hyaluronic acids, starches, gums	PL aquagel-OH 60/50/40 15 µm in series	



Agilent Bio SEC-3

- Exceptional loading capacity, stability, and reproducibility for size-based biomolecule separations
- Sharper peaks, higher resolution, and better protein recovery
- Faster separations than large-particle SEC columns
- Compatibility with most aqueous buffers
- Excellent stability in high-salt and low-salt conditions

Agilent Bio SEC-3 HPLC columns are a breakthrough technology for size exclusion chromatography (SEC). They are packed with spherical, narrowly dispersed 3 µm silica particles coated with a proprietary hydrophilic layer. This thin polymeric layer is chemically bonded to pure, mechanically stable silica under controlled conditions, ensuring a highly efficient size exclusion particle.

Agilent Bio SEC-3 HPLC columns are available in 100Å, 150Å and 300Å pore sizes to accommodate most peptide and protein size exclusion separations.

Column Specifications

Pore Size	Particle Size	MW Range	pH Range	Max Pressure	Flow Rate
100Å	3 µm	100-100,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
150Å	3 µm	500-150,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
300Å	3 µm	5,000-1,250,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)

TIPS & TOOLS

Deactivated/silanized vials have inert surfaces that will not interact with metals, biologicals or proteins, and will not cause pH shifts. Avoid standard polypropylene vials for biological or light-sensitive compounds.

Calibration curves – Bio SEC-3

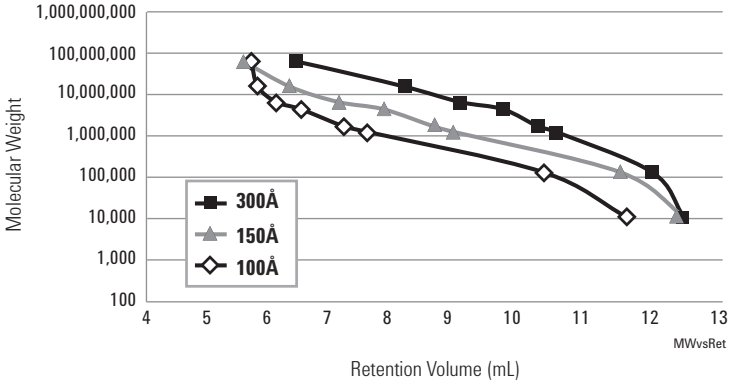
Column: **Bio SEC-3**
7.8 x 300 mm, 3 µm

Mobile Phase: 150 mM Na phosphate, pH 7.0

Flow Rate: 1.0 mL/min

Detector: UV

Proteins	MWt	300Å	150Å	100Å
Thyroglobulin	670000	6.34	5.50	5.63
Gamma globulin	158000	8.03	6.24	5.74
BSA	67000	8.90	7.00	6.03
Ovalbumin	45000	9.57	7.70	6.41
Myoglobin	17000	10.12	8.50	7.10
Ribonuclease A	12700	10.40	8.80	7.46
Vitamin B-12	1350	11.90	11.40	10.20



Intact MAb monomer and dimer separation

Column: **Bio SEC-3, 300Å**
5190-2511
7.8 x 300 mm, 3 µm

Buffer: Sodium phosphate buffer, pH 7.0, 150 mM

Isocratic: 0-100% Buffer A from 0-30 min

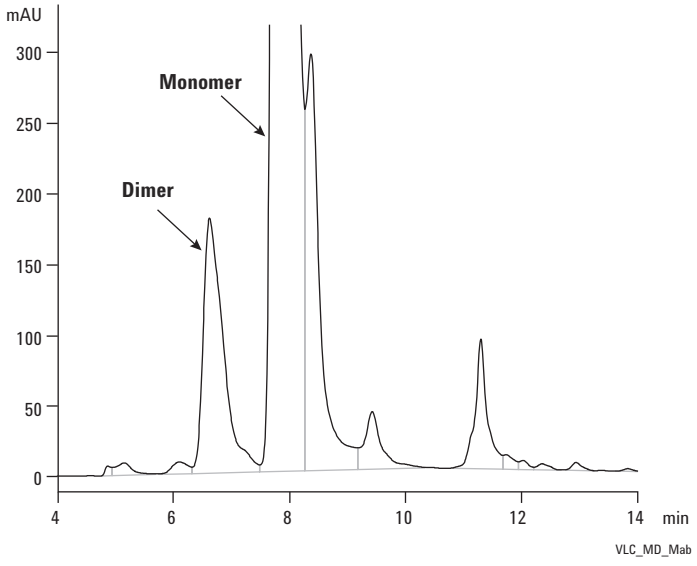
Flow Rate: 1.0 mL/min

Sample: CHO-humanized MAb, 5 mg/mL – intact

Injection: 5 µL

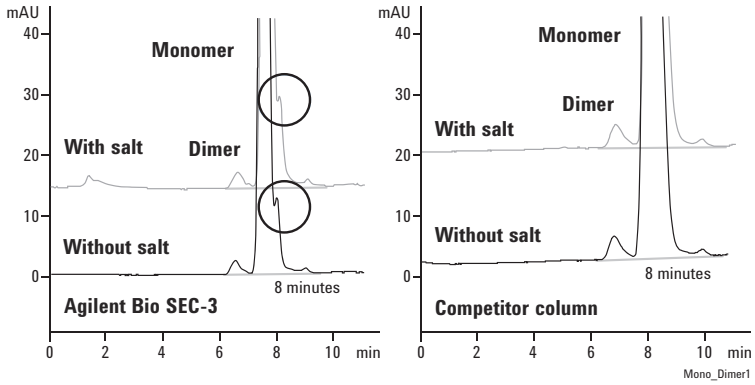
Detector: UV 220 nm

Temperature: Ambient



Comparison of Agilent Bio SEC-3 and competitor column in the analysis of a monoclonal antibody

Column:	**Bio SEC-3, 300Å 5190-2511 7.8 x 300 mm, 3 µm**
Column:	Competitor 7.8 x 300 mm
Mobile Phase:	150 mM sodium phosphate + 100 mM Na sulfate (with salt) 150 mM sodium phosphate (without salt)
Flow Rate:	1.0 mL/min
Detector:	UV, 220 nm
Sample:	MAb (2 mg/mL)



The Agilent Bio SEC-3 column reveals the presence of smaller MW species missed by the competitor column.

Monoclonal Antibody Monomer and Dimer Analysis using Agilent Bio SEC-3 and a Competitor Column

Eluent	Column	Resolution Ratio Monomer:Dimer	Monomer Efficiency	Percentage Dimer
With salt	Agilent	2.04	7,518	0.59
With salt	Competitor	1.88	3,967	0.59
Without salt	Agilent	2.08	7,942	0.60
Without salt	Competitor	1.92	4,164	0.57

Pore Size Choice

The choice of media pore size will influence the resolution in SEC. As the separation is based on differences in molecular size in solution, the sample must be able to permeate the porous structure of the particles – if the pore size is too small, the samples will be excluded from the pores and elute in the void volume of the column, and if too large then, all will be able to fully permeate the particles and so there will be very little separation.

Pore size choice: Proteins

Column A: **Bio SEC-3, 100Å**
5190-2503
4.6 x 300 mm, 3 µm

Column B: **Bio SEC-3, 150Å**
5190-2508
4.6 x 300 mm, 3 µm

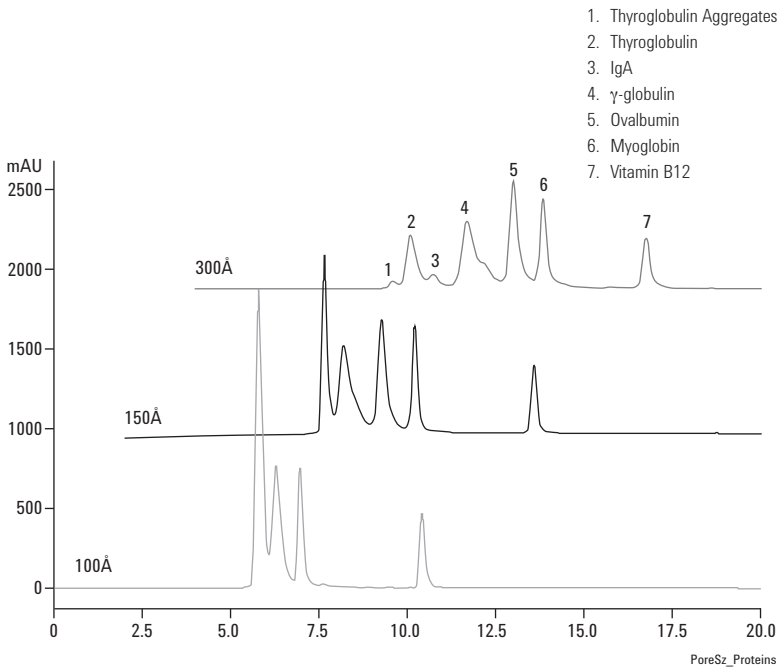
Column C: **Bio SEC-3, 300Å**
5190-2513
4.6 x 300 mm, 3 µm

Mobile Phase: 50 mM Na_2HPO_4, 50 mM NaH_2PO_4 + 0.15 M NaCl, pH 6.8

Flow Rate: 0.35 mL/min

Detector: UV, 220 nm

Sample: BioRad Gel Filtration Standards Mix



Pore size choice: Mouse IgG

Column A: **Bio SEC-3, 100Å**
5190-2503
4.6 x 300 mm, 3 µm

Column B: **Bio SEC-3, 150Å**
5190-2508
4.6 x 300 mm, 3 µm

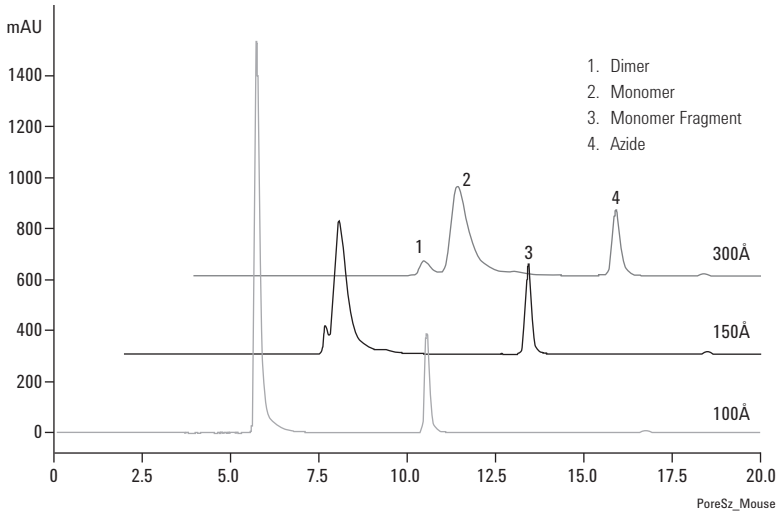
Column C: **Bio SEC-3, 300Å**
5190-2513
4.6 x 300 mm, 3 µm

Mobile Phase: 50 mM Na_2HPO_4, 50 mM NaH_2PO_4 + 0.15 M NaCl, pH 6.8

Flow Rate: 0.35 mL/min

Detector: UV, 220 nm

Sample: Mouse IgG

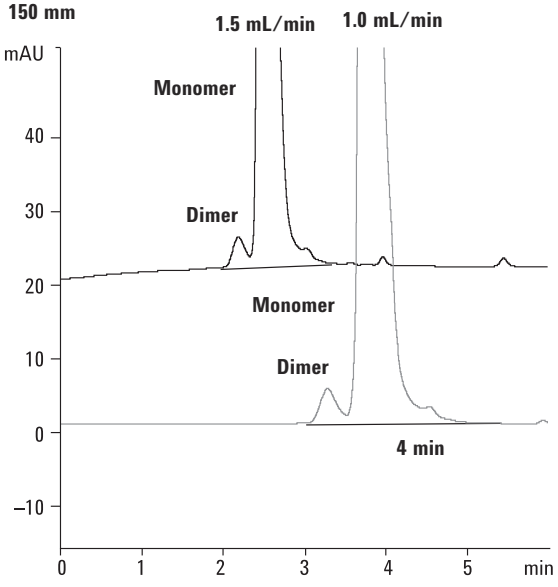


Column Length

Where the separation time is a critical parameter, shorter columns packed with the higher efficiency, 3 µm media are used. With the shorter columns, higher flow rates are used to reduce the analysis time but without compromising the quality of the data – quantitation of monoclonal antibody monomer and dimer.

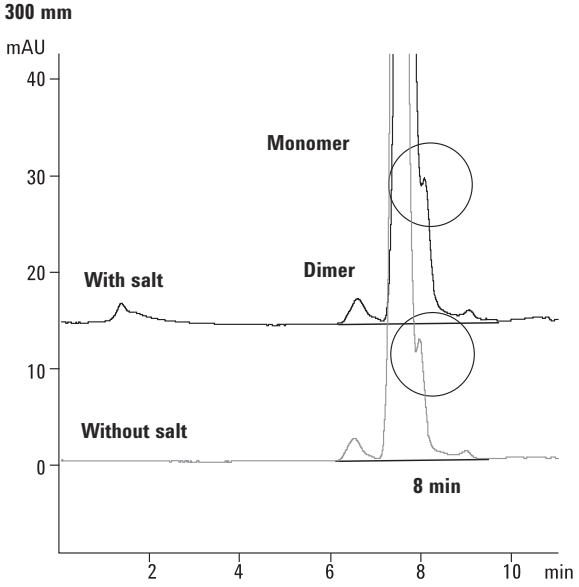
Agilent Bio SEC-3 column length comparison, 150 mm

Column:	**Bio SEC-3, 300Å** **5190-2512** **7.8 x 150 mm, 3 µm**
Mobile Phase:	150 mM sodium phosphate
Flow Rate:	1.0 mL/min (56 bar), 1.5 mL/min (75 bar)
Detector:	UV, 220 nm
Sample:	MAb (2 mg/mL)



Agilent Bio SEC-3 column length comparison, 300 mm

Column:	**Bio SEC-3, 300Å** **5190-2511** **7.8 x 300 mm, 3 µm**
Mobile Phase:	150 mM sodium phosphate + 100 mM Na sulfate (with salt) 150 mM sodium phosphate (without salt)
Flow Rate:	1.0 mL/min
Detector:	UV, 220 nm
Sample:	MAb (2 mg/mL)



Agilent Bio SEC-3

Size (mm)	Particle Size (µm)	Bio SEC-3 100Å USP L33	Bio SEC-3 150Å USP L33	Bio SEC-3 300Å USP L33
7.8 x 300	3	5190-2501	5190-2506	5190-2511
7.8 x 150	3	5190-2502	5190-2507	5190-2512
4.6 x 300	3	5190-2503	5190-2508	5190-2513
4.6 x 150	3	5190-2504	5190-2509	5190-2514
7.8 x 50, Guard	3	5190-2505	5190-2510	5190-2515



Agilent Bio SEC-5



- Maximum recovery for a broad range of size-based, biomolecule separations
- Outstanding reproducibility and column lifetime
- Excellent stability, even under high-pH, high-salt, and low-salt conditions
- Compatibility with most aqueous buffers

Agilent Bio SEC-5 HPLC columns are packed with 5 µm silica particles coated with a proprietary, neutral, hydrophilic layer for maximum efficiency and stability. Our specially designed packing also provides high pore volume, improving both peak capacity and resolution.

Bio SEC-5 columns are available in 5 µm particles with 100Å, 150Å, 300Å, 500Å, 1000Å, and 2000Å nominal pore sizes.

Column Specifications

Pore Size	Particle Size	MW Range	pH Range	Max Pressure	Flow Rate
100Å	5 µm	100-100,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
150Å	5 µm	500-150,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
300Å	5 µm	5,000-1,250,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
500Å	5 µm	15,000-5,000,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
1000Å	5 µm	50,000-7,500,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)
2000Å	5 µm	>10,000,000	2-8.5	240 bar, 3500 psi	0.1-1.25 mL/min (7.8 mm id)
					0.1-0.4 mL/min (4.6 mm id)

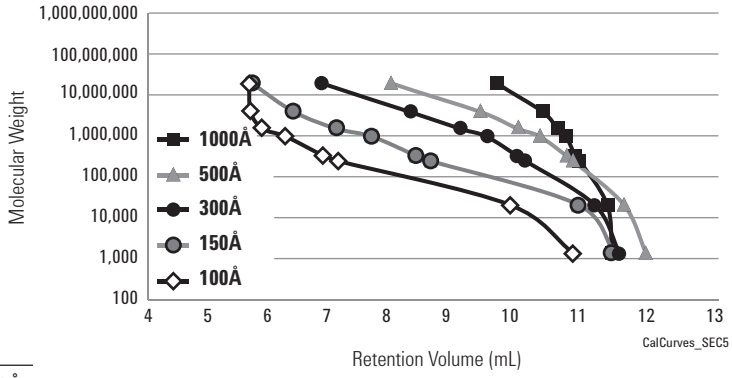
Calibration curves – Bio SEC-5

Column: **Bio SEC-5**
7.8 x 300 mm, 5 µm

Mobile Phase: 150 mM Na phosphate, pH 7.0

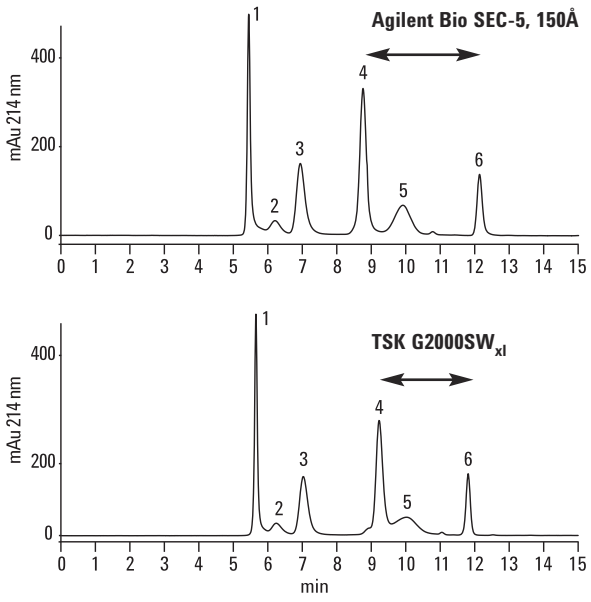
Flow Rate: 1.0 mL/min

Detector: UV, 214 nm



		Retention Volume				
Proteins	**MW**	**1000Å**	**500Å**	**300Å**	**150Å**	**100Å**
Thyroglobulin	670000	10.07	8.23	7.03	5.82	5.77
Gamma globulin	158000	10.88	9.80	8.57	6.55	5.79
BSA	67000	11.13	10.44	9.44	7.29	6.00
Ovalbumin	45000	11.28	10.83	9.89	7.90	6.40
Myoglobin	17000	11.44	11.28	10.42	8.66	7.05
Ribonuclease A	12700	11.52	11.41	10.58	8.93	7.32
Vitamin B-12	1350	12.00	12.59	11.78	11.49	10.30

Side-by-side comparison



Column: **Bio SEC-5**
5190-2521
7.8 x 300 mm, 5 µm

Mobile Phase: 150 mM Na phosphate, pH 7.0

Flow Rate: 1.0 mL/min

Detector: UV, 214 nm

1. Thyroglobulin, 5.43 min
2. BSA dimer, 6.19 min
3. BSA monomer, 6.93 min
4. Ribonuclease A, 8.74 min
5. Poly-DL-alanine (1-5 kDa), 9.90 min
6. Uracil, 12.13 min

1. Thyroglobulin, 5.64 min
2. BSA dimer, 6.23 min
3. BSA monomer, 7.02 min
4. Ribonuclease A, 9.22 min
5. Poly-DL-alanine (1-5 kDa), 10.02 min
6. Uracil, 11.81 min

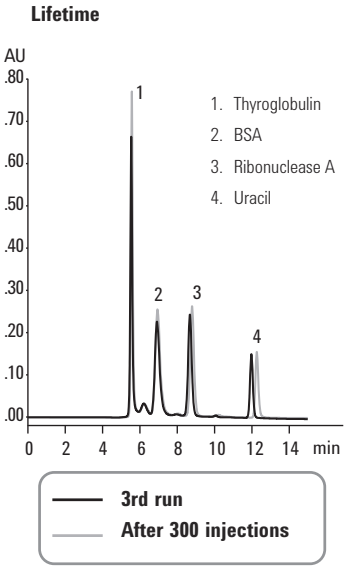
Separation of a protein mixture on an Agilent Bio SEC-5 HPLC column and a Tosoh TSK-Gel column. Notice the sharper peaks and better resolution on the Agilent Bio SEC-5 HPLC column.

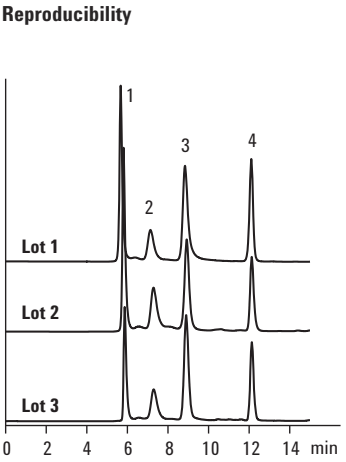
Exceptional lifetime, and lot-to-lot reproducibility

Column: **Bio SEC-5, 150Å**
5190-2521
7.8 x 300 mm, 5 µm

Mobile Phase: 150 mM Phosphate Buffer, pH 7.0

The four protein mixture shows excellent retention time reproducibility over 300 injections and on three columns from different manufacturing lots.





Comparison between Agilent Bio SEC-3 and Agilent Bio SEC-5

Analysis of monoclonal antibody

Column: **Bio SEC-3, 300Å**
5190-2511
7.8 x 300 mm, 3 µm

Column: **Bio SEC-5, 300Å**
5190-2526
7.8 x 300 mm, 5 µm

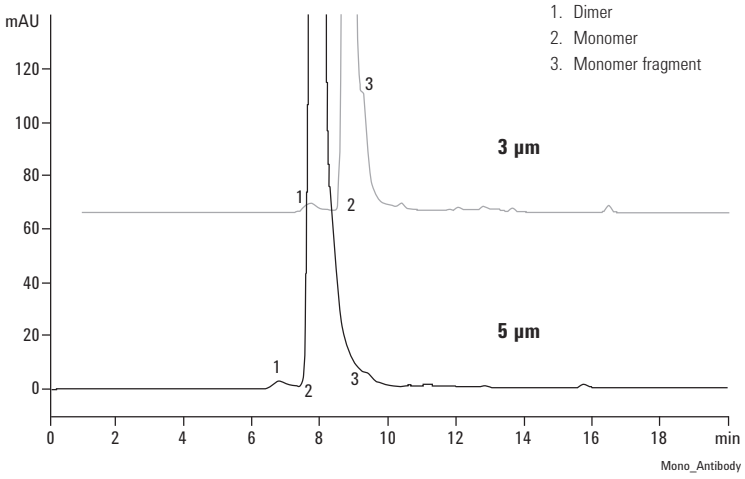
Mobile Phase: 150 mM Sodium Phosphate, pH 7

Flow Rate: 1 mL/min

Detector: UV @ 220 nm

Sample: Humanized monoclonal antibody

The 3 µm column gives better separation



Agilent Bio SEC-5

Size (mm)	Particle Size (µm)	Bio SEC-5 100Å USP L33	Bio SEC-5 150Å USP L33	Bio SEC-5 300Å USP L33	Bio SEC-5 500Å USP L33	Bio SEC-5 1000Å USP L33	Bio SEC-5 2000Å USP L33
7.8 x 300	5	5190-2516	5190-2521	5190-2526	5190-2531	5190-2536	5190-2541
7.8 x 150	5	5190-2517	5190-2522	5190-2527	5190-2532	5190-2537	5190-2542
4.6 x 300	5	5190-2518	5190-2523	5190-2528	5190-2533	5190-2538	5190-2543
4.6 x 150	5	5190-2519	5190-2524	5190-2529	5190-2534	5190-2539	5190-2544
7.8 x 50, Guard	5	5190-2520	5190-2525	5190-2530	5190-2535	5190-2540	5190-2545



TIPS & TOOLS

The Agilent rack can be used to optimize your 1290 Infinity LC for ultra-low dispersion, which can enhance performance of high-efficiency columns. Further information can be found in application note 5990-9502EN at **www.agilent.com/chem/library**



ProSEC 300S

- Mechanically robust silica particles that do not bleed during use
- Single column with extended linear resolving range
- Column dimensions for use with multi-detector systems

The Agilent ProSEC 300S column is specifically designed as a single column solution for globular protein analysis. The pore size selection and optimization provides an extended linear resolving range so that this single column can be used for analysis across the full range of globular proteins.

The particles are extremely robust and do not fragment during use to leach particulates. This gives exceptionally stable baselines making this column an ideal choice for use with light scattering detectors.

Two column dimensions, 7.5 mm id and 4.6 mm id, to suit multi-detector size exclusion chromatography provide an option for the analysis of small masses.

ProSEC 300S Column Specifications

Bonded Phase	Pore Size	Particle Size	Protein MW Range	pH Range	Flow Rate	Max Pressure
ProSEC 300S	300Å	5 µm	1,500-800,000	2-7.5	<1.5 mL/min (7.5 mm id)	250 bar, 3700 psi
					<0.5 mL/min (4.6 mm id)	

ProSEC 300S

Dimensions	Particle Size (µm)	Part No.
4.6 x 250	5	PL1547-5501
7.5 x 300	5	PL1147-6501
Guard Columns		
4.6 x 50	5	PL1547-1501
7.5 x 50	5	PL1147-1501

Calibration of the ProSEC 300S column with globular proteins

Mobile Phase: 50 mM KH_2PO_4-K_2HPO_4 (@ pH 6.8) containing 0.3 M NaCl

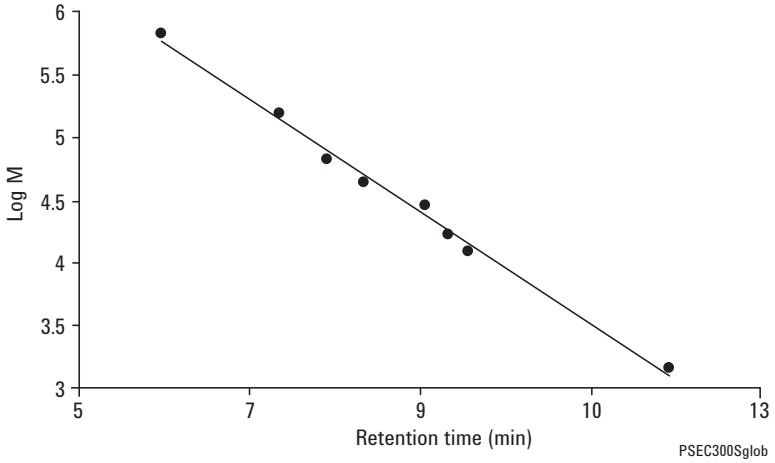
Flow Rate: 1.0 mL/min

Detector: UV, 280 nm

Sample: Protein samples

Molecular weights of the proteins

Mw/Daltons	Protein
670,000	Thyroglobulin
155,000	γ-Globulin
66,430	Bovine serum albumin
44,287	Ovalbumin
29,000	Carbonic anhydrase
16,700	Myoglobulin
12,384	Cytochrome c
1,423	Bacitracin



Analysis of Bovine Serum Albumin by light scattering using ProSEC 300S columns

Column: ProSEC 300S
PL1147-6501
7.5 x 300 mm, 5 µm

Mobile Phase: Water + 120 mM NaCl, 2.7 mM KCl, 10 mM NaH_2PO_4

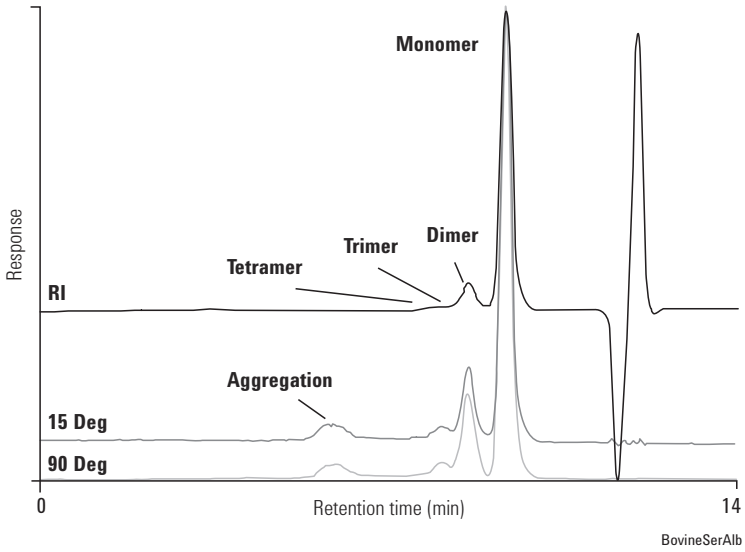
Flow Rate: 1.0 mL/min

Detector: Differential refractive index + PL-GPC 50 Dual Angle Light Scattering Detector

Sample: Bovine serum albumin

Molecular Weights

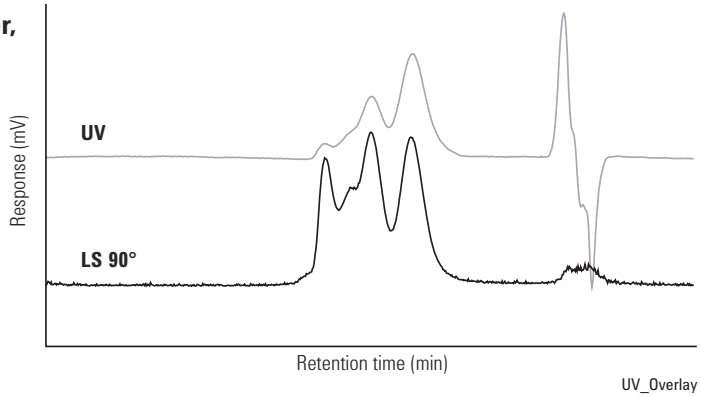
Monomer	66,900 Daltons, 88.5%
Dimer	34,900 Daltons (2.02 x monomer molecular weight), 9.8%
Trimer	197,000 Daltons (2.94 x monomer molecular weight), 1.2%
Tetramer	279,300 Daltons (5.17 x monomer molecular weight), 0.5%



Overlay of differential refractive index and dual angle light scattering sample.

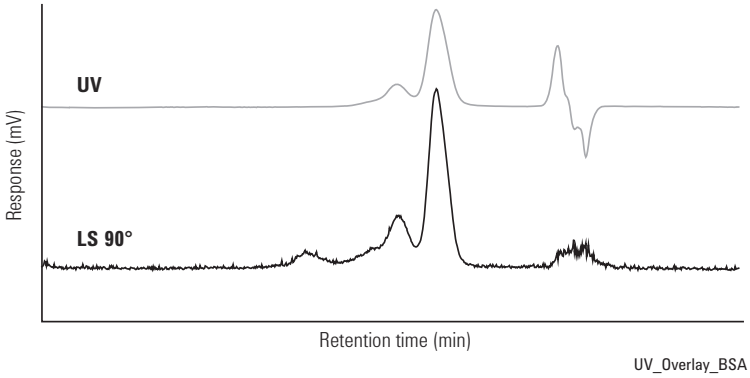
Overlay of UV and light scattering 90° for a sample of γ-globulins, illustrating monomer, dimer, and trimer peaks

Column:	**ProSEC 300S PL1147-6501 7.5 x 300 mm, 5 µm**
Mobile Phase:	0.1 M KH_2PO_4 containing 0.3 M NaCl, pH 8.0
Flow Rate:	1.0 mL/min
Temperature:	5 °C
Detector:	UV at 310 nm + PL-GPC 50 Dual Angle Light Scattering Detector
Sample:	Proteins



Overlay of UV and light scattering 90° for a sample of BSA, illustrating monomer, dimer, trimer and aggregate peaks

Column:	**ProSEC 300S PL1147-6501 7.5 x 300 mm, 5 µm**
Mobile Phase:	0.1 M KH_2PO_4 containing 0.3 M NaCl, pH 8.0
Flow Rate:	1.0 mL/min
Temperature:	5 °C
Detector:	UV at 310 nm + PL-GPC 50 Dual Angle Light Scattering Detector
Sample:	Proteins



ZORBAX GF-250 and GF-450 Gel Filtration Columns



GF-250 Gel Filtration Columns

- High efficiency and reproducibility with short analysis time
- Semi-prep and prep column dimensions
- Compatible with organic modifiers and denaturants
- Wide usable pH range (3-8)

Agilent ZORBAX GF-250 and GF-450 size exclusion (gel filtration) columns are ideal for size separations of proteins and other biomolecules. The separation range is 4,000-900,000 for globular proteins when using GF-250 and GF-450 columns in series. The GF-250/GF-450 size exclusion columns have a hydrophilic diol bonded phase for high recovery of proteins (typically >90%) and a unique zirconia modification of the silica for a pH operating range from 3-8. The GF-250 and GF-450 columns are packed with precisely sized porous silica microspheres with narrow pore size and particle size distributions. The result is a highly efficient, rugged and reproducible size exclusion column that can be used for both analytical and preparative separations of proteins with flow rates of up to 3 mL/min. These columns are compatible with organic modifiers (<25%) and denaturants in the mobile phase to reduce protein aggregation. Some common applications include separations of protein monomers, dimers and aggregates, desalting, protein molecular weight estimation and separations of modified proteins.

Column Specifications

Bonded Phase	Pore Size	Particle Size	MW Range	Surface Area	pH Range	Flow Rate	Max Pressure
ZORBAX GF-250	150Å	4 µm	4,000-400,000	140 m^2/g	3.0-8.0	<3.0 mL/min	350 bar
ZORBAX GF-450	300Å	6 µm	10,000-900,000	50 m^2/g	3.0-8.0	<3.0 mL/min	350 bar

Specifications represent typical values only

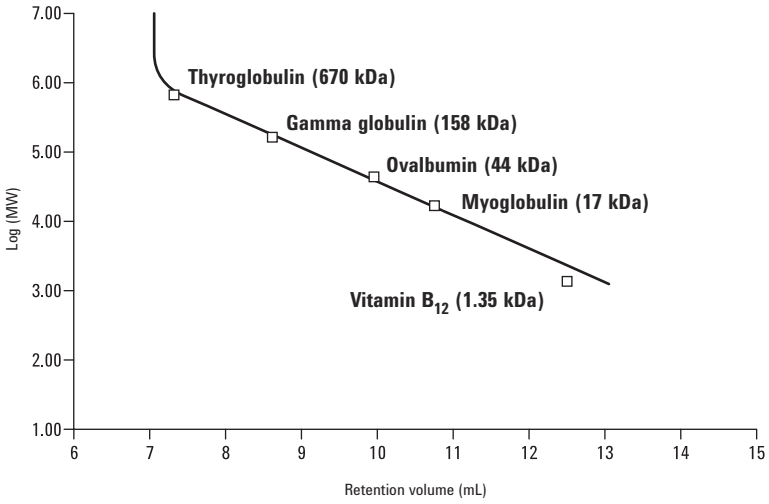
Retention volume versus log (MW) for the Bio-Rad standards separated on an Agilent ZORBAX GF-250 column

Column: **ZORBAX GF-250**
884973-901
9.4 x 250 mm, 4 µm

Mobile Phase: 200 mM Sodium phosphate, pH 7.0

Temperature: Ambient

Detector: UV, 254 nm



Separations of proteins on preparative columns

Column: **ZORBAX GF-250**
884973-901
9.4 x 250 mm, 4 µm

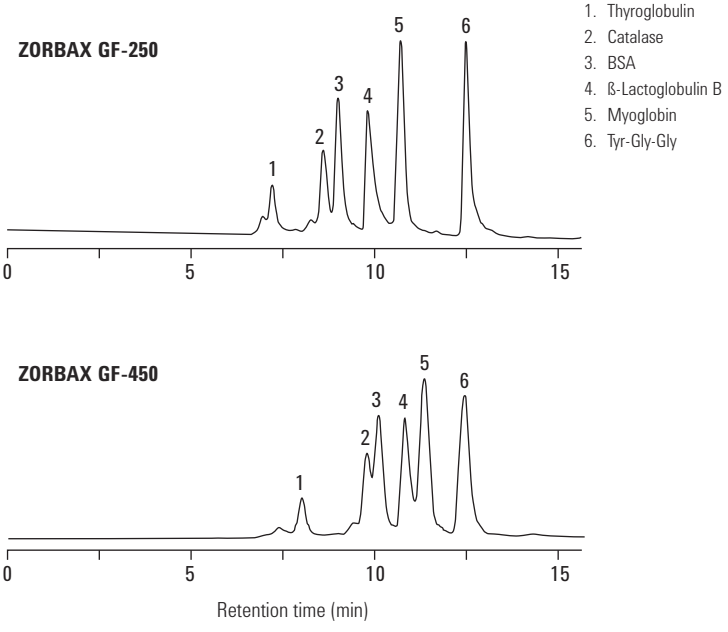
Column: **ZORBAX GF-450**
884973-902
9.4 x 250 mm, 6 µm

Mobile Phase: 0.2 M Na_2HPO_4, pH 7.0

Flow Rate: 5.0 mL/min

Detector: UV, 280 nm

Sample: 200 µL



ZORBAX GF-250 (USP L33) and GF-450 (USP L35) Gel Filtration Columns

Hardware	Description	Size (mm)	Particle Size (µm)	Part No.
	GF-250, 150Å	9.4 x 250	4	884973-901
	GF-250, 150Å	4.6 x 250	4	884973-701
	GF-450, 300Å	9.4 x 250	6	884973-902
Guard Columns (hardware required)				
P	GF-250 Diol, Guard Cartridge, 2/pk	9.4 x 15	6	820675-111
ZGC	GF-250 Diol, Guard Cartridge, 4/pk	4.6 x 12.5	6	820950-911
P	GF-450 Diol, Guard Cartridge, 2/pk	9.4 x 15	6	820675-111
ZGC	GF-250 Diol, Guard Cartridge, 4/pk	4.6 x 12.5	6	820950-911
P	Prep Guard Hardware Kit			840140-901
ZGC	Guard Hardware Kit			820999-901
PrepHT Columns				
PL	PrepHT GF-250, 150Å	21.2 x 250	6	877974-901
PL	PrepHT GF-450, 300Å	21.2 x 250	6	877974-910
PL	PrepHT Endfittings, 2/pk			820400-901
PL	PrepHT GF-250, Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-911
PL	PrepHT GF-450, Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-911
PL	Guard Cartridge Hardware			820444-901



Bio-Monolith Protein A Column, 5069-3639

Affinity Chromatography

Affinity chromatography is a powerful technique which takes advantage of highly specific molecular interactions, frequently between specific proteins (e.g. antigen/antibody). Agilent offers several specialty affinity products, a monolithic Protein A column for the isolation and quantitation of IgG and a series of Multiple Affinity Removal Systems for the elimination of high abundance proteins in biological samples.

Agilent Bio-Monolith Protein A HPLC Columns

- Designed for the analytical separation of all IgG (human and mouse), except for IgG class3
- Flow-rate independent separations; no diffusion, no pores and no void volume make transport between mobile and stationary phase very rapid
- Extremely fast separations speed up method development time and decrease costs
- Locking in method parameters takes significantly less time and buffer

Agilent Bio-Monolith Protein A HPLC columns are part of the Agilent Bio-Monolith column family. Protein A Bio-Monolith columns are compatible with HPLC and preparative LC systems, including Agilent 1100 and 1200 HPLC systems.

TIPS & TOOLS

For information on Ion-Exchange Bio-Monolith columns, turn to pages 412-415.

Column Specifications	
Dimensions	5.2 mm x 4.95 mm
Column volume	100 µL
Maximum pressure	150 bar (15 MPa, 2200 psi)
Temperature min/max	Working: 4-40 °C
	Storage: 4-30 °C
Recommended pH	Working range: 2-13
	Cleaning-in-place: 1-14
Materials of construction	Hardware: Stainless steel
	Packing: poly(glycidyl methacrylate-co-ethylene dimethacrylate) highly porous monolith
Color ring identifier	Bio-Monolith Protein A: White
Shelf life/expiration date	Protein A: 12 months

Bio-Monolith Protein A

Column	Description	Key Applications	Part No.
Bio-Monolith Protein A	The Protein A affinity column is designed for the analytical separation of all IgG (human and mouse), except for IgG class3.	• Quantitative determination of IgG (fermentation titer calculation)	5069-3639

TIPS & TOOLS

Further information can be found in the following application note:

Rapid Human Polyclonal IgG Quantification Using the Agilent Bio-Monolith Protein A HPLC Column (publication # 5989-9733EN)

www.agilent.com/chem/library

Rapid human polyclonal IgG quantification using the Agilent Bio-Monolith Protein A HPLC column

Column: **Protein A**
5069-3639
5.2 x 4.95 mm

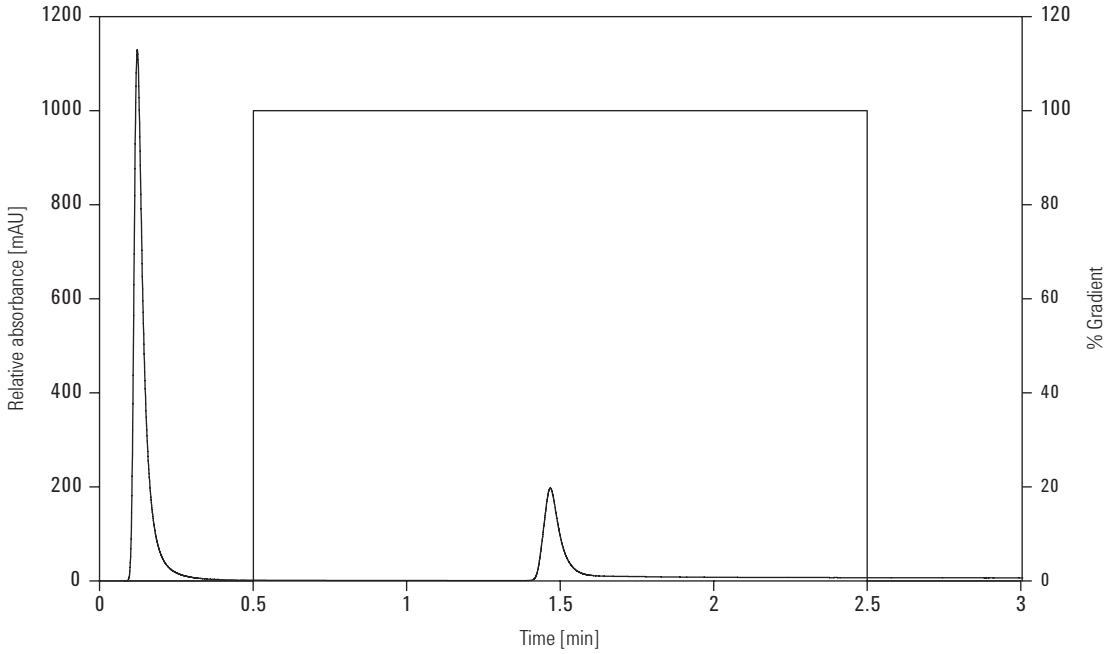
Mobile Phase: PBS buffer, pH 7.4
0.5 M acetic acid, pH 2.6

Flow Rate: 1 mL/min

Gradient: Stepwise gradient: 100% buffer A-100% buffer B-100% buffer A (0.5 min each step)

Detector: A high pressure gradient HPLC system, Agilent 1200 Infinity LC - UV at 280 nm

Sample: Human Plasma diluted with binding buffer (PBS buffer, pH 7.4)



The selectivity of the Bio-Monolith Protein A column for the IgG from human plasma. IgG binds to protein A, a 100% buffer B step gradient is applied, and IgG elutes at 1.5 min.



Key:

Lane 1: Whole serum prior to separation

Lane 2: IgG standard

Lane 3: Peak 1 (flow-through fraction)

Lane 4: Peak 2 (Protein A-bound fraction; i.e. IgG1 and IgG2)

SDS PAGE analysis of fractions from the separation.

Agilent Protein Fractionation System and Proteomics Reagents



- LC/MS analysis of biological samples
- Preparation for electrophoretic analysis
- Sample preparation for biomarker discovery
- Instrument and workflow validation
- Cost-effective immunodepletion
- Sample desalting, concentration, and fractionation

In order to more easily isolate and identify proteins in biological samples, such as serum, plasma, and cerebro-spinal fluid (CSF), the Agilent Multiple Affinity Removal System is designed to chromatographically eliminate interfering high-abundance proteins from biological samples. Removal of these abundant proteins improves the subsequent LC/MS and electrophoretic analysis of the sample by effectively expanding the dynamic range.

For sample fractionation and desalting, the Agilent mRP-C18 High-Recovery Protein column is designed to simultaneously desalt, concentrate, and fractionate in one easy step with extremely high recovery of samples as compared to conventional RP HPLC columns that are fully compatible with LC/MS analysis.

In addition, validated reagents for sample preparation in biomarker discovery and other proteomics applications are also available, including a complex standard, and proteomics grade trypsin. For your convenience, these reagents are fully compatible with Agilent LC/MS methods and require no additional sample pretreatments.

Large volume requirements and custom column dimensions can also be addressed with our custom configurations.



Multiple Affinity Removal System

Multiple Affinity Removal System

The Multiple Affinity Removal System from Agilent enables the identification and characterization of high-value, low abundant proteins and biomarkers found in serum, plasma, and other biological fluids.

The Multiple Affinity Removal System reproducibly and specifically removes up to 14 high abundant proteins found in human biological fluids and 3 high abundant proteins found in mouse biological fluids.

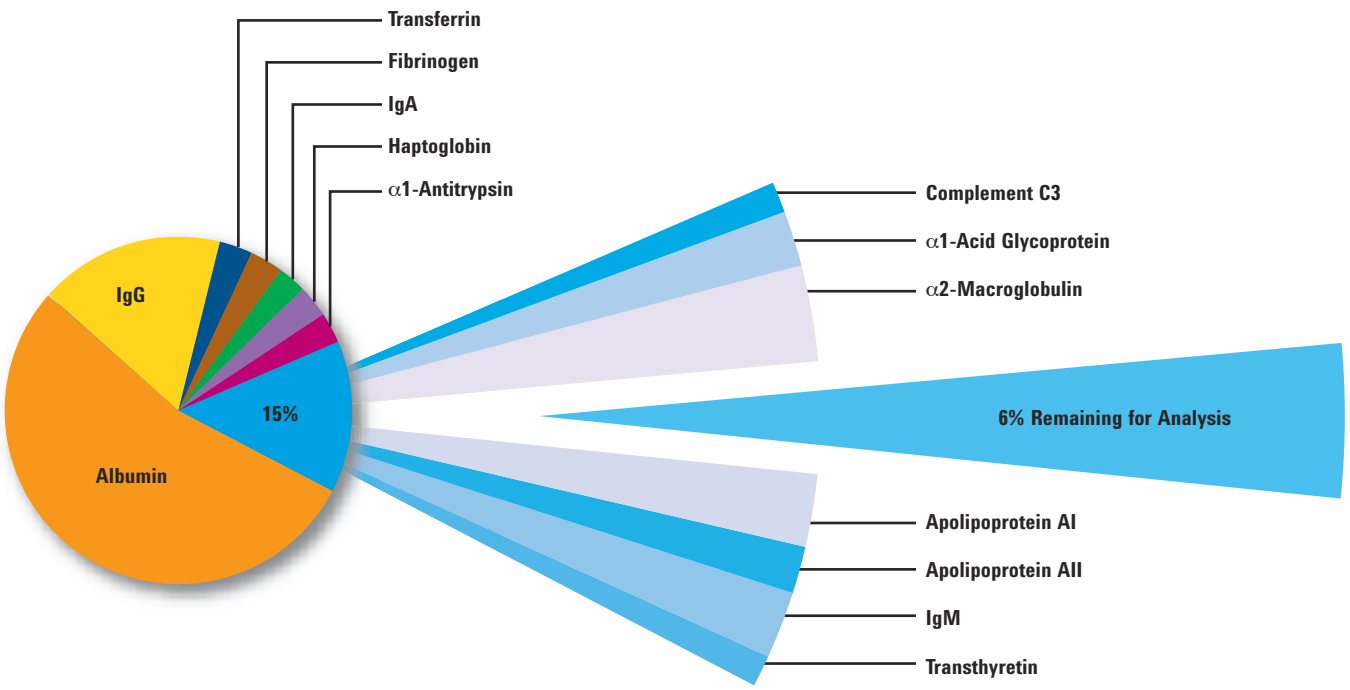
The Multiple Affinity Removal System is available in a variety of LC column dimensions and in spin cartridge format. When combined with Agilent's optimized buffers, convenient spin filters and concentrators, the Agilent Multiple Affinity Removal System creates an automated, integrated depletion solution compatible with most LC instruments (columns), and bench top centrifuges (spin cartridges).

Samples depleted using the Multiple Affinity Removal System are ready for downstream analyses such as 2-D gel electrophoresis, LC/MS, and other analytical techniques.

Multiple Affinity Removal System Selection Guide

Product	Proteins Removed	Total Protein Removed	Dimension	Load Capacity	Part No.
MARS Human-14	Albumin, IgG, antitrypsin, IgA, transferrin, haptoglobin, fibrinogen, alpha2-macroglobulin, alpha1-acid glycoprotein, IgM, apolipoprotein AI, apolipoprotein AII, complement C3, transthyretin	94%	Spin Cartridge	8 - 10 µL	5188-6560
			4.6 x 50 mm	20 µL	5188-6557
			4.6 x 100 mm	40 µL	5188-6558
			10.0 x 100 mm	250 µL	5188-6559
MARS Human-7	Albumin, IgG, IgA, transferrin, haptoglobin, antitrypsin, fibrinogen	88-92%	Spin Cartridge	12 - 14 µL	5188-6408
			4.6 x 50 mm	30 - 35 µL	5188-6409
			4.6 x 100 mm	60 - 70 µL	5188-6410
			10.0 x 100 mm	250 - 300 µL	5188-6411
MARS Human-6	Albumin, IgG, IgA, transferrin, haptoglobin, antitrypsin	85-90%	Spin Cartridge	7 - 10 µL	5188-5230
			4.6 x 50 mm	15 - 20 µL	5185-5984
			4.6 x 100 mm	30 - 40 µL	5185-5985
MARS Human-6 High Capacity	Albumin, IgG, IgA, transferrin, haptoglobin, antitrypsin	85-90%	Spin Cartridge	14 - 16 µL	5188-5341
			4.6 x 50 mm	30 - 40 µL	5188-5332
			4.6 x 100 mm	60 - 80 µL	5188-5333
			10.0 x 100 mm	up to 340 µL	5188-5336
MARS Human-2	Albumin, IgG	69%	Spin Cartridge	50 µL	5188-8825
			4.6 x 50 mm	100 µL	5188-8826
MARS Human-1	Albumin	50-55%	Spin Cartridge	65 µL	5188-5334
			4.6 x 50 mm	130 µL	5188-6562
MARS Mouse-3	Albumin, IgG, transferrin	80%	Spin Cartridge	25 - 30 µL	5188-5289
			4.6 x 50 mm	37 - 50 µL	5188-5217
			4.6 x 100 mm	75 - 100 µL	5188-5218

Illustration of high abundance proteins removed by Agilent Multiple Affinity Removal Columns and Spin Cartridges



TIPS & TOOLS

Learn more about Agilent's complete services portfolio at **www.agilent.com/chem/services**

Multiple Affinity Removal System Starter Kits

The LC Column and Spin Cartridge Reagent Starter Kits include all the required supplies to use with Multiple Affinity Removal System. These buffers provide optimal conditions for column longevity and sample reproducibility.

- The kits provide enough Buffer A and Buffer B for approximately 200 sample depletions using the 4.6 x 50 mm LC columns, approximately 100 sample depletions using the 4.6 x 100 mm LC columns and 200 spin cartridge uses.
- Buffer A, the loading buffer, minimizes protein-protein interactions, allowing low abundant proteins often bound to high abundant proteins to pass through the column, while the targeted high abundant proteins bind to their associated antibodies.
- Buffer B, the elution buffer, then disrupts the antibody-protein interaction eluting the high abundant proteins off the column.

Multiple Affinity Removal System Starter Kits

Description	Part No.
LC Column Reagent Starter Kit Includes:	5185-5986
Buffer A, 1 L, for loading, washing, and equilibrating, qty 2	5185-5987
Buffer B, 1 L, for eluting	5185-5988
0.22 µm cellulose acetate, 25/pk, qty 2	5185-5990
Spin concentrators, 5K MWCO, 4 mL, 25/pk	5185-5991
Multiple Affinity Removal Spin Cartridge Reagent Kit Includes:	5188-5254
Buffer A, 1 L, for loading, washing, and equilibrating	5185-5987
Buffer B, 1 L, for eluting	5185-5988
Spin filters, 0.22 µm cellulose acetate, 25/pk, qty 2	5185-5990
Spin concentrators, 5K MWCO, 4 mL, 25/pk	5185-5991
Luer-Lok adapters, 2/pk	5188-5249
Plastic syringe, 5 mL, Luer-Lok, 2/pk	5188-5250
Microtube, 1.5 mL, screw top, 100/pk, qty 6	5188-5251
Caps and plugs, 6/pk	5188-5252
PTFE needles, Luer-Lok, 10/pk	5188-5253
High concentration sample dilution buffer, 50 mL	5188-8283



LC Column Reagent Starter Kit, 5185-5986



Luer-Lok adapters, 5188-5249



Luer-Lok syringe, 5188-5250



Luer-Lok needles, 5188-5253



mRP-C18 High-Recovery Protein Column, 4.6 x 50 mm, 5188-5231

mRP-C18 High-Recovery Protein Columns

The mRP (macroporous reversed-phase) C18 High-Recovery Protein column is designed for high recovery, high resolution separation, fractionation, and simultaneous desalting of complex protein samples (like immunodepleted serum or plasma proteins).

- Greater than 95-99% protein sample recovery has been observed with immunodepleted serum using the Agilent Multiple Affinity Removal System – LC column
- Can load up to 380 µg of total protein mass without reducing chromatographic resolution of the proteins
- Column packed with macroporous C18-bonded ultrapure 5 µm particle silica designed to reduce or eliminate strong adsorption of proteins
- Maximum operating pressure of 250 bar (4000 psi)
- Compatible with water and all common organic solvents

mRP-C18 High-Recovery Protein Columns

Description	Protein Load Capacity	Part No.
mRP-C18, 0.5 x 100 mm	10 ng - 5 µg	5188-6510
mRP-C18, 2.1 x 75 mm	8 - 85 µg	5188-6511
mRP-C18, 4.6 x 50 mm	40 - 380 µg	5188-5231

Proteomics Reagents for LC/MS Analysis

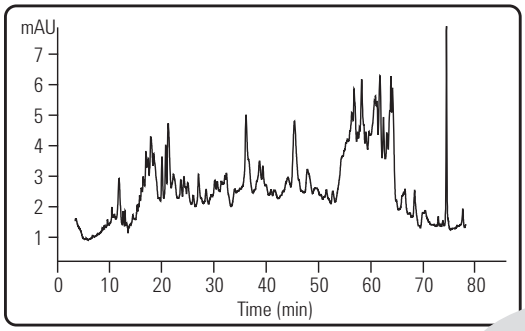
The Agilent Complex Proteomics Standard is a soluble Pfu protein extract containing over 1,500 proteins. Together with our TPCK-treated proteomics grade trypsin this is an ideal combination for workflow validation in LC/MS biomarker discovery and other proteomic studies.

Proteomics Reagents for LC/MS Analysis

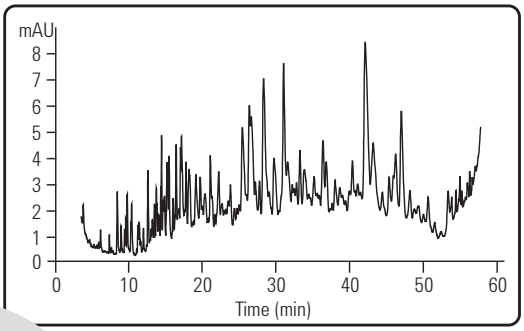
Description	Part No.
Complex Proteomics Standard	400510
Proteomics Grade Trypsin	204310

Protein Fractionation of Complex Samples on the mRP Column

mRP-C18, 4.6 x 50 mm

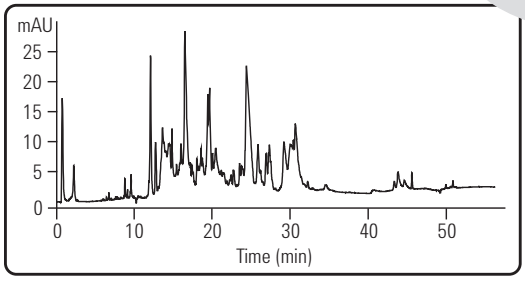


HeLa Membrane Prep

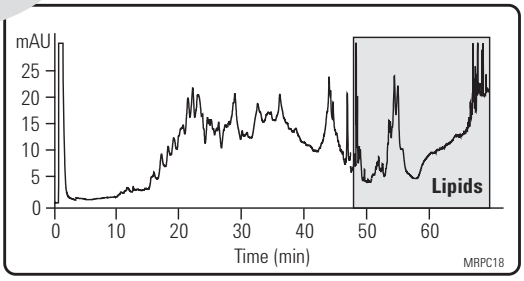


HeLa Cell Lysate (352 µg)

Highest Recovery



"Top-6" Depleted Human Serum



Human Brain Membrane Lipid Raft Prep (500 µg)



mRP-C18 High-Recovery Protein Column, 0.5 x 100 mm, 5188-6510

Method Development

ZORBAX Column Methods

This ZORBAX Column Selection Strategy for Proteins and Peptides provides some critical details on method development for proteins or polypeptides.

Choose the Initial Column and Conditions for Peptides, Polypeptides, and Proteins

Peptides, Polypeptides, Proteins MW <50 kDa	Peptides, Polypeptides, Proteins MW >50 kDa

Initial Bonded Phase

StableBond 300SB-C8

300SB columns are wide-pore columns with unbeatable lifetime in TFA-containing mobile phases. This makes them an ideal first choice for separations of peptides and proteins.

- C8 is an excellent starting bonded phase because of its moderate hydrophobicity
- C18 and C8 are generally selected for peptides and protein digests but can also be used for proteins
- C3, C4 and CN are generally selected for larger, hydrophobic polypeptides and proteins but can also be used for peptides
- PLRP-S when chemical and thermal stability are needed

Poroshell 300SB-C18

Poroshell 300SB columns use an innovative particle technology to deliver rapid protein separations. Short anaysis times with efficient peaks are easily obtained with Poroshell columns.

- C18 is a good starting bonded phase choice with Poroshell for most peptides, polypeptides and proteins because the retention is maximized
- C8 is generally selected for moderate size proteins but can be used with polypeptides or very large proteins
- C3 is generally selected for antibodies or large proteins but can be used for peptides and polypeptides

Initial Separation Conditions

Column:	**StableBond 300SB-C8** **4.6 x 150 mm, 3.5 or 5 µm** **883995-906** **863973-906**
Mobile Phase:	A: 95% H_2O: 5% ACN with 0.1% TFA B: 5% H_2O: 95% ACN with 0.085% TFA
Gradient:	0-60% B in 60 min
Temperature:	35-40 °C
Flow Rate:	1 mL/min

Column:	**Poroshell 300SB-C18** **2.1 x 75 mm, 5 µm** **660750-902**
Mobile Phase:	A: 95% H_2O: 5% ACN with 0.1% TFA B: 5% H_2O: 95% ACN with 0.085% TFA
Gradient:	0-60% B in 60 min
Temperature:	35-40 °C
Flow Rate:	2 mL/min

Start at Low pH with Simple Aqueous/Organic Gradient

Typically, a water/acetonitrile with 0.1% TFA gradient is used to elute all components of interest. A typical high resolution gradient on a 300Å pore size column requires 30-50 min. A Poroshell column requires a shorter analysis time and a higher flow rate and still provides exceptional resolution. To improve resolution, increase the gradient time, decrease column length, or increase flow rate.

Optimize Sample Solubility

For best peak shape and recovery at any pH, it is important to completely solubilize a sample. Highly acidic or neutral solvents can be used with ZORBAX 300StableBond and Poroshell 300SB, while neutral solvents and dilute bases can be used with ZORBAX 300Extend-C18.

Solvent Choices to Solubilize Proteins and Peptides

Water/phosphate Buffer
Dilute acid (TFA, Acetic Acid or HCl)
Neutral pH, 6-8 M guanidine-HCl or isthiocyanate
5% HOAc/6 M urea
Dilute acid + aqueous/organic solvents (ACE, MeOH, THF)
Dilute base (ammonium hydroxide)
DMSO or 0.1%-1% in DMSO
Formamide

Weakest
↓
Strongest

Increase the Temperature

Separations of proteins and peptides are influenced by temperature and higher column temperature can dramatically improve both resolution and recovery of proteins and hydrophobic and aggregating peptides.

StableBond 300SB - up to 80 °C

Poroshell 300SB - up to 80 °C

Optimize Mobile Phase pH
Try Mid and High pH if Low pH does not work

If an optimized, low pH method does not provide an ideal separation, then mid or high pH mobile phase can be used. At high pH, selectivity is often very different because acidic amino acids become negatively charged and some basic amino acids may lose their charge. ZORBAX 300Extend-C18 is an excellent choice for mid to high pH separation.

Column:	**ZORBAX 300Extend-C18 4.6 x 150 mm, 5 µm 773995-902**	Gradient:	5-60% B in 30 min
		Temperature:	25-30 °C (<60 °C)
Mobile Phase:	A: 20 mM NH_4OH in H_2O B: 20 mM NH_4OH in 80% ACN	Flow Rate:	1 mL/min

Starting Column Choices for Analytical Separations of Peptides, Polypeptides, and Proteins

Low pH		Mid and High pH
MW <50 kDa **ZORBAX 300SB-C8** **4.6 x 150 mm, 3.5 µm** 863973-906	**MW >50 kDa** **Poroshell 300SB-C18** **2.1 x 75 mm, 5 µm** 660750-902	**MW <25 kDa** **ZORBAX 300Extend-C18** **2.1 x 150 mm, 3.5 µm** 763750-902

Reversed-Phase LC/MS Methods

LC/MS of proteins and peptides is used to provide information for protein characterization, to accurately identify post-translational modifications of proteins, and to determine the molecular weight of synthetic and natural peptides. LC/MS is also used to provide protein identification in 2-D separations for proteomics applications. Therefore, LC/MS of proteins and peptides is a critical separation area, which requires some special column and mobile phase recommendations. In general, smaller column sizes are used for LC/MS and TFA is generally not used in mobile phase because of reduced sensitivity in the MS with this mobile phase additive.

Initial Column Choices for LC/MS Separations of Proteins and Polypeptides

Analytical LC/MS applications – 2.1 mm id columns provide good sensitivity when sample size is not limited. With Poroshell columns, smaller 1 mm column ids are used.

Low pH		Mid and High pH
MW <50 kDa **ZORBAX 300SB-C8** **2.1 x 150 mm, 3.5 µm** 863750-906	**MW <1000 kDa** **Poroshell 300SB-C18** **1.0 x 75 mm, 5 µm** 661750-902	**MW <25 kDa** **ZORBAX 300Extend-C18** **2.1 x 150 mm, 3.5 µm** 763750-902

High Sensitivity/Proteomics Applications

Capillary columns are used for high sensitivity protein and peptide applications. The 0.5 mm id columns are used for protein and protein digest separations while the 0.3 mm id columns are most often used for protein digests. These can be analyzed at high pH with an ammonium hydroxide mobile phase. Nano columns (0.1 and 0.075 mm id) are often used in 2-D LC/MS systems for proteomics and the initial choice is C18 bonded phase.

Bio Ion-Exchange Column Methods

Bio MAb Monoclonal Antibodies	Cation-Exchange (SCX, WCX) Monoclonal Antibodies, Proteins, Peptides, and Glycoproteins	Anion-Exchange (SAX, WAX) Oligonucleotides, Proteins

Recommended Initial Conditions

	Bio MAb Monoclonal Antibodies	Cation-Exchange (SCX, WCX) Monoclonal Antibodies, Proteins, Peptides, and Glycoproteins	Anion-Exchange (SAX, WAX) Oligonucleotides, Proteins
Mobile Phase:	A: 20 mM sodium phosphate, pH 5.5 B: Buffer A plus 400 mM NaCl	A: 20 mM sodium phosphate, pH 5.0 for WCX or pH 6.0 for SCX B: Buffer A plus 500 mM NaCl	A: 10 mM Tris buffer, pH 8 for WAX or pH 9.0 for SAX B: Buffer A plus 400 mM NaCl
Gradient:	10-35% B in 50 min	1-100% B in 30 min for 50 mm columns; 60 min for 250 mm columns	1-100% B in 30 min for 50 mm columns and 60 min for 250 mm columns
Sample Size:	2 mg/mL; 5 µL injection	2 mg/mL; 5 µL injection	2 mg/mL; 5 µL injection
Temperature:	Ambient	Ambient	Ambient
Detection:	UV 220 nm	UV 220/280 nm	UV 220/280 nm

Select Flow Rate Based on Column Diameter and Particle Size

2.1 mm id Columns		4.6 mm id Columns	
Particle Size, µm	**Flow Rate, mL/min**	**Particle Size, µm**	**Flow Rate, mL/min**
5	0.1-0.5	1.7	0.1-0.3
1.7	0.1-0.8	3	0.1-0.5
		5	0.1-0.8
		10	0.1-1.0

Optimize Conditions

Some separations may require a specific buffer, ionic strength, pH, and/or temperature

Ionic Strength:

Certain ionic strength is required to sustain the function of columns. Usually, a minimal concentration of 10-20 mM salt is required. However, greater than 20 mM strength may prevent the adsorption of biomolecules onto the column. Commonly used salts are sodium and potassium chloride and acetate. For elution, a typical salt concentration is 400-500 mM.

Note: Never use water alone for washing columns as it causes a significant increase in backpressure.

Selection of Buffers and pH:

Buffers play a key role in the optimization of separations. Phosphate buffers are typically used for antibodies and many biomolecules. The following are also recommended: MES, Tris, and ACES buffers. Use buffers of pH 5.0-6.5. pH can be adjusted usually by +/- 0.2 units. For some specific proteins, buffers with higher pH (>pH 6.5) may be needed. Phosphoric acid, acetic acid, HCl and NaOH can be used to adjust pH.

pH gradients can also be used for elution.

Selection of Buffers and pH:

For anion-exchange, acetate and phosphate buffers of pH 8.0-9.0 are recommended. pH can be adjusted usually by +/- 0.2 units. For some specific proteins, buffers with higher or lower pH may be needed. Phosphoric acid, acetic acid, HCl and NaOH can be used to adjust pH.

pH gradients can also be used for elution.

Additives

Organic Solvents:

Acetonitrile, ethanol, methanol, and other similar solvents can be used up to 50%.

Detergents:

Non-ionic, anionic, and zwitterionic detergents can be used. Cationic detergents are not recommended.

Additives

Organic Solvents:

Acetonitrile, ethanol, methanol, and other similar solvents can be used up to 50%.

Detergents:

Non-ionic, cationic, and zwitterionic detergents can be used. Anionic detergents are not recommended.

Temperature:

Agilent Bio MAb and IEX columns are stable up to 80 °C. However, many proteins and biomolecules are heat labile. Be sure to establish the temperature stability of your sample before routinely using high temperature for separation.

SEC Column Methods

Choose Initial Columns and Conditions for Size-Based Separation of Biomolecules, Aggregation Analysis – Peptides, Polypeptides, and Proteins

Peptides, Polypeptides, Proteins MW >0.1-1,250 kDa

Peptides, Polypeptides, Proteins MW >0.1-10,000 kDa

Select Column Based on Molecular Weight Range and Pore Size

Agilent Bio SEC-3 (3 µm)

Pore Size	MW range, kDa
100Å	0.1-100
150Å	0.5-150
300Å	5-1,250

Agilent Bio SEC-5 (5 µm)

Pore Size	MW range, kDa
100Å	0.1-100
150Å	0.5-150
300Å	5-1,250
500Å	15-5,000
1000Å	50-7,500
2000Å	>10,000

Recommended Initial Separation Conditions

Column: Agilent Bio SEC (3 µm and 5 µm)

Mobile Phase: 150 mM phosphate buffer, pH 7.0*

Gradient: Isocratic in 30-60 min range

Temperature: Recommended: 10-30 °C, Maximum: 80 °C

Flow Rate: 0.1-0.4 mL/min for 4.6 mm id columns
0.1-1.25 mL/min for 7.8 mm id columns

Sample Size: ≤ 5% of total column volume

*Other aqueous buffers with high and low salt can be used

For additional information, see application note: *Defining the Optimum Parameters for Efficient Size Separations of Proteins* (publication # 5990-8895EN)
www.agilent.com/chem/library

After the initial chromatogram, additional changes may be needed to improve the separation, maintain protein solubility, or to decrease sample interaction with the chromatographic media. The ionic strength of the mobile phase can be adjusted up or down in strength to attain an optimized separation. pH can also be adjusted usually + 0.2 units. If further optimization is necessary, the upward or downward range should be expanded. A change of temperature or addition of an organic solvent can also be used.

For protocols requiring additional salt, these buffers are typical:

100-150 mM sodium chloride in 50 mM sodium phosphate, pH 7.0

100-150 mM sodium sulfate in 50 mM sodium phosphate, pH 7.0

50-100 mM urea in 50 mM sodium phosphate, pH 7.0

Other similar salts (e.g. KCl) and guanidine hydrochloride can also be used

pH Range:

2.0-8.5

Potential organic solvent additions include:

5-10% ethanol (or other similar solvents) in 50 mM sodium phosphate, pH 7.0

5% DMSO in 50 mM sodium phosphate, pH 7.0

Temperature:

Typically, SEC separations are run at 20-30 °C. Separation of proteins and peptides may require higher temperature to improve both resolution and recovery of proteins and hydrophobic peptides.

Maximum temperature of Bio SEC columns is 80 °C

High Sensitivity Capillary Column Methods

Mobile Phase Considerations

Low pH

TFA is generally not used for LC/MS separations of proteins and peptides. The first step is normally to replace TFA with 0.1 to 1% formic acid. Acetic acid, up to 1% can also be used as an alternative mobile phase modifier. At low pH, the best separation may still be obtained with TFA in the mobile phase. In some cases, the TFA can be displaced post-column with an alternative acid, such as propionic acid.

Mid and High pH

LC/MS can also be done at high pH with 10-20 mM NH_4OH as a mobile phase additive.



Nano Columns

Capillary and Nano Columns

- Highest sensitivity for your smallest sample sizes
- Compatible with all LC/MS interfaces
- Internal diameters of 0.5, 0.3, 0.1, and 0.075 mm
- Packings/phases for both small and large molecules (80Å and 300Å pore sizes, respectively)
- Ideal for 1-D and 2-D (proteomics) applications

Agilent ZORBAX Capillary (0.5 and 0.3 mm id) and Nano (0.1 and 0.075 mm id) columns are now available in a wide variety of phases, pore sizes, and dimensions. These columns are ideal for very sample-limited applications because they provide enhanced sensitivity by reducing on-column sample dilution. This high sensitivity can be provided with exceptional reproducibility using Agilent columns and low dispersion HPLC instruments. The fastest growing application for capillary and nano columns is 2-D LC/MS for complex proteomics samples. Agilent provides all the columns needed for the 2-D separation – the SCX columns for the first dimension, the reversed-phase trapping column, and the reversed-phase column for the second dimension.

TIPS & TOOLS

Agilent offers a variety of e-Seminars and on-site training to help you learn how to be a more effective chromatographer.

For more information, visit
www.agilent.com/chem/education



ZORBAX Nano columns for high sensitivity protein digest analysis by LC/MS

Column: **ZORBAX 300SB-C18**
5065-9911
0.075 x 150 mm, 3.5 µm

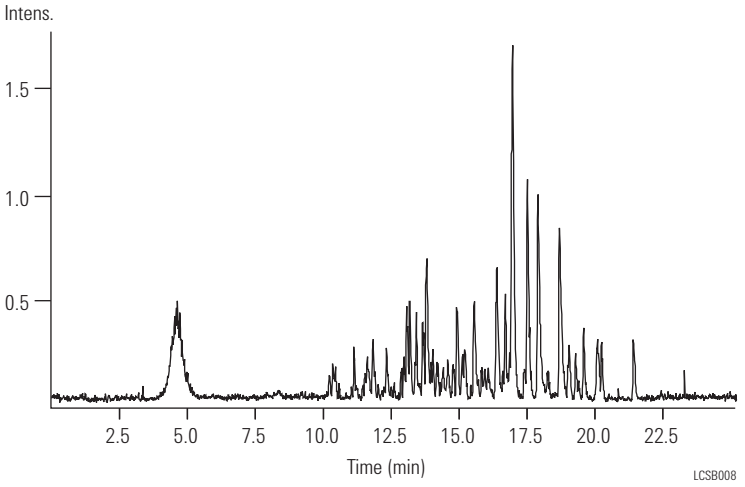
Mobile Phase: A: Water + 0.1% Formic acid,
B: ACN + 0.1% Formic acid

Flow Rate: 600 nL/min

Gradient: 2% B to 52% B in 25 min

Detector: Positive Ion Nano Electrospray MS

Sample: 100 fm (1 µL) Digest of 8 Proteins



A ZORBAX Nano HPLC column, 0.075 mm id, is used for high sensitivity LC/MS analysis of a protein digest sample.

High sensitivity with capillary columns

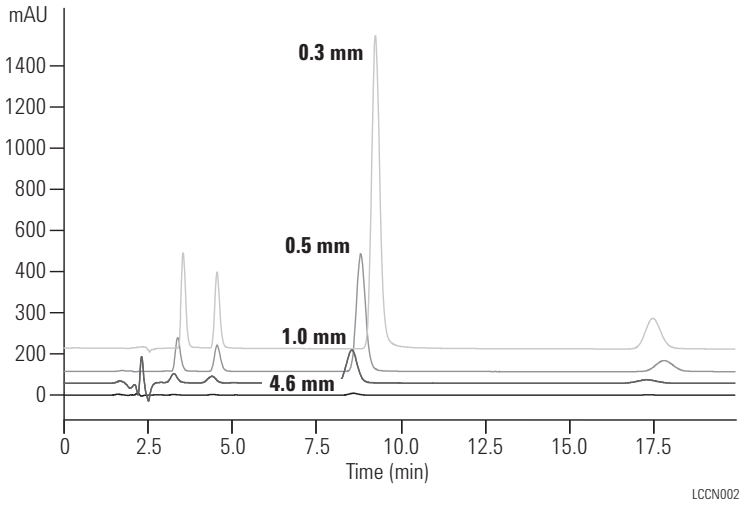
Column: **ZORBAX SB-C18**
5064-8255
0.3 x 150 mm, 5 µm

Column: **ZORBAX SB-C18**
5064-8256
0.5 x 150 mm, 5 µm

Column: **ZORBAX SB-C18**
863600-902
1.0 x 150 mm, 3.5 µm

Column: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Sample: 200 ng Biphenyl



Sample-limited applications require capillary column dimensions to minimize on-column sample dilution and to enhance sensitivity. The 0.3 mm capillary in this example provides 100 times more sensitivity than the standard 4.6 mm column. Agilent Nanobore (0.1 mm to 0.075 mm id) columns can provide up to 2,000 times more sensitivity for your most limited sample applications.

Human serum: Low abundance protein isolation and identification from 1-D gel band by LC/MS

Column: **ZORBAX 300SB-C18**
Trap: 0.3 x 5 mm, 5 µm, 5065-9913
Analytical: 0.3 x 150 mm, 5 µm, 5064-8263

Mobile Phase: A: Water + 0.1% Formic acid
B: Acetonitrile + 0.1% Formic acid

Flow Rate: 6 µL/min

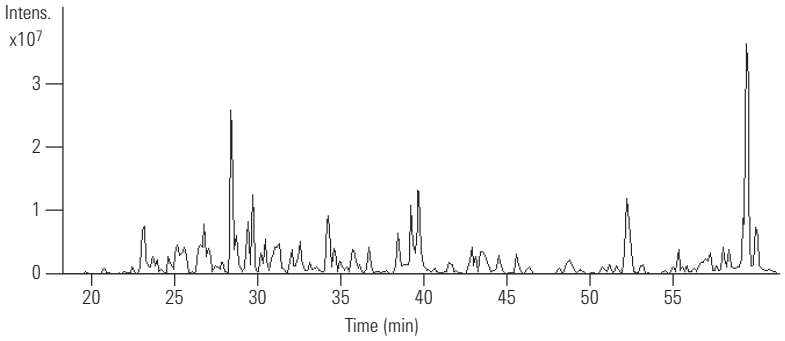
Gradient: 0 min 3% B
5 min 3% B (loading)
50 min 45% B
52 min 80% B
57 min 80% B
60 min 3% B

Sample: Band from 1-D in gel digest

Proteins Identified

1. α-1-Antichymotrypsin
2. Antithrombin-III Precursor
3. Complement Factor B Precursor

Base Peak Chromatogram



Sample Preparation of Human Serum:
Major serum proteins removed using Multiple Affinity Removal Column:
4.6 x 100 mm, P/N 5185-5985
Followed by 1-D gel digest

Peptide phosphorylation sites LC and LC/MS using Capillary LC columns

Column: **ZORBAX 300SB-C18**
5064-8268
0.5 x 150 mm, 3.5 µm

Mobile Phase: A: Water + 0.1% Formic acid
B: Acetonitrile + 0.1% Formic acid

Flow Rate: 5.5 µL/min

Gradient: 5-55% B in 50 min, to
85% B from 55-57 min

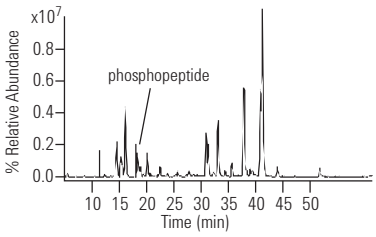
Detector: UV, 206 nm

MS Conditions:

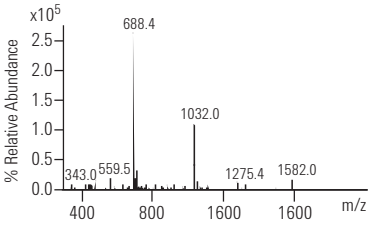
LC/MS:	Pos. Ion ESI with LC/MSD trap
Vcap:	4000 V
Drying gas flow:	7 L/min
Drying gas temperature:	250 °C
Nebulizer:	15 psi
Capillary Exit Volt:	50 V Max
Accum Time:	300 ms
Total Averages:	3
Isolation Width:	3 m/z
Frag Ampitude:	1.0 V

Sample: Beta case in digest, 100 nL (4 pmol)

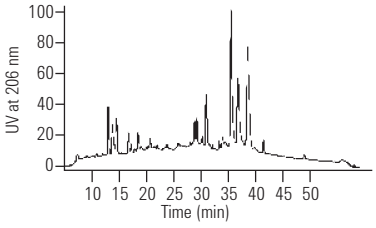
MS



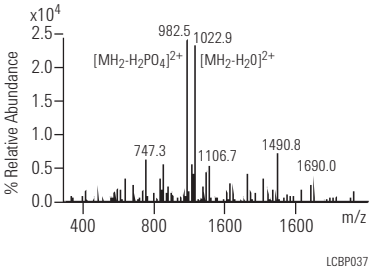
Full Scan MS



UV



MS/MS of [M+2H]$^{2+}$ at m/z 1032



Capillary columns for HPLC analyses with UV and MS detection

Column: **ZORBAX 300SB-C18**
5064-8263
0.3 x 150 mm, 5 µm

Mobile Phase: 5-55% B in 50 min, to 85% B from 55-57 min
A: Water + 0.1% Formic acid
B: Acetonitrile + 0.1% Formic acid

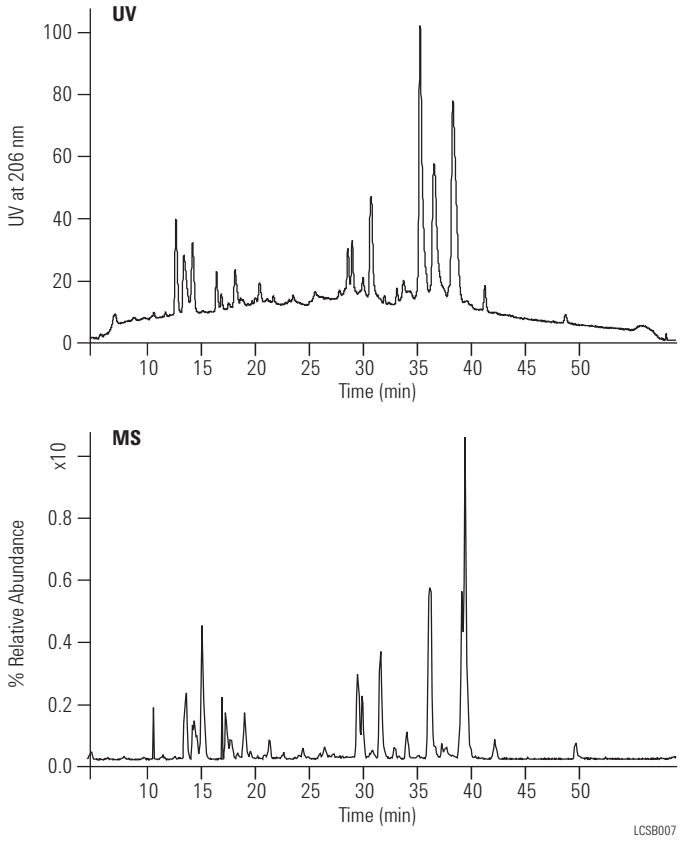
Flow Rate: 5.5 µL/min

Detector: UV, 206 nm

MS Conditions: LC/MS: Pos. Ion ESI with LC/MSD trap-Vcap 4000 V
Drying Gas Flow: 7 L/min
Drying Gas Temperature: 250 °C
Nebulizer: 15 psi
Capillary Exit Volt: 50 V
Max Accum Time: 300 ms
Total Averages: 3
Isolation Width: 3 m/z
Frag Ampitude: 1.0 V

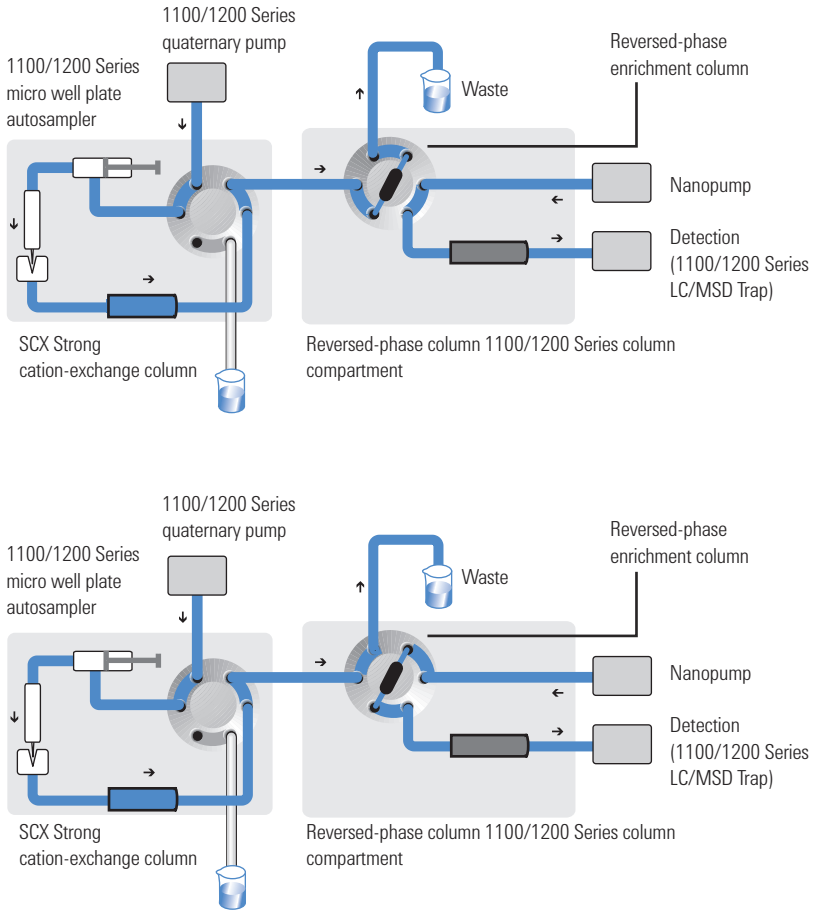
Sample: 100 nL
Beta Casein Digest (4 pmol)

A ZORBAX 300SB-C18 capillary column (0.3 mm id) is used for the separation of the protein digest. Detection is by both UV and Electrospray MS. MS detection can be used for identification of peptide fragments.



2-D LC/MS Analyses Using ZORBAX Capillary and Nano LC Columns

Typical Column Configuration for 2-D HPLC



Flow path of an Agilent customized Nanoflow Proteomics Solution system.
1. Sample loading, elution from SCX and trapping on enrichment column
2. Valve switch in column compartment, elution from enrichment column; separation on RP, and MS anaylsis

Proteins in a complex sample by 2-D HPLC with Nano HPLC columns

Column: **ZORBAX 300SB-C18**
5065-9913
0.3 x 5 mm, 5 µm

Column: **ZORBAX 300SB-C18**
5065-9911
0.075 x 150 mm, 3.5 µm

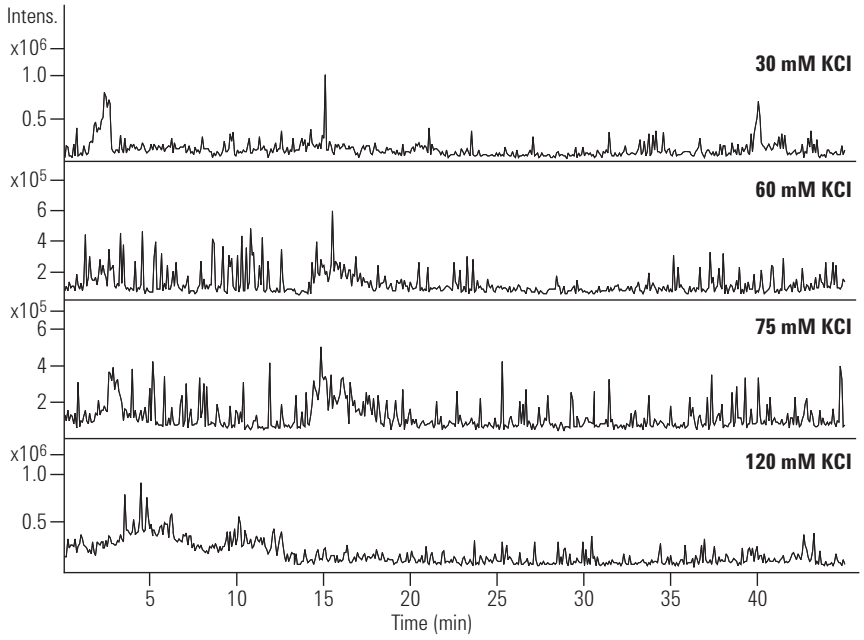
Mobile Phase: Quaternary Pump: 3% Acetonitrile/0.1% Formic acid
Nanopump: A = Water, 0.1% Formic acid, B = ACN, 0.1% Formic acid

Flow Rate: Quaternary Pump: 30 µL/min
Nanopump: 300 nL/min

Gradient: Quaternary Pump: Isocratic
Nanopump:
6 min = 3% B, 120 min = 60% B, 125 min = 80% B, 130 min = 80% B, 131 min = 3% B, 140 min = 3% B

MS Conditions: Source: Nano ESI, drying gas flow: 5 L/min, drying gas temp: 225 °C
Ion Trap: Skim: 1:35 V, cap exit offset: 115 V, octupole 1:12 V, octupole 2:3.5 V, trap drive: 80 V. ICC: on, averages: 4, max accu time: 150 ms; target 60.000, ion mode positive, MS/MS mode.

Sample: Tryptic Digest of bovine serum albumin
Volume: 1 to 8 µL
Salt Step Elution: 8 mL of 10 mM-100 mM KCl (10 mM increments), 125 mM, 150 mM, 200 mM, 300 mM, 500 mM, 1 M.



Tryptic digest of bovine serum albumin (BSA). The base peak chromatograms show a selection of fractions from a 2-D HPLC separation. Single chromatograms represent peptides from BSA eluting at a given salt concentration followed by enrichment and reversed-phase chromatography.



Nano Columns

ZORBAX Bio-SCX Series II

ZORBAX has Bio-SCX Series II columns designed for optimized 2-D separations of peptides and proteins using LC/MS. This packing is based on ultra-pure 3.5 µm ZORBAX silica particles, bonded with a bio-friendly polymer that is functionalized with sulfonic acid groups. This gives strong retention and good peak shape in the ion-exchange step of 2-D analysis of peptides and proteins.

Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	Functionality	Max Pressure
ZORBAX Bio-SCX Series II	300Å	90 m^2/g	2.5-8.5	Sulfonic acid	350 bar

ZORBAX Bio-SCX Series II

Description	Size (mm)	Particle Size (µm)	Bio-SCX Series II
Capillary	0.3 x 35	3.5	5065-9912
Capillary	0.8 x 50	3.5	5065-9942

ZORBAX Bio-SCX Series II provides more retention of small peptides

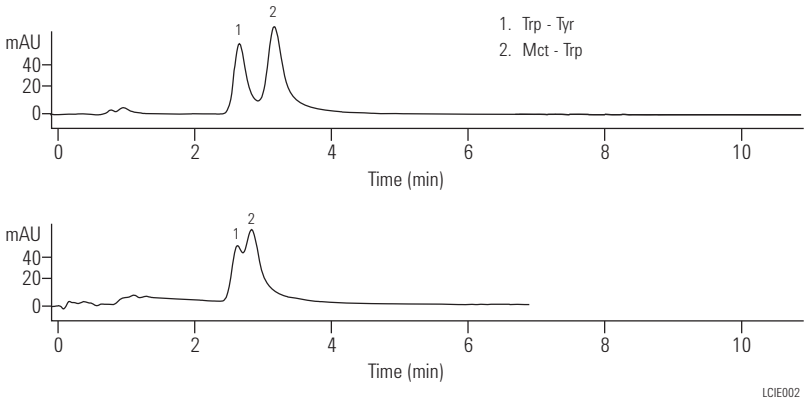
Column: **ZORBAX Bio SCX Series II 5065-9912 0.3 x 35 mm, 3.5 µm**

Mobile Phase: 95% 40 mM NaCl: 5% ACN, 0.3% Formic acid

Flow Rate: 5 µL/min

Detector: 230 nm

Sample: Synthetic Dipeptides



LCIE002

The new ZORBAX Bio-SCX Series II column retains smaller peptides more strongly than some other SCX columns. The result is increased resolution of more hydrophilic peptides fragments and more accurate identification when these columns are used in 2-D HPLC analysis.

ZORBAX HPLC Capillary Columns (glass-lined stainless steel)

Description	Size (mm)	Particle Size (µm)	300SB-C18	300SB-C8	Poroshell 300SB-C8	300Extend-C18	Bio-SCX Series II
Capillary	0.8 x 50	3.5					5065-9942
Capillary	0.5 x 250	5	5064-8266				
Capillary	0.5 x 150	5	5064-8264				
Capillary RR	0.5 x 150	3.5	5064-8268				
Capillary	0.5 x 75	5			5065-4468		
Capillary	0.5 x 35	5	5064-8294				
Capillary RR	0.5 x 35	3.5	5065-4459				
Capillary	0.3 x 250	5	5064-8265				
Capillary	0.3 x 150	5	5064-8263				
Capillary	0.3 x 35	5	5064-8295				
Capillary	0.3 x 35	3.5					5065-9912
Capillary RR	0.3 x 150	3.5	5064-8267	5065-4460		5065-4464	
Capillary RR	0.3 x 100	3.5	5064-8259	5065-4461		5065-4465	
Capillary RR	0.3 x 75	3.5	5064-8270	5065-4462		5065-4466	
Capillary RR	0.3 x 50	3.5	5064-8300	5065-4463		5065-4467	
Replacement Screens, 10/pk			5065-4427	5065-4427	5065-4427	5065-4427	



ZORBAX 300SB-C18 trap/guard, 5065-9913

ZORBAX Nano HPLC Columns (PEEK)

Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7
Nano RR	0.1 x 150	3.5	5065-9910	
Nano RR	0.075 x 150	3.5	5065-9911	
Nano RR	0.075 x 50	3.5	5065-9924	5065-9923
Trap/Guard, 5/pk	0.3 x 5	5	5065-9913	5065-9914
Trap/Guard Hardware kit			5065-9915	5065-9915

MicroBore (1.0 mm id) Columns

- High sensitivity for small sample sizes
- Compatible with LC/MS interfaces
- Wide variety of bonded phases
- Silica and polymeric particles

Agilent MicroBore (1.0 mm id) columns are a good choice when sample sizes are limited. They can improve detection limits 5 times over 2.1 mm id columns when the same sample mass is used. This increase in sensitivity can be critical. MicroBore columns use low flow rates (typically ~ 50 µL/min). Therefore, these columns are ideal for use with detectors requiring low flow rates such as some mass spectrometers and with capillary LC systems.

Optimum performance is achieved when MicroBore columns are used with UHPLC/HPLC Microbore systems. A wide variety of bonded phases is available for use up to 400 bar including StableBond, 300SB-C18, 300SB-C8, and Poroshell columns. Polymeric reversed-phase, PLRP-S, and ion-exchange PL-SAX and PL-SCX are also available for applications requiring exceptionally stable wide pore particles. Guard columns are also now available with an adjustable tube stop depth to provide a perfect zero dead volume connection every time.

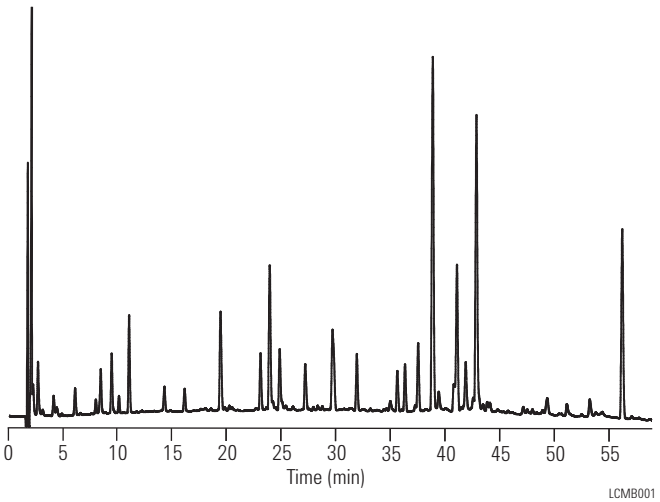


Sterically Protected 300StableBond Bonded Phase

Separation of a tryptic digest on ZORBAX MicroBore 300SB-C18

Column:	**ZORBAX 300SB-C18** **863630-902** **1.0 x 150 mm, 3.5 µm**
Mobile Phase:	Gradient: 2-60% B in 60 min A: 0.1% TFA B: 0.075% TFA/80% ACN
Flow Rate:	50 µL/min
Temperature:	50 °C
Detector:	UV, 215 nm
Sample:	2 µL Tryptic Digest of rhGH

This example of a tryptic digest separated on a MicroBore column demonstrates the high sensitivity and resolution possible with 1.0 mm id columns.



Microbore HPLC for sensitive peptide analysis

Column: **PLRP-S 100Å 5 µm, 150 mm x various id**

Mobile Phase: A: 0.01 M Tris HCl, pH 8
B: A + 0.35 M NaCl, pH 8

Flow Rate: 1 mL/min

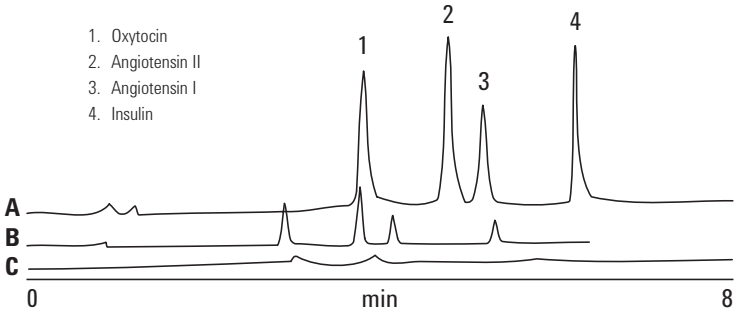
Gradient: Linear 20% ACN, 0.1% TFA to 50% ACN, 0.1% TFA over 15 min

Injection Volume: 0.5 µL

Sample Conc: 0.25 mg/mL

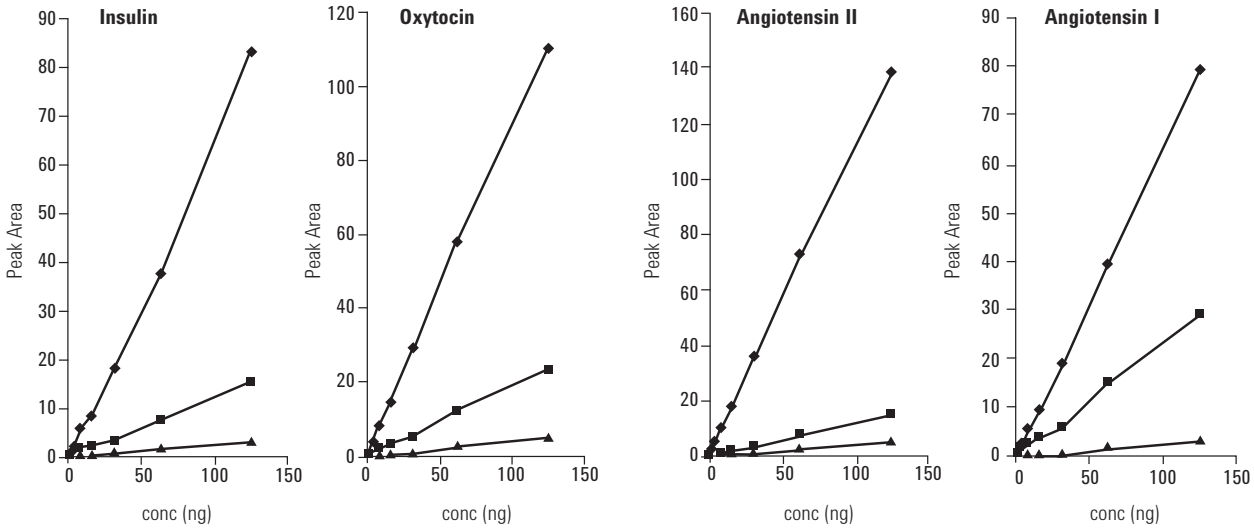
Detector: UV, 220 nm

Peak Identification
A. 1.0 mm id (flow rate 47 µL/min)
B. 2.1 mm id (flow rate 200 µL/min)
C. 4.6 mm id (flow rate 1 mL/min)



Peptide separation on Agilent PLRP-S 100Å 5 µm columns

Peak Identification
◆ 1.0 mm
■ 2.1 mm
▲ 4.6 mm



Standard curve data-point graphs on Agilent PLRP-S columns

MicroBore (1.0 mm id)

Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7		
MicroBore	1.0 x 250	5	861630-902			
MicroBore RR	1.0 x 150	3.5	863630-902	863630-906		
MicroBore RR	1.0 x 50	3.5	865630-902	865630-906		
MicroBore Guard, 3/pk	1.0 x 17	5	5185-5920	5185-5920		

Description	Size (mm)	Particle Size (µm)	Poroshell 300SB-C18	Poroshell 300SB-C8	Poroshell 300SB-C3	Poroshell 300Extend-C18
MicroBore	1.0 x 75	5	661750-902	661750-906	661750-909	671750-902
MicroBore Guard, 3/pk	1.0 x 17	5	5185-5968	5185-5968	5185-5968	

Description	Size (mm)	Particle Size (µm)	PLRP-S 100Å USP L21	PLRP-S 300Å USP L21	PLRP-S 1000Å USP L21	PLRP-S 4000Å USP L21
MicroBore	1.0 x 150	3	PL1312-3300			
MicroBore	1.0 x 50	3	PL1312-1300	PL1312-1301		
MicroBore	1.0 x 50	5	PL1312-1500	PL1312-1501	PL1312-1502	PL1312-1503
MicroBore	1.0 x 50	8			PL1312-1802	PL1312-1803

Description	Size (mm)	Particle Size (µm)	PL-SCX 1000Å	PL-SCX 4000Å	PL-SCX 1000Å	PL-SCX 4000Å
MicroBore	1.0 x 50	5	PL1351-1502	PL1351-1503	PL1345-1502	PL1345-1503



Polymeric Prep HPLC Columns

Purification – Prep HPLC

Agilent has a comprehensive range of silica and polymeric HPLC columns and media designed for biomolecule purification. There are high efficiency small particle prep columns optimized for the purification of µg and mg amounts of a biopharmaceutical drug candidate and fully porous bulk media, to pack development and process columns to purify multiple 100 g, kg and multi-kg of API.

Some columns are specifically designed to address the needs of high efficiency purification, while other products provide easy scale-up from small particle analytical columns to full scale API production. **Table 1** shows prep column/media options and the quantity of product that can be purified.

BioPharmaceutical Lifecycle		Discovery	Development	Production
		µg mg	g	kg multi-kg
		high efficiency		high throughput
Reversed-Phase	**mRP-C18**	→		
	ZORBAX Prep HT 300Å StableBond	→	→	
	VariTide RPC	→	→	
	PLRP-S 100Å, 300Å, 1000Å, 4000Å	→	→	→
	PL-SAX	→	→	→
Ion-Exchange	**PL-SCX**	→	→	→
Size Exclusion	**ZORBAX GF-250/450**	→	→	

Table 1: Agilent columns and media for biomolecule purification – chromatographic type, product family and purification scale.

Purification Column Selection

Application	Technique	Notes	Agilent Columns
Proteomics	Reversed-Phase	A specialist high recovery column for proteomics applications. It is designed for µg scale purifications with maximum recovery.	mRP-C18
All Biomolecules	Reversed-Phase	High efficiency 300Å silica-based particles.	ZORBAX PrepHT 300SB
Synthetic Peptides	Reversed-Phase	Polymeric material designed for the purification of synthetic peptides. It is a high efficiency single-column solution for the full range of synthetic peptides, acidic, basic, hydrophobic and hydrophilic, and covers the size range of peptides produced by both solution and solid phase synthesis.	VariTide RPC
All Biomolecules	Reversed-Phase	The premium polymeric reversed-phase family with a range of pore sizes and particle sizes to enable high efficiency laboratory scale purification using small particle prep column, and scale-up to high yield production purification with larger particles at the process scale. Use PLRP-S when purification will be scaled up to produce APIs and will need regulatory documentation.	PLRP-S
		• 3 µm and 5 µm for high efficiency • 8 µm, 10 µm, 10-15 µm, 15-20 µm, 30 µm and 50 µm particles for larger scale and low pressure purification	
All Biomolecules	Ion-Exchange	A fully porous strong anion-exchanger	PL-SAX
		• 5 µm particle size for high efficiency separations • 8 µm, 10 µm and 30 µm particles for larger scale medium and low pressure purification	
		A fully porous strong cation-exchanger	PL-SCX
		• 5 µm particle size for high efficiency separations • 8 µm, 10 µm and 30 µm particles for larger scale medium and low pressure purification	

TIPS & TOOLS

Further information can be found in the following publication:

Biomolecule Purification
(publication # 5990-8335EN)

www.agilent.com/chem/library



ZORBAX 300Å StableBond Prep HT Cartridge Columns

ZORBAX PrepHT

High purity, high recovery, and high throughput can be easily achieved with Agilent ZORBAX PrepHT columns. These are available in a variety of bonded phases – StableBond 300Å, C18, C8, C3, and CN – for optimized resolution and loadability under any conditions.

ZORBAX PrepHT columns are packed with 5 and 7 µm particle sizes for very high resolution. The high resolution allows high loadability, high yield, and high purity of compounds. The larger diameter columns and mechanically stronger ZORBAX particles allow for flow rates up to 100 mL/min, thus increasing throughput.

ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations on larger columns (21.2 mm id, 150 mm length and longer), Agilent has carefully chosen the 7 µm particle size to achieve a balance between high efficiency and high loadability.

ZORBAX 300Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-CN USP L10	300SB-C3 USP L56
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
	PrepHT Cartridge	21.2 x 250	7	897250-102	897250-106	897250-105	897250-109
	PrepHT Cartridge	21.2 x 150	7	897150-102	897150-106		897150-109
	PrepHT Cartridge	21.2 x 150	5	895150-902	895150-906		895150-909
	PrepHT Cartridge	21.2 x 100	5	895100-902	895100-906		895100-909
	PrepHT Cartridge	21.2 x 50	5	895050-902	895050-906		895050-909
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901
	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-921	820212-918	820212-924	820212-924
	Guard Cartridge Hardware			820444-901	820444-901	820444-901	820444-901

PLRP-S for Prep to Process



- Discovery stage to multi-kg cGMP production reduces method development time
- Chemical stability for separations, optimization, sanitation, and regeneration increases selectivity and column lifetime
- Single batch packing of multiple columns reduces system downtime and validation costs

The PLRP-S media, rigid poly(styrene/divinylbenzene) particles, are available in a range of pore sizes for small molecule, synthetic biomolecule and macromolecule purification. Their thermal and chemical stability makes them ideal for purifications that require extreme conditions for sample preparation, compound elution, and column regeneration.

Capacity and resolution are two key parameters for maximizing the throughput of a purification. With a wide choice of pore sizes and extended range of operating conditions, PLRP-S provides more options to achieve the optimum process. Particle sizes range from 3 µm to 50 µm for scale-up from the µg/mg discovery stage to multi-kg cGMP production. Excellent chemical stability, up to 1 M NaOH, permits sanitation and regeneration that increase column lifetime. PLRP-S media batch sizes of up to 600 L are available, providing single batch packing of multiple columns.

As part of our commitment to quality and continuity of supply, all manufacturing is carried out under a fully documented process. A Type II Drug Master File and regulatory support files are available for process materials, and facility audits are routinely conducted.



PLRP-S Prep to Process Application Guide

Application	PLRP-S Media Pore Size			
	100Å	300Å	1000Å	4000Å
Synthetic biomolecules, peptides, and oligonucleotides	✓	✓		
Recombinant biomolecules, peptides, and proteins	✓	✓		
Large biomolecules, antibodies, DNA fragments			✓	✓
Small molecules, unstable compounds including metal sensitivity	✓			

Column Specifications

pH Range	1-14
Buffer Content	Unlimited
Organic Modifier	1-100%
Temperature Limits	200 °C
Maximum Pressure	5-8 µm: 3000 psi (210 bar)
	3 µm: 4000 psi (300 bar)

Purification of a 25-mer trityl-off oligonucleotide and analytical quantitation of the fraction using PLRP-S 100Å, 4.6 x 50 mm

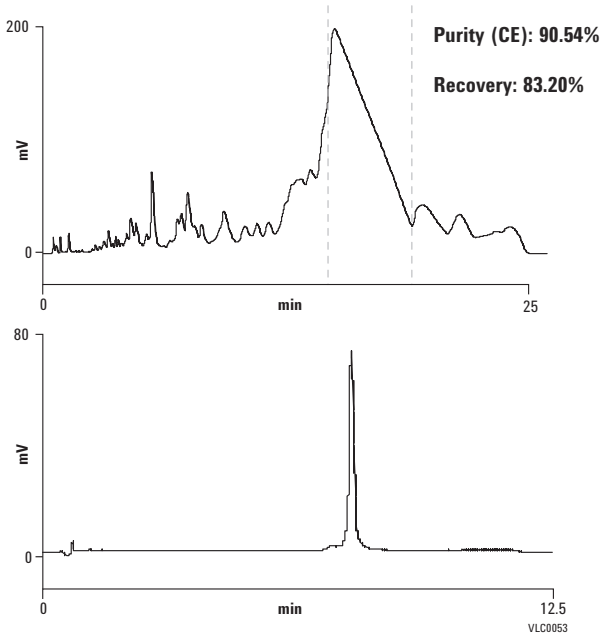
Column: **PLRP-S 100Å**
PL1512-1300
4.6 x 50 mm, 3 µm

Mobile Phase: A: 100 mM Triethylammonium acetate (TEAA)
B: 100 mM TEAA in 25:75 Acetonitrile:water

Flow Rate: 1 mL/min

Gradient: 25% B 0 min, 35% B 2 min, 45% B 22.5 min, 45% B 23 min, 25% B 23.05 min, 25% B 26 min

Temperature: 80 °C



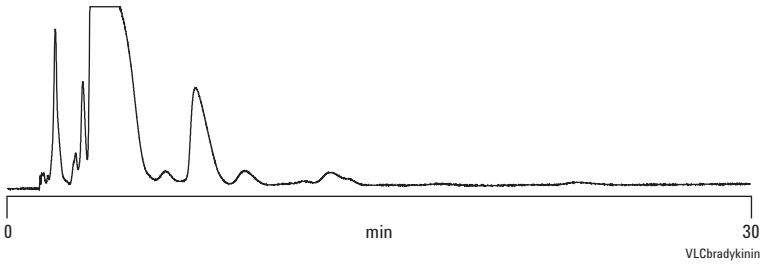
Crude bradykinin prep load

Column: **PLRP-S 100Å**
PL1512-5100
4.6 x 250 mm, 10 µm

Sample: 30 µL containing 1.5 mg of crude peptide

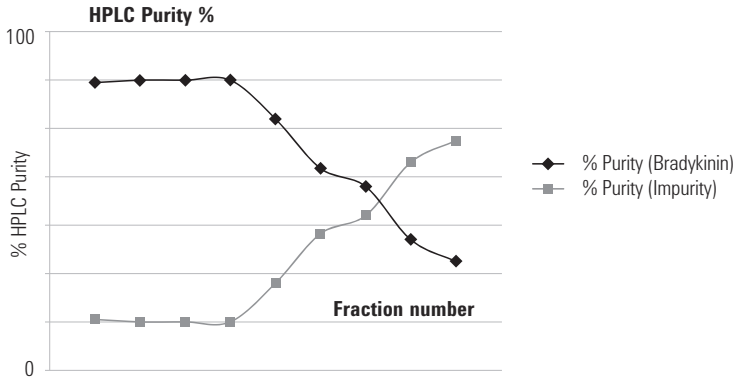
Mobile Phase: 0.1% TFA in 21% ACN:79% water

Flow Rate: 1 mL/min (360 cm/hr)



Fraction analysis – the concentration overload purification

HPLC analysis of the fractions collected across the peak showed that fractions 1 to 4 contained only the peptide of interest and that the level of the critical impurity increased with increasing fraction number. Using the high efficiency PLRP-S column it was possible to obtain from the crude, 91.7% pure, a recovery of 97% with 100% purity. For more information, see application note 5990-7736EN.



Prep to Process PLRP-S

Size (mm)	Particle Size (µm)	PLRP-S 100Å	PLRP-S 300Å	PLRP-S 1000Å	PLRP-S 4000Å
100 x 300	30			PL1812-3102	PL1812-3103
100 x 300	15-20	PL1812-6200	PL1812-6201		
100 x 300	10-15	PL1812-6400	PL1812-6401		
100 x 300	10	PL1812-6100	PL1812-6101		
100 x 300	8	PL1812-6800	PL1812-6801		
50 x 300	8	PL1712-6800	PL1712-6801		
50 x 150	30			PL1712-3702	PL1712-3703
50 x 150	15-20	PL1712-3200	PL1712-3201		
50 x 150	10-15	PL1712-3400	PL1712-3401		
50 x 150	10	PL1712-3100	PL1712-3101	PL1712-3102	PL1712-3103
50 x 150	8	PL1712-3800	PL1712-3801		
25 x 300	15-20	PL1212-6200	PL1212-6201		
25 x 300	10-15	PL1212-6400	PL1212-6401		
25 x 300	10	PL1212-6100	PL1212-6101		
25 x 300	8	PL1212-6800	PL1212-6801		
25 x 150	30			PL1212-3702	PL1212-3703
25 x 150	10	PL1212-3100	PL1212-3101	PL1712-3102	PL1712-3103
25 x 150	8	PL1212-3800	PL1212-3801		
25 x 50	10			PL1212-1102	PL1212-1103
PLRP-S Method Development Columns					
4.6 x 250	30			PL1512-5702	PL1512-5703
4.6 x 250	15-20	PL1512-5200	PL1512-5201		
4.6 x 250	10-15	PL1512-5400	PL1512-5401		
4.6 x 250	10	PL1512-5100	PL1512-5101	PL1512-5102	PL1512-5103
4.6 x 250	8	PL1512-5800	PL1512-5801		
4.6 x 150	30			PL1512-3702	PL1512-3703
4.6 x 150	15-20	PL1512-3200	PL1512-3201		
4.6 x 150	10-15		PL1512-3401		
4.6 x 150	10	PL1512-3100	PL1512-3101	PL1512-3102	PL1512-3103
4.6 x 150	8	PL1512-3800	PL1512-3801		

PLRP-S Bulk Media

Particle Size (µm)	Unit	PLRP-S 100Å	PLRP-S 300Å	PLRP-S 1000Å	PLRP-S 4000Å
50	1 kg	PL1412-6K00	PL1412-6K01	PL1412-6K02	
	100 g	PL1412-4K00	PL1412-4K01	PL1412-4K02	
30	1 kg			PL1412-6702	PL1412-6703
	100 g			PL1412-4702	PL1412-4703
15-20	1 kg	PL1412-6200	PL1412-6201		
	100 g	PL1412-4200	PL1412-4201		
10-15	1 kg	PL1412-6400	PL1412-6401		
	100 g	PL1412-4400	PL1412-4401		
10	1 kg	PL1412-6100	PL1412-6101	PL1412-6102	PL1412-6103
	100 g	PL1412-4100	PL1412-4101	PL1412-4102	PL1412-4103
8	1 kg	PL1412-6800	PL1412-6801		

For larger quantities, please contact your local Agilent sales office



PL-SAX and PL-SCX for Prep to Process

- Ion-exchange purifications over a wider pH range extend applications
- HPLC flow rates and rapid equilibration reduce purification cycle times
- Large pore size for improved mass transfer delivers high speed, high resolution purifications

These rigid, strong ion-exchange materials are extremely hydrophilic and are designed for purification of biomolecules. The PL-SAX and PL-SCX materials are totally polymeric and are chemically and thermally stable over a full range of HPLC conditions. The strong ion-exchange functionalities, covalently linked to a chemically stable polymer, facilitate ion-exchange purifications over a wider pH range. This stability can be exploited for column sanitation and clean-up. Thermal stability also enables the use of denaturing conditions and stabilizing/solubilizing agents for the purification of target compounds, as encountered in the purification of synthetic oligonucleotides with self-complementary sequences.

Both the 1000Å and 4000Å wide-pore materials are mechanically stable and robust and can be operated over a wide range of linear velocities, with fast loading of dilute solutions and wash cycles. HPLC flow rates and rapid equilibration reduces purification cycle times.

Packing in dynamic axial compression (DAC) column hardware is straightforward and high efficiency columns are achieved with excellent reproducibility and lifetimes. The 1000Å pore size is for high-capacity purifications and the 4000Å gigaporous particles with improved mass transfer are intended for large biomolecules and high-speed, high-resolution purifications.



Column Specifications		
	PL-SAX	**PL-SCX**
Matrix	Fully polymeric	Fully polymeric
Pore Sizes	1000Å, 4000Å	1000Å, 4000Å
Particle Sizes	10 µm, 30 µm	10 µm, 30 µm
Bead Form	Rigid spherical	Rigid spherical
Functionality	Quaternary amine	Sulfonic acid
Pressure Stability	3000 psi	3000 psi
Temperature Stability	80 °C	80 °C
pH Range	1-14	1-14
Eluent Compatibility	All anion-exchange buffers	All cation-exchange buffers
Packed Bed Density	0.39 g/mL	0.39 g/mL

Purification of a large oligonucleotide

Column: **PL-SAX 1000Å, 8 µm**

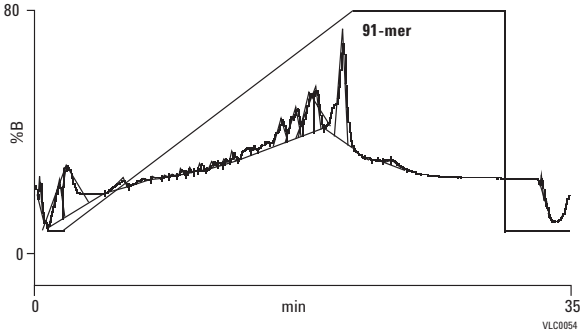
Mobile Phase: A: 93% 0.1 M TEAA, pH 7:7% ACN
B: 93% 0.1 M TEAA, 3.24 M ammonium acetate, pH 7:7% ACN

Gradient: 0-100% B in 20 min

Flow Rate: 1.5 mL/min

Temperature: 60 °C

Detector: UV, 290 nm



Preparative fractionation of a culture filtrate containing amyloglucosidases on Agilent PL-SAX 4000Å

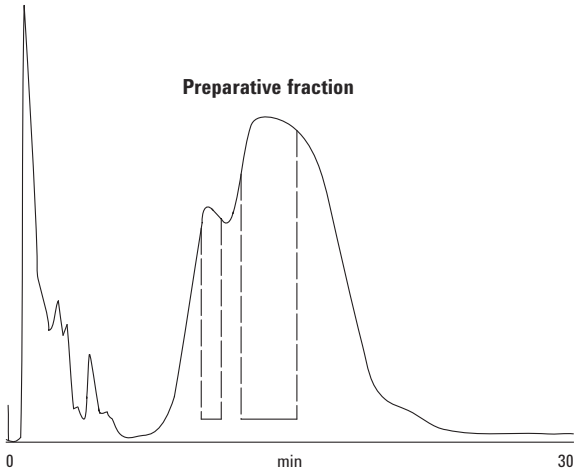
Column: **PL-SAX**
PL1551-1803
4.6 x 50 mm, 8 µm

Mobile Phase: A: 0.01 M Tris HCl, pH 8
B: A + 0.5 M NaCl, pH 8

Flow Rate: 4.0 mL/min

Gradient: Linear 0-100% B in 2 min

Detector: UV, 280 nm





Prep to Process PL-SAX and PL-SCX Columns and Bulk Media

Prep to Process PL-SAX and PL-SCX

Dimensions	Particle Size (µm)	PL-SAX 1000Å	PL-SAX 4000Å	PL-SCX 1000Å	PL-SCX 4000Å
100 x 300	30	PL1851-3102	PL1851-3103	PL1845-3102	PL1845-3103
100 x 300	10	PL1851-2102	PL1851-2103	PL1845-2102	PL1845-2103
50 x 150	30	PL1751-3702	PL1751-3703	PL1745-3702	PL1745-3703
50 x 150	10	PL1751-3102	PL1751-3103	PL1745-3102	PL1745-3103
25 x 150	30	PL1251-3702	PL1251-3703	PL1245-3702	PL1245-3703
25 x 150	10	PL1251-3102	PL1251-3103	PL1245-3102	PL1245-3103
25 x 50	10	PL1251-1102	PL1251-1103	PL1245-1102	PL1245-1103
7.5 x 150	8	PL1151-3802	PL1151-3803		
7.5 x 50	8	PL1151-1802	PL1151-1803	PL1145-1802	PL1145-1803
PL-SAX and PL-SCX Method Development Columns					
4.6 x 250	30	PL1551-5702	PL1551-5703	PL1545-5702	PL1545-5703
4.6 x 250	10	PL1551-5102	PL1551-5103	PL1545-5102	PL1545-5103
4.6 x 150	30	PL1551-3702	PL1551-3703	PL1545-3702	PL1545-3703
4.6 x 150	10	PL1551-3102	PL1551-3103	PL1545-3102	PL1545-3103

PL-SAX and PL-SCX Bulk Media

Particle Size (µm)	Unit	PL-SAX 1000Å	PL-SAX 4000Å	PL-SCX 1000Å	PL-SCX 4000Å
30	1 kg	PL1451-6702	PL1451-6703	PL1445-6702	PL1445-6703
	100 g	PL1451-4702	PL1451-4703	PL1445-4702	PL1445-4703
10	1 kg	PL1451-6102	PL1451-6103	PL1445-6102	PL1445-6103
	100 g	PL1451-4102	PL1451-4103	PL1445-4102	PL1445-4103

For larger quantities, please contact your local Agilent sales office

Peptide Purification



VariTide RPC Columns

VariTide is a cost-effective solution for the production of synthetic peptides. This column lets you manage the cost and efficiency of high-volume synthetic peptide purification, from µg to g scale. VariTide provides a solution for peptide houses that manufacture small quantities of hundreds or thousands of peptides where manufacturing time is the economic driving force.

VariTide RPC Columns for Synthetic Peptides

- A single column to cover the full range of synthetic peptides
- Small particle size for maximum efficiency, even with 1 and 2 in prep columns
- Bulk media to pack 1 and 2 in prep columns for the purification of mg to g quantities

VariTide RPC columns and media are part of the VariPep Peptide Solution. This is the recommended option for cost-effective separation and purification of synthetic peptides using generic methods.

VariTide RPC Columns for Synthetic Peptides

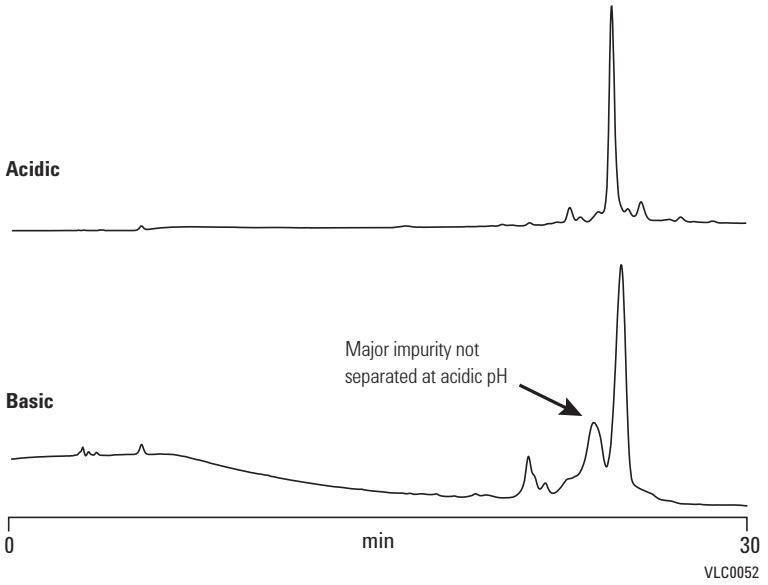
Size (mm)	Part No.
21.2 x 250	PL1E12-5A05
10.0 x 250	PL1012-5A05
4.6 x 250	PL1512-5A05

VariTide RPC Bulk Media

Description	Part No.
100 g	PL1412-4A05
1 kg	PL1412-6A05

Crude peptide screen

Column:	**VariTide RPC PL1512-5A05 4.6 x 250**
Mobile Phase:	Acidic A: 0.1% TFA in 95% water: 5% ACN B: 0.1% TFA in 50% water: 50% ACN Basic A: 5% ACN, 95% 20 mm ammonium carbonate pH 9.5 B: 50% ACN, 50% 20 mm ammonium carbonate pH 9.5
Flow Rate:	1.0 mL/min (360 cm/h)
Gradient:	0-100% B in 30 min
Detector:	UV, 220 nm



VariPure IPE

- Pre-packed for convenience
- Removal of ion-pairing agents for improved productivity
- High performance and economy for excellent efficiency

VariPure IPE is a polymer-supported quaternary-amine resin with a bicarbonate counter ion, designed for removing acidic ion-pair reagents, such as trifluoroacetic acid (TFA), formic acid or acetic acid. VariPure IPE is a high performance and economical acid removal material conveniently supplied as pre-packed SPE type devices. The particle size, capacity and device geometry are matched to provide sufficient residence time to achieve effective ion-air extraction under gravity flow. For acid labile peptides, removal of the ion-pairing agent prevents acid degradation of the peptide during post-HPLC work-up, and increases the yield of purified product.

VariPure IPE

Loading	Counter-ion Removal Capacity	Unit	Part No.
100 mg per 3 mL tube	~ 5 mL 0.1% TFA	50/pk	PL3540-D603VP
500 mg per 6 mL tube	~ 25 mL 0.1% TFA	50/pk	PL3540-C603VP
1 g per 20 mL tube	~ 50 mL 0.1% TFA	25/pk	PL3540-P603VP
25 g			PL3549-3603VP

BioHPLC Columns Literature

Title	Column/Product	Application	Publication Number	Publication Type
Rapid Analysis of Adenovirus Type 5 Particles with Bio-Monolith Anion-Exchange HPLC Columns to Support the Development of a High-Titre Manufacturing Platform	Bio-Monolith QA	Adenovirus	5990-5524EN	Application Note
Separation of Two Sulfurated Amino Acids with other Seventeen Amino Acids by HPLC with Pre-Column Derivatization	Eclipse Plus-C18	Amino acid analysis	5990-5977EN	Application Note
Rapid, Accurate, Sensitive, and Reproducible HPLC Analysis of Amino Acids	ZORBAX Eclipse AAA	Amino acid analysis	5980-1193EN	Application Note
High-Speed Amino Acid Analysis (AAA) on 1.8 µm Reversed-Phase (RP) Columns	ZORBAX Eclipse Plus	Amino acid analysis	5989-6297EN	Application Note
Improved Amino Acid Methods Using Agilent ZORBAX Eclipse Plus C18 Columns for a Variety of Agilent LC Instrumentation and Separation Goals	ZORBAX Eclipse Plus	Amino acid analysis	5990-4547EN	Application Note
Rapid and Precise Determination of Cellular Amino Acid Flux Rates using HPLC with Automated Derivatization with Absorbance Detection	ZORBAX Eclipse Plus	Amino acid analysis	5990-3283EN	Application Note
Agilent PL-SAX 1000Å HPLC Columns and Media	PL-SAX	Analysis/Prep - Oligonucleotides	5990-8200EN	Flyer
Compliance for Biopharmaceutical Laboratories	LC columns	Compliance	5990-7001EN	Primer
Macroporous Reversed-Phase C18 High-Recovery Protein Fractionation HPLC Column	mRP-C18	Human serum, Biomarkers	5989-2714EN	Brochure
Rapid Human Polyclonal IgG Quantification using the Agilent Bio-Monolith Protein A HPLC Column	Bio-Monolith	IgG	5989-9733EN	Application Note
Rapid IgM Quantification in Cell Culture Production and Purification Process Monitoring using the Agilent Bio-Monolith QA Column	Bio-Monolith QA	IgM	5989-9674EN	Application Note
Optimization of Protein Separations on Weak Cation-Exchange Columns – a Study of the Particle Size, Buffer Salts and Gradients	Bio IEX	MAbs	5990-8833EN	Technical Poster

(Continued)

BioHPLC Columns Literature				
Title	**Column/Product**	**Application**	**Publication Number**	**Publication Type**
pH Gradient Elution for Improved Separation of Monoclonal Antibody Charged Variants	Bio MAb	MAbs	5990-9629EN	Application Note
Characterization of Monoclonal Antibodies on the Agilent 1260 Infinity Bio-inert Quaternary LC by Size Exclusion Chromatography using the Agilent Bio SEC Columns	Bio SEC	MAbs	5990-6414EN	Application Note
Agilent BioHPLC Columns for the Characterization of Monoclonal Antibodies	Biocolumns	MAbs	5990-7753EN	Flyer
Fast Separation of Monoclonal Antibody and Dimer by SEC with Agilent Bio SEC	Bio SEC	MAbs	5990-8613EN	Application Note
Choosing a ZORBAX Poroshell Phase (C3, C8, or C18) for Fast Separation of Monoclonal Antibodies	Poroshell 300	MAbs	5989-0071EN	Application Note
Determination of the Glycosylation Status of Intact Recombinant Human Antibodies using Time of Flight Mass Spectrometry	Poroshell 300	MAbs	N/A	Technical Poster
High Speed and Ultra-High Speed Peptide Mapping of Human Monoclonal IgG on Poroshell 300SB-C18, C8, and C3	Poroshell 300	MAbs	5989-0590EN	Application Note
Rapid HPLC Analysis of Monoclonal Antibody IgG1 Heavy Chains using ZORBAX Poroshell 300SB-C8	Poroshell 300	MAbs	5989-0070EN	Application Note
Comparison of ZORBAX StableBond 300Å LC Columns to Optimize Selectivity for Antibody Separations Using HPLC and LC/MS	ZORBAX 300SB	MAbs	5989-6840EN	Application Note
Ultra High Speed and High Resolution Separations of Reduced and Intact Monoclonal Antibodies with Agilent ZORBAX RRHD Sub-2 µm 300 Diphenyl UHPLC Column	ZORBAX RRHD 300-Diphenyl	MAbs	5990-9668EN	Application Note
Reversed-Phase Optimization for Ultra Fast Profiling of Intact and Reduced Monoclonal Antibodies using Agilent ZORBAX Rapid Resolution High Definition 300SB-C3 Column	ZORBAX RRHD 300SB-C3	MAbs	5990-9667EN	Application Note

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BioHPLC Columns Literature				
Title	**Column/Product**	**Application**	**Publication Number**	**Publication Type**
Reversed-Phase Separation of Intact Monoclonal Antibodies (MAb) using Agilent ZORBAX RRHD 300SB-C8	ZORBAX RRHD 300SB-C8	MAbs	5990-9016EN	Application Note
Rapid UHPLC Analysis of Reduced Monoclonal Antibodies using an Agilent ZORBAX Rapid Resolution High Definition (RRHD) 300SB-C8 Column	ZORBAX RRHD 300SB-C8	MAbs	5990-9631EN	Application Note
Increased UV-Sensitivity in Combination with Novel WCX Column Separation for Better Detectability of Charge State Variants of Biotherapeutic Proteins	Bio MAb	MAbs and other proteins	N/A	Technical Poster
Agilent HPLC Column Selection Guide	HPLC columns	Many	5990-4435EN	Selection Guide
The LC Handbook: Guide to LC Columns and Method Development	LC columns	Method development	5990-7595EN	Primer
Agilent PLRP-S 100Å HPLC Columns and Media	PLRP-S	Oligonucleotides	5990-8187EN	Flyer
HPLC Purification of 26-bp Serial Analysis of Gene Expression Ditags	PLRP-S	Oligonucleotides	5990-7739EN	Application Note
Improved Column Lifetime with Thermally Stable Polymer Columns for Oligonucleotide Ion-Pair RP HPLC	PLRP-S	Oligonucleotides	5990-7764EN	Application Note
Ion-Pair Reversed-Phase Purification of De-Protected Oligonucleotides – Choice of Pore Size	PLRP-S	Oligonucleotides	5990-7763EN	Application Note
Use Temperature to Enhance Oligonucleotide Mass Transfer and Improve Resolution in Ion-Pair RP HPLC	PLRP-S	Oligonucleotides	5990-7765EN	Application Note
High Resolution Separations of Oligonucleotides using PL-SAX Strong Anion-Exchange HPLC Columns	PL-SAX	Oligonucleotides	5990-8297EN	Application Note
Fast Impurity Profiling of Synthetic Oligonucleotides with the Agilent 1290 Infinity LC System and Agilent 6530 Accurate-Mass QTOF LC/MS	ZORBAX Eclipse Plus C18 RRHD	Oligonucleotides	5990-5825EN	Application Note
Agilent PLRP-S Media and Load & Lock Columns – The Future of Prep/Process Chromatography	Prep/Process	Oligonucleotides, Peptides, Proteins	5990-8201EN	Flyer
Agilent PLRP-S 50 µm HPLC Media	PLRP-S	Oligonucleotides, Peptides, Small proteins	5990-8188EN	Flyer

(Continued)

BioHPLC Columns Literature

Title	Column/Product	Application	Publication Number	Publication Type
Analysis of Peptides on a PLRP-S 100Å 10 µm with ELS Detection and Acetonitrile-Free Eluents	PLRP-S	Peptides	5990-7760EN	Application Note
Investigation into the Alternatives to Acetonitrile for the Analysis of Peptides	PLRP-S	Peptides	5990-7740EN	Application Note
Investigation into the Alternatives to Acetonitrile for the Analysis of Peptides on a SepTech ST150 10-C18	SepTech	Peptides	5990-7951EN	Application Note
Investigation into the Alternatives to Acetonitrile for the Analysis of Peptides on a VariTide RPC	VariTide RPC	Peptides	5990-8145EN	Application Note
Fast Monitoring of Bacteriophage Production During Fermentation Using the Agilent Bio-Monolith HPLC Column	Bio-Monolith	Phage production, process monitoring	5990-3247EN	Application Note
Physicochemical Characterization of a Therapeutic Protein by Peptide Mapping, SEC and IEX using the Agilent 1260 Infinity Bio-inert Quaternary LC System	Bio MAb, Bio SEC, ZORBAX Eclipse Plus, Poroshell 120	Protein analysis	5990-6192EN	Application Note
Optimization of the Agilent 1100 HPLC System for Superior Results with ZORBAX Poroshell Columns	Poroshell 300	Protein analysis	5988-9998EN	Application Note
Using Poroshell 300SB-C18 for High-Sensitivity, High-Throughput Protein Analysis on the Agilent LC/MSD	Poroshell 300-C18	Protein analysis	5988-7031EN	Application Note
Analysis of Albumin Proteins using ProSEC 300S Columns	ProSEC 300S	Protein analysis	5990-7852EN	Application Note
Analysis of Complex Bacterial Cell Division Proteins by Size Exclusion Chromatography (SEC)	ProSEC 300S	Protein analysis	5990-8143EN	Application Note
Analysis of Globulins using ProSEC 300S Columns	ProSEC 300S	Protein analysis	5990-7851EN	Application Note
Analysis of Hsp47, a Collagen Chaperone, by Size Exclusion Chromatography (SEC)	ProSEC 300S	Protein analysis	5990-8142EN	Application Note
Analysis of Various Globular Proteins using ProSEC 300S Columns	ProSEC 300S	Protein analysis	5990-7850EN	Application Note
Effect of pH on Protein Size Exclusion Chromatography	ProSEC 300S	Protein analysis	5990-8138EN	Application Note
Globular Proteins and the Calibration of ProSEC 300S Columns	ProSEC 300S	Protein analysis	5990-7767EN	Application Note

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BioHPLC Columns Literature				
Title	**Column/Product**	**Application**	**Publication Number**	**Publication Type**
Reduce Tubing Volume to Optimize Column Performance	Small diameter columns	Optimizing instrument performance	5990-4964EN	Application Note
Using the High-pH Stability of ZORBAX Poroshell 300Extend-C18 to Increase Signal-to-Noise in LC/MS	ZORBAX 300 Extend-C18	Optimizing instrument performance	5989-0683EN	Application Note
Increase Sensitivity with Microbore Polymeric HPLC Columns from Agilent	PLRP-S (Microbore)	Peptide hormone, small proteins, small molecules	5990-8666EN	Technical Overview
Decreasing Analysis Time Using Poroshell 300SB-C18 in Analysis of a Protein Digest	Poroshell 300	Peptide mapping	5988-6081EN	Application Note
Rapid Peptide Mapping Method with High Resolution using a sub 2-µm Column	ZORBAX 300SB-C18	Peptide mapping	5990-4712EN	Application Note
Increased Peak Capacity for Peptide Analysis with the Agilent 1290 Infinity LC System	ZORBAX Eclipse Plus	Peptide mapping	5990-6313EN	Application Note
Trypsin-Digested Monoclonal Antibody and BSA using Agilent ZORBAX RRHD 300SB-C18	ZORBAX RRHD 300SB-C18	Peptide mapping	5990-8244EN	Application Note
Preparative Scale Purification of Bradykinin by Concentration Overload	PLRP-S	Peptide purification	5990-7736EN	Application Note
Preparative Scale Purification of Bradykinin by Volume Overload	PLRP-S	Peptide purification	5990-7741EN	Application Note
Preparative Scale Purification of Depherelin by Concentration Overload	PLRP-S	Peptide purification	5990-7742EN	Application Note
Preparative Scale Purification of Leuprolide by Concentration Overload	PLRP-S	Peptide purification	5990-7735EN	Application Note
Superior Resolution of Peptides on SepTech ST150 10-C18 using Acetonitrile-Free Gradient Elution	SepTech	Peptide purification	5990-7761EN	Application Note
Agilent PLRP-S Media for HPLC Analysis of Peptides	PLRP-S	Peptides	5990-8667EN	Technical Overview

(Continued)

BioHPLC Columns Literature

Title	Column/Product	Application	Publication Number	Publication Type
Light Scattering Analysis of BSA with ProSEC 300S Columns	ProSEC 300S	Protein analysis	5990-7766EN	Application Note
Static Light Scattering Analysis of Globular Proteins with Agilent ProSEC 300S Columns	ProSEC 300S	Protein analysis	5990-7939EN	Application Note
LC Handbook and Compliance Guide to Recombinant Protein Characterization	N/A	Protein analysis	5990-8561EN	Primer
Agilent ZORBAX 300SB-C18 1.8µm Rapid Resolution High Definition Columns for Proteins	ZORBAX 300SB-C18	Protein analysis	5990-7989EN	Technical Overview
Analysis of Oxidized Insulin Chains using Reversed-Phase Agilent ZORBAX RRHD 300SB-C18	ZORBAX RRHD 300SB-C18	Protein analysis	5990-7988EN	Application Note
Fast Separation of Recombinant Human Erythropoietin using Reversed-Phase Agilent ZORBAX RRHD 300SB-C18, 1.8 µm	ZORBAX RRHD 300SB-C18	Protein analysis	5990-9248EN	Application Note
ACN-free HPLC Analysis and Prep Purification of ACP Fragment	PLRP-S	Protein purification	5990-7762EN	Application Note
Isocratic Purification of Synthetic Acyl Carrier Protein Fragment 65-74	PLRP-S	Protein purification	5990-7737EN	Application Note
Agilent PL-SAX Anion-Exchange Media for Amyloglucosidase Purification and Analysis	PL-SAX	Protein purification	5990-8664EN	Technical Overview
Progressive Denaturation of Globular Proteins in Urea	ProSEC 300S	Protein purification	5990-8141EN	Application Note
Optimizing Protein Separations with Agilent Weak Cation-Exchange Columns	Bio IEX	Protein separation	5990-9628EN	Application Note
Faster Separations Using Agilent Weak Cation-Exchange Columns	Bio IEX	Protein separation	5990-9931EN	Application Note
Optimum Pore Size for Characterizing Biomolecules with Agilent Bio SEC Columns	Bio SEC	Protein separation	5990-9894EN	Application Note
Separation of High MW Fibrous Proteins	PLRP-S	Protein separation	5990-8137EN	Application Note

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BioHPLC Columns Literature				
Title	**Column/Product**	**Application**	**Publication Number**	**Publication Type**
Fast Protein Separations Using Agilent Poroshell 300	Poroshell 300	Protein separation	5989-9899EN	Application Note
Fast Separation of Large and Heterogeneous Proteins using ZORBAX Poroshell C18, C8, and C3 Phases	Poroshell 300	Protein separation	5989-0015EN	Application Note
Protein Identification and Impurity Profiling using Wide-Pore Reversed-Phase HPLC/UHPLC	Poroshell 300	Protein separation	5991-0625EN	Brochure
Use of Temperature to Increase Resolution in the Ultrafast HPLC Separation of Proteins with ZORBAX Poroshell 300SB-C8 HPLC Columns	Poroshell 300-C8	Protein separation	5989-0589EN	Application Note
The Effect of NaCl Concentration on Protein Size Exclusion Chromatography	ProSEC 300S	Protein separation	5990-8139EN	Application Note
The Effect of Temperature on Protein Size Exclusion Chromatography	ProSEC 300S	Protein separation	5990-8140EN	Application Note
Infinitely Better for Bio-Molecule Analysis	Agilent 1260 Infinity Bio-inert Quaternary LC System	Proteins	5990-6220EN	Brochure
Defining the Optimum Parameters for Efficient Size Separations of Proteins	Bio SEC	Proteins	5990-8832EN	Technical Poster
Defining the Optimum Parameters for Efficient Size Separations of Proteins	Bio SEC	Proteins	5990-8895EN	Application Note
Compliance for Biopharmaceutical Laboratories	Many	Proteins	5990-7001EN	Primer
Gradient Purification of Synthetic Acyl Carrier Protein Fragment 65-74	PLRP-S	Proteins	5990-7738EN	Application Note
Fast Agilent HPLC for Large Biomolecules	PLRP-S, PL-SAX, PL-SCX	Proteins	5990-8663EN	Technical Overview
Agilent Anion-Exchange Media for Proteins – Loading vs Resolution – Effect of Flow Rate and Example Protein Separations	PL-SAX	Proteins	5990-8777EN	Technical Overview
Purity Assessment Following Affinity Separation	PL-SAX	Proteins	5990-8436EN	Technical Overview
Agilent PL-SCX Cation-Exchange Media for Large Biomolecules	PL-SCX	Proteins	5990-8665EN	Technical Overview

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BioHPLC Columns Literature

Title	Column/Product	Application	Publication Number	Publication Type
Poroshell 300SB-C18 for Fast, High Protein Separation	Poroshell 300	Proteins	5988-2100ENUS	Brochure
Progressive Denaturation of Globular Proteins in Urea	ProSEC 300S	Proteins	5990-8141EN	Application Note
ProSEC 300S Columns Protein Characterization Columns	ProSEC 300S	Proteins	5990-7468EN	Flyer
Static Light Scattering Analysis of Globular Proteins with Agilent ProSEC 300S Columns	ProSEC 300S	Proteins	5990-7939EN	Application Note
Confidently Separate and Characterize Biomolecules with Agilent BioHPLC Columns	Bio SEC, Bio IEX, Bio MAb	Proteins	5990-5195EN	Brochure
Increase your Productivity with Agilent ZORBAX RRHD 300Å 1.8 µm Columns	ZORBAX RRHD 300SB-C18, C8	Proteins, Peptides	5990-8124EN	Flyer
High Purity, High Recovery, High Throughput – Agilent Technologies Offers Two New Lines of Preparative HPLC Columns	Agilent Prep HT	Purification/Prep	5989-2350EN	Brochure
Biomolecule Purification – Purification Columns and Media for Peptides, Oligonucleotides, and Proteins	PLRP-S, PL-SAX, PL-SCX	Purification/Prep	5990-8335EN	Brochure
The Influence of Silica Pore Size on Efficiency, Resolution and Loading in Reversed-Phase HPLC	SepTech	Purification/Prep	5990-8298EN	Application Note
Analysis of Protein Primary Structure when using Wide-Pore sub-2-µm Particles and UHPLC	ZORBAX RRHD 300SB-C18	Purification/Prep	5990-8830EN	Technical Poster
Polyethylene Glycol/Oxide Standards and the Calibration of Agilent ProSEC 300S Columns	ProSEC 300S	SEC	5990-8147EN	Application Note

TIPS & TOOLS

For the latest application notes and new product information, go to **www.agilent.com/chem/library**

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Schneider, N. *et al.* (20111) Prevalence and stability of lysozyme in cheese. *Food Chemistry,* 128(1): 145-151

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GPC/SEC Columns and Standards

- A full portfolio of products for analysis of synthetic and natural polymers
- A wide selection of polymer standards to cover the range of applications in organic and water based solvents
- PL aquagel-OH-series, for aqueous SEC separations, and PLgel, for organic polymer applications, are available in mixed and individual pore sizes across a range of particle sizes, to cover the full spectrum of molecular weights (MW)
- Prep scale columns are available, along with narrow bore columns and columns designed for specific applications

Gel permeation chromatography (GPC) and size exclusion chromatography (SEC) are names applied to the most popular technique for measuring the molecular weight distribution (MWD) of natural and synthetic polymers, a property that affects many of the physical parameters of materials such as strength, toughness and chemical resistance. GPC and SEC are liquid chromatographic techniques that separate individual polymer chains on the basis of their size in solution and not on their chemistry. Gel permeation chromatography (GPC) is the name used to describe the analysis of polymers in organic solvents, such as tetrahydrofuran. Size exclusion chromatography (SEC) is the name used to describe the analysis of polymers in water and water-based solvents, such as buffer solutions. GPC/SEC is the only established method for obtaining a comprehensive understanding of a polymer's molecular weight distribution.

TIPS & TOOLS

For information on SEC columns for proteins, turn to pages 416-417.

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GPC/SEC Columns

The key to successful GPC/SEC separations is the correct choice of columns. The comprehensive range of Agilent products for GPC/SEC has been designed to cover virtually all polymer analysis application areas, and to make selection for the correct column, solvent, and calibration standard fast and reliable.

Agilent's PLgel GPC series of columns are for polymer applications using organic solvents. PLgel is a highly cross-linked, porous polystyrene/divinylbenzene matrix, which is recognized as a market leader in GPC column technology. PLgel materials have high pore volume and high-efficiency to maximize resolution. Their unequalled solvent compatability makes for easy transfer between polar and non-polar eluents, and outstanding physical rigidity provides extended lifetimes that maximize downtime. For more information and full ordering details, see pages 496-497.

Agilent's PL aquagel-OH series of columns provide a chemically and physically stable matrix for reliable aqueous SEC separations. The columns are packed with macroporous copolymer beads with an extremely hydrophilic polyhydroxyl functionality. The "neutral" surface and the capability to operate across a wide range of eluent conditions provide for high performance analyses of compounds with neutral, ionic, and hydrophobic moieties, alone or in combination. PL aquagel-OH is available for analytical and preparative applications. For more information and full ordering details, see page 523.



Polymer standards for GPC/SEC

Agilent manufactures the highest quality polymer standards with extremely narrow polydispersity and the widest molecular weight range commercially available. These quality polymer standards are supplied with extensive characterization data utilizing a variety of independent techniques (e.g. light scattering and viscometry) and high performance GPC to verify polydispersity and assign the peak molecular weight (Mp).

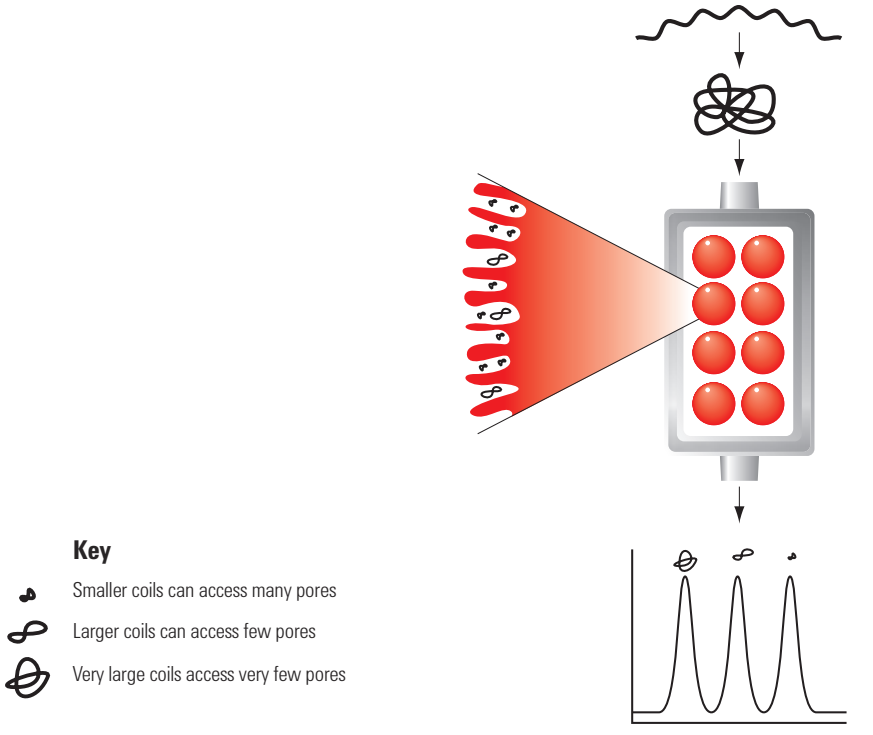
EasiVial – for organic and aqueous calibration. EasiVial is the fastest and most convenient method to deliver an accurate 12-point column calibration. EasiVial eliminates tedious weight procedures for improved calibration accuracy and reduces solvent dispensing to limit risks associated with handling solvents.

EasiCal – for organic solvents. EasiCal packs are pre-prepared for a no-fuss process. Two different combs, each with ten detachable spatulas, support a mixture of five polymer standards. The cost-effective format is designed to save money.

Individual standards and kits – an extensive range of polymer standard kits of different chemistries designed to match specific column sets are available, as well as individual standards in various pack sizes. For more details about Agilent's calibration standards for GPC/SEC, see page 530.

How GPC/SEC works:

- Polymer molecules dissolve in solution to form spherical coils with size dependent on molecular weight
- The polymer coils are introduced to eluent flowing through the column
- Columns are packed with insoluble porous beads with well-defined pore structure
- The size of pores is similar to that of the polymer coils
- The polymer coils diffuse in and out of the pores
- Result is elution based on size – large coils first, smaller coils last
- Size separation converted to molecular weight separation by use of a calibration curve constructed by the use of polymer standards



Mechanisms of GPC and SEC

Recommendations for setting up a GPC/SEC system

The following questions will help you find the recommended columns and standards for any given application, as well as system parameters such as injection volumes.

Choosing an eluent for GPC/SEC

Question	Answer	Recommendation	Comments
1. What is the sample soluble in?	Water or water buffer with up to 50% methanol	Agilent PL aquagel-OH	Best choice for water-based applications but cannot accommodate organics apart from methanol up to 50%
Many polymers are only soluble in a small number of solvents. This is the key question when developing methods for analyzing polymers. The solvents mentioned here are all common eluents employed in GPC/SEC.	Typical organic solvent such as THF, chloroform, toluene	Agilent PLgel or Agilent PlusPore	PLgel are the workhorse columns, PlusPore columns are an alternative
	Organic/water mixtures or polar organics such as, DMF, NMP	Agilent PolarGel	PolarGel is a smaller column range than PLgel or PL aquagel-OH columns but is suited to mixtures of organics and water

TIPS & TOOLS

More information on GPC/SEC instrumentation and systems is a click away. We have a variety of application notes, data sheets and brochures available from Agilent for free.

To learn more, visit
www.agilent.com/chem/gpc



Choosing a column for GPC/SEC

Columns shown in bold are the best initial choice

Question	Answer	Recommendation	Comments
2. What is the expected molecular weight? *It may seem strange to ask this question, but in GPC/SEC the resolution of a column is related to the resolving range. Knowing something of the expected molecular weight of a sample helps to choose the best column that will give optimum results.*	High (up to several millions)	Aqueous solvents **PL aquagel-OH MIXED-H 8 µm** or combination of PL aquagel-OH 40 and 60 15 µm	The 15 µm column combination is best only where sample viscosity is very high, otherwise 8 µm columns give greater resolution
		Organic solvents **PLgel 10 µm MIXED-B** or PLgel 20 µm MIXED-A	The PLgel MIXED-A column resolves higher than the PLgel MIXED-B but at lower efficiency due to larger particle size
		Mixed solvents **PolarGel**	No PolarGel column available for this molecular weight range. Contact your local GPC/SEC expert for advice
	Intermediate (up to hundreds of thousands)	Aqueous solvents **PL aquagel-OH MIXED-M 8 µm**	A wide-ranging column that covers most water-soluble polymers
		Organic solvents **PLgel 5 µm MIXED-C** or PLgel 5 µm MIXED-D, PolyPore or ResiPore	The PLgel columns are the most widely applicable for the majority of applications; PolyPore and ResiPore columns are alternatives
		Mixed solvents **PolarGel-M**	Covers most applications
	Low (up to tens of thousands)	Aqueous solvents **Combination of PL aquagel-OH 40 and PL aquagel-OH 30 8 µm**	These two columns in a combined set cover the low end of the molecular weight range
		Organic solvents **PLgel 3 µm MIXED-E** or MesoPore	The PLgel column provides high resolution and is designed for low molecular weight applications; the MesoPore column is an alternative
		Mixed solvents **PolarGel-L**	For low molecular weight applications
	Very low (a few thousand)	Aqueous solvents **PL aquagel-OH 20 5 µm**	This high-performance column gives high resolution at low molecular weight
		Organic solvents **OligoPore** or PLgel 3 µm 100Å	The OligoPore column is less prone to dispersion than the PLgel column, but both work well
		Mixed solvents **PLgel**	No PolarGel column covers this range so use PLgel columns as alternatives
	Unknown	Aqueous solvents **PL aquagel-OH MIXED-M 8 µm**	Covers the molecular weight ranges of most polymer samples
		Organic solvents **PLgel 5 µm MIXED-C** or PolyPore	This PLgel column is the most widely applicable for the majority of applications
		Mixed solvents **PolarGel-M**	Covers the majority of applications

Setting up the GPC/SEC system

Question	Answer	Recommendation	Comments
3. How many columns to use? *The greater the particle size of the media in the column (which is dependent on the expected molecular weight of the samples), the lower the resolution and the more columns are required to maintain the quality of the results. For higher molecular weight samples, larger particles are necessary to reduce the danger of shear degradation of samples during analysis.*	Depends on the particle size of the columns	Particle size 20 µm use 4 columns Particle size 13 µm use 3 columns Particle size 10 µm use 3 columns Particle size 8 µm use 2 columns Particle size 5 µm use 2 columns Particle size 3 µm use 2 columns	Increased number of columns required for large particle sizes to make up for low efficiencies

Question	Answer	Recommendation	Comments
4. What size injection volume? *The injection volume required is dependent on the particle size of the column – smaller particles need lower injection volumes to minimize dead volume. Larger injection volumes allow the introduction of high molecular weight samples at lower concentrations, reducing viscosity and ensuring a quality chromatogram is obtained.*	Depends on the particle size of the columns	Particle size 20 µm use 200 µL injection Particle size 13 µm use 200 µL injection Particle size 10 µm use 200 µL injection Particle size 5 µm use 100 to 200 µL injection Particle size 3 µm use 20 µL injection	Smaller particle sizes require smaller loops to minimize band broadening

What standards should I use?

Standards shown in bold are the best initial choice

Question	Answer	Recommendation	Comments
5. What is the eluent? *Standards are polymers, so the choice of standard mainly reflects solubility in the chosen eluents.*	Water or water buffer with up to 50% methanol	**Polyethylene glycol (PEG)/oxide (PEO)** or polysaccharides (SAC)	These standards perform in all water-based systems, PEG/PEO in convenient Agilent EasiVial format
	Typical organic solvent such as THF, chloroform, toluene	**Polystyrene (PS)** or polymethylmethacrylate (PMMA)	Polystyrene is the most commonly used standard in convenient EasiVial format
	Organic/water mixtures or polar organics such as DMF, NMP	**Polyethylene glycol/oxide** or polymethylmethacrylate	Polar standards perform well

(Continued)

What standards should I use?

Question	Answer	Recommendation	Comments
6. What format of standards are recommended?	For the quickest and simplest approach where accurate concentrations are not required	Easiest option – **EasiVial** or EasiCal	Simple to use, EasiVial preferred before EasiCal because of the wider choice of polymer types
Different formats of standards are available depending on customer preference.	If accurate concentrations are required	Accurate concentrations required – **EasiVial** or individual standards	Both formats allow accurate sample concentrations, EasiVials are simpler to use

Typical polymer molecular weights

If you are unsure of the molecular weight of your sample, the table below shows some approximate molecular weight ranges for common polymers, which will help you select the right column for your application.

Polymer Type	Typical molecular weight of polymer	Typical polydispersity[1] of polymer
Polymers from free radical synthesis	High (up to several million) Intermediate (up to hundreds of thousands)	~ 2
Polymers from ionic synthesis	Intermediate (up to hundreds of thousands) Low (up to tens of thousands)	~ 1.01
Polymers from addition synthesis	Intermediate (up to hundreds of thousands) Low (up to tens of thousands)	~ 2
Polymers from controlled radical polymerization	Low (up to tens of thousands) Very low (a few thousand)	~ 1.1 to 1.5
Polyolefins	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2 to 200
Acrylates	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2
Small molecule additives	Very low (a few thousand)	1
Pre-polymers	Low (up to tens of thousands) Very low (a few thousand)	~ 2 to 10
Resins	Low (up to tens of thousands) Very low (a few thousand)	~ 2 to 10
Natural biopolymers such as polysaccharides	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2 to 10
Rubbers	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2 to 10
Biodegradable polymers	Intermediate (up to hundreds of thousands) Low (up to tens of thousands)	~ 1.1 to 2

[1] Polydispersity is a measure of the distribution of molecular mass of a polymer. Polydispersity index (PDI) = M_w/M_n.

Organic GPC

PLgel GPC Columns

- Robust performance under the most exacting conditions
- Temperature stability up to 220 °C
- Solvent compatibility allows easy and rapid transfer between solvents of varying polarity

PLgel materials have high pore volume and high efficiency to maximize resolution. Their unequalled solvent compatibility makes for easy transfer between polar and non-polar eluents, and outstanding physical rigidity provides extended lifetimes that minimize downtime.

The key to successful GPC separations is the correct choice of columns. The comprehensive range of PLgel products has been designed to cover virtually all organic solvent-based polymer analysis application areas, and to make selection of the correct column, solvent, and calibration standard fast and reliable.

PLgel is a highly cross-linked, porous polystyrene/divinylbenzene matrix, which is recognized as a market leader in GPC column technology. PLgel is manufactured to ISO 9001:2000 and benefits from comprehensive QC/QA for total reproducibility, batch-to-batch and column-to-column.

Solvent Compatibility

PLgel columns are routinely supplied in ethyl benzene* but you can easily and rapidly transfer between solvents of varying polarity. In organic GPC, sample to column interaction may occur occasionally and eluent modification can be used to eliminate these effects. PLgel columns are the ideal choice for such analyses, as they easily tolerate eluents in the pH range 1-14, as well as up to 10% water in a miscible organic solvent.

PLgel is compatible with all of these solvents

Solvent Polarity	Solvent
6.0	Perfluoroalkane
7.3	Hexane
8.2	Cyclohexane
8.9	Toluene
9.1	Ethyl acetate
9.1	Tetrahydrofuran (THF)
9.3	Chloroform
9.3	Methyl ethyl ketone (MEK)
9.7	Dichloromethane
9.8	Dichloroethene
9.9	Acetone
10.0	o-Dichlorobenzene (o-DCB)
10.0	Trichlorobenzene (TCB)
10.2	m-Cresol
10.2	o-Chlorophenol (o-CP)
10.7	Pyridine
10.8	Dimethyl acetamide (DMAc)
11.3	n-Methyl pyrolidone (NMP)
12.0	Dimethyl sulfoxide (DMSO)
12.1	Dimethyl formamide (DMF)

*We also provide a custom packing service in which columns can be shipped in specific solvents to provide extra convenience to our customers.

PLgel Frit Porosity

Media Type	Porosity (µm)
PLgel 3 µm	2
PLgel 5 µm	2
PLgel 10 µm	5
PLgel 20 µm	10

For PLgel column accessories ordering information please see page 529

PLgel MIXED Columns

The PLgel MIXED range greatly simplifies column selection for easy decision making. By using these mixed columns, you can eliminate mismatched column sets and spurious peaks for more reliable results. Every column contains a mixture of individual pore size materials, accurately blended to cover a specified broad range of molecular weight with a linear calibration to eliminate column mismatch. Simply add extra columns for even greater resolution.

Column Specifications

Column	Linear MW Operating Range (g/mol)	Guaranteed Column Efficiency	Typical Pressure	Maximum Flow Rate	Maximum Pressure	Maximum Temperature
PLgel MIXED-A	2,000-40,000,000	> 17,000 p/m	1 mL/min (7.5 mm id): ≈ 3 bar (44 psi) per 300 mm 0.3 mL/min (4.6 mm id): ≈ 2.4 bar (35 psi) per 250 mm (THF @ 20 °C, TCB @ 140 °C)	7.5 mm id: 1.5 mL/min 4.6 mm id: 0.5 mL/min	150 bar (2175 psi)	220 °C
PLgel MIXED-B	500-10,000,000	> 35,000 p/m	1 mL/min (7.5 mm id): ≈ 10 bar (145 psi) per 300 mm 0.3 mL/min (4.6 mm id): ≈ 8 bar (116 psi) per 250 mm (THF @ 20 °C, TCB @ 140 °C)	7.5 mm id: 1.5 mL/min 4.6 mm id: 0.5 mL/min	150 bar (2175 psi)	220 °C
PLgel MIXED-C	200-2,000,000	> 50,000 p/m	1 mL/min (7.5 mm id): ≈ 30 bar (435 psi) per 300 mm 0.3 mL/min (4.6 mm id): ≈ 24 bar (348 psi) per 250 mm (THF @ 20 °C, TCB @ 140 °C)	7.5 mm id: 1.5 mL/min 4.6 mm id: 0.5 mL/min	150 bar (2175 psi)	150 °C
PLgel MIXED-D	200-400,000	> 50,000 p/m	1 mL/min (7.5 mm id): ≈ 30 bar (435 psi) per 300 mm 0.3 mL/min (4.6 mm id): ≈ 24 bar (348 psi) per 250 mm (THF @ 20 °C, TCB @ 140 °C)	7.5 mm id: 1.5 mL/min 4.6 mm id: 0.5 mL/min	150 bar (2175 psi)	150 °C
PLgel MIXED-E	up to 30,000	7.5 x 300 mm: > 80,000 p/m 4.6 x 250 mm: > 70,000 p/m	1 mL/min (7.5 mm id): ≈ 50 bar (725 psi) per 300 mm 0.3 mL/min (4.6 mm id): ≈ 42 bar (609 psi) per 250 mm (THF @ 20 °C)	7.5 mm id: 1.5 mL/min 4.6 mm id: 0.5 mL/min	180 bar (2611 psi)	110 °C

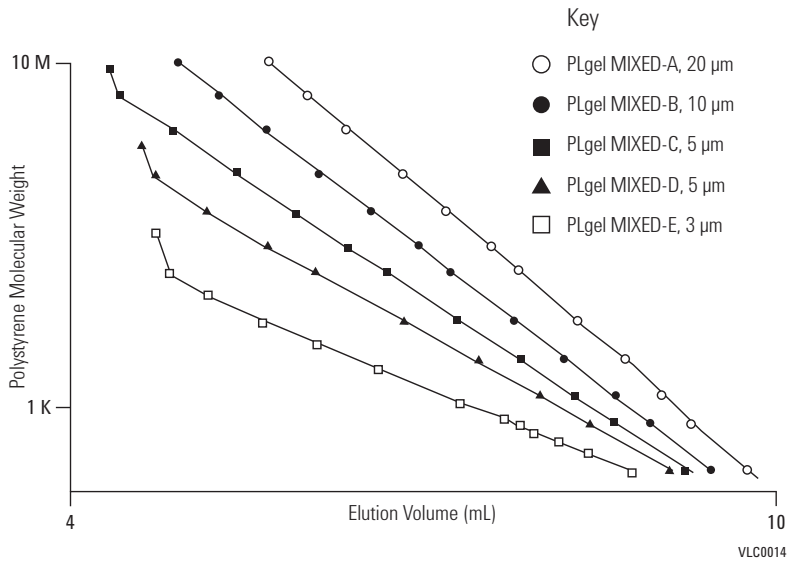
PLgel MIXED Column Selection Guide

UHMW polymer distributions	PLgel MIXED-A, 20 µm
High MW polymers, demanding eluents	PLgel MIXED-B, 10 µm
Mid range MW polymers, high resolution	PLgel MIXED-C, 5 µm
Resins, condensation polymers	PLgel MIXED-D, 5 µm
Low MW resins, prepolymers	PLgel MIXED-E, 3 µm



PLgel MIXED Gel Calibration Curves

MIXED gel calibration curves are designed to be linear over a specified molecular weight range, ensuring that the same degree of resolution is achieved across the full operating range of the column. The particle size of the packing and porosity of a particular MIXED gel column are carefully matched to the MW range and application, thus optimizing performance and eliminating the effects of shear degradation. Resolution in GPC is controlled by the slope of the calibration curve and the particle size of the packing material. Agilent has scientifically determined the minimum number of MIXED gel columns required to perform accurate MWD determinations based on specific resolution (Rsp). Thus you can have complete confidence in the accuracy and precision of the calculated data.



Reference: Meehan, E. (1998) Size exclusion chromatography columns from Polymer Laboratories. In: Chi-San Wu (Ed.) Column Handbook for Size Exclusion Chromatography. Academic Press, New York, USA.

PLgel MIXED Columns

Description	Size (mm)	Part No.
PLgel 20 µm MIXED-A	7.5 x 300	PL1110-6200
PLgel 10 µm MIXED-B	7.5 x 300	PL1110-6100
PLgel 5 µm MIXED-C	7.5 x 300	PL1110-6500
PLgel 5 µm MIXED-D	7.5 x 300	PL1110-6504
PLgel 3 µm MIXED-E	7.5 x 300	PL1110-6300

PLgel MIXED Guards

Size (mm)	Particle Size (µm)	Part No.
7.5 x 50	20	PL1110-1220
7.5 x 50	10	PL1110-1120
7.5 x 50	5	PL1110-1520
7.5 x 50	3	PL1110-1320

Starches

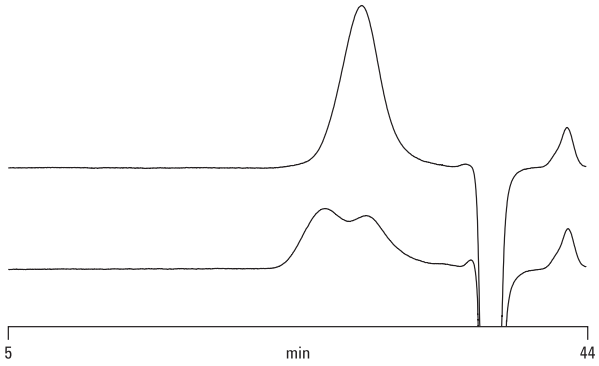
Column: **4 x PLgel 20 µm MIXED-A**
PL1110-6200
7.5 x 300 mm

Mobile Phase: DMSO + 5 mM $NaNO_3$

Flow Rate: 1.0 mL/min

Temperature: 80 °C

Detector: RI



Polyphenylene Sulfides

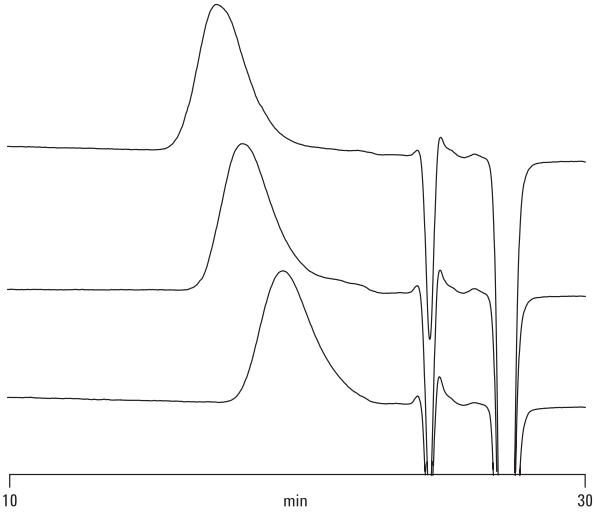
Column: **3 x PLgel 10 µm MIXED-B**
PL1110-6100
7.5 x 300 mm

Mobile Phase: o-Chloronaphthalene

Flow Rate: 1.0 mL/min

Temperature: 210 °C

Detector: RI



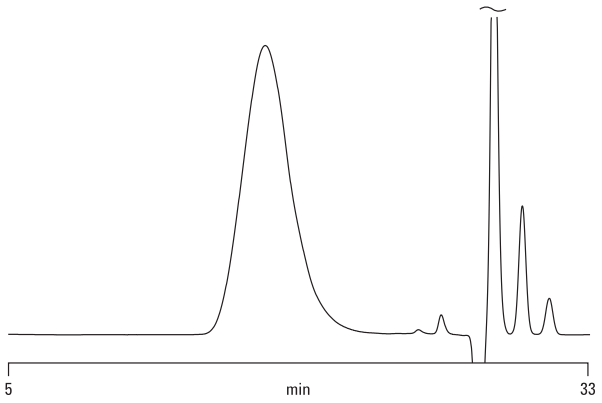
Plasticized PVC

Column: **3 x PLgel 5 µm MIXED-C**
PL1110-6500
7.5 x 300 mm

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: RI



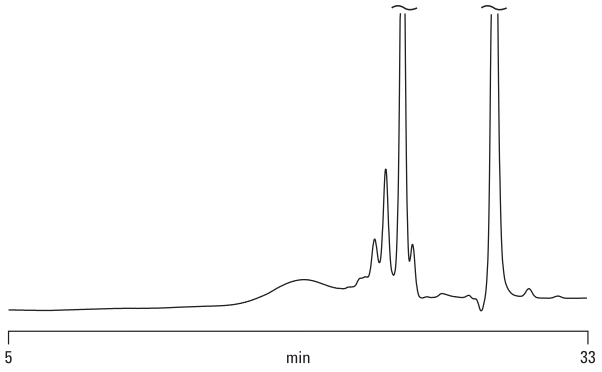
Epoxy Resin

Column: **3 x PLgel 5 µm MIXED-D**
PL1110-6504
7.5 x 300 mm

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: RI



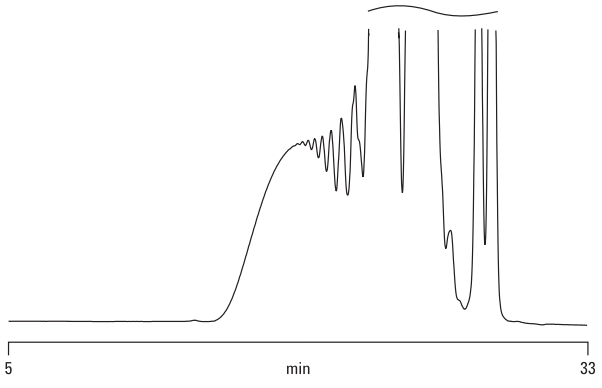
Polyol

Column: **PLgel 3 µm MIXED-E**
PL1110-6300
7.5 x 300 mm

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: UV, 254 nm



PLgel MIXED-LS Columns

- Obtain an instant improvement in data quality
- No need for conditioning, saving time and solvent costs
- Maximize the potential of light scattering detectors

The PLgel MIXED-LS series is a PS/DVB packing using an innovative proprietary suspension polymerization technique to virtually eliminate nano-particle leakage. A startling improvement is achieved immediately in the quality of light scattering data obtained with PLgel MIXED-LS columns in place of conventional GPC columns. The light scattering chromatograms shown here were obtained after flushing the columns for one hour in THF at 1 mL/min. A polystyrene standard (Mp 210,000) was injected at 1 mg/mL in order to illustrate the dramatic improvement in signal-to-noise with the PLgel MIXED-LS column.

The performance of PLgel MIXED-LS columns has been matched to PLgel 20 µm MIXED-A and PLgel 10 µm MIXED-B columns in terms of calibration, column efficiency, wide solvent compatibility, and operating temperature. MIXED-LS are also ideal for online viscosity detection, minimizing the risk of capillary blockage, and can be used with regular PLgel guard columns that are packed with rigid low pore size gels with no particle bleed.

PLgel MIXED-LS Columns

Description	Size (mm)	Linear MW Operating Range (g/mol) (PS)	Guaranteed Efficiency (p/m)	Part No.
PLgel 10 µm MIXED-B LS	7.5 x 300	500-10,000,000	>35,000	PL1110-6100LS
PLgel 10 µm guard	7.5 x 50			PL1110-1120
PLgel 20 µm MIXED-A LS	7.5 x 300	2,000-40,000,000	>17,000	PL1110-6200LS
PLgel 20 µm guard	7.5 x 50			PL1110-1220

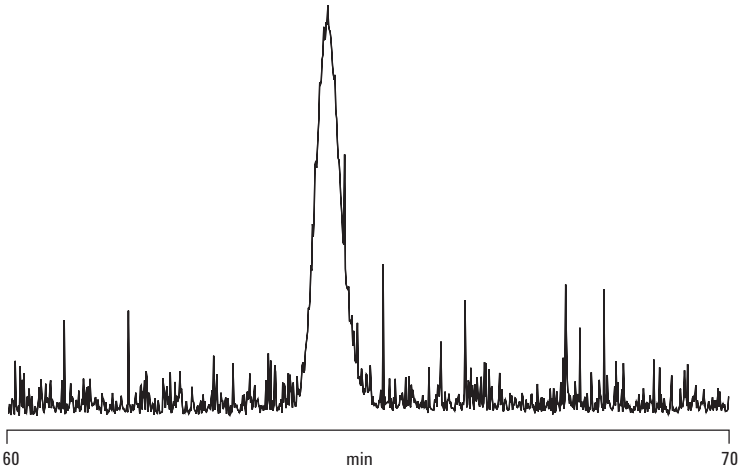
Conventional GPC column

Column: **Conventional GPC column**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: LS



Light scattering detection with a conventional GPC column – noise due to particulate bleed.

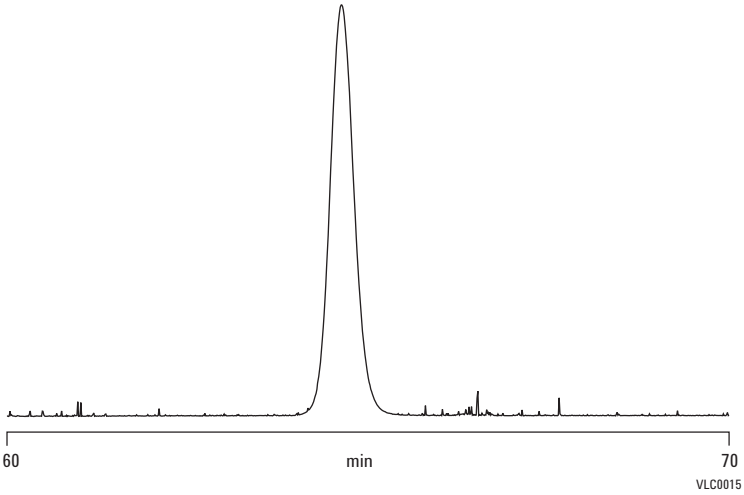
PLgel LS column

Column: **PLgel 10 µm MIXED-B LS**
PL1110-6100LS
7.5 x 300 mm, 10 µm

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: LS



Light scattering detection with a PLgel LS column – minimal particulate bleed gives greatly improved baseline.

PLgel MiniMIX Columns

- Use about 70% less solvent and save money
- Store less solvent and increase operator safety
- High performance comparable to Agilent's conventional id columns

For reduced solvent cost and consumption, use industry standard PLgel MiniMIX mixed gel columns in 250 x 4.6 mm narrow bore dimensions. These narrow bore columns offer high performance, excellent solvent compatibility and mechanical stability. PLgel MiniMIX columns can be used with conventional GPC equipment.

To maintain the same linear velocity through the column, the volumetric flow rate must be reduced to 0.3 mL/min in line with the column cross sectional area, resulting in significantly lower solvent consumption. Sample loading should also be scaled down in line with reduced column volume, and system dead volume should be minimized to avoid excessive band broadening.

PLgel MiniMIX Columns

Description	Size (mm)	Linear MW Operating Range (g/mol) (PS)	Guaranteed Efficiency (p/m)	Part No.
PLgel 20 µm MiniMIX-A	4.6 x 250	2,000-40,000,000	> 17,000	PL1510-5200
PLgel 20 µm MiniMIX-A guard	4.6 x 50			PL1510-1200
PLgel 10 µm MiniMIX-B	4.6 x 250	500-10,000,000	> 35,000	PL1510-5100
Plgel 10 µm MiniMIX-B guard	4.6 x 50			PL1510-1100
PLgel 5 µm MiniMIX-C	4.6 x 250	200-2,000,000	> 50,000	PL1510-5500
PLgel 5 µm MiniMIX-C guard	4.6 x 50			PL1510-1500
PLgel 5 µm MiniMIX-D	4.6 x 250	200-400,000	> 50,000	PL1510-5504
PLgel 5 µm MiniMIX-D guard	4.6 x 50			PL1510-1504
PLgel 3 µm MiniMIX-E	4.6 x 250	up to 30,000	> 70,000	PL1510-5300
PLgel 3 µm MiniMIX-E guard	4.6 x 50			PL1510-1300

PLgel Individual Pore Size Columns

- Very high efficiency improves productivity
- Choose the optimum column for a perfect match of performance and application
- Fast analysis with fewer columns saves time and money

Individual pore size GPC columns offer high resolution over a specific molecular weight range. The linear portion of the calibration curve, where the slope is at its shallowest, defines the MW region over which optimum resolution will be achieved.

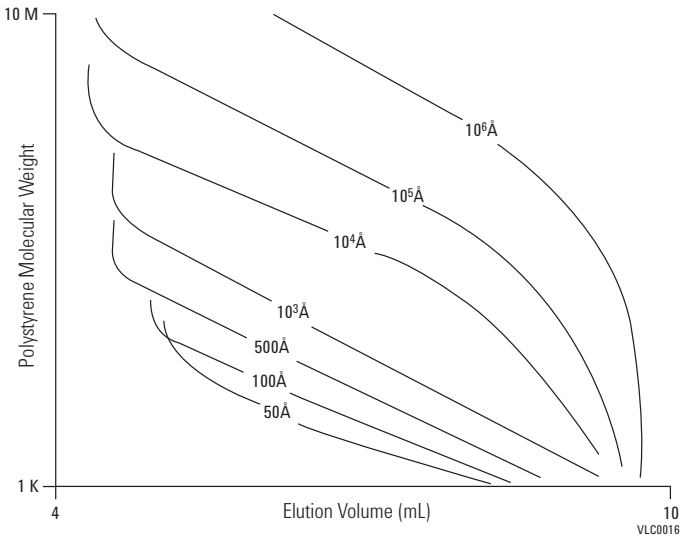
PLgel Individual Pore Size Columns

Size (mm)	Particle Size (µm)	Pore Size (Å)	Linear MW Operating Range (g/mol) (PS)	Guaranteed Efficiency (p/m)	Part No.
7.5 x 300	3	100	up to 4,000	> 100,000	PL1110-6320
7.5 x 300	5	50	up to 2,000	> 60,000	PL1110-6515
7.5 x 300	5	100	up to 4,000	> 60,000	PL1110-6520
7.5 x 300	5	500	500-30,000	> 60,000	PL1110-6525
7.5 x 300	5	10^3	500-60,000	> 50,000	PL1110-6530
7.5 x 300	5	10^4	10,000-600,000	> 50,000	PL1110-6540
7.5 x 300	5	10^5	60,000-2,000,000	> 50,000	PL1110-6550
7.5 x 300	10	50	up to 2,000	> 35,000	PL1110-6115
7.5 x 300	10	100	up to 4,000	> 35,000	PL1110-6120
7.5 x 300	10	500	500-30,000	> 35,000	PL1110-6125
7.5 x 300	10	10^3	500-60,000	> 35,000	PL1110-6130
7.5 x 300	10	10^4	10,000-600,000	> 35,000	PL1110-6140
7.5 x 300	10	10^5	60,000-2,000,000	> 35,000	PL1110-6150
7.5 x 300	10	10^6	600,000-10,000,000	> 35,000	PL1110-6160

PLgel Guard Column information can be found on page 500

Calibration curves

Calibrant: Polystyrene
Mobile Phase: THF
Flow Rate: 1.0 mL/min



PLgel Preparative Columns

- Excellent column efficiency provides optimum resolution
- High loading can isolate mg amounts for further study
- Over 10 times scale up permits efficient quantification

Preparative GPC is generally employed to fractionate polymers, isolate components in a polymer formulation or simplify mixtures of relatively small molecules in complex matrices. Mixtures of materials are easily separated on the basis of size, preferably in a low boiling organic solvent. They are then collected as a series of discrete fractions and isolated by simple evaporation of the solvent.

PLgel preparative columns are packed with the same rigid, high performance media as the analytical columns. The 10 µm particle provides high column efficiency (> 25,000 p/m) for optimum resolution and loading characteristics. PLgel 25 mm id preparative columns offer over 10 times scale-up compared to the 7.5 mm analytical columns. The increased id and column volume permit even higher loading. With low molecular weight materials, sample concentration can also be significantly increased, enabling production of milligram quantities of very pure material. The actual loading is ultimately controlled by the sample and its molecular weight.

PLgel Preparative Columns

Size (mm)	Particle Size (µm)	Pore Size (Å)	Linear MW Operating Range (g/mol) (PS)	Part No.
25 x 300	10	50	up to 2,000	PL1210-6115
25 x 300	10	100	up to 4,000	PL1210-6120
25 x 300	10	500	500-30,000	PL1210-6125
25 x 300	10	10^3	500-60,000	PL1210-6130
25 x 300	10	10^4	10,000-600,000	PL1210-6140
25 x 300	10	10^5	60,000-2,000,000	PL1210-6150
25 x 300	10	10^6	600,000-10,000,000	PL1210-6160
MIXED-B 25 x 300	10		500-10,000,000	PL1210-6100
MIXED-D 25 x 300	10		200-400,000	PL1210-6104
Prep guard 25 x 25				PL1210-1120

Columns for Special GPC/SEC Applications

EnviroPrep

- High sample loading ensures effective trace analysis
- Simple clean-up procedure saves sample preparation costs
- Optimized particle size distribution provides high resolution

EnviroPrep columns permit a simple, one stage clean-up as part of a methodology to determine pesticides in many organic matrices. The higher molecular weight fractions such as lipids, polymers, natural resins and dispersed high molecular weight components are easily eliminated in the GPC analysis.

Preparative GPC for soil extract clean-up is described in EPA Method 3640A using 300 x 25 mm and 150 x 25 mm columns to give higher sample loading and fraction yields, which is particularly useful for low levels of pollutants. Low pore size EnviroPrep columns are ideal for this method. The columns have 10 µm particles with 100Å pore sizes for high resolution, with an exclusion limit of 4000 g/mol. The preparative columns offer good resolution and high loading through optimization of the particle size distribution.

EnviroPrep

Size (mm)	Part No.
21.2 x 150	PL1E10-3120EPA
25 x 150	PL1210-3120EPA
21.2 x 300	PL1E10-6120EPA
25 x 300	PL1210-6120EPA

Columns for sample clean-up

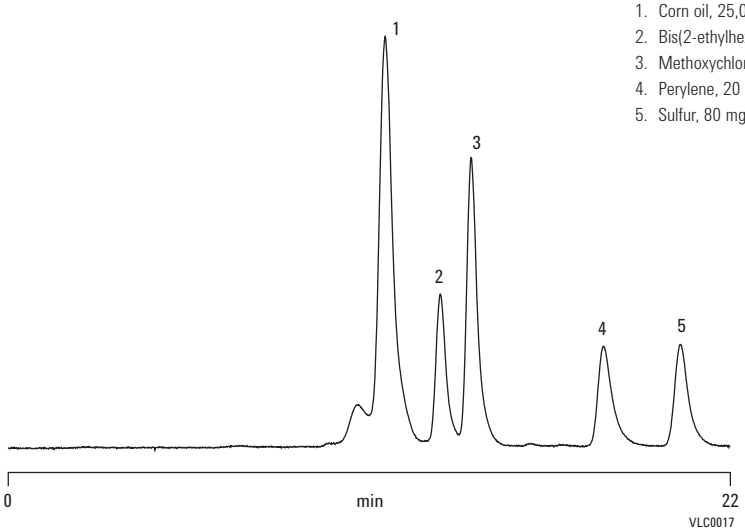
Column: **EnviroPrep PL1210-6120EPA 25 x 300 mm**

Column: **EnviroPrep PL1210-3120EPA 25 x 150 mm**

Mobile Phase: DCM

Flow Rate: 10 mL/min

Detector: UV, 254 nm



1. Corn oil, 25,000 mg/L
2. Bis(2-ethylhexyl) phthalate, 1,000 mg/L
3. Methoxychlor, 200 mg/L
4. Perylene, 20 mg/L
5. Sulfur, 80 mg/L

PLgel Olexis

- Optimized design for polyolefin analysis
- High temperature capability
- High resolution with no damage from sample shear provides clean separations

PLgel Olexis is designed for the analysis of very high molecular weight polymers, specifically polyolefins. The column resolves up to 100,000,000 g/mol (polystyrene in THF), and is packed with 13 µm particles to optimize efficiency and resolution without the risk of sample shear degradation during analysis. The packing of PLgel Olexis has the mechanical stability and robustness expected from a PLgel column, and so it is able to operate up to 220 °C for the analysis of highly crystalline materials.

PLgel Olexis

Description	Size (mm)	Part No.
PLgel Olexis	7.5 x 300	PL1110-6400
PLgel Olexis guard	7.5 x 50	PL1110-1400

PLgel Olexis reveals true modalities across the range of polyolefins

Column: **3 x PLgel Olexis PL1110-6400 7.5 x 300 mm**

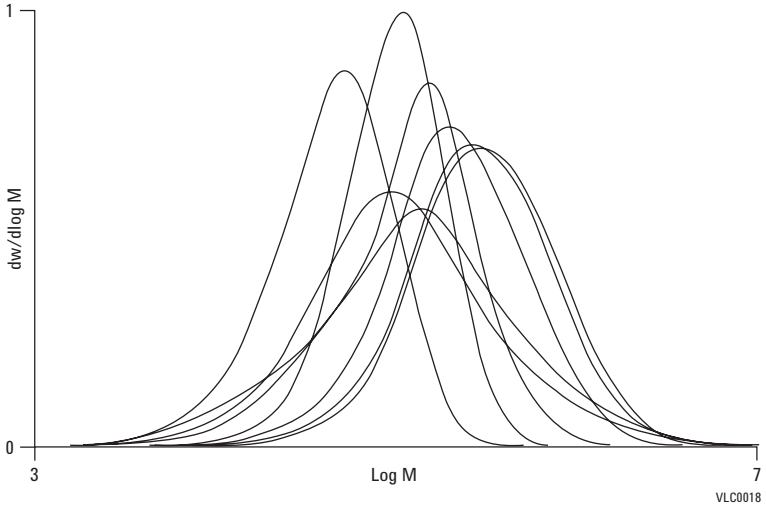
Mobile Phase: Trichlorobenzene + 0.0125% BHT

Flow Rate: 1.0 mL/min

Injection Volume: 200 µL

Temperature: 160 °C

Detector: PL-GPC 220 (RI)



PL HFIPgel

- Optimized separation range delivers high performance with no artifacts
- Highly durable packing prolongs column lifetime
- Low operating pressure reduces system wear and unnecessary downtimes

Hexafluoroisopropanol (HFIP) is used as a solvent in GPC for the analysis of important industrial polymers such as polyesters, polyamides and polylactide/glycolide copolymers. For greatly improved performance in extremely polar solvents such as HFIP and trifluoroethanol, we have developed novel "multipore" technology to produce PL HFIPgel, a PS/DVB packing featuring a monodisperse particle size, high pore volume, and high resolution.

Using PL HFIPgel avoids issues associated with conventional packings and HFIP, such as excessive curvature of calibration curves, dislocations/shoulders on peaks for polydisperse samples, and poor resolution in the low MW region.

Column efficiency is guaranteed > 30,000 p/m and the columns are very durable, with a maximum operating pressure of 145 bar (2030 psi). They are packed and tested in methanol but shipped ready-to-use in HFIP.

PL HFIPgel columns with 7.5 mm id normally operate at 1 mL/min. However, the 4.6 mm id columns run at 0.3 mL/min, providing a 70% reduction in solvent consumption with consequent savings in the cost of buying and disposing of solvents.

MW range for PL HFIPgel columns is 2,000,000 g/mol (PMMA in THF).

PL HFIPgel

Description	Size (mm)	Part No.
PL HFIPgel	4.6 x 250	PL1514-5900HFIP
PL HFIPgel	7.5 x 300	PL1114-6900HFIP
PL HFIPgel guard	7.5 x 50	PL1114-1900HFIP
PL HFIPgel guard	4.6 x 50	PL1514-1900HFIP

Polyamides

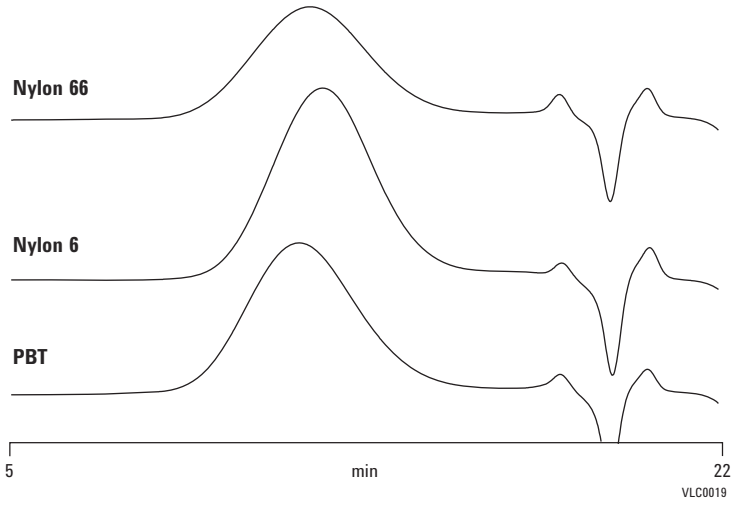
Column: **2 x PL HFIPgel PL1114-6900HFIP 7.5 x 300 mm**

Mobile Phase: HFIP + 20mM NaTFAc

Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: PL-GPC 50 (RI)



PL Rapide

- Analysis in less than ten minutes saves time
- Significantly increased sample throughput improves efficiency
- Reduced solvent consumption and disposal costs save money
- Available in L, M, and H versions for low, medium, and high molecular weights; available in F version for flow injection analysis

Rapid GPC is an excellent tool for screening polymer MWD for trend analysis. Short PL Rapide columns reduce analysis times while maintaining the excellent solvent compatibility and mechanical stability of all GPC columns from Agilent.

PL Rapide columns are ideal for high speed applications such as high throughput screening, process monitoring, or tracking changes in MW distributions, where time is the most critical factor in the analysis. Packed with high quality gels, these columns cover the complete spectrum of molecular weights and are available for the analysis of both organic and water soluble polymers. Key features include high pore volume, high resolution packing materials, no special system requirements, choice of molecular weight resolving range, wide solvent compatibility, and excellent mechanical stability.

PL Rapide

Description	Size (mm)	MW Range (g/mol)	Guaranteed Efficiency (p/m)	Part No.
PL Rapide H	7.5 x 150	500-10,000,000	> 35,000	PL1113-3100
	10 x 100			PL1013-2100
PL Rapide M	7.5 x 150	200-2,000,000	> 60,000	PL1113-3500
	10 x 100			PL1013-2500
PL Rapide L	7.5 x 150	200-400,000	> 80,000	PL1113-3300
	10 x 100			PL1013-2300
PL Rapide F	7.5 x 150	up to 4,500	> 55,000	PL1113-3120
	10 x 100	up to 4,500	> 40,000	PL1013-2120
PL Rapide Aqua H	7.5 x 150	100-10,000,000	> 35,000	PL1149-3800
	10 x 100			PL1049-2800
PL Rapide Aqua L	7.5 x 150	100-30,000	> 35,000	PL1120-3830
	10 x 100			PL1020-2830

Resin analysis by rapid GPC

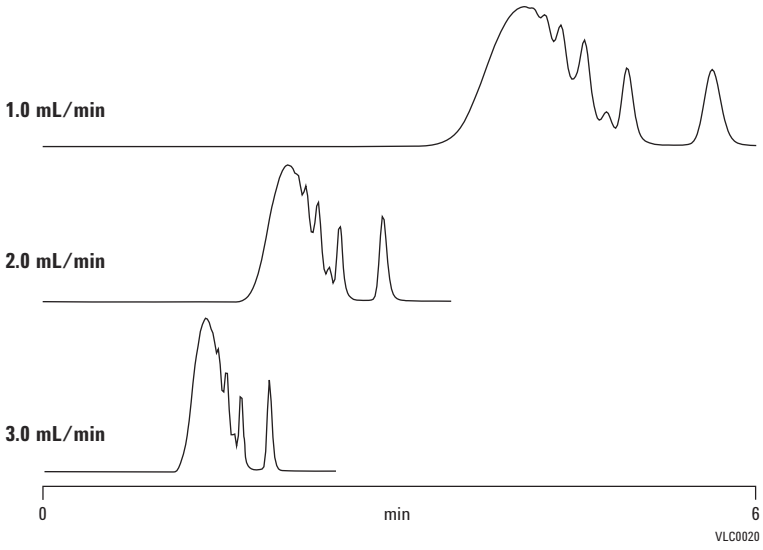
Column: **PL Rapide L**
PL1013-2300
10 x 100 mm

Sample: Epoxy resin

Mobile Phase: THF

Flow Rate: 1.0 , 2.0 and 3.0 mL/min

Detector: UV, 254 nm



PolarGel

- Medium polarity surface and high mechanical stability
- Operate in a wide range of solvents and solvent combinations
- Available in two resolving ranges, PolarGel-L and PolarGel-M

The PolarGel range is ideal for use with polar solvents, such as dimethyl formamide (DMF) and dimethyl sulfoxide (DMSO), and for solvent combinations such as tetrahydrofuran with water. These eluents are very useful in GPC/SEC to separate polar materials, such as polar resins, modified polysaccharides or complex polar polymers that are difficult to analyze in traditional SEC solvents, such as tetrahydrofuran alone. PolarGel-L is used for low molecular weight polar polymers and PolarGel-M for high MW polar polymers.

With polar polymers, highly polar groups can lead to non-specific interactions and secondary separation mechanisms when using polar solvents and traditional non-polar styrene/divinylbenzene columns. Additives and/or column conditioning are normally required to reduce these interactions. PolarGel has no need for these interventions, and also avoids the interactions and secondary effects that produce chromatogram distortions.

These PolarGel "mixed bed" columns have a medium polarity surface and high mechanical stability. They are capable of operating in a wide range of solvents and solvent combinations, greatly enhancing your ability to analyze polar polymers that are not necessarily water soluble. PolarGel is available in two resolving ranges to meet your precise requirements.

PolarGel

Description	Size (mm)	MW Range (g/mol) (PEG/PEO)	Part No.
PolarGel-L	7.5 x 300	Up to 30,000	PL1117-6830
PolarGel-L guard	7.5 x 50		PL1117-1830
PolarGel-L repair gel			PL1417-0830
PolarGel-M	7.5 x 300	Up to 2,000,000	PL1117-6800
PolarGel-M guard	7.5 x 50		PL1117-1800
PolarGel-M repair gel			PL1417-0800

Two samples of melamine resin analyzed by PolarGel-L

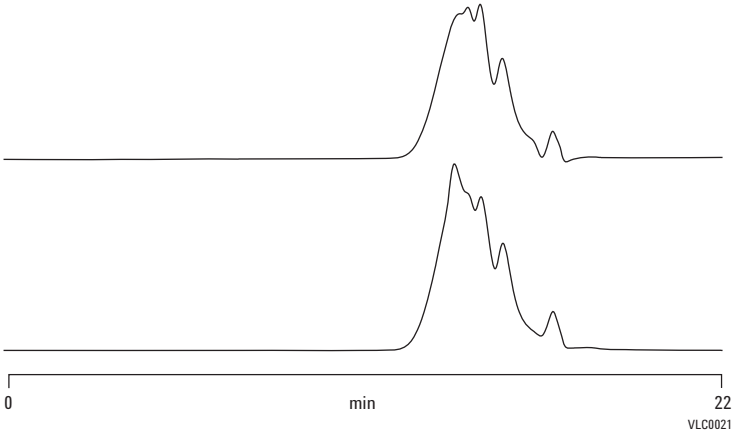
Column: **2 x PolarGel-L, 300 x 7.5 mm PL1117-6830**

Mobile Phase: Dimethyl acetamide + 0.1% LiBr

Flow Rate: 1.0 mL/min

Injection Volume: 100 µL

Detector: Agilent PL-GPC 220 (RI)



Excellent separation of two phenol formaldehyde resins with PolarGel-M

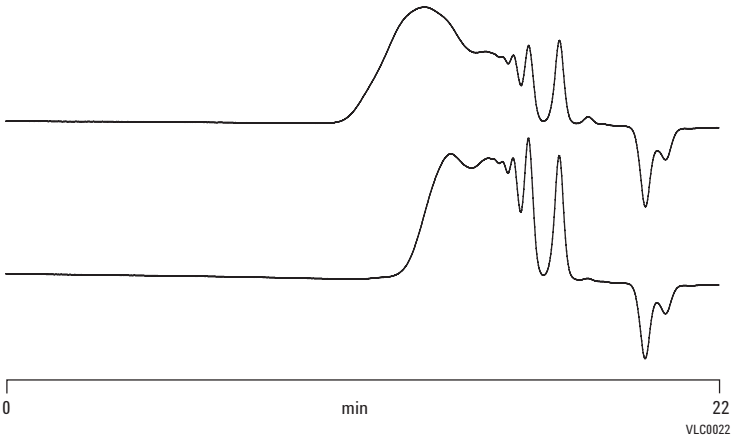
Column: **2 x PolarGel-M, 300 x 7.5 mm PL1117-6800**

Mobile Phase: 0.2% (w/v) DMF & 0.1% LiBr to reduce sample aggregation

Flow Rate: 1.0 mL/min

Injection Volume: 100 µL

Detector: Agilent PL-GPC 50 (RI)



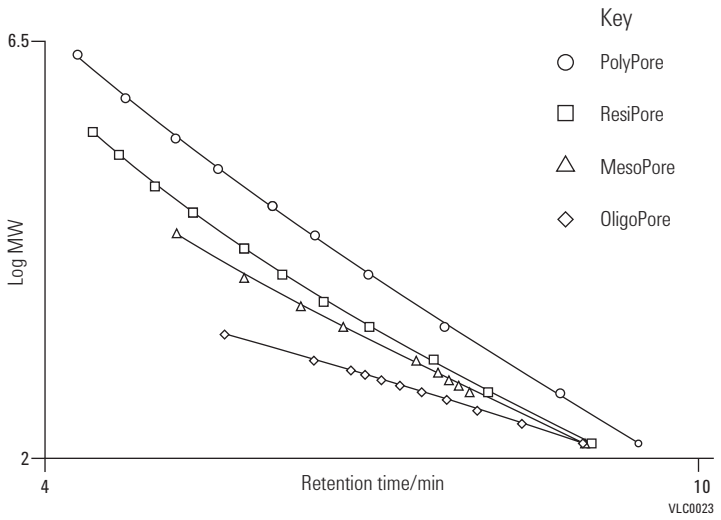
PlusPore

The PlusPore range has an increased pore volume that provides high resolution for specific applications. The high stability media permits the use of a wide range of organic solvents with accuracy and precision so that there is no distortion of the MW distribution shape.

The PlusPore series of columns has been specifically designed for high resolution GPC, and represents the very latest in GPC column technology. These novel packing materials are based on the industry standard, highly cross-linked polystyrene/divinylbenzene (PS/DVB), for the widest applicability and solvent compatibility. Each is made using a novel polymerization process to produce particles that exhibit a specific, controlled pore structure for optimum GPC performance. Typical applications include resins, condensation polymers, prepolymers, and oligomers.

For high resolution polymer analysis, the PolyPore, ResiPore, MesoPore, and OligoPore columns of the PlusPore product series exhibit a wide pore size distribution with near linear calibration curves covering an extended molecular weight range. These so-called "multipore" structures have increased pore volume compared to regular PS/DVB packing materials. This results in very high resolution GPC columns designed for specific application areas. The highly cross-linked porous particles provide excellent chemical and physical stability and permit easy transfer across the full range of organic solvents with little change in the shape of the calibration curve or the efficiency of the columns. As this multipore column technology does not require the combination of individual pore size packing materials, the result is high accuracy and precision without any artifacts in the shape of the molecular weight distribution.

PlusPore calibration curves



PlusPore Selection Guide

Column	MW Range (g/mol) (PS)	Nominal Particle Size (µm)	Typical Efficiency (p/m)	Recommended Calibrants	Frit Porosity (µm)
PolyPore	200-2,000,000	5	> 60,000	EasiCal PS-1or EasiVial PS-H	2
ResiPore	200-400,000	3	> 80,000	EasiCal PS-2 or EasiVial PS-M	2
MesoPore	up to 25,000	3	> 80,000	Polystyrene S-L-10 Kit	2
OligoPore	up to 4,500	6	> 55,000	Polystyrene S-L2-10 Kit	2

PolyPore

- Routine polymer analysis with very high resolution
- Wide operating range simplifies column choice
- Low particle size extracts maximum information from the analyte

PolyPore columns have been specifically developed to give unrivaled resolution for the analysis of polymers with broad molecular weight distributions. With a wide operating range covering many decades of molecular weight, PolyPore columns combine a 5 µm particle size with extremely high pore volume to give the highest possible resolution, ensuring the most detailed information possible from your analysis.

PolyPore

Description	Size (mm)	Part No.
PolyPore	7.5 x 300	PL1113-6500
PolyPore guard	7.5 x 50	PL1113-1500

Comparison of PolyPore with conventional individual pore size GPC columns

Column A: **2 x PolyPore PL1113-6500 7.5 x 300 mm**

Column B: **PLgel 10^3Å 7.5 x 300 mm, 5 µm**

Column C: **PLgel 10^5Å 7.5 x 300 mm, 5 µm**

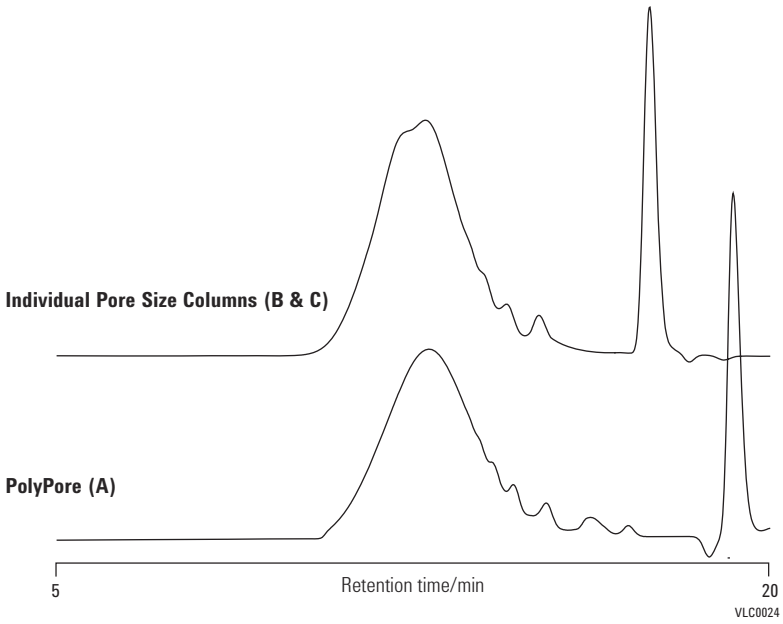
Sample: High MW Resin

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Injection Volume 100 µL

Detector: Agilent PL-GPC 50 (RI)



Polymethylmethacrylate in DMF

Column: **2 x PolyPore PL1113-6500 7.5 x 300 mm**

Sample: Commercial PMMA

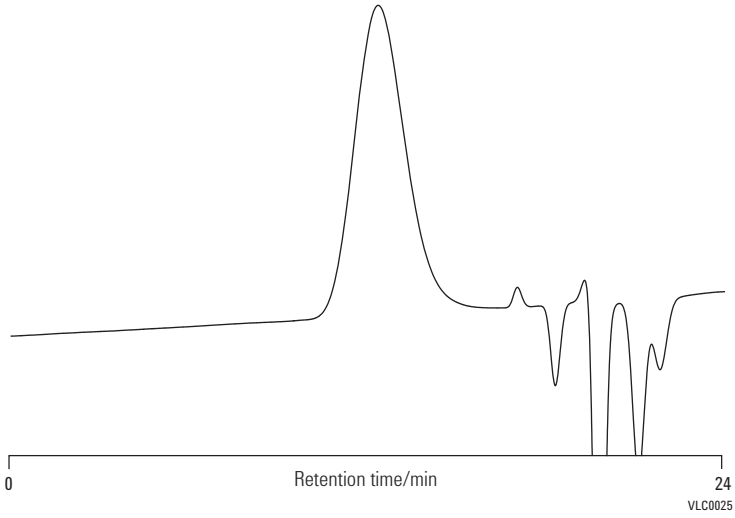
Mobile Phase: DMF + 0.1% LiBr

Flow Rate: 1.0 mL/min

Temperature: 80 °C

Injection Volume: 100 µL

Detector: Agilent PL-GPC 50 (RI)



ResiPore

- Efficient separation of complex molecular weight distributions
- Reveals oligomer content to provide a true representation of the sample
- High pore volume extracts maximum information from the analyte

ResiPore columns are the ideal choice for the analysis of resins and condensation polymers with complex molecular weight distributions that include oligomer content. By combining a 3 µm particle size and high pore volume, high efficiency ResiPore columns offer maximum resolution of these intermediate molecular weight polymers.

ResiPore

Description	Size (mm)	Part No.
ResiPore	7.5 x 300	PL1113-6300
ResiPore guard	7.5 x 50	PL1113-1300

Alkyd resin

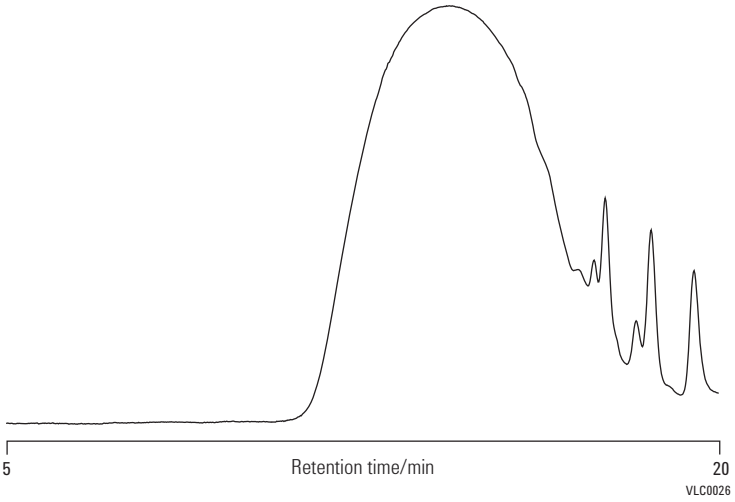
Column: **2 x ResiPore PL1113-6300 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Injection Volume: 20 µL

Detector: UV, 254 nm



Polyester

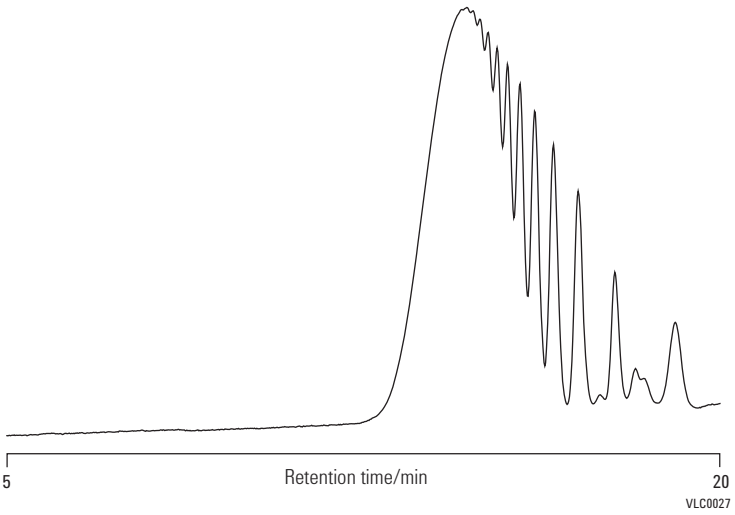
Column: **2 x ResiPore PL1113-6300 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Injection Volume: 20 µL

Detector: UV, 254 nm



MesoPore

- Full solvent compatibility with no detrimental effect on efficiency
- Low particle size extracts maximum information from the analyte
- No MWD dislocations so the distribution is an accurate representation of the sample

MesoPore columns have been specifically designed to provide optimum results in the analysis of prepolymers, i.e. polymeric materials with a large oligomeric component. By combining a 3 µm particle size with high pore volume, MesoPore columns give the highest resolution separations for the analysis of low molecular weight polymers, such as prepolymers, resins, polyols, and siloxanes.

MesoPore

Description	Size (mm)	Part No.
MesoPore	7.5 x 300	PL1113-6325
MesoPore guard	7.5 x 50	PL1113-1325

Polyurethanes

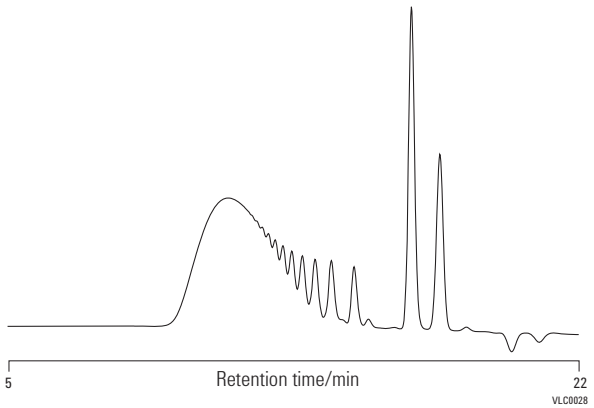
Column: **2 x MesoPore PL1113-6325 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Injection Volume: 20 µL

Detector: Agilent PL-GPC 50 (RI)



Polyesterimide

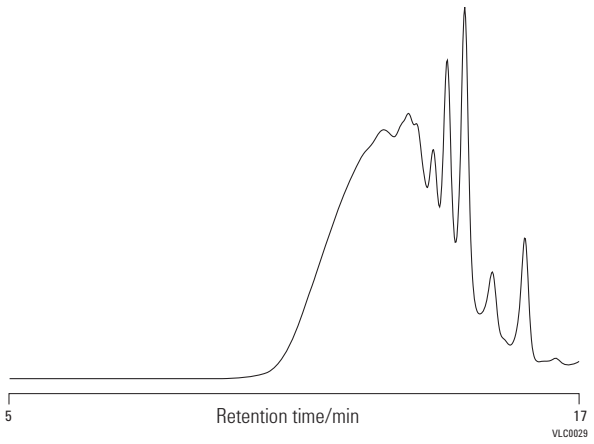
Column: **2 x MesoPore PL1113-6325 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Injection Volume: 20 µL

Detector: Agilent PL-GPC 50 (RI)



OligoPore

- Near linear calibration curve for best accuracy and precision
- Very stable media allows for a wide choice of solvents
- Isolation of individual fractions reveals more information from whole samples

OligoPore columns have been developed from an innovative new media that exhibits significantly increased pore volumes compared to conventional low pore size GPC columns. The outcome is higher resolution in the oligomeric region. The 300 x 25 mm preparative column offers high resolution at greatly increased loading for effective isolation of individual components. Oligomer fractions collected from the OligoPore preparative column can then be re-injected on analytical columns to check for the purity of the fractions and for comparison with the whole sample.

OligoPore

Description	Size (mm)	Part No.
OligoPore	25 x 300	PL1213-6520
OligoPore	7.5 x 300	PL1113-6520
OligoPore guard	7.5 x 50	PL1113-1320

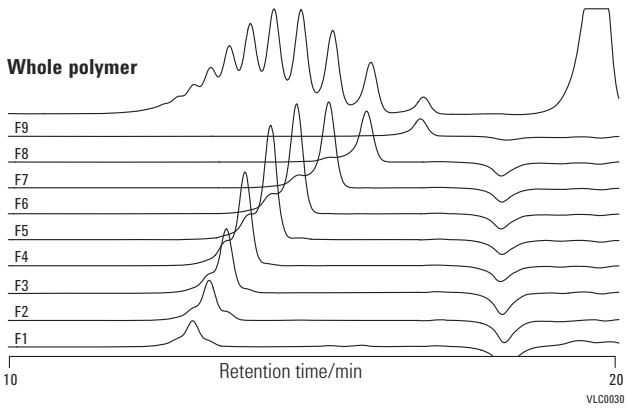
Analysis of low molecular weight polystyrene and oligomer fractions collected from OligoPore preparative columns

Column: **2 x OligoPore PL1113-6520 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: UV



Analytical separation of low molecular weight polystyrene

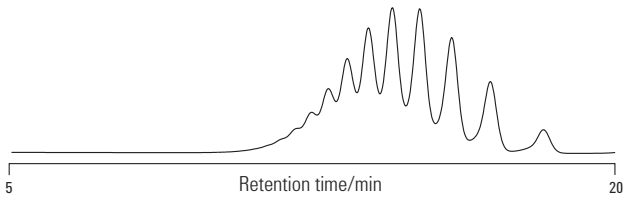
Column: **2 x OligoPore PL1213-6520 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Loading: 0.2%, 100 mL

Detector: UV



Preparative separation of low molecular weight polystyrene

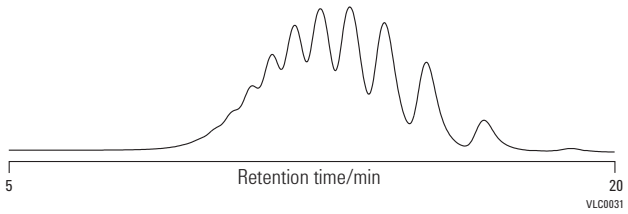
Column: **2 x OligoPore PL1213-6520 25 x 300 mm**

Mobile Phase: THF

Flow Rate: 10.0 mL/min

Loading: 2.0%, 2 mL

Detector: UV



Aqueous SEC of Polymers

PL aquagel-OH SEC

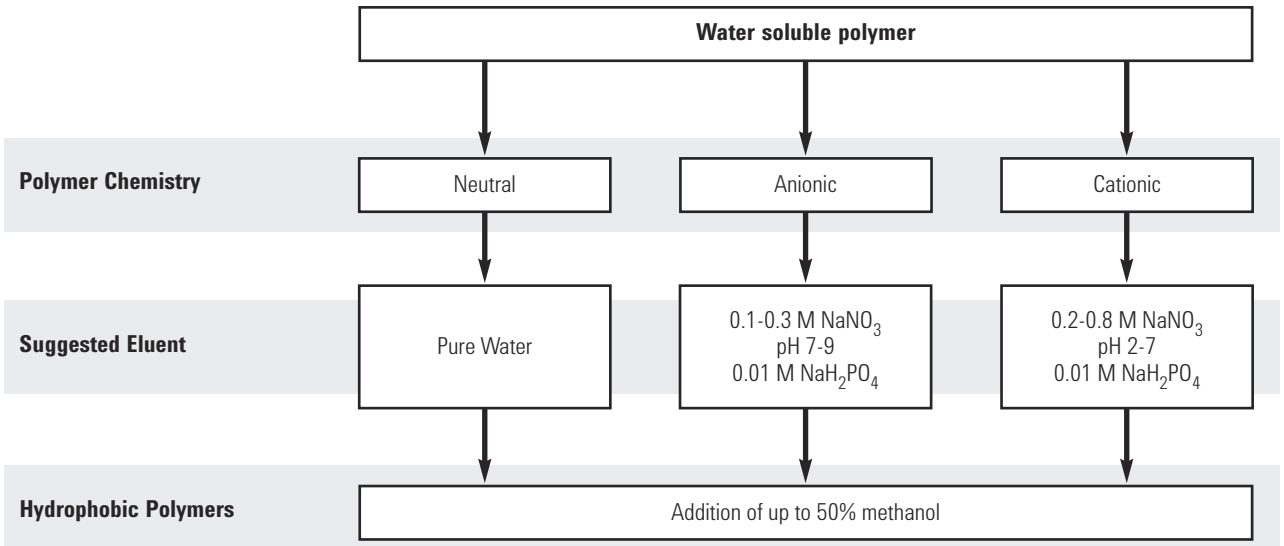
Aqueous size exclusion chromatography (SEC) is widely used for the determination of molecular weight distributions of a variety of synthetic and naturally occurring water-soluble polymers, and separations of oligomers and small molecules. The requirement to eliminate ionic and hydrophobic effects makes aqueous SEC very demanding.

The PL aquagel-OH series provides a chemically and physically stable matrix for reliable aqueous SEC separations. The columns are packed with macroporous copolymer beads with an extremely hydrophilic polyhydroxyl functionality. The "neutral" surface and the capability to operate across a wide range of eluent conditions provide for high performance analyses of compounds with neutral, ionic, and hydrophobic moieties, alone or in combination. PL aquagel-OH is available for analytical and preparative applications.

Optimizing Conditions for Aqueous SEC with PL aquagel-OH Columns

Due to the complex nature of water-soluble polymers, it is often necessary to modify the eluent in order to avoid sample-to-sample and sample-to-column interactions which can result in poor aqueous SEC separations. The excellent stability of the PL aquagel-OH packing material allows the eluent to be tailored to suit the polymer, while retaining the high column efficiency. For ionic interactions, the eluent can be modified by the addition of salt and/or the adjustment of pH. For water soluble polymers with a hydrophobic character, only the addition of a weak organic solvent (methanol) is required to inhibit hydrophobic interactions.

Guide to eluent selection for PL aquagel-OH applications



PL aquagel-OH Column Selection Guide

Sample Type	Typical Applications	Recommended Column Sets
Low MW polymers and oligomers	Surfactants, oligosaccharides, PEGs, lignosulfonates, polyacrylates	2 or 3, 30, 20 PL aquagel-OH 8 µm, or PL aquagel-OH 20 5 µm, or PL aquagel-OH MIXED-M 8 µm
Polydisperse synthetic or naturally occurring polymers	Polysaccharides, PVA, cellulose derivatives, PEO, polyacrylic acid	2 or 3 PL aquagel-OH MIXED-H 8 µm, or PL aquagel-OH 60/50/40 8 µm
Very high MW polymers	Polyacrylamides, hyaluronic acids, CMC, starches, gums	PL aquagel-OH 60/50/40 15 µm in series

PL aquagel-OH Analytical

- Highly stable matrix ensures reliable separations, even with modified eluents
- MIXED columns cover a wide range of molecular weights, simplifying column selection
- Highly versatile for neutral, polar, anionic and cationic samples

The PL aquagel-OH analytical series has a pH range of 2-10, compatibility with organic solvent (up to 50% methanol), mechanical stability up to 140 bar (2030 psi) and low column operating pressures.

PL aquagel-OH Analytical

Description	Size (mm)	MW Range (g/mol) (PEG/PEO)	Guaranteed Efficiency (p/m)	Part No.
PL aquagel-OH 20 5 µm	7.5 x 300	100-20,000	> 5,000	PL1120-6520
PL aquagel-OH 20 8 µm	7.5 x 300	100-20,000	> 35,000	PL1149-6820
PL aquagel-OH 30 8 µm	7.5 x 300	100-30,000	> 35,000	PL1120-6830
PL aquagel-OH 40 8 µm	7.5 x 300	10,000-200,000	> 35,000	PL1149-6840
PL aquagel-OH 40 15 µm	7.5 x 300	10,000-200,000	> 15,000	PL1149-6240
PL aquagel-OH 50 8 µm	7.5 x 300	50,000-1,000,000	> 35,000	PL1149-6850
PL aquagel-OH 50 15 µm	7.5 x 300	50,000-1,000,000	> 15,000	PL1149-6250
PL aquagel-OH 60 8 µm	7.5 x 300	200,000-> 10,000,000	> 35,000	PL1149-6860
PL aquagel-OH 60 15 µm	7.5 x 300	200,000-> 10,000,000	> 15,000	PL1149-6260
PL aquagel-OH MIXED-H 8 µm	7.5 x 300	100-10,000,000	> 35,000	PL1149-6800
PL aquagel-OH MIXED-M 8 µm	7.5 x 300	Up to 600,000	> 35,000	PL1149-6801
PL aquagel-OH 10 µm guard	25 x 25			PL1249-1120
PL aquagel-OH 5 µm guard	7.5 x 50			PL1149-1530
PL aquagel-OH 8 µm guard	7.5 x 50			PL1149-1840

TIPS & TOOLS

Buffers in a stored column may crystallize and cause damage. Flush the column with water containing a small amount of sodium azide to prevent biological growth.



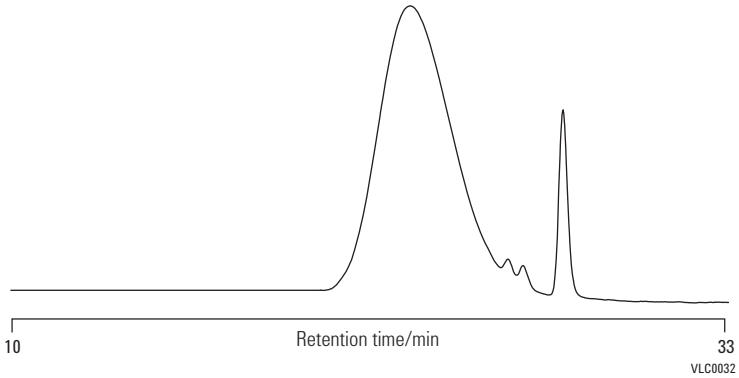
Polyvinyl alcohol

Column: **3 x PL aquagel-OH MIXED-H 8µm**
PL1149-6800
7.5 x 300 mm

Mobile Phase: 0.2 M $NaNO_3$, 0.01 M NaH_2PO_4, pH 7

Flow Rate: 1.0 mL/min

Detector: Agilent PL-GPC 50 (RI)



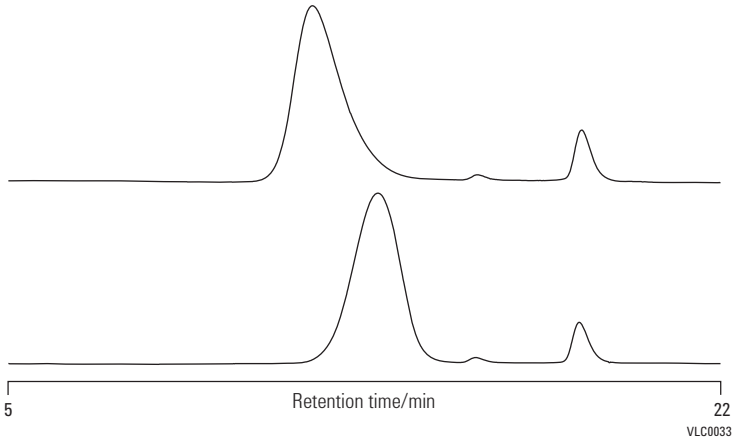
Heparin

Column: **2 x PL aquagel-OH 30 8 µm**
PL1120-6830
7.5 x 300 mm

Mobile Phase: 0.2 M $NaNO_3$, 0.01 M NaH_2PO_4, pH 7

Flow Rate: 1.0 mL/min

Detector: Agilent PL-GPC 50 (RI)



Hyaluronic acid

Column: **PL aquagel-OH 60 15 µm**
PL1149-6260
7.5 x 300 mm

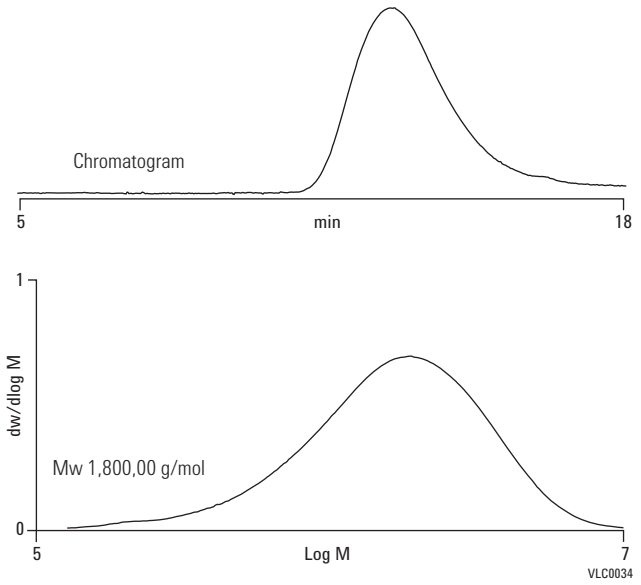
And

PL aquagel-OH 40 15 µm
PL1149-6240
7.5 x 300 mm

Mobile Phase: 0.2 M $NaNO_3$, 0.01 M NaH_2PO_4, pH 7

Flow Rate: 1.0 mL/min

Detector: Agilent PL-GPC 50 (RI)



Differences in composition of two alkyl naphthalene sulfonates

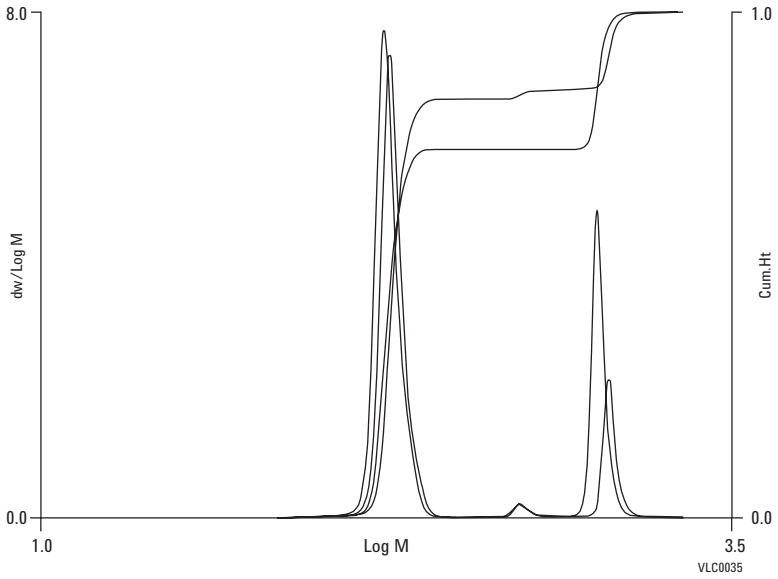
Column: **2 x PL aquagel-OH 20 5µm**
PL1120-6520
7.5 x 300 mm

Mobile Phase: 0.25 M ammonium formate in water

Flow Rate: 1.0 mL/min

Injection Volume: 20 µL

Detector: ELS (neb=30 °C, evap=30 °C, gas=1.4 SLM)



PL aquagel-OH Preparative

- Up to 10 times scale-up maximizes yield
- High loading maximizes sample throughput
- Carefully chosen particle size provides optimum resolution

Preparative SEC is used for the fractionation of a wide variety of water-soluble samples based on their size in solution. The technique is applied to the fractionation of disperse polymers or to isolate components in a polymer formulation.

Preparative PL aquagel-OH columns and associated guard columns enable rapid and convenient scale-up from analytical separations. The 25 mm id prep column offers at least a 10 times scale-up in loading from the 7.5 mm id analytical columns. Typically, a 10 mL/min flow rate results in a separation time of ten minutes with a 300 mm column. The columns are packed with the same robust macroporous particles as the analytical column range. The 8 µm particle size provides optimum resolution and loading characteristics with column efficiency > 20,000 plates/m.

PL aquagel-OH Preparative

Description	Size (mm)	MW Range (g/mol) (PEG/PEO)	Part No.
PL aquagel-OH 30 8 µm	25 x 300	100-30,000	PL1220-6130
PL aquagel-OH 40 8 µm	25 x 300	10,000-200,000	PL1249-6140
PL aquagel-OH 50 8 µm	25 x 300	50,000-1,000,000	PL1249-6150
PL aquagel-OH MIXED 8 µm	25 x 300	100-10,000,000	PL1249-6100
PL aquagel-OH 10 µm guard	25 x 25		PL1249-1120

Polyvinyl alcohol

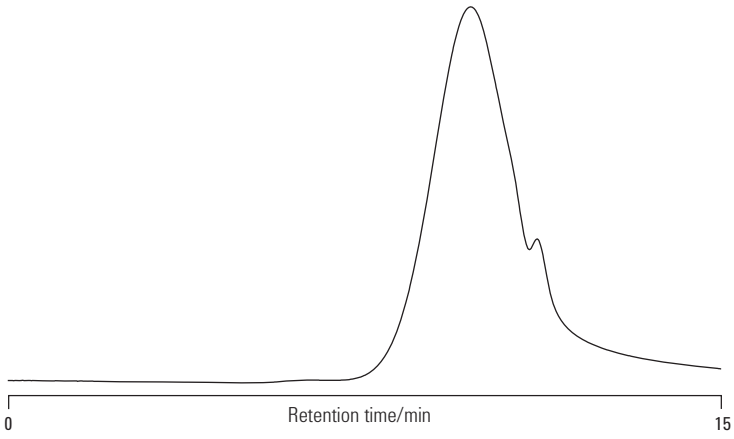
Column: **PL aquagel-OH 40 8 µm PL1249-6140 25 x 300 mm**

Mobile Phase: 0.2 M $NaNO_3$, 0.01 M NaH_2PO_4, pH 7

Flow Rate: 10.0 mL/min

Loading: 10 mg/mL, 2 mL

Detector: Agilent PL-GPC 50 (RI)



GPC Column Accessories

Description	Unit	Part No.
Frit removal tool for threaded columns only	1/pk	PL1310-0001
2 µm frit kit for threaded columns, 7.5 mm id	5/pk	PL1310-0002
5 µm frit kit for threaded columns, 7.5 mm id	5/pk	PL1310-0012
10 µm frit kit for threaded columns, 7.5 mm id	5/pk	PL1310-0036
PLgel column repair gel, 10 µm	1/pk	PL1410-0101
PLgel column repair gel, 5 µm	1/pk	PL1410-0501
Column connecting nuts, 1/16 in tube	5/pk	PL1310-0007
Tubing ferrules, 1/16 in tube	5/pk	PL1310-0008
Connecting tubing, 10 cm length, 0.01 in id	10/pk	PL1310-0048
LDV intercolumn stainless steel connector	1/pk	PL1310-0005
PLgel column repair gel, 3 µm	1/pk	PL1410-0301
PLgel Olexis column repair gel	1/pk	PL1410-0200

Polymer Standards for GPC/SEC

Polymer standards from Agilent are the ideal reference materials for generating accurate, reliable GPC/SEC column calibrations, with the assurance of the ISO 9001:2000 quality standard. Additional applications for our highly characterized homopolymers exhibiting unique characteristics are used as model polymers for research and analytical method development.

Agilent manufactures the highest quality polymer standards with extremely narrow polydispersity and the widest molecular weight range commercially available. These quality polymer standards are supplied with extensive characterization data utilizing a variety of independent techniques (e.g. light scattering and viscometry) and high performance GPC to verify polydispersity and assign that all important peak molecular weight (Mp).

Our comprehensive range of EasiVial, EasiCal, and traditional calibration kits has been specifically designed to cover all molecular weight ranges for organic and aqueous GPC/SEC applications. We provide you with the widest choice to maximize your specific characterization needs. In addition, we supply other polymers as individual molecular weights, and broad distribution polymers for system validation or broad standard calibration procedures.



Calibration Kits

Agilent offers a wide range of polymer standards kits for conventional GPC/SEC column calibration or for calibrating light scattering and viscometry detectors. The kits are in boxed sets of ten different polymer standards covering a particular molecular weight range, to be used with organic and aqueous, medium polarity, and polar solvents. Every individual polymer has its own Certificate of Analysis of the analytical conditions and values, such as Mp needed for constructing a calibration plot. The polymers are chosen to give equidistant calibration points on a logarithmic MW scale, providing a more uniform calibration curve.

Individual Polymer Molecular Weights

We design our individual standards to have the narrowest molecular weight distribution commercially available. Additionally, they cover the widest molecular weight range, from 162-15 million MW. The current polystyrene nominal molecular weight of 15 million MW has a polydispersity ≤1.10. These standards are generally available in 1, 5 and 10 g quantities, and each comes with its own Certificate of Analysis detailing analysis conditions and relevant data.

GPC/SEC Standards Selection Guide

Polymer Type	Individual MW	Calibration Kits	EasiCal	EasiVial	Type of GPC/SEC
Polystyrene	✓	✓	✓	✓	Organic
Polymethylmethacrylate	✓	✓		✓	Organic
Polyethylene glycol (PEG)	✓	✓		✓	Organic/Aqueous
Polyethylene oxide (PEO)	✓	✓		✓	Organic/Aqueous
Pullulan polysaccharide	✓	✓			Organic/Aqueous
Polyacrylic acid Na salt	✓	✓			Aqueous

EasiVial

- Eliminates tedious weighing procedures to improve calibration accuracy
- Reduces solvent dispensing to limit risks associated with handling solvents
- For conventional and multi detector GPC to maximize applicability

For organic and aqueous GPC/SEC column calibration, this premier product is the quickest and most convenient method to deliver an accurate 12-point column calibration.

The key to achieving baseline separation from polymer mixtures, and therefore eliminating doubt and errors, is in selecting only the narrowest polydispersity polymers. This is where Agilent polymer standards excel and deliver, as shown in the chromatograms.

The EasiVial standards kit is a pre-prepared, time saving product for rapid and reliable GPC column calibration. EasiVial kits contain three vials, each with a mixture of four accurately pre-weighed polymer standards, providing a 12-point GPC calibration in just three injections. The mass of each polymer in the vial is accurately known, so that upon addition of a fixed volume of eluent, the solution is prepared at a precise concentration. EasiVial is ideal for both conventional and multi detector GPC calibration. Simply prepare and manually inject, or transfer to autosampler vials, or place directly into a compatible autosampler.

Every EasiVial kit contains 30 vials (ten of each type) that are color-coded for easy identification and are available in 4 or 2 mL vials making them suitable for most autosamplers. The kits are available for polystyrene (PS), polymethylmethacrylate (PMMA), polyethylene glycol/oxide (PEG/PEO) and polyethylene glycol (PEG). For added value, a Tri-Pack (90 vials) is offered, extending reproducibility.



EasiVial PS-H

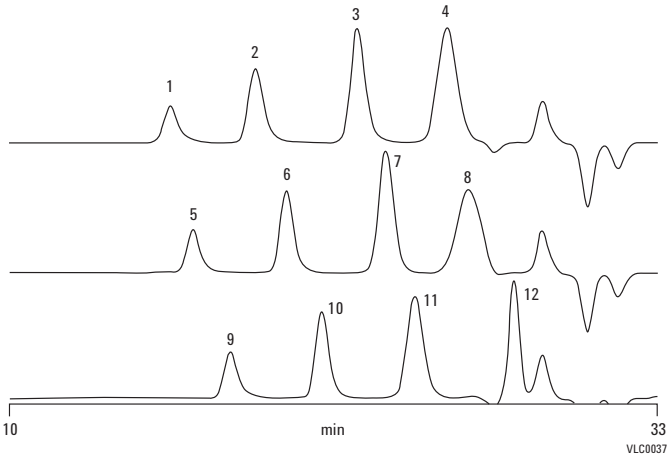
Column: **3 x PLgel 10 µm MIXED-B**
PL1110-6100
7.5 x 300 mm

Mobile Phase: THF

Flow Rate: 1.0 mL/min

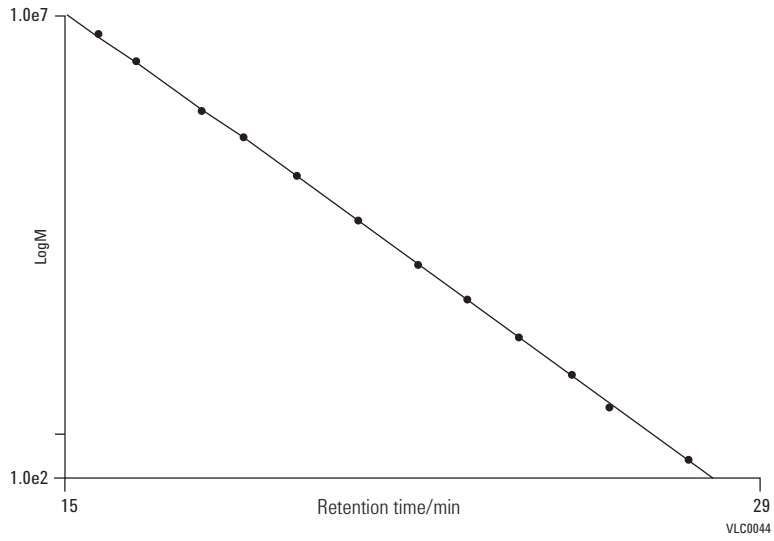
Temperature: 40 °C

Detector: PL-GPC 220 (RI)



1. 6,035,000
2. 483,000
3. 19,720
4. 1,260
5. 3,053,000
6. 84,900
7. 8,450
8. 580
9. 915,000
10. 60,450
11. 3,370
12. 162

Polystyrene calibration generated with EasiVials



Specifications

EasiVial Color	EasiVial PS-H	EasiVial PS-M	EasiVial PS-L	EasiVial PM	EasiVial PEG/PEO	EasiVial PEG
			Nominal Mp (g/mol)			
Red	1,300	780	580	2,000	600	282
	20,000	6,000	3,000	30,000	12,000	1,000
	500,000	50,000	10,000	300,000	125,000	6,000
	6,000,000	400,000	40,000	2,000,000	1,200,000	35,000
Yellow	580	370	370	1,000	200	194
	8,500	2,500	2,000	13,000	4,000	600
	185,000	25,000	6,000	150,000	60,000	3,750
	3,000,000	200,0001	25,000	800,000	1,000,000	21,000
Green	162	162	162	600	100	106
	3,400	1,500	1,000	5,700	1,500	420
	60,000	11,000	4,000	80,000	25,000	2,000
	900,000	100,000	16,000	470,000	460,000	12,000

Description Key

PS: Polystyrene
PM: Polymethylmethacrylate
PEG/PEO: Polyethylene Glycol/Oxide
H: High
M: Medium
L: Low

EasiVial Pre-weighed Calibration Kits

Description	Range of Nominal Mp (g/mol)	Vial Volume (mL)	Unit	Part No.
EasiVial PEG/PEO	100-1,200,000	2	30/pk	PL2080-0201
EasiVial PEG/PEO	100-1,200,000	4	30/pk	PL2080-0200
EasiVial PEG	106-35,000	2	30/pk	PL2070-0201
EasiVial PEG	106-35,000	4	30/pk	PL2070-0200
EasiVial PM	600-2,000,000	2	30/pk	PL2020-0201
EasiVial PM	600-2,000,000	4	30/pk	PL2020-0200
EasiVial PS-H	162-6,000,000	2	30/pk	PL2010-0201
EasiVial PS-H	162-6,000,000	4	30/pk	PL2010-0200
EasiVial PS-M	162-400,000	2	30/pk	PL2010-0301
EasiVial PS-M	162-400,000	4	30/pk	PL2010-0300
EasiVial PS-L	162-40,000	2	30/pk	PL2010-0401
EasiVial PS-L	162-40,000	4	30/pk	PL2010-0400
PEG/PEO Tri-Pack		2	90/pk	PL2080-0202
PEG/PEO Tri-Pack		4	90/pk	PL2080-0203
PEG Tri-Pack		2	90/pk	PL2070-0202
PEG Tri-Pack		4	90/pk	PL2070-0203
PMMA Tri-Pack		2	90/pk	PL2020-0202
PMMA Tri-Pack		4	90/pk	PL2020-0203
PS-H Tri-Pack		2	90/pk	PL2010-0202
PS-H Tri-Pack		4	90/pk	PL2010-0203
PS-L Tri-Pack		2	90/pk	PL2010-0402
PS-L Tri-Pack		4	90/pk	PL2010-0403



EasiCal

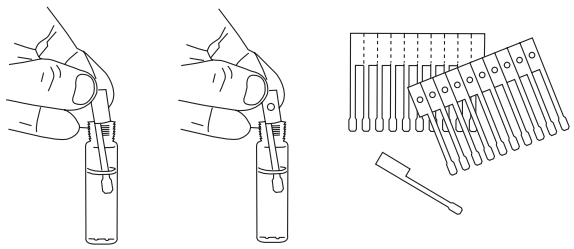
- Easy three-step process with no fuss
- Cost-effective format saves money
- Only two injections for improved productivity

The EasiCal system for organic solvents consists of two different combs, each with ten detachable spatulas, supporting a mixture of five polymer standards. The thin film of polymer (approximately 5 mg) on the tip of the PTFE spatulas rapidly dissolves when immersed in eluent to provide two GPC/SEC calibration solutions. A single pack provides ten spatulas of each type, with MWs selected to provide equidistant calibration points for greater accuracy.

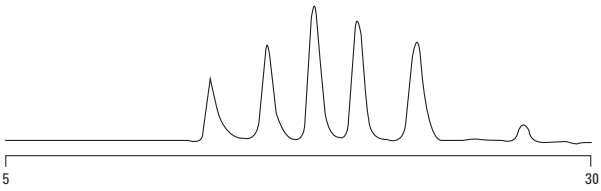
EasiCal Pre-prepared Polystyrene Kits

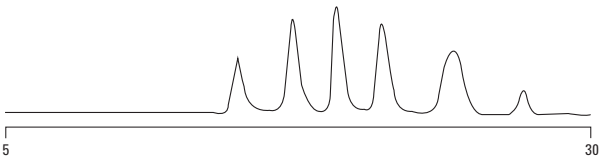
Description	Range of Nominal Mp (g/mol)	Unit	Part No.
Polystyrene PS-1	580-7,500,000	1/pk	PL2010-0501
		5/pk	PL2010-0505
Polystyrene PS-2	580-400,000	1/pk	PL2010-0601
		5/pk	PL2010-0605

Column calibration for GPC/SEC is as easy as 1, 2, 3...

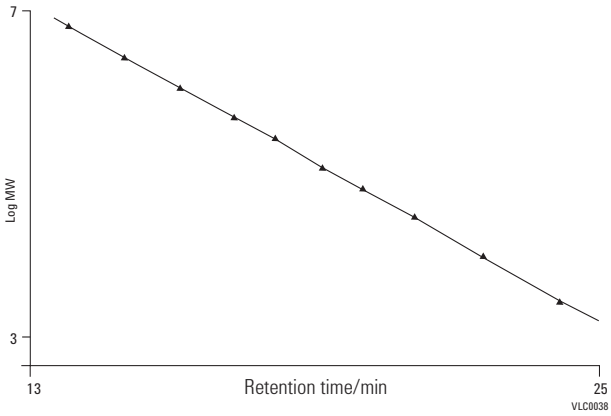


1. Place one spatula of each type into appropriate volume of solvent.





2. Chromatograph each solution; only two injections required



3. Generate a 10-point calibration

Polystyrene

- Compatible with most organic solvents
- Certificate of Analysis meets international protocols
- Calibration capability for virtually all applications

Polystyrene standards are the first choice for many organic solvents, either for conventional GPC column calibration or for calibrating light scattering and viscosity detectors. Our organic polymers cover a range from 162-15 million MW, with MWs selected to provide equidistant calibration points for greater accuracy. Every kit contains 0.5 g of ten different molecular weight standards.

Calibration Kits, (All Kits 10 x 0.5 g)

S-H-10 Part No. PL2010-0103	S-H2-10 Part No. PL2010-0104	S-M-10 Part No. PL2010-0100	S-M2-10 Part No. PL2010-0102	S-L-10 Part No. PL2010-0101	S-L2-10 Part No. PL2010-0105
Constituent Polymer Nominal Mp (g/mol)					
300,000	1,000	580	580	162	162
460,000	3,000	1,450	1,400	580	370
700,000	8,600	4,000	2,400	900	580
1,100,000	25,000	10,000	4,750	1,400	800
1,700,000	73,000	27,000	9,500	2,200	1,000
2,600,000	210,000	66,000	19,000	3,400	1,500
4,000,000	600,000	180,000	38,000	5,100	1,900
6,200,000	1,780,000	460,000	75,000	8,100	2,500
9,500,000	5,000,000	1,190,000	150,000	12,800	3,200
15,000,000	15,000,000	3,000,000	300,000	20,000	4,500

Description Key

H: High
M: Medium
L: Low

Individual Polymer Molecular Weights

Polymer Nominal Mp (g/mol)	Nominal Mw/Mn	1 g Part No.	5 g Part No.	10 g Part No.
162	1.00	PL2012-1001	PL2012-1005	PL2012-1010
370	1.11	PL2012-0001	PL2012-0005	PL2012-0010
580	1.11	PL2012-2001	PL2012-2005	PL2012-2010
1,000	1.09	PL2012-3001	PL2012-3005	PL2012-3010
1,300	1.07	PL2012-4001	PL2012-4005	PL2012-4010
2,000	1.05	PL2012-5001	PL2012-5005	PL2012-5010
3,000	1.04	PL2012-6001	PL2012-6005	PL2012-6010
5,000	1.03	PL2012-7001	PL2012-7005	PL2012-7010
7,000	1.04	PL2012-8001	PL2012-8005	PL2012-8010
10,000	1.02	PL2012-9001	PL2012-9005	PL2012-9010
20,000	1.02	PL2013-1001	PL2013-1005	PL2013-1010
30,000	1.02	PL2013-2001	PL2013-2005	PL2013-2010
50,000	1.03	PL2013-3001	PL2013-3005	PL2013-3010
70,000	1.03	PL2013-4001	PL2013-4005	PL2013-4010
100,000	1.02	PL2013-5001	PL2013-5005	PL2013-5010
130,000	1.01	PL2013-6001	PL2013-6005	PL2013-6010
200,000	1.05	PL2013-7001	PL2013-7005	PL2013-7010
300,000	1.03	PL2013-8001	PL2013-8005	PL2013-8010
500,000	1.03	PL2013-9001	PL2013-9005	PL2013-9010
700,000	1.03	PL2014-0001	PL2014-0005	PL2014-0010
1,000,000	1.05	PL2014-1001	PL2014-1005	PL2014-1010
1,500,000	1.04	PL2014-2001	PL2014-2005	PL2014-2010
2,000,000	1.04	PL2014-3001	PL2014-3005	PL2014-3010
2,500,000	1.05	PL2014-4001	PL2014-4005	PL2014-4010
4,000,000	1.04	PL2014-6001	PL2014-6005	PL2014-6010
7,000,000	1.04	PL2014-7001	PL2014-7005	PL2014-7010
10,000,000	1.06	PL2014-8001	PL2014-8005	PL2014-8010
15,000,000	1.06	PL2014-9001	PL2014-9005	PL2014-9010

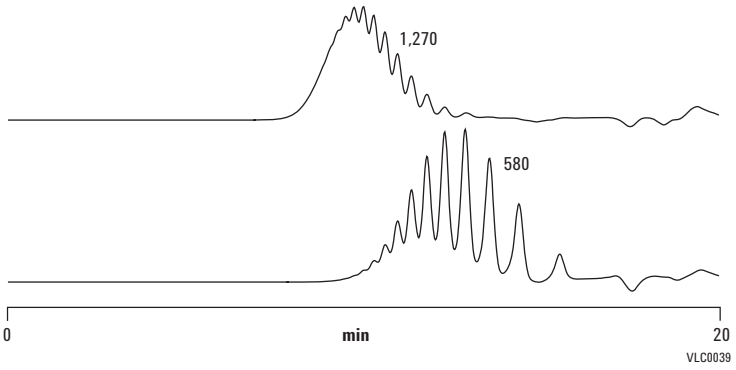
Polystyrene standards

Column: **2 x OligoPore PL1113-6520 7.5 x 300 mm**

Mobile Phase: THF

Flow Rate: 1.0 mL/min

Detector: Agilent PL-GPC 50 (RI)



Polymethylmethacrylate

- Many solvent options increase applicability
- Stringent quality control improves performance
- Proprietary manufacturing methods ensure consistent supply

Polymethylmethacrylate (PMMA) standards are extremely versatile as they can be used for organic GPC with a wide range of medium polarity eluents, such as tetrahydrofuran, toluene, methyl ethyl ketone, and ethyl acetate. They also work well with more polar organic eluents, for example dimethylformamide, dimethylacetamide, and hexafluoroisopropanol. The MWs are selected to provide equidistant calibration points for greater accuracy, covering from 500-1.5 million MW. Every kit contains 0.5 g of ten different molecular weight standards.

Calibration Kits, (All Kits 10 x 0.5 g)

M-L-10 Part No. PL2010-0100	**M-M-10 Part No. PL2020-0101**
Constituent Polymer Nominal Mp (g/mol)	
600	1,000
840	2,200
1,400	5,000
2,350	11,200
3,900	25,500
6,400	58,000
10,800	130,000
18,000	290,000
30,000	660,000
50,000	1,500,000

Description Key

M: Medium
L: Low

Individual Polymer Molecular Weights

Polymer Nominal Mp (g/mol)	Nominal Mw/Mn	1 g Part No.	5 g Part No.	10 g Part No.
500	1.19	PL2022-2001	PL2022-2005	PL2022-2010
1,000	1.26	PL2022-3001	PL2022-3005	PL2022-3010
2,000	1.08	PL2022-5001	PL2022-5005	PL2022-5010
3,000	1.08	PL2022-6001	PL2022-6005	PL2022-6010
5,000	1.09	PL2022-7001	PL2022-7005	PL2022-7010
7,000	1.08	PL2022-8001	PL2022-8005	PL2022-8010
10,000	1.03	PL2022-9001	PL2022-9005	PL2022-9010
13,000	1.03	PL2023-0001	PL2023-0005	PL2023-0010
20,000	1.03	PL2023-1001	PL2023-1005	PL2023-1010
30,000	1.02	PL2023-2001	PL2023-2005	PL2023-2010
50,000	1.02	PL2023-3001	PL2023-3005	PL2023-3010
70,000	1.02	PL2023-4001	PL2023-4005	PL2023-4010
100,000	1.02	PL2023-5001	PL2023-5005	PL2023-5010
130,000	1.05	PL2023-6001	PL2023-6005	PL2023-6010
200,000	1.02	PL2023-7001	PL2023-7005	PL2023-7010
300,000	1.02	PL2023-8001	PL2023-8005	PL2023-8010
500,000	1.06	PL2023-9001	PL2023-9005	PL2023-9010
700,000	1.03	PL2024-0001	PL2024-0005	PL2024-0010
1,000,000	1.09	PL2024-1001	PL2024-1005	PL2024-1010
1,500,000	1.09	PL2024-2001	PL2024-2005	PL2024-2010

Polymethylmethacrylate standards

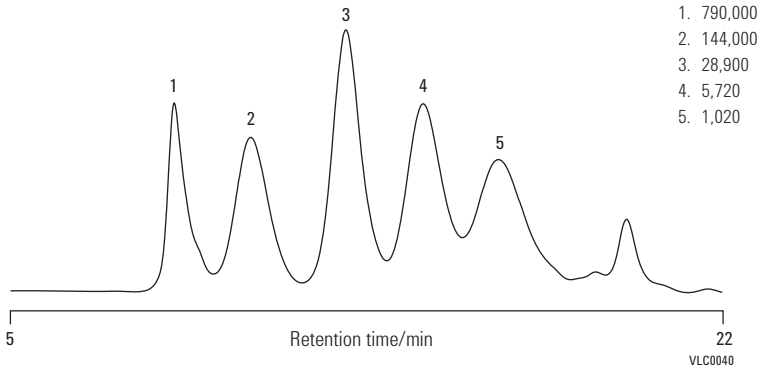
Column: **2 x PL HFIPgel PL1114-6900HFIP 7.5 x 300 mm**

Mobile Phase: HFIP + 20 mM NaTFAc

Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: Agilent PL-GPC 50 (RI)



Polyethylene Glycol/Oxide

- Simple-to-use kit form
- Combines glycols and oxides to extend the MW range and cover more applications
- MWs selected to provide equidistant calibration points for greater accuracy

These hydrophilic polymers are suitable for both aqueous SEC and organic GPC using the majority of polar organic solvents. The oxides are available in high molecular weights, while the glycols cover the lower molecular weight range. The two types are chemically similar so they can be used together across a wider molecular weight range, with aqueous and organic polymers from 106-1 million MW. Every kit contains 0.2 g or 0.5 g of ten different molecular weight standards.

Calibration Kits

PEG-10 (10 x 0.5 g) **Part No.** **PL2070-0100**	**PEO-10 (10 x 0.2 g)** **Part No.** **PL2080-0101**
Constituent Polymer Nominal Mp (g/mol)	
106	20,000
194	30,000
400	50,000
600	70,000
1,000	100,000
2,000	200,000
4,000	300,000
7,000	400,000
13,000	700,000
20,000	1,000,000

Individual Polymer Molecular Weights

Polymer Nominal Mp (g/mol)	Nominal Mw/Mn	1 g Part No.	5 g Part No.	10 g Part No.
Polyethylene Glycol				
106	1.00	PL2070-1001	PL2070-1005	PL2070-1010
194	1.00	PL2070-2001	PL2070-2005	PL2070-2010
238	1.00	PL2071-2001	PL2071-2005	PL2071-2010
282	1.00	PL2071-3001	PL2071-3005	PL2071-3010
420	1.09	PL2070-3001	PL2070-3005	PL2070-3010
600	1.06	PL2070-4001	PL2070-4005	PL2070-4010
1,000	1.04	PL2070-5001	PL2070-5005	PL2070-5010
1,500	1.04	PL2070-6001	PL2070-6005	PL2070-6010
4,000	1.03	PL2070-7001	PL2070-7005	PL2070-7010
7,000	1.04	PL2070-8001	PL2070-8005	PL2070-8010
10,000	1.05	PL2070-9001	PL2070-9005	PL2070-9010
13,000	1.07	PL2071-0001	PL2071-0005	PL2071-0010
20,000	1.07	PL2071-1001	PL2071-1005	PL2071-1010
Polyethylene Oxide				
20,000	1.05	PL2083-1001	PL2083-1005	PL2083-1010
30,000	1.07	PL2083-2001	PL2083-2005	PL2083-2010
50,000	1.05	PL2083-3001	PL2083-3005	PL2083-3010
70,000	1.05	PL2083-4001	PL2083-4005	PL2083-4010
100,000	1.06	PL2083-5001	PL2083-5005	PL2083-5010
130,000	1.07	PL2083-6001	PL2083-6005	PL2083-6010
200,000	1.07	PL2083-7001	PL2083-7005	PL2083-7010
300,000	1.07	PL2083-8001	PL2083-8005	PL2083-8010
500,000	1.06	PL2083-9001	PL2083-9005	PL2083-9010
700,000	1.07	PL2084-0001	PL2084-0005	PL2084-0010
1,000,000	1.12	PL2084-1001	PL2084-1005	PL2084-1010
1,500,000	1.13	PL2084-2001	PL2084-2005	PL2084-2010

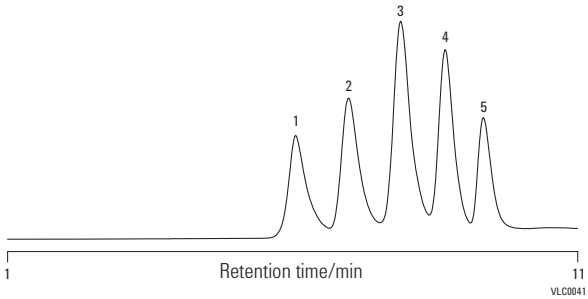
Polyethylene Glycol/Oxide standards

Column: **PL aquagel-OH MIXED-H 8 µm**
PL1149-6800
7.5 x 300 mm

Mobile Phase: Water

Flow Rate: 1.0 mL/min

Detector: Agilent PL-GPC 50 (RI)



1. 1,702,000
2. 120,000
3. 12,600
4. 1,470
5. 106

Polysaccharides

- Comprehensive format provides full MW range in one handy kit
- Also available as individual standards

The pullulan polysaccharides kit consists of several simple sugars with relatively narrow polydispersity linear macromolecules of maltotriose units.

Calibration Kits

SAC-10 (10 x 0.2 g) **Part No.** **PL2090-0100**
Constituent Polymer Nominal Mp (g/mol)
180
738
5,000
10,000
20,000
50,000
100,000
200,000
400,000
700,000

Individual Polymer Molecular Weights

Polymer Nominal Mp (g/mol)	Unit	Part No.
1,500	0.2 g	PL2091-2000
2,000	0.2 g	PL2091-3000
3,000	0.2 g	PL2091-4000
5,000	0.5 g	PL2090-1000
20,000	0.5 g	PL2090-3000
50,000	0.5 g	PL2090-4000
100,000	0.5 g	PL2090-5000
200,000	0.5 g	PL2090-6000
700,000	0.5 g	PL2090-8000
1,660,000	0.2 g	PL2091-1000

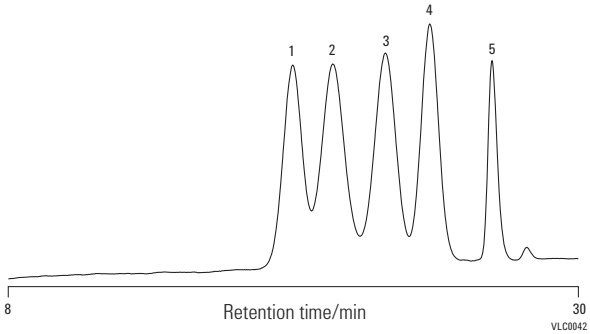
Pullulan polysaccharide standards

Column: **3 x PL aquagel-OH MIXED-H 8 µm**
PL1149-6800
7.5 x 300 mm

Mobile Phase: 0.2 M $NaNO_3$, 0.01 M NaH_2PO_4, pH 7

Flow Rate: 1.0 mL/min

Detector: Agilent PL-GPC 50 (RI)



1. 788,000
2. 212,000
3. 47,300
4. 11,800
5. 667

Polyacrylic Acid

- Compatible with all aqueous columns for wide applicability
- Aqueous polymers 1,000-2 million MW
- Well-characterized Mp values ensure wide utility

Calibration Kits

PAA-10 (10 x 0.2 g)
Part No.
PL2140-0100

Constituent Polymer Nominal Mp (g/mol)
1,000
3,000
7,000
13,000
30,000
70,000
100,000
300,000
700,000
1,000,000

Individual Polymer Molecular Weights

Polymer Nominal Mp (g/mol)	0.2 g Part No.	1 g Part No.
1,000	PL2142-3000	PL2142-3001
2,000	PL2142-5000	
3,000	PL2142-6000	PL2142-6001
5,000	PL2142-7000	PL2142-7001
7,000	PL2142-8000	PL2142-8001
13,000	PL2143-0000	PL2143-0101
30,000	PL2143-2000	PL2143-2001
50,000	PL2143-3000	PL2143-3001
70,000	PL2143-4000	PL2143-4001
100,000	PL2143-5000	PL2143-5001
130,000	PL2143-6000	PL2143-6001
200,000	PL2143-7000	PL2143-7001
300,000	PL2143-8000	PL2143-8001
500,000	PL2143-9000	PL2143-9001
700,000	PL2144-0000	PL2144-0101
1,000,000	PL2144-1000	PL2144-1001
1,500,000	PL2144-2000	PL2144-2001
2,000,000	PL2144-3000	PL2144-3001

LC and LC/MS Troubleshooting

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Baseline disturbance at void time	Positive/negative – Difference in refractive index of injection solvent	Use mobile phase for sample solvent
Detector leaks	Plugged inlet frit	Replace seals/gaskets
Drifting baseline	Positive direction – Contaminant buildup/elution	Flush column, clean up sample, use pure solvents
	Positive/negative – Difference in refractive index of injection solvent	Use mobile phase for sample solvent
	Negative direction (gradient) – Absorbance of "A" mobile phase solvent	Use non-absorbing or HPLC-grade or better solvent
	Positive direction (gradient) – Absorbance of "B" mobile phase solvent	Use non-absorbing or HPLC-grade or better solvent
	Random – Temperature changes	Insulate column and tubing
	Random – Temperature changes	Thermostat column and tubing
	Wavy or undulating – Temperature changes in room	Monitor room temperature and control
Ghost peaks	Peaks from previous injection	Flush column to remove contaminants
	Contamination	Sample cleanup or pre-fractionation
	Unknown interferences in samples	Sample cleanup or pre-fractionation
	Ion-pair – Upset equilibrium	Prepare sample in actual mobile phase to minimize disturbance
	Peptide mapping – Oxidation of TFA	Prepare fresh daily; use anti-oxidant
	Reversed-phase – Contaminated water	Check suitability of water by running different amount through reversed-phase column and measure peak height with elution; use HPLC grade solvents
	Spikes – Bubbles in solvent	De-gas solvents
High column backpressure	Column blockage, adsorbed sample	Better sample cleanup; use guard column
	Mobile phase viscosity too high	Use lower viscosity solvents or higher temperature
	Particle size too small	Use larger d_p packing
	Plugged inlet frit	Replace column
	Plugged inlet frit	Reverse solvent flow
Leaks	Subtle – White powder at fitting/loose fitting	Tighten fittings, cut tubing, or replace ferrules
Leaks, injection valve	Catastrophic – Worn valve rotor	Replace rotor in valve
Leaks, column or other fittings	Catastrophic – Loose fittings	Tighten or replace fittings
Leak, pump	Catastrophic – Pump seal failure	Replace pump seal

(Continued)

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Negative peaks	RI detector – solute refractive index less than solvent	No problem; reverse polarity to make positive
	UV detector – solute absorbance less than mobile phase	Use mobile phase with lower UV absorbance; do not recycle solvent too long
Noisy baseline	Random – Contaminant buildup	Flush column; clean up sample; use HPLC-grade solvent
	Continuous – Detector lamp problem	Replace detector lamp
	Occasional – External electrical interference	Use voltage stabilizer for LC system
Peak doubling	Sample volume too large	Reduce the volume e.g. by half and re-inject
	Injection solvent too strong	Use weaker injection solvent or mobile phase
	Blocked frit	Replace and use 0.5 µm porosity in-line filter
	Column void or channeling	Replace column; for some columns, fill in void with packing
	Unswept injector flowpath	Replace injector rotor
	Void at head of column	Replace column, top off column with packing
	Column overloaded with sample	Use higher capacity stationary phase Increase column diameter Decrease sample size
	Single peak – interfering components	Sample cleanup; pre-fractionation
Peak tailing	Beginning of peak doubling	See "peak doubling"
	Unswept dead volumes	Minimize number of connections Ensure injector seal is tight Ensure fittings are properly seated
	Basic compounds – Silanol interactions	Choose endcapped bonded phase Switch to polymeric phase
	Basic substances – Silanol interactions	Use stronger mobile phase or add competing base (e.g. TMA)
	Silica-based – Column degradation	Use specialty column; polymeric column or sterically protected

(Continued)

HPLC Troubleshooting

Symptom Type	Possible Cause	Solution
Peaks are broad	Injection volume too large	Decrease solvent strength of injection solvent to focus solute
	Peak dispersion in injector valve	Introduce air bubble in front/back of sample to decrease dispersion
	Sampling rate of data system too slow	Increase frequency of sampling
	Slow detector time constant	Adjust time constant to match peak width
	Mobile phase viscosity too high	Increase column temperature
	Detector cell volume too large	Use smallest possible cell volume with no heat exchanger in system
	Injector volume too large	Decrease injection volume
	Long retention times	Use gradient elution or stronger mobile phase
Pressure fluctuation	Leaky check valve	Replace check valve
	Pump seal leaks	Replace pump seals
	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
Pressure increasing	Buildup of particulates	Filter sample; in-line filter; filter mobile phase
	Water/organic systems – buffer precipitation	Test buffer-organic mixtures; ensure compatibility
Retention beyond total permeation volume	Size exclusion – Specific interactions	Add mobile phase modifiers or change solvent
Retention times changing	Column temperature varying	Thermostat column; insulate column; ensure lab temperature constant
	Equilibration time insufficient with gradient run or changes in isocratic mobile phase	Make sure at least 10 column volumes pass through column after solvent change or gradient conclusion
	Selective evaporation of mobile phase component	Less vigorous helium sparging; keep solvent reservoirs covered; prepare fresh mobile phase
	Buffer capacity insufficient	Use >20 mM concentration of buffer
	Inconsistent on-line mobile phase mixing	Ensure gradient system delivering constant composition; check vs. manual prep of mobile phase
	Contamination buildup	Occasionally flush column with strong solvent to remove contaminants
	First few injections – Adsorption on active sites	Condition column by initial injection of concentrated sample

(Continued)

HPLC Troubleshooting		
Symptom Type	**Possible Cause**	**Solution**
Retention times decreasing	Flow rate increasing	Check pump to make sure correct; if not, reset
	Column overloaded with sample	Decrease sample size
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
Retention times increasing	Flow rate is slowing	Fix leaks in liquid lines, replace pump seals, check for pump cavitation or air bubbles
	Active sites on silica packing	Use mobile phase modifier
	Loss of bonded stationary phase	Keep mobile phase pH between 2 and 8.5
	Mobile phase composition changing	Make sure mobile phase container is covered
	Active sites on silica packing	Add competing base to mobile phase
	Active sites on silica packing	Use higher coverage packing for stationary phase
Sensitivity problem	Peaks are outside of linear range of detector	Dilute/concentrate to bring into linear region
	First few sample injections – Absorption of sample in loop or column	Condition loop/column with concentrated sample
	Autosampler flow lines blocked	Check flow and make sure there are no blockages
	Injector sample loop underfilled	Make sure that loop is overfilled with sample
	Sample-related losses during preparation	Use internal standard during sample prep; optimize sample prep method
Slow column equilibration times (ion-pairing)	Equilibration time slow for long-chain ion-pairing reagents	Use shorter alkyl chain ion-pair reagent

LC/MS Troubleshooting

Symptom Type	Solution
No peaks	Spray from the nebulizer
	Make sure capillary voltage is set correctly
	Make sure LC/MSD is tuned correctly
	Make sure LC/MSD pressures are within normal ranges
	Check drying gas flow and temperature
	Make sure fragmentor is set correctly
Poor mass accuracy	Recalibrate the mass axis
	Make sure ions used for tuning span mass range of sample ions and show strong stable signals
Low signal	Check the solution chemistry; make sure solvent is appropriate for sample
	Make sure sample is fresh and has been stored correctly
	Make sure LC/MSD is tuned correctly
	Check the nebulizer condition
	Clean the capillary entrance
	Check the capillary for damage and contamination
Unstable signal	Make sure drying gas flow and temperature are correct for the solvent flow
	Make sure solvent is throroughly degassed
	Make sure LC backpressure is steady; this indicates a steady solvent flow

(Continued)

LC/MS Troubleshooting

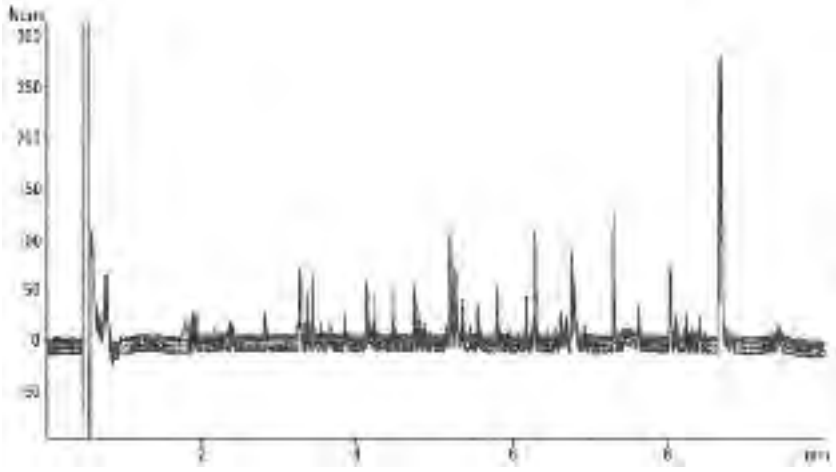
Symptom Type	Solution
High spectral noise	Use appropriate mass filter values
	Check spray shape; nebulizer may be damaged or set incorrectly
	Make sure drying gas flow and temperature are correct for the solvent flow
	Make sure solvent is throroughly degassed
	Make sure LC backpressure is steady; this indicates a steady solvent flow
	If you are using water as part of the mobile phase, make sure it is de-ionized (> 18 MΩ cm)
Droplets, not spray, exiting the nebulizer	Make sure nebulizing gas pressure is set high enough for the LC flow
	Check position of needle in nebulizer
	Stop solvent flow and remove nebulizer assembly
	Examine end of nebulizer for damage
No flow	Make sure LC is on and there is sufficient solvent in correct bottle
	Check for LC error messages
	Check for blockages
	Repair or replace any blocked components
	Check for leaks
	Make sure MS stream selector valve is set to LC to MSD
Undesired fragmentation	(APCI vs. Electrospray)
	APCI temperature is too high
	Fragmentor voltage is set too high

BioPharmaceutical Applications

NEW!

Protein digest analysis

Column:	**ZORBAX 300SB-C18** **858750-902** **2.1 x 100 mm, 1.8 µm**
Mobile Phase:	A: 0.1% TFA in water B: 0.085% TFA in ACN
Flow Rate:	0.5 mL/min
Pressure:	640 bar
Gradient:	2% B 1 min, 2-45% B 8.8 min, 45-95% B 0.2 min, 95% B 2 min, 98-2% B 0.2 min, 2% B 1.8 min
Temperature:	50 °C
Detector:	Agilent 1290 Infinity LC
Injection:	5 µL
Sample:	Protein digest
Sample Conc:	1 mg/mL

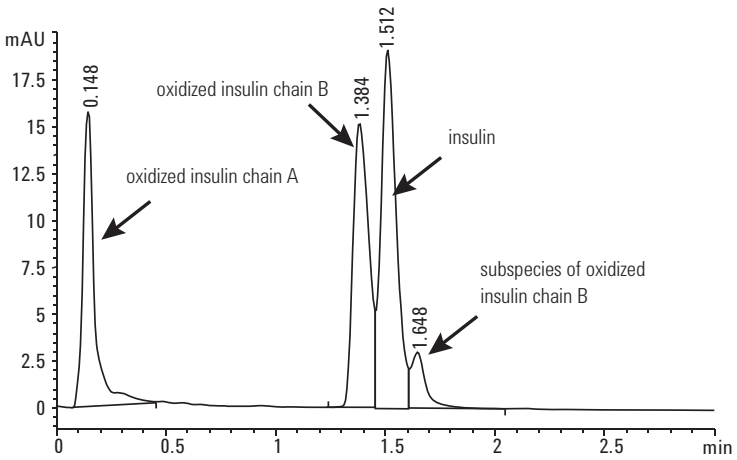


Overlaid chromatograms of 30 runs of a protein digest on an Agilent ZORBAX RRHD 300SB-C18 column.

NEW!

Analysis of oxidized insulin chains

Column:	**ZORBAX RRHD 300SB-C18 857750-902 2.1 x 50 mm, 1.8 µm**
Mobile Phase:	A: 0.1% TFA in water B: 80% ACN + 0.01% TFA in water
Flow Rate:	1.0 mL/min
Pressure:	650-700 bar
Gradient:	33-50% B, 0-4 min; 33% B, 4-5 min
Detector:	UV, 280 nm Agilent 1290 Infinity LC
Sample:	Insulin, oxidized insulin chain A and chain B from bovine pancreas (Sigma Aldrich, St. Louis, MO)
Sample Conc:	1 mg/mL
Injection:	2 µL

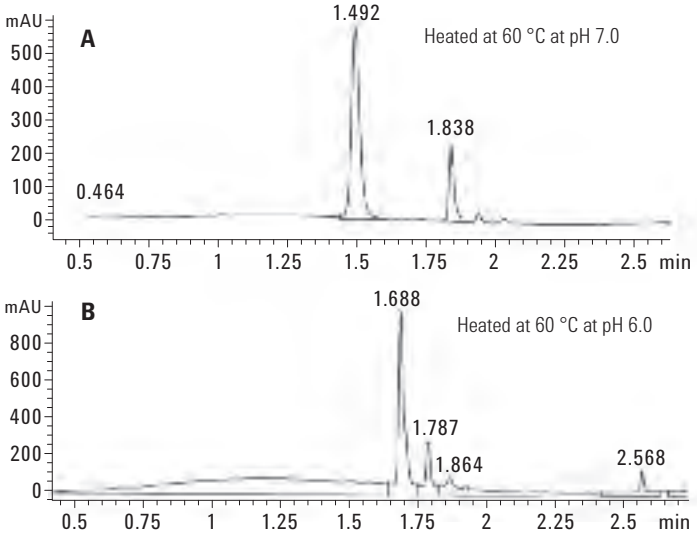


Insulin and oxidized insulin A and B chains are resolved quickly but insulin and oxidized chain B often co-elute.

NEW!

Fast separation of recombinant human erythropoietin

Column:	**ZORBAX RRHD 300SB-C18 857750-902 2.1 x 50 mm, 1.8 µm**
Mobile Phase:	A: 0.1% TFA in water B: 0.01% TFA in ACN
Flow Rate:	1.0 mL/min
Pressure:	650 bar
Gradient:	5 to 100% B solvent from 0 to 2.5 min
Detector:	UV, 280 nm Agilent 1290 Infinty LC
Sample:	Recombinant human EPO protein (rEPO)
Sample Conc:	1.0 mg/mL
Injection:	3 µL



Heat-treated rEPO protein are well resolved by the Agilent ZORBAX RRHD 300SB-C18 column. The column separated these heat-treated rEPO proteins.

NEW!

Separation optimization for ultra fast analysis of reduced and alkylated monoclonal antibody

Column: **ZORBAX RRHD 300SB-C8**
858750-906
2.1 x 100 mm, 1.8 µm

Mobile Phase: (Various)
A: H_2O + 0.1% TFA (v/v)
B: n-propanol:ACN:H_2O (80:10:10) + 0.1% TFA (v/v)

Injection: 1-3 µL

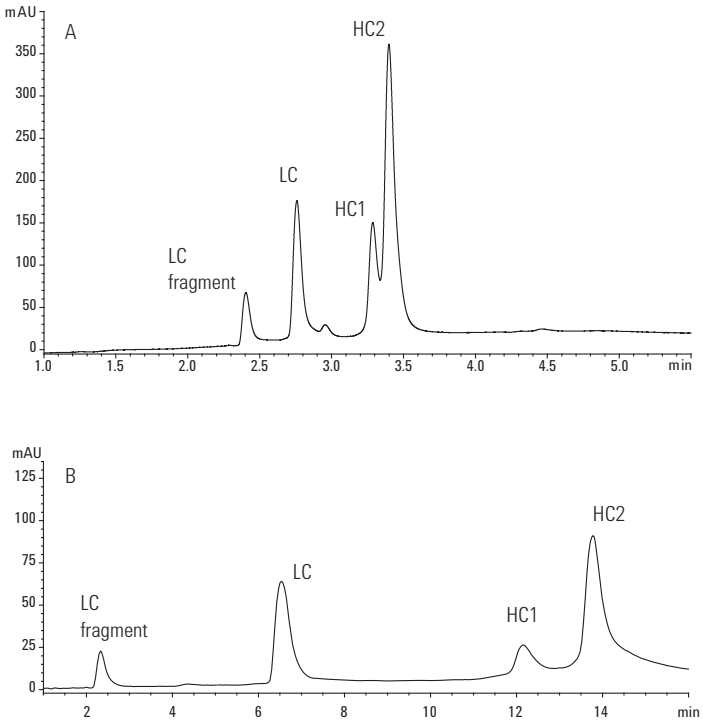
Flow Rate: 0.5 mL/min

Gradient: Multi-segmented
A (optimized for speed): 0 min-20% B, 3 min-35% B, 4 min-40% B, 5 min-40% B, 5.1 min-90% B, 5.5 min-90% B, 6 min-25% B
B (optimized for resolution): 0 min-25% B, 15 min-32% B, 16 min-32% B, 17 min-90% B, 17.5 min-90% B, 18 min-25% B

Temperature: 75 °C

Detector: UV, 225 nm
Agilent 1290 Infinity LC

For consecutive chromatographic runs, a 2-minute post run was added to re-equilibrate the column.



Comparison of two optmimized gradients for the ultra fast separation of reduced and alkylated monoclonal antibodies on an Agilent ZORBAX RRHD 300SB-C8 column. The top panel details a rapid separation of the light and heavy chain variants in a shortened run time of less than 4 minutes. The bottom panel displays complete baseline resolution of the two heavy chain variants during a longer runtime using a shallower gradient profile. Both separations were performed at 75 °C and completed with a fast 90% 1-propanol wash step (UV not shown).

NEW!

Column reproducibility – 200 injections of reduced monoclonal antibody using an Agilent ZORBAX RRHD 300SB-C3 column

Column: **Agilent ZORBAX RRHD 300SB-C3**
858750-909
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA in water
B: 80% n-propyl alcohol, 10% ACN, 9.9% water and 0.1% TFA

Flow Rate: 0.4 mL/min

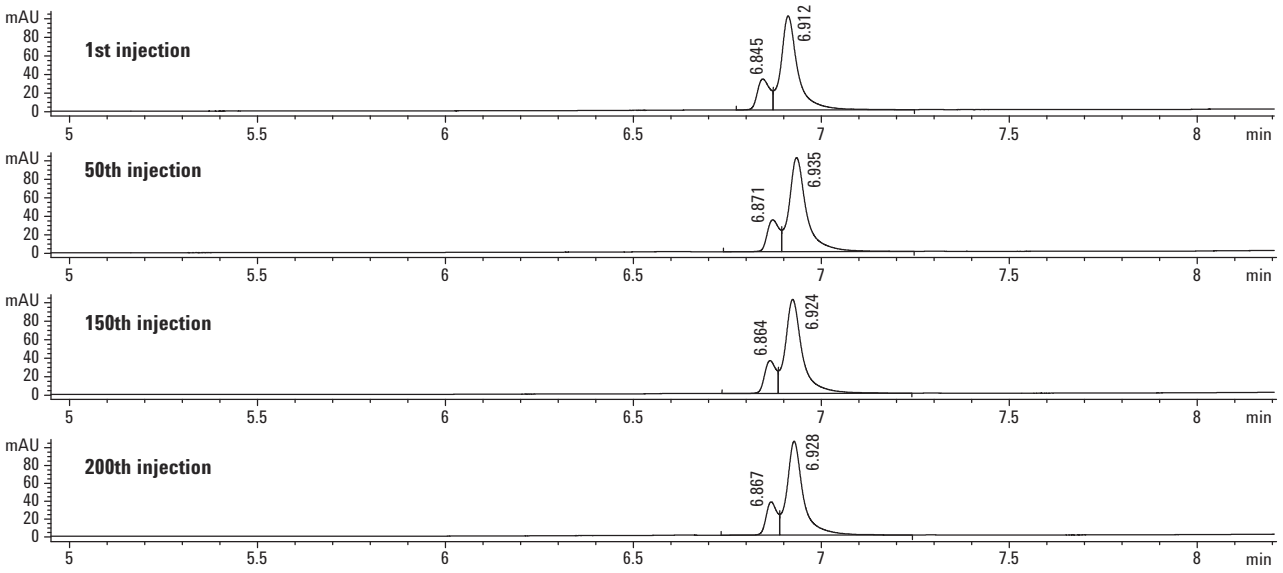
Gradient: 0 min-1% B, 2 min-20% B, 5 min-50% B, 7 min-50% B, 8.0 min-90% B, 8.3 min-1% hold for 2 min

Temperature: 75 °C

Detector: UV, 280
Agilent 1290 Infinity LC

Sample: Reduced monoclonal antibody (IgG1) (1.0 mg/mL) - Agilent BL05 IgG1

Injection: 2 µL



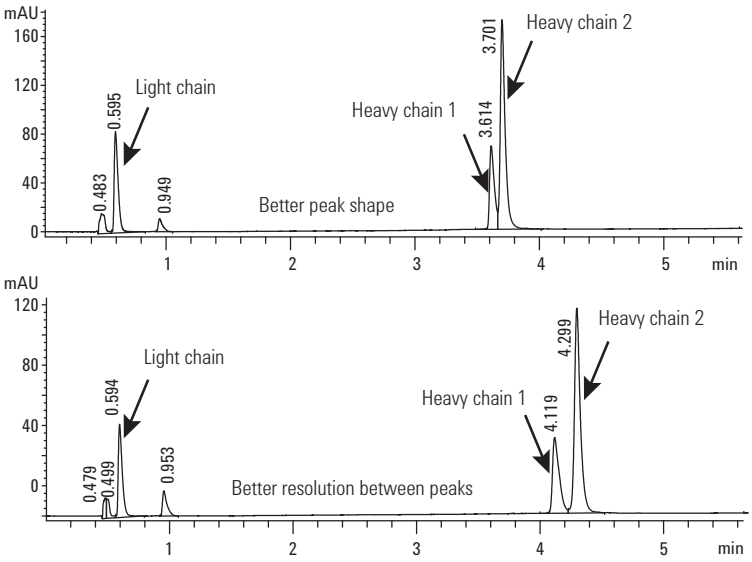
Reduced and alkylated mAb profiling during 200 repeated injections.

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

Gradient optimizations for ultra fast analysis of reduced monoclonal antibody

Column:	**Agilent ZORBAX RRHD 300SB-Diphenyl 858750-944 2.1 x 100 mm, 1.8 µm**
Mobile Phase:	A: 0.1% TFA in water B: 80% propyl alcohol, 10% ACN, 9.9% water and 0.1% TFA
Flow Rate:	0.5 mL/min
Gradient:	1st condition: 0 min-1% B, 2 min-20% B, 5 min-70% B 2nd condition: 0 min-1% B, 2 min-20% B, 5 min-50% B
Temperature:	74 °C
Detector:	UV, 280 nm
Sample:	Reduced monoclonal antibody (IgG1) (1.0 mg/mL) - BioCreative IgG1
Injection:	2 µL



Comparison of two ultra-fast separations of reduced monoclonal antibodies was achieved on a Agilent ZORBAX RRHD 300SB-Diphenyl under different optimized conditions. The top panel separation delivered narrow peak widths with shorter retention times. The bottom panel separation displays higher resolution between the two heavy chain peaks, but with less efficiency.

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

Ultra high speed and high resolution of intact monoclonal antibodies

Column: **Agilent ZORBAX RRHD 300-Diphenyl**
858750-944
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA in water
B: 80% n-propyl alcohol, 10% ACN, 9.9% water and 0.1% TFA

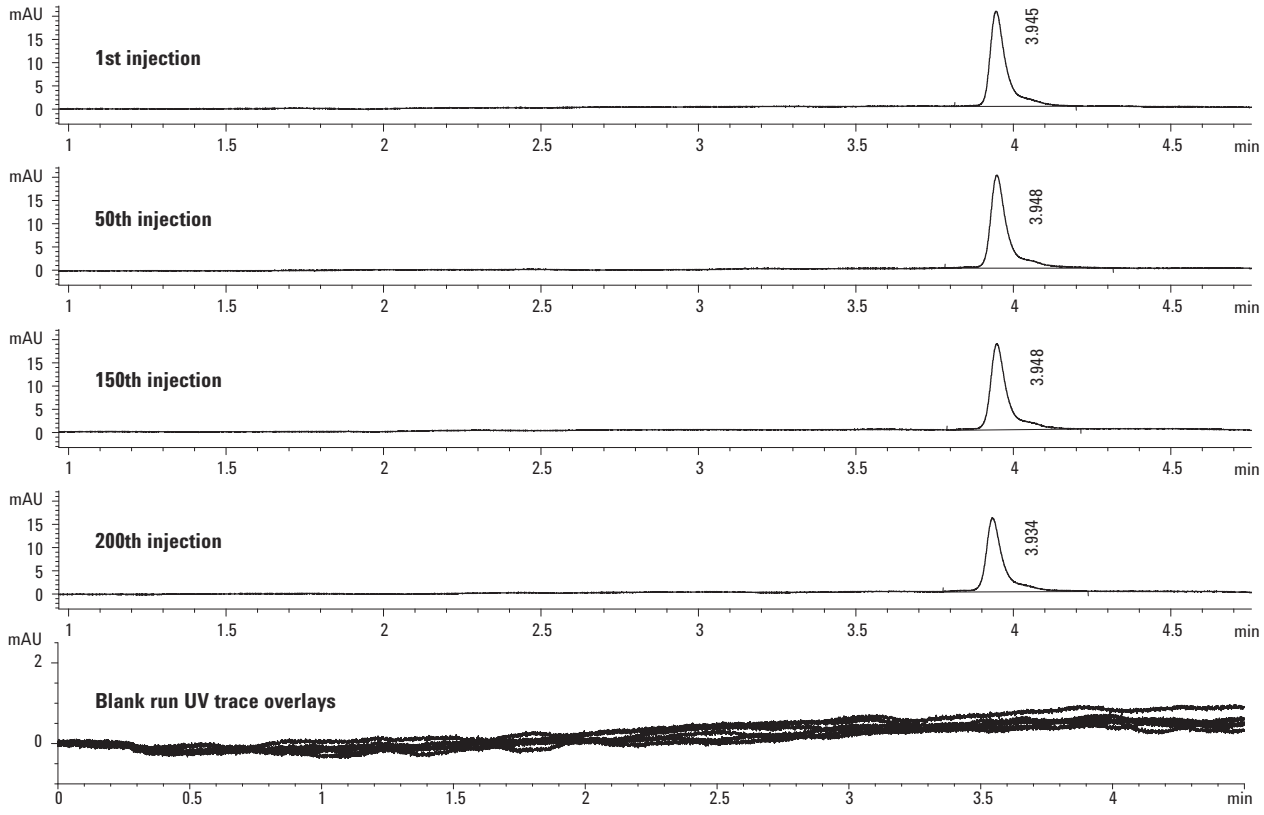
Flow Rate: 1.0 mL/min

Temperature: 74 °C

Detector: UV, 280 nm

Sample: Monoclonal antibody (IgG1) (1.0 mg/mL) - BioCreative IgG1 and Agilent Standard IgG1

Injection: 1 µL



Details of intact mAb profiling during 200 repeated injections. Intact mAb separations shown were collected at 1, 50, 150, and 200th run intervals. The bottom panel displays 5 UV blank run trace overlays collected every 20th run during the column evaluation (**note:** overlay traces are scaled to 2 mAu).

NEW!

Optimizing protein separations with Agilent weak cation-exchange columns

Column: **Agilent Bio WCX, stainless steel**
5190-2453
4.6 x 250 mm, 10 µm

Column: **Agilent Bio WCX, stainless steel**
5190-2445
4.6 x 250 mm, 5 µm

Mobile Phase: A: water
B: 1.6 M NaCl
C: 40.0 mM NaH_2PO_4
D: 40.0 mM Na_2HPO_4
By combining predetermined proportions of C and D, 20 mM buffer solutions at the desired pH range were produced (proportions determined using Buffer Advisor software)

Flow Rate: 1.0 mL/min

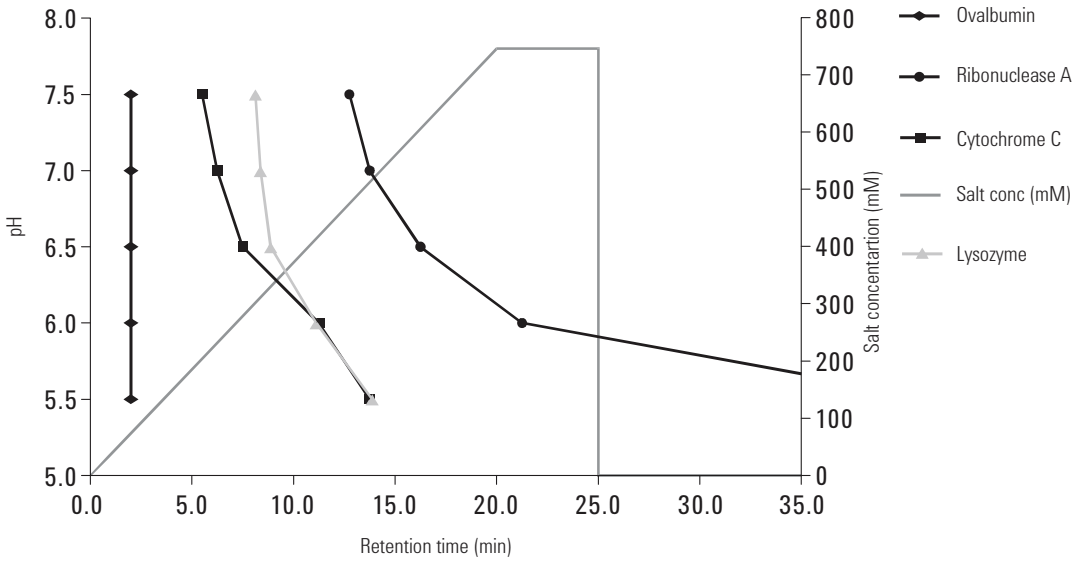
Gradient: 0 to 50% B, 0 to 20 min
50% B, 20 to 25 min
0% B, 25 to 35 min

Temperature: Ambient

Detector: UV, 220 nm
Agilent 1260 Infinity Bio-inert Quaternary LC

Sample: Ovalbumin, Ribonuclease A, Cytochrome c, Lysozyme

Sample Conc: 2 mg/mL (in 20 mM sodium phosphate buffer, pH 6.0)



Effect of pH on retention time of protein standards using a Agilent Bio WCX column.

NEW!

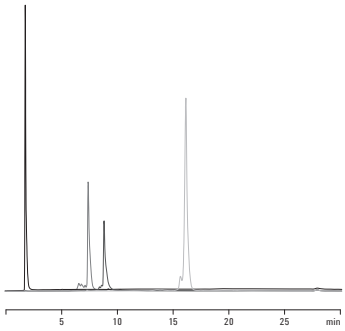
Improved resolution with smaller particle size with Agilent weak cation-exchange columns

Column: **Agilent Bio WCX, stainless steel**
5190-2453
4.6 x 250 mm, 10 µm

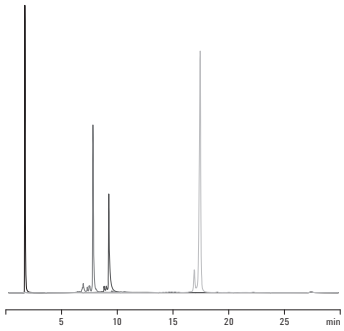
Column: **Agilent Bio WCX, stainless steel**
5190-2445
4.6 x 250 mm, 5 µm

Mobile Phase:	A: water B: 1.6 M NaCl C: 40.0 mM NaH_2PO_4 D: 40.0 mM Na_2HPO_4 By combining predetermined proportions of C and D, 20 mM buffer solutions at the desired pH range were produced (proportions determined using Buffer Advisor software)
Gradient:	0 to 50% B, 0 to 20 min 50% B, 20 to 25 min 0% B, 25 to 35 min
Temperature:	Ambient
Detector:	UV, 220 nm Agilent 1260 Infinity Bio-inert Quaternary LC
Sample:	Ovalbumin, Ribonuclease A, Cytochrome c, Lysozyme
Sample Conc:	2 mg/mL (in 20 mM sodium phosphate buffer, pH 6.0)

1. Ovalbumin
2. Ribonuclease A
3. Cytochrome c
4. Lysozyme



Separation of protein standards at pH 6.5 using an Agilent Bio WCX, NP10 column.

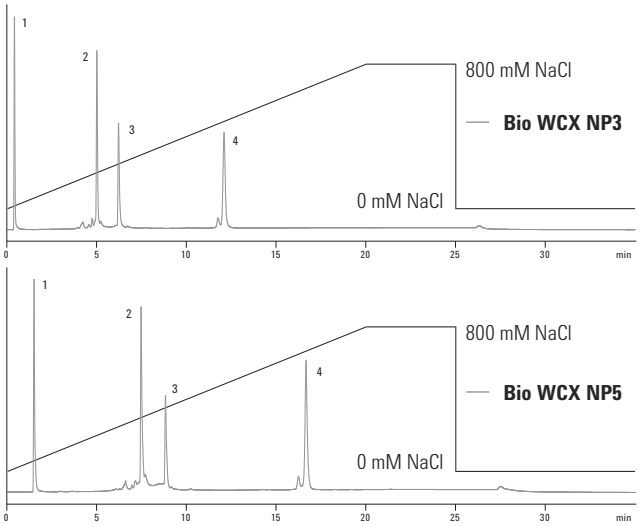


Separation of protein standards at pH 6.5 using an Agilent Bio WCX, NP5 column.

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

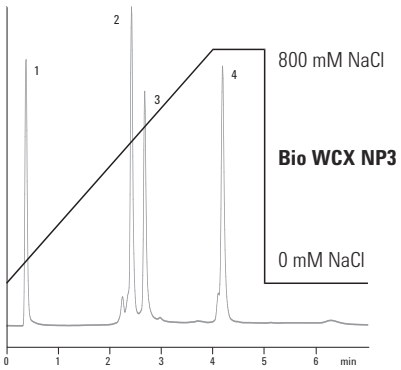
Faster separations using Agilent weak cation-exchange columns

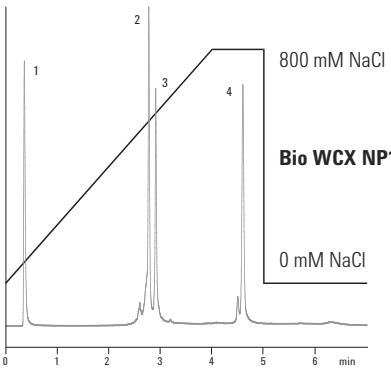


Protein separation on Agilent Bio WCX NP5 versus Agilent Bio WCX NP3.

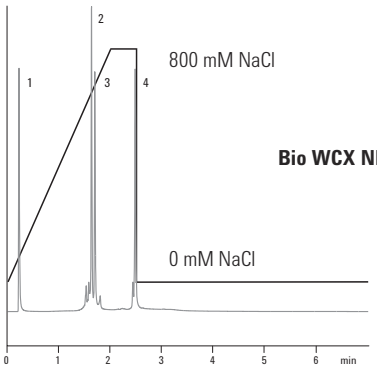
Column:	**Agilent Bio WCX, stainless steel 5190-2445 4.6 x 250 mm, 5 µm**
Column:	**Agilent Bio WCX, stainless steel 5190-2443 4.6 x 50 mm, 3 µm**
Column:	**Agilent Bio WCX, stainless steel 5190-2441 4.6 x 50 mm, 1.7 µm**
Mobile Phase:	A: 20 mM sodium phosphate, pH 6.5 B: A + 1.6 M NaCl
Flow Rate:	1.0 mL/min
Gradient:	0 to 50% B
Temperature:	Ambient
Detector:	UV, 220 nm Agilent 1260 Infinity Bio-inert Quaternary LC
Sample:	Ovalbumin, Ribonuclease A, Cytochrome c, Lysozyme
Sample Conc:	0.5 mg/mL

1. Ovalbumin
2. Ribonuclease A
3. Cytochrome c
4. Lysozyme





Comparison of Agilent Bio WCX NP3 versus Agilent Bio WCX NP1.7 (flow rate 1.0 mL/min).



Agilent Bio WCX NP1.7 for protein separations under 3 minutes (flow rate 1.7 mL/min).

NEW!

pH gradient elution for improved separation of monoclonal antibody charged variants

Column: **Bio MAb, stainless steel**
5190-2405
4.6 x 250 mm, 5 µm

Mobile Phase: A: water
B: 1.6 M NaCl
C: 100 mM NaH_2PO_4
D: 100 mM Na_2HPO_4
By combining predetermined proportions of C and D, buffer solutions at the desired pH range were produced at the selected buffer strengths.

Flow Rate: 1.0 mL/min

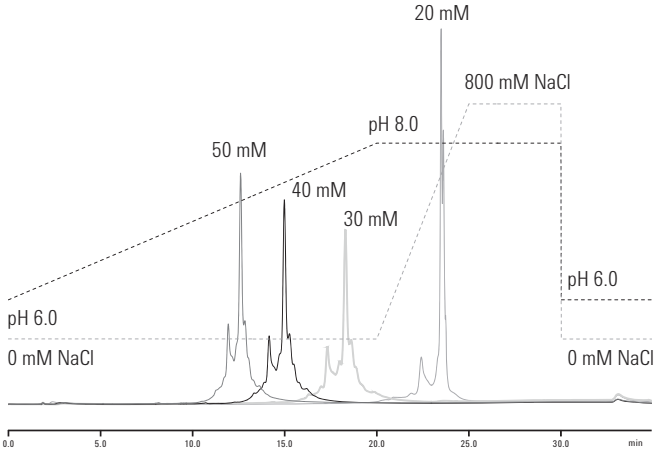
Gradient: pH 6.0 to 8.0, 0 to 20 minutes
0 to 800 mM NaCl, 20 to 25 minutes
800 mM NaCl, 25 to 30 minutes

Temperature: Ambient

Detector: UV, 220 nm
Agilent 1260 Infinity Bio-inert Quaternary LC

Sample: IgG monoclonal antibody

Sample Conc: 2 mg/mL (in 20 mM sodium phosphate buffer, pH 6.0)



Chromatograms of IgG monoclonal antibody at different ionic strengths.

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

Separation of recombinant human erythropoietin (rEPO) using Agilent Bio SEC-3

Column: **Bio SEC-3, 100Å**
5190-2503
4.6 x 300 mm, 3 µm

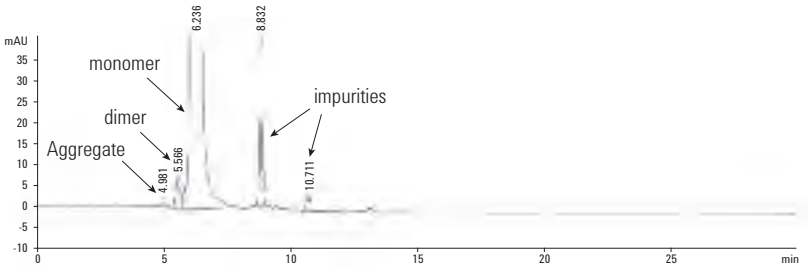
Mobile Phase: 150 mM sodium phosphate buffer, pH 7.0

Flow Rate: 0.35 mL/min

Detector: UV, 225 nm
Agilent 1260 Infinity Bio-inert Quaternary LC

Sample: Recombinant human EPO protein (rEPO)

Sample Conc: 1.0 mg/mL



Consistent ion-exchange MAb separation

Column: **Bio MAb, PEEK**
5190-2411
2.1 x 250 mm, 5 µm

Buffer: A: Sodium phosphate buffer, 20 mM
B: Buffer A + 400 mM NaCl

Gradient: 15-35% Buffer B from 0-30 min

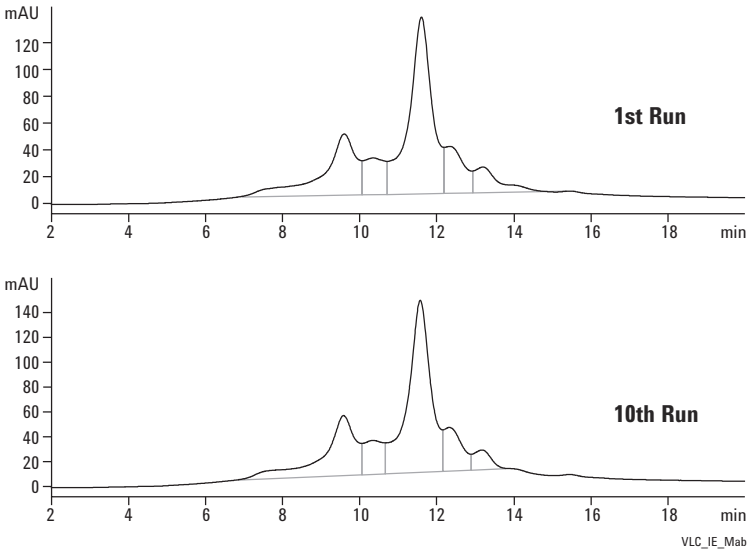
Flow Rate: 0.65 mL/min

Sample: CHO-humanized MAb, 1 mg/mL

Injection: 2.5 µL

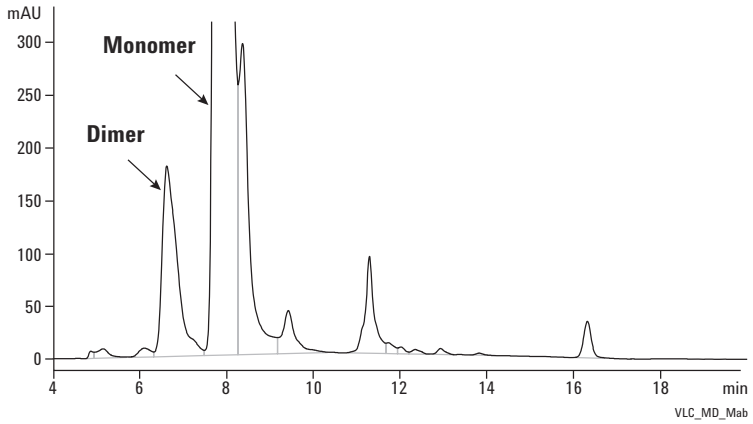
Detector: UV, 220 nm

Temperature: Ambient



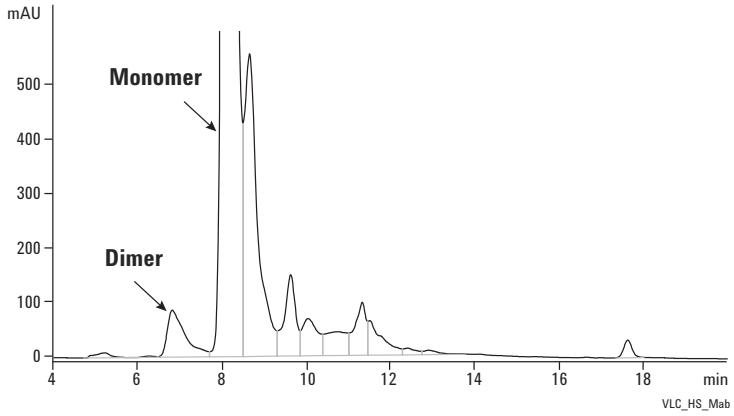
Intact MAb monomer and dimer separation

Column:	**Bio SEC-3, 300Å 5190-2511 7.8 x 300 mm, 3 µm**
Buffer:	Sodium phosphate buffer, pH 7.0, 150 mM
Gradient:	0-100% Buffer A from 0-30 min
Flow Rate:	1.0 mL/min
Sample:	CHO-humanized MAb, 5 mg/mL – intact
Injection:	5 µL
Detector:	UV, 220 nm
Temperature:	Ambient



Separation of heated, stressed MAb

Column:	**Bio SEC-3, 300Å 5190-2511 7.8 x 300 mm, 3 µm**
Buffer:	Sodium phosphate buffer, pH 7.0, 150 mM +150 mM sodium sulfate
Gradient:	0-100% Buffer A from 0-30 min
Flow Rate:	1.0 mL/min
Sample:	CHO-humanized MAb, 5 mg/mL – stressed at 60 °C
Injection:	5 µL
Detector:	UV, 220 nm
Temperature:	Ambient



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Nucleosides, purines and pyrimidines

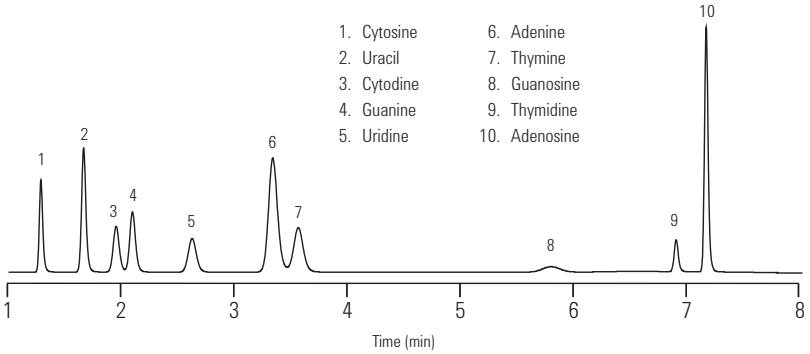
Column: **Eclipse Plus Phenyl Hexyl**
959993-912
4.6 x 150 mm, 5 µm

Mobile Phase: 1% MeOH: 99% 20 mm Ammonium Acetate, pH 4.5

Flow Rate: 1 mL/min

Detector: UV, 254 nm

1. Cytosine
2. Uracil
3. Cytodine
4. Guanine
5. Uridine
6. Adenine
7. Thymine
8. Guanosine
9. Thymidine
10. Adenosine



nucleosides

Amino acid standard separation on Eclipse Plus C18

Column: **Eclipse Plus C18**
959763-902
2.1 x 150 mm, 3.5 µm

Mobile Phase: A: 10 mM Na_2HPO_4, 10 mM $Na_2B_4O_7$, 0.5 mM NaN_3, pH 8.2
B: acetonitrile: methanol: water (45:45:10) (v/v/v)

Flow Rate: 0.42 mL/min

Temperature: 40 °C

Detector: UV, 338 nm, then switch to 280 nm at 15.7 min

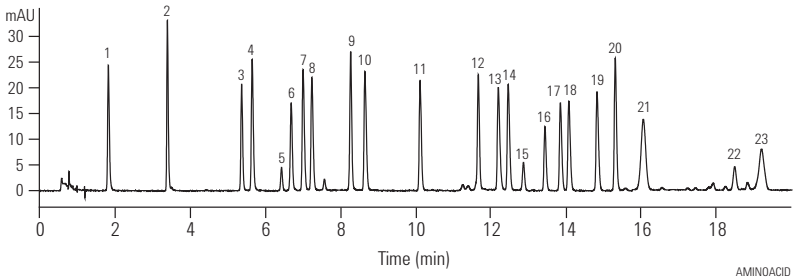
Sample: 900 pmol Amino Acids with extended Amino Acids and Internal Standards (500 pmol)

Derivatization: Automated, online, OPA / FMOC

1. ASP
2. GLU
3. ASN
4. SER
5. GLN
6. HIS
7. GLY
8. THR
9. ARG
10. ALA
11. TYR
12. CY2
13. VAL
14. MET
15. NVA
16. TRP
17. PHE
18. ILE
19. LEU
20. LYS
21. HYP
22. SAR
23. PRO

Gradient

Time (min)	% B
0	2
0.5	2
20	57
20.1	100
23.5	100
23.6	2
25	stop



AMINOACID

Antibodies: Fast separation of IgM and IgG antibodies

Column: **ZORBAX GF-250**
884973-701
4.6 x 250 mm, 4 µm

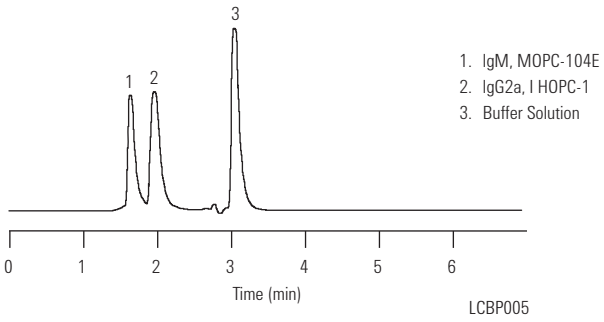
Mobile Phase: 200 mM Sodium Phosphate (pH 7), 0.01% Azide

Flow Rate: 0.94 mL/min

Temperature: Ambient

Detector: UV, 230 nm

Sample: 2.5 µL (1 mg/mL)



Glycosylated proteins: Large molecules on Poroshell 300SB-C18 and 300SB-C8

Column A: **Poroshell 300SB-C18**
661750-902
1.0 x 75 mm, 5 µm

Column B: **Poroshell 300SB-C8**
661750-906
1.0 x 75 mm, 5 µm

Column C: **ZORBAX 300SB-C18**
865630-902
1.0 x 50 mm, 3.5 µm

Mobile Phase: A: 0.1% TFA in H_2O
B: 0.07% TFA in ACN

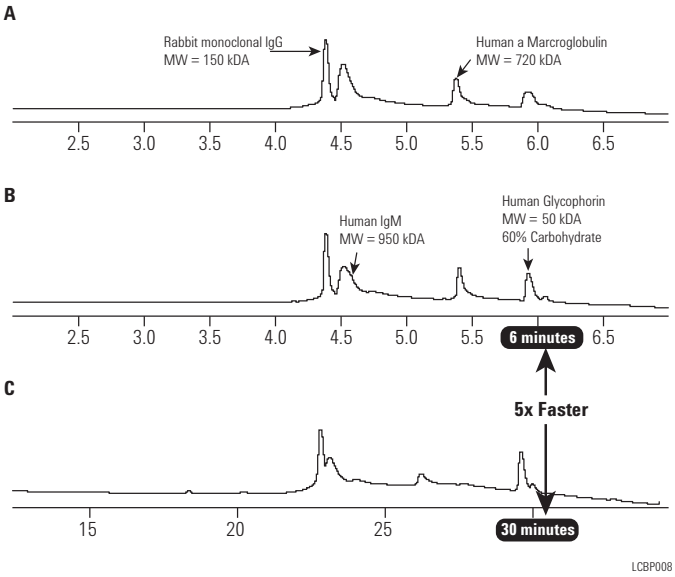
Flow Rate: A, B: 0.454 mL/min
C: 0.071 mL/min

Gradient: A, B: 0 min 5% B
10 min 100% B
C: 0 min 5% B
50 min 100% B

Temperature: 70 °C

Detector: DAD 212 nm, 1.7 µL flow cell, <0.01 min peak width

Sample: Large glycosylated proteins



Courtesy of:
Novartis AG, Basel.
Dr. Kurt Forrer
Patrik Roethlisberger

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

HSA tryptic digest on ZORBAX Rapid Resolution HT 1.8 µm

Column A: **ZORBAX SB-C18**
883700-922
2.1 x 150 mm, 5 µm

Column B: **ZORBAX SB-C18**
822700-902
2.1 x 50 mm, 1.8 µm

Mobile Phase: A: Water w/0.1% TFA
B: ACN w/0.1% TFA

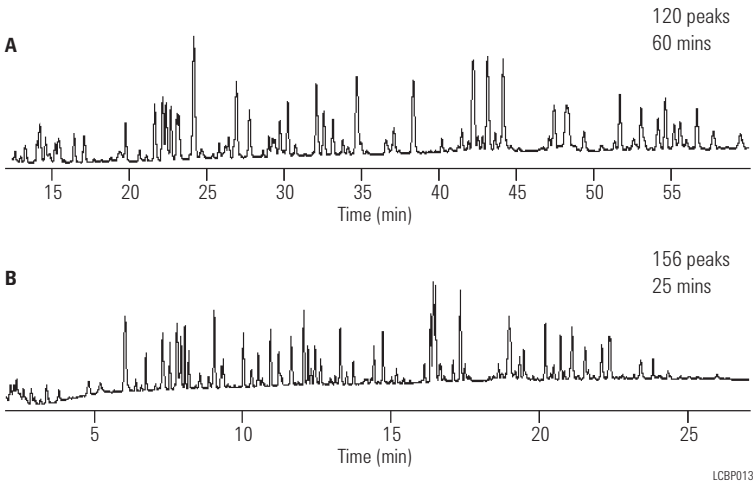
Flow Rate: A: 0.2 mL/min
B: 0.5mL/min

Gradient: A: 2 to 50% B in 70min
B: 2 to 50% B in 30min

Temperature: 50 °C

Detector: UV, 214 nm

Sample: HSA tryptic digest, 8 µL of 15 pmol/µL (120 pmol on column)



Human serum: Low abundance protein isolation and identification from 1-D gel band by LC/MS

Column: **ZORBAX 300SB-C18**
Trap: 0.3 x 5 mm, 5 µm, 5065-9913
Analytical: 0.3 x 150 mm,
5 µm, 5064-8263

Mobile Phase: A: Water + 0.1% Formic acid
B: Acetonitrile + 0.1% Formic acid

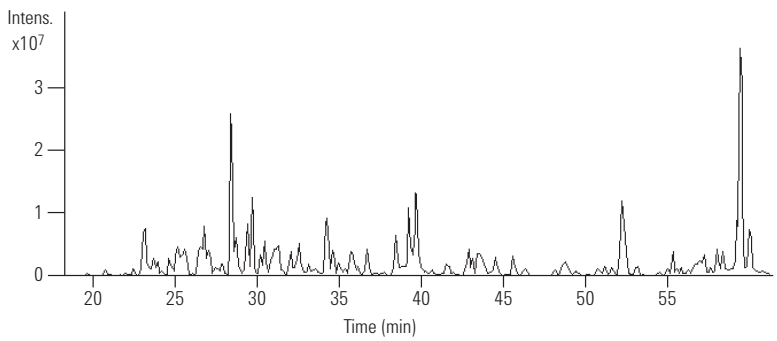
Flow Rate: 6 µL/min

Gradient: 0 min 3% B
5 min 3% B (loading)
50 min 45% B
52 min 80% B
57 min 80% B
60 min 3% B

Sample: Band from 1-D in gel digest

Sample Preparation of Human Serum:
Major serum proteins removed using Multiple Affinity Removal
Column: 4.6 x 100 mm, P/N 5185-5985
Followed by 1-D gel digest

Base Peak Chromatogram



Proteins Identified

1. α-1-Antichymotrypsin
2. Antithrombin-III Precursor
3. Complement Factor B Precursor

Monoclonal IgG1 chains: Separation on Poroshell 300SB-C8

Column: **Poroshell 300SB-C8**
660750-906
2.1 x 75 mm, 5 µm

Mobile Phase: A: 90% water: 10% ACN + 3 mL/L of MW 300 PEG
B: 10% water: 90% ACN + 3 mL/L of MW 300 PEG

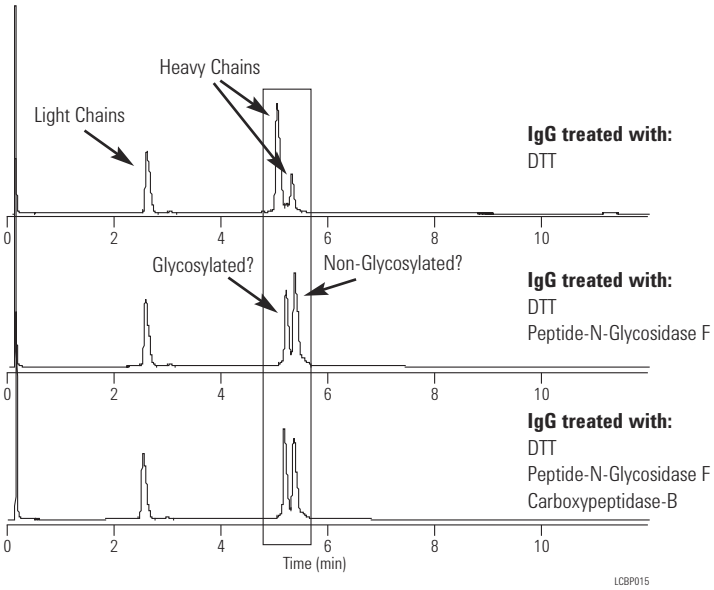
Flow Rate: 1.0 mL/min

Gradient: 0 min 25% B
10 min 40% B
10.1 min 25% B
12 min 25% B

Temperature: 70 °C

Sample: Monoclonal IgG1

Courtesy of:
Novartis AG, Basel.
Dr. Kurt Forrer
Patrik Roethlisberger



Use ZORBAX Extend-C18 for alternate selectivity at high pH

Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in Water
B: 0.085% TFA in 80% ACN

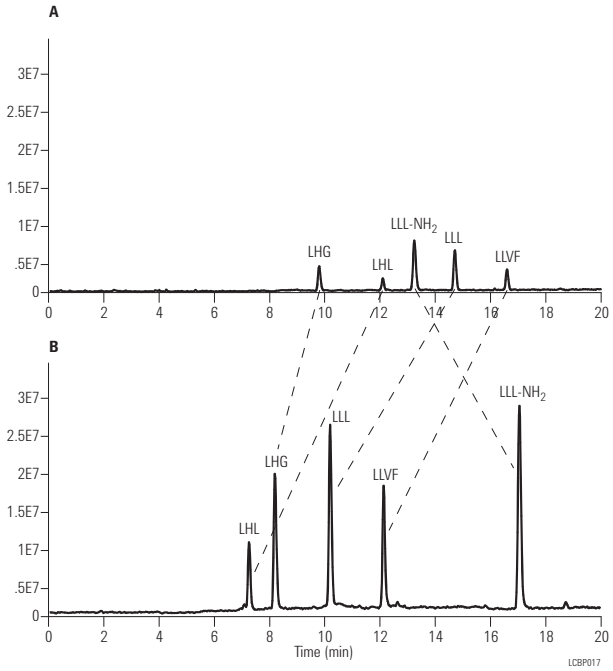
A: 20 mM NH_4OH in Water
B: 20 mM NH_4OH in 80% ACN

Flow Rate: 0.25 mL/min

Gradient: 5-60% B in 20 min

Temperature: 25 °C

MS Conditions: Pos. Ion ESI-Vf 70V, Vcap 4.5 kV
N_2 – 35 psi, 12 L/min, 300 °C
4 µL (50 ng each peptide)



The Extend column can be used for high pH separations of peptides. At high and low pH, very different selectivity can result. Just by changing pH, a complementary method can be developed and it is possible to determine if all peaks are resolved. The Extend column can be used at high and low pH, so the complementary separation can be investigated with one column. Better MS sensitivity for this sample is also achieved at high pH.

Nucleosides: Separation of deoxy and ribonucleosides

Column: **ZORBAX SB-C3**
883975-909
4.6 x 150 mm, 5 µm

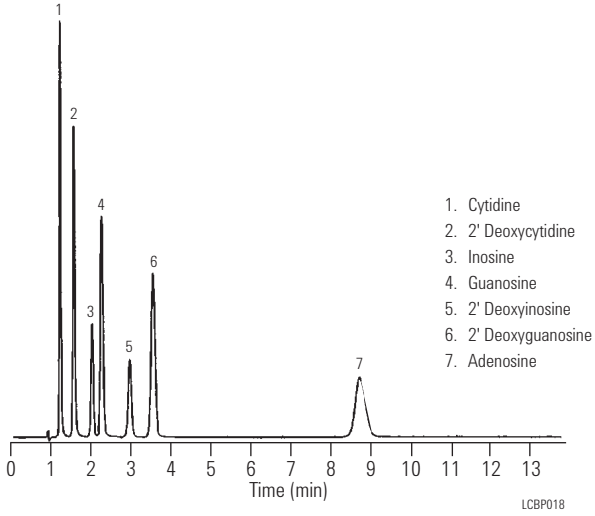
Mobile Phase: 4 mM Ammonium Phosphate (pH 4.0 with Phosphoric Acid)

Flow Rate: 2.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: 2 µL (1.6 µg each)



1. Cytidine
2. 2' Deoxycytidine
3. Inosine
4. Guanosine
5. 2' Deoxyinosine
6. 2' Deoxyguanosine
7. Adenosine

Nucleotides: Separation of mononucleotides

Column: **ZORBAX SAX**
880952-703
4.6 x 250 mm, 5 µm

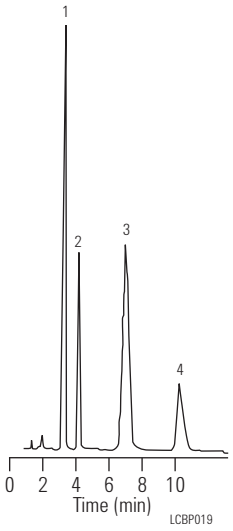
Mobile Phase: 0.1 M $NH_4H_2PO_4$

Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Orotic Acid, UMP, GMP, XMP



1. Orotic Acid
2. UMP
3. GMP
4. XMP

Separation of basic peptides on Bonus-RP versus traditional Alkyl phase

Column A: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Column B: **Alkyl C8**

Mobile Phase: A: 0.010 M ammonium phosphate, pH 7/0.050 M sodium perchlorate
B: 0.010 M ammonium phosphate/0.050 M sodium perchlorate in 50% ACN

Flow Rate: 1.0 mL/min

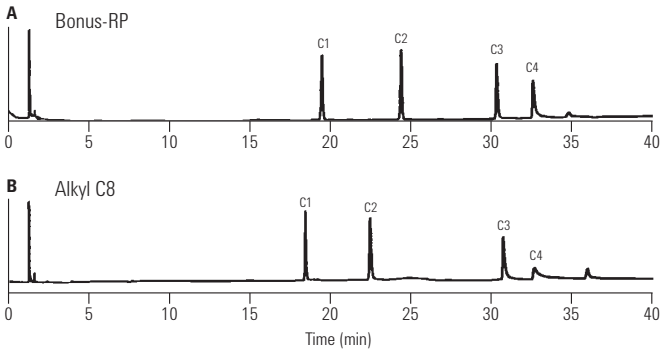
Gradient: 0-100% B in 50 min

Temperature: 40 °C

Detector: 215 nm

Sample: Basic 11-residue peptides with net +1, +2, +3, +4 positive charges at neutral pH

C1: Ac-Gly-Gly-Gly-Leu-Gly-Gly-Ala-Gly-Gly-Leu-Lys-amide
C2: Ac-Lys-Tyr-Gly-Leu-Gly-Gly-Ala-Gly-Gly-Leu-Lys-amide
C3: Ac-Gly-Gly-Ala-Leu-Lys-Ala-Leu-Lys-Gly-Leu-Lys-amide
C4: Ac-Lys-Tyr-Ala-Leu-Lys-Ala-Leu-Lys-Gly-Leu-Lys-amide



LCBP020

Peptides: Effect of TFA concentration

Column: **ZORBAX 300SB-C8**
883995-906
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water and TFA
B: ACN and TFA

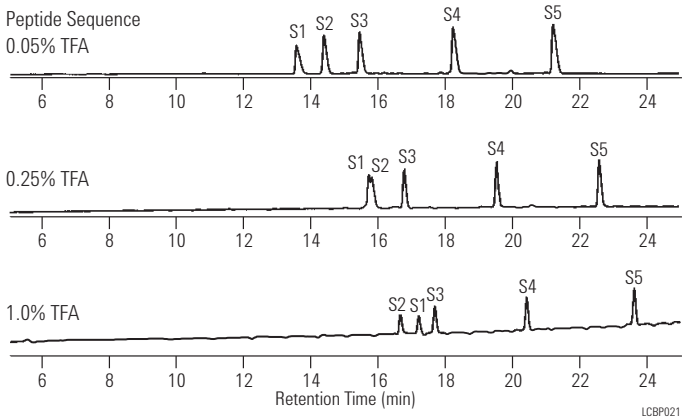
Flow Rate: 1.0 mL/min

Gradient: 0 min 0% B
30 min 30% B

Temperature: 40 °C

Detector: UV, 254 nm

Sample: Peptide Standards S1-S5, decapeptides differing slightly in hydrophobicity, 6 µL



LCBP021

Exploiting chemical stability – TFA concentration

Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

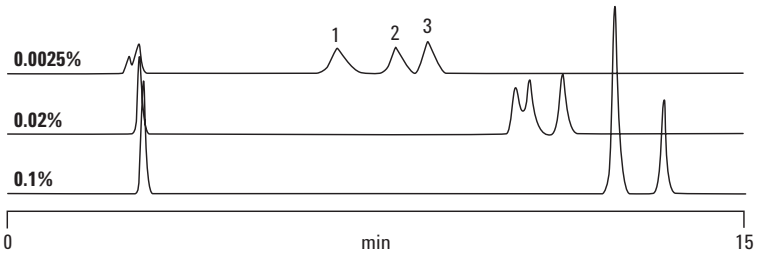
Mobile Phase: A: TFA (various %) in water
B: TFA (various %) in ACN

Gradient: Linear 12-40% B in 15 min

Flow Rate: 1.0 mL/min

Detector: ELS (neb=75 °C, evap=85 °C, gas=1.0 SLM)

1. Angiotensin III
2. Angiotensin II
3. Angiotensin I



VLC0068

Peptides: Separation of Antiotensins I, II, III with TFA and NH_4OH

Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

Mobile Phase: A: Acidic Conditions
A: 0.1% TFA in water
B: 0.085% TFA in 80% ACN
B: Basic Conditions
A: 10 mM NH_4OH in water
B: 10 mM NH_4OH in 80% ACN

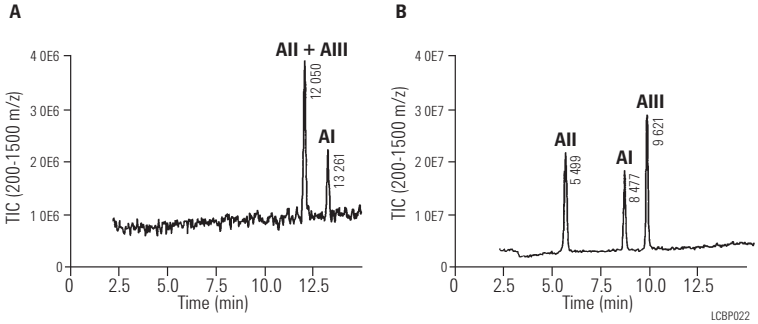
Flow Rate: 0.2 mL/min

Gradient: 15-50% B in 15 min

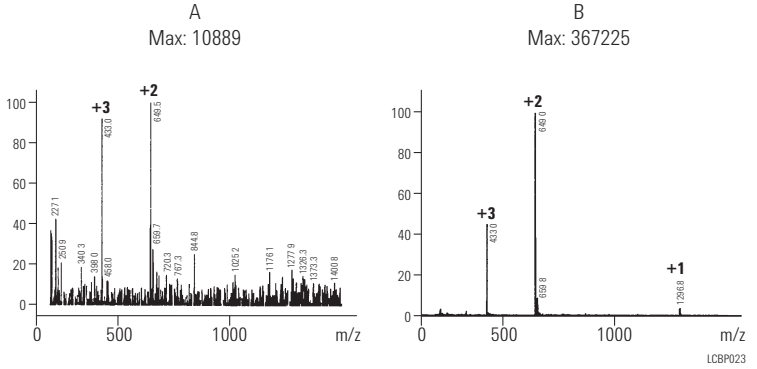
Temperature: 35 °C

MS Conditions: Pos. Ion ESI - Vf 70V, Vcap 4.5 kV
N_2-35 psi, 12 L/min, 325 °C

Sample: 2.5 µL sample (50 pmol each)



LCBP022



LCBP023

Peptides/proteins: Equivalent gradient separations

Column: **ZORBAX 300SB-C8**
883995-906
4.6 x 150 mm, 5 µm

Column: **ZORBAX 300SB-C8**
883750-906
2.1 x 150 mm, 5 µm

Mobile Phase: A: 95% Water: 5% ACN with 0.1% TFA
B: 5% Water: 95% ACN with 0.085% TFA

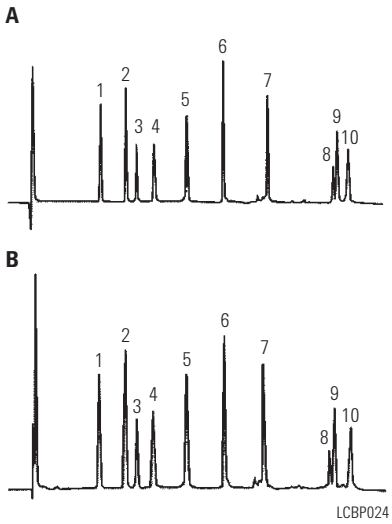
Flow Rate: A: Analytical
1 mL/min
B: Narrow Bore
0.2 mL/min

Gradient: 10-60% B in 30 min

Temperature: 35 °C

Detector: UV, 215 nm

Sample: 10 µL injection, concentration 2-6 µg



LCBP024

1. Met-enkephalin
2. Leu-enkephalin
3. Angiotensin II
4. Neurotensin
5. RNase
6. Insulin (BOV)
7. Lysozyme
8. Calmodulin
9. Myoglobin
10. Carbonic anhydrase

Peptides/proteins: Effect of elevated temperature

Column: **ZORBAX 300SB-C3**
883995-909
4.6 x 150 mm, 5 µm

Mobile Phase: A: 5:95 ACN:Water with 0.10% TFA (v/v%)
B: 95:5 ACN:Water with 0.085% TFA (v/v%)

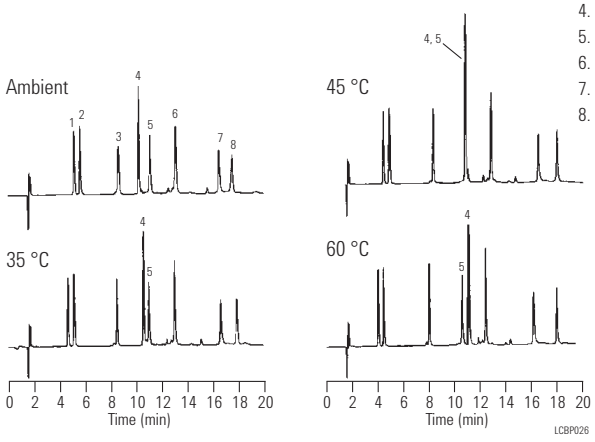
Flow Rate: 1.0 mL/min

Gradient: 15-53% in 20 min, post time 12 min

Temperature: Ambient – 60 °C

Detector: UV, 215 nm

Sample: Polypeptides



LCBP026

1. Leucine Enkephalin
2. Angiotensin II
3. RNase A
4. Insulin (BOV)
5. Cytochrome c
6. Lysozyme
7. Myoglobin
8. Carbonic anhydrase

Separation of polypeptides in under 1 minute

Column: **Poroshell 300SB-C18**
660750-902
2.1 x 75 mm, 5 µm

Mobile Phase: A: 0.1% TFA, H_2O
B: 0.07% TFA, ACN

Flow Rate: 3 mL/min

Gradient: 0-100% B in 1.33 min

Temperature: 70 °C

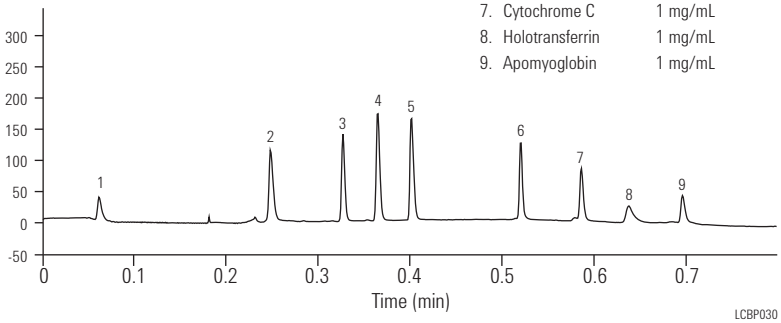
Detector: DAD 215/16 nm, ref = 310/10 nm

Sample: Peptides/proteins, 0.5 µL

Mixer bypassed with P/N G1312-67301; Loop-bypass program

Sample (peptides/proteins)

1.	gly-tyr	0.125 mg/mL
2.	Val-tyr-val	0.5 mg/mL
3.	Met-enkephalin	0.5 mg/mL
4.	Leu-enkephalin	0.5 mg/mL
5.	Angiotensin II	0.5 mg/mL
6.	RNase A	1 mg/mL
7.	Cytochrome C	1 mg/mL
8.	Holotransferrin	1 mg/mL
9.	Apomyoglobin	1 mg/mL



LCBP030

Fast, high-resolution separation of peptides and proteins with Poroshell 300SB-C18

Column: **Poroshell 300SB-C18**
660750-902
2.1 x 75 mm, 5 µm

Mobile Phase: A: 0.1% TFA
B: 0.07% TFA in ACN

Flow Rate: 3.0 mL/min (360 bar pressure)

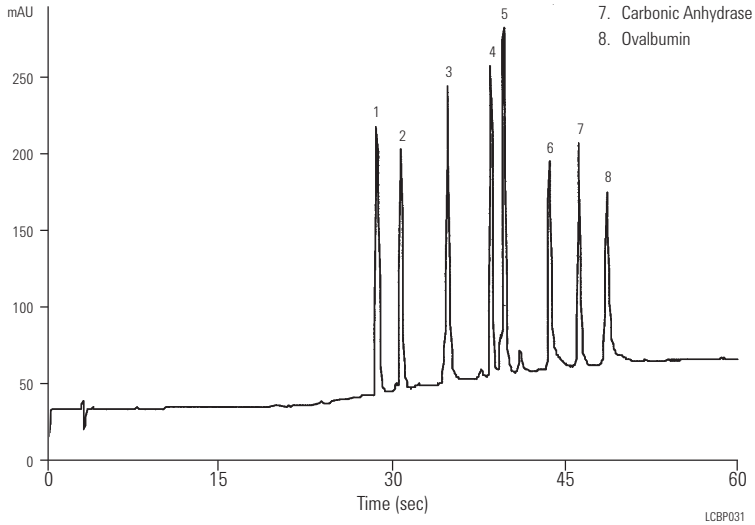
Gradient: 5-100% B in 1.0 min

Temperature: 70 °C

Detector: UV, 215 nm

Spaces between solutes indicate good peak capacity for rapidly separating complex samples.

1. Angiotensin II
2. Neurotensin
3. RNase
4. Insulin
5. Lysozyme
6. Myoglobin
7. Carbonic Anhydrase
8. Ovalbumin



LCBP031

Peptide RP-HPLC/ESI-MS using NH_4OH mobile phase yields both positive and negative ion spectra

Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

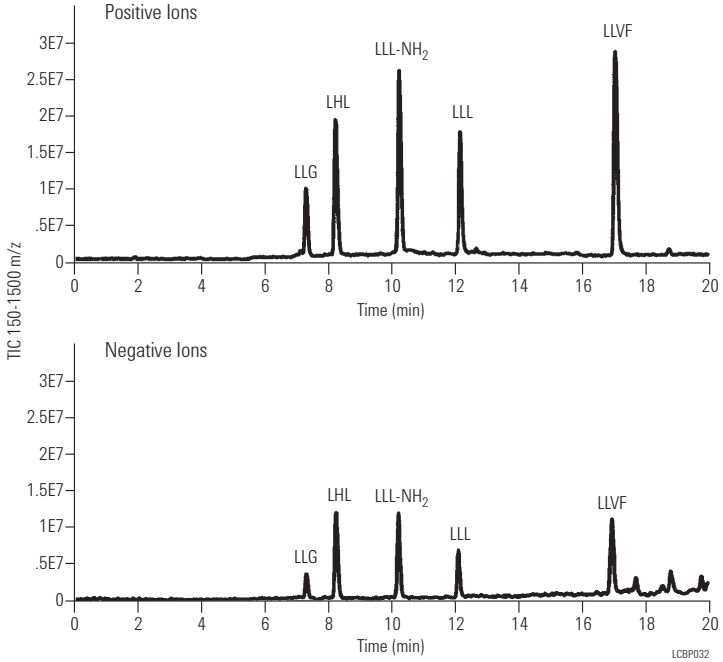
Flow Rate: 0.25 mL/min

Gradient: 5-60% B in 20 min

Temperature: 25 °C

MS Conditions: Pos. Ion ESI – Vf 70 V, Vcap 4.5 kV,
N_2 – 35 psi, 12 L/min, 300 °C
TIC 150-1500 m/z

Sample: 4 µL (50 ng each peptide)



Comparison of Aβ peptide RP-HPLC separations at low and high pH

Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in water
B: 0.085% TFA in 80% ACN

Flow Rate: 0.25 mL/min

Gradient: 29-41% B in 30 min

Temperature: 80 °C

Detector: UV, 210 nm

Sample: 5 µL sample (100 pmol each)

Mobile Phase: A: 20 mM NH_4OH in water
B: 20 mM NH_4OH in 80% ACN

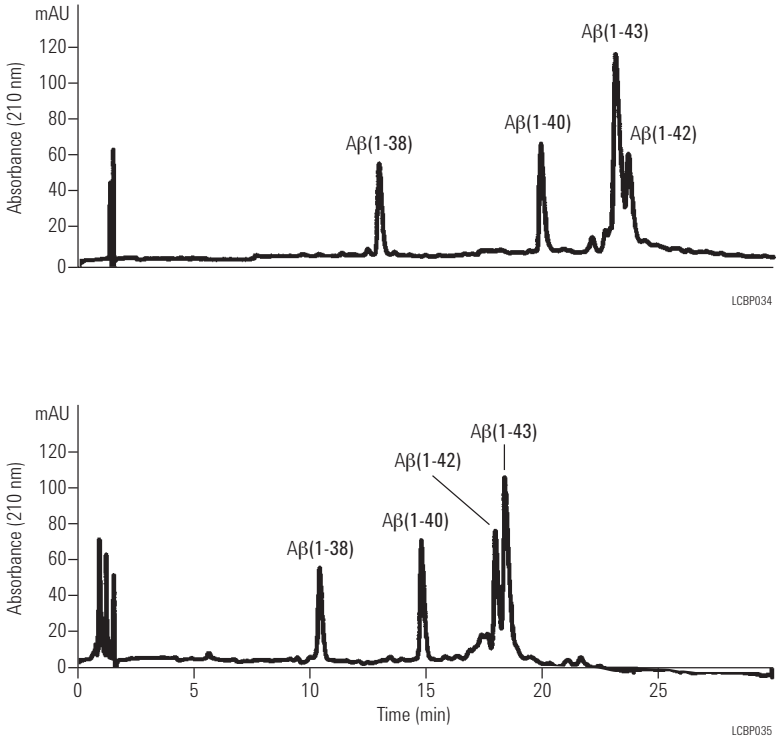
Flow Rate: 0.25 mL/min

Gradient: 26-38% B in 30 min

Temperature: 25 °C

Detector: UV, 210 nm

Sample: 5 µL sample (100 pmol each)



Selectivity comparison of TFA and NH_4OH for peptide RP-HPLC\ESI-MS analysis

Column: **ZORBAX Extend-C18**
773700-902
2.1 x 150 mm, 5 µm

Mobile Phase: TFA Conditions:
A: 0.1% TFA in water
B: 0.085% TFA in 80% ACN
NH_4OH Conditions:
A: 20 mM NH_4OH in water
B: 20 mM NH_4OH in 80% ACN

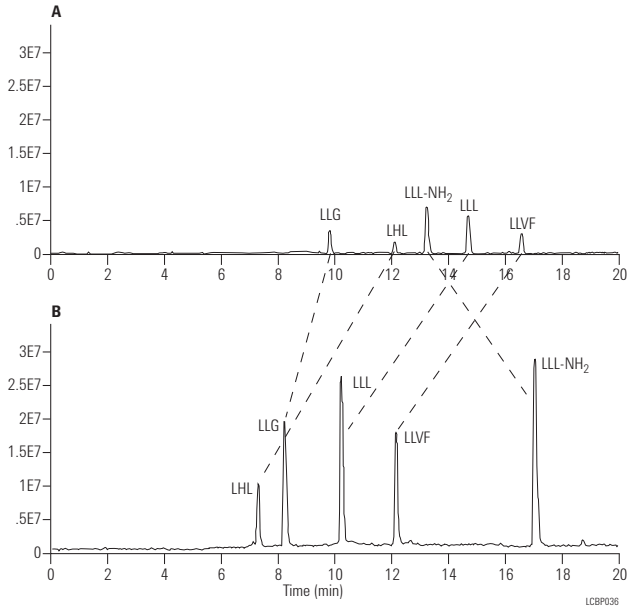
Flow Rate: 0.25 mL/min

Gradient: 5-60% B in 20 min

Temperature: 25 °C

MS Conditions: Pos. Ion ESI – Vf 70V, Vcap 4.5 kV,
N_2 – 35 psi, 12 L/min., 300 °C
TIC 150-1500 m/z

Sample: 4 µL (50 ng each peptide)



Peptide phosphorylation sites LC and LC/MS using Capillary LC columns

Column: **ZORBAX 300SB-C18**
5064-8268
0.5 x 150 mm, 3.5 µm

Mobile Phase: A: Water + 0.1% Formic acid
B: Acetonitrile + 0.1% Formic acid

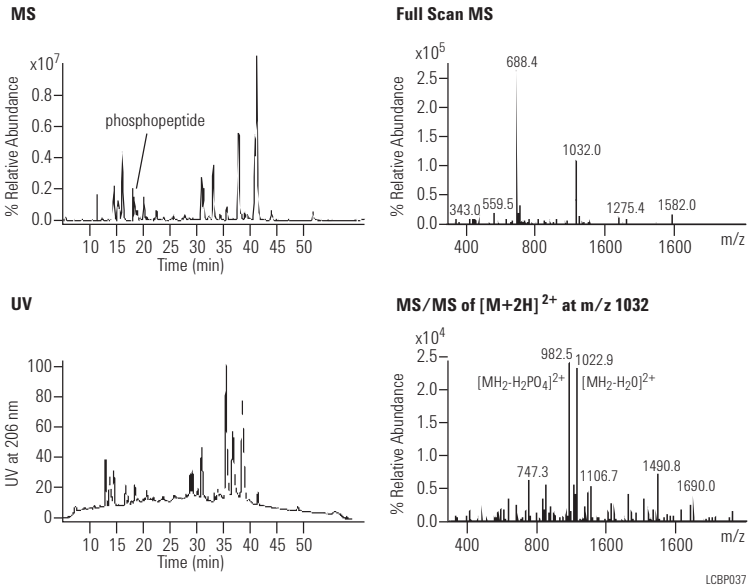
Flow Rate: 5.5 µL/min

Gradient: 5-55% B in 50 min, to
85% B from 55-57 min

Detector: UV, 206 nm

MS Conditions: LC/MS: Pos. Ion ESI with LC/MSD trap
Vcap: 4000 V
Drying gas flow: 7 L/min
Drying gas temperature: 250 °C
Nebulizer: 15 psi
Capillary Exit Volt: 50 V Max
Accum Time: 300 ms
Total Averages: 3
Isolation Width: 3 m/z
Frag Ampitude: 1.0 V

Sample: Beta case in digest, 100 nL (4 pmol)



Proteins: Effect of bonded phase, RP

Column A: **ZORBAX 300SB-C8**
883995-906
4.6 x 150 mm, 5 µm

Column B: **ZORBAX 300SB-CN**
883995-905
4.6 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in Water,
B: 0.1% TFA in 50/50 ACN/Water

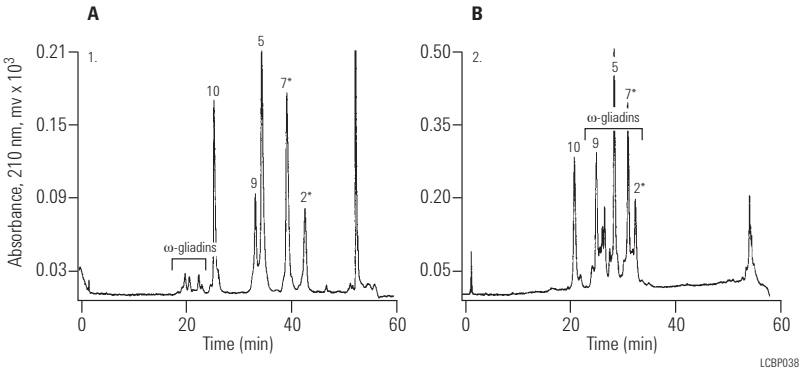
Flow Rate: 1.0 mL/min

Gradient: 1. 46-96% B in 60 min 23-48% ACN
2. 50-86% B in 60 min 25-43% ACN

Temperature: 50 °C

Detector: UV, 210 nm

Sample: Wheat proteins, including w-gliadins



Proteins: Effect of bonded phase

Column A: **ZORBAX RRHD 300SB-C18**
883995-902
4.6 x 150 mm, 5 µm

Column B: **ZORBAX 300SB-C8**
883995-906
4.6 x 150 mm, 5 µm

Column C: **ZORBAX 300SB-C3**
883995-909
4.6 x 150 mm, 5 µm

Column D: **ZORBAX 300SB-CN**
883995-905
4.6 x 150 mm, 5 µm

Mobile Phase: A: 0.1% TFA in H_2O
B: 0.09% TFA in 80% ACN/20% Water

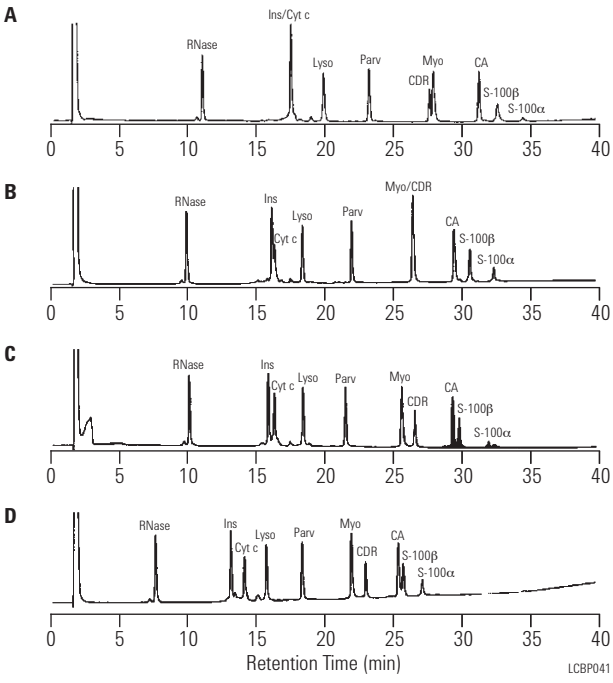
Flow Rate: 1.0 mL/min

Gradient: 25-70% B in 40 min

Temperature: 60 °C

Detector: UV, 210 nm

Sample: Polypeptides, 3 µg each



Standard proteins by reversed-phase

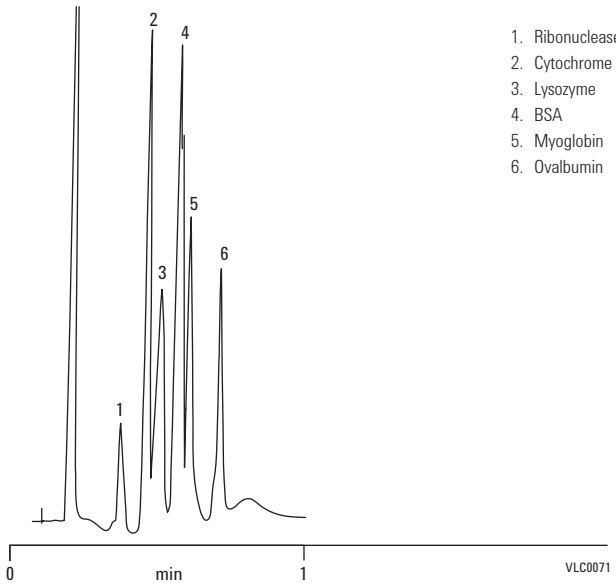
Column: **PLRP-S 4000Å**
PL1512-1803
4.6 x 50 mm, 8 µm

Mobile Phase: A: 0.1% TFA in 95% water:5% ACN
B: 0.1% TFA in 5% water:95% ACN

Gradient: Linear 18-60% B in 1 min

Flow Rate: 4.0 mL/min

Detector: UV, 280 nm



1. Ribonuclease A
2. Cytochrome C
3. Lysozyme
4. BSA
5. Myoglobin
6. Ovalbumin

Standard ion-exchange protein separation

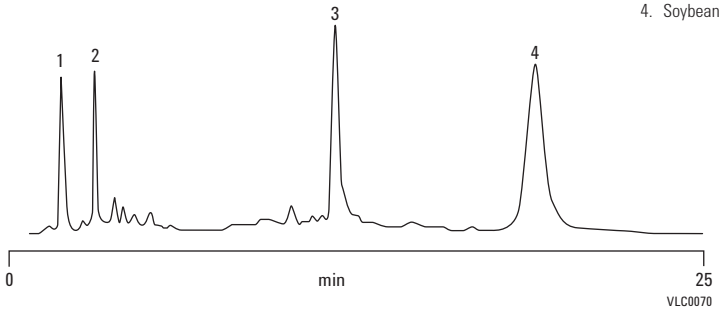
Column: **PL-SAX 1000Å**
PL1551-1502
4.6 x 50 mm, 5 µm

Mobile Phase: A: 10 mM Tris HCl pH 8
B: A+0.35 M NaCl pH 8

Gradient: 0-100% B in 20 min

Flow Rate: 1.0 mL/min

Detector: UV, 220 nm



1. Myoglobin
2. Bovine carbonic anhydrase
3. Ovalbumin
4. Soybean trypsin inhibitor

Deoxynucleosides: Using rapid resolution 3.5 µm columns

Column A: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

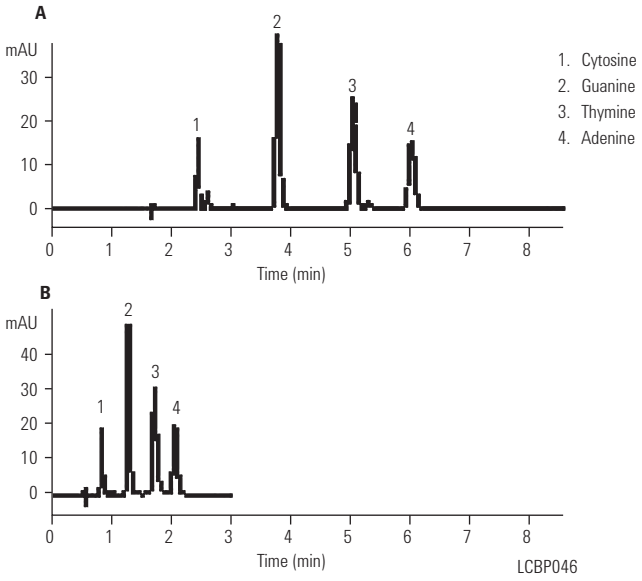
Column B: **ZORBAX SB-CN**
835975-905
4.6 x 50 mm, 3.5 µm

Mobile Phase: A: 0.1% TFA
B: 90/10 v/v Methanol/Water (0.1% TFA)
Isocratic, 97.5% A, 2.5% B

Flow Rate: 1.0 mL/min

Temperature: 30 °C

Detector: UV, 254 nm



BSA tryptic digest on RRHT

Column: **ZORBAX SB-C18**
820700-902
2.1 x 150 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA, 5% ACN
B: 0.08% TFA, 95% ACN

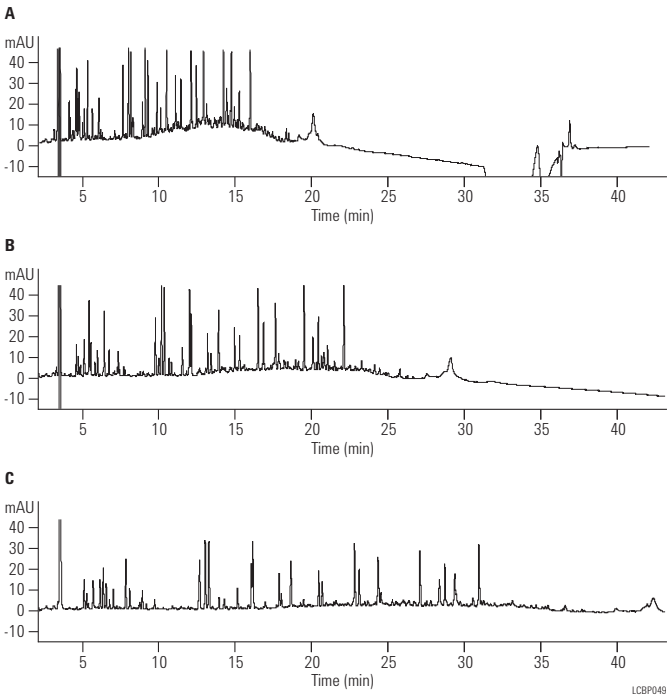
Flow Rate: 0.5 mL/min

Gradient: A: Time 0% B 5 min, Time 30% B 60 min
B: Time 0% B 5 min, Time 45% B 60 min
C: Time 0% B 5 min, Time 67.5% B 60 min

Temperature: 80 °C

Detector: UV, 214 nm

Sample: BSA tryptic digest



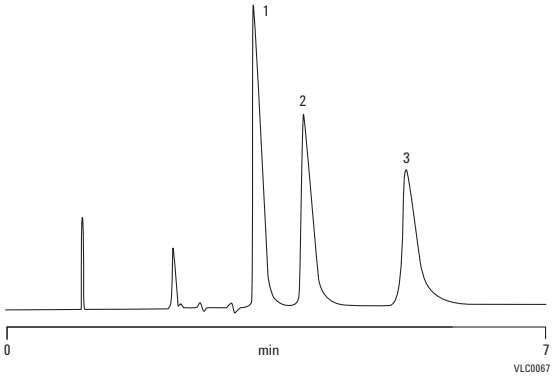
Catecholamines

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: 95% 25 mM citric acid, 25 mM Na_2HPO_4, 1 mM heptane sulfonic acid:5% ACN, pH 2.85

Flow Rate: 1.0 mL/min

Detector: UV, 280 nm



1. Noradrenaline
2. Adrenaline
3. Dopamine

Whey proteins in dairy samples – milk

Column: **PLRP-S 300Å**
PL1512-3801
4.6 x 150 mm, 8 µm

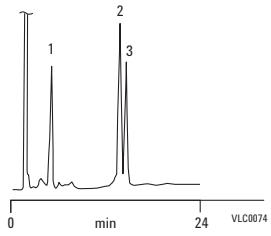
Mobile Phase: A: 0.1% TFA in 99% water:1% ACN
B: 0.1% TFA in 1% water:99% ACN

Gradient: 36-48% B, 0-24 min, 48-100% B, 24-30 min
100% B, 30-35 min, 100-36% B, 35-40 min

Flow Rate: 1.0 mL/min

Injection Volume: 10 µL

Detector: UV, 220 nm



1. α-Lactalbumin
2. β-Lactoglobulin (B chain)
3. β-Lactoglobulin (A chain)

Temperature as a tool to enhance mass transfer and improve resolution of oligonucleotides in ion-pair reversed-phase HPLC

Column: **PLRP-S 100Å**
PL1512-1300
4.6 x 50 mm, 3 µm

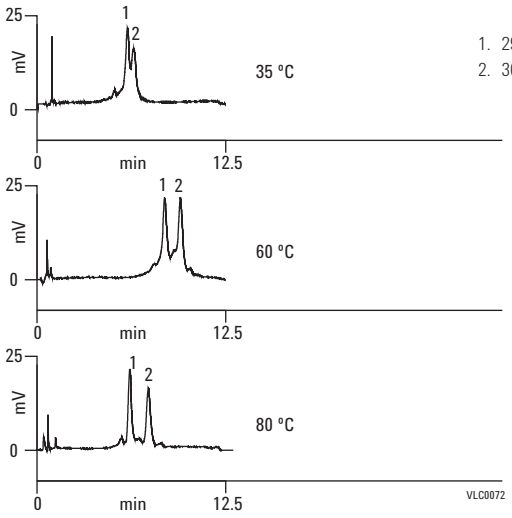
Mobile Phase: A: 100 mM TEAA
B: 100 mM TEAA in 25% ACN

Gradient: 5% change in buffer B over 5 min

Flow Rate: 1.0 mL/min

Temperature: 35 °C, 60 °C, or 80 °C

Detector: UV, 254 nm



1. 29-mer
2. 30-mer

Hydrophilic purine/pyrimidine separation

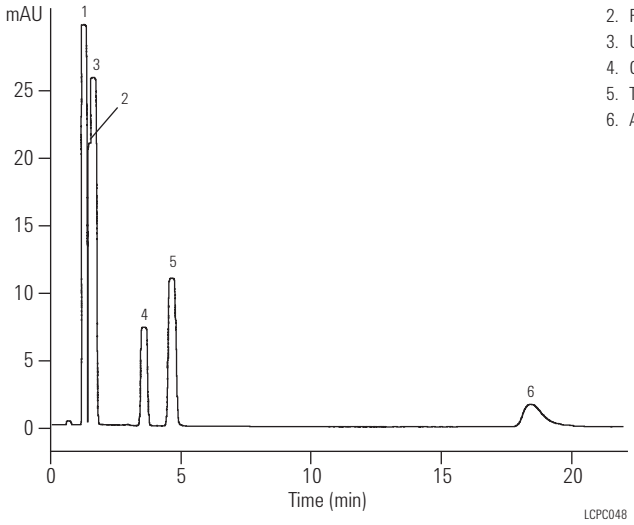
Column: **ZORBAX SB-Aq**
883975-914
4.6 x 150 mm, 5 µm

Mobile Phase: 50 mM NaOAc, pH 4.6

Flow Rate: 2.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm



1. Cytosine
2. Fluorocytosine
3. Uracil
4. Guanine
5. Thymine
6. Adenine

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Chemical/Industrial Applications

Analysis of biocides in hand sanitizer

Column: **ZORBAX RRHD Eclipse Plus C18**
959757-902
2.1 x 50 mm, 1.8 µm

Mobile Phase: A: H_2O (0.5% TFA)
B: ACN (0.04% TFA)

Flow Rate: 1.7 mL/min

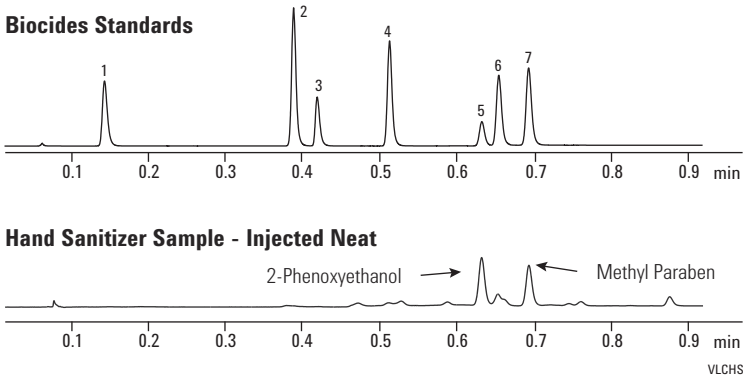
Gradient:

Time 0.0	95/5 A/B	
Time 1.0	55/45 A/B	
Time 1.1	0/100 A/B	

DAD: 275 nm (0 min)
225 nm (0.46 min)
255 nm (0.67 min)

Sample: 1 µL injection of 50 ppm std.

Temperature: 30 °C



1. Kathon 1A
2. Kathon 1B
3. Carbendazim
4. 1,2-Benzisothiazol-3(2H)-one
5. 2-Phenoxyethanol
6. Benzoic Acid
7. Methyl Paraben

Triton X-114: Decreasing run-time by changing bonded phase

Column A: **ZORBAX SB-C3**
883975-909
4.6 x 150 mm, 5 µm

Column B: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

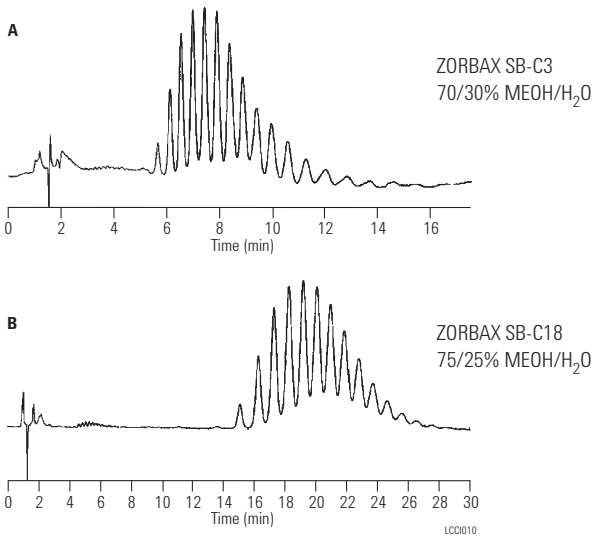
Mobile Phase: MeOH and H_2O (as indicated)

Flow Rate: 1.0 mL/min

Temperature: 50 °C

Detector: UV, 225 nm

Sample: Triton X-114



Organic acids separated on ZORBAX SB-Aq

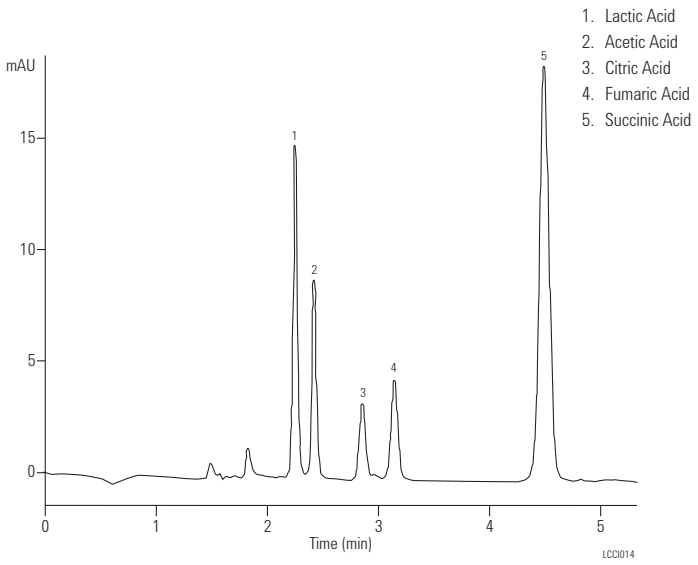
Column: **ZORBAX SB-Aq**
883975-914
4.6 x 150 mm, 5 µm

Mobile Phase: 99% 20 mM NaH_2PO_4, pH 2, 1% ACN

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 210 nm



Brij 35

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water
B: ACN

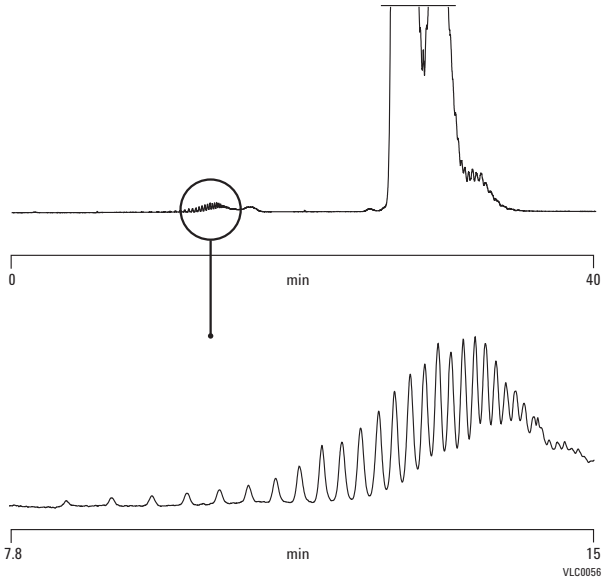
Gradient: 0-100% B in 40 min

Flow Rate: 0.8 mL/min

Injection Volume: 10 µL

Sample Conc: 1 mg/mL

Detector: ELS (neb=50 °C, evap=70 °C, gas=1.5 SLM)



Alcohols and aliphatic compounds

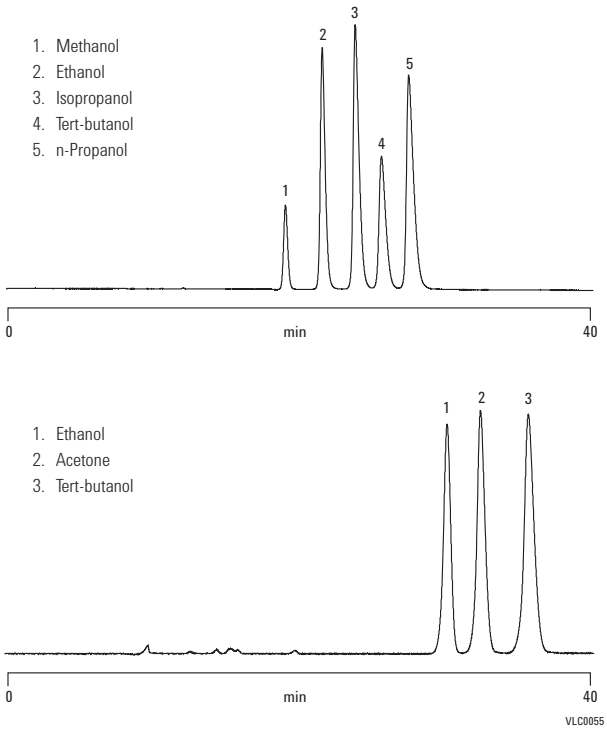
Column: **Hi-Plex H**
PL1170-6830
7.7 x 300 mm, 8 µm

Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 40 °C

Detector: 356-LC RI



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Environmental Applications

NEW!

Fast LC/MS/MS analysis of group 4 pharmaceuticals from EPA-1694

Column: **ZORBAX RRHD HILIC Plus**
959758-901
2.1 x 100 mm, 1.8 µm

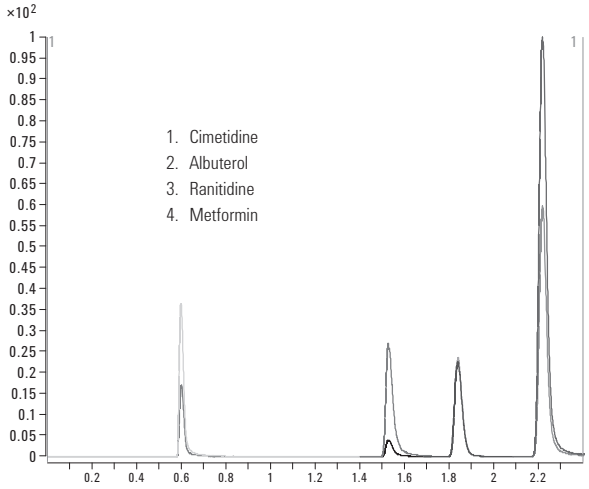
Mobile Phase: A: 10 mM ammonium acetate in water, pH 6.7
B: acetonitrile

Flow Rate: 1 mL/min

Detector: Agilent 1290 Infinity LC with an
Agilent 6410 Triple Quadrupole Mass Spectrometer

MS Conditions: TCC: 25 °C
dMRM, ESI positive mode, cycle time 35 ms
Drying Gas: 9 L/min, 300 °C
Nebulizer Pressure: 40 psig
Capillary Voltage: 4000

Sample: 0.1 µL injection of 0.1 mg/mL each in acetonitrile/water (3:1): cimetidine, albuterol, ranitidine and metformin



NEW!

Separation of azo dye degradation products

Column A: **Poroshell 120 EC-C18**
695775-902
2.1 x 100 mm, 2.7 µm

Column B: **Poroshell 120 SB-C18**
685775-902
2.1 x 100 mm, 2.7 µm

Column C: **Poroshell 120 Phenyl-Hexyl**
695775-912
2.1 x 100 mm, 2.7 µm

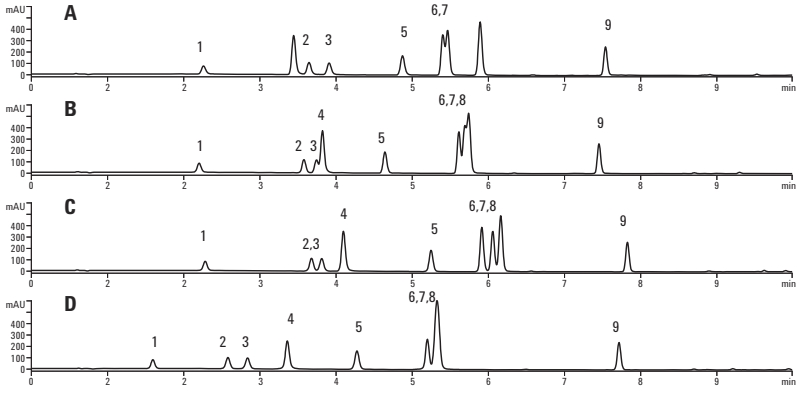
Column D: **Poroshell 120 Bonus RP**
685775-901
2.1 x 100 mm, 2.7 µm

Flow Rate: 0.4 mL/min

Gradient: 15 to 100% MeOH over 10 min

Solvent: 10 mM Ammonium acetate, pH 4.8

1. Aniline
2. o-Toluidine
3. Methoxyaniline
4. Chloroaniline
5. Benzidine
6. Dimethylbenzidine
7. 3,3'-Dimethoxybenzidine
8. Napthylamine
9. Dichlorobenzidine



Comparison of phenols separation with Poroshell 120

Column: **Poroshell 120 EC-C18**
699975-902
4.6 x 50 mm, 2.7 µm

Mobile Phase: A: Water with 0.1% Formic Acid
B: Acetonitrile

Gradient:

Time	%B
0.8	5%
6.8	60%

1200 SL controlled temperature
at 25 °C 2 mm flow cell

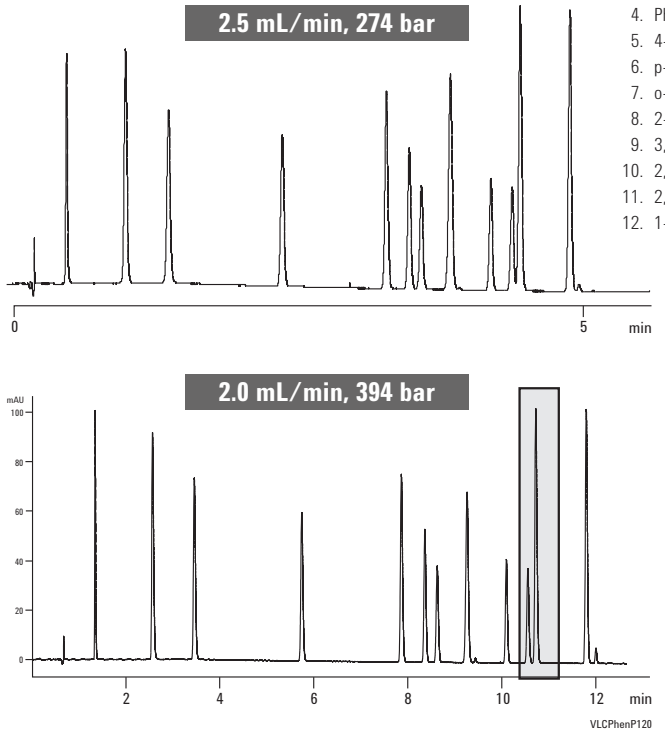
Column: **Poroshell 120 EC-C18**
695975-902
4.6 x 100 mm, 2.7 µm

Mobile Phase: A: Water with 0.1% Formic Acid
B: Acetonitrile

Gradient:

Time	%B
2.0	5%
17	60%

1200 RRLC SL controlled temperature
at 25 °C 2 mm flow cell



1. Hydroquinone
2. Resourcinol
3. Catechol
4. Phenol
5. 4-Nitrophenol
6. p-cresol
7. o-cresol
8. 2-Nitrophenol
9. 3,4 di methyl phenol
10. 2,3 di methyl phenol
11. 2,5 di methyl phenol
12. 1-napthol

DNPH: Derivatized Aldehydes obtained from air

Column: **ZORBAX ODS**
884950-543
4.6 x 250 mm, 5 µm

Mobile Phase: A: 100% Water
B: 100% ACN

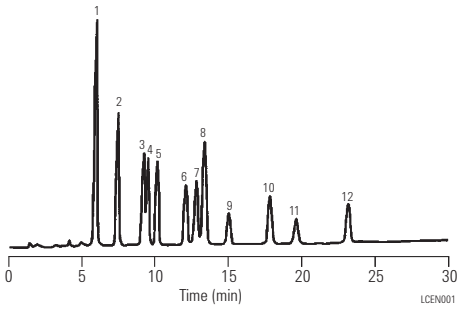
Flow Rate: 1.0 mL/min

Gradient: 60-75% B in 30 min; Wash: From 75-100% B in 5 min, after 5 min return to 60% B

Temperature: 35 °C

Detector: UV, 230 nm

Sample: DNPH Derivatized Aldehydes



1. Formaldehyde – DNPH
2. Acetaldehyde – DNPH
3. Acetone – DNPH
4. Acrolein – DNPH
5. Propionaldehyde – DNPH
6. Crotonaldehyde – DNPH
7. 2-Butanone (MEK) – DNPH
8. Methacrolein – DNPH
   n-Butyraldehyde – DNPH
9. Benzaldehyde – DNPH
10. Valeraldehyde – DNPH
11. m-Tolualdehyde – DNPH
12. Hexaldehyde – DNPH

Amitrol in water by LC/MS, 0.05 ppb

Column: **ZORBAX SB-C18**
863954-302
3.0 x 150 mm, 3.5 µm

Mobile Phase: A: 10 mM ammonium acetate
B: MeOH

Flow Rate: 0.4 mL/min

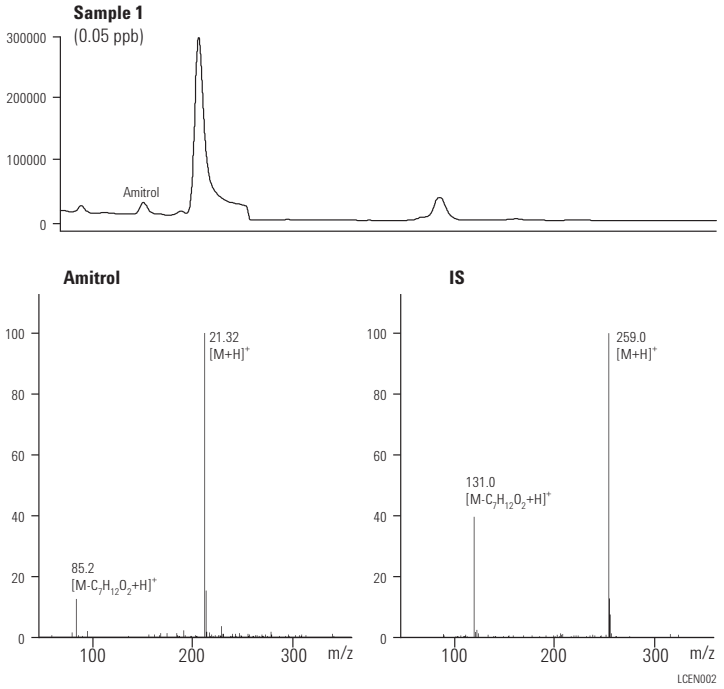
Gradient: 0 min, 65% B; 10 min, 65% B;
15 min, 100% B; 20 min, 65% B

Temperature: 30 °C

MS Conditions:

Ionization Mode:	APCI, positive polarity
SIM parameters:	Ion: 213 Amitrol
Ion:	259 IS
Fragmentor:	100 V
SIM Resolution:	Low
Vaporizer:	325 °C
Drying Gas (N_2):	5.0 L/min
Gas Temperature:	350 °C
Nebulizer pressure:	60 psig
Vcap:	4000 V
Corona:	4.0 uA

Sample: Amitrol in water, 100 µL



Anilines, substituted: Rapid separation

Column: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

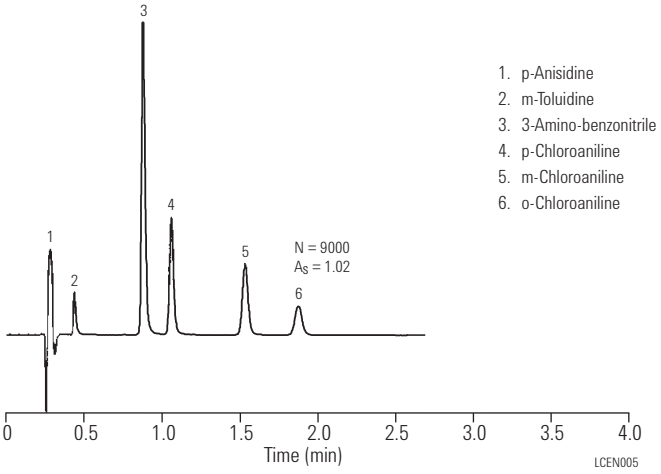
Mobile Phase: 20% ACN/80% 25 mM phosphate buffer, pH 2.5

Flow Rate: 3.0 mL/min

Temperature: 60 °C

Detector: UV, 254 nm

Sample: Anilines



1. p-Anisidine
2. m-Toluidine
3. 3-Amino-benzonitrile
4. p-Chloroaniline
5. m-Chloroaniline
6. o-Chloroaniline

Explosives and related compounds: Qualitative and quantitative analysis

Column A: **ZORBAX SB-C18**
883700-922
2.1 x 150 mm, 5 µm

Column B: **ZORBAX SB-CN**
883700-905
2.1 x 150 mm, 5 µm

Mobile Phase: A = ACN + 5% H_2O + 5 mM CF_3COONH_4
B = H_2O + 5% ACN + 5 mM CF_3COONH_4,
pH 2.7 (CF_3COOH)

Flow Rate: 0.23 mL/min

Gradient: A:
0 min 80% B
2 min 80% B
10 min 70% B
20 min 65% B
25 min 60% B
35 min 30% B
40 min 30% B
42 min 80% B

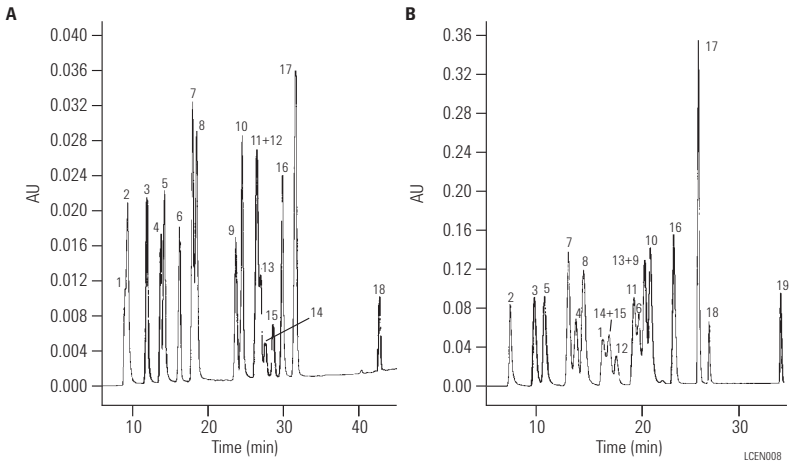
B:
0 min 80% B
1 min 80% B
15 min 70% B
30 min 20% B
35 min 20% B
37 min 80% B

Temperature: 18 °C

Detector: UV, 210, 240, 360 nm, wavelength switching for each compound

Sample: 10 µL of 19 explosive compounds in ACN/H_2O (20/80)

1. Picric acid
2. 4-Amino-2-nitrotoluene
3. 2-Amino-6-nitrotoluene
4. RDX
5. 2-Amino-4-nitrotoluene
6. HMX
7. 1,3-Dinitrobenzene
8. 1,3,5-Trinitrobenzene
9. 2-Amino-4,6-dinitrotoluene
10. 2,4-Dinitrotoluene
11. 4-Amino-4,6-dinitrotoluene
12. 2-Nitrotoluene
13. 2,6-Dinitrotoluene
14. 4-Nitrotoluene
15. 3-Nitrotoluene
16. 2,4,6-Trinitrotoluene
17. Tetryl
18. Diphenylamine
19. Hexyl



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Explosives from soil extract

Column: **ZORBAX SB-C18**
880975-302
3.0 x 250 mm, 5 µm

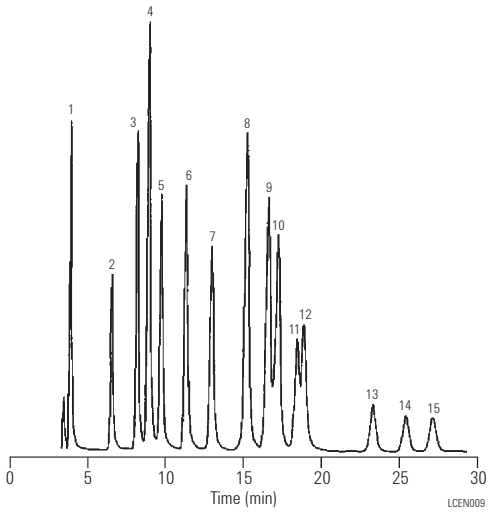
Mobile Phase: Methanol/Water (50/50) (v/v)

Flow Rate: 0.3 mL/min

Temperature: Ambient

Detector: UV, 230 nm

Sample: 10 µL explosives mix



1. Octogen (HMX)
2. Hexogen (RDX)
3. 2-Amino-6-nitrotoluene
4. 1,3,5-Trinitrobenzene
5. 2-Amino-4-nitrotoluene
6. 1,3-Dinitrobenzene
7. Tetryl
8. 2,4,6-Trinitrotoluene
9. 4-Amino-2,6-dinitrotoluene
10. 2-Amino-4,6-dinitrotoluene
11. 2,6-Dinitrotoluene
12. 2,4-Dinitrotoluene
13. 2-Nitrotoluene
14. 4-Nitrotoluene
15. 3-Nitrotoluene

Herbicides on different bonded phases

Column A: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

Column B: **ZORBAX SB-Phenyl**
883975-912
4.6 x 150 mm, 5 µm

Column C: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

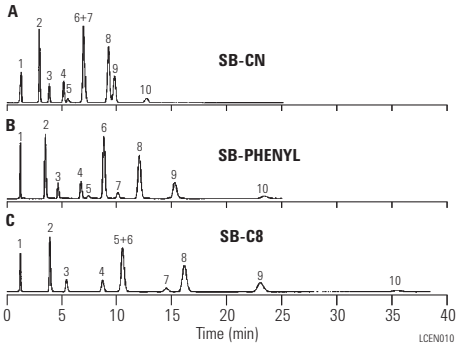
Mobile Phase: 35% ACN, 65% Water

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

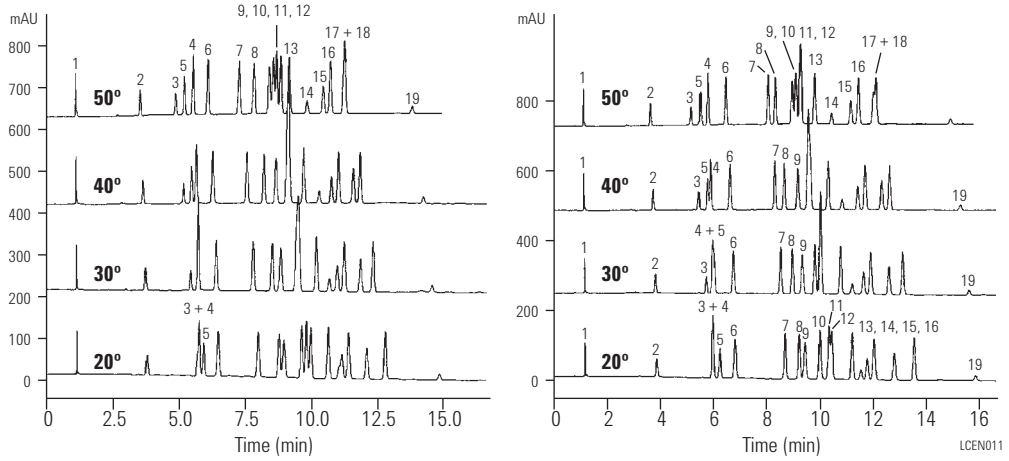
Sample: Herbicides



1. Bentazon
2. Tebuthiuron
3. Simazine
4. Atrazine
5. Prometon
6. Diuron
7. Propazine
8. Propanil
9. Prometryne
10. Metolachlor

Herbicide/pesticide standards: Effect of bonded phase

	Column: Eclipse XDB-C8 993967-906 4.6 x 150 mm, 5 µm	Column: Eclipse XDB-C18 993967-902 4.6 x 150 mm, 5 µm
Mobile Phase:	Water/Acetonitrile	Water/Acetonitrile
Flow Rate:	1.0 mL/min	1.0 mL/min
Gradient:	20-60% in 15 min	20-60% in 15 min
Temperature:	50 °C 40 °C 30 °C 20 °C	50 °C 40 °C 30 °C 20 °C
Detector:	DAD 240	DAD 240
Sample:	Herbicide & pesticide standards	Herbicide & pesticide standards



1. Desethyldesisopropylatrazine
2. Desethylatrazine
3. Benzthiazuron
4. Hexazinon
5. Metoxuron
6. Simazine
7. Methabenzthiazuron
8. Simazine
9. Atrazine
10. Isoproturon
11. Diuron
12. Monolonuron
13. Metobromuron
14. Metazachlor
15. Propazine
16. Sebutylazine
17. Terbutylazine
18. Linuron
19. Metolachlor

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Separation of EPA 610 PAH Mix

Column: **Eclipse PAH**
959990-318
3.0 x 250 mm, 5 µm

Mobile Phase: A: Water
B: Acetonitrile
Initial %B = 40

Flow Rate: 0.85 mL/min

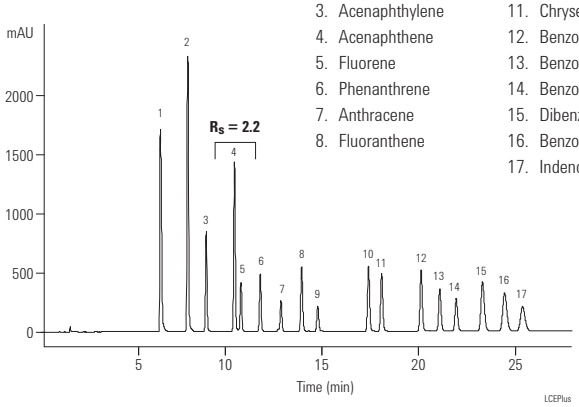
Gradient:

Time (Min)	%B
0.00	45
17.5	100
24.0	100
25.5	40
27.5	40

Stop Time = 25.0

Temperature: 25 °C

Detector: 220, 4 nm No Ref.; Stop time = 26.0 min



1. Toluene
2. Naphthalene
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Phenanthrene
7. Anthracene
8. Fluoranthene
9. Pyrene
10. Benzo(a)anthracene
11. Chrysene
12. Benzo(b)fluoranthene
13. Benzo(k)fluoeanthene
14. Benzo(a)pyrene
15. Dibenzo(a,h)anthracene
16. Benzo(g,h,i)perylene
17. Indeno(1,2,3-c,d)pyrene

Polycyclic aromatic hydrocarbons according to EPA Method 610

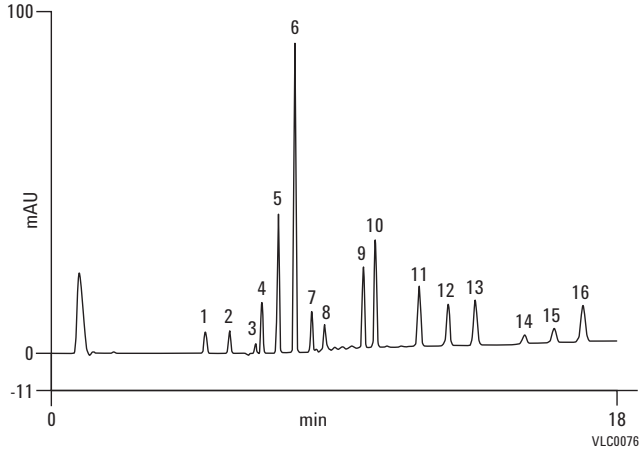
Column: **Pursuit PAH**
A7001100X046
4.6 x 100 mm, 3 µm

Sample: NIST 16473 Standard

Mobile Phase: A: ACN:water, 25:75
B: ACN

Flow Rate: 2.0 mL/min

Detector: UV, 254 nm



1. Naphthalene
2. Acenaphthylene
3. Aceneaphthene
4. Fluorene
5. Phenanthrene
6. Anthracene
7. Fluoranthene
8. Pyrene
9. Benzo[a]anthracene
10. Chrysene
11. Benzo[b]fluoranthene
12. Benzo[k]fluoranthene
13. Benzo[a]pyrene
14. Dibenzo[a,h]anthracene
15. Benzo[ghi]perylene
16. Indeno[1,2,3-cd]pyrene

NEW!

Rapid method development for 18 PAH compounds with an Agilent RRHD Eclipse PAH column

Column: **ZORBAX RRHD Eclipse PAH**
959758-918
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: Water
B: Acetonitrile

Flow Rate: 0.84 mL/min

Gradient: 40-100% B, gradient time (t_g) varies from 1 to 20 min; isocratic hold at 100% B for 2 min, re-equilibrate column at 40% B for 3 min

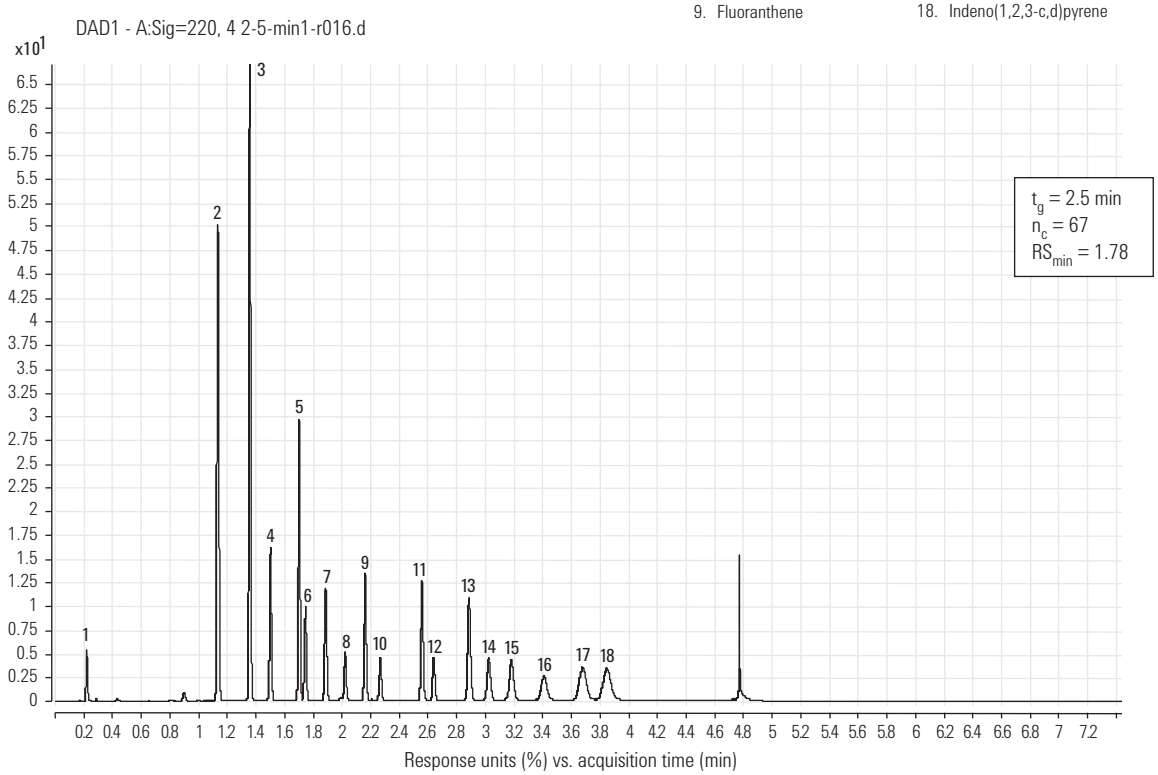
Temperature: 25 °C

Detector: Agilent 1290 Infinity LC

MS Conditions: Sig = 220, 4 nm; Ref = Off

Sample: 0.5 µL injection of diluted Agilent PAH Mixture (P/N 8500-6035) spiked with thiourea as a v_0 marker

1. Thiourea (V_0 marker)
2. Toluene
3. Naphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo(a)anthracene
12. Chrysene
13. Benzo(b)fluoranthene
14. Benzo(k)fluoranthene
15. Benzo(a)pyrene
16. Dibenzo(a,h)anthracene
17. Benzo(g,h,i)perylene
18. Indeno(1,2,3-c,d)pyrene



Gradient times are rapidly screened for the separation of 18 compounds.

Separation of 20 PAHs on Eclipse PAH

Column: **Eclipse PAH**
959964-918
4.6 x 100 mm, 1.8 µm

Mobile Phase: A: Water
B: Acetonitrile

Flow Rate: 1.8 mL/min

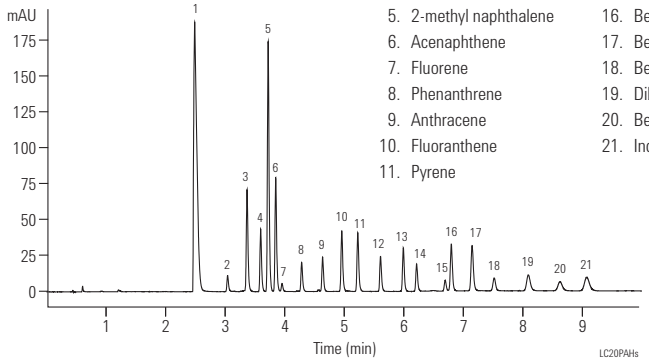
Gradient:

Time (Min)	% B
0	40
6	100
9.5	100
10	40

Stop Time = 12

Temperature: 25 °C

Detector: 230, 8 nm No Ref.; Data rate 0.2 s, micro flow cell



1. Toluene
2. Naphthalene
3. Acenaphthylene
4. 1-methyl naphthalene
5. 2-methyl naphthalene
6. Acenaphthene
7. Fluorene
8. Phenanthrene
9. Anthracene
10. Fluoranthene
11. Pyrene
12. Terphenyl-d14
13. Benzo(a)anthracene
14. Chrysene
15. Benz(e)pyrene
16. Benzo(b)fluoranthene
17. Benzo(k)fluoranthene
18. Benzo(a)pyrene
19. Dibenzo(a,h)anthracene
20. Benzo(g,h,i)perylene
21. Indeno(1,2,3-c,d)pyrene

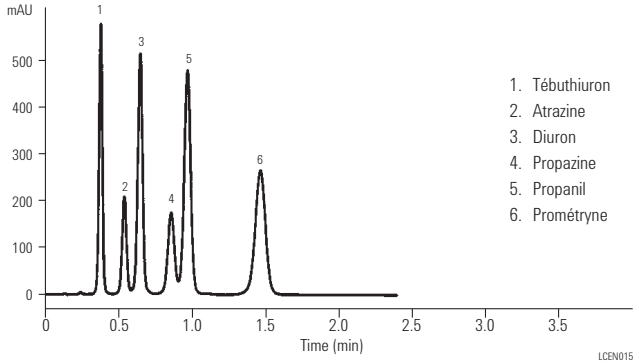
Herbicides: Rapid separation

Column: **Eclipse XDB-C18**
933975-902
4.6 x 30 mm, 3.5 µm

Mobile Phase: MeOH:H_2O (60:40)

Flow Rate: 2 mL/min

Temperature: Ambient



1. Tébuthiuron
2. Atrazine
3. Diuron
4. Propazine
5. Propanil
6. Prométryne

Phenoxyacid herbicides

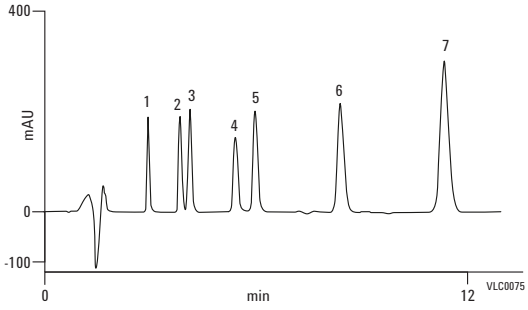
Column: **Pursuit XRs C8**
A6010150X046
4.6 x 150 mm, 5 µm

Mobile Phase: MeCN:water+0.1% HCOOH, 50:50

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 220 nm



1. Phenoxyacetic acid
2. o-Chlorophenoxyacetic acid
3. p-Chlorophenoxyacetic acid
4. 2,3-Dichlorophenoxyacetic acid
5. 2,4-Dichlorophenoxyacetic acid.
6. 2,4,5-Trichlorophenoxyacetic acid
7. 2,4,5-Trichlorophenoxypropionic acid (Silvex)

Triazine pesticides on Bonus-RP and Alkyl C8 phase

Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

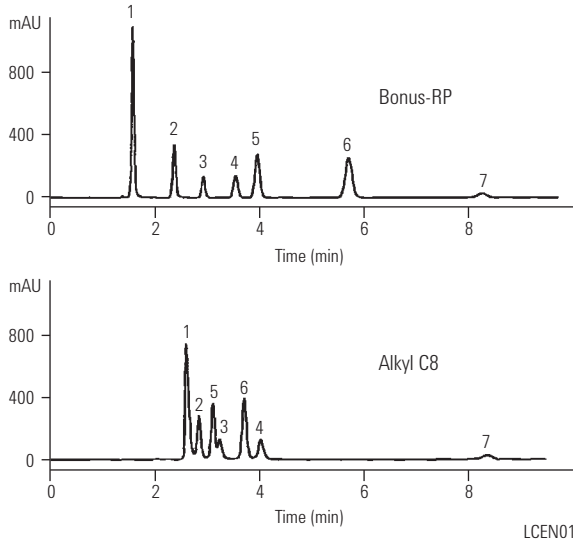
Mobile Phase: MeOH: 0.1% TFA (70:30)*

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: Triazine pesticides, 2 µL
1. Prometryne
2. Tebuthiuron
3. Atrazine
4. Propazine
5. Diuron
6. Propanil
7. Dacthal



LCEN01

* For low pH work with Bonus-RP, a TFA mobile phase is often preferred over phosphate, and is compatible with LC/MS.

Phenols, substituted

Column: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Mobile Phase: 20% ACN/80% 0.01 M H_3PO_4 to 45% ACN in 7.5 min

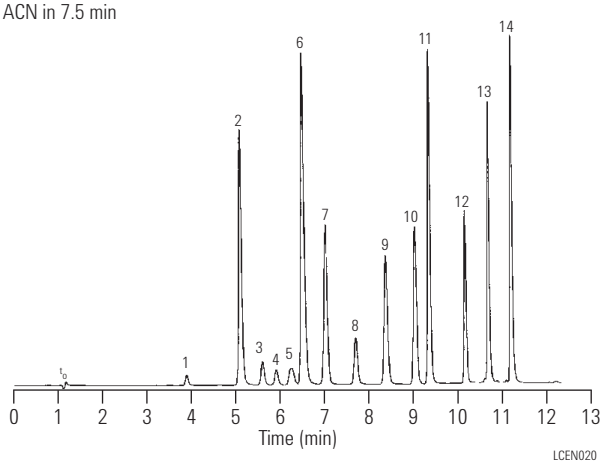
Flow Rate: 1.5 mL/min

Gradient: 80% ACN in 2.0 min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Phenols



LCEN020

1. Phenol
2. 4-Nitrophenol
3. m-Cresol
4. o-Cresol
5. 2-Chlorophenol
6. 2,4-Dinitrophenol
7. 2-Nitrophenol
8. 2,4-Dimethylphenol
9. 4-Chloro-3-methylphenol
10. 2,4-Dichlorophenol
11. 2-Methyl-4,6-dinitrophenol
12. 2,4,6-Trichlorophenol
13. 2,3,4,6-Tetrachlorophenol
14. Pentachlorophenol

Plant hormones: Rapid gradient elution separation

Column: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

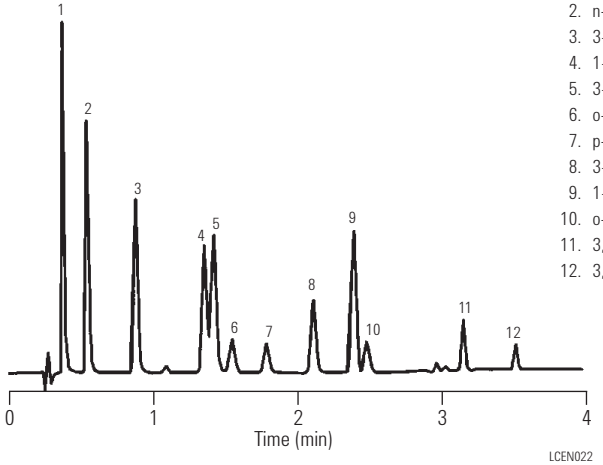
Mobile Phase: A: Water with 0.1% TFA
B: Acetonitrile with 0.1% TFA

Flow Rate: 3.0 mL/min

Temperature: 60 °C

Detector: UV, 245 nm

Sample: Plant hormones



1. Kinetin
2. n-6-Benzyl adenine
3. 3-Indole acetic acid
4. 1-Naphthyl acetamide
5. 3-Indole proprionic acid
6. o-Chlorophenoxy acetic acid
7. p-Chlorophenoxy acetic acid
8. 3-Indole butyric acid
9. 1-Naphthyl acetic acid
10. o-Chlorophenoxy proprionic acid
11. 3,4,5-Trichlorophenoxy acetic acid
12. 3,4,5-Trichlorophenoxy proprionic acid

VX nerve agent metabolites by LC/MS-IS standard (C13 labeled)

Column: **ZORBAX NH2**
860700-708
2.1 x 50 mm, 5 µm

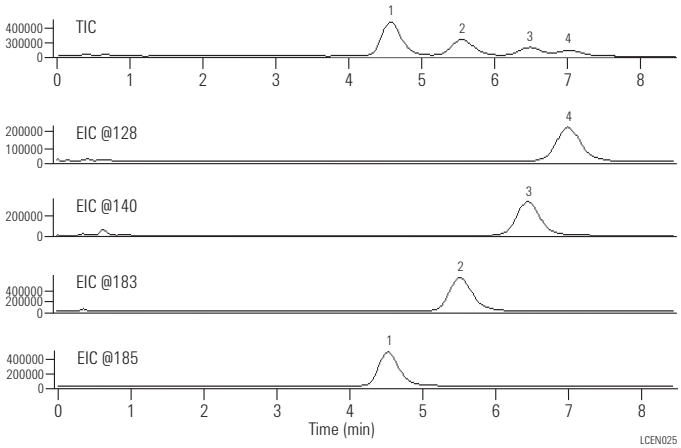
Mobile Phase: 1:1 (20 mM Ammonium Actetate pH 4.5/Acetonitrile)

Flow Rate: 0.5 mL/min, 1 µL injection (prepared std in ACN)

Temperature: 35 °C

Detector: ESI-Negative Ion, Gas Flow 12 L/min, Nebulizer 60 psi

Sample	MW
1. Cyclohexyl methylphosphonic acid	178
2. Pinacolyl methylphosphonic acid	180
3. Isopropyl methylphosphonic acid	138
4. Ethyl methylphosphonic acid	124



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Food and Consumer Product Applications

NEW!

Blueberry anthocyanin analysis

Column A: **Poroshell 120 SB-C18**
687975-902
4.6 x 75 mm, 2.7 µm

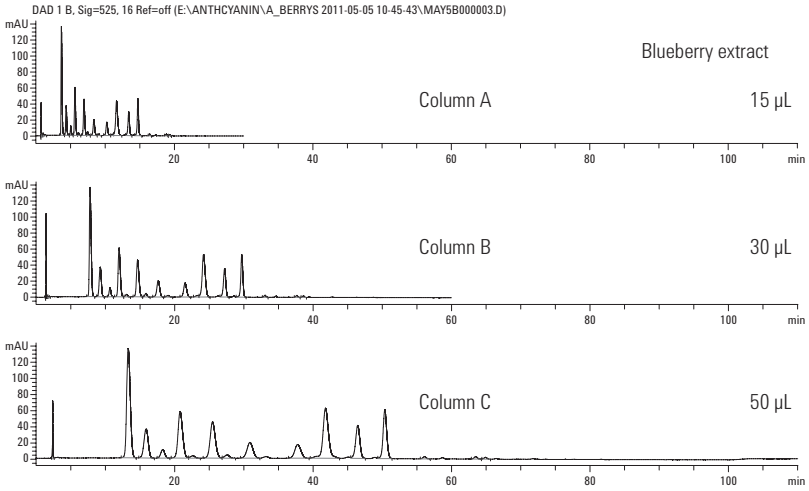
Column B: **ZORBAX SB-C18**
863953-902
4.6 x 150 mm, 3.5 µm

Column C: **ZORBAX SB-C18**
880975-902
4.6 x 250 mm, 5 µm

Flow Rate: 1 mL/min

Detector: Agilent 1260 Rapid Infinity LC

Blueberry anthocyanin analysis on totally porous and superficially porous StableBond C18 columns. Overlay of anthocyanin method with 250 mm 5 µm, 150 mm 3.5 µm, and 75 mm 2.7 µm at 1 mL/min.



NEW!

Analysis of pesticide residues in green tea

Column: **Poroshell 120 EC-C18**
695775-902
2.1 x 100 mm, 2.7 µm

Mobile Phase: A: 5 mM FA in water
B: 5 mM FA in ACN

Flow Rate: 0.4 mL/min

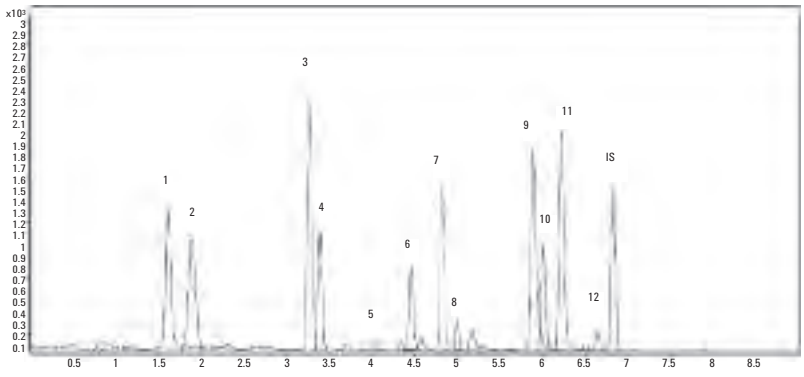
Gradient: 5% B in 1 min, 50% B in 3 min, 90% B in 7 min, 90% B in 8 min, 5% B in 8.2 min, 5% B in 9 min

Temperature: 30 °C

MRM chromatograms of 50 ng/g fortified sample processed by EN method.

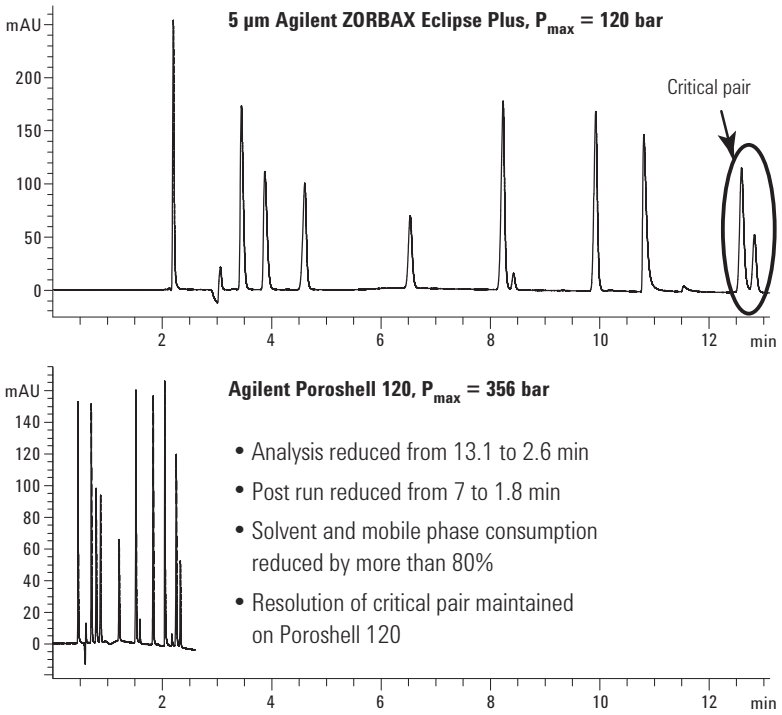
1. Acephate
2. Pymetrozine
3. Carbendazim
4. Thiabendazole
5. Imidacloprid
6. Imazalil
7. Propoxur
8. Carbaryl
9. Cyprodinil
10. Ethoprophos
11. Penconazole
12. Kresoxim-methyl

IS TPP



NEW!

An overlay of the original ZORBAX Eclipse Plus 5 µm method and Agilent Poroshell 120 method. All 11 peaks on Poroshell 120 are resolved by the time the first peak elutes on the original 5 µm ZORBAX Eclipse Plus method



- Analysis reduced from 13.1 to 2.6 min
- Post run reduced from 7 to 1.8 min
- Solvent and mobile phase consumption reduced by more than 80%
- Resolution of critical pair maintained on Poroshell 120

Column:	**Eclipse Plus C18 959990-902 4.6 x 250 mm, 5 µm**
Mobile Phase:	A: 20 mM ammonium acetate, pH 4.80 B: acetonitrile
Flow Rate:	1.000 mL/min
Gradient:	14% B at t_0, ramp to 52% B in 12.0 min
Temperature:	30 °C

Column:	**Poroshell 120 EC-C18 695975-302 3.0 x 100 mm, 2.7 µm**
Mobile Phase:	A: 20 mM ammonium acetate, pH 4.80 B: acetonitrile
Flow Rate:	0.851 mL/min
Gradient:	14% B at t_0, ramp to 52% B in 2.1 min
Temperature:	30 °C

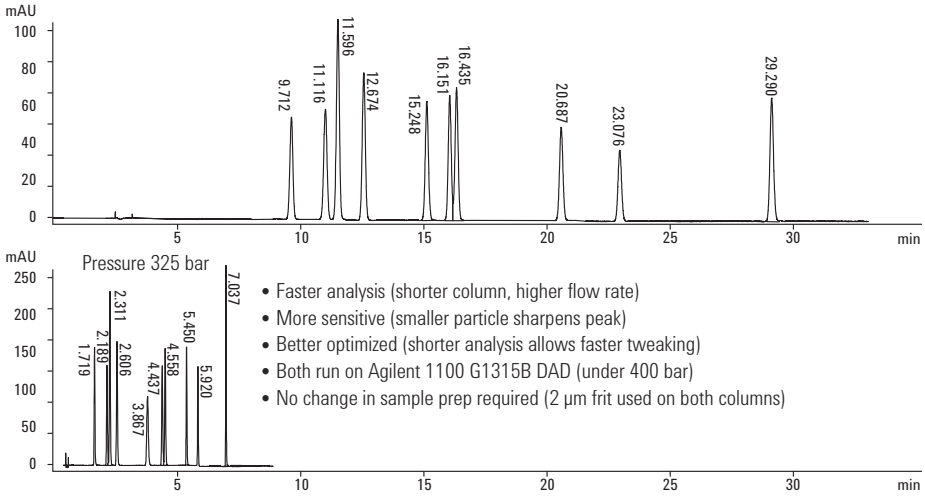
For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

Fast analysis of sulfa drugs

Column:	**Eclipse Plus C18 959990-902 4.6 x 250 mm, 5 µm**
Column:	**Poroshell 120 EC-C18 695975-902 4.6 x 100 mm, 2.7 µm**
Gradient:	Formic acid/acetonitrile
Detector:	Agilent 1100 Series LC
Sample:	Ten sulfa drugs

A separation of ten sulfa drugs scaled from an Agilent ZORBAX Eclipse Plus C18 column to an Agilent Poroshell 120 EC-C18 column showing analysis time decreased from 30 min to 8 min using a formic acid/acetonitrile gradient.



- Faster analysis (shorter column, higher flow rate)
- More sensitive (smaller particle sharpens peak)
- Better optimized (shorter analysis allows faster tweaking)
- Both run on Agilent 1100 G1315B DAD (under 400 bar)
- No change in sample prep required (2 µm frit used on both columns)

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

Determination of anthocyanins in blueberries

Column: **ZORBAX RRHD Eclipse Plus C18**
959758-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD Eclipse Plus Phenyl-Hexyl**
959758-912
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD SB-Aq**
858700-914
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD SB-Phenyl**
858700-912
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 5% HCOOH in H_2O
B: CH_3CN

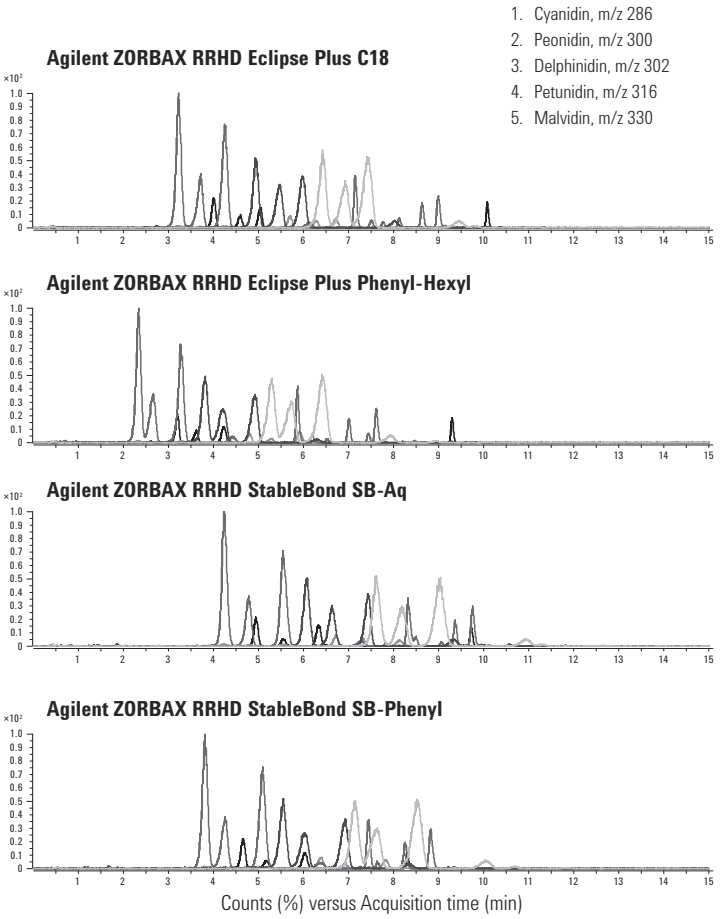
Flow Rate: 0.65 mL

Gradient: 10-50% B in 15 min

Detector: Agilent 1290 Infinity LC

MS Conditions: DAD: Sig = 525, 8 nm; Ref = Off
MS2 Scan: ESI + 200-1000
Scan time: 100 ms, 0.2 amu step
Fragmentor: 180 V
Drying gas: 10 L/min, 350 °C
Nebulizer Pressure: 50 psig
Capillary Voltage: 3500

Sample: 5 µL injection of blueberry extract



Separation of Azo Dyes

Column: **Eclipse Plus Phenyl Hexyl**
959996-912
4.6 x 100 mm, 5 µm

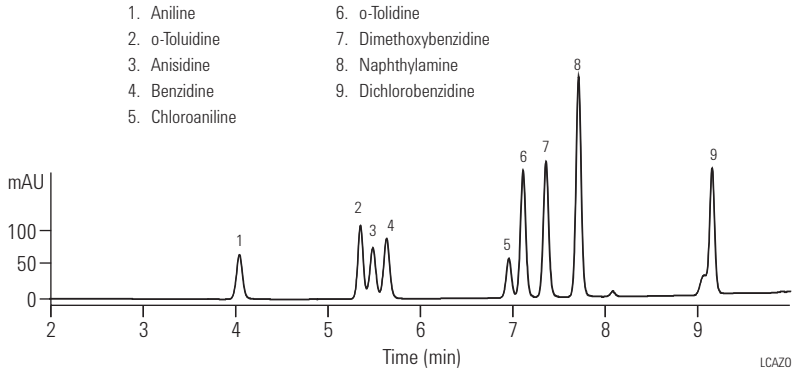
Mobile Phase: A: 10 mM Ammonium Acetate, pH 4.7
B: MeOH

Flow Rate: 1.5 mL/min

Gradient:

Time (Min):	%B:
0	25
5	50

Detector: UV, 254 nm



Anthocyanins from blueberries: High-efficiency high-speed separation

Column A: **ZORBAX SB-C18**
880975-902
4.6 x 250 mm, 5 µm

Column B: **ZORBAX SB-C18**
863953-902
4.6 x 150 mm, 3.5 µm

Column C: **ZORBAX SB-C18**
866953-902
4.6 x 75 mm, 3.5 µm

Mobile Phase: A: 3% Phosphoric acid
B: 100% MeOH

Flow Rate: 1.0 mL/min

Gradient: As shown

Temperature: 30 °C

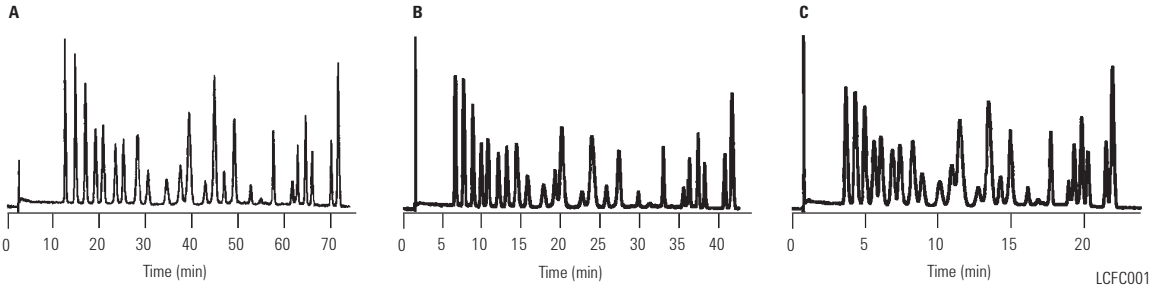
Detector: UV, 525 nm

Sample: Natural anthocyanins

Time	Percent B
0 min	23% B
35 min	26% B
97 min	60% B

Time	Percent B
0 min	23% B
21 min	26% B
58.2 min	60% B

Time	Percent B
0 min	23% B
10.5 min	26% B
29.1 min	60% B



Aromatics II

Column: **Eclipse XDB-Phenyl**
963967-912
4.6 x 150 mm, 3.5 µm

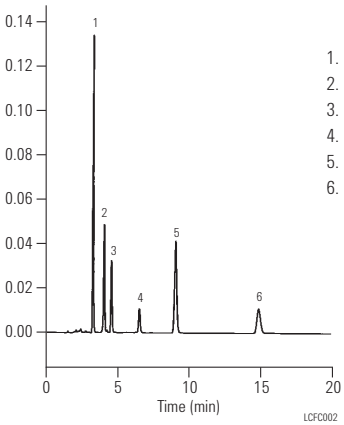
Mobile Phase: H_2O: MeOH, 40:60

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Aromatic Sample



1. Acetophenone
2. Cinnamaldehyde
3. Eugenol
4. Cinnamaldehyde Impurity
5. Ethyl cinnamate
6. p-Cymene

Aspartame: Metabolites and applications

Column: **ZORBAX SB-C18**
866953-902
4.6 x 75 mm, 3.5 µm

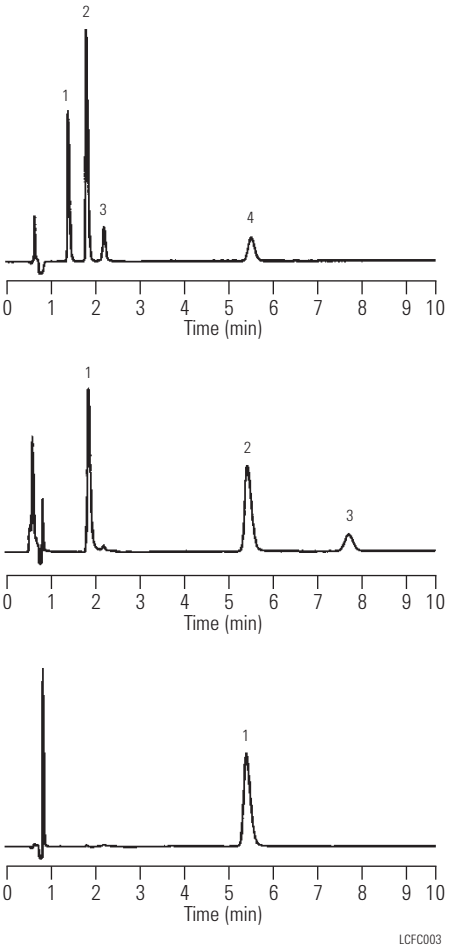
Mobile Phase: 85/15, 0.1% TFA/ACN

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 210 nm

Sample: Aspartame



Aspartame and Its Metabolites

1. Phenylalanine
2. 5-benzyl-3,6-dioxo-2-piperazineacetic acid
3. Aspartic acid-phenylalanine dipeptide
4. Aspartame

Diet Coke

1. Caffeine
2. Aspartame
3. Unknown

Equal Sweetener

1. Aspartame

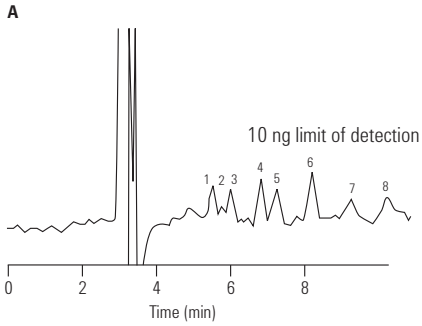
Carbohydrates: Carbohydrate standards

Column: **ZORBAX Carbohydrate Analysis**
843300-908
4.6 x 150 mm, 5 µm

Mobile Phase: 63% CH_3CN/H_2O
Flow Rate: 0.5 mL/min

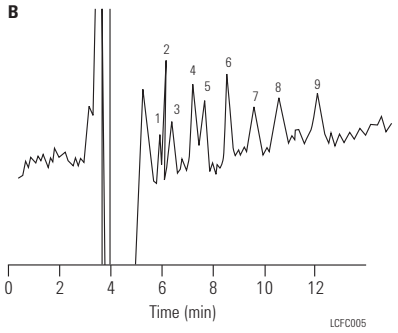
Detector: Agilent RID
Sample: Carbohydrate standard:
A: 25 ng/ L, 1 µL injected
B: 500 pg/ L, 50 µL injected

Carbohydrates: Separation showing high sensitivity



1. Ribose
2. Rhamnose
3. Xylose
4. Fructose
5. Glucose
6. Sucrose
7. Maltose
8. Lactose
9. Raffinose

Sensitivity of high injection volume (50 µL)



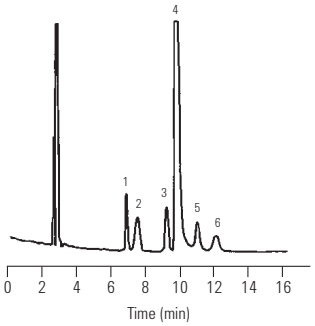
Carbohydrates: Effect of mobile phase strength

Column: **ZORBAX NH2**
880952-708
4.6 x 250 mm, 5 µm

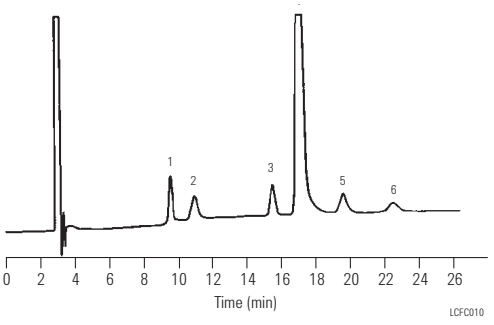
Mobile Phase: ACN/Water, as indicated
Flow Rate: 1.0 mL/min

Temperature: Ambient
Detector: RI
Sample: Mono- and Disaccarides

ACN/H_2O: 70/30



ACN/H_2O: 75/25



1. Fructose
2. Glucose
3. Saccharose
4. Palatinose
5. Trehalulose
6. Isomaltose

Carbohydrates in colas

Column: **ZORBAX Carbohydrate Analysis 843300-908 4.6 x 150 mm, 5 µm**

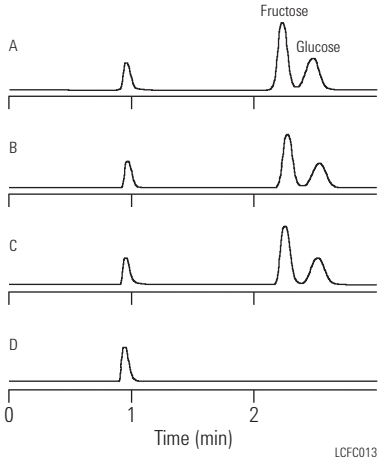
Mobile Phase: 75% ACN:25% H_2O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: RID

Sample: No dilution
A: COLA, Fountain
B: COLA, Can, Brand A
C: COLA, Brand B
D: COLA, Brand B, diet



Carbohydrates: Sugar alcohols

Column: **ZORBAX Carbohydrate Analysis 843300-908 4.6 x 150 mm, 5 µm**

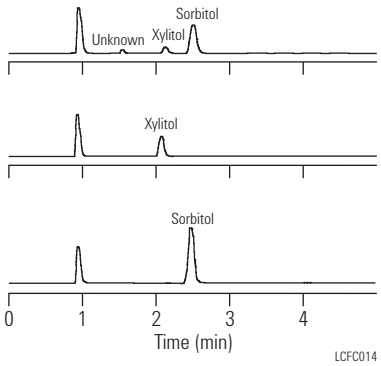
Mobile Phase: 75% ACN:25% H_2O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: RID

Sample: Chewing gum, sugar-free



Carbohydrates in juices

Column: **ZORBAX Carbohydrate Analysis 843300-908 4.6 x 150 mm, 5 µm**

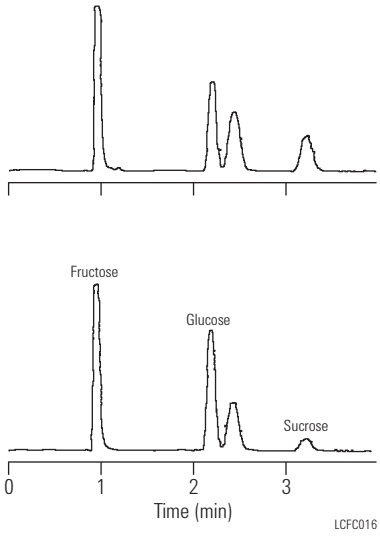
Mobile Phase: 75% ACN/25% H_2O

Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: RID

Sample: Diluted to 0.1X in 50:50 ACN:H_2O



Apple Drink
36.8% Fructose
24.9% Sucrose
38.3% Glucose

Apple Juice
58.7% Fructose
9.9% Sucrose
33.4% Glucose

Carbohydrates in milk

Column: **ZORBAX Carbohydrate Analysis**
843300-908
4.6 x 150 mm, 5 µm

Mobile Phase: 75% ACN/25% H_2O

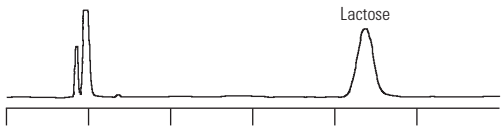
Flow Rate: 2.0 mL/min

Temperature: 30 °C

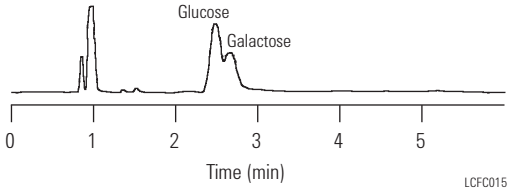
Detector: RID

Sample: Partitioned between CH_3Cl_2: H_2O

Milk (2%)



100% Lactose-Free Milk



Flavoring agents

Column: **ZORBAX SB-Phenyl**
860975-912
2.1 x 50 mm, 5 µm

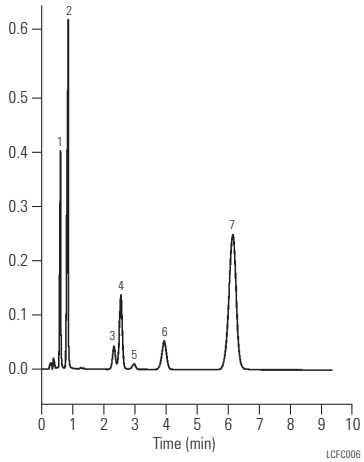
Mobile Phase: 0.3% TFA: ACN, 65:35

Flow Rate: 0.3 mL /min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Cool mint Listerine sample



1. Unknown
2. Benzoic acid
3. Methyl salicylate
4. Carvone
5. Unknown
6. Thymol
7. Anethole

Food colors, FD&C

Column: **ZORBAX Eclipse XDB-C18**
935967-902
4.6 x 50 mm, 3.5 µm

Mobile Phase: A: 0.1% TFA, pH to 4.4 with TEA, B: MeOH

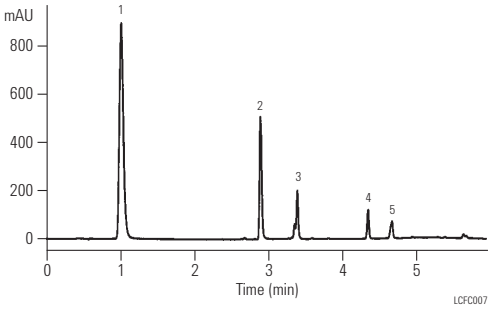
Flow Rate: 1.0 mL/min

Gradient: 17 to 100% B/4 min

Temperature: Ambient

Detector: UV, 254 nm

1. Yellow #5	$C_{16}H_9N_4Na_3O_9S_2$	MW=534
2. Red #40	$C_{18}H_{14}N_2Na_2O_8S_2$	MW=496
3. Blue #1	$C_{37}H_{34}N_2Na_2O_9S_3$	MW=760
4. Propylparaben	$C_{10}H_{12}O_3$	MW=180
5. Red #3	$C_{20}H_{14}Na_2O_5$	MW=878



Neutraceuticals: Extract from green tea

Column: **ZORBAX SB-C8**
863953-906
4.6 x 150 mm, 3.5 µm

Mobile Phase: 75% 0.1% Trifluoroacetic acid: 25% Methanol

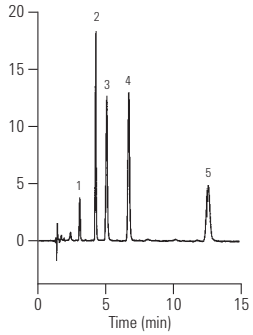
Injection: 1 mL/min

Temperature: 40 °C

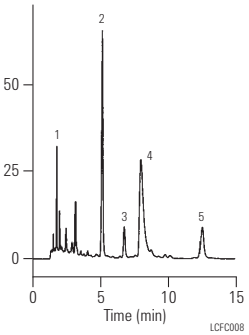
Detector: UV, 280 nm

Sample: Green tea extract, 5 µL

Catechin Mixture



Green Tea Extract



LCFC008

1. Epagallocatechin
2. Epicatechin
3. Epigallocatechin gallate
4. Catechol
5. Epicatechin gallate

Tocopherols by LC/MS with APPI

Column: **Eclipse XDB-C18**
993967-302
3.0 x 150 mm, 5 µm

Mobile Phase: 97% MeOH: 3% 10 mM CH_3COONH_4

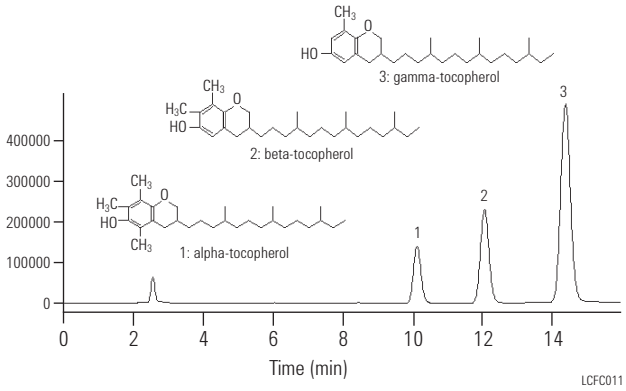
Flow Rate: 0.5 mL/min

Temperature: 40 °C

MS Conditions:

MS:	Agilent 1100MSD SL
Ionization:	APPI (Positive)
Scan range:	m/z 100-500
Vcap:	1500 V
SIM ion:	base peak
Drying gas:	7 L/min at 350 °C
Nebulizer gas:	60 psi
Vaporizer temp:	350 °C
Fragmentor:	140 V
EM gain:	4

Sample Volume: 10 µL



LCFC011

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Sugars in plain and milk chocolate

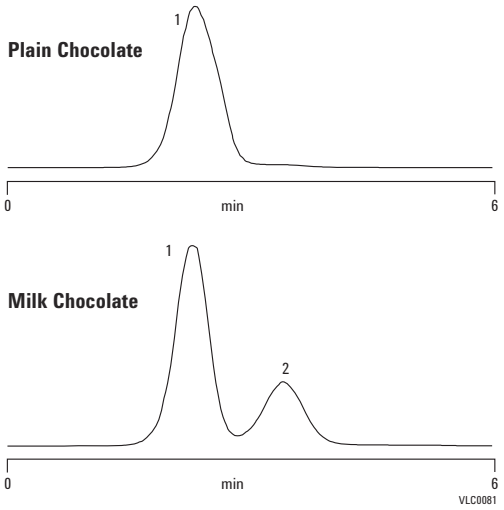
Column: **Hi-Plex Pb**
PL1170-6820
7.7 x 300 mm, 8 µm

Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 80 °C

Detector: RI



1. Sucrose
2. Lactose

Sugars

Column: **Hi-Plex K**
PL1170-6860
7.7 x 300 mm, 8 µm

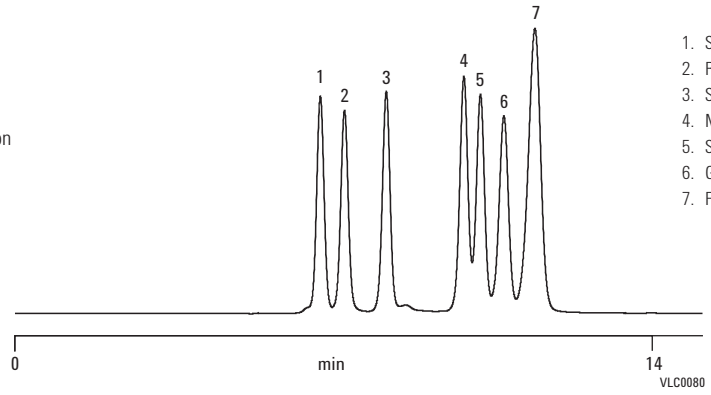
Sample: Sugars mixture (all 10 mg/mL), 20 µL injection

Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 85 °C

Detector: 356-LC RI



1. Stachyose
2. Raffinose
3. Sucrose
4. Mannitol
5. Sorbitol
6. Glucose
7. Fructose

Parabens: High speed separation

Column: **ZORBAX SB-C18 Rapid Resolution Cartridge**
833975-902
4.6 x 30 mm, 3.5 µm

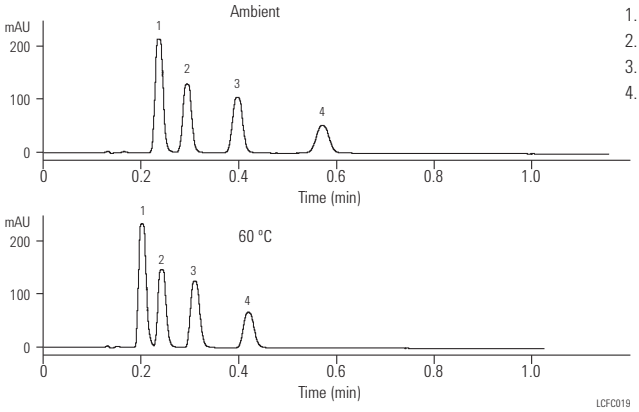
Mobile Phase: 0.1% H_3PO_4:ACN, (50:50)

Flow Rate: 2 mL/min

Temperature: Top: ambient, bottom: 60 °C

Detector: UV, 254 nm with standard flow cell (13 µL)

Sample: Parabens, 1 µL



1. Methylparaben
2. Ethylparaben
3. Propylparaben
4. Butylparaben

Separation of vitamin D2/D3

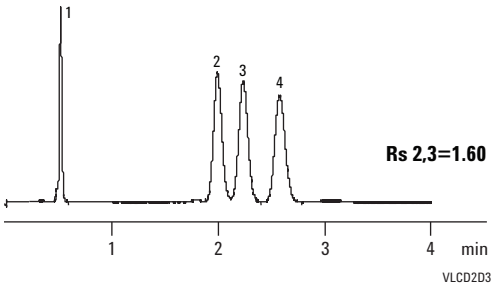
Column: **Eclipse PAH**
959941-918
4.6 x 50 mm, 1.8 µm

Mobile Phase: 92% MeOH, 8% water

Flow Rate: 2 mL/min

Temperature: 40 °C

Detector: 325 nm for VA/280 nm for VD and VE



1. Vitamin A
2. Vitamin D2
3. Vitamin D3
4. Vitamin E (a-VE)

Fat-soluble vitamins on ZORBAX Eclipse XDB-C8

Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

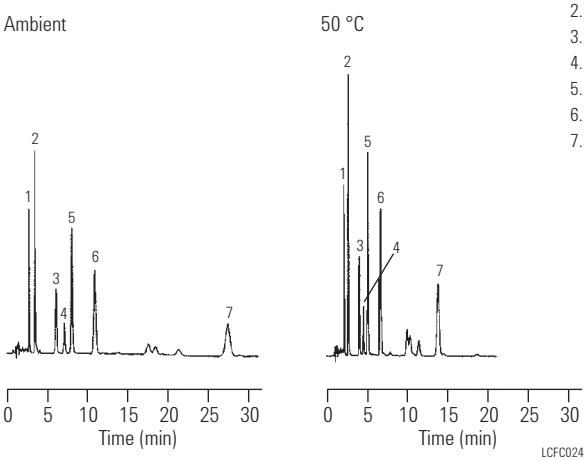
Mobile Phase: 5/95 Water/MeOH

Flow Rate: 1.0 mL/min

Temperature: A: Ambient
B: 50 °C

Detector: UV, 280 nm

Sample: Fat-soluble vitamins



1. Retinol
2. Retinol acetate
3. Vitamin D3
4. γ-Tocopherol
5. α-Tocopherol
6. Tocopherol acetate
7. Retinol palmitate

Water-soluble vitamins

Column: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

Mobile Phase: A: 50 mM Sodium Phosphate, pH 2.5/MeOH (90/10)
B: 50 mM Sodium Phosphate, pH 2.5/MeOH (10/90)

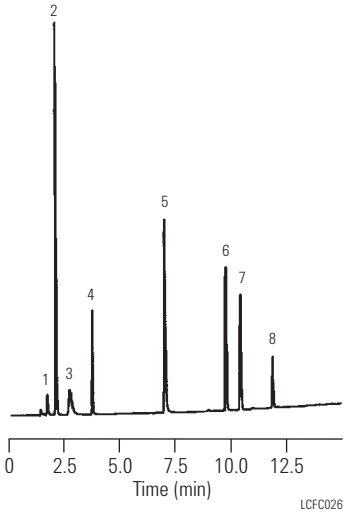
Flow Rate: 1.0 mL/min

Gradient: 0-70% B in 18 min

Temperature: Ambient

Detector: UV, 245 nm

Sample: Water-soluble vitamins



1. B_1-Thiamine
2. Vitamin C
3. B_3-Niacin
4. B_6-Pyridoxine
5. Pantothenic acid
6. Folic acid
7. B_{12}-Cyanocobalamin
8. B_2-Riboflavin

Water-soluble vitamins: High speed separation using ion-pairing

Column: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

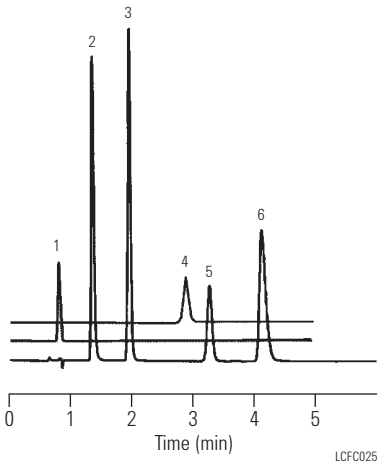
Mobile Phase: 10 mM Hexane Sulfonate with 0.1% Phosphoric Acid: MeOH (74:26)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 245 nm

Sample: Water-soluble vitamins



1. Vitamin C
2. B_3-Niacin
3. B_6-Pyridoxine
4. Folic acid
5. B_2-Riboflavin
6. B_1-Thiamine

Water-soluble vitamins using the USP 23 method

Column: **ZORBAX SB-C18**
880975-902
4.6 x 250 mm, 5 µm

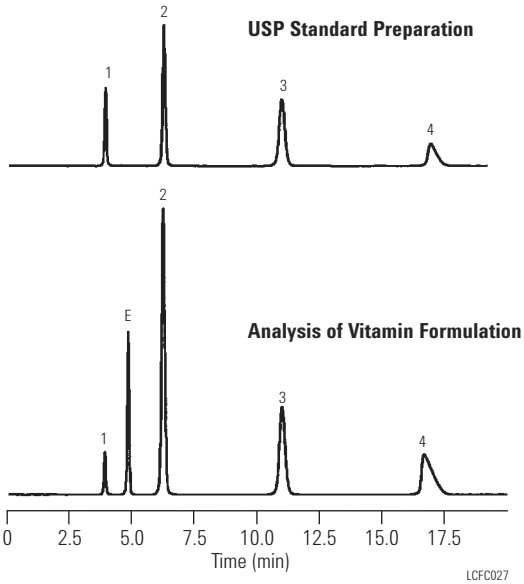
Mobile Phase: 7.2 mM Hexane Sulfonate/MeOH/Acetic Acid (73/27/1) (ratio to 101)

Flow Rate: 1.0 mL/min

Temperature: 30 °C

Detector: UV, 280 nm

Sample: Water-soluble vitamins



1. B_3-Niacin
2. B_6-Pyridoxine
3. B_2-Riboflavin
4. B_1-Thiamine
E. Excipent

Water-soluble B vitamins separated on ZORBAX SB-Aq

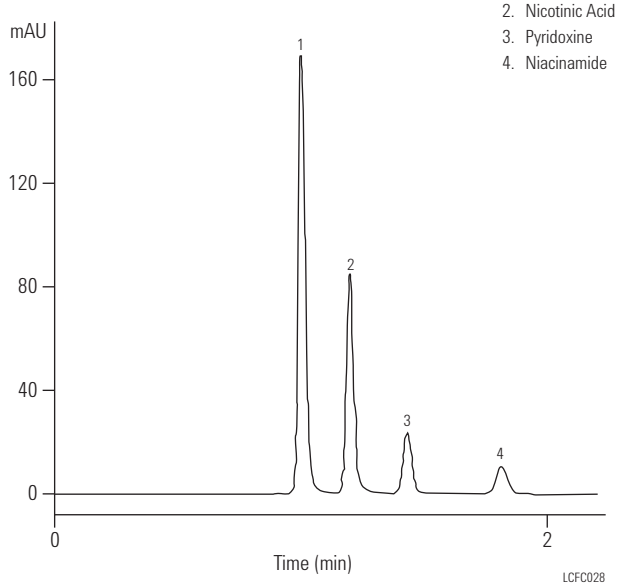
Column: **ZORBAX SB-Aq**
883975-914
4.6 x 150 mm, 5 µm

Mobile Phase: 5% MeOH/95% water (0.1% TFA)

Flow Rate: 2.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm



1. Thiamine
2. Nicotinic Acid
3. Pyridoxine
4. Niacinamide

Sunscreen ingredients: Perform conventional, fast and ultra-fast separations on the same column family

Column A: **Eclipse XDB-C18**
993967-902
4.6 x 150 mm, 5 µm
6 µL inj

Column B: **Eclipse XDB-C18**
961967-902
4.6 x 100 mm, 3.5 µm
4 µL inj

Column C: **Eclipse XDB-C18**
927975-902
4.6 x 50 mm, 1.8 µm
2 µL inj

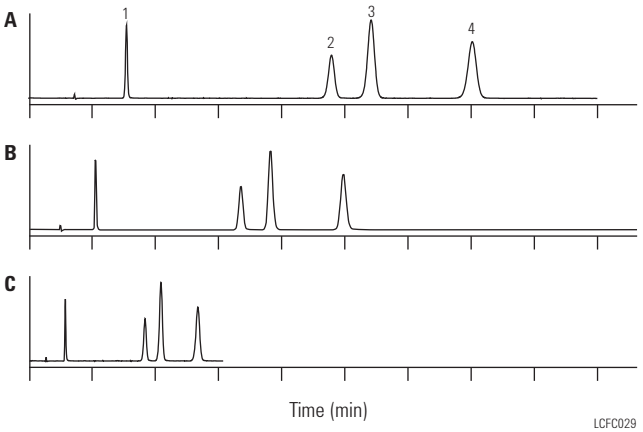
Mobile Phase: A: 15% water
B: 85% MeOH

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Sunscreens



1. 2-hydroxy-4-methoxybenzophenone
2. Padimate O
3. 2-ethylhexyl trans-4-methoxycinnamate
4. 2-ethylhexyl salicylate

Fast vitamin E analysis on Rapid Resolution HT

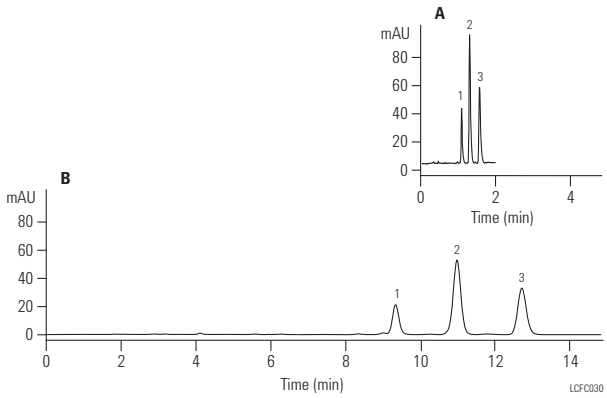
Column A: **Eclipse XDB-C18**
927975-902
4.6 x 50 mm, 1.8 µm

Column B: **Eclipse XDB-C18**
993967-902
4.6 x 150 mm, 5 µm

Mobile Phase: A: 5% water
B: 95% MeOH

Flow Rate: 3 mL/min, 1 mL/min

Temperature: Ambient



1. α-tocopherol
2. β-tocopherol
3. γ-tocopherol

Theobromine in beverages

Column: **ZORBAX SB-C18**
827975-902
4.6 x 50 mm, 1.8 µm

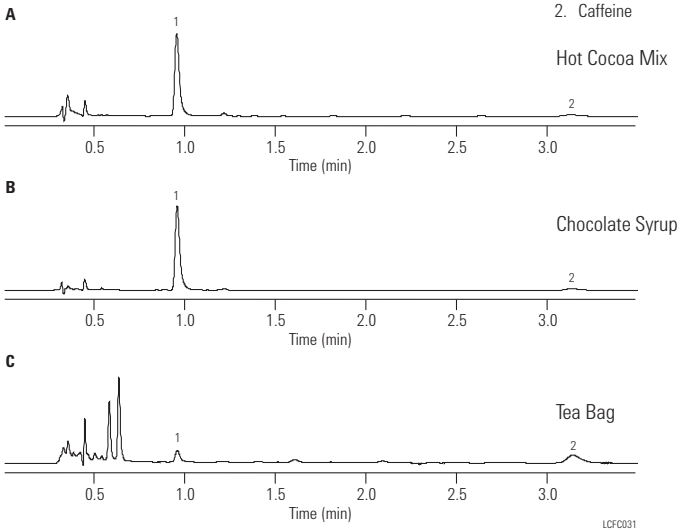
Mobile Phase: A: 92% 0.1% formic acid
B: 8% 0.1% formic acid in ACN

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV, 254 nm, flow cell 2 µL,
3 mm flow path

Sample: Theobromine



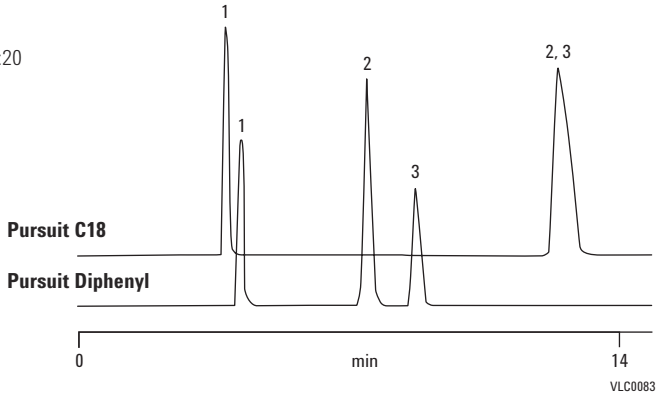
1. Theobromine
2. Caffeine

Benzoic acid/sorbic acid

Mobile Phase: 0.1% formic acid in water:
0.1% formic acid in MeCN, 80:20

Flow Rate: 0.7 mL/min

Detector: UV, 254 nm



1. p-Aminobenzoic acid
2. Sorbic acid
3. Benzoic acid

Quantification and qualification of vitamin C and citric acid in fresh grapefruit juice

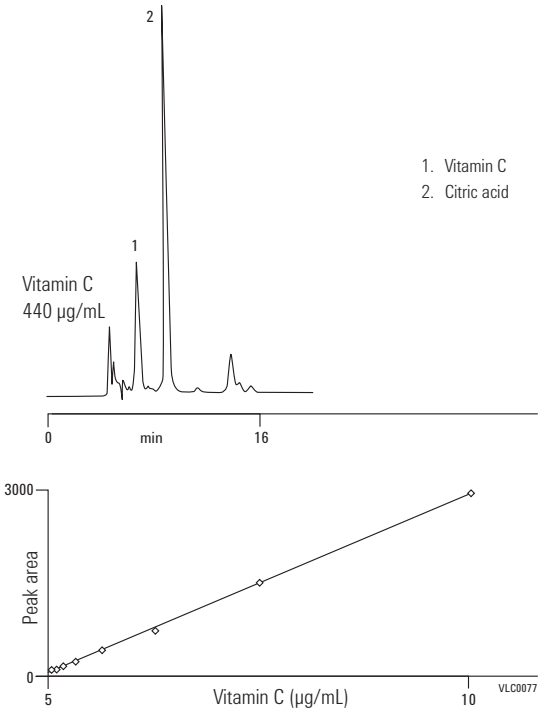
Column: PLRP-S 100Å
PL1512-5500
4.6 x 250 mm, 5 µm

Sample: Diluted 1:50 in eluent

Mobile Phase: 0.2M NaH_2PO_4, pH 2.14

Flow Rate: 0.5 mL/min

Detector: UV, 220 nm



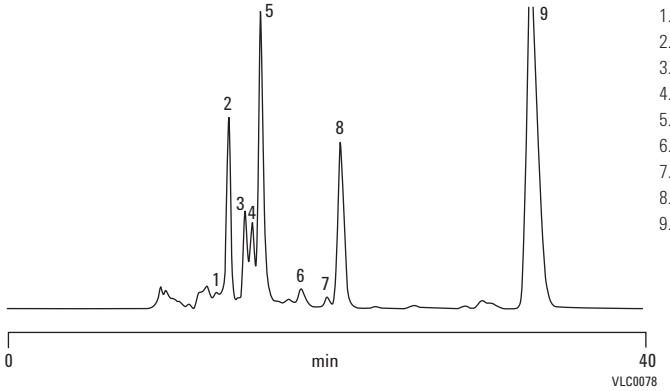
1. Vitamin C
2. Citric acid

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Rose wine

Column: **Hi-Plex H**
PL1170-6830
7.7 x 300 mm, 8 µm

Mobile Phase: 0.004M H_2SO_4
Flow Rate: 0.4 mL/min
Pressure: 13 bar
Temperature: 75 °C
Detector: RI

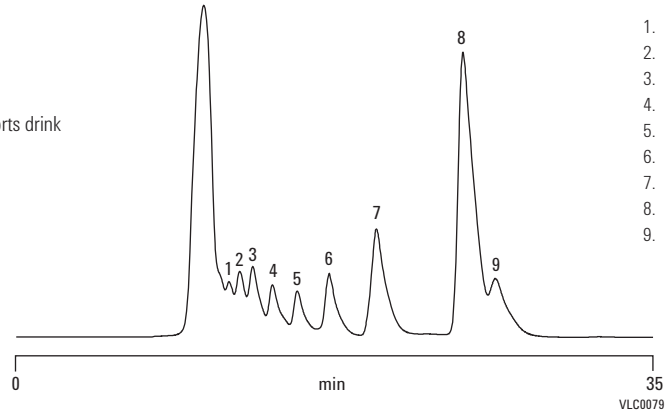


1. Citric acid
2. Tartaric acid
3. Glucose
4. Malic acid
5. Fructose
6. Succinic acid
7. Lactic acid
8. Glycerol
9. Ethanol

Sports drink

Column: **Hi-Plex Na**
PL1171-6140
7.7 x 300 mm, 10 µm

Sample: High energy orange flavor non-carbonated sports drink
Mobile Phase: Water
Flow Rate: 0.3 mL/min
Temperature: 80 °C
Detector: RI

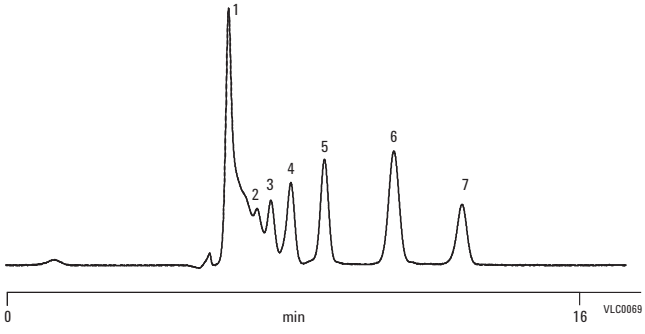


1. Dp8
2. Dp7
3. Dp6
4. Dp5
5. Dp4
6. Dp3
7. Dp2
8. Dp1 (Glucose)
9. Fructose

Oligosaccharides

Column: **Hi-Plex Ca (Duo)**
PL1F70-6850
6.5 x 300 mm, 8 µm

Mobile Phase: DI water
Flow Rate: 0.5 mL/min
Temperature: 90 °C
Detector: RI



1. Higher MW sugars
2. DP5
3. DP4
4. DP3
5. DP2
6. DP1
7. Fructose

Pharmaceutical Applications

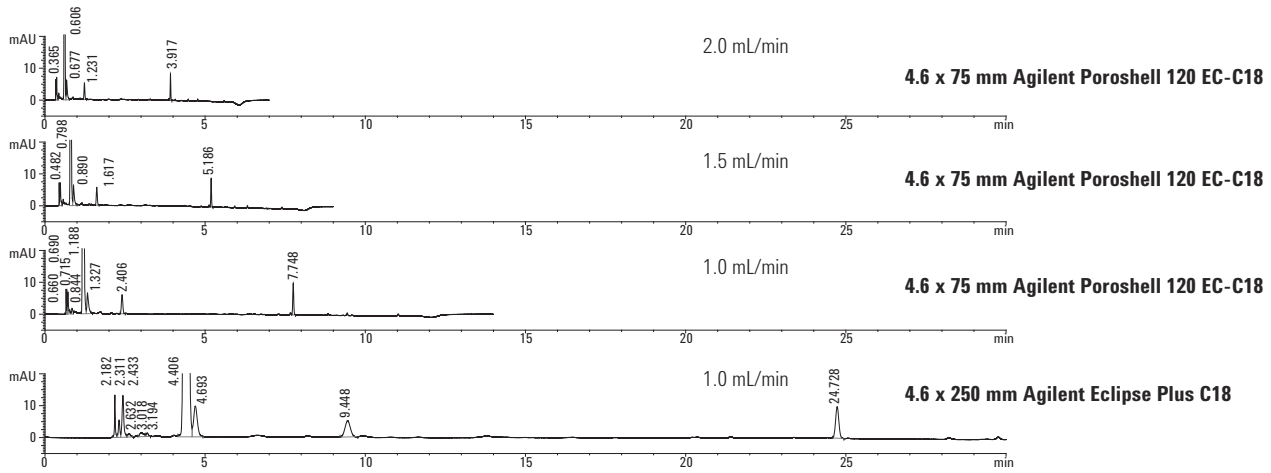
NEW!

Fast analysis of cefepime and related impurities

Column: **Poroshell 120 EC-C18**
697975-902
4.6 x 75 mm, 2.7 µm

Column: **Eclipse Plus C18**
959990-902
4.6 x 250 mm, 5 µm

Detector: Agilent 1200 Infinity Series



NEW!

Naproxen analysis

Column A: **Eclipse Plus C18**
959993-902
4.6 x 150 mm, 5 µm

Column B: **Poroshell 120 EC-C18**
699975-902
4.6 x 50 mm, 2.7 µm

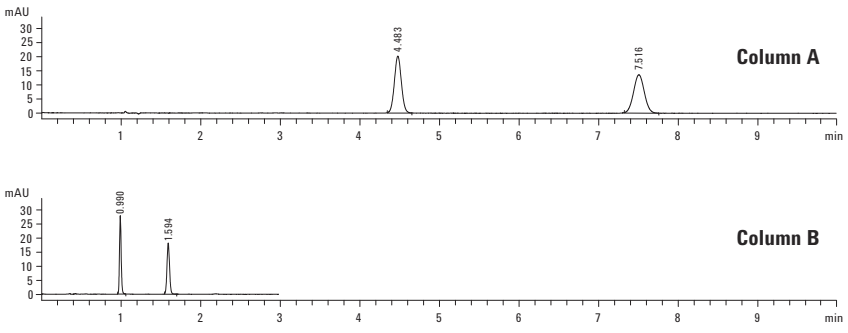
Mobile Phase: 50:49:1 MeCN:H_2O:Glacial acetic acid

Flow Rate: 1.2 mL/min

Injection: Column A: 20 µL
Column B: 6.7 µL

Injection: Naproxen

Method requirement N > 4000 Rs better than 11.5



4-fold reduction in analysis time for this method when transferring to Poroshell 120.

NEW!

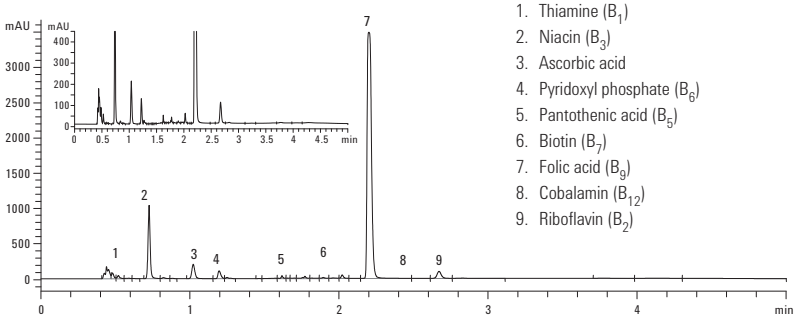
Analysis of water soluble vitamins in multivitamin tablets

Column: **Poroshell 120 EC-C18**
697975-902
4.6 x 75 mm, 2.7 µm

Flow Rate: 1.5 mL/min

Gradient: 0 min-1% B, 0.5 min-12% B, 0.52 min-30% B, 3.5 min-30% B, 4.5 min-1% B

Injection: 5 µL



1. Thiamine (B_1)
2. Niacin (B_3)
3. Ascorbic acid
4. Pyridoxyl phosphate (B_6)
5. Pantothenic acid (B_5)
6. Biotin (B_7)
7. Folic acid (B_9)
8. Cobalamin (B_{12})
9. Riboflavin (B_2)

NEW!

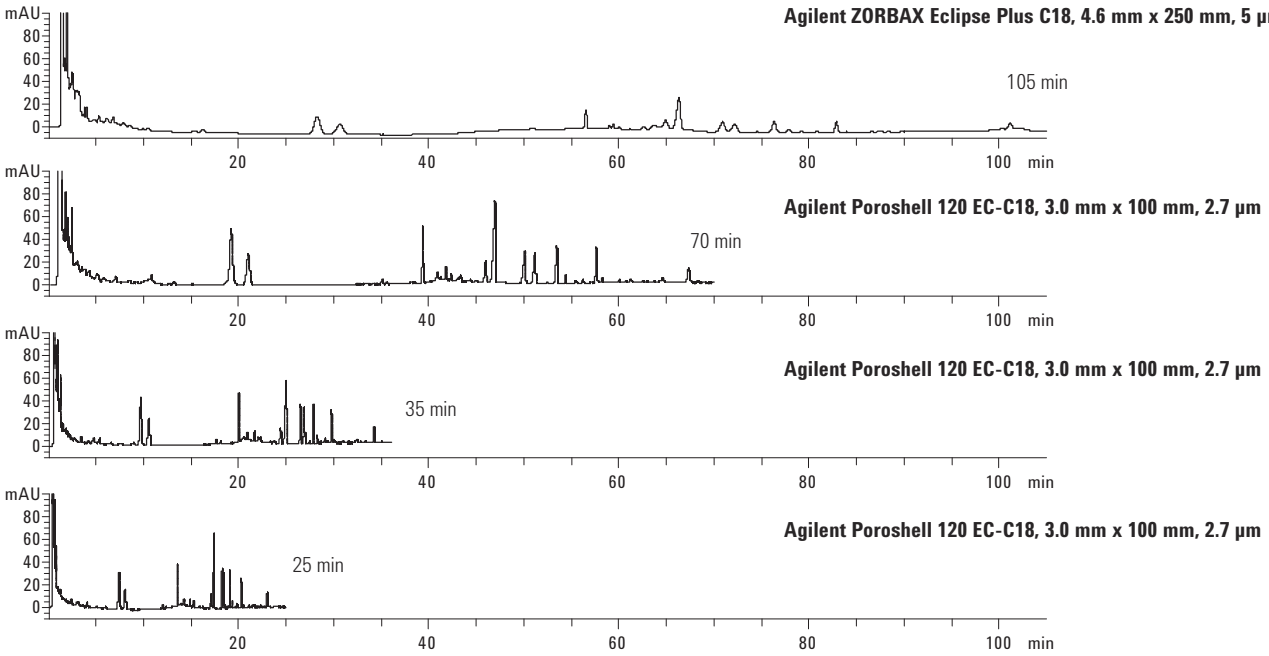
Fast method for ginseng analyses scaled from a traditional method

Column: **Eclipse Plus C18**
959993-902
4.6 x 150 mm, 5 µm

Column: **Poroshell 120 EC-C18**
695975-302
3.0 x 100 mm, 2.7 µm

Detector: 1200 Infinity Series

Sample: Ginsenoside



Agilent ZORBAX Eclipse Plus C18, 4.6 mm x 250 mm, 5 µm

Agilent Poroshell 120 EC-C18, 3.0 mm x 100 mm, 2.7 µm

Agilent Poroshell 120 EC-C18, 3.0 mm x 100 mm, 2.7 µm

Agilent Poroshell 120 EC-C18, 3.0 mm x 100 mm, 2.7 µm

NEW!

Separation of 8 steroids

Column A: **Poroshell 120 EC-C18**
695775-902
2.1 x 100 mm, 2.7 µm

Column B: **Poroshell 120 SB-C18**
685775-902
2.1 x 100 mm, 2.7 µm

Column C: **Poroshell 120 Phenyl-Hexyl**
695775-912
2.1 x 100 mm, 2.7 µm

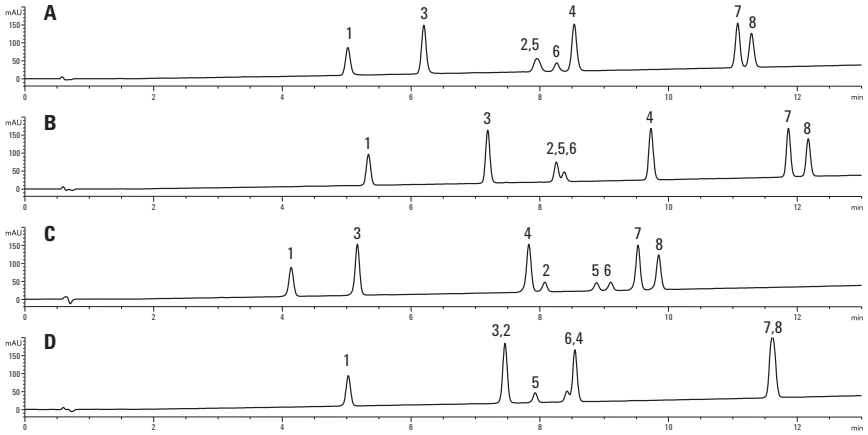
Column D: **Poroshell 120 Bonus RP**
685775-901
2.1 x 100 mm, 2.7 µm

Mobile Phase: 0.1% formic acid in both water and MeOH

Flow Rate: 0.4 mL/min, 25 ºC, 2.1 x 100 mm 40 ºC

Gradient: 40-80% MeOH in 14 min

1. Hydrocortisone
2. β-Estradiol
3. Androstadiene 3,17 dione
4. Testosterone
5. Ethynylestradiol
6. Estrone
7. Norethindrone acetate
8. Progesterone



NEW!

Mixture of beta blockers

Column A: **Poroshell 120 Bonus RP**
685775-901
2.1 x 100 mm, 2.7 µm

Column B: **Poroshell 120 Phenyl-Hexyl**
695775-912
2.1 x 100 mm, 2.7 µm

Column C: **Poroshell 120 EC-C18**
695775-902
2.1 x 100 mm, 2.7 µm

Column D: **Poroshell 120 SB-C18**
685775-902
2.1 x 100 mm, 2.7 µm

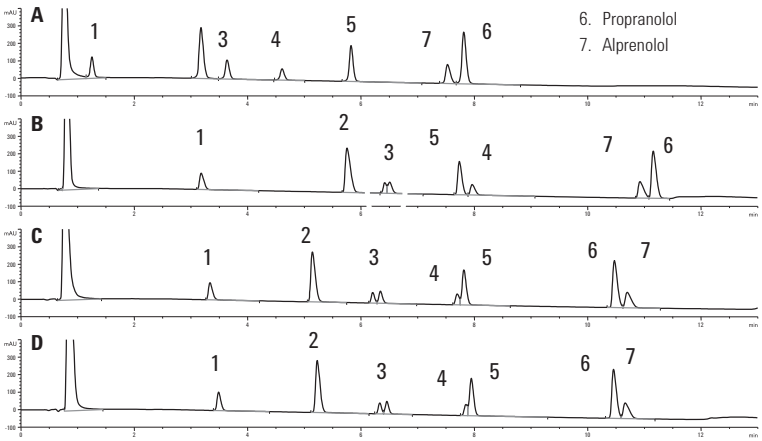
Mobile Phase: 10 mM pH 3.8 NH_4HCO_2, methanol

Flow Rate: 0.35 mL/min

Gradient: 90% B to 30% B over 12 min

* Nadolol is isobaric and elutes as two peaks.

1. Atenolol
2. Pindolol
3. Nadolol
4. Metoprolol
5. Acebutolol
6. Propranolol
7. Alprenolol



NEW!

Several ZORBAX RRHD 1.8 µm selectivities facilitate method development

Column: **ZORBAX RRHD Eclipse Plus C18**
959758-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD Eclipse XDB-C18**
981758-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD SB-C18**
858700-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD Extend-C18**
758700-902
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: H_2O
B: CH_3CN, each with 0.1% HCOOH

Detector: Agilent 1290 Infinity LC with an
Agilent 6410 Triple Quadrupole Mass Spectrometer

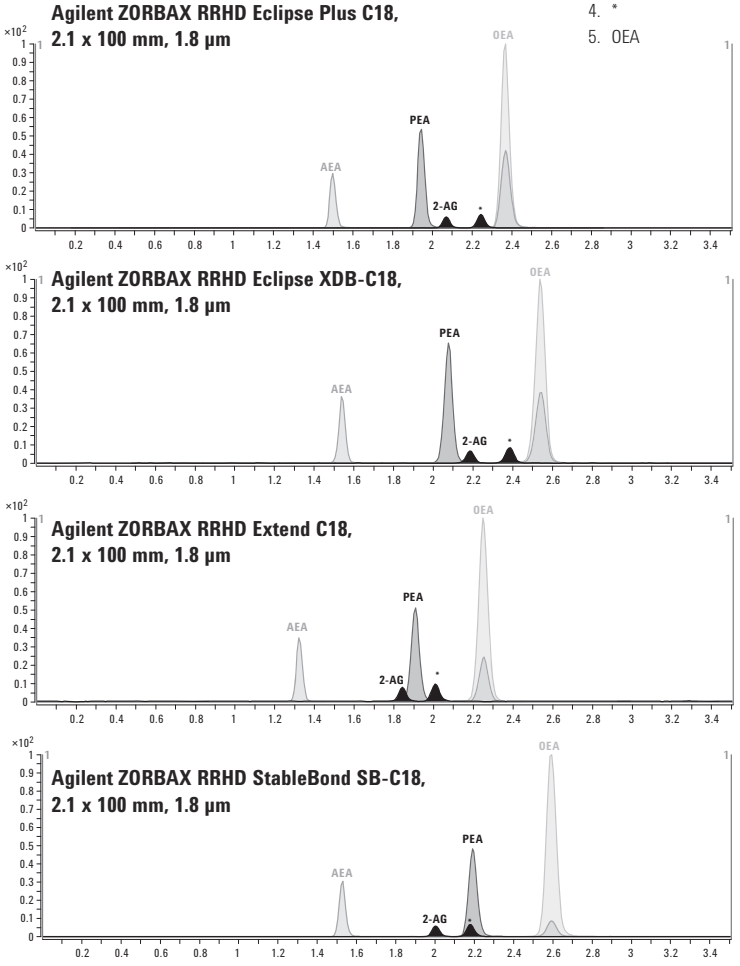
MS Conditions: TCC: 30 °C
MS Source: Electrospray AP-ESI
Drying-gas temperature and flow: 325 °C, 12 L/min
Nebulizer gas pressure: 35 psi
Capillary voltage: 3000 V

Sample: Four endocannabinoid fatty amides:
Arachidonoylglycerol (AEA)
2-Arachidonoylglycerol (2-AG)
Palmitoylethanolamide (PEA)
Oleoylethanolamide (OEA)

*** The second black peak is an impurity, believed to be 1,3-arachidonolyglycerol, a rearrangement of 2-AG**

The selectivity of four Agilent ZORBAX RRHD C18 columns is compared using a method for endocannabinoids.

1. AEA
2. PEA
3. 2-AG
4. *
5. OEA



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Fast analysis 11 common compounds found in analgesics

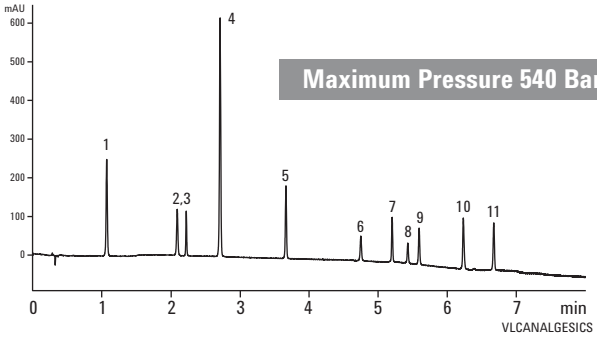
Column: **Poroshell 120 EC-C18**
695975-902
4.6 x 100 mm, 2.7 µm

Mobile Phase: A : Water + 0.1% formic acid
B: ACN

Flow Rate: 3.5 mL/min

Temperature: 40 °C

Detector: DAD 254 nm



Maximum Pressure 540 Bar

1. Acetaminophen
2. Caffeine
3. 2-Acetamidophenol
4. Acetamide
5. Phenacetin
6. Sulindac
7. Piroxicam
8. Tolmetin
9. Ketoprofen
10. Diflusinal
11. Diclofenac

Faster analysis of USP Method for simvastatin tablet

Column A: **Eclipse Plus C18**
959990-902
4.6 x 250 mm, 5 µm

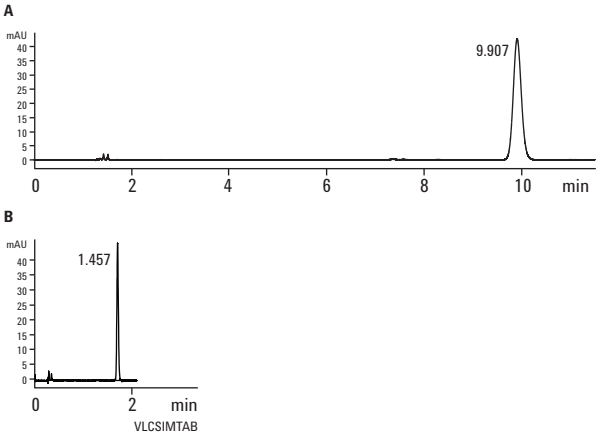
Column B: **Poroshell 120 EC-C18**
697975-902
4.6 x 75 mm, 2.7 µm

Mobile Phase: 65% CH_3CN,
35% 3.9 g/L NaH_2PO_4 (pH 4.5)

Flow Rate: 1.5 mL/min for 5 µm column
2.8 mL/min for 2.7 µm Poroshell 120 column

Temperature: 45 °C

Detector: DAD Sig = 238, 8
Ref = 360, 100 nm



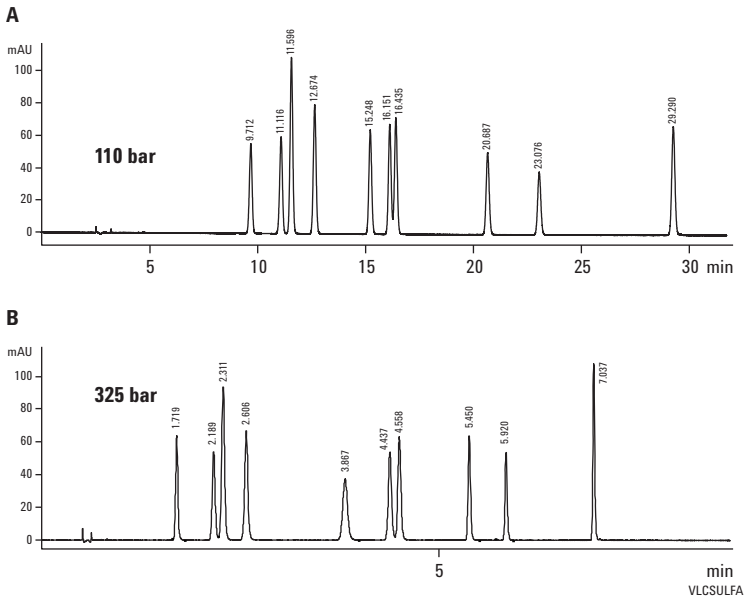
	USP Requirement	5 µm (1.5 mL/min)	2.7 µm (2.8 mL/min)
T_R	N/A	9.907	1.457
k'	> 3.0	5.962	5.122
N	> 4500	16939	14439
T_f	< 2.0	1.09	1.10

Faster separation of sulfa drugs

		Time	%B
Column A:	**Eclipse Plus C18**	0	8
	959990-902	33	33
	4.6 x 250 mm, 5 µm	35	33
Column B:	**Poroshell 120 EC-C18**	**Time**	**%B**
	695975-902	0	8
	4.6 x 100 mm, 2.7 µm	12	33
		13.2	33

Mobile Phase: A: 0.1% formic acid in Water
B: 0.1% formic acid in ACN

Flow Rate: 1 mL/min



Separation of pharmaceutical cardiac drugs

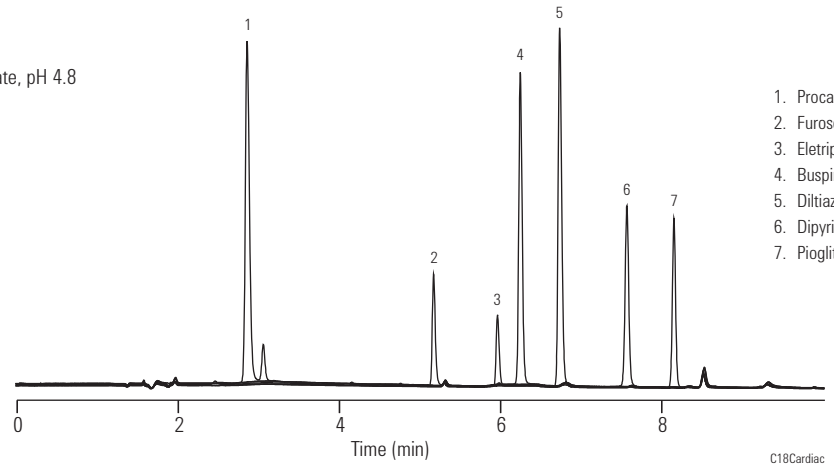
Column: **Eclipse Plus C18**
959996-902
4.6 x 100 mm, 5 µm

Mobile Phase: A: 20 mM Ammonium Acetate, pH 4.8
B: ACN

Flow Rate: 1 mL/min

Gradient: 10-90% in 10 min

Detector: UV, 254 nm



1. Procainamide
2. Furosemide
3. Eletriptan
4. Buspirone
5. Diltiazen
6. Dipyridamole
7. Pioglitazone

Fast and ultra-fast analysis of basic compounds

Column: **Eclipse Plus C18**
959941-902
4.6 x 50 mm, 1.8 µm

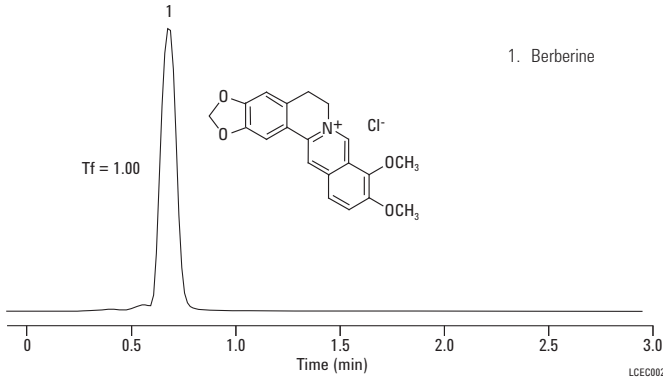
Mobile Phase: A: 50% 8 mM K_2HPO_4, pH 7
B: 50% ACN

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Berberine, 0.4 mg/mL, 2 µL



1. Berberine

Xanthines: Higher resolution, same selectivity with RRHT

Column A: **ZORBAX SB-C18**
846975-902
4.6 x 50 mm, 5 µm

Column B: **ZORBAX SB-C18**
827975-902
4.6 x 50 mm, 1.8 µm

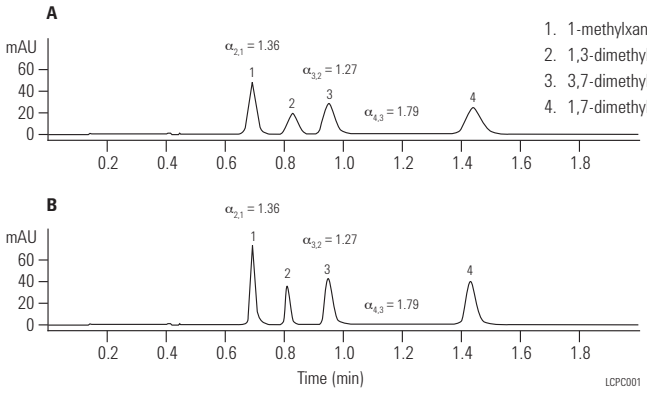
Mobile Phase: A: 92% 0.1% formic acid
B: 8% 0.1% formic acid in ACN

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Xanthines



1. 1-methylxanthine
2. 1,3-dimethyluric acid
3. 3,7-dimethylxanthine (theobromine)
4. 1,7-dimethylxanthine

Antihistamines: Fast separations on RRHT Extend-C18

Column A: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Column B: **ZORBAX Extend-C18**
727975-902
4.6 x 50 mm, 1.8 µm

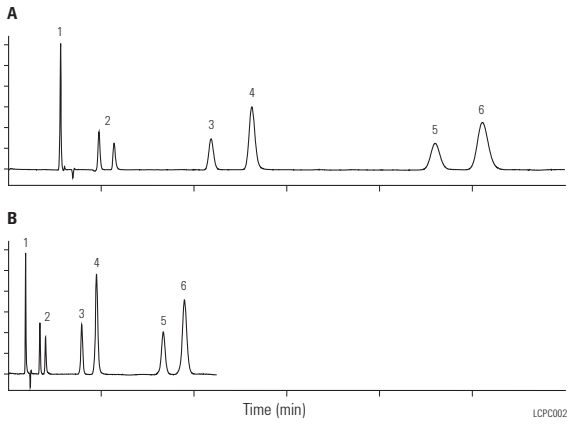
Mobile Phase: A: 30% 50 mM pyrrolidine buffer
B: 70% MeOH

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 220 nm

Sample: Antihistamines



1. Scopolamine
2. Pseudoephedrine
3. Doxylamine
4. Chlorpheniramine
5. Diphenhydramine
6. Triprolidine

Ibuprofen:
Optimizing selectivity with RRHT Columns

Column A: **SB-C8**
827975-906
4.6 x 50 mm, 1.8 µm

Column B: **Eclipse XDB-C8**
927975-906
4.6 x 50 mm, 1.8 µm

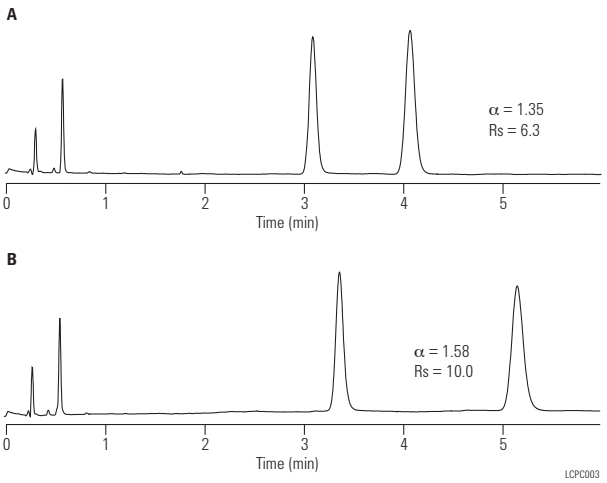
Mobile Phase: A: 63% water
B: 37% acetonitrile + 1.8 mL H_3PO_4

Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Ibuprofen oral suspension



1. Benzophenone
2. Ibuprofen

Analgesics

Column: **Pursuit XRs Diphenyl**
A6020150X046
4.6 x 150 mm, 5 µm

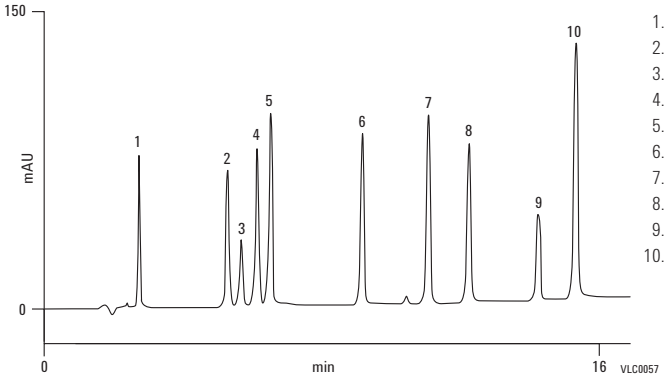
Mobile Phase: A: Water+0.1% HCOOH
B: MeCN+0.1% HCCOH

Gradient: 25-80% B in 20 min

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. Acetaminophen
2. Acetanilide
3. Salicylic acid
4. Acetylsalicylic acid
5. Phenacetin
6. Carbamazepine
7. Tolmetin
8. Naproxen
9. Ibuprofen
10. Diclofenac

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Anesthetics, local: Bonded phase selectivity

Column A: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Column B: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

Column C: **ZORBAX SB-C3**
883975-909
4.6 x 150 mm, 5 µm

Column D: **ZORBAX SB-Phenyl**
883975-912
4.6 x 150 mm, 5 µm

Column E: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

Mobile Phase: A: 50 mM NaH_2PO_4 pH 2.5 in 95% H_2O/5% ACN
B: 50 mM NaH_2PO_4 pH 2.5 in 47% H_2O/53% ACN

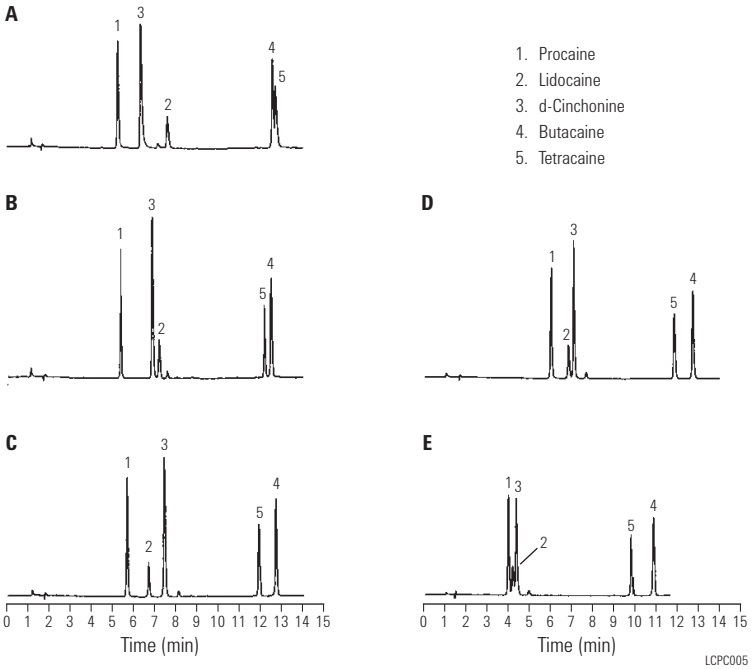
Flow Rate: 1.5 mL/min

Gradient: 0-100% B in 18.8 min

Temperature: 26 °C

Detector: UV, 254 nm

Sample: 10 µL, 10 ug/mL



1. Procaine
2. Lidocaine
3. d-Cinchonine
4. Butacaine
5. Tetracaine

Local anesthetics

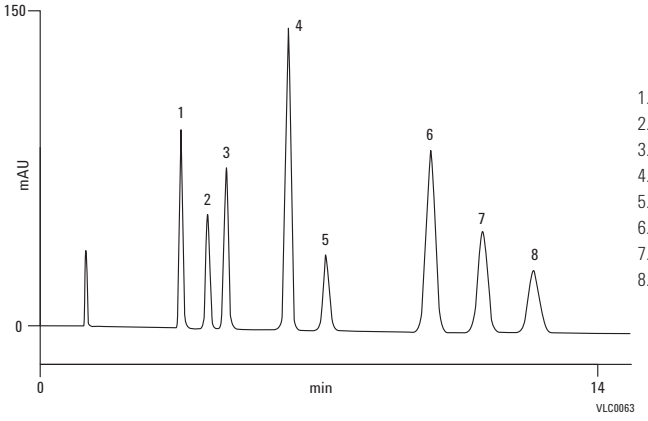
Column: **Pursuit XRs C8**
A6010150X046
4.6 x 150 mm, 5 µm

Mobile Phase: 65:35 MeOH:5 mM NH_4CO_3, pH 10

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 210 nm



1. Benzocaine
2. Procaine
3. Chlorocaine
4. Mepivacaine
5. 4-Hydroxyropivacaine
6. Cocaine
7. Lidocaine
8. Ropivacaine

Antibiotics: High speed separation

Column: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

Mobile Phase: 8.0% acetonitrile/92% 0.1% aqueous TFA

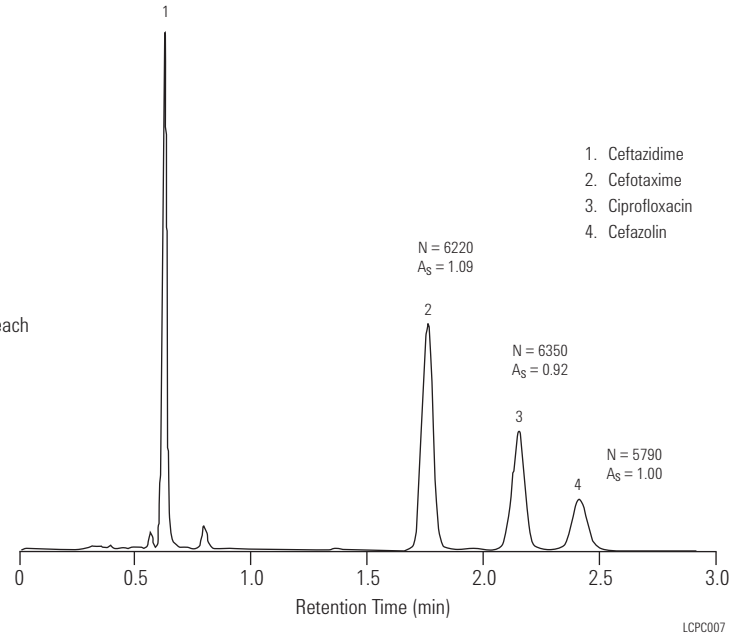
Flow Rate: 3.0 mL/min

Gradient: 45-70% B in 35 min

Temperature: 60 °C

Detector: UV, 260 nm

Sample: 1 µL containing 0.40, 0.36, 0.10 and 0.37 µg each of 1-4 resp.



Antibiotics: Lincomycin and Clindamycin by LC-APCI-MS LC-TIC

Column: **ZORBAX SB-C18 cartridge**
823700-902
2.1 x 30 mm, 1.8 µm

Mobile Phase: Gradient: 15-50% B in 1 min, hold for 1.5 min,
A: 0.2% formic acid pH 2.8
B: ACN + 0.2% formic acid

Flow Rate: 0.5 mL/min

Gradient: Post time: 1.5 min

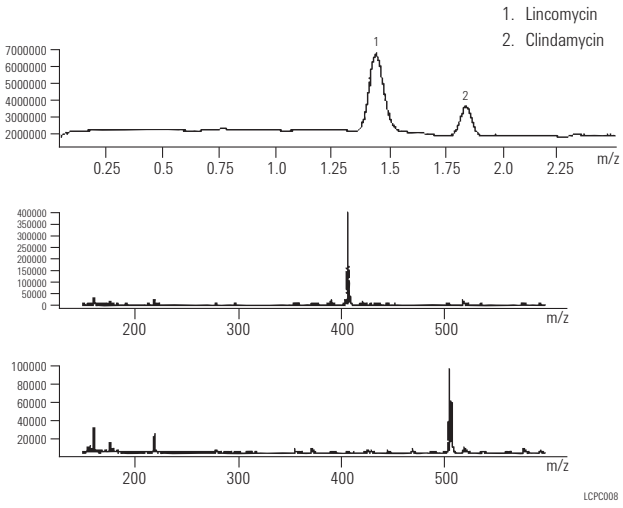
Temperature: Ambient

Detector: APCI, Positive ion

MS Conditions:

Peak width:	0.10 min
Scan:	150-600 Da, step 0.1
Fragmentor:	70
Gas Temp:	350 °C
Vaporizer:	350 °C
Drying gas:	12 L/min
Nebulizer pres:	50 psi
Vcap:	+3000 V
Corona:	4.0 µA

Sample: Antibiotics, 1 µL



Antifungal medications

Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

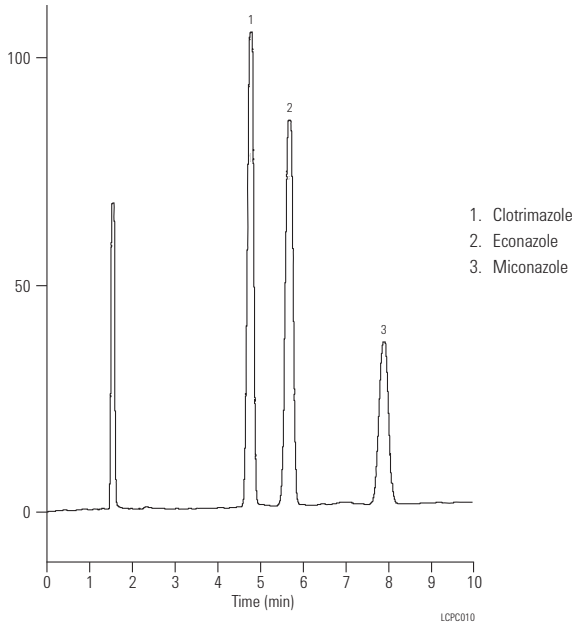
Mobile Phase: 35% 25 mM NaH_2PO_4, Dibasic (pH 6.5 with H_3PO_4): 65% ACN

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: UV, 220 nm

Sample: Antifungals, 2 µL



1. Clotrimazole
2. Econazole
3. Miconazole

Antifungals

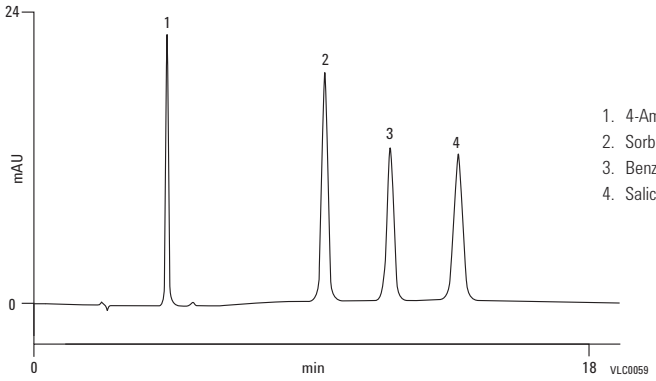
Column: **Pursuit XRs Diphenyl**
A6020150X046
4.6 x 150 mm, 5 µm

Mobile Phase: Water+0.1% HCOOH: MeCN+0.1% HCOOH, 80:20

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. 4-Aminobenzoic acid
2. Sorbic acid
3. Benzoic acid
4. Salicylic acid

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Analgesics: Non-steroidal anti-inflammatory drugs: Narrow bore separation

Column: **Eclipse XDB-C8**
993700-906
2.1 x 150 mm, 5 µm

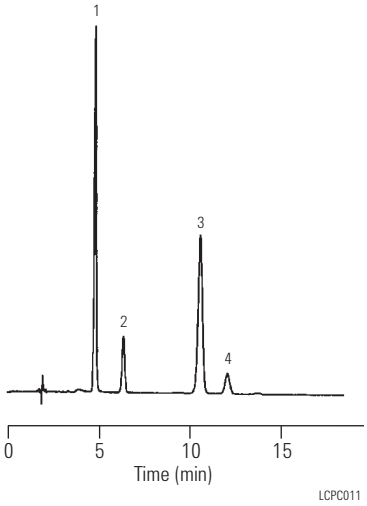
Mobile Phase: 50/50, 25 mM Sodium Phosphate (pH 7.0 with Phosphoric Acid), MeOH

Flow Rate: 0.2 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: 2 µL, 10 ug/mL



NSAID	pK_a
1. Phenacetin	2.2
2. Tolmetin	3.5
3. Phenylbutazone	4.4
4. Fenoprofen	4.5

Separation of small molecule anorectics

Column A: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Column B: **Traditional Alkyl C8 Phase**

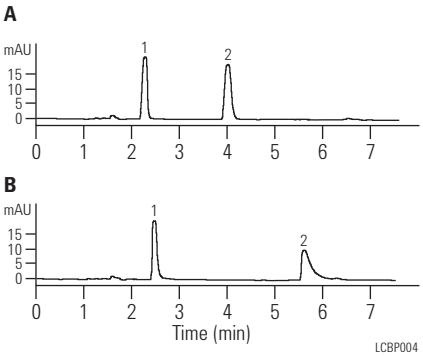
Mobile Phase: 25 mM K_2HPO_4, pH 7.2/MeOH: ACN (50:50), 45/55

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Anorectics "Fen-phen", 5 µL



1. Phentermine
2. Fenfluramine

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Aromatic acids/benzoic acids: Selectivity differences

Column A: **ZORBAX SB-C8**
880975-906
4.6 x 250 mm, 5 µm

Column B: **ZORBAX SB-Phenyl**
880975-912
4.6 x 250 mm, 5 µm

Column C: **ZORBAX SB-CN**
880975-905
4.6 x 250 mm, 5 µm

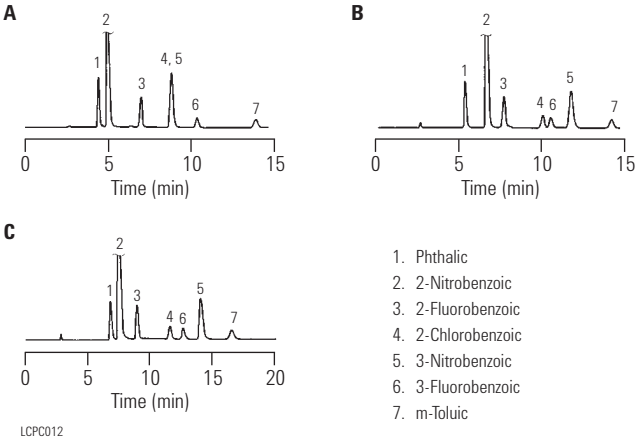
Mobile Phase: 30-45% methanol in 25 mM Na Phosphate, pH 2.5
A: 45% Methanol
B: 40% Methanol
C: 30% Methanol

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Benzoic acids



LCPC012

1. Phthalic
2. 2-Nitrobenzoic
3. 2-Fluorobenzoic
4. 2-Chlorobenzoic
5. 3-Nitrobenzoic
6. 3-Fluorobenzoic
7. m-Toluic

Catecholamines/biogenic amines: Rapid separation using ion-pair reagents

Column: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

Mobile Phase: 0.14 M sodium phosphate,
20 mM EDTA,
0.75 mM octyl sulfonate,
9% methanol pH 3.5

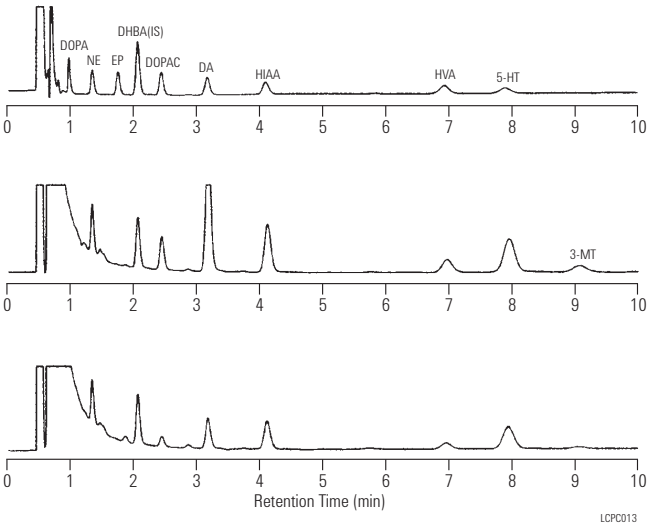
Flow Rate: 1.5 mL/min

Temperature: 26 °C

Detector: 0.75 V vs Ag/AgCl with electro-chemical detection

Sample: 10 µg/mL each standard; volume
20 µL (2 g tissue sample)
A: Standards (2pmol; DHBA 5pmol)
B: Mouse Sriatum
C: Mouse Neocortex

1. DOPA-Dihydroxyphenylalanine
2. DHBA-Dihydroxybenzyl amine
3. DOPAC-Dihydroxyphenyl acetic acid
4. NE-Norepinephrine
5. DA-Dopamine
6. HIAA-Hydroxyindoleaacetic acid
7. EP-Epinephrine
8. HVA-Homovanillic acid
9. 5-HT-Hydroxytryptamine
10. 3-MT-Methaxytyrosine



LCPC013

Chiral ethiazide (diuretic drug) separation

Column: **Ultron ES-OVM Chiral 702111651 4.6 x 150 mm, 5 µm**

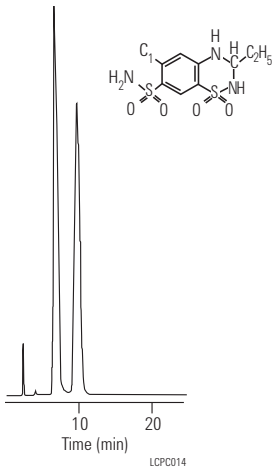
Mobile Phase: 20 mM KH_2PO_4 (pH 4.6)

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 220 nm

Sample: 20 µL containing 0.35 µg Ethiazide



Chiral separation of fluoxetine enantioners (Prozac)

Column: **Ultron ES-OVM Chiral 702111651 4.6 x 150 mm, 5 µm**

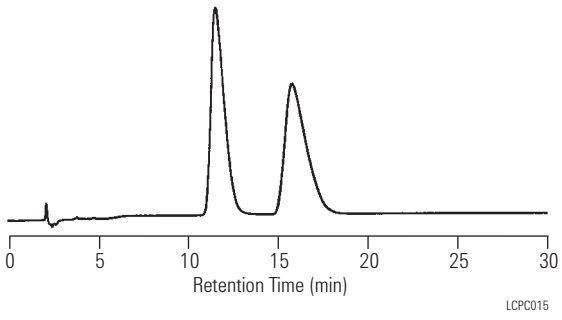
Mobile Phase: 25/75 (v/v) EtOH / 20 mM KH_2PO_4, pH 5.5 (adjusted with NaOH)

Flow Rate: 0.8 mL/min

Temperature: Ambient

Detector: UV, 225 nm

Sample: Mixture fluoxetine (Prozac) enantiomers



Courtesy of D.S. Ristry and V.S. Sharp, Eli Lilly and Co.

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Goldenseal and related alkaloids on Rapid Resolution Eclipse XDB-C18

Column: **Eclipse XDB-C18**
963967-902
4.6 x 150 mm, 3.5 µm

Mobile Phase: 68% 30 mM ammonium acetate,
14 mM TEA, pH ~4.85
32% Acetonitrile

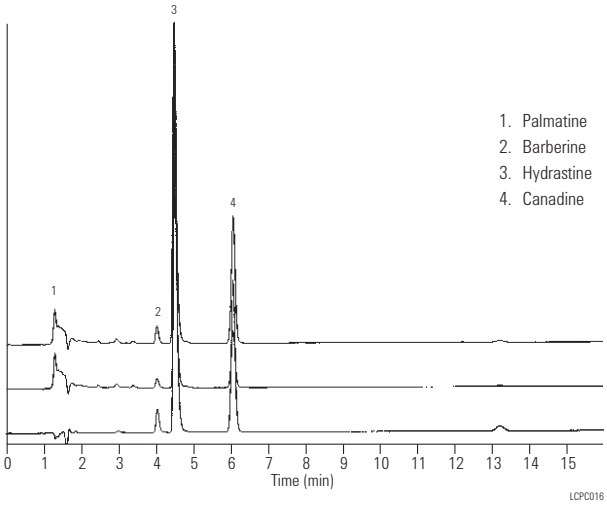
Flow Rate: 1.0 mL/min

Temperature: 30 °C

Detector: 230 nm

Sample: Goldenseal and related alkaloids

Alkaloids, such as the active components in Goldenseal and other related plants, are quickly and accurately separated using isocratic conditions on an Eclipse XDB-C18 Rapid Resolution column.



1. Palmatine
2. Barberine
3. Hydrastine
4. Canadine

Components of green tea separated on Rapid Resolution StableBond SB-C8

Column: **ZORBAX SB-C8**
863953-906
4.6 x 150 mm, 3.5 µm

Mobile Phase: 75% 0.1% TFA : 25% MeOH

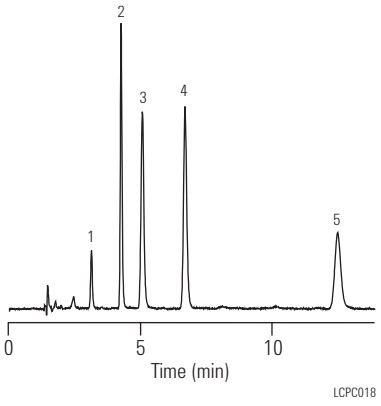
Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: 280 nm

Sample: Green tea

Nutraceuticals, such as the components of green tea, are quickly separated on a StableBond SB-C8 Rapid Resolution column.



1. Epigallocatechin
2. Epicatechin
3. Epigallocatechin gallate
4. Catechol
5. Epicatechin gallate

Chiral separation of hexobarbitol

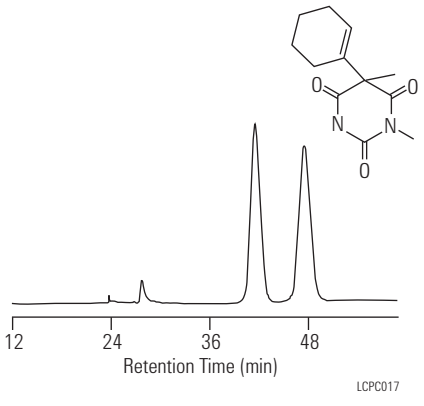
Column: **Chiradex**
79925CB-584
4.0 x 250 mm, 5 µm

Mobile Phase: Methanol/water, 20:80

Flow Rate: 1.0 mL/min

Detector: UV, 220 nm

Sample: Hexobarbitol



Chiral separation of S- and R-Norfluoxetine

Column: **Ultron ES-OVM Chiral**
724111653
4.6 x 250 mm, 10 µm

Mobile Phase: 6/94 (v/v) MeOH / 20 mM KH_2PO_4

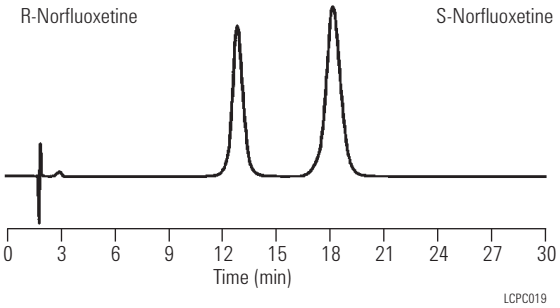
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 225 nm

Sample: 50 µg/mL of 2:3 mixture R- : S-Norfluoxetine

Courtesy of D.S. Ristry and V.S. Sharp, Eli Lilly and Co.



Chiral separation of salbutamol

Column: **Ultron ES-Pepsin**
822111631A
4.6 x 150 mm, 5 µm

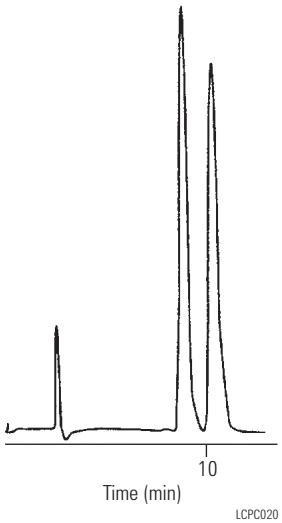
Mobile Phase: 20 mM phosphate buffer, pH 6.0

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 220 nm

Sample: 20 µL containing 0.35 µg salbutamol mixture



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Chiral separation of tolperison enantiomers

Column: **Ultron ES-OVM Chiral**
702111651
4.6 x 150 mm, 5 µm

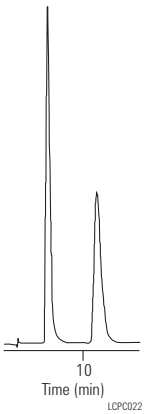
Mobile Phase: 20 mM KH_2PO_4 (pH 5.5), C_2H_5OH (100/4 v/v)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 220 nm, 0.04 AUFS

Sample: Tolperison, 5 µL



Chiral separation of atenolol

Column: **Ultron ES-Pepsin**
822111631A
4.6 x 150 mm, 5 µm

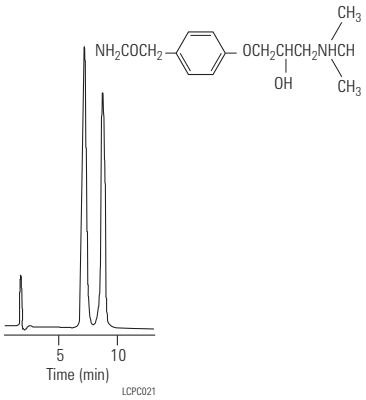
Mobile Phase: 20 mM phosphate buffer, pH 6.0/Ethanol (99/1)

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 220 nm, 0.04 AUFS

Sample: 1.5 µL, 0.25 mg/mL, atenolol racemic mixture



Cocaine and metabolites

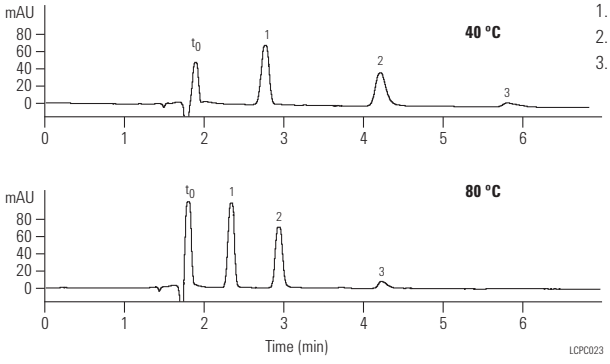
Column: **ZORBAX Rx-SIL**
883975-901
4.6 x 150 mm, 5 µm

Mobile Phase: MeOH: NH_4 Acetate, 25 mM, pH 6 (70:30)

Flow Rate: 1.0 mL/min

Temperature: 40 and 80 °C

Detector: UV, 210 nm



1. Benzoylecgonine
2. Cocaine
3. Ecgonine methylester

Aspirin and cough remedy

Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

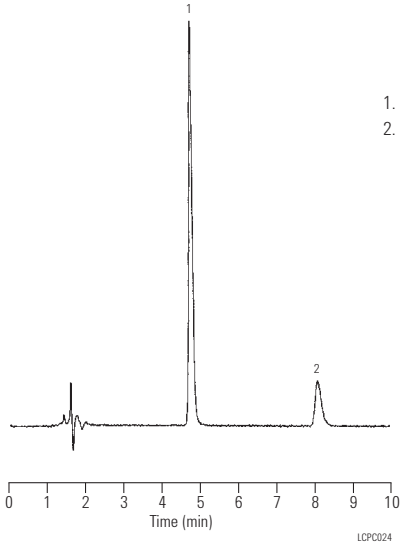
Mobile Phase: (75:25) 25 mM Na_2HPO_4 (pH 3.0): ACN

Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: UV, 254 nm

Sample: 5 µL, 10 µg/mL



1. Acetylsalicylic acid
2. Dextromethorphan

Cough formula mixture: Fast and efficient separation

Column A: **ZORBAX SB-CN**
866953-905
4.6 x 75 mm, 3.5 µm

Column B: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

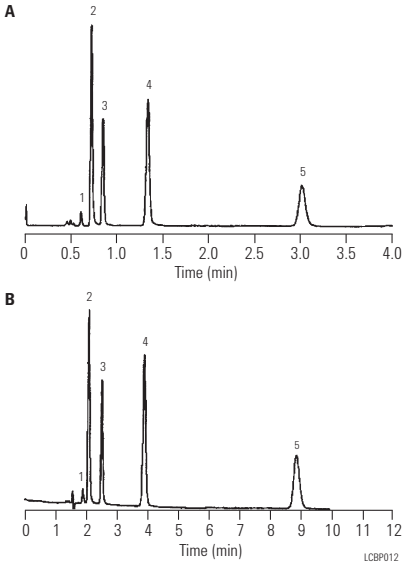
Mobile Phase: 20/80, Acetonitrile/150 mM Na Citrate, pH 2.6

Flow Rate: 1.5 mL/min, 1.0 mL/min

Temperature: 35 °C

Detector: UV, 270 nm

Sample: 2 µL, cough formula



1. Maleic acid
2. Pseudo-ephedrine
3. Acetaminophen
4. Chlorpheniramine
5. Dextromethorphan

Guaifenesin: USP analysis of guaifenesin

Mobile Phase: 40% Methanol:60% Water:1.5% Glacial Acetic Acid

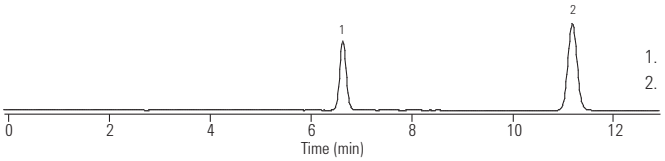
Flow Rate: 1.0 mL/min

Temperature: 25 °C

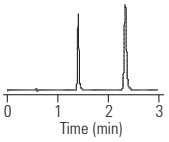
Sample: Guaifenesin
A: 8 µL
B: 2 mL

Column: **Eclipse XDB-C18**
990967-902
4.6 x 250 mm, 5 µm

Peak	TR	N	Rs
1	6.63	12,737	0
2	11.19	18,552	15.8



1. Guaifenesin: 0.04 mg/mL
2. Benzoic Acid: 0.10 mg/mL



Column: **Eclipse XDB-C18**
922975-902
4.6 x 50 mm, 1.8 µm

Peak	TR	N	Rs
1	1.4	11,421	0
2	2.33	12,909	12.3

Minimum Resolution Required = 3.0

Metronidazole: Updating USP methods

Column A: **ZORBAX C8**
883952-706
4.6 x 150 mm, 5 µm

Column B: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Column C: **Eclipse XDB-C8**
963967-906
4.6 x 150 mm, 3.5 µm

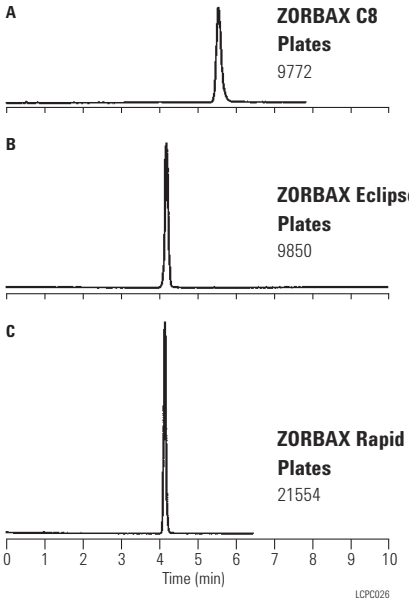
Mobile Phase: 80/20, Water/Methanol

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Metronidazole



A **ZORBAX C8**

Plates	USP TF	Particle Size
9772	1.30	5 µm

B **ZORBAX Eclipse XDB-C8**

Plates	USP TF	Particle Size
9850	0.98	5 µm

C **ZORBAX Rapid Resolution Eclipse XDB-C8**

Plates	USP TF	Particle Size
21554	1.13	3.5 µm

Morphine and metabolites: Extracted blood plasma sample separation

Column: **ZORBAX SB-C18**
863953-902
4.6 x 150 mm, 3.5 µm

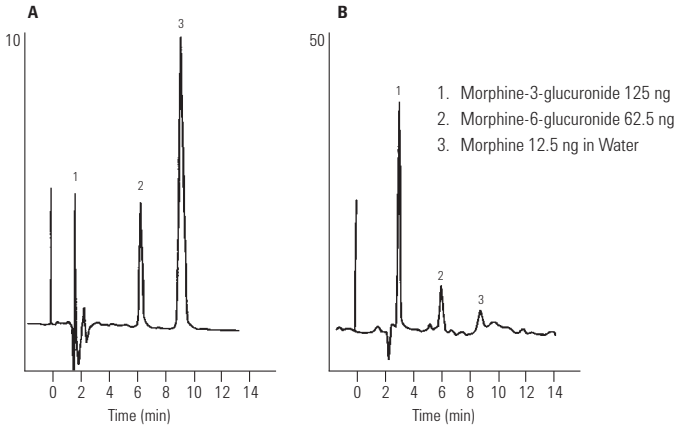
Mobile Phase: 97/3 70 mM KH_2PO_4 + 1 mM EDTA/ACN, pH 4.5

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: A: Electrochemical, 720 mV
B: Fluorescence, Ex = 285 nm, Em = 352 nm

Sample: 50 µL
Morphine-3-glucuronide 125 ng
Morphine-6-glucuronide 62.5 ng
Morphine 12.5 ng in Water



Courtesy of J. Visser, Center for Pharmacy, Univ. Groningen, The Netherlands.

Opiates (drugs of abuse) by LC/MS

Column: **ZORBAX SB-AQ**
830990-914
2.1 x 150 mm, 3.5 µm

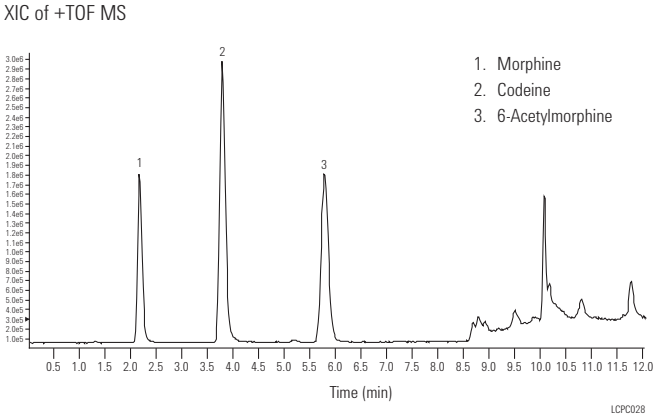
Mobile Phase: A: Acetonitrile with 0.1% formic acid
B: Water with 0.1% formic acid

Flow Rate: 0.25 mL/min

Gradient: 0 min 10% B
5 min 35% B
5.1 min 100% B

MS Conditions: Time of Flight (TOF)
Standard with calibrant delivery system providing constant low flow of ~ 2 µM purine and HP-921 calibrant to dual ESI for continuous auto-calibration

Sample: Opiates



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

NEW!

Comparing HILIC and RPLC of morphine using Agilent ZORBAX RRHD columns with UHPLC/MS

Column: **Agilent ZORBAX Eclipse Plus C18**
2.1 x 100mm, 5 µm
(Custom column)

Column: **ZORBAX RRHD HILIC Plus**
959758-901
2.1 x 100 mm, 1.8 µm

Mobile Phase: A: 10 mM NH_4HCO_2, pH 3.2
B: CH_3CN/100 mM NH_4HCO_2, pH 3.2 (9:1)
Column A: 10% B isocratic
Column B: 70% B isocratic

Flow Rate: Column A: 0.4 mL/min
Column B: 1 mL/min

Pressure: Column A: 90 bar
Column B: 810 bar

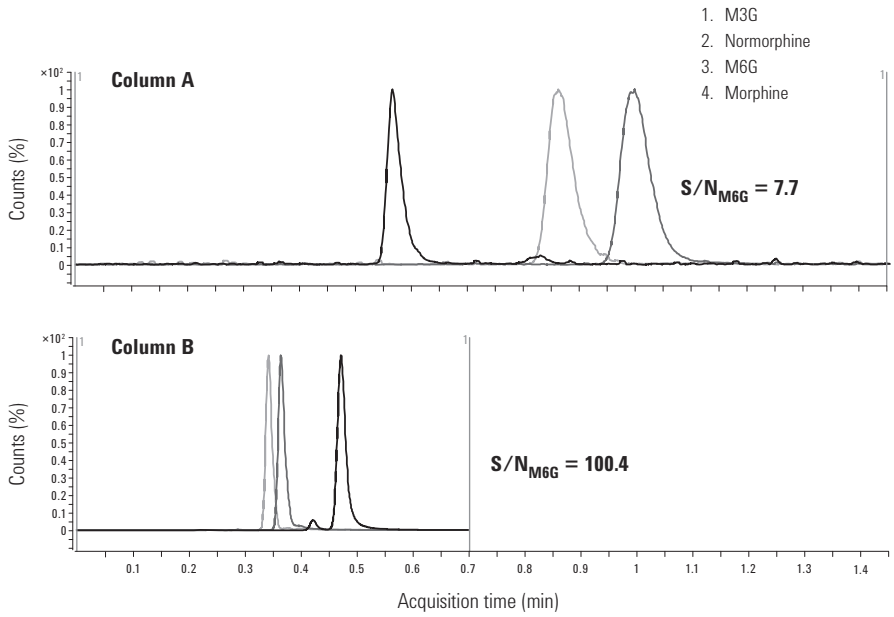
Temperature: 25 °C

Detector: Agilent 1290 Infinity LC with an Agilent 6410A Triple Quadrupole Mass Spectrometer

MS Conditions:
MS Source: Positive ESI, capillary 4000 V, drying gas temperature, flow rate and nebulizer pressure vary with mobile phase flow rate
MS Acquisition: Selected ion mode (SIM), delta EMV 200 V, MS dwell time caries with mobile phase flow rate
Software: Agilent MassHunter versions B.03.01, B.02.00 AND B.03.01 were used for data acquisition, qualitative, and quantitative analyses, respectively

Sample: 2 µL injection of 1 µg/mL each of morphine, normorphine, morphine-3-ß-D-glucuronide: HILIC sample was prepared in CH_3CN; RPLC sample was prepared in H_2O

HILIC mode with UHPLC columns cuts analysis time in half, while improving sensitivity by more than a factor of 10, compared to traditional LC columns in RPLC mode with MS detection.



Neutraceuticals: Hypericin separation in St. John's Wort

Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

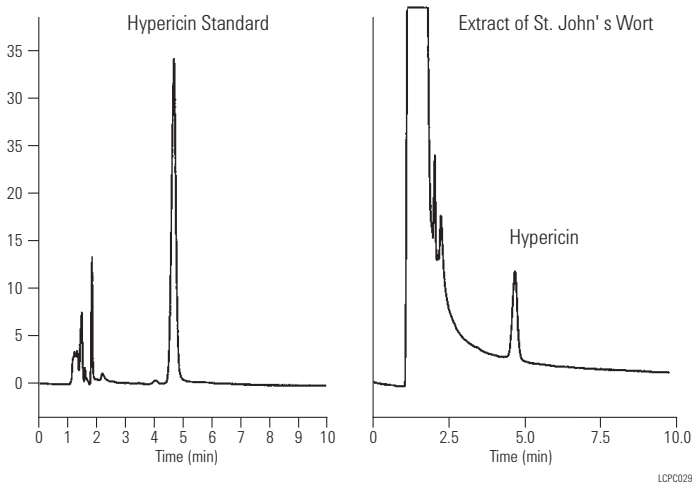
Mobile Phase: 23% 25 mM Na_2HPO_4 ,
Dibasic (pH 7.0 with H_3PO_4): 77% MeOH

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample: Neutraceuticals



Pharmaceuticals: Rapid, high sensitivity LC and LC/MS of 11 drugs

Column: **Eclipse XDB-C18**
925700-902
2.1 x 50 mm, 1.8 µm

Mobile Phase: A: 10 mM NH_4 Formate (pH = 3.6)
B: ACN with 10 mM NH_4 Formate

Flow Rate: 0.6 mL/min

Gradient: 5% B to 70% B in 7.5 min, to 95% B in 8.5 min

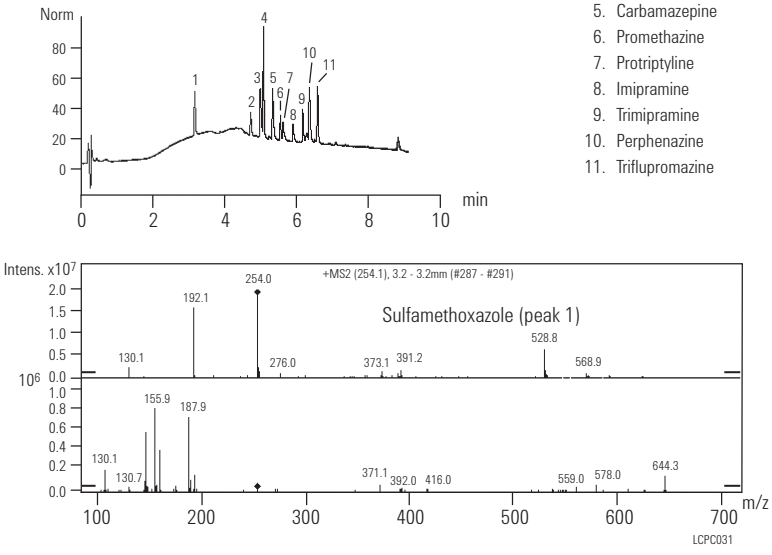
Temperature: 65 °C

Detector: UV, 230 nm and MSD Trap SL

MS Conditions:

Pos. Dry Gas:	345 °C
Neb.:	45 psi
HV Cap:	3500 V
Range:	100-700
Average:	5 Spectra
ICC:	30000
Charge Con:	On
Smart Par. Settings:	Tar Mas: 250 m/z
Comp. Stab.:	100%
Trap Drive:	100%
Frag. Options:	Smart Frag: On
Frag. Width:	10 m/z

1. Sulfamethoxazole
2. Tripelennamine
3. Prednisolone
4. Diphenhydramine
5. Carbamazepine
6. Promethazine
7. Protriptyline
8. Imipramine
9. Trimipramine
10. Perphenazine
11. Triflupromazine



Hormones/steroids

Column: **ZORBAX RRHT SB-C18**
823975-902
4.6 x 30 mm, 1.8 µm

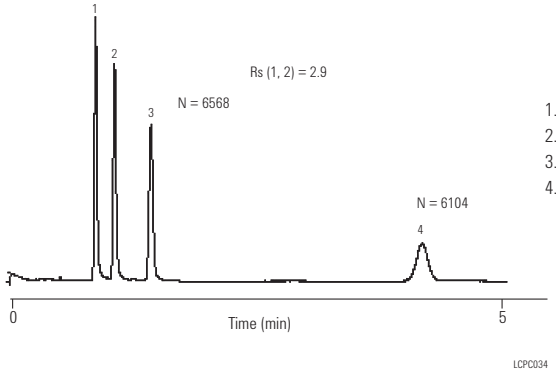
Mobile Phase: 50% 20 mM NaH_2PO_4, pH 2.8: 50% ACN

Flow Rate: 1.0 mL/min

Temperature: RT

Detector: UV, 230 nm

Sample: Hormones/steroids



1. Estradiol
2. Ethinylestradiol
3. Dienestrol
4. Norethindrone

Steroids: Separation

Column: **Eclipse XDB-CN**
993967-905
4.6 x 150 mm, 5 µm

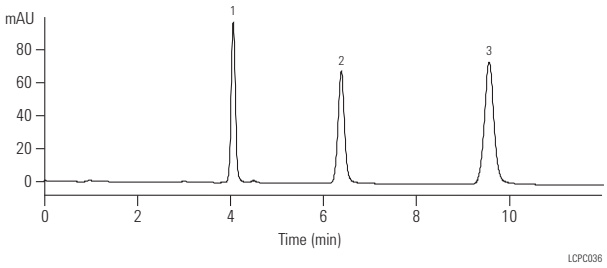
Mobile Phase: 40:60 ACN:Water

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Detector: UV, 205 nm

Sample: 1. Norethindrone 0.514 mg/mL
2. Progesterone 0.407 mg/mL
3. Mestranol 0.057 mg/mL



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Steroids

Column A: **Eclipse XDB-Phenyl**
963967-912
4.6 x 150 mm, 3.5 µm

Column B: **Eclipse XDB-C18**
993967-902
4.6 x 150 mm, 5 µm

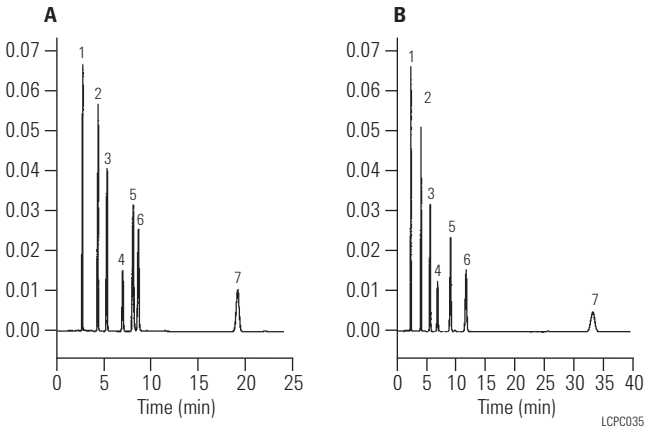
Mobile Phase: H_2O:ACN, 60:40

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: UV, 254 nm

Sample:
1. Prednisolone
2. Corticosterone
3. 11 -hydroxyprogesterone
4. Cortisone acetate
5. Deoxycorticosterone
6. 17 hydroxyprogesterone
7. Progesterone



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Triamcinolone – USP analysis of triamcinolone

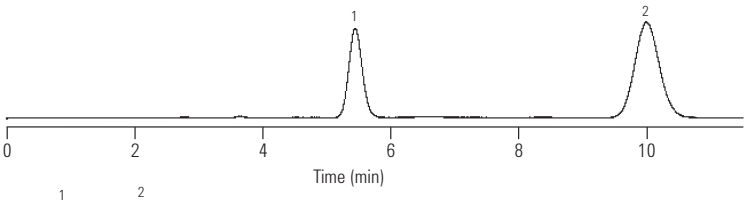
Column: **Eclipse XDB-C18**
923975-902
4.6 x 30 mm, 1.8 µm

Mobile Phase: 47% Methanol:53% Water

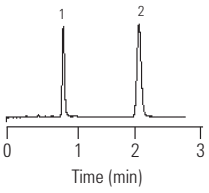
Flow Rate: 1.5 mL/min

Temperature: 25 °C

Sample: Triamcinolone, 1 µL



Peak	TR	N	Rs
1	5.45	3199	0
2	9.99	3212	8.1



1. Triamcinolone: 0.2 mg/mL
2. Hydrocortisone: 0.3 mg/mL

Minimum Resolution Required = 3.0

Peak	TR	N	Rs
1	0.89	3256	0
2	2.07	4851	11.8

LCPC038

Separation of highly basic antidepressants above their pKa in free base form (pKa 9.5-9.7)

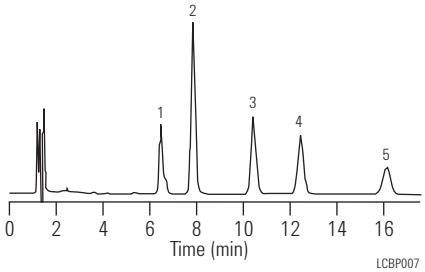
Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: 75% Methanol / 25% 50 mM Pyrrolidine Buffer, pH 11.5

Flow Rate: 0.5 mL/min

Temperature: 40 °C

Detector: UV, 215 nm



1. Doxepin
2. Imipramine
3. Nortriptyline
4. Amitriptyline
5. Trimipramine

LCBP007

Basic drugs can often be separated in their charged form at low pH with StableBond or at mid-range pH with Eclipse XDB or Bonus -RP columns. With Extend-C18, you can separate at high pH to improve solubility, improve retention, or obtain different selectivity.

Antidepressants, tricyclic: Comparative separation

Column A: **ZORBAX Bonus-RP 883668-901 4.6 x 150 mm, 5 µm**

Column B: **Brand A Polar-linked C8**

Column C: **Brand B Polar-linked C18**

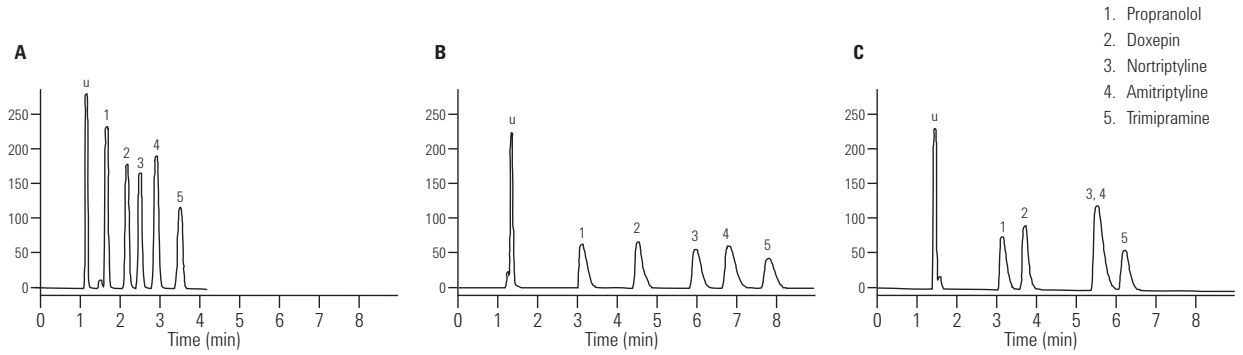
Mobile Phase: ACN: 20 mM Na Citrate, pH 6 (60:40)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Tricyclic antidepressants (u= uracil)



LCBP011

Tricyclic antidepressants

Column: **Eclipse XDB-C8 993967-906 4.6 x 150 mm, 5 µm**

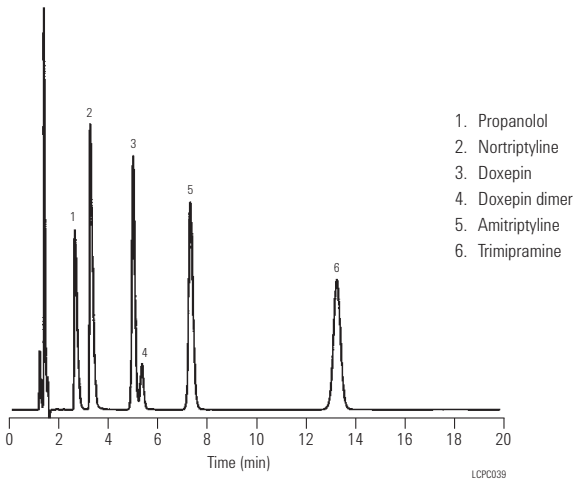
Mobile Phase: 38/62 THF/25 mM Potassium Phosphate, pH7

Flow Rate: 1.0 mL/min

Temperature: 23 °C

Detector: UV, 254 nm

Sample: 10 µL, Antidepressant mix, 10 µg/mL



LCPC039

Tricyclic antidepressants and metabolites: Effect of pore size

Column A: **ZORBAX SB-C18**
863953-902
4.6 x 150 mm, 3.5 µm

Column B: **ZORBAX RRHD 300SB-C18**
883995-902
4.6 x 150 mm, 5 µm

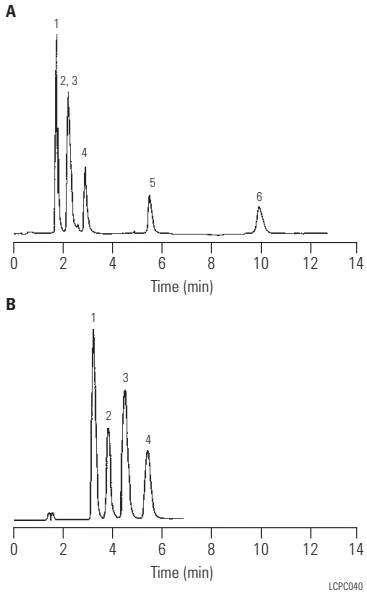
Mobile Phase: 40/60, 25 mM Phosphate Buffer, 10 mM Triethylamine, pH 6.2/ACN

Flow Rate: 1.2 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: 10 µL, Antidepressant mix, 10 µg/mL



1. trans- 10-OH - Nortriptyline
2. trans- 10-OH - Amitriptyline
3. cis- 10-OH - Nortriptyline
4. cis- 10-OH - Amitriptyline
5. Nortriptyline
6. Amitriptyline

Ulcer treatment drugs at intermediate pH

Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

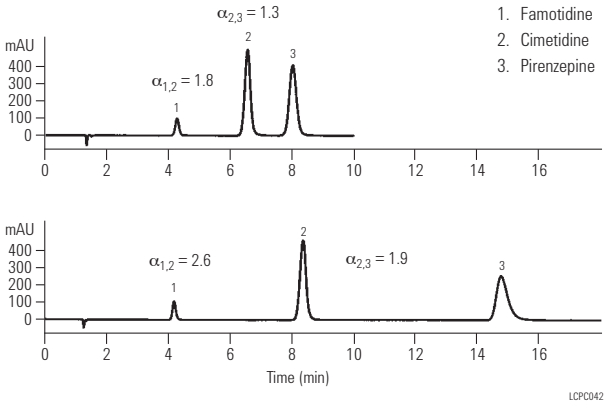
Mobile Phase: Na citrate, 20 mM, pH 6.1: MeOH, (80:20)

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 220 nm

Sample: Ulcer treatment drugs



1. Famotidine
2. Cimetidine
3. Pirenzepine

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Urine, LSD analysis by LC/MS

Column: **Eclipse XDB-C8**
960967-906
2.1 x 50 mm, 5 µm

Mobile Phase: 15 : 85, ACN : 10 mM Ammonium Formate, pH 3.7

Flow Rate: 0.3 mL/min

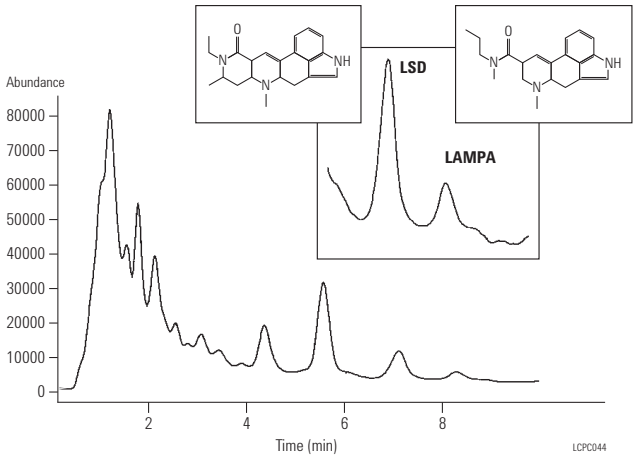
Temperature: 30 °C

Detector: MS

MS Conditions: SIM mode, Ions: 324.2, 223.1, 208.1
Fragmentor (dynamically ramped) 100V at 324.2, 148V at 223.1, 170V at 208.1

Sample: LSD

Hughes, J.M., C.A. Miller and S.M. Fischer, "Development of a Method for the Forensic Analysis of LSD in Urine", presented at the ASMS, Palm Springs, June 1997.



USP method:
Glyburide and internal standard, progesterone

Column: **Eclipse XDB-C8**
990967-906
4.6 x 250 mm, 5 µm

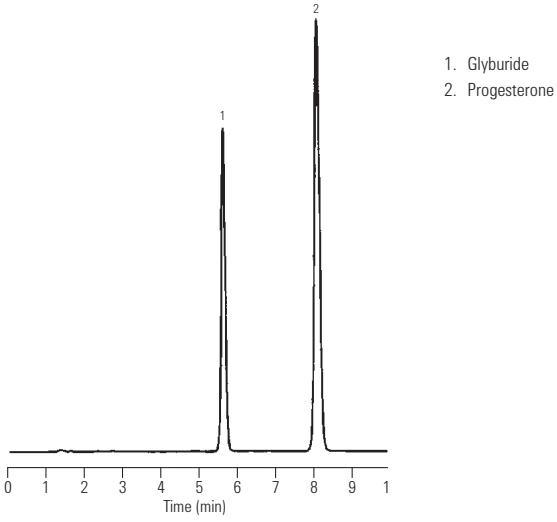
Mobile Phase: 45/55, 50 mM Ammonium Phosphate/ACN, Final pH 5.35

Flow Rate: 1.5 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: 5 µL, 10 ug/mL each of standard



1. Glyburide
2. Progesterone

Dexamethasone, USP method: Rapid analysis

Column A: **ZORBAX SB-C8**
880975-906
4.6 x 250 mm, 5 µm

Column B: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

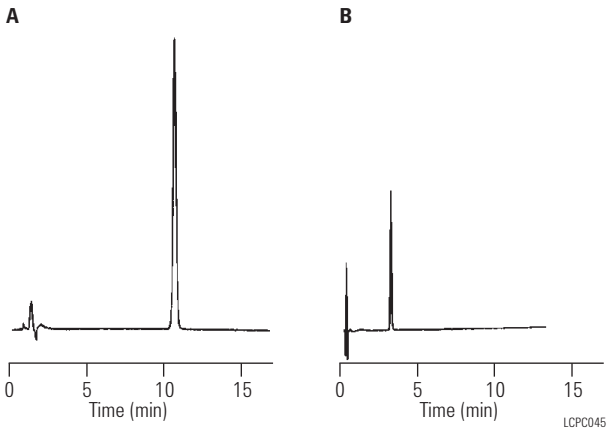
Mobile Phase: A = Water, B = ACN; Isocratic 30% B

Flow Rate: 2.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm

Sample: Dexamethasone
10 µL and 5 µL, 10 ug/mL



USP analysis of tetracyclines

Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

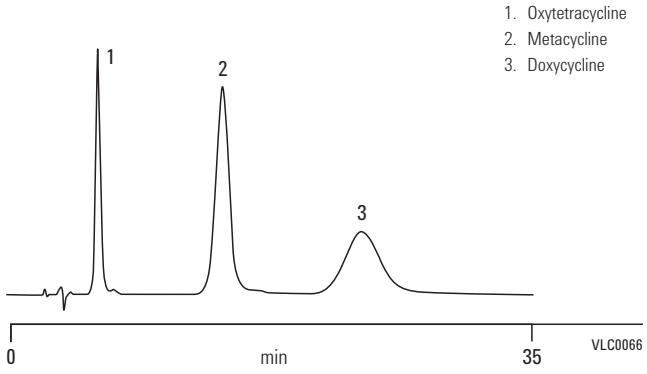
Sample: 20 mg tetracycline in 25 mL 0.01M HCl

Mobile Phase: 60 g 2-Methyl-2-propanol + 200 mL UHP water + 400 mL 0.2 M K_2HPO_4 at pH 8 + 50 mL 10 g/L tetrabutylammonium hydrogen sulphate at pH 8 + 10 mL 40 g/L sodium edetate at pH 8, made up to 1000 mL with water (adjust pH with dilute NaOH)

Flow Rate: 1.0 mL/min

Temperature: 60 °C

Detector: UV, 254 nm



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Warfarin: USP chromatographic purity method using Eclipse XDB-CN

Column: **Eclipse XDB-CN**
993967-905
4.6 x 150 mm, 5 µm

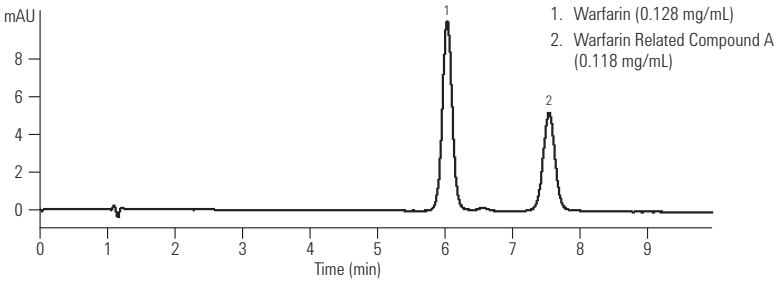
Mobile Phase: 32:68:1 Acetonitrile:Water:Glacial Acetic Acid

Flow Rate: 1.5 mL/min

Temperature: 25 °C

Detector: UV, 260 nm

Sample: Warfarin, 2 µL



Ten cardiac drugs on Rapid Resolution HT SB-C18

Column: **SB-C18**
829975-902
4.6 x 150 mm, 1.8 µm

Mobile Phase: A: 0.1% TFA, 5% ACN
B: 0.08% TFA, 95% ACN

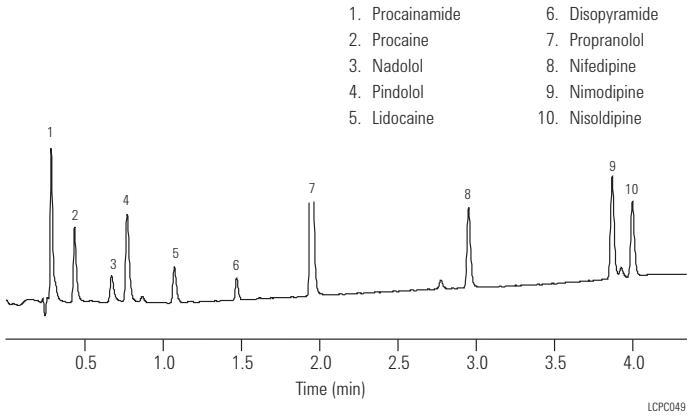
Flow Rate: 2 mL/min

Gradient: 0.0 min 12.5% B
10.5 min 60% B
12.0 min 60% B

Temperature: 70 °C

Detector: UV, 230 nm

Sample: Cardiac drugs



Sulfonamides – Fast analysis with RRHT columns

Column: **SB-C18**
824700-902
2.1 x 30 mm, 1.8 µm

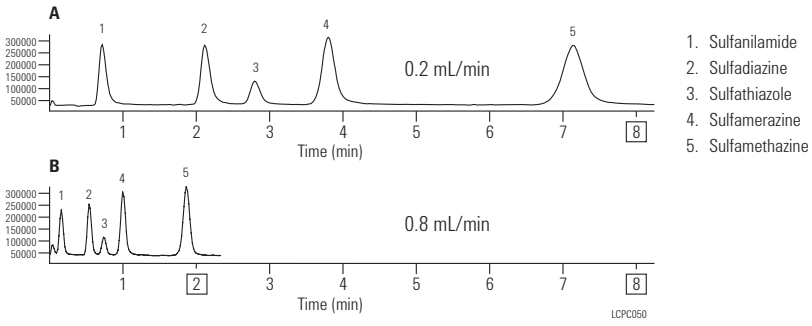
Mobile Phase: A: 90% 0.1% formic acid
B: 10% 0.1% formic acid in MeOH

Flow Rate: A: 0.2 mL/min
B: 0.8 mL/min

Temperature: 35 °C

Detector: TIC, Single Quad

Sample: Sulfonamides



Sulfa drugs

Column: **Pursuit XRs Ultra C8**
A7511100X020
2.0 x 100 mm, 3.0 µm

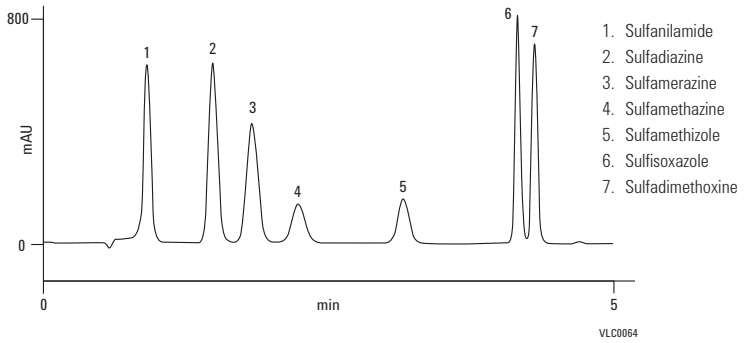
Mobile Phase: A: Water+0.1% TFA
B: MeCN+0.1% TFA

Gradient: 10% B for 10 min,
ramp to 45% B in 1 min and hold for 1 min,
return to 10% B in 1 min and hold for 1 min

Flow Rate: 0.65 mL/min

Temperature: Ambient

Detector: UV, 254 nm



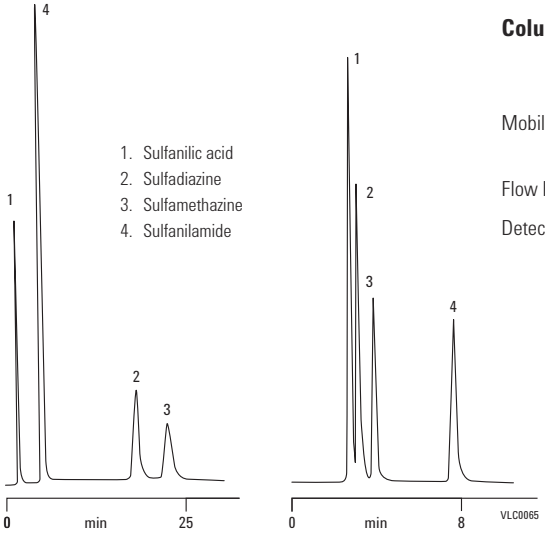
Sulfa drugs

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: Potassium sulfate:
ACN 7:1, pH 2.2

Flow Rate: 1.0 mL/min

Detector: UV, 254 nm



Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: Disodium tetraborate: ACN 6:1,
pH 9.3

Flow Rate: 1.0 mL/min

Detector: UV, 254 nm

For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

Fast analysis of Pindolol

Column A: **ZORBAX SB-CN**
863953-905
4.6 x 150 mm, 3.5 µm

Column B: **ZORBAX SB-CN**
827975-905
4.6 x 50 mm, 1.8 µm

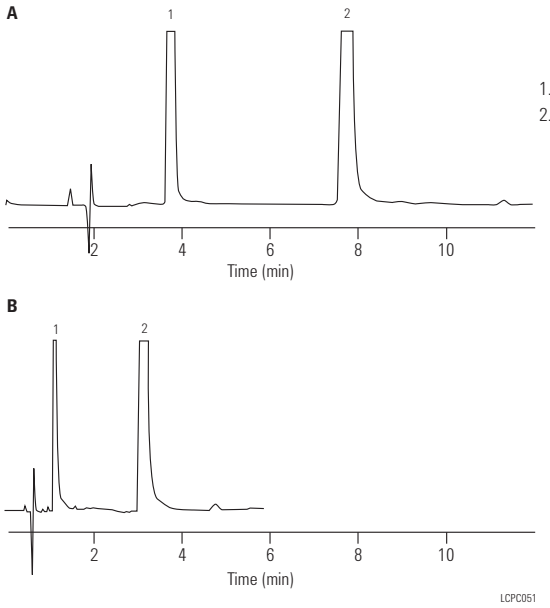
Mobile Phase: A: 70% 50 mM Na Acetate
B: 30% ACN

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: UV, 219 nm

Sample: Pindolol, 2 µL



1. Indole
2. Pindolol

Lamotrigine

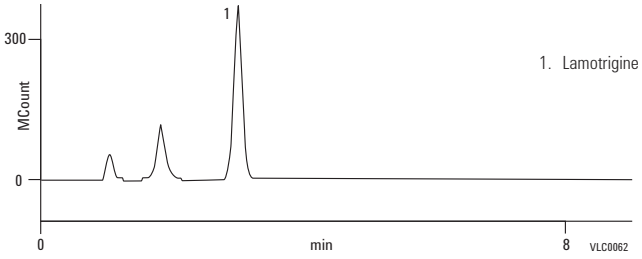
Column: **Pursuit XRs Ultra C8**
A7511100X020
2.0 x 100 mm, 3.0 µm

Mobile Phase: ACN:water, 25:90 for 1 min

Flow Rate: 0.2 mL/min

Injection Volume: 5 µL, 50% MeOH

Detector: MS



1. Lamotrigine

Barbiturates

Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

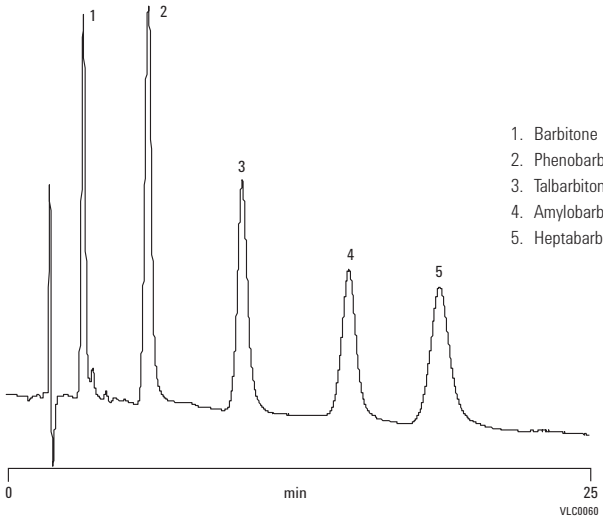
Mobile Phase: Water

Flow Rate: 1.0 mL/min

Temperature: 200 °C

Detector: UV, 220 nm

Courtesy: Smith, RM, Burgess, RJ, Cheinthavorn, O and Stuttard, JR (1999) Superheated water: a new look at chromatographic eleunts for reversed-phase liquid chromatography. LCGC Europe, January 1999, 30-36. Used with permission.



1. Barbitone
2. Phenobarbitone
3. Talbarbitone
4. Amylobarbitone
5. Heptabarbitone

Analysis of ciprofloxacin and ciprofloxacin metabolites

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

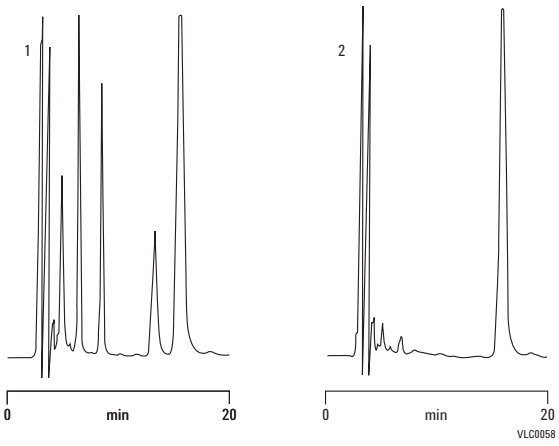
Mobile Phase: 74% 20 mM TCA:22% ACN:4% MeOH adjusted to pH 3

Flow Rate: 1.0 mL/min

Detector: UV, 277 nm

Krol GJ, Noe, AJ and Beerman, D (1986) Liquid chromatographic analysis of ciprofloxacin and ciprofloxacin metabolites in body fluids. Journal of Liquid Chromatography, 9(13), 2897-2919. Reprinted with permission of the publisher (Taylor & Francis Group, www.informaworld.com).

1. Blank urine sample containing known concentrations of internal standard, ciprofloxacin and its metabolites
2. Blank urine sample containing only internal standard



For a comprehensive listing of chromatograms searchable by compound name, visit our online Chromatogram Library at **www.agilent.com/chem/library**

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Room/Bldg/Dept:		
City:		
State/Province/Country:		
Zip/Postal Code:		
Deliver to:		

Part Number	Description	Quantity	Price	Total Cost

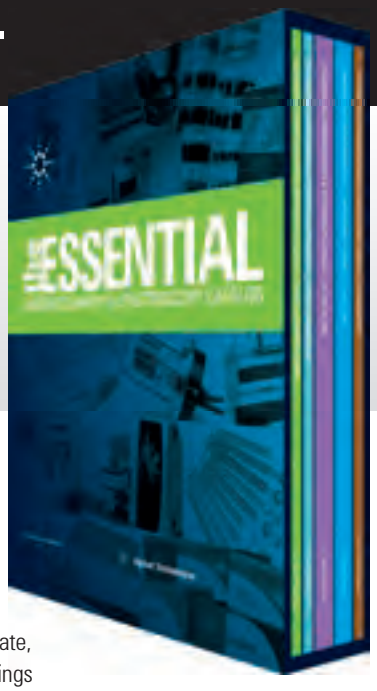
Special Instructions:

Subtotal:	
Tax:	
Total:	

For Assistance: Please call the Agilent Technologies Customer Contact Center at 1-800-227-9770 (U.S. and Canada)
Email Node: cag_sales-na@agilent.com
Fax Number: 302-633-8901 U.S. and Canada

Note: 1. All pricing, tax, discount, and availability information is subject to verification by Agilent Technologies.
2. Shipping and handling is free for orders over $2000 US.

NEW FORMAT. SAME ESSENTIAL RESOURCE.



The Essential Chromatography and Spectroscopy Catalog is now available in a boxed set to help you easily find the products and information you need. Each catalog is your essential resource for:

- Product photos and ordering information
- Selection guides and applications
- Compatibility charts
- Troubleshooting tips
- Maintenance schedules

Your boxed set includes comprehensive information for Agilent's entire portfolio of Chromatography and Spectroscopy columns and supplies in the following catalogs:



General Chromatography Supplies – Minimize contamination and ensure accurate, reproducible results with our selection of vials, syringes, gas purification systems, fittings and tools, and electrochemistry meters.

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GC and GC/MS – Achieve excellent, reproducible performance for difficult samples with ultra inert solutions for GC, premium inlet supplies, Agilent J&W GC columns and standards, and more.

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For more information and to request additional catalogs, please visit **www.agilent.com/chem/catalog**



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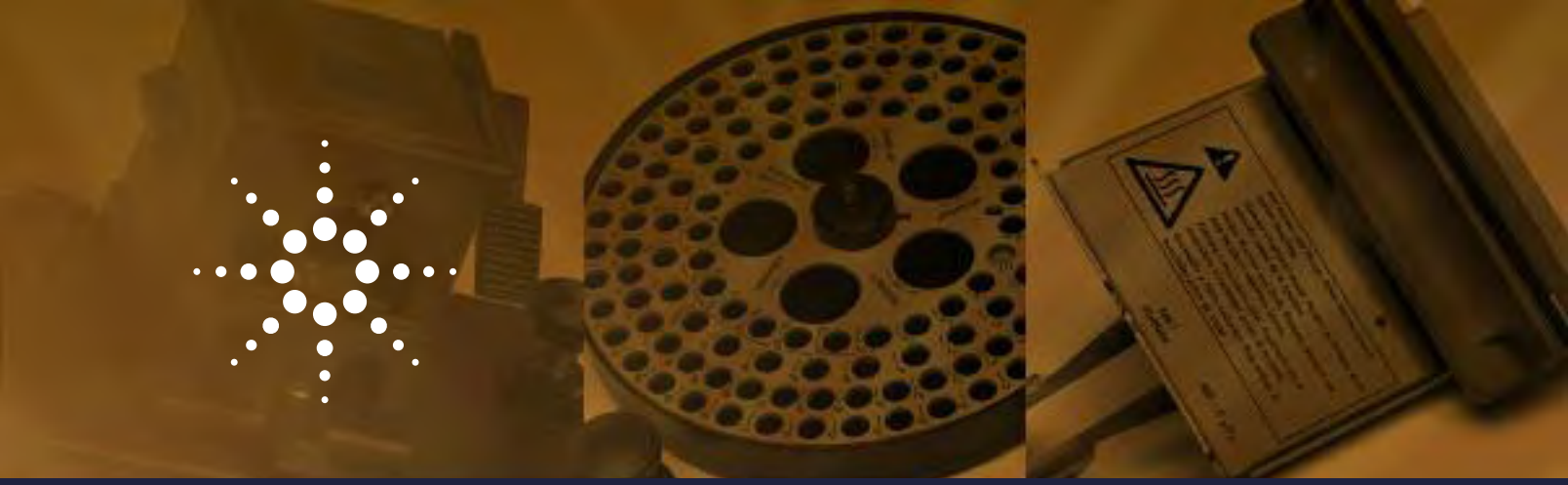
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The Measure of Confidence

Agilent Technologies



SPECTROSCOPY

Your Essential Resource for Supplies



The Measure of Confidence

Agilent Technologies

SPECTROSCOPY

Satisfy your growing demand to screen large numbers of samples, faster

The acquisition of Varian – a company with more than 60 years of spectroscopy innovation – has made Agilent your single source for atomic and molecular spectroscopy supplies.

We even retained the familiar Varian part numbers for easy, error-free ordering, and we're continuing to expand the portfolio.



240FS AA Fast Sequential
Atomic Absorption Spectrometer



Agilent 730 Series ICP-OES



Agilent 7700e ICP-MS

Our product range now includes:

- **Atomic Absorption supplies** that help you lower detection limits. Our research and development efforts have also led to innovations such as single-element and solid-cathode multi-element lamps, along with high-intensity UltrAA lamps.
- **ICP-OES supplies** that deliver reliable results for complex matrices. From spray chambers and brackets...to nebulizers, torches, and peristaltic pump tubing...Agilent ICP-OES supplies help you confidently determine major and trace elements in samples such as food, water, and soil.
- **ICP-MS supplies** for confident trace analysis. Agilent ICP-MS supplies continually push the boundaries of design and innovation, helping you reduce interferences and improve productivity.
- **MP-AES supplies** and accessories that maintain the superior performance of our revolutionary MP-AES – a system that literally runs on air.
- **Molecular supplies** that ensure high performance, non-destructive measurements for quantitative analysis and spectral imaging. From high quality UV cuvettes, flow cells or fiber optic probes for solution measurement, sample holders for direct measurement to source lamps, cell holders, reference materials and other critical parts, Agilent Molecular supplies help you discover, characterize, and test a variety of solid, liquid, organic and inorganic materials.

And remember, all Agilent supplies are engineered or selected by our experienced instrument design teams, manufactured to our demanding specifications, and tested under the strictest conditions. They are also backed by unmatched technical support – plus a 90-day warranty from the date of shipment.











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PUT MORE THAN 40 YEARS OF RELENTLESS INNOVATION BEHIND YOUR EVERY RESULT

By continually raising the standards for technologies that support your routine analyses, Agilent's R&D efforts have led to breakthroughs such as:

- **New GC columns** that help you achieve higher levels of inertness and column-to-column reproducibility
- **LC column choices** that deliver the sensitivity and reliability you need for demanding applications
- **Cutting-edge sample preparation products** that promote reliable extraction and concentration
- **Fresh atomic and molecular spectroscopy ideas** for identifying and confirming targets and unknowns

Longtime Agilent customers have experienced our commitment firsthand. And now, we look forward to demonstrating how Agilent's approach to relentless innovation can work to your advantage, too.

CHEMICAL ANALYSIS SOLUTIONS



Food

From high-volume screening of vegetables for large numbers of pesticides to rapid identification of pathogens, Agilent understands the analytical needs of food producers, shippers, and regulators. When a new toxin appears, we deploy substantial resources to quickly help customers develop robust and reliable methods. Agilent's leading separations, mass spectrometry, and spectroscopy solutions are emerging as valuable food testing techniques.



Environmental

Agilent offers more than 40 years of environmental testing and regulatory expertise. We help government and private labs with the full range of assays, from routine testing of soils for heavy metals to detection of pharmaceuticals in groundwater, in concentrations down to parts per trillion.



Energy and Fuels

Agilent collaborates closely with process industry customers to offer analytical systems that meet their needs for separation, detection, throughput, and support. We'll even preconfigure custom or standard analyzers so they arrive at the lab ready-to-go. Agilent's expertise in both chemical analysis and life science is a powerful combination for researching and producing biofuels, including a wide range of analytical techniques for fatty acid methyl esters (FAMEs). Our newly-expanded portfolio also offers powerful tools for developing and producing photovoltaic films and solar panels.



Forensics

Because the careers of world class athletes and many other individuals hinge on drug testing, it's critical that those doing the testing have the highest level of confidence in the results. Forensics analysts worldwide have grown to depend on Agilent tools for accuracy, reliability, and speed in this high stakes, high-throughput field. Our best selling GC, GC/MS and popular LC and LC/MS are workhorses in forensics labs.



Traditional Lab Informatics

The ways labs generate and store data profoundly affect their efficiency. Agilent offers a rich, integrated suite of software products built on a set of customer-driven architectural values with the Agilent OpenLAB Laboratory Software Suite. OpenLAB delivers superior performance, open systems integration and investment protection. Our commitment is to deliver more value across each step in the life cycle of scientific data – from data collection and analysis to interpretation and management.



Materials Science

Agilent offers a newly expanded portfolio of instruments used for the research, manufacturing and testing of advanced materials, from precision optics to pulp, paper and polymers. Tools for chromatography, atomic absorption spectroscopy, molecular spectroscopy, X-ray crystallography, and nuclear magnetic resonance all support continuous progress in materials science.

LIFE SCIENCE SOLUTIONS



Biopharmaceutical

As "multi-omics" studies gain momentum in the search for new therapeutics, Agilent is uniquely positioned to provide the instruments, reagents, and powerful software needed for performing experiments in multiple disciplines and combining the massive amounts of data into biological insight.



Pharmaceutical

Drug manufacturing requires the accuracy, sensitivity and high throughput of other analytical applications, along with the demands of regulatory record-keeping and validation requirements. Agilent provides a potent combination of rugged, high-throughput tools and unmatched compliance services. Agilent now offers the market-leading family of dissolution apparatus and sampling systems that pair perfectly with our HPLC and UV systems.



Proteomics

Research into how large sets of proteins affect the health of an organism requires special sets of analytical tools. Agilent has built a formidable arsenal of liquid chromatograph/mass spectrometers, bioinformatics systems, multiple affinity protein removal columns, and OFFGEL electrophoresis for protein identification and protein biomarker discovery. Accurate-Mass mass spectrometry and the microfluidic HPLC-Chip/MS are two Agilent innovations speeding the work of proteomics researchers around the globe.



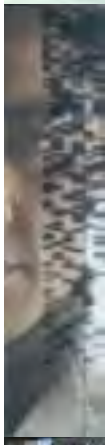
Metabolomics

Collections of small molecules are increasingly being seen as rich sources of biomarkers, but studying metabolites presents many challenges. The need for speed, accuracy, and powerful interpretation capabilities in looking at chemical profile snapshots is underscored because molecules are constantly entering, leaving or changing within the metabolome. Agilent's GC, LC, NMR and MS portfolios, along with our excellent bioinformatics offerings, user-customizable METLIN metabolite database for LC/MS, and the industry's first commercial GC/MS retention time locked metabolite library align well with needs of metabolomics researchers.



Genomics

Agilent is a global leader in microarrays, scanners, and reagents used in a wide variety of genomic-based disease research experiments. Our SureSelect Target Enrichment System dominates the category, streamlining next generation sequencing studies worldwide. Agilent offers a wide range of catalog microarrays and a highly-developed capability to produce custom arrays featuring ink jet-based SurePrint fabrication and the eArray on-line design tool. All Agilent microarrays feature highly sensitive, selective 60-mer probes. With as many as eight arrays printed on a standard 1 x 3 in. slide, the cost per experiment becomes very affordable.



Life Science Informatics

Mirroring its extensive instrument portfolio, Agilent offers the industry's most extensive suite of bioinformatics software, helping users derive knowledge from complex genomic, proteomic, metabolomic and other biological data. This includes DNA Analytics for analyzing CGH, ChIP and methylation microarray data. The GeneSpring suite includes informatics software for microarray-based gene expression data, genotyping data, and GeneSpring MS, which are useful for analyzing mass spec data from proteomics and metabolomics experiments and comparing complex datasets to explore biological questions from multiple perspectives.



Lab Automation

To meet the skyrocketing demand for more throughput and automation, Agilent has substantially expanded its lab automation offerings. The Agilent line of liquid handlers and microplate processors are designed to streamline high-volume life science workflows. Agilent is also continually upgrading its advanced autosamplers for LC, GC, LC/MS and GC/MS, adding functionality and speed to reflect the performance of its advanced instruments.



Vacuum Technology

Agilent works with customers to solve vacuum challenges from experiments in high-energy physics to developing systems for producing flat panel displays. Agilent manufactures vacuum systems used in its own mass spectrometry instruments as well as those of other manufacturers. Agilent's vacuum technology has been proven by the most powerful physics experiment ever built, CERN's Large Hadron Collider machine, which was used in the discovery of the Higgs boson particle.



Get the Agilent Service Guarantee

Should your instrument require service while covered by an Agilent service agreement, we guarantee repair or we will replace your instrument for free.

No other company offers this level of commitment to keep your lab up and running at peak efficiency.



Laboratory decision makers and users ranked Agilent as their first choice for general laboratory compliance services.

Agilent Service and Support for Instrument Systems

Focus on what you do best

For over 40 years, Agilent has been building and maintaining the instruments you count on to stay competitive and successful. Trust us to protect your investment with a broad portfolio of services, backed by a global network of experienced service professionals dedicated to the productivity of your lab.

Agilent Advantage Service Plans

The best service available for your Agilent instruments

Agilent offers a flexible range of service plans so that you can choose the level of coverage that is best for your lab.

- **Agilent Advantage Gold** – Priority-one coverage for ultimate uptime and productivity
- **Agilent Advantage Silver** – Comprehensive coverage for dependable laboratory operations
- **Agilent Advantage Bronze** – Total repair coverage at a fixed annual price
- **Agilent Repair Service** – Basic coverage for reliable instrument repair

Agilent Advantage service plans include Agilent Remote Advisor for real-time remote monitoring and diagnostics. Through secure internet connections, you can interact with Agilent service professionals, receive detailed asset reports, and configure text or email alerts to notify you before problems occur – helping you to maximize instrument uptime and optimize laboratory workflows.

Agilent Compliance Services

Equipment qualification that meets the most stringent requirements

Enterprise Edition Compliance was developed to streamline compliance across your entire lab. Used globally in regulated labs, including standards organizations and regulatory agencies, Enterprise Edition enables you to:

- Improve qualification efficiency by automating protocols across platforms to ensure greater efficiency and minimize regulatory risk
- Standardize your entire compliance operation with robust test designs that work with all your instruments
- Add, remove or reconfigure tests based upon your unique user requirements
- Significantly reduce staff review time with consistently formatted, computer generated, tamper-proof reports

Agilent Education and Consulting Services



Our best minds, working for you

Make the most of your instrument with training and consulting from the same experts who designed the instruments, software and processes you use every day.

- Classroom and on-site training in instrument operation, troubleshooting and maintenance
- Customized consulting services to meet your lab's unique needs

The Agilent Value Promise – 10 Years of Guaranteed Value

In addition to continually evolving products, we offer something else unique to the industry – our 10-year value guarantee. The Agilent Value Promise guarantees you at least 10 years of instrument use from your date of purchase, or we will credit you with the residual value of the system toward an upgraded model. Not only does Agilent ensure a reliable purchase now, but we also ensure that your investment is just as valuable in the future.

For more detailed information,
please go to **www.agilent.com/chem/services**
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Technical Support at work for you



Have a hardware, software, application, instrument repair or troubleshooting question? Agilent's technical experts are available to answer your questions. With years of laboratory experience, our technical support specialists can provide in-depth knowledge and experience.

For questions pertaining to supplies found in this catalog, contact your local Agilent office or Authorized Agilent Distributor or visit **www.agilent.com/chem/techsupport**

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- Get fast sales and product assistance by phone. Simply use the scroll-down menu to select your country.
- Receive email assistance using our convenient online forms.

AGILENT ATOMIC SPECTROSCOPY PORTFOLIO

New Technologies, More Possibilities

Agilent has changed the atomic spectroscopy landscape. Remarkable innovations like the ICP-QQQ with unique MS/MS capabilities and MP-AES have added even more application opportunities to those already offered by Agilent ICP-MS, ICP-OES, and AA solutions.

Atomic Absorption (AA) Spectrometers



Extend your productivity, performance, and output boundaries

Agilent AA instruments are suitable for routine analysis where reliability and simple operation are vital. With the world's fastest flame AA, the world's most sensitive furnace AA, user-friendly software, and unbeaten instrument ruggedness, you can be sure you're getting answers you can trust.

Microwave Plasma-Atomic Absorption Spectrometer (MP-AES)



Say goodbye to expensive and flammable gases. Say hello to enhanced productivity.

The safer, cost efficient Agilent 4100 MP-AES has higher sensitivity with detection limits down to sub µg/L levels, speed that goes beyond flame Atomic Absorption, and no combustible gases. Best of all, the revolutionary Agilent 4100 MP-AES runs on air, without flammable or expensive gas supply, dramatically reducing your operating costs.



Agilent 700 Series ICP-OES

The world's most productive high-performance simultaneous ICP-OES

Our 700 Series ICP-OES features temperature-controlled optics with no moving parts, which ensures stability and long-term precision. In addition, Agilent's superior plasma performance allows direct analysis of samples ranging from organic solvents to industrial waste and brines, minimizing sample preparation times. With extended dynamic range, robust plasma, and one-step measurement of major, minor, and trace elements, the Agilent 700 Series ICP-OES gives you maximum confidence in your results.

Agilent 7700 Series ICP-MS

Extraordinary design, unparalleled performance

As ICP-MS has evolved into the premier technique for trace-metals analysis, Agilent has been at the forefront of development, design, and innovation. With our 7700 Series, Agilent continues to shape the ICP-MS landscape by increasing performance, reducing interferences and improving productivity – all while making the technology easier to use, maintain, and service.





Agilent 8800 Triple Quadrupole ICP-MS

Transforming ICP-MS technology

The Agilent 8800 is a truly ground-breaking instrument that transforms the ICP-MS landscape. Combining the proven capabilities of ICP-MS with the unique power of MS/MS, the 8800 Triple Quadrupole ICP-MS is a new analytical tool that can handle even the most difficult samples and applications with ease. With MS/MS, the 8800 Triple Quadrupole ICP-MS unlocks the potential of reaction cell chemistry to remove spectral interferences, delivering greater accuracy and more consistent results – particularly in complex sample matrices.

AGILENT MOLECULAR SPECTROSCOPY PORTFOLIO

Distinctly Better Solutions

Agilent provides an extensive portfolio of molecular spectroscopy solutions. With over 60 years of experience, Agilent brings you UV-Vis-NIR, FTIR, and Fluorescence Spectroscopy products engineered to help you discover, characterize, and test a variety of solid, liquid, organic and inorganic materials. Take advantage of powerful analysis routines for reliable results with built-in ease-of-use to ensure your productivity.



Agilent Cary Eclipse Fluorescence

Superior fluorescence sensitivity and fast kinetics

The Agilent Cary Eclipse Spectrophotometer with unique Xenon flash lamp technology delivers superior sensitivity with fiber optics, high signal-to-noise, and fast kinetic measurement capabilities. Combined with room light immunity and a wide range of options including polarization and a microplate reader, the Cary Eclipse is sensitive, accurate and flexible. With a range of measurement options, you can be sure that the Cary Eclipse is the ideal workhorse for all your analytical needs.

Agilent Cary 600 Series FTIR



Unrivaled analytical performance

The Agilent Cary 600 Series FTIR provides unrivaled analytical performance under real-world conditions. From bench-top instruments offering the highest spectral resolution and signal-to-noise (S/N) performance to dedicated portable analyzers, there is an instrument to suit every need and simplify your workflow. The Agilent Cary 660 FTIR is a high-performance spectrometer suitable for your routine and research analysis. The Agilent Cary 670/680 FTIR offer the highest performance for researchers in fields such as polymers/materials, pharmaceuticals, biotechnology and academia.

Agilent Cary 630 FTIR

Innovative, intuitive, reliable



The compact Agilent Cary 630 FTIR spectrometer is innovative, intuitive, and reliable, providing superior quantitative and qualitative information for routine analysis of solids, liquids, and gases. With a wide range of sample interfaces and high performing optics – including our unique DialPath for measuring liquids – the compact Agilent Cary 630 FTIR will give you accurate results – fast.



FTIR Microscopy and Imaging

See more than ever – fast

The Agilent Cary 610/620 FTIR microscope is the highest performing, most versatile FTIR microscope and spectrochemical imaging system available. Featuring the industry's largest field of view, unique field expanding optics, and the highest spatial resolution, Agilent FTIR Imaging systems analyze samples in seconds without compromise. Agilent's Cary 610 features a single element detector, making it ideal for characterizing small and heterogeneous samples. Agilent's Cary 620 utilizes true Focal Plane Array (FPA[1]) imaging, enabling you to collect hundreds to thousands of spectra simultaneously. Suitable for a diverse range of applications including polymers/materials, pharmaceuticals, biotechnology, chemicals and forensics, it provides an efficient workflow for intuitive and comprehensive imaging and data manipulation.

[1]This product is regulated by the U.S. Department of State under the International Traffic in Arms Regulations, 22 CFR 120-130 ("ITAR"). An export license from the U.S. government is therefore required to export this product from the United States, and other ITAR restrictions apply to the shipment, use, service and other aspects of this product and the FTIR instrument in which it is used.



UV-Vis and UV-Vis-NIR Spectrophotometers

You can do it all with a Cary spectrophotometer

The Agilent Cary range of UV-Vis and UV-Vis-NIR spectrophotometers are renowned for their superior performance, flexibility and ease-of-use. With unsurpassed photometric accuracy and a wide range of flexible accessories, the series is designed to meet your application requirements now and in the future. The instruments vary in capabilities from the budget-priced Cary 60 to the industry-leading Cary 6000i and from scanning spectrophotometers to the photodiode-array-based 8453.



Agilent hollow cathode lamps

Agilent uncoded hollow cathode lamps provide economical operation, superb performance and are compatible with all Agilent and most AA systems from other manufacturers (except PE). Agilent manufactures its' own lamps to ensure optimum purity, stable operation and long lifetime.

Turn to page 11.

Inert OneNeb universal nebulizer for ICP-OES and MP-AES



The OneNeb nebulizer is an inert, high efficiency universal nebulizer that is virtually indestructible, provides superb tolerance to high levels of dissolved solids and tolerant to most sample matrices determined using ICP-OES and MP-AES, including high acids, HF digests and organic solvents. It replaces a conventional glass concentric nebulizer and is compatible with most conventional cyclonic spray chambers.

Turn to pages 39-41.



ICP-MS Interface cones for superior, reproducible performance

Optimum performance of your ICP-MS is critically dependent on the size, shape and condition of the interface cones. They provide the ideal combination of matrix tolerance and high sensitivity. Agilent cones ensure optimum performance and maximum uptime. Don't risk performance problems with non genuine cones. Agilent also offers a trade-in credit against return of used Pt cones when purchasing replacements, ensuring cost savings for you and reducing your lab's environmental impact.

Turn to pages 70-71.

Atomic Absorption

Agilent provides a comprehensive range of consumables for Atomic Absorption, designed to maintain the high performance of your AA instrument. In addition, Agilent continues to research and manufacture an extensive range of single-element and solid-cathode multi-element lamps, plus high-intensity UltrAA lamps for superior cost-effective performance.



240FS AA Fast Sequential
Atomic Absorption Spectrometer

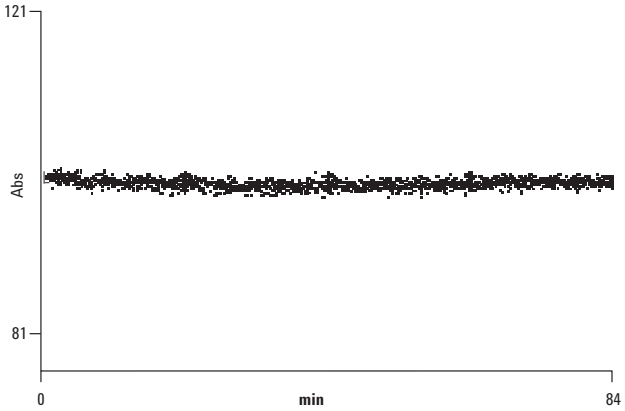
Hollow Cathode Lamps

Agilent hollow cathode lamps provide optimal signal-to-noise performance, permitting determinations at even lower levels with the most demanding applications. We manufacture our lamps and instruments to guarantee quality and reliability, and ensure they are optimized to deliver the best performance from your AA. Our lamps provide high spectral purity because of purified materials, an extended processing cycle and factory lamp conditioning procedures. These ensure minimal lamp warm-up time and good stability during operation.

Economical operation is assured by the long lamp life, typically exceeding 8000 mA hours, over and above our factory conditioning and testing service.

Consistent performance is also assured. All lamps are tested to confirm that the emission intensity exceeds a minimum level. No lamp leaves our factory without having satisfied our demanding test standards. These tests ensure that you receive quality lamps that can provide optimum signal-to-noise and stable performance throughout the life of the lamp.

H.C.L. Drift Test



The trace shows the variation in emission intensity from a lamp over 1 hour 24 minutes. The steady trace demonstrates the superb stability and low drift achieved when using our hollow cathode lamps (after a suitable warm-up period).



Coded Single Element Lamps

- High performance – manufactured from the purest cathode materials
- Easier to use – element coded for automatic lamp recognition, preventing errors
- Stable operation – extended processing ensures minimal warm-up and good lamp stability



Coded Single Element Lamp, Cu, 5610101400

Coded Single Element Lamps

Element	Part No.	Element	Part No.
Aluminum – Al	5610100100	Neodymium – Nd	5610103600
Antimony – Sb	5610100200	Nickel – Ni	5610103700
Arsenic – As	5610100300	Niobium – Nb	5610103800
Barium – Ba	5610100400	Osmium – Os	5610103900
Beryllium – Be	5610100500	Palladium – Pd	5610104000
Bismuth – Bi	5610100600	Phosphorus – P	5610107700
Boron – B	5610100700	Platinum – Pt	5610104100
Cadmium – Cd	5610100800	Potassium – K	5610104200
Calcium – Ca	5610101000	Praseodymium – Pr	5610104300
Cerium – Ce	5610101100	Rhenium – Re	5610104400
Cesium – Cs	5610100900	Rhodium – Rh	5610104500
Chromium – Cr	5610101200	Rubidium – Rb	5610104600
Cobalt – Co	5610101300	Ruthenium – Ru	5610104700
Copper – Cu	5610101400	Samarium – Sa	5610104800
Dysprosium – Dy	5610101500	Scandium – Sc	5610104900
Erbium – Er	5610101600	Selenium – Se	5610105000
Europium – Eu	5610101700	Silicon – Si	5610105100
Gadolinium – Gd	5610101800	Silver – Ag	5610105200
Gallium – Ga	5610101900	Sodium – Na	5610105300
Germanium – Ge	5610102000	Strontium – Sr	5610105400
Gold – Au	5610102100	Tantalum – Ta	5610105500
Hafnium – Hf	5610102200	Tellurium – Te	5610105600
Holmium – Ho	5610102300	Terbium – Tb	5610105700
Indium – In	5610102500	Thallium – Tl	5610105800
Iridium – Ir	5610102600	Thulium – Tm	5610106000
Iron – Fe	5610102700	Tin – Sn	5610106100
Lanthanum – La	5610102800	Titanium – Ti	5610106200
Lead – Pb	5610102900	Tungsten – W	5610106300
Lithium – Li	5610103000	Vanadium – V	5610106500
Lutetium – Lu	5610103100	Ytterbium – Yb	5610106600
Magnesium – Mg	5610103200	Yttrium – Y	5610106700
Manganese – Mn	5610103300	Zinc – Zn	5610106800
Mercury – Hg	5610103400	Zirconium – Zr	5610106900
Molybdenum – Mo	5610103500		

Uncoded Single Element Lamps

- No element coding for economical operation
- Compatible with all Agilent and most other AA systems
- Same excellent performance as provided by Agilent coded single element lamps

Uncoded Single Element Lamps

Element	Part No.	Element	Part No.
Aluminum – Al	5610122000	Neodymium – Nd	5610125500
Antimony – Sb	5610122100	Nickel – Ni	5610125600
Arsenic – As	5610122200	Niobium – Nb	5610125700
Barium – Ba	5610122300	Osmium – Os	5610125800
Beryllium – Be	5610122400	Palladium – Pd	5610125900
Bismuth – Bi	5610122500	Phosphorus – P	5610126000
Boron – B	5610122600	Platinum – Pt	5610126100
Cadmium – Cd	5610122700	Potassium – K	5610126200
Calcium – Ca	5610122900	Praseodymium – Pr	5610126300
Cerium – Ce	5610123000	Rhenium – Re	5610126400
Cesium – Cs	5610122800	Rhodium – Rh	5610126500
Chromium – Cr	5610123100	Rubidium – Rb	5610126600
Cobalt – Co	5610123200	Ruthenium – Ru	5610126700
Copper – Cu	5610123300	Samarium – Sa	5610126800
Dysprosium – Dy	5610123400	Scandium – Sc	5610126900
Erbium – Er	5610123500	Selenium – Se	5610127000
Europium – Eu	5610123600	Silicon – Si	5610127100
Gadolinium – Gd	5610123700	Silver – Ag	5610127200
Gallium – Ga	5610123800	Sodium – Na	5610127300
Germanium – Ge	5610123900	Strontium – Sr	5610127400
Gold – Au	5610124000	Tantalum – Ta	5610127500
Hafnium – Hf	5610124100	Tellurium – Te	5610127600
Holmium – Ho	5610124200	Terbium – Tb	5610127700
Indium – In	5610124400	Thallium – Tl	5610127800
Iridium – Ir	5610124500	Thulium – Tm	5610128000
Iron – Fe	5610124600	Tin – Sn	5610128100
Lanthanum – La	5610124700	Titanium – Ti	5610128200
Lead – Pb	5610124800	Tungsten – W	5610128300
Lithium – Li	5610124900	Vanadium – V	5610128500
Lutetium – Lu	5610125000	Ytterbium – Yb	5610128600
Magnesium – Mg	5610125100	Yttrium – Y	5610128700
Manganese – Mn	5610125200	Zinc – Zn	5610128800
Mercury – Hg	5610125300	Zirconium – Zr	5610128900
Molybdenum – Mo	5610125400		



Uncoded single element lamp, Au, 5610124000

Convenient Multi-Element Lamps

- Primary lines checked to avoid and minimize spectral interferences
- Save time by eliminating lamp warm-up, when switching elements
- Same excellent performance as provided by Agilent single element lamps



Coded multi-element lamp, Cu/Fe/Mn/Zn, 5610109600

Coded Multi-Element Lamps – for automatic lamp recognition, preventing errors

Element	Part No.
Aluminum/Calcium/Magnesium – Al/Ca/Mg	5610108800
Calcium/Magnesium – Ca/Mg	5610107100
Cobalt/Chromium/Copper/Iron/Manganese/Nickel – Co/Cr/Cu/Fe/Mn/Ni	5610107600
Cobalt/Molybdenum/Lead/Zinc – Co/Mo/Pb/Zn	5610109800
Copper/Iron/Manganese/Zinc – Cu/Fe/Mn/Zn	5610109600
Copper/Iron/Silicon/Zinc – Cu/Fe/Si/Zn	5610109700
Copper/Zinc – Cu/Zn	5610119200
Silver/Cadmium/Lead/Zinc – Ag/Cd/Pb/Zn	5610108700
Silver/Chromium/Copper/Iron/Nickel – Ag/Cr/Cu/Fe/Ni	5610109500
Sodium/Potassium – Na/K	5610107000



Uncoded multi-element lamp, Co/Cr/Cu/Fe/Mn/Ni, 5610129200

Uncoded Multi-Element Lamps – for economical operation and universal compatibility

Element	Part No.
Barium/Chromium – Ba/Cr	5610133500
Calcium/Magnesium – Ca/Mg	5610129100
Cobalt/Chromium/Copper/Iron/Manganese/Nickel – Co/Cr/Cu/Fe/Mn/Ni	5610129200
Copper/Zinc – Cu/Zn	5610129300
Sodium/Potassium – Na/K	5610129000

High Intensity UltrAA Coded Single Element Lamps



High intensity UltrAA lamp, As, 5610108100

- Emission intensity is increased by 3-5 times, for lower noise
- Sensitivity is increased by up to 40%, due to the sharper emission profile, allowing determinations at even lower levels
- Element coded for automatic lamp recognition, preventing errors

UltrAA lamps are high-intensity, boosted discharge hollow cathode lamps. They use the standard lamp current, but apply an additional boost discharge within the lamp to increase the emission intensity. The boost current is supplied from a secondary control module (either integrated into the instrument or supplied from an external module).

UltrAA lamps are manufactured from the purest cathode materials, and every lamp is QA/QC tested to guarantee performance and reliability. These lamps are coded for automatic lamp recognition (except for 50/55 AA, SpectrAA-50/55 and SpectrAA-5 models), eliminating the risk of time-consuming errors when reprogramming the lamp position.

High Intensity UltrAA Coded Single Element Lamps

Element	Part No.
Antimony – Sb	5610108000
Arsenic – As	5610108100
Bismuth – Bi	5610134200
Boron – B	5610135700
Cobalt – Co	5610134100
Copper – Cu	5610109100
Germanium – Ge	5610134300
Gold – Au	5610109000
Iron – Fe	5610108600
Lead – Pb	5610108200
Manganese – Mn	5610133700
Nickel – Ni	5610108500
Palladium – Pd	5610135800
Platinum – Pt	5610135900
Selenium – Se	5610108300
Silicon – Si	5610133400
Tellurium – Te	5610134000
Thallium – Tl	5610108400
Tin – Sn	5610133900

High Intensity UltrAA Multi-Element Lamps

- Unique combinations of compatible elements extend the versatility and performance of any AA spectrometer
- Save time by avoiding the need to warm up a new lamp
- Same excellent performance as provided by Agilent single element lamps



High intensity UltrAA lamp, Ag/Cd/Pb/Zn, 5610108900



High intensity UltrAA lamp, As/Cu/Fe, 5610135300

High Intensity UltrAA Coded Multi-Element Lamps

Element	Part No.
Aluminum/Calcium/Magnesium – Al/Ca/Mg	5610133600
Cobalt/Chromium/Copper/Iron/Manganese/Nickel – Co/Cr/Cu/Fe/Mn/Ni	5610134500
Cobalt/Molybdenum/Lead/Zinc – Co/Mo/Pb/Zn	5610135200
Copper/Iron/Manganese/Zinc – Cu/Fe/Mn/Zn	5610135000
Copper/ Iron/Silicon/Zinc – Cu/Fe/Si/Zn	5610135100
Copper/Zinc – Cu/Zn	5610134600
Silver/Cadmium/Lead/ Zinc – Ag/Cd/Pb/Zn	5610108900
Silver/Chromium/Copper/Iron/Nickel – Ag/Cr/Cu/Fe/Ni	5610134900

High Intensity UltrAA Uncoded Multi-Element Lamps

Element	Part No.
Arsenic/Copper/Iron – As/Cu/Fe	5610135300
Nickel/Selenium – Ni/Se	5610135400

Background Correction Lamps

Deuterium background correction lamps provide accurate and fast correction over the widest possible absorbance range and are QC-selected for optimal lifetime.



Deuterium lamp, 5610021800

Background Correction Lamps

Element	Part No.
Deuterium background correction lamp for AA systems	5610021800

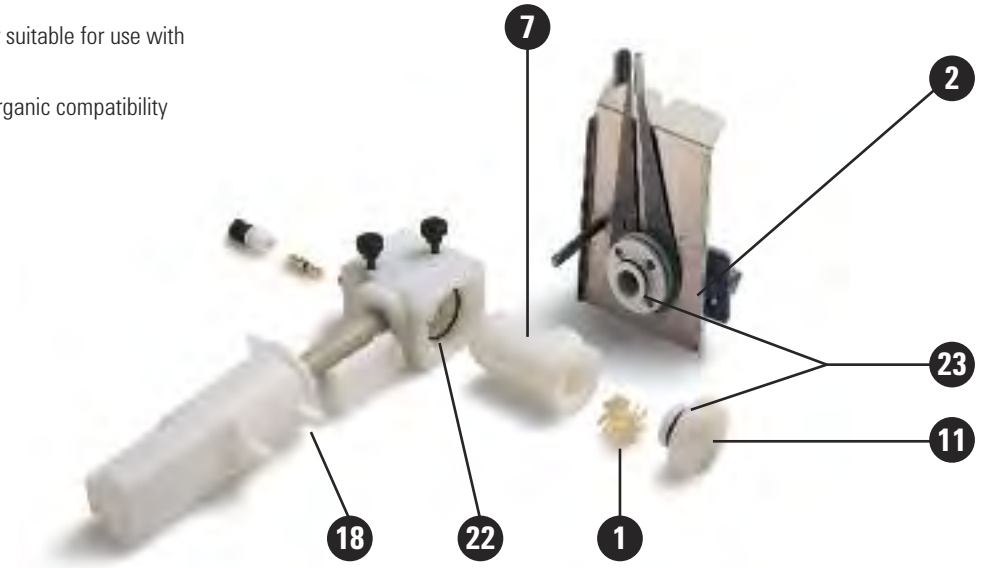
TIPS & TOOLS

Deuterium background correction is only usable over the range from 185 to ~ 430 nm. At higher wavelengths, there is no usable output from the lamp

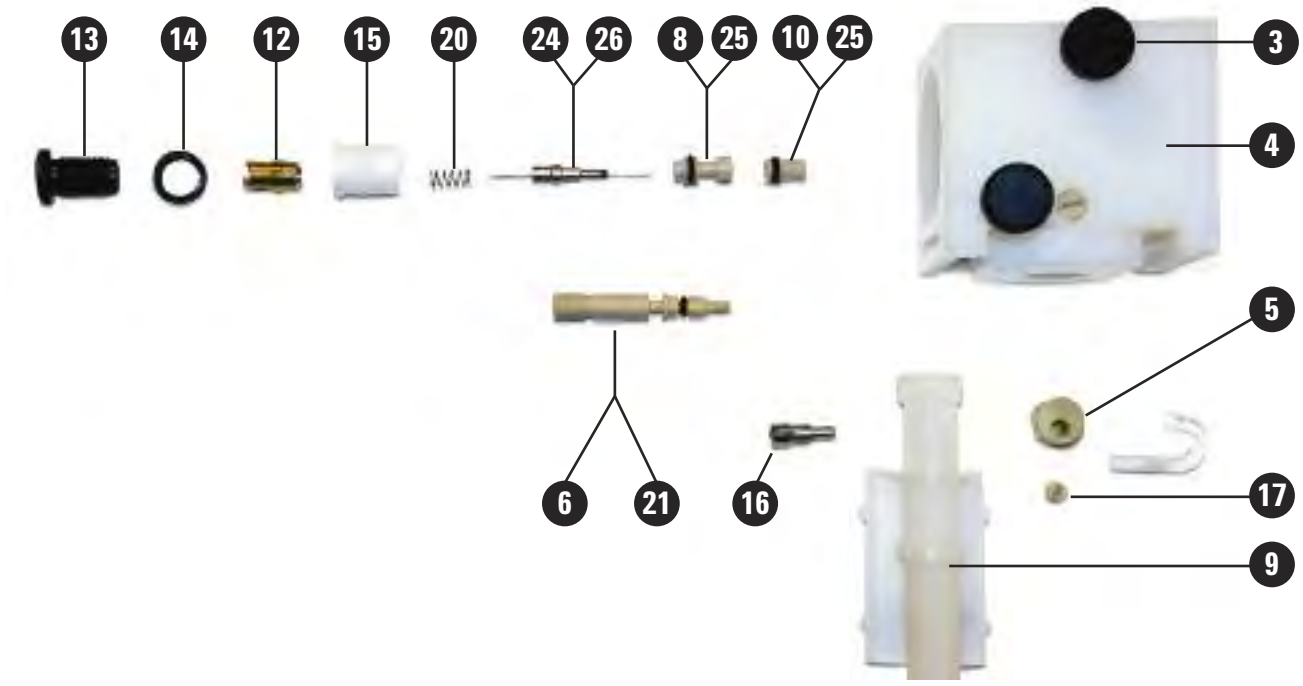
Flame Atomization System

Mark 7 Spray Chambers

- Simple-to-use twist and lock assembly makes for easy cleaning and routine maintenance
- Flexible operation with the capability to tune performance using the externally adjustable impact bead, fit mixing paddles for better precision, or both
- Inert construction makes spray chamber suitable for use with aqueous and organic solutions
- Fit organic resistant O-rings to ensure organic compatibility



Complete Mark 7 spray chamber assembly, 110634490



Exploded view of nebulizer block from the Mark 7 spray chamber

Item — Mark 7 Spray Chamber

	Description	Part No.
	Complete Mark 7 spray chamber assembly	110634490
1	Mixing paddle, fluorinated, 1/pk	110637000
	Mixing paddles, fluorinated, 5/pk	9910093600
2	Mark 7 air/acetylene burner	210164000
	Mark 7 nitrous oxide/acetylene burner	210164100
7	Spray chamber body, fluorinated	6210092090
11	Pressure relief bung, fluorinated	1610118800
18	Kit, fluorinated liquid trap, drain tube with integrated float and magnet	9910105800
22	O-ring spray chamber, nitrile	6910037000
22	O-ring spray chamber, organic solvent compatible	6910036800
23	O-ring spray chamber bung, nitrile	6910010500
23	O-ring spray chamber bung organic solvent compatible	6910013100

Item — Nebulizer components for Mark 7 Spray Chamber

	Description	Part No.
3	Spray chamber screw mounting	1510226600
4	Nebulizer block, fluorinated (excludes integrated nebulizer)	9910093100
5	Clamp bead adjuster	810133400
6	Screw bead adjuster	1510225000
8	Nebulizer capillary guide	810134400
9	Kit, fluorinated liquid trap, drain tube with integrated float and magnet	9910105800
10	Venturi nebulizer, PEEK	1610117390
12	Clamp bush guide	810134300
13	Screw capillary adjuster	1510226800

(Continued)

Item — Nebulizer components for Mark 7 Spray Chamber

	Description	Part No.
14	Nut lock M12 x 0.5	1510226700
15	Bearing bush nebulizer	310046600
16	Screw lock dog point M8	1510226000
17	Screw M6 x 6 Ertalyte	1510226500
18	Kit, fluorinated liquid trap, drain tube with integrated float and magnet	9910105800
20	Spring nebulizer	4610017400
21	O-ring screw bead adjuster, nitrile	6910000100
21	O-ring screw bead adjuster organic solvent compatible	6910036900
24	O-ring 1/32 in id x 3/32 in od x 1/32 in nitrile	6910009700
25	O-ring 3/16 in id x 5/16 in od x 1/16 in nitrile	6910009800
25	O-ring 3/16 in id x 5/16 in od x 1/16 in organic solvent compatible	6910013600
26	Nebulizer Capillary Kit Includes capillary assembly, capillary guide, nebulizer spring, nebulizer cleaning wire, Hi-Vac capillary tubing and standard capillary tubing	9910093000
	Glass impact beads, 5/pk	9910025700
	PTFE impact beads (for use with HF digests), 5/pk	9910053300
	Mark 7 O-ring kit, for aqueous samples Includes O-rings to suit screw bead adjuster (1 ea), nebulizer capillary assembly (1 ea), capillary guide and venturi (7 ea), spray chamber bung and burner (3 ea), and nebulizer block (1 ea).	9910093400
	Mark 7 O-ring kit, for organic solvents Includes O-rings to suit screw bead adjuster (1 ea), nebulizer capillary assembly (1 ea), capillary guide and venturi (2 ea), spray chamber bung and burner (2 ea), and nebulizer block (1 ea).	9910093500
	Drain tubing for aqueous solutions, per meter, 2 m length required	3710009200
	Venturi extraction tool	7210027700
	Nebulizer capillary extraction tool	7210027600
	Stand for Mark V, VI and 7 spray chambers	9910049800



Mark 7 Flame Atomization System Operating Kit

Typical operation supplies required for moderate use of Flame Atomic Absorption Spectrometer Systems with Mark 7 spray chamber.

Mark 7 Flame Atomization System Operating Kit

Description	Kit Quantity	Unit	Part No.
Mark 7 operating supplies kit			190034100
Kit Contents			
Venturi nebulizer, PEEK	1		1610117390
Nebulizer Capillary Kit Includes capillary assembly, capillary guide, nebulizer spring, nebulizer cleaning wire, Hi-Vac capillary tubing and standard capillary tubing	1		9910093000
Nebulizer block, fluorinated (excludes integrated nebulizer)	4		9910093100
Glass impact beads	1	5/pk	9910025700
High solids capillary tubing	1	3 m	9910024800
Mark 7 O-ring kit, for aqueous samples Includes O-rings to suit screw bead adjuster (1 ea), nebulizer capillary assembly (1 ea), capillary guide and venturi (7 ea), spray chamber bung and burner (3 ea), and nebulizer block (1 ea).	1		9910093400
Mixing paddles, fluorinated	1	5/pk	9910093600
Burner cleaner strips	1	100/pk	9910053900

TIPS & TOOLS

The best way to clean the burner is to polish the burner inside the burner slot using the burner cleaning strips and a liquid metal polish (like "Brasso"). Then clean the outside of the burner slot with a clean rag. Then sonicate for a few minutes in a detergent solution, rinse and dry. Ensure the burner is dry before refitting and igniting the flame. To avoid damaging the bead when replacing, ensure the adjusting screw is turned full clockwise. Then fit the bead and tighten the locking screw.

Burners

The Mark 7 burner fits all current AA instruments and the earlier SpectrAA series instruments and is compatible with the Mark V, VI and 7 spray chambers.

Burners

Description	Part No.
Mark 7 air/acetylene burner	210164000
Mark 7 nitrous oxide/acetylene burner	210164100
Burner cleaner strips, 100/pk	9910053900



Mark 7 air/acetylene burner, 210164000

Nebulizers and Nebulizer Maintenance

Description	Use With	Part No.
Barrel nebulizer, adjustable	Mark V and VI spray chambers	9910043500
Barrel nebulizer, high vacuum	Mark V and VI spray chambers	9910043700
Spare tantalum venturi kit	Mark V and VI spray chambers	9910024400
Pt/Ir capillary spares kit Includes capillary assembly, capillary guide, nebulizer spring, nebulizer tool, nebulizer cleaning wire, Hi-Vac capillary tubing and standard capillary tubing	Mark V and VI spray chambers	9910024500
High solids capillary tubing, 3 m	Mark V, VI and 7 spray chambers	9910024800
High vacuum capillary tubing, 3/pk	Mark V, VI and 7 spray chambers	9910044000
Nebulizer Capillary Kit Includes capillary assembly, capillary guide, nebulizer spring, nebulizer cleaning wire, Hi-Vac capillary tubing and standard capillary tubing	Mark 7 spray chamber	9910093000
Nebulizer cleaning wire, 3 x 0.3 m lengths	Mark V, VI and 7 spray chambers	9910024700
Nebulizer O-ring kit	Barrel nebulizers	9910035200



Capillary spares kit, 9910024500



High solids capillary tubing, 9910024800



Nebulizer cleaning wire, 9910024700

Impact Beads

Description	Use With	Unit	Part No.
Glass impact beads	Mark V/VI/7 spray chambers	5/pk	9910025700
PTFE impact beads (for use with HF digests)	Mark V/VI/7 spray chambers	5/pk	9910053300



Glass impact beads, 9910025700



PTFE impact beads, 9910053300



High vacuum capillary tubing, 9910044000

Mark VI Flame Atomization System Operating Kit

Typical operation supplies required for moderate use of Flame Atomic Absorption Spectrometer Systems with the Mark VI spray chamber.

Mark VI Flame Atomization System Operating Kit – For use with aqueous samples

Description	Kit Quantity	Unit	Part No.
Mark VI operating supplies kit			190024800
Kit Contents			
Spare tantalum venturi kit	1		9910024400
Pt/Ir capillary spares kit	1		9910024500
Barrel nebulizer, high vacuum	1	1/ea	9910043700
Nebulizer O-ring kit	1		9910035200
High vacuum capillary tubing	1	3 m	9910044000
O-ring/gasket kit	1		9910026500
Mixing paddles	1	5/pk	9910063600
Burner cleaner strips	1	100/pk	9910053900

Mark VI Standard Spray Chambers

The Mark VI spray chamber was used with older model instruments. It has many of the design features and benefits of the Mark 7 design.

Mark VI Standard Spray Chambers – For use with aqueous samples

Description	Part No.
O-ring/gasket kit	9910026500
Mixing paddles, 5/pk	9910063600
Liquid trap and float assembly	110315690
Drain tubing for aqueous solutions, per meter, 2 m length required	3710009200
Nebulizer bung assembly Requires nebulizer	110351990
Complete Mark VI spray chamber assembly Requires nebulizer	110351790



Liquid trap and float assembly, 110315690



Liquid trap and float assembly, 9910061600

Mark VI Universal Spray Chamber – For use with organic solvents*

Description	Part No.
O-ring/gasket kit	9910045700
Mixing paddles, 5/pk	9910063600
Liquid trap and float assembly	9910061600
Nebulizer bung assembly Requires nebulizer	9910063200
Pressure relief bung	9910063100
Drain tubing for organic solvents, nitrile rubber, per meter, 2 m length required	3710011700
Complete universal spray chamber and liquid trap assembly Requires nebulizer	9910061100

*Also suitable for use with aqueous solutions



Nebulizer bung assembly, 9910063200



SPS 3 Autosampler for AA, MP-AES, ICP-OES and UV/Vis instruments (shown with diluter fitted)

SPS 3 Autosampler Supplies

Agilent's fast spectroscopy autosampler meets the diverse requirements of high-throughput analytical laboratories.

SPS 3 Start-up and Operating Supplies Kit

Description	Kit Quantity	Unit	Part No.
SPS 3 start-up and operating supplies kit			190065400
Kit Contents			
0.8 mm id inert probe, PTFE sleeved	1	Each	9910111900
Pump tubing, PVC Solvaflex, 3-bridged, gray/gray	2	12/pk	3710049000
Silicon tubing, 1 mm id, per m	1	Each	3710026400
Nalgene tubing, per m	2	Meter	3710031500
Nebulizer capillary tubing, per m	2	Meter	2410020500
Rinse reservoir, 12 L	1	Each	6610011800
Polypropylene tubes, 16 mm od	1	1000/pk	190049700
Sample rack for 30 mm od tubes, 21 positions	3	Each	6610026600
Polypropylene sample tubes, 50 mL	1	500/pk	190065200



Autosampler cover, 910245400

Optional Accessories for SPS 3

Description	Comments	Part No.
Autosampler cover, transparent	Prevents contamination of samples and standards from dust and drafts Has provision for optional purge connection and/or exhaust outlet to enable removal of corrosive or solvent fumes	910245400
Internal purge kit	Includes all components required to purge inside of cover with inert gas Includes flow meter, regulator, tubing and instructions	9910120200
Exhaust port connection	Installs on rear panel of cover and allows safe removal of corrosive or solvent fumes; suitable for connection to 2 in (50 mm) diameter exhaust ducting	9910130600



Internal purge kit, 9910120200

Test Tubes

Description	Unit	Part No.
Polypropylene tubes, 16 mm od	125/pk	3710051100
	1000/pk	190049700
Polypropylene test tubes, 17 mm od, 16.5 mL	1000/pk	00000001600L



Polypropylene test tubes, 3710051100

Digestion Tubes

Description	Unit	Part No.
Digestion tubes, screw capped, 30 mm od, 50 mL polyethylene	500/pk	190047900



Digestion tubes, screw capped, 190047900

Probes

Description	Part No.
0.8 mm id inert probe, PTFE sleeved For use with AA instruments (without diluter)	9910111900
1.0 mm id inert probe, PTFE sleeved For use with AA, MP-AES, ICP-OES and UV/Vis instruments (or with diluter)	9910112000
1.3 mm id inert probe, PTFE sleeved For use with viscous solutions and high matrix samples	9910130900



0.8 mm id inert probe, PTFE sleeved, 9910111900



Sample rack, 6610026400



Standard rack for 29 mm od tubes, 810167000



Rack overlay for 60 position sample rack, 6610026100

Racks

Description	Part No.
Sample Racks	
Sample rack for 13 mm od tubes, 90 positions	6610026400
Sample rack for 16 mm od tubes, 60 positions	6610025400
Sample rack for 20 mm od tubes, 40 positions	6610025500
Sample rack for 25 mm od tubes, 24 positions	6610026500
Sample rack for 30 mm od tubes, 21 positions	6610026600
Spare Standards Racks	
Standard rack for 16 mm od tubes, 11 positions	810166900
Standard rack for 29 mm od tubes, 6 positions	810167000
Rack Overlays for Sample Racks	
Rack overlay for 60 position sample rack Allows 13 mm od tubes to be used in 60 position rack (Qty 2 recommended per rack)	6610026100
Rack overlay for 40 position sample rack Allows 18 mm od tubes to be used in 40 position rack (Qty 2 recommended per rack)	6610026000

Diluter Spares

Description	Part No.
Syringe-to-valve tube kit	9910062700
Replacement tubing kit for auto diluter, screw fittings Includes all tubing and connectors	9910083100
Rinse reservoir, 12 L	6610011800



Rinse reservoir, 6610011800

Diluter Maintenance Supplies

Description	Part No.
Syringe, 20 mL	4710003000
Syringe-to-valve tube kit	9910062700
Replacement tubing kit for auto diluter, bung fittings Includes all tubing and connectors	9910059100
Replacement tubing kit for auto diluter, screw fittings Includes all tubing and connectors	9910083100

Tubing

Description	Use With	Part No.
Nalgene tubing, per m	For outlet rinse vessel	3710031500
Pump tubing, PVC Solvaflex, 3-bridged, gray/gray, 12/pk	For use with aqueous samples on AA, MP-AES and ICP-OES instruments	3710049000
Pump tubing Santoprene, 3-bridged, gray/gray, 12/pk	For ketone-based solvents on AA, MP-AES and ICP-OES instruments	3710057500
Replacement spill tray		6610025100



Pump tubing, PVC Solvaflex, 3710049000



Replacement spill tray, 6610025100



SIPS 20 Sample Introduction Pump System for flame AA



SIPS 10/20 pump tubing, 9910075900



Constant pressure head bottle, rectangular, 110533590

Pump bands, 9910077600



SIPS 20 3-way tee piece assembly, 110585790

SIPS 10/20 Supplies

The Sample Introduction Pump System (SIPS) is an innovative sample introduction and dilution system for flame AA that eliminates the task of manual preparation of multiple calibration standards, providing fast, accurate on-line dilution of over range samples.

SIPS 10/20 Maintenance Supplies

Description	Part No.
SIPS 10/20 pump tubing, 6/pk	9910075900
Tubing kit, to connect constant pressure head bottle to tee piece	9910076100
Constant pressure head bottle, rectangular, 1 L	110766690
Constant pressure head bottle, rectangular, 500 mL	110533590
Pump bands, 10/pk	9910077600
SIPS 10 2-way tee piece assembly	110651090
SIPS 20 3-way tee piece assembly	110585790

SIPS 10/20 Operating Supplies Kit

Description	Kit Contents	Part No.
SIPS 10/20 operating supplies kit	Includes 2 constant pressure bottles, 500 mL (110533590); 1 L diluent bottle (6610014600); SIPS 3-way tee piece assembly for SIPS 20 (110585790); SIPS pump tubing, 6/pk (9910075900); SIPS tubing kit (9910076100); SIPS pump bands, 10/pk (9910077600)	190025400

VGA 77 Supplies

The Vapor Generation Accessory (VGA 77) is ideal for µg/L determination of Hg and the hydride-forming elements.



VGA 77 Vapor Generation Accessory

Hydride Modules*

Description	Part No.
AA hydride module VGA 77	9910062100
ICP hydride module VGA 77P	9910062200

*A separate hydride module should be used exclusively for Hg determinations to reduce cross contamination



AA hydride module VGA 77, 9910062100

Operating Supplies Kit

Description	Kit Contents	Part No.
VGA 77 operating supplies kit	Includes 2 Tubing and connectors (9910061900); 2 packs pump tubes, black/black, 12/pk (3710027200); 2 packs pump tubes, purple/black, 12/pk (3710027300); pump bed kit (9910050700); gas liquid separator (9910071100); mercury flow-through cell (9910040700); 2 boxes hydride absorption cells, 2/box (9910040000); spare plumbing module (9910062100)	190025200

Absorption Cells

Description	Use With	Part No.
Flow through mercury absorption cell, single cell	VGA-76/77	9910040700
Hydride absorption cells, quartz, 2/pk	VGA-76/77	9910040000



Flow through mercury absorption cell, 9910040700



Hydride absorption cells, quartz, 9910040000



Tubing and connector kit, 9910061900



Transfer Tubing, VGA-76/77, 3710026390



AA Gas-liquid separator for VGA 77, 9910071100

Tubing

Description	Use With	Part No.
Reagent pump tubing, black/black, 12/pk	VGA-76/77	3710027200
Sample pump tubing, purple/black, 12/pk	VGA-76/77	3710027300
Tubing and connector kit Includes 1 sample and 2 reagent peristaltic pump tubes, inlet tubing for sample and reagents (3 x 0.4 m lengths), connectors, acid resistant connecting tubing, gas inlet tubing to gas-liquid separator, reaction coil and O-ring strap to secure gas-liquid separator	VGA 77	9910061900
Drain tubing for gas-liquid separator to waste per meter, 2 m length required	VGA-76/77	3710009200
Transfer tubing Gas-liquid separator to absorption cell	VGA-76/77	3710026390
Tubing and connector kit Includes 1 sample and 2 reagent peristaltic pump tubes, inlet tubing for sample and reagents (3 x 0.4 m lengths), connectors, acid resistant connecting tubing, gas inlet tubing to gas-liquid separator and reaction coil	VGA-76	9910039900

Gas-liquid Separators

Description	Use With	Part No.
Gas-liquid separator	VGA 77 for AA	9910071100
	VGA 77P for ICP	9910062000
	VGA-76 for AA	9910040200
	VGA-76 for ICP	9910056900

VGA-76/77 Miscellaneous Supplies

Description	Part No.
Reagent vessel and cap, PE 500 mL	6610011600
Pump tube beds kit	9910050700
VGA cell support for Mark 7 burner	110654990
VGA cell support for Mark VI burner	110375990
Bracket to mount VGA 77 on the 700 Series ICP-OES	410427590
Spare thumbscrews to secure VGA 77 mounting bracket to 700 Series ICP-OES (Qty 4 required)	1510267900



Gas-liquid separator, 9910062000

Reagents for VGA-76/77 Operation

Description	Part No.
Sodium tetrahydroborate, 500 g	8210029100



Pump tube beds kit, 9910050700



280Z dedicated graphite furnace
Atomic Absorption Spectrometer

Graphite Furnace Parts and Supplies

Maximize your uptime by keeping one of these kits handy.



GTA 120 Deuterium furnace operating supplies kit, 190067900

Kits for GTA 120 Furnace System

Description			Part No.
GTA 120 Deuterium furnace operating supplies kit			190067900
Kit Contents	**Kit Quantity**	**Unit**	**Part No.**
Graphite electrodes For GTA 120	2	1 pair	6310003400
Graphite shroud For GTA 120	1		6310003100
Omega platform tubes, pyrolytically coated	5	10/pk	6310003700
Syringe, 100 µL	1		4710003200
Capillary assembly	1	5/pk	9910115100
Glass beakers, 25 mL	1	5/pk	6610008200
Sample vials, 2 mL, conical polyethylene	2	1000/pk	9910028200



GTA 110 Deuterium furnace operating supplies kit, 190024900

Kits for GTA 100/GTA 110 Furnace Systems

Description			Part No.
GTA 110 Deuterium furnace operating supplies kit			190024900
GTA 110 Zeeman furnace operating supplies kit			190025000
Kit Contents	**Kit Quantity**	**Unit**	**Part No.**
Omega platform tubes, pyrolytically coated	5	10/pk	6310003700
Syringe, 100 µL	1		4710002300
Plunger for 100 µL syringe, PTFE tipped	1		4710003100
Capillary assembly	1	5/pk	9910032300
Glass beakers, 25 mL	1	5/pk	6610008200
Sample vials, 2 mL, conical polyethylene	2	1000/pk	9910028200
And			
Graphite electrodes For GTA-95/96/97/100/110	2	1 pair	6310001600
Or			
Graphite electrodes For GTA-96/100/110 Zeeman	2	1 pair	6310001700



Graphite shroud for GTA 120, 6310003100

Graphite Tubes and Platforms

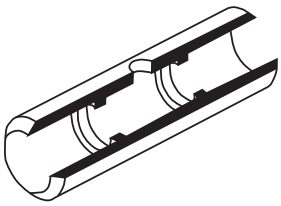
- High purity graphite reduces spurious absorption from trace contaminants and improves signal-to-noise
- Every tube is hand-checked for reproducible and reliable results
- Perform fewer repeats and increase productivity

Graphite tubes are quality tested to ensure each batch passes our demanding performance specifications for contamination, sensitivity, precision, electrical resistance and lifetime.

Use partitioned tubes for general purpose work and when you need the best detection limits with samples that have low background. These are also ideal when measuring organic solutions, or samples with low viscosity that may spread throughout the tube, potentially degrading precision.

Omega platform tubes combine ease-of-use with perfect atomization: the integrated platform ensures the perfect thermal profile to produce dense atom clouds for good signal-to-noise ratios and the best detection limits.

The combination of the solid pyrolytic platforms and plateau tubes provide continuity with older methods, and gives the best platform effect. This ensures best performance with samples that have high background or interferences. More operator skill is required for best results.



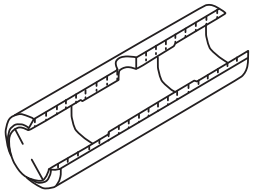
Partitioned tubes, 6310001200



Omega platform tubes, 6310003700



Solid pyrolytic graphite platforms, 6310001300



Plateau tubes, 6310001100

Graphite Tubes and Platforms

Description	Unit	Part No.
Partitioned tubes, pyrolytically coated	10/pk	6310001200
Omega platform tubes, pyrolytically coated	10/pk	6310003700
Solid pyrolytic graphite platforms Only for plateau tubes, 6310001100	10/pk	6310001300
Plateau tubes, pyrolytically coated Only for pyrolytic platforms, 6310001300	10/pk	6310001100

Graphite Electrodes



Graphite electrodes for GTA 120, 6310003400



Graphite electrodes for GTA-95/96/97/100/110, 6310001600

- Spare electrodes maximize uptime
- Good electrical contact ensures optimum performance and maximize tube life
- High purity graphite reduces spurious absorption from trace contaminants and improves signal-to-noise

Graphite Electrodes

Description	Unit	Part No.
Graphite electrodes for GTA 120	1 pair	6310003400
Graphite electrodes for GTA 120 Zeeman	1 pair	6310003500
Graphite electrodes for GTA-95/96/97/100/110	1 pair	6310001600
Graphite electrodes for GTA-96/100/110 Zeeman	1 pair	6310001700

TIPS & TOOLS

Easy, Reliable pH Testing, Designed for Chromatographers

Agilent now offers a full line of pH meters and electrodes. Designed for chromatographers, these pH meters offer intuitive user design and exceptional ruggedness for your lab. Learn more at **www.agilent.com/chem/phmeters**



Graphite Shrouds

Graphite Shrouds

Description	Part No.
Graphite shroud for GTA 120	6310003100
Graphite shroud for GTA 120 Zeeman	6310003600
Graphite shroud for GTA-95/96/97/100/110	6310001800
Graphite shroud for GTA-96/100/110 Zeeman	6310001900



Graphite shroud for GTA 120, 6310003100



Graphite shroud for GTA 120 Zeeman, 6310003600

Graphite Furnace Tools

Graphite Furnace Tools

Description	Part No.
Electrode extractor tool for GTA-96/97/100/110/120, 2 draw bars	9910031200
Shroud removal tool for GTA-96/97/100/110/120	9910033300
Electrode extractor tool for GTA-96/100/110/120 Zeeman, 2 draw bars	9910049300
Shroud removal tool for GTA-96/100/110/120 Zeeman	9910050400



Electrode extractor tool, 9910031200

Programmable Sample Dispensers (PSD) used with Graphite Furnace AA



Sample vials, 2 mL, 9910028200



Glass beakers, 6610008200



Plastic beakers, 9910115600



Carousel adaptors, 9910054200



High capacity carousel kit, 9910113100

Spares and Supplies

Description	Use With	Part No.
Sample vials, 1.1 mL, polyethylene, 2000/pk	PSD 120 high capacity sample carousel	6610025900
Sample vials, 2 mL, conical polyethylene, 1000/pk	PSD-95/96/97/100/120	9910028200
Glass beakers, 25 mL, 5/pk	PSD-95/96/97/100	6610008200
Plastic beakers, 10 mL, 5/pk	PSD 120	9910115600
Rinse bottle, Nalgene, 1 L	PSD-97/100/120	6610012100
Cap for rinse bottle	PSD-97/100/120	1610094600
Capillary assembly, 5/pk	PSD 120	9910115100
	PSD-95/96/97/100	9910032300
Carousel adaptors, 5/pk Allows use of 2 mL sample vials in the central carousel locations	PSD-96/97/100	9910054200
Syringe, 100 µL	PSD 120	4710003200
	PSD-95/96/97/100	4710002300
Plunger for 100 µL syringe, PTFE tipped	PSD-95/96/97/100/120	4710003100
Replacement carousel plate	PSD 100/120	5410029700
Replacement carousel plate for 130 sample carousel	PSD 120	5410046300
Furnace workhead viewing mirror	GTA 110/120	9910091200
Furnace workhead viewing mirror	GTA-96/97/100	9910032700

Optional Accessories for Graphite Furnace AAS

Description	Use With	Part No.
GTA viewing and fume extraction accessory Mounts on sample compartment to remove fumes from the GTA workhead and improves viewing of the tube for easier alignment; connects to a 150 mm (6 in.) or 125 mm (5 in.) exhaust duct	GTA 120	210190000
High capacity carousel kit Includes carousel disk (130 samples), 1.1 mL vials (2000/pk) and five 10mL plastic beakers for bulk solutions	GTA 120	9910113100
Bubble-free syringe update kit	PSD-97/100	9910116800

ICP-OES

Agilent is the recognized world leader and innovator in ICP-OES with thousands of systems installed worldwide. Agilent's 700 Series ICP-OES systems feature our unique CCD detector, innovative ICP Expert II software, and your choice of axial or radial configurations. Our ICP range can handle both routine and the most challenging applications. A choice of sample introduction options and a wide range of performance and productivity enhancing accessories and options make Agilent systems the fastest and most flexible ICP-OES systems available today. Agilent's 700 series ICP-OES are compatible with a range of supplies designed to extend the capabilities of the instruments.



715 Series ICP-OES Spectrometer

Sample Compartment Spray Chambers and Brackets

- Single-pass glass cyclonic spray chamber for good signal-to-noise performance with excellent washout
- Double-pass glass cyclonic spray chamber provides improved plasma stability with organic and high TDS samples
- Sturman-Masters spray chamber is inert, minimizes interferences and improves stability with high TDS samples

Sample Compartment Kits

Description	Part No.	For axial ICP	For radial ICP
Sample compartment O-ring kit Includes all O-rings for spray chamber area, demountable torch, and ASA	9910057200		
Sample compartment/torch box tube connection kit Includes all tubing for spray chamber area and spare nipples for drain (excluding pump tubing)	9910057100		
Tubing and connectors kit Includes two packs of standard peristaltic pump tubing, snap connectors and other connectors used in sample compartment and torch box area; ideal for spare start-up kit		9910097500	9910105400
Molding drip tray for 700 Series ICP-OES	6210113000		



Sample compartment O-ring kit, 9910057200



Sample compartment/torch box tube connection kit, 9910057100

Sample Compartment Spray Chambers and Brackets

Description	Use With	Part No.
Single-pass glass cyclonic spray chamber for axial ICP-OES Needs mounting bracket	Routine aqueous samples where best signal-to-noise performance is required	2010081700
Double-pass glass cyclonic spray chamber, suitable for all ICP-OES Needs mounting bracket	Organic solvents and high matrix or high TDS samples	7910043700
Cooled double-pass glass cyclonic action spray chamber with cooling gallery Includes mounting bracket for Liberty Series I/II, Vista and 700 Series ICP-OES instruments; requires, but does not include, a refrigerated water recirculator for subambient operation	Ideal for use with highly volatile organic solvents	9910070400
Sturman-Masters spray chamber, white Needs mounting bracket	Samples dissolved in hydrofluoric acid (HF) or when using the V-groove nebulizer for fusions or slurries	110593190
Bracket for mounting glass cyclonic spray chambers	715/725/735 radial, Vista-PRO radial and early axial, Vista-MPX radial and Liberty Series II radial and early axial models	110611700
	710/720/730 axial, Vista-PRO axial, Vista-MPX axial and Liberty Series II axial models	110665200
Bracket for mounting Sturman-Masters spray chamber	715/725/735 radial, Vista-PRO radial and early axial, Vista-MPX radial models and Liberty Series II radial and early axial models	410298400
	710/720/730 axial, Vista-PRO axial, Vista-MPX axial and Liberty Series II axial models	410328600

Sturman Masters Spray Chamber Supplies

Description	Part No.
Nebulizer holder (to suit 6 mm od concentric nebulizer)	810128100
Internal baffle for spray chamber	1610114600
Drain fitting assembly for spray chamber	110593000
Sample aerosol outlet to torch	1610114800
O-ring for drain and aerosol outlet	6910006000
O-ring for spray chamber body	6910017400
O-ring for nebulizer fitting	6910019800



Single pass cyclonic spray chamber, 2010081700



Double pass glass cyclonic spray chamber, 7910043700



Sturman-Masters spray chamber, 110593190

Nebulizers and Accessories

- Manufactured to fine tolerances for reproducible and stable sample uptake
- Tight specifications deliver fine droplets for best signal intensity and optimum signal-to-noise
- Fewer repeats means less downtime and improved productivity



Concentric glass nebulizer (SeaSpray), 2010096400

Nebulizers and Accessories

Description	Application	Part No.
OneNeb inert concentric nebulizer	Ideal for routine analysis of samples up to 25% TDS with good precision and better sensitivity than a SeaSpray; inert construction makes it suitable for most solution types	2010126900
Concentric glass nebulizer (SeaSpray) Includes sample and gas inlet fittings	Routine analysis of samples to 20% TDS	2010096400
K-style (Conikal) concentric glass nebulizer Includes sample and gas inlet fittings	Routine analysis of organic solvents and samples to 5% TDS	2010106800
Micro-concentric glass nebulizer (MicroMist), 0.4 mL/min uptake Includes sample and gas inlet fittings	Small sample volumes	2010126000
Inert V-groove nebulizer kit for use with Sturman-Masters spray chamber Includes tubing and fittings	Samples with hydrofluoric acid, fusions, slurries or >20% TDS	9910057400
Concentric glass slurry nebulizer	Slurry samples with particles to 150 µm, or >20% TDS	2010097600
High flow concentric glass slurry nebulizer for Liberty Series II axial systems	Slurry samples or those >20% TDS	2010097700
High flow K-style (Conikal) concentric glass nebulizer for Liberty Series II axial systems Includes gas inlet fittings	Routine analysis of samples to 5% TDS	2010081600

(Continued)



OneNeb inert concentric nebulizer, 2010126900



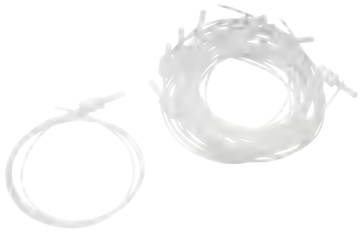
Inert V-groove nebulizer kit, 9910057400



K-style (Conikal) nebulizer, 2010106800

Nebulizers and Accessories

Description	Application	Part No.
Sample inlet (EzyFit) fitting for concentric glass nebulizer on axial ICP-OES, 0.75 mm id x 1.3 mm od capillary tubing, 10/pk		9910107700
Sample inlet (EzyFit) fitting for concentric glass nebulizer on radial ICP-OES, 0.75 mm id x 1.6 mm od capillary tubing, 10/pk	Suitable for SVS1 accessory	1610136400
Gas inlet connector (EzyLok) for concentric glass nebulizer		9910127800
Y-piece connector for online addition of internal standard/ionization buffer		1610132400
Nebulizer cleaner	Suitable for conventional concentric nebulizer	G3266-80020
Nebulizer bung O-ring , 7/32 in. id x 11/32 in. od		6910008200
Nalgene tubing, per m, 1/8 in. id x 1/4 in. od	Connects argon supply to nebulizer	3710031500
Nebulizer gas connector	Connects nebulizer gas supply tubing to gas outlet connector on instrument	1610085300
Auxiliary gas connector	Connects auxiliary gas supply tubing to gas outlet connector on instrument	1610085600
Speedy clamp	Secures gas supply tubing to nebulizer or auxiliary gas connector, Qty 2 required	810103200



Sample inlet (EzyFit) fitting, 9910107700



Gas inlet connector (EzyLok), 9910127800



Y-piece connector, 1610132400

TIPS & TOOLS

The OneNeb universal nebulizer can be used with HF, high dissolved solids, organic solvents and low flow applications. Provides improved sensitivity too. See OneNeb application note, *Evaluation of a novel nebulizer using an ICP-OES* (publication number 5990-8340EN)

Torches

- Ignite easily and stay lit, reducing downtime
- Even and stable plasma delivers reproducible results
- Guard your instrument warranty to protect your investment



Low flow axial quartz torch with
2.4 mm id injector tube, 2010090400

One Piece Axial Torches

Description	Application	Part No.
Low flow quartz torch with 2.4 mm id injector tube	Routine analysis of aqueous samples <10% TDS	2010090400
Low flow quartz torch with 0.8 mm id injector tube	Routine analysis of volatile organic solvents, e.g. gasoline	2010104700
Low flow quartz torch with 1.4 mm id injector tube	Routine analysis of organic solvents, e.g. kerosene, xylene and white spirit	2010104800
High solids torch with Agilent injector design, 2.4 mm id	Routine analysis of samples to 25% TDS	2010094800
Extended length high solids torch with Agilent injector design, 2.4 mm id	Routine analysis of samples to 25% TDS	2010104600
Sheath gas high solids torch with Agilent injector design, 2.4 mm id Used with the AGM 1 oxygen addition accessory (P/N 10055900) for better performance than the extended high solids torch	Routine analysis of samples to 25% TDS	2010122400

One Piece Radial Torches

Description	Application	Part No.
Low flow quartz torch with 1.4 mm id injector tube	Routine analysis of aqueous samples <10% TDS	2010069690
Low flow quartz torch with 0.8 mm id injector tube, annealed for greater strength	Routine analysis of volatile organic solvents, e.g. gasoline	2010117400
Low flow quartz torch with 1.4 mm id injector tube, annealed for greater strength	Routine analysis of organic solvents, e.g. kerosene, xylene and white spirit	2010117500
High solids torch with Agilent injector design, 1.8 mm id	Routine analysis of samples to 25% TDS	2010095000



High solids axial torch with Agilent injector design,
2010094800



Sheath gas high solids torch for axial ICP,
2010122400



Low flow quartz torch for radial ICP, 2010069690



High solids torch with Agilent injector design
for radial ICP, 2010095000



Spare quartz torch bonnet, 2010070790



Transfer tube FEP for axial ICP, 7910051590

Torch Spares

Description	Part No.
Spare quartz torch bonnet for radial ICP-OES	2010070790
GazFit fittings 6 mm id for one-piece and semi-demountable ICP-OES torches, 4/pk	9910107100
Transfer tube FEP cyclone spray chamber for radial ICP	7910051290
Transfer tube FEP Sturman-Masters spray chamber for radial ICP	7910051490
Transfer tube FEP for axial ICP (suitable for cyclone and Sturman-Masters spray chambers)	7910051590
Silicon pump tubing, 3/16 in. id x 5/16 in. od, per m Connects the torch plasma and auxiliary gas lines to the argon supply	2410023800
Tubing, 1/4 in. id, spray chamber to torch, per m	3710033400



Pre-optics cone for Vista/700 Series axial ICP-OES, 3610007300

Cones for Axial ICP-OES

Description	Part No.
Finger nut for cone	1510220200
Pre-optics cone for Vista/700 Series axial ICP-OES	3610007300
Pre-optics cone for Liberty Series axial ICP-OES	3610006200
Esteele cleaning powder For cleaning interface cone on axially-viewed ICP-OES	8110002800



Semi-demountable inert axial torch assembly kit, 9910084700



Semi-demountable inert radial torch assembly kit, 9910056800

Semi-demountable and Fully Demountable Torches

Description	Part No.
Semi-demountable inert axial torch assembly kit	9910084700*
Semi-demountable inert radial torch assembly kit	9910056800*
Fully demountable axial torch assembly kit Includes torch and bracket kit	9910106300
Fully demountable radial torch assembly kit Includes torch and bracket kit	9910106400

*Application: Samples with free HF when used with an inert alumina injector (2410067590); for volatile organic solvents, use narrow bore 0.8 mm id quartz injector (2010077500)



Fully demountable axial torch assembly kit, 9910106300



Fully demountable radial torch assembly kit, 9910106400

Spares for Semi-demountable Torches

Description	Part No.
Spare semi-demountable quartz torch body for axial ICP-OES	2010083400
Spare semi-demountable quartz torch body for radial ICP-OES	2010072900
Injector holder kit Includes O-rings	9910057300
Alumina injector tube, 1.8 mm	2410067590
Quartz injector tube, 1.4 mm	9910057000
Quartz injector tube, 0.8 mm	2010077500

Spares for Fully Demountable Torches

Description	Part No.
Spare fully demountable axial torch body	7910044400
Spare full demountable radial torch body	7910044500
Quartz outer tube, axial	2010095200
Quartz intermediate tube, axial and radial	2010095300
Quartz outer tube, radial body	2010095500
Quartz outer tube for high solids, radial	2010120300
Ceramic outer tube, radial	2010095800
O-rings kit	9910108200
Alumina injector, 1.8 mm, axial or radial	2010095900
Quartz injector, 1.0 mm, radial	2010096000
Quartz injector, 1.5 mm id, radial	2010095600
Quartz injector, 2.4 mm, axial	2010095400



Spare semi-demountable quartz torch body, 2010072900



Injector holder kit, 9910057300

Alumina injector tube, 2410067590

Quartz injector tube, 0.8 mm, 2010077500



Spare full demountable radial torch body, 7910044500



Quartz intermediate tube, axial and radial, 2010095300

Quartz outer tube, radial body, 2010095500



Alumina injector, 1.8 mm, axial or radial, 2010095900



Peristaltic pump tubing, 3710034400

Tubing

Peristaltic Pump Tubing

Peristaltic Pump Tubing Chemical Compatibility

Tubing	Recommendations
Standard PVC tubes	Suitable for all aqueous solutions, medium-concentrated acids and bases
Solvent Flexible (Solvaflex)	Suitable for kerosene, white spirit, alcohols, medium-highly concentrated acids and bases
Viton	Suitable for gasoline, naptha, toluene, xylene (aromatic hydrocarbons), highly concentrated acids and bases
Marprene	Suitable for ketone-based solvents including MIBK and DIBK

Common Peristaltic Pump Tubing Dimensions

Bridge Colors	Inner Diameter (mm)	Inner Diameter (in.)
Orange/Red	0.19	0.0075
Orange/Blue	0.25	0.010
Orange/Green	0.38	0.015
Orange/Yellow	0.51	0.020
Orange/White	0.64	0.025
Black/Black	0.76	0.030
Orange/Orange	0.89	0.035
White/White	1.03	0.040
Red/Red	1.14	0.045
Grey/Grey	1.30	0.050
Yellow/Yellow	1.42	0.055
Yellow/Blue	1.52	0.060
Blue/Blue	1.65	0.065
Green/Green	1.85	0.070
Purple/Purple	2.06	0.080
Purple/Black	2.29	0.090
Purple/Orange	2.54	0.100

Length 16 in. (406 mm), Bridge Interval 6 in. (152 mm)

Standard pump tubing sizes used with Agilent ICP-OES systems for aqueous samples	
Axial ICP-OES*	
Sample	White/White
Drain	Blue/Blue
Internal Standard	Orange/White

*For organic solvents and high matrix samples, the sample pump tube used would be smaller in diameter e.g. black/black

Radial ICP-OES*	
Sample	Grey/Grey
Drain	Blue/Blue
Internal Standard	Orange/White

*For organic solvents and high matrix samples, the sample pump tube used would be smaller in diameter e.g. black/black

PVC Tubing for Aqueous Samples

Description	Part No.
Peristaltic pump tubing, orange/white, 12/pk	3710046900
Peristaltic pump tubing, black/black, 12/pk	3710027200
Peristaltic pump tubing, white/white, 12/pk	3710034400
Peristaltic pump tubing, grey/grey, 12/pk	3710034500
Peristaltic pump tubing, blue/blue, 12/pk	3710034600
Replacement Tubing for Aqueous Samples	
Tubing, spray chamber to torch, per m	3710033400
Tubing, spray chamber to peri-pump waste line (Sturman-Masters spray chamber), per m	3710033900
Tubing, spray chamber to peri-pump waste line (glass cyclonic spray chamber), per m	3710024600
Nebulizer capillary tubing, per m	2410020500



Peristaltic pump tubing, 3710034400



Peristaltic pump tubing, 3710047000

PVC SolvaFlex Tubing for Low Volatile Organic Samples

Description	Part No.
Peristaltic pump tubing, black/black, 12/pk	3710034800
Peristaltic pump tubing, white/white, 12/pk	3710035000
Peristaltic pump tubing, grey/grey, 12/pk	3710035200
Peristaltic pump tubing, purple/black, 12/pk	3710047000
Replacement Tubing for Low Volatile Organic Samples	
Tubing, spray chamber to torch, per m	3710037800
Tubing, spray chamber to peri-pump waste line (Sturman-Masters spray chamber), per m	3710035300
Tubing, spray chamber to peri-pump waste line (glass cyclonic spray chamber), per m	3710035400
Nebulizer capillary tubing, per m	2410020500



Peristaltic pump tubing, 3710044100

Marprene Tubing for Ketone-Based Organic Samples

Description	Part No.
Peristaltic pump tubing, orange/yellow, 6/pk	3710044000
Peristaltic pump tubing, black/black, 6/pk	3710044100
Peristaltic pump tubing, white/white, 6/pk	3710044200
Peristaltic pump tubing, grey/grey, 6/pk	3710044300
Peristaltic pump tubing, blue/blue, 6/pk	3710044400
Replacement Tubing for Ketone-Based Organic Samples	
Tubing, spray chamber to torch, per m	3710037800
Tubing, spray chamber to peri-pump waste line (Sturman-Masters spray chamber), per m	3710035300
Tubing, spray chamber to peri-pump waste line (glass cyclonic spray chamber), per m	3710035400
Nebulizer capillary tubing, per m	2410020500



Peristaltic pump tubing, 3710043600

Viton Tubing for Aromatic Organic Samples

Description	Part No.
Peristaltic pump tubing, orange/yellow, 12/pk	3710043500
Peristaltic pump tubing, black/black, 12/pk	3710043600
Peristaltic pump tubing, white/white, 12/pk	3710043700
Peristaltic pump tubing, grey/grey, 12/pk	3710043800
Peristaltic pump tubing, blue/blue, 12/pk	3710043900
Peristaltic pump tubing, orange/yellow, 6/pk	3710053500
Peristaltic pump tubing, black/black, 6/pk	3710053600
Peristaltic pump tubing, white/white, 6/pk	3710053700
Peristaltic pump tubing, grey/grey, 6/pk	3710053800
Peristaltic pump tubing, blue/blue, 6/pk	3710053900

Internal Standard Kit

The Internal Standard Kit enables online addition of internal standard. It includes:

- One pack standard PVC pump tubing
- One pack EzyFit sample inlet connectors, 10/pk
- Five Y piece connectors
- Connecting tubing



Internal standard kit 2 with orange/white tubing, 9910124100

Internal Standard Kit

Description	Part No.
Internal standard kit 1 with black/black pump tubing	9910124000
Internal standard kit 2 with orange/white pump tubing	9910124100

Tubing Kits

Aqueous Samples and High Dissolved Solids

The ICP-OES tubing kit for aqueous samples and high dissolved solids includes:

- Two packs standard PVC peristaltic pump tubing, 12/pk (one each blue/blue and white/white for the axial ICP kits, and one each grey/grey and blue/blue for the radial ICP kits)
- One FEP transfer tube (spray chamber to torch)
- Drain tubing, 1 m
- Tubing for waste line from spray chamber, 1 m
- One pack EzyFit sample inlet connectors, 10/pk
- Nebulizer capillary tubing, 2 m length
- Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id)
- Connecting tubing, 0.5 m



Aqueous tubing kit 1 for axial ICP-OES, 9910123600

Aqueous Samples and High Dissolved Solids

Description	Use With	Part No.
Aqueous tubing kit 1 – axial	OneNeb/SeaSpray/K-style nebulizers and double- or single-pass cyclonic spray chamber	9910123600
Aqueous tubing kit 1 – radial	OneNeb/SeaSpray/K-style nebulizers and double- or single-pass cyclonic spray chamber	9910123700
Aqueous tubing kit 2 – axial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910123800
Aqueous tubing kit 2 – radial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910123900

Low Volatile Organic Solvents

The ICP-OES tubing kit for low volatile organic solvents includes:

- Two packs PVC Solva-flex peristaltic pump tubing, 12/pk (one each black/black and white/white)
- One FEP transfer tube (spray chamber to torch)
- Drain tubing, 1 m
- Tubing for waste line from spray chamber, 1 m
- One pack EzyFit sample inlet connectors, 10/pk
- Nebulizer capillary tubing, 2 m
- Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id)



Organics tubing kit 1 for radial ICP-OES, 9910124300

Low Volatile Organic Solvents

Description	Use With	Part No.
Organics tubing kit 1 – axial	OneNeb/SeaSpray nebulizer and double-pass cyclonic spray chamber	9910124200
Organics tubing kit 1 – radial	OneNeb/SeaSpray nebulizer and double-pass cyclonic spray chamber	9910124300
Organics tubing kit 2 – axial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910124400
Organics tubing kit 2 – radial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910124500



Organics tubing kit 3 for radial ICP-OES, 9910124700

Aromatic Organic Solvents

The ICP-OES tubing kit for aromatic organic solvents includes:

- Two packs viton peristaltic pump tubing, 12/pk (one each black/black and white/white)
- One FEP transfer tube (spray chamber to torch)
- Drain tubing, 1 m
- Tubing for waste line from spray chamber, 1 m
- OnePack EzyFit sample inlet connectors, 10/pk
- Nebulizer capillary tubing, 2 m
- Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id)

Aromatic Organic Solvents

Description	Use With	Part No.
Organics tubing kit 3 – axial	OneNeb/SeaSpray nebulizer and double-pass cyclonic spray chamber	9910124600
Organics tubing kit 3 – radial	OneNeb/SeaSpray nebulizer and double-pass cyclonic spray chamber	9910124700
Organics tubing kit 4 – axial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910124800
Organics tubing kit 4 – radial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910124900

Ketone-Based Organic Solvents

The ICP-OES tubing kit for ketone-based organic solvents includes:

- Two packs Marprene peristaltic pump tubing, 6/pk (one each black/black and white/white)
- One FEP transfer tube (spray chamber to torch)
- Drain tubing, 1 m
- Tubing for waste line from spray chamber, 1 m
- One pack EzyFit sample inlet connectors, 10/pk
- Nebulizer capillary tubing, 2 m
- Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id)



Organics tubing kit 6 for radial ICP-OES, 9910125300

Ketone-Based Organic Solvents

Description	Use With	Part No.
Organics tubing kit 5 – axial	OneNeb/SeaSpray nebulizer and double-pass cyclonic spray chamber	9910125000
Organics tubing kit 5 – radial	OneNeb/SeaSpray nebulizer and double-pass cyclonic spray chamber	9910125100
Organics tubing kit 6 – axial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910125200
Organics tubing kit 6 – radial	OneNeb/V-groove nebulizer and Sturman-Masters spray chamber	9910125300



Volatile organics tubing kit – radial, 9910125500

Volatile Organic Samples

The ICP-OES tubing kit for volatile organic samples includes:

- Two packs Viton peristaltic pump tubing, 6/pk (one each black/black and white/white)
- Transfer tube (spray chamber to torch), 1 m
- Drain tubing, 1 m
- Tubing for waste line from spray chamber, 1 m
- One pack EzyFit sample inlet connectors, 10/pk
- Nebulizer capillary tubing, 2 m
- Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id)
- Connecting tubing, 1 m

Volatile Organic Samples

Description	Use With	Part No.
Volatile organics tubing kit – axial	OneNeb/SeaSpray nebulizer, cooled spray chamber and full length torch	9910125400
Volatile organics tubing kit – radial	OneNeb/SeaSpray nebulizer, cooled spray chamber and annealed (organics) torch or semi-demountable torch	9910125500

Applications Kits

Spare Sample Introduction Kits

These sample introduction kits include:

- Nebulizer
- Spray chamber
- Mounting bracket
- FEP transfer tube (spray chamber to torch)
- Nebulizer gas connector with connecting tubing and 2 tubing clamps

Axial ICP-OES

Description	Nebulizer, Spray Chamber	Part No.
Aqueous samples kit	SeaSpray nebulizer, single-pass glass cyclonic spray chamber	9810039790
High sensitivity kit for aqueous samples	OneNeb nebulizer, single-pass glass cyclonic spray chamber	9810046690
Flexible kit for use with high solids or organic solvents	OneNeb nebulizer, double-pass glass cyclonic spray chamber	9810046590
Common organic solvents kit	Conikal (K style) nebulizer, single-pass glass cyclonic spray chamber	9810039890
Volatile organic solvents kit	SeaSpray nebulizer, double-pass glass cyclonic spray chamber	9810039690

Radial ICP-OES

Description	Nebulizer, Spray Chamber	Part No.
High solids kit	SeaSpray nebulizer, double-pass glass cyclonic spray chamber	9810039590
High sensitivity kit for high solids	OneNeb nebulizer, double-pass glass cyclonic spray chamber	9810046490
Inert high solids kit (use with HF/fusions)	V-groove nebulizer, Sturman-Masters double-pass cyclonic spray chamber	9810039490
Inert high sensitivity kit for high solids (use with HF/fusions)	OneNeb nebulizer, Sturman-Masters double-pass cyclonic spray chamber	9810046390



High solids kit 2 – radial, 9910125900

High Dissolved Solids

The application kits for high dissolved solids include:

- Nebulizer
- Spray chamber
- Mounting bracket
- Agilent high-solids torch (unless otherwise stated)
- Argon saturator accessory
- ICP-OES tubing kit includes two packs peristaltic pump tubing (12/pk), one FEP transfer tube (spray chamber to torch), drain tubing (1 m length), tubing for waste line from spray chamber (1 m length), one pack Ezyfit sample inlet connectors (10/pk), nebulizer capillary tubing (2 m length), Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id) and connecting tubing (0.5 m length).

High Dissolved Solids

Description	Nebulizer, Spray Chamber	Part No.
High solids kit 1 – axial	SeaSpray nebulizer, double-pass glass cyclonic spray chamber	9910125600
High solids kit 1 – radial	SeaSpray nebulizer, double-pass glass cyclonic spray chamber	9910125700
High solids kit 2 – axial	V-groove nebulizer, Sturman-Masters spray chamber	9910125800
High solids kit 2 – radial	V-groove nebulizer, Sturman-Masters spray chamber	9910125900
High solids kit 3 – axial	V-groove nebulizer, Sturman-Masters spray chamber, sheath gas high-solids torch with Agilent injector design (2.4 mm id), AGM 1 auxiliary gas module for flow control over sheath gas flow	9910141000

Inert Sample Introduction Systems

The inert sample introduction systems kit is for solutions with free HF and includes:

- V-groove nebulizer
- Double-pass Sturman-Masters spray chamber
- Mounting bracket
- Semi-demountable torch with 1.8 mm id alumina injector
- ICP-OES tubing kit includes two packs peristaltic pump tubing (12/pk), one FEP transfer tube (spray chamber to torch), drain tubing (1 m length), tubing for waste line from spray chamber (1 m length), one pack Ezyfit sample inlet connectors (10/pk), nebulizer capillary tubing (2 m length), Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id) and connecting tubing (0.5 m length).

Inert Sample Introduction Systems

Description	Nebulizer, Spray Chamber	Part No.
Inert kit – axial	V-groove nebulizer, Sturman-Masters spray chamber	9910126000
Inert kit – radial	V-groove nebulizer, Sturman-Masters spray chamber	9910126100
Inert kit – radial	Excludes spray chamber and mounting bracket	9910126200



Inert kit – radial, 9910126100

Ketone-Based Organic Solvents

The application kits for ketone-based organic solvents include:

- Nebulizer
- Spray chamber
- Mounting bracket
- One-piece torch with 1.4 mm id injector
- ICP-OES tubing kit includes two packs peristaltic pump tubing (6/pk), one FEP transfer tube (spray chamber to torch), drain tubing (1 m length), tubing for waste line from spray chamber (1 m length), one pack Ezyfit sample inlet connectors (10/pk), nebulizer capillary tubing (2 m length), Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id) and connecting tubing (0.5 m length).

AGM 1 oxygen accessory (P/N 10055900) is recommended when analyzing organic solvents on axial ICP-OES.



Organics kit 6 – radial, 9910127400

Ketone-Based Organic Solvents

Description	Nebulizer, Spray Chamber	Part No.
Organics kit 5 – axial	Glass concentric (Conikal) nebulizer, double-pass glass cyclonic spray chamber	9910127100
Organics kit 5 – radial	Glass concentric (Conikal) nebulizer, double-pass glass cyclonic spray chamber, annealed torch	9910127200
Organics kit 6 – axial	V-groove nebulizer, double-pass Sturman-Masters spray chamber	9910127300
Organics kit 6 – radial	V-groove nebulizer, double-pass Sturman-Masters spray chamber, annealed torch	9910127400

Volatile Organics

The volatile organics kit reduces vapor pressure that can destabilize the plasma and lead to signal loss. The kit includes:

- Glass concentric (Conikal) nebulizer
- Water-cooled spray chamber
- Mounting bracket
- One-piece torch with 0.8 mm id injector
- ICP-OES tubing kit includes two packs peristaltic pump tubing (6/pk), transfer tube (spray chamber to torch) 1 m length, drain tubing (1 m length), tubing for waste line from spray chamber (1 m length), one pack Ezyfit sample inlet connectors (10/pk), nebulizer capillary tubing (2 m length), Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id) and connecting tubing (0.5 m length).

AGM 1 oxygen accessory (P/N 10055900) is recommended when analyzing volatile organic solvents. Cooled spray chamber requires a refrigerated, water recirculator able to cool fluid down to -10 °C for analysis of volatile organic solvents such as gasoline and naphtha.

Volatile Organics

Description	Nebulizer, Spray Chamber	Part No.
Volatile organics kit – axial	Glass concentric (Conikal) nebulizer, water-cooled spray chamber	9910127500
Volatile organics kit – radial	Glass concentric (Conikal) nebulizer, water-cooled spray chamber, annealed torch	9910127600



Volatile organics kit – radial, 9910127600

Common Organic Solvents

The application kits for common organic solvents include:

- Nebulizer
- Spray chamber
- Mounting bracket
- One-piece torch with 1.4 mm id injector
- The ICP-OES tubing kit includes two packs of peristaltic pump tubing (12/pk), one FEP transfer tube (spray chamber to torch), drain tubing (1 m length), tubing for waste line from spray chamber (1 m length), one pack Ezyfit sample inlet connectors (10/pk), nebulizer capillary tubing (2 m length), Barb connectors for joining tubing (5 ea 1/16 to 1/8 in id and 5 ea 1/16 to 1/16 in id) and connecting tubing (0.5 m length).



Organics kit 1 – radial, 9910126400

AGM 1 oxygen accessory (P/N 10055900) is recommended when analyzing organic solvents on axial ICP-OES.

Common Organic Solvents

Description	Application	Nebulizer, Spray Chamber	Part No.
Organics kit 1 – axial	Common, low volatility organic solvents, e.g. kerosene, xylene and white spirit	Glass concentric (Conikal) nebulizer, double-pass glass cyclonic spray chamber	9910126300
Organics kit 1 – radial	Common, low volatility organic solvents, e.g. kerosene, xylene and white spirit	Glass concentric (Conikal) nebulizer, double-pass glass cyclonic spray chamber, annealed torch	9910126400
Organics kit 2 – axial	High particulate samples dissolved in common, low volatility organic solvents, e.g. kerosene, xylene and white spirit	V-groove nebulizer, double-pass Sturman-Masters spray chamber	9910126500
Organics kit 2 – radial	High particulate samples dissolved in common, low volatility organic solvents, e.g. kerosene, xylene and white spirit	V-groove nebulizer, double-pass Sturman-Masters spray chamber, annealed torch	9910126600

SVS 1 and SVS 2 Switching Valves for ICP-OES

The SVS 1 and SVS 2 Switching Valve Systems are innovative sample introduction systems for ICP-OES that improve productivity and reduce memory effects by rinsing while the next sample is introduced. Excess sample is diverted away from the spray chamber, reducing sample carry-over. The SVS 2 doubles ICP-OES productivity by loading the next solution into a sample loop during the rinse phase, using a high speed pump.



SVS 1 Supplies

Description	Part No.
Replacement 4-port valve. Replace every 4-6 months, depending on usage	3610010100
Flangeless fittings (Qty 4 required)	1610136500
Ferrules (Qty 4 required)	1610136600
Sample inlet (EzyFit) fitting for concentric glass nebulizer on radial ICP-OES	1610136400
Capillary tubing, PFA, 0.0625 in x 0.02 in id	3710052400



Replacement 4-port valve, 3610010100

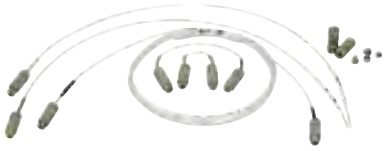


Flangeless fittings, 1610136500

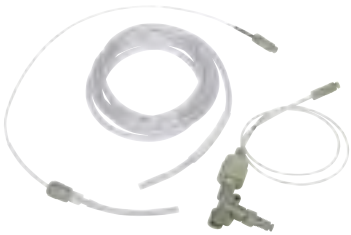
Ferrules (Qty 4 required), 1610136600



SVS 2 sample loop, 1.0 mL, 9910143400



SVS 2 tubing kit, 7910063800



Tubing kit for SVS 2 Fast Uptake Pump, 3710066700

SVS 2 Supplies

Description	Part No.
Nebulizer Ezyfit connector for SVS 0.75 mm id x 1.6 mm od tubing (10/pk)	1610146100
Replacement triple stack 4-port valve Replace every 12 months, depending on usage	3610023100
SVS 2 sample loop, 0.25 mL	9910143200
SVS 2 sample loop, 0.5 mL	9910143300
SVS 2 sample loop, 1.0 mL	9910143400
SVS 2 sample loop, 1.5 mL	9910143500
SVS 2 sample loop, 2.0 mL	9910143600
SVS 2 sample loop, 2.5 mL	9910143700
SVS 2 sample loop, 3.0 mL	9910143800
SVS 2 sample loop, 3.5 mL	9910143900
SVS 2 tubing kit Includes SVS2 carrier/rinse tubing, 300 mm (tubing color coded blue), SVS2 internal standard tubing, 300 mm (tubing color coded yellow), loop link, 80 mm (tubing color coded green/green), SVS2 internal standard link, 120 mm (tubing color coded gray/brown), SVS2 sample loop – volume 1.0 mL (tubing color coded black/black) and 2 x ¼ in 28 super flangeless fitting plus 2 x 1-16 in super flangeless ferrules	7910063800
Replacement wiper seal kit for SVS 2 Fast Uptake Pump Replace every 12 months, depending on usage. Requires pump seal installation tool P/N 7910046600	7910064500
Tubing kit for SVS 2 Fast Uptake Pump Includes PVC 2.5 mm id waste tubing, 1.5 m, PVC 2.5 mm id inlet tubing, 50 mm, valve waste tubing, 320 mm (tubing color coded red), bubble injector tubing, 400 mm, bubble injector tee piece and bubble injector 1-way valve	3710066700

ICP-MS

As ICP-MS has evolved to become the premier technique for trace metals analysis, Agilent has been at the forefront of development and design, introducing many important innovations. With the 8800 Series Triple Quadrupole ICP-MS, the innovative MS/MS operation provides precise control of reaction processes in the collision/reaction cell ensuring better performance than conventional reaction cell ICP-MS. This new technology delivers unrivaled flexibility for solving difficult applications.



7700 Series ICP-MS

ICP-MS Maintenance Schedule

Item	Actions/Comments	Typical Schedule
Argon gas	Check argon gas pressure and volume	Daily
Drain vessel	Check, empty if required	
Peristaltic pump tubing	Check for damage/deterioration	
Sampling cone, skimmer cone	Check orifice for foreign matter, deformation and enlargement Clean if required	Weekly
Foreline pump (rotary pump)	Check oil level and color Check mist filter for presence of oil	Monthly
Nebulizer	Run nebulizer test, take appropriate action as indicated	
Shield contact	Clean	
Cooling water	Check water level and condition	
Extraction/Omega lenses	Clean	3-6 Months
Other ion lenses	Clean	6 Months
Foreline pump (rotary pump)	Change oil	
Rotary pump oil mist filter	Check/replace mist filter	Annually
Penning gauge (7500 Series)	Clean and replace when necessary	
Water strainer	Check and clean	
Octopole	Clean	
Sample introduction area, e.g. spray chamber, end cap	Clean	Periodically
Torch	Clean and replace when necessary	
Electron multiplier	Evaluate and replace when necessary	
Plasma gas, auxiliary gas tubing	Check and replace when necessary	
Argon gas filter	Replace 2 years after installation	
Graphite gasket	Replace when surface or shape is damaged	

Sample Introduction Supplies

Sample Line Supplies

Description	Specifications	Use	Unit	7700 Part No.	7500 Part No.
Peri-pump sample tubing, Tygon	1.02 mm id, 40 cm	Standard for sample introduction	12/pk	G1833-65569	G1833-65569
Peri-pump tubing for ISTD, flared end, 2 stopper, blue/orange	0.25 mm id	Standard for 7700/8800 Series	12/pk	G3280-67047	G3280-67047
Peri-pump tubing for ISTD, flared end, 2 stopper, red/orange	0.19 mm id	Standard for 7500 Series	12/pk	G3280-67008	G3280-67008
Peri-pump tubing, Fluran, 3 stopper, yellow/blue	1.52 mm id	For xylene analysis	1/pk	5042-4799	5042-4799
Peri-pump tubing, silicone	1.02 mm id, 16 in L		6/pk	G1820-65217	G1820-65217
Peri-pump ISTD tubing, Tygon	0.19 mm id, 40 cm		12/pk		G1833-65571
Peri-pump drain tubing, Ismaprene	1.52 mm id, 0.75 wall, 40 cm		12/pk	G1833-65570	G1833-65570
Sample tubing, PFA	0.5 mm id, 1.6 mm od, 5 m		1/pk	G1820-65105	G1820-65105
	0.2 mm id, 1.6 mm od, 70 cm		3/pk	G1833-65573	G1833-65573
	0.15 mm id, 1.6 mm od, 70 cm		3/pk	G1833-65572	G1833-65572
Sample tubing with PEEK guide, PFA	0.3 mm id, 1.6 mm od, 70 cm		5/pk	G1820-65531	G1820-65531
	0.2 mm id, 1.6 mm od, 70 cm		5/pk	G1820-65527	G1820-65527
	0.15 mm id, 1.6 mm od, 70 cm		5/pk	G1820-65526	G1820-65526
ISTD tubing, PFA	0.3 mm id, 1.6 mm od, 3 m	For online ISTD addition	1/pk	G1820-65478	G1820-65478
Online ISTD addition kit			1/pk	G3280-60590	G1833-65071
Plastic tubing cutter			1/pk	8710-1930	8710-1930
Sample tray			1/pk	G3280-40103	
Plug for cross joint			3/pk	G3138-65129	G3138-65129
PTFE nut for cross joint		For 1.6 mm od tubing	10/pk	5064-8023	5064-8023
Front and back ferrule		For 1.6 mm od tubing	10/pk	5064-8024	5064-8024



Peri-pump sample tubing, Tygon, G1833-65569



Sample tubing, PFA, G1820-65105



Plastic tubing cutter, 8710-1930

Nebulizers and Supplies

Description	Specifications	Use	Unit	7700 Part No.	7500 Part No.
MicroMist Nebulizer	Borosilicate glass	Standard on 7700x/e, 8800 and 7500cx/ce. Suitable for most sample types except those containing HF or suspended particulates. When ordered for the 7500a, the spray chamber end cap (P/N G1833-65475) is also required.	1/pk	G3266-65003	G3266-65003
Sample tubing	0.25 mm id, 700 mm, with connector	For MicroMist Nebulizer	10/pk	G3266-80010	G3266-80010
Sample tubing	0.5 mm id, 700 mm, with connector	For MicroMist Nebulizer	10/pk	G3266-80011	G3266-80011
Carrier gas connector		For MicroMist Nebulizer	1/pk	G3266-80015	G3266-80015
Nebulizer cleaner		For MicroMist Nebulizer	1/pk	G3266-80020	G3266-80020
MicroFlow Nebulizer	PFA, 200 µL/min	For analysis of high purity and HF samples	1/pk	G3139-65100	G3139-65100
MicroFlow Nebulizer with I-AS probe	PFA, 200 µL/min	Standard on 7700s, 8800 semicon configuration and 7500s. For analysis of high purity and HF samples when using the Integrated Autosampler (sample uptake tube terminates as a sampling probe).	1/pk	G3139-65102	G3139-65102
MicroFlow Nebulizer	PFA, 20-50 µL/min		1/pk	G3139-65106	G3139-65106
MicroFlow Nebulizer with I-AS probe	PFA, 20-50 µL/min		1/pk	G3139-65108	G3139-65108
Carrier gas line connector		For MicroFlow Nebulizer	2/pk	G1833-65583	G1833-65583

(Continued)



MicroMist Nebulizer, G3266-65003



Sample tubing, G3266-80010



Carrier gas connector, G3266-80015



Nebulizer cleaner, G3266-80020



MicroFlow Nebulizer with I-AS probe, G3139-65102



Carrier gas line connector, G1833-65583

Nebulizers and Supplies

Description	Specifications	Use	Unit	7700 Part No.	7500 Part No.
Mira Mist Nebulizer	PTFE		1/pk	G3161-80000	G3161-80000
Mira Mist Nebulizer	PEEK	For high solids applications such as environmental, geological, etc. Not for semiconductor use since it does not self aspirate. When ordered for the 7500a, the spray chamber end cap (G1833-65475) is also required (included with 7500cx/cs).	1/pk	G3161-80001	G3161-80001
Babington Nebulizer	Includes Viton O-ring, PTFE sample tubing, and connector	Use to introduce samples with high matrix and high total salts. Clean when contaminated or when orifices are clogged.	1/pk		G1820-60453
End cap for Babington Nebulizer, polypropylene	Includes Viton O-rings	Replace when memory effects do not disappear after cleaning. Insert nebulizer in middle of end cap all the way through. Attach end cap to spray chamber with "TOP" mark facing up.	1/pk		G1833-65476
Babington Nebulizer removal tool			1/pk		G1820-65345
PFA Concentric Nebulizer	PFA 50 µL/min	Recommended for VPD and high matrix semiconductor, specifically Si matrices above 100 mg/L, and for H_3PO_4. Use in free aspiration mode.	1/pk	G3285-80002	
PFA Concentric Nebulizer with I-AS probe	PFA 50 µL/min	Recommended for VPD and high matrix semiconductor, specifically Si matrices above 100 mg/L, and for H_3PO_4. Use in free aspiration mode.	1/pk	G3285-80003	
Concentric Nebulizer, Pyrex	Use with P/N G1820-65052 Argon gas connector, P/N G1820-60160 Connector kit, P/N G1820-65121 end cap	Use with clean samples only. Not resistant to hydrochloric acid. Clean with a 5% HNO_3 (v/v) bath; do not use ultrasonic bath.	1/pk	G1820-65030	G1820-65030
Concentric Nebulizer, quartz	Use with P/N G1820-65337 Quartz spray chamber, P/N G1820-80237 Quartz connecting pipe	Recommended for trace analysis of clean samples. Lower contamination level than Pyrex. Clean using 5% HNO_3 (v/v) bath; do not use ultrasonic bath.	1/pk	G1820-65138	G1820-65138
Connector for carrier gas line, polypropylene	4 mm tubing, includes ferrule and O-ring	For gas line connection to Concentric Nebulizer	1/pk	G1820-65052	G1820-65052

(Continued)



Polypropylene connector, G1820-65052

Nebulizers and Supplies

Description	Specifications	Use	Unit	7700 Part No.	7500 Part No.
Sample tubing with connector, PTFE	Tool included	For Babington Nebulizer, replace when heavily contaminated by high matrix samples.	1/pk		G1820-65276
Sample line connector	Includes Viton O-ring	Connects Concentric Nebulizer with sample line. Port with large hole connects to nebulizer; smaller port connects with sample tubing.		G1820-60160	G1820-60160
Union fitting	4 mm tubing	For PFA Concentric Nebulizer	1/pk	5064-8078	5064-8078
Ferrule and Viton O-ring kit for carrier gas line connector		For Babington/Concentric Nebulizer	1/pk	G1820-65533	G1820-65533
End cap for Concentric Nebulizer, PTFE	Includes Viton O-rings	Connects the Concentric Nebulizer (Pyrex or Quartz) with the spray chamber. For MicroMist, MicroFlow, and other concentric nebulizers.	1/pk		G1833-65475
O-rings for Babington Nebulizer, Viton		Used to create seal between Babington Nebulizer and end cap.	4/pk		G1820-65199
O-ring kit for Concentric Nebulizer, Viton	2 sizes, 10 each		20/pk	G1820-65491	G1820-65491
O-rings for Concentric Nebulizer, for organic solvents (3 types)			4/pk	G1820-65520	G1820-65520
O-rings for end cap, Viton		Use for the end cap of the Babington Nebulizer, Cross Flow Nebulizer and Concentric Nebulizer.	5/pk		G1820-65198
O-rings for end cap, for organic solvents			2/pk		G1820-65518
CrossFlow Nebulizer	Includes bushing, carrier gas line connector, blend gas line connector, sample tubing, and gas line tubings with inner sleeves	Standard nebulizer for the inert kit. Resistant to hydrofluoric acid. Set carrier gas pressure to 500 kPa (5 kg/cm^2). Clean with 5% HNO_3 (v/v) bath. Replace when memory effects remain after cleaning.			G1833-65462
O-ring A for concentric nebulizer	Perfluoro, 1.07 mm id		5/pk	G3280-67115	
O-ring B for concentric nebulizer	Perfluoro, 3.8 mm id		5/pk	G3280-67116	



Ferrule and Viton O-ring kit for carrier gas line connector, G1820-65533



PFA inert kit, sapphire, 2.5 mm id, G4912-68000



End cap, G3285-80020

Connector tube with gas port, G4912-80016



Sapphire injector for PFA inert kit, 2.5 mm id injector, G3285-80034

PFA Inert Sample Introduction Kit Supplies

The PFA inert sample introduction kits replaces the standard quartz sample introduction parts with those suitable for the analysis of high purity and HF samples. Kit includes endcap (PFA), spray chamber (PFA), connecting pipe, demountable torch with PFA base and torch injector (either Pt or sapphire). The kit with the sapphire injector is recommended for volatile organic solvents. The kit with the Pt injector is recommended for semiconductor applications. Requires but does not include a nebulizer. The PFA nebulizer is recommended and should be ordered separately

PFA Inert Sample Introduction Kit Supplies

Description	7700 Part No.	7500 Part No.
PFA inert kit, sapphire, 2.5 mm id Torch included	G4912-68000	
PFA inert kit, platinum, 2.5 mm id Torch included	G4912-68001	
PFA inert kit, sapphire, 1.5 mm id Torch included	G4912-68002	
PFA inert kit, platinum, 1.5 mm id Torch included	G4912-68003	
Inert sample introduction kit, sapphire, 2.5 mm id Torch not included		G3285-80014
Inert sample introduction kit, platinum, 2.5 mm id Torch not included		G3285-80015
Inert sample introduction kit, sapphire, with O_2 port, 1.5 mm id Torch not included		G3285-80016
Inert sample introduction kit, platinum, with O_2 port, 1.5 mm id Torch not included		G3285-80017
End cap	G3285-80020	G3285-80020
Spray chamber	G3285-80021	G3285-80021
Drain tube	G4912-80014	G3285-80022
Long connector tube	G3285-80024	G3285-80024
Connector tube with gas port	G4912-80016	G3285-80023
O-ring for injection assembly, 10/pk	G3285-80085	G3285-80085
Sapphire injector for PFA inert kit, 2.5 mm id injector	G3285-80034	G3285-80034
Platinum injector for PFA, 2.5 mm id	G3285-80035	G3285-80035
Sapphire injector for PFA inert kit, 1.5 mm id injector	G4912-80010	
Sapphire injector for PFA inert kit with O_2 port, 1.5 mm id		G3285-80036
Platinum injector for PFA inert kit, 1.5 mm id injector	G4912-80011	G3285-80037
Demountable torch (no injector)	G4912-80013	G4912-80013

PP Inert Sample Introduction Kit Supplies

Description	7500 Part No.
Spray chamber, polypropylene (sapphire tube)	G1833-65463
Inert torch, quartz, without injector	G1833-65422
Platinum injector for inert torch, 2.0 mm id	G1833-65409
Platinum injector for inert torch, 2.5 mm id	G1833-65415
Platinum injector for inert torch, 1.5 mm id	G1833-65416

HMI Kit Supplies for 7500 Series

Description	Part No.
Plug for make-up gas connector	G3270-20067
Inner sleeve	5022-1703
Gas connector	5042-4774
End cap assembly	G3270-60207
Torch, 2.5 mm, 2 projections	G3270-80043
Quartz connector tube with dilution port for HMI	G3270-80024
Quartz connector tube (straight)	G3270-80025
Connector rod, oxygen	G3270-80026



Connector rod, dilution, G3270-80024

Spray Chambers

Description	Use	Unit	7700 Part No.	7500 Part No.
Spray chamber, double pass design, quartz	Standard for 7700/8800 Series and 7500 Series		G3280-80008	G1820-65337
End cap for spray chamber			G3280-60008	
Connector for gas line at end cap			5042-4775	
Plug for make-up gas connector			G3270-20067	
End cap nut for nebulizer connection			0535-1082	
Drain tubing assembly			G3280-60555	
Drain tubing	Tubing between peri-pump tubing and drain tank		G1820-65515	G1820-65515
Drain tubing, Tygon, 3/32 x 5/32 in, 5 m			G3160-67000	
Drain tank, polyethylene, 4 L			5042-4769	5042-4769
Drain tank with PVC connector, 1 L			G1820-65016	G1820-65016
Drain tank for organic solvents			G1820-65505	G1820-65505
Drain tubing kit Includes 2 connectors, 1 bushing, 1 tubing (4 mm id, 12 cm)	Tubing between spray chamber and peri-pump tubing		G1833-65411	G1833-65411
Bushing at spray chamber drain, Viton		5/pk		G1820-65482
Bushing at spray chamber drain, for organic solvents	For use with organic solvents			G1820-65504
Connector for spray chamber drainage, polypropylene				G1820-65503
Spray chamber	For ultra trace B analysis		G3280-80503	G3270-80300
Connector, quartz	Between spray chamber and torch			G1833-65426
Connector, polypropylene	Between spray chamber and torch			G1833-65464
T-connector for optional gas introduction, quartz	Between spray chamber and torch			G1833-65427
O-rings for polypropylene connector, Viton		10/pk		G1833-65480
Clamps	Used to hold connectors	2/pk		G1833-65430
Tygon tubing, 3 m	For drain to drain tank		G3280-60077	G3280-60077
Organic solvent introduction kit for 7700 Series Replaces the standard quartz torch, sample introduction and drain parts with those suitable for analysis of volatile organic solvents. Includes quartz torch with 1.5 mm id injector (1.0 mm id torch is not supplied, but is available for volatile organics), sample tubing with guide (5 pcs 0.15 mm id x 70 cm length and 5 pcs 0.2 mm id x 70 cm length), sample tubing (0.3 mm id x 3 m length) peristaltic pump tubing for drain (30 pcs) and organic solvent warning label. A quartz concentric nebulizer is also recommended (not supplied). A Pt sampling cone is also required, when O2 Carrier Gas is added to allow analysis of organic solvents.			G3280-60580	



End cap for spray chamber, G3280-60008



Spray chamber, quartz, G3280-80008



Connector for gas line at end cap, 5042-4775



Drain tubing assembly, G3280-60555

Torch and Components

Description	Specifications	Use	7700 Part No.	7500 Part No.
Torch, quartz	2.5 mm id	Standard for 7700/8800 Series and 7500 Series Not suitable for samples containing hydrofluoric acid	G3280-80053	G3270-80043
Torch, quartz	1.5 mm id, taper type	For use with organic solvents. Not suitable for samples containing hydrofluoric acid	G3280-80080	G1833-65424
Torch, quartz	1.0 mm id, taper type	For use with organic solvents. Not suitable for samples containing hydrofluoric acid	G3280-80081	G1833-65425
Shield plate, long life		Use with the bonnet.	G1833-65419	G1833-65419
Bonnet (quartz ring for shield torch)		Use with shield plate (P/N G1833-65406 or P/N G1833-65419) for Shield Torch system	G1833-65421	G1833-65421
RF coil			G3280-60638	G1833-65432
Alignment plate for RF coil			G1833-66011	G1833-66011
Quartz connector tube with dilution port for HMI			G3270-80024	G3270-80024
Quartz connector tube (straight)			G3270-80025	G3270-80025
Clamps, 2/pk		Used to hold connectors	G1833-65430	G1833-65430

See PFA Inert Sample Introduction Kit Supplies table for the torch for inert kit

TIPS & TOOLS

The torch must be completely dried before installing and igniting the plasma. Replace if chipped, cracked or distorted.



Torch, quartz, G3280-80053



Bonnet for Shield Torch, G1833-65421



Connector rod, dilution, G3270-80024

Interface Cones and Ion Lenses

Interface Cone Guide for Agilent 7700 Series ICP-MS/8800 Triple Quad ICP-MS			
Description	**Part No.**	**7700x/e and 8800**	**7700s and 8800 semicon**
Sampling cone			
Nickel sampling cone	G3280-67040	Std	✓
Platinum sampling cone	G3280-67036	✓	Std
Nickel plated sampling cone	G3280-67061	✓	✓
Platinum sampling cone, 18 mm insert	G3280-67056	✓	✓
Skimmer cone			
Nickel skimmer cone	G3280-67041	Std	
Platinum skimmer cone	G3280-67060	✓	
Platinum skimmer cone, nickel base	G3280-67063	✓	
Platinum skimmer cone, copper base	G3280-67064		Std
Nickel skimmer cone	G3280-67066		✓
Platinum skimmer cone, nickel base	G3280-67065		✓
Copper skimmer cone	G3280-67067		✓
Skimmer base			
Skimmer base, stainless steel	G3280-60608	Std	
Skimmer base, brass	G3280-60621	✓	
Skimmer base, brass	G1833-65590		Std
Skimmer base, stainless steel	G1833-65591		✓
Skimmer base (offset), brass, for special application	G3280-60381		✓

Key

✓: Compatible Part
Std: Fitted as standard when instrument shipped from factory



Sampling cone, nickel, G3280-67040



Platinum sampling cone, G3280-67036

TIPS & TOOLS

Did you know you can save money and help the environment by returning your used Agilent platinum ICP-MS cones? Find out more about the trade-in credits on used Pt cones for the 7700/8800/7500 ICP-MS at **www.agilent.com/chem/ptcone**

Recommendations on What Cone to Use		
Type of Cone	**For Which Model?**	**Recommended Application**
Nickel (Ni) sample/skimmer cones	Standard on 7700x/e and 8800	Suitable for most common applications. Provides most economical operation
Ni-plated sampling cone		For samples containing > 0.5% HCl, or for routine operation with HMI with max. aerosol dilution ratio
Platinum sample/skimmer cones	Standard on 7700s and 8800 semicon configuration. Optional for other models	Required for analysis of aggressive acids (esp. HF) and when O_2/Ar option gas is used for analysis of organic solvents
Pt skimmer with Ni base		Recommended for organics analysis. Requires the brass skimmer base
Pt skimmer with Cu base	Standard on 7700s and 8800 semicon configuration	Recommended for the lowest LODs and for higher matrix samples. Requires the brass skimmer base



Skimmer cone, nickel, G3280-67041



Platinum skimmer cone, G3280-67060



Skimmer base, stainless steel, G3280-60608

Interface Cone Guide for Agilent 7500 Series								
Description	**Part No.**	**7500a**	**7500i**	**7500s**	**7500c**	**7500ce/cx**	**7500cs**	**T-mode**
Sampling cone								
Nickel sampling cone	G1820-65238	Std	Std	✓	Std	Std	✓	
Platinum sampling cone, 10 mm insert	G1820-65239	✓	✓	Std	✓	✓	Std	
Platinum sampling cone, 18 mm insert	G1820-65360	✓	✓	✓	✓	✓	✓	
Nickel sampling cone for T-mode	G1820-65480	T-mode	T-mode	T-mode				✓
Skimmer cone								
Nickel skimmer cone	G1820-65050	Std	Std	✓				
Nickel skimmer cone	G3270-65024					Std		
Nickel skimmer cone	G1833-65497				Std		✓	
Platinum skimmer cone	G1820-65237	✓	✓	Std				
Platinum skimmer cone	G1833-65092				✓			
Platinum skimmer cone	G1833-65132						Std	
Platinum skimmer cone (Ni base)	G3270-60106					✓	✓	
Copper skimmer cone	G3270-60643						✓	
Nickel skimmer cone for T-mode	G1820-65481	T-mode	T-mode	T-mode				✓
Skimmer base								
Stainless steel base for nickel skimmer	G1833-65407	Std	Std	✓				✓
Stainless steel base for nickel skimmer	G1833-65591					Std	✓	
Stainless steel base for nickel skimmer	G1833-65498				Std			
Brass base for platinum skimmer	G1833-65408	✓	✓	Std				
Brass base for platinum skimmer	G1833-65505				✓			
Brass base for platinum skimmer	G1833-65590					✓	Std	

Key

✓: Compatible Part
Std: Fitted as standard when instrument shipped from factory

NOTES:

- 18 mm Pt cone insert is recommended for measuring H_2SO_4 above 2%
- Pt T-mode cones are not available
- T-mode is not used with ORS models

Sampling and Skimmer Cone Supplies

Description	7700/8800 Part No.	7500 Part No.
Interface wrench for sampling cone	G3280-01507	G1833-65405
Retaining ring for sampling cone	G3280-20504	
Graphite gasket for sampling cone, 3/pk	G3280-67009	
Interface wrench for skimmer cone removal	G3280-60502	G1833-65079
Screws for skimmer base, 4/pk	G1820-65435	G1820-65435
Cone cleaning detergent, 1 gallon	5188-5359	5188-5359
Alumina powder, abrasive, 1 kg	8660-0791	8660-0791
Cotton swab, ultra-fine cone bud shape, both ends, 100/pk	9300-2574	9300-2574
O-ring for sampling cone, Viton		G1820-65025



Interface wrench for sampling cone, G3280-01507



Retaining ring for sampling cone, G3280-20504

Ion Lens System Components for 7700/8800 Series

Description	Part No.
7700x/e and 8800	
Extraction-offset lens assembly	G3280-67039
Extraction lens 1	G3280-60612
Extraction lens 2	G3280-60613
Omega bias lens	G3280-01650
Omega lens	G3280-60609
Screw and spacer kit for x-lens	G3280-67037
Spacer (deflect/plated b), 4/pk	G3280-67110
7700s and 8800 semicon configuration	
Extraction-omega lens assembly	G3280-67035
Extraction lens 1	G1833-65592
Extraction lens 2	G1833-65593
Omega bias lens	G3280-20646
Omega lens	G3280-20653
Screw and spacer kit for s-lens	G3280-67038



Extraction-offset lens assembly, G3280-67039



Octopole, G3280-67045

Ion Lens System Components for 7700/8800 Series

Description	Part No.
7700x/s/e and 8800 series	
Reaction cell assembly	G3280-60650
Octopole	G3280-67045
Cell focus lens	G3280-20633
Cell entrance lens	G3280-20618
Cell exit lens	G3280-20664
Screw/spacer/O-ring for cell	G3280-67044
Tubing for cell gas	G3280-20663
Deflect lens	G3280-20628
Plate bias	G3280-60615
Polishing paper kit Waterproof sheets, #400 and #1200, 5 of each	G1833-65404
Manual vent valve	G3280-67046
Offset skimmer tool	G3280-60671

Ion Lens System Components for 7500 Series

Description	Part No.
7500a/i/s/c/cs	
Plate bias (for Eagle Q-pole)	G1833-65494
Plate bias (for Slim ring Q-pole)	G1833-65444
Polishing paper kit Waterproof sheets, #400 and #1200, 5 of each	G1833-65404
7500a/i/s	
Extraction lens 1	G1833-65417
Extraction lens 2	G1833-65413
Omega lens assembly	G1833-65418
Screw kit for Extraction lens	G1833-65024
Screw kit for Omega lens	G1833-65025



Extraction lens 1, G1833-65417



Extraction lens 2, G1833-65413

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Ion Lens System Components for 7500 Series

Description	Part No.
7500c	
Einzel lens 1	G1833-65500
Einzel lens 2	G1833-65501
Einzel lens 3	G1833-65502
Extraction lens	G1833-65499
Octopole	G1833-65094
Octopole assembly (includes cell entrance/exit without O-ring)	G1833-65503
Screw and spacer kit for extraction Einzel lens	G1833-65578
Screw kit for reaction cell	G1833-65088
Tubing for reaction gas, 2/pk	G1833-65089
7500ce/cx	
O-ring for reaction cell	G1833-66035
Extraction-Omega lens assembly	G3270-65023
Extraction lens 1	G3270-65028
Extraction lens 2	G3270-65029
Omega lens	G3270-65030
Omega bias lens	G3270-65031
Screw and spacer kit for Extraction and Omega lens	G3270-60639

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Ion Lens System Components for 7500 Series

Description	Part No.
7500cs	
Extraction lens 1	G1833-65592
Extraction lens 2	G1833-65593
Extraction-Omega lenses assembly	G1833-65596
Omega bias lens	G1833-65594
Omega lens	G1833-65595
Screw and spacer kit for ion lens	G1833-65125
Cell entrance lens	G1833-65598
Cell exit lens	G1833-66000
Cell focus lens	G1833-65597
7500cs/ce/cx	
Focus lens for Q-pole	G1833-65599
Octopole	G1833-65133
Octopole assembly (includes cell focus, cell entrance/exit, and QP focus)	G1833-65134
Reaction cell assembly	G1833-66001
Screw and spacer kit for reaction cell	G1833-65138
Plate bias for S/N JP14100050 – JP14100313	G1833-65513
Plate bias for S/N JP14100314 or later	G1833-65562
Reaction cell assembly, stainless steel	G3270-65060
O-ring for reaction cell, 2/pk	G3270-65036



Electron multiplier, 5190-0108

Electron Multipliers

Description	8800 Part No.	7700 Part No.	7500 Part No.
Electron multiplier (ETP)			5184-1983
Electron multiplier (HPK)			G1833-65575
Electron multiplier	5190-0123	5190-0108	

Vacuum System Supplies

- When plasma is ON, check pump oil level every three months
- Maintain oil level between Max and Min levels on the gauge
- Standard frequency for changing the oil is approximately every six months



Oil mist filter element for E2M18, 1535-4970



Odor element for oil mist filter, 5063-9153

Vacuum System Supplies

Description	Unit	7700/8800 Part No.	7500 Part No.
Oil mist filter element for E2M18		1535-4970	1535-4970
Oil mist filter kit for E1M18/E2M28		3162-1056	3162-1056
O-Ring for vacuum chamber, Viton		5042-4790	5042-0901
Odor element for oil mist filter	5/pk	5063-9153	5063-9153
Foreline pump (rotary pump) oil, 4 L	1 gal	6040-0798	6040-0798
Foreline pump (rotary pump) oil, Inland 45, 1 L	1 liter	6040-0834	6040-0834
Foreline pump fluid (Fomblin06/6) 1 L for use with strong acid samples	1 liter	5069-4478	5069-4478
Electrode kit for penning gauge			G1820-81013
Tube AIM gauge			G1820-81012
O-rings for vent valve, Viton	2/pk		G1833-65332

WARNINGS & CAUTION

Be careful when changing oil because it may have absorbed dangerous substances. The oil in the foreline pump (rotary pump) on the interface side of a 7700/8800/7500 equipped with a hydrofluoric acid resisting introduction system is especially dangerous.

DO NOT TOUCH THE OIL WITH BARE HANDS.





Tray B, 53 position for 18 mL vials, PP, G3160-80061



Peristaltic pump tubing set with connectors, G3160-65326

Autosampler Supplies

The Integrated Autosampler is ideal for ultra-trace analysis and small sample volumes (as low as 0.5 mL). It features a pumped rinse station and offers flexible rack configurations with a max. capacity of 89 vials, plus 3 rinse vials.

Integrated Autosampler(I-AS) Supplies

Description	Unit	Common Part No.
Tray A, 89 position for 6 mL vials, PP		G3160-80060
Tray B, 53 position for 18 mL vials, PP		G3160-80061
Tray C, 18 position for 50 mL vials, PP		G3160-80062
Tray D, 79 x 2 mL + 10 x 18 mL positions, PP		G3160-80063
Tray E, 79 x 6 mL + 10 x 18 mL positions, PP		G3160-80064
Tray F, 15 position for use in special semiconductor applications, holds 15 vials of up to 48 mm od x 55 mm high, PP		G3160-80065
PFA vials, 1.5 mL for use with Tray D	10/pk	G3160-65317
6 mL polypropylene vials, for use with Tray A and E	200/pk	G3160-65303
18 mL polypropylene vials, for use with Tray B, D and E	55/pk	G3160-65304
50 mL polypropylene vials, for use with Tray C	20/pk	G3160-65305
2 mL polyethylene vial, for use with Tray D	200/pk	G3160-65315
PFA needle, 0.3 mm id, standard probe		G3160-65306
Rinsing bottle, 100 mL	3/pk	G3160-65307
Tray cover		G3160-65321
Rinse fluid inlet/outlet tubing (for I-AS with diaphragm pump)		G3160-65320
PFA Needle, 0.8 mm id, for use with the ISIS		G3160-65324
Tubing holder, PEEK, for use with MicroFlow nebulizer (without a sampling probe) and 2 mL vials		G3160-65325
Needle holder		G3160-80041
Holder for carry tray cover		G3160-60015
Peristaltic pump tubing set with connectors	1 set	G3160-65326
Peristaltic pump tubing set with connectors	5 sets	G3160-65327
Drain tubing, Tygon, from peristaltic pump to rinse bottle or drain bottle	2 pieces	G3160-65328
Serial-USB converter cable for use with G7201A MassHunter		G3160-80200

ASX-500 Series Autosampler Supplies

The ASX-500 Series Autosampler is fully automated, making it ideal for medium to high sample throughput applications. It features a pumped rinse station and offers flexible rack configurations with a max. capacity of 4 racks providing up to 360 vial positions with 5 x 250 mL bottle positions and bottles for rinse and tune solutions.

ASX-500 Series Autosampler Supplies

Description	Common Part No.
Sample rack, 21 position, 50 mL vials	G3286-80103
Sample rack, 24 position, 30 mL vials	G3286-80104
Sample rack, 40 position, 20 mL vials	G3286-80105
Sample rack, 60 position, 14 mL vials	G3286-80106
Sample rack, 90 position, 8 mL vials	G3286-80107
Sample probe, 0.8 mm id (red band)	G3286-80100
Sample probe, 0.3 mm id (black band)	G3286-80101
Sample probe, 0.5 mm id (blue band)	G3286-80102
Carbon fiber sample probe, 0.8 mm id (red band)	G3286-80110
Carbon fiber sample probe, 0.3 mm id (black band)	G3286-80111
Carbon fiber sample probe, 0.5 mm id (blue band)	G3286-80112
Rinse/drain tubing hookup kit	G3286-80117
Drain pump tubing and connector kit (Tygon)	G3286-80118
Z-axis drive assembly with nylon cable	G3286-80230
Rinse station	G3286-80224
USB 2.0 cable (10 ft.) for use with G7201A MassHunter	G1680-63720



ASX-520 Autosampler



Sample rack, 60 position, G3286-80106



Sample probe, G3286-80102



Drain pump tubing and connector kit (Tygon), G3286-80118

Rinse station, G3286-80224

Peripherals Supplies

The Agilent Integrated Sample Introduction System (ISIS) provides the highest sample throughput, using either high-speed uptake with constant flow nebulization or discrete sampling using a six-port valve and sample loop with time resolved acquisition. This allows for advanced sample handling and sample delivery options for advanced applications. The ISIS also simplifies handling of high matrix samples by reducing interface exposure to sample matrix. This means less signal drift and improved precision plus less frequent cone cleaning.



Agilent Integrated
Sample Introduction System (ISIS)

ISIS Supplies

Description	Specifications	Unit	7700 Part No.	7500 Part No.
Comprehensive spares for ISIS Provides a complete set of spare sample lines and connectors, plus fittings, mixing coil, block adaptors, clamps and tray. Includes Qty 1 of these components (unless listed otherwise): Sample tubing (0.5 mm id x 5 m length, 0.3 mm id x 3 m length, 2.0 mm id x 5 m length, 0.8 mm id x 5 m length), peristaltic pump tubing (0.89 mm id, 3 stoppers, Tygon, 12/pk), peristaltic pump tubing (flared end, Tygon, 2 stopper (Blue/Orange), 0.25 mm id, 12/pk), peristaltic pump tubing (1.02 mm id, 2 stoppers, Tygon, 12/pk), peristaltic pump tubing (flared end, Tygon, 2 stopper (Blue/Orange), 0.25 mm id, 12/pk), tubing adapter 2/pk, 2 x tag for tubing identification (10/pk), Tee joint, Cross joint, Union joint, PTFE nut for 3 mm od tubing (10/pk), Front and Back Ferrule for 3 mm od Tubing (10/pk), PTFE nut for 1.6 mm od tubing (10/pk), Front and Back Ferrule for 1.6 mm od Tubing (10/pk) and Tubing Clamp (Small-10/pk, Large-5/pk), Spiral Tubing 5 m			G4911-67001	G3138-65006
Preconfigured tubing kit for auto dilution Includes set of sample lines and connectors for auto-dilution			G4911-68201	G3138-65024
Preconfigured tubing kit for discrete sampling Includes set of sample lines and connectors for discrete sampling			G4911-68202	G3138-65025
Preconfigured kit (high-throughput)				G3138-65023
Peristaltic pump tubing, Tygon	0.89 mm id, 3 stops	12/pk	5064-8014	5064-8014
Peristaltic pump tubing	0.25 mm id, 2 stops, flared end	12/pk	G4911-67000	
Peristaltic pump tubing, Tygon	0.25 mm id, 3 stops	12/pk		5064-8034
Peristaltic pump tubing, Tygon	0.25 mm id, 2 stops	12/pk		5064-8015
Peristaltic pump tubing, Tygon	1.02 mm id, 2 stops	12/pk	5064-8028	5064-8028
Peristaltic pump tubing, Tygon	2.29 mm id, 2 stops	12/pk	5043-0010	5043-0010
Peristaltic pump tubing adapter		2/pk	5064-8026	5064-8026
Peristaltic pump tubing adapter	2.29 mm id		G4911-20021	

(Continued)

ISIS Supplies

Description	Specifications	Unit	7700 Part No.	7500 Part No.
Sample tubing, PTFE	0.8 mm id, 1.6 mm od		5064-8016	5064-8016
Sample tubing, PTFE	2 mm id, 3 mm od		5064-8020	5064-8020
Sample tubing, PFA	0.5 mm id, 1.6 mm od, 5 m	1/pk		G1820-65105
ISTD tubing, PFA	0.3 mm id, 1.6 mm od, 3 m	1/pk		G1820-65478
T-joint			5064-8017	5064-8017
T-joint with earth block			G3280-67062	
Cross joint			5064-8018	5064-8018
Union joint			5064-8019	5064-8019
PTFE nut	For 3 mm od tubing	10/pk	5064-8021	5064-8021
Front and back ferrule	For 3 mm od tubing	10/pk	5064-8022	5064-8022
PTFE nut for cross joint	For 1.6 mm od tubing	10/pk	5064-8023	5064-8023
Front and back ferrule	For 1.6 mm od tubing	10/pk	5064-8024	5064-8024
Tubing adapter				G3138-65158
Tubing clamp			5064-8027	5064-8027
Spiral tubing, 5 m			5064-8029	5064-8029
Wrench for valve maintenance			5064-8032	5064-8032
Tag for tubing identification		10/pk	5064-8033	5064-8033
APG remote cable			5182-2581	5182-2581
Joint holder				G3138-65102
Joint holder for nebulizer pump			G4911-01201	
Joint holder for ISIS Pump			G3138-65103	G3138-65103
Sample line connector				G3138-65104
Rotor seal for valve			G3138-65117	G3138-65117
Nut for valve		6/pk	G3138-65118	G3138-65118
Ferrule for valve		6/pk	G3138-65119	G3138-65119
Mixer			G3138-65121	G3138-65121
Sample loop, 100 µL			G3138-65122	G3138-65122
Plastic tray				G3138-65125
Tray for ISIS			G4911-60011	



Front and back ferrule, 5064-8024

ISIS Hydride Generation Accessory Supplies

Description	Specifications	Unit	Common Part No.
Hydride generation kit for 7700/8800 Series with ISIS (Enables hydride generation analysis with improved sensitivity with hydride forming elements such as As, Se and Sb, and for Hg using the vapor-generation technique)			G4911-68210
Gas/Liquid separator set Includes separator gas chamber, membrane filter O-ring, separator holder, exclusive concentric nebulizer, O-ring for nebulizer, cyclone chamber and membrane filters (5/pk)			G3138-65130
Separator gas chamber			G3138-65131
O-ring for filter			G3138-65132
Membrane filter		10/pk	G3138-65137
Separator holder			G3138-65133
Exclusive concentric nebulizer			G3138-65134
O-ring for nebulizer		2/pk	G3138-65135
Cyclone chamber			G3138-65136
Peristaltic pump tubing, PharMed	2.54 mm id, 2 stops	6/pk	G3138-65128
Tubing for gas line	3 mm id, 4 mm od, 5 m		G3138-65138
Plug for cross joint		3/pk	G3138-65129
Reducing union connector	8 x 4 mm		G3138-65144
Reducing union connector	6 x 3 mm		G3138-65139
Reducing union connector	6 x 4 mm		G3138-65140
Plug for carrier gas connector	4 mm od	3/pk	G3138-65141
Y connector for pump tubing	2.5 mm id	5/pk	G3138-65143



Separator gas chamber, G3138-65131



Membrane filter, G3138-65137

Consumables Kits for 7700/8800 Series

Description	Kit Contents	Part No.
Basic consumables kit for 7700x/e and 8800 ICP-MS	Includes peri-pump tubing for sample introduction, 12/pk; peri-pump tubing for drain, 1.52 mm, 12/pk; peri-pump tubing for ISTD, 0.19 mm, 12/pk; sample tubing, PFA, 0.5 mm id, 1/6 mm od, 5 m; torch, quartz, 2.5 mm id; graphite gasket for sampling cone, 3/pk; and vacuum pump oil	G3280-67003
Comprehensive spares for 7700x/e and 8800 ICP-MS	Includes Qty 1 of these components (unless listed otherwise): sample peristaltic pump tubing (2 x 12/pk), drain peristaltic pump tubing (12/pk), Int. Std. flared end peristaltic pump tubing (2 x 12/pk), sample tubing (0.5 mm id x 5 m length), sample tubing for MicroMist nebulizer (10/Pk), on-line Int. Std. addition kit, drain tube assembly, spray chamber, tubing for spray chamber drain, ball joint connector, gas connector for dilution gas port, carrier gas connector for MicroMist, plug for dilution gas port, clamp (2/pk), carrier gas tubing, torch with 2.5 mm id injector, long life shield plate, bonnet for shield torch, plasma/aux. gas tubing, inner sleeve (qty 2), gas line connector, work coil, graphite gaskets for sampling cone (pk/3), Ni sampling cone (Qty 2), Ni skimmer cone (Qty 2), screw and spacer kit for x-lens, screw/spacer O-ring, PTFE tubing for internal reaction gas line, octopole assay, polishing paper for ion lens and interface (pk/5), oil mist filter element and rotary pump oil (Qty 2 x 1 L).	G3280-67004
Comprehensive spares for 7700s and 8800 semicon configuration ICP-MS	Includes Qty 1 of these components (unless listed otherwise): sample peristaltic pump tubing (2 x 12/pk), drain peristaltic pump tubing (12/pk), Int. Std. flared end peristaltic pump tubing (2 x 12/pk), sample tubing (0.5 mm id x 5 m length), On-line Int. Std. Addition Kit, drain tube assembly, spray chamber, tubing for spray chamber drain, ball joint connector, gas connector for dilution gas port, carrier gas connector for MicroMist, plug for dilution gas port, clamp (2/pk), carrier gas tubing, torch with 2.5 mm id injector, long life shield plate, bonnet for shield torch, plasma/aux. gas tubing, inner sleeve (qty 2), work coil, graphite gaskets for sampling cone (pk/3), Pt sampling cone, Pt skimmer cone, screw and spacer kit for s-lens, screw/spacer O-ring, PTFE tubing for internal reaction gas line, Octopole assay, polishing paper for ion lens and interface (pk/5), oil mist filter element and rotary pump oil (Qty 2 x 1 L).	G3280-67007
Comprehensive spares for 7700e ICP-MS	Includes Qty 1 of these components (unless listed otherwise): sample peristaltic pump tubing (2 x 12/pk), drain peristaltic pump tubing (12/pk), Int. Std. flared end peristaltic pump tubing (2 x 12/pk), sample tubing (0.5 mm id x 5 m length), sample tubing for MicroMist nebulizer, On-line Int. Std. Addition Kit, drain tube assembly, spray chamber, gas connector for dilution gas port, carrier gas connector for MicroMist, clamp (2/pk), carrier gas tubing, torch with 2.5 mm id injector, long life shield plate, bonnet for shield torch, plasma/aux. gas tubing, inner sleeve, gas line connector, work coil, graphite gaskets for sampling cone (pk/3), Ni sampling cone (Qty 2), Ni skimmer cone (Qty 2), screw and spacer kit for x-lens, screw/spacer O-ring, PTFE tubing for reaction gas line, Octopole assay, polishing paper for ion lens and interface (pk/5), oil mist filter element and rotary pump oil (Qty 2 x 1 L).	G3280-67085

GC Interface Supplies for 7500 Series

Description	Part No.
Injector assembly	G3158-65001
Torch	G3158-65007
Stainless steel pipe (Sulfinert) for GC-ICP-MS interface, 1/16 in	G3158-65003

GC Interface Supplies for 7700/8800 Series

Description	Part No.
Transfer line for GC interface	G3158-80060
Injector assembly for GC interface	G3158-80050
Torch for GC interface	G3158-80074
Pre-heating pipe with connector, stainless steel, 1/16 in	G3158-80080
Stainless steel pipe, 1/16 in (Sulfinert, 1.05 m)	G3158-80081
Vespel/Graphite reducing ferrule (1/8 in to 1/16 in, VG1, 10/pk)	0100-1344
Vespel/Graphite ferrule (1/4 in, VG1, 10/pk)	0100-1331
Vespel/Graphite ferrule for 320 µm columns (0.5 mm, VG1, 10/pk)	5062-3506
Vespel/Graphite ferrule (1/16 in, VG2, 10/pk)	0100-1379
PFA tubing, 1/8 in, 2 m	G3158-60010
3-way manual valve	G3158-80024
Swagelok plug, stainless steel, 1/8 in	0100-0071
Nut with pipe	G3158-80009
Stainless steel tee for O_2 gas mix, 1/8 in	0100-0542

Speciation Columns and Supplies

Description	Notes	Part No.
As speciation column for drinking water		G3154-65001
As speciation column for urine		G3288-80000
As speciation guard column		G3154-65002
Cr speciation column for drinking water		G3268-80001*
Comprehensive LC connection kit	Suitable for LC-ICP-MS applications other than Cr in water and As in water/urine. This is a comprehensive pack of tubing and connectors required to set up LC-ICP-MS. Includes sample Tubing (5 x PFA 0.15 mm id x 0.7 m length, 1 x PTFE 0.8 mm id x 0.5 m length, 1 x PTFE 2.0 mm id x 5 m length), Peristaltic Pump Tubing (Tygon, 3-stop, 0.89 mm id, 12/pk), 2 x Tee Joint, 5 x Union Joint, PTFE Nut for 3 mm od tubing (10/pk), Front and Back Ferrule for 3 mm od Tubing (10/pk), PTFE Nut for 1.6 mm od tubing (10/pk), Front and Back Ferrule for 1.6 mm od Tubing (10/pk), 2 x Peristaltic Pump Tubing Adapters, APG Remote cable, Gender changer Connector D9S-FF and Manual/setup guide	G1833-65200
Basic LC connection kit	Includes sample tubing (PFA, 0.3 mm id, 1.6 mm od, 3 m), 2 union joints, 3 x PEEK finger-tight fitting - 1/16 in x 10-32 male nut (2/pk), APG remote cable and gender changer connector D9S-FF	G1820-65541
Total consumption nebulizer for capillary LC interface		G3280-80602
Single pass spray chamber for capillary LC interface		G3280-80603

*Cr speciation handbook, P/N G3268-90001

Miscellaneous Supplies

Description	Part No.
7700 maintenance video DVD	G3280-60910
Cooling water hose, 10 m	G1833-65429
Strainer for cooling water	G1833-66024
Poly-clear fluid for G3292A chiller	G3292-80010
Fluid filter for G3292A chiller	G3292-80109
Air filter for G3292A chiller	G3292-80112
Filter for cooling water for 7500 Series	G1820-65018
Water filter connector for 7500 Series	G1820-80430
O-ring for water filter cartridge for 7500 Series	G1833-66042



Strainer for cooling water, G1833-66024

Gas Line Supplies

Gas Line Supplies

Description	Specifications	Use	Unit	7700 Part No.	7500 Part No.
Plasma/aux tubing with inner sleeve	0.2 m		2/pk	G3280-67023	
Connectors for plasma/aux gas lines, PTFE	6 mm and 4 mm	For gas line connection to torch	1/ea	G1820-65027	G1820-65027
Inner sleeve for carrier/aux/blend gas line	CTFE	For gas line connection to connector	5/pk		5042-0922
Inner sleeve for plasma gas line	CTFE	For gas line connection to connector	5/pk		5042-0923
Carrier/make-up/dilution gas tubing				G3280-67022	
Gas connector for dilution gas port		For dilution gas line connection to dilution port		0100-2583	
Argon gas tubing kit	1/4 in od, 5 m, inner sleeve, connector	For external line			G1820-65023
Tubing for carrier/blend gas, PTFE	3 mm id, 4 mm od, 35 cm	For gas line connection to nebulizer	2/pk		G1833-65414
Plasma and auxiliary gas line tubing	3.17 mm id, 6.35 mm od, 35 cm (plasma) 2.38 mm id, 3.96 mm od, 35 cm (aux)	For gas line connection to torch	2/pk		G3270-65021
Argon humidifier				G3270-80029	G3270-80029
Ar gas filter				G1820-80341	G1820-80341
Ar clean gas filter		For semicon applications		5064-8092	5064-8092
Ar gas tubing kit for 7700x/e and 8800		For external line		G3280-60160	
Ar gas tubing kit for 7700s and 8800 semicon configuration		For external line		G3280-60163	
Stainless steel tubing	1/8 in od, 6 m	For external cell gas line		G3270-65035	G3270-65035



Plasma/aux tubing with inner sleeve, G3280-67023



Connectors for plasma/aux, G1820-65027

Carrier/make-up/dilution gas tubing, G3280-67022

Ultra Clean ICP-MS Traps

Description	Part No.
Agilent Gas Clean GC/MS filter	CP17973
Viton O-rings, two sets	CP7983



Agilent Gas Clean GC/MS filter, CP17973

Gas Regulators – US only

Description	Part No.
Regulator for Helium gas	0101-1398
Regulator for Hydrogen gas	0101-1399
Regulator for Argon gas	0101-1400
Regulator for NH_3/He gas	5188-5374

Gas Line Connectors for 7500 Series

Description	Specifications	Use	7500 Part No.
Connector for end cap and gas line		For gas line connection to nebulizer	5063-5263
Connectors for plasma/aux gas lines, PTFE	6 mm and 4 mm	For gas line connection to torch	G1820-65027
Connector for carrier gas line, PTFE	4 mm tubing, includes ferrule and O-ring	For gas line connection to Babington Nebulizer	G1820-65214
Connector for carrier gas line, polypropylene	4 mm tubing, includes ferrule and O-ring	For gas line connection to Concentric Nebulizer	G1820-65052
Connector for blend gas line, polypropylene, 2/pk	4 mm tubing	For gas line connection to Crossflow/Babington Nebulizer	G1820-65119
Connector for make-up gas line, polypropylene	4 mm tubing, Luer type	For gas line connection to Crossflow/Babington Nebulizer	G1833-65477
Union fitting	4 mm tubing	For PFA Concentric Nebulizer	5064-8078



Polypropylene connector, G1820-65052



PTFE connector, G1820-65214

Connector for blend gas line, G1820-65119



4100 Microwave
Plasma-Atomic Emission Spectrometer

MP-AES

Agilent has revolutionized atomic spectroscopy with the introduction of an instrument that doesn't just redefine a category – it creates a new one!

The Agilent 4100 Microwave Plasma-Atomic Emission Spectrometer runs entirely on air, which means your lab can eliminate flammable and expensive gases. It's safer and more cost efficient than other spectrometers. The 4100 MP-AES enables superior detection and can perform unattended multi-element analyses.

Agilent provides all of the supplies and accessories you need for the 4100 MP-AES.



Easy-fit torch, G8000-70002



Torch clamp, G8000-64140



Concentric nebulizer, G8000-70004



Nebulizer gas connector, G8000-64142



OneNeb inert concentric nebulizer, 2010126900

Agilent 4100 MP-AES Supplies

4100 MP-AES Torch Supplies

Description	Part No.
Easy-fit torch	G8000-70002
Torch clamp	G8000-64140

4100 MP-AES Nebulizers and Supplies

Description	Part No.
Concentric nebulizer for use with aqueous solutions and normal digests	G8000-70004
Nebulizer gas connector Connects to gas outlet on instrument	G8000-64142
OneNeb inert concentric nebulizer for use with HF solutions and organic solvents	2010126900

4100 MP-AES Spray Chambers and Supplies

Description	Part No.
Single-pass glass cyclonic spray chamber	G8000-70006
Double-pass glass cyclonic spray chamber for use with organic solvents	G8000-70007
Drain tube kit	G8000-64143
Inert single-pass cyclonic spray chamber for use with HF solutions	G8000-70008



Single-pass glass cyclonic spray chamber, G8000-70006

4100 MP-AES Peristaltic Pump Tubing

Description	Unit	Part No.
Pump tubing, PVC, white/white for sample	12/pk	3710034400
Pump tubing, PVC, blue/blue for spray chamber waste	12/pk	3710034600
Pump tubing, Solvaflex, blue/blue	12/pk	3710067900
Pump tubing, Solvaflex, orange/green	12/pk	3710068000



Double pass spray chamber, G8000-70007

4100 MP-AES Miscellaneous Supplies

Description	Part No.
Pre-optic window	G8000-64112
Inlet cooling air filter	G8000-68002
Onboard argon bottle for plasma ignition	G8000-70001
Air inlet filter kit for Agilent 4107 Nitrogen Generator Includes 1 each of the replacement filter elements - the large 5 micron particle filter (white filter element), the small 1 micron particle filter (blue filter element) and the activated carbon filter (mesh filter element).	G8001-64004



Inlet cooling air filter, G8000-68002



Multi-Mode Sample Introduction System (MSIS)

Multi-Mode Sample Introduction System (MSIS)

The MSIS provides simultaneous vapor generation of environmentally sensitive elements including As, Se and Hg with low µg/L detection limits. It provides better performance through thin film hydride technology, while offering a choice of three modes that eliminates changeover and allows routine and hydride elements to be determined using the same setup.

Description	Part No.
Multi-Mode Sample Introduction System (MSIS)	G8000-63003



External Gas Control Module (EGCM)

External Gas Control Module (EGCM)

Add the EGCM to enable determination of organic solvents and sulfur. The EGCM injects air into the plasma, minimizing carbon build up and reducing background.

Description	Part No.
External Gas Control Module (EGCM)	G8000-63005

Organics Kit

The 4100 MP-AES Organics Kit includes all items required to adapt the 4100 for determination of organic solvents.

Description	Part No.
4100 MP-AES Organics Kit Includes External Gas Control Module (EGCM), OneNeb nebulizer and solvent resistant tubing	G8000-68004

AA/MP-AES, ICP-OES & ICP-MS Standards

Agilent offers a comprehensive range of single and multi-element standards, ionization buffers and environmental standards for atomic spectroscopy. With the assurance of NIST traceability, Agilent's selection of standard mixes offers accurate, reliable calibrations at great value.

All of Agilent's atomic spectroscopy standards are prepared to exacting specifications that ensure consistency. Every solution is manufactured using high purity starting materials, which are regularly tested in accordance with NIST guidelines to provide traceability.

- Give you confidence in your AAS, ICP-OES or ICP-MS and MP-AES results
- Standards shipped from stock to maximize uptime
- Supplied with a Material Safety Data Sheet (MSDS) and Certificate of Analysis for complete assurance
- All standards packaged in a pre-leached HDPE bottle, secured with a tamper-evident seal

AA, MP-AES and ICP-OES Standards

Wavelength Calibration Solutions for 700 Series and Vista Series ICP-OES and MP-AES

Description	Part No.
Wavelength calibration solution for ICP-OES and MP-AES: 500 mL, contains 50 mg/L Al, As, Ba, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sr, Zn and 500 mg/L K in 5 % HNO_3 + tr HF Dilute 10 times prior to use	6610030000
Wavelength calibration solution for ICP-OES and MP-AES: 500 mL, contains 5 mg/L Al, As, Ba, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Se, Sr, Zn and 50 mg/L K in 5 % HNO_3 + tr HF Ready to use	6610030100



Wavelength calibration solution for ICP-OES and MP-AES, 6610030100

Multi-Element Calibration Standards

Description	Part No.
Calibration mix 1: 125 mL, contains 100 mg/L Sb, Mo, Sn and Tl in 2 % HNO_3 + 0.5 % HF	6610030500
Calibration mix 2: 125 mL, contains 100 mg/L Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, Se, Tl, Th, U, V and Zn in 5 % HNO_3	6610030600
Calibration mix majors: 125 mL, contains 500 mg/L Ca, Fe, K, Mg and Na in 5 % HNO_3	6610030700
Calibration mix 3, organic: 100 mL, contains 500 mg/L Ag, Al, B, Ba, Ca, Cd, Cr, Cu, Fe, Mg, Mn, Na, Ni, P, Pb, Si, Sn, Ti, V and Zn in mineral oil	6610030200



Copper, 8200201301

Single Element Standards for AA/MP-AES

Supplied in 100 mL bottles. Concentration = 1,000 mg/L (0.1%). One mL of solution contains 1 mg of metal.

Description	Part No.	Description	Part No.
Aluminum	8200200001	Manganese	8200203101
Antimony	8200200101	Mercury	8200203201
Arsenic	8200200201	Molybdenum	8200203301
Barium	8200200301	Nickel	8200203501
Beryllium	8200200401	Palladium	8200203801
Bismuth	8200200501	Platinum	8200203901
Boron	8200200601	Potassium	8200204001
Cadmium	8200200701	Selenium	8200204801
Calcium	8200200801	Silver	8200205001
Cesium	8200201001	Sodium	8200205101
Chromium	8200201101	Strontium	8200205201
Cobalt	8200201201	Silicon	8200205301
Copper	8200201301	Tellurium	8200205401
Europium	8200201601	Thallium	8200205601
Gold	8200202001	Tin	8200205901
Indium	8200202301	Titanium	8200206001
Iron	8200202501	Tungsten	8200206101
Lead	8200202701	Vanadium	8200206301
Lithium	8200202801	Zinc	8200206601
Magnesium	8200203001	Zirconium	8200206701

Buffers/Ionization Suppressant for Flame AA

Supplied in 500 mL bottles

Description	Part No.
Cesium buffer solution – 1% 10,000 mg/L Cs in 2-5% nitric acid	190064500
Lanthanum Buffer Solution – 10% 100,000 mg/L La in 2-5% HNO_3	8200206901
Potassium Buffer Solution – 10% 100,000 mg/L K in 2-5% HNO_3	8200206801
Strontium Buffer Solution – 10% 100,000 mg/L Sr in 2-5% HNO_3	8200207001



Cesium buffer solution – 1%, 190064500

Matrix Modifiers for Graphite Furnace AA

Supplied in 100 mL bottles

Description	Part No.
Ammonium nitrate 5% ammonium nitrate in 2% nitric acid	190024000
Ammonium phosphate 40% ammonium dihydrogen phosphate in water	190024100
Nickel nitrate 5000 mg/L nickel in 5% nitric acid	190024200
Palladium nitrate 2000 mg/L palladium in 2-5% nitric acid	190024300



Palladium nitrate, 190024300



Calcium, 190026409

Single Element Standards for ICP-OES/MP-AES

Supplied in 100 mL bottles. Concentration = 10,000 mg/L (1.0 %). One mL of solution contains 10 mg of metal.

Description	Part No.	Description	Part No.
Aluminum	190026401	Molybdenum	190026422
Antimony	190026402	Nickel	190026423
Arsenic	190026403	Phosphorus	190026424
Barium	190026404	Platinum	190026425
Beryllium	190026405	Potassium	190026426
Bismuth	190026406	Selenium	190026428
Boron, 5,000 mg/L	190026407	Silicon	190026429
Cadmium	190026408	Silver	190026430
Calcium	190026409	Sodium	190026431
Cesium	190026410	Strontium	190026432
Chromium	190026411	Sulfur	190026433
Cobalt	190026412	Tantalum	190026434
Copper	190026413	Thallium	190026435
Gold	190026414	Tin	190026436
Iron	190026415	Titanium	190026437
Lead	190026417	Vanadium	190026439
Lithium	190026418	Yttrium	190026449
Magnesium	190026419	Zinc	190026440
Manganese	190026420	Zirconium	190026441
Mercury	190026421		

Environmental Standards for ICP-OES

Supplied in 500 mL bottles

Description	Application	Part No.
INTF-A Quality Control standard Contains Al, Ca & Mg at 5,000 mg/L; Fe at 2,000 mg/L	Interference check standard; for preparation of EPA CLP standards ICSA and ICSAB	190064800
ICV-7 Quality Control standard Contains Ca, Mg, K & Na at 5000 mg/L; Al & Ba at 200 mg/L; Fe at 100 mg/L; Sb at 60 mg/L; Co & V at 50 mg/L; Ni at 40 mg/L; Cu at 25 mg/L; Zn at 20 mg/L; Mn at 15 mg/L; As, Cr, Ag & Tl at 10 mg/L; Be, Cd, Pb & Se at 5 mg/L	Initial/continuing calibration verification standard; for EPA CLP analyses	190064900
QCSTD-27 Quality Control standard Contains Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Si, Ag, Sr, Na, Tl, Ti, V & Zn at 100 mg/L	Quality control standard; for environmental analyses	190065000
ANALT-B Quality Control standard Contains Cd, Ni, Pb, Ag & Zn at 100 mg/L; Ba, Be, Co, Cr, Cu, Mn & V at 50 mg/L	Interference check standard; for preparation of EPA CLP standard ICSAB	190065100

Internal Standard/Ionization Suppressant for ICP-OES/MP-AES

Description	Unit	Part No.
Cesium buffer solution – 1% 10,000 mg/L Cs in 2-5% nitric acid	500 mL bottle	190064500
Cesium buffer solution - 10% 100,000 mg/L Cs in 2-5% nitric acid	500 mL bottle	190064600
Yttrium solution - 1% 10,000 mg/L Also used for instrument optimization	500 mL bottle	190064700
Cesium buffer solution – 1% 10,000 mg/L Cs in 2-5% nitric acid	500 mL bottle	190064500
ICP internal standard Contains 100 mg/L ^{6}Li, Sc, Y, In, Tb and Bi in 5 % HNO_3	125 mL bottle	6610030400



Cesium buffer solution – 1%, 190064500

ICP-MS Standards



Stock Tuning Solution, 5188-6564

Installation and Checkout Standards

Description	Part No.
ICP-MS Checkout Solutions for 7700, 8800 and 7500 ce/cx/cs system installation kit Contains tuning solution, dual mode (1), dual mode (2), wash, and water blank solutions	5185-5850
ICP-MS Checkout Solutions for 7500s system installation kit Contains tuning solution, dual mode (1), dual mode (2), abundance sensitivity (1), abundance sensitivity (2), detection limit solution, high sensitivity tune, wash, and water blank solutions	5184-3564
ICP-MS Checkout Solutions for 7500a/i/c system installation kit Contains tuning solution, dual mode (1), dual mode (2), wash, and water blank solutions	5184-3565

Tuning Solutions

Description	Part No.
PA Tuning Solution Kit: Tuning 1: 20 mg/L each of Zn, Be, Cd, As; 10 mg/L each of Ni, Pb, Mg; 5 mg/L each of Tl, Na, Al, U, Cu, Th, Ba, Co, Sr, V, Cr, Mn, ^{6}Li, Sc, In, Lu, Bi; 2.5 mg/L each of Y, Yb; matrix 2-5% HNO_3 Tuning 2: 10 mg/L each of Mo, Sb, Sn, Ge, Ru, Pd; 5 mg/L of Ti, Ir; matrix 10% HCl and 1% HNO_3 with trace amounts of HF	5188-6524
Stock Tuning Solution: Li, Y, Ce, Tl and Co; 100 mL, 10 mg/L; matrix 2% HNO_3	5188-6564
Stock Tuning Solution: Li, Mg, Y, Ce, Tl and Co; 100 mL, 10 mg/L; matrix 2% HNO_3	5190-0465
Tuning Solution: Li, Y, Ce, Tl and Co; 2 x 500 mL, 10 µg/L; matrix 2% HNO_3	5184-3566
Tuning Solution: Li, Mg, Y, Ce, Tl, Co; 2 x 500 mL, 1 µg/L; matrix 2% HNO_3	5185-5959

Multi-Element Calibration Standards

Description	Part No.
Multi-Element Calibration Standard-1, 100 mL: 10 mg/L of Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Th, Tm, Y, Yb; matrix 5% HNO_3	8500-6944
Multi-Element Calibration Standard-2A, 2 x 100 mL: 1 bottle: 10 mg/L of Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, K, Li, Mg, Mn, Na, Ni, Pb, Rb, Se, Sr, Tl, U, V, Zn; matrix 5% HNO_3 2 bottle: 10mg/L Hg in 5% HNO_3	8500-6940
Multi-Element Calibration Standard-3, 100 mL: 10 mg/L of Sb, Au, Hf, Ir, Pd, Pt, Rh, Ru, Te, Sn; matrix 10% HCl/1% HNO_3	8500-6948
Multi-Element Calibration Standard-4, 100 mL: 10 mg/L of B, Ge, Mo, Nb, P, Re, S, Si, Ta, Ti, W, Zr; matrix H_2O/trace HF	8500-6942

Single Element Standards

Description	Part No.
Bismuth, 100 mL, 10 mg/L	8500-6936
Cobalt, 100 mL, 10 mg/L	8500-6947
Gold, 100 mL, 10 mg/L	8500-7000
Indium, 100 mL, 10 mg/L	8500-6946
Mercury, 100 mL, 10 mg/L	8500-6941
Rhodium, 100 mL, 10 mg/L	8500-6945

Interference Check Mixes

Description	Part No.
6020 Interference Check Solution A, 100 mL: 20,000 mg/L of Cl; 3,000 mg/L of Ca; 2,500 mg/L each of Fe, Na; 2,000 mg/L of C; 1,000 mg/L each of Al, Mg, P, K, S; 20 mg/L each of Ti, Mo; matrix 5% HNO_3 with trace amounts of HF	5188-6526
6020 Interference Check Solution B, 100 mL: 20 mg/L each of Cr, Co, Cu, Mn, Ni, V; 10 mg/L each of As, Cd, Se, Zn; 5 mg/L of Ag; matrix 5% HNO_3	5188-6527

Environmental Standards

Description	Part No.
Environmental Calibration Standard, 100 mL: 1,000 mg/L of Fe, K, Ca, Na, Mg; 10 mg/L of Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn, Th, U; matrix 10% HNO_3	5183-4688
Initial Calibration Verification Standard, 100 mL: 1,000 mg/L of Fe, K, Ca, Na, Mg, Sr; 10 mg/L of Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn, Th, U; matrix 5% HNO_3	5183-4682
Internal Standard Mix, 100 mL: 100 mg/L of ^{6}Li, Sc, Ge, Rh, In, Tb, Lu, Bi; matrix 10% HNO_3	5188-6525
Internal Standard Mix, 100 mL: 10 mg/L of ^{6}Li, Sc, Ge, Y, In, Tb, Bi; matrix 5-10% HNO_3	5183-4681
Environmental Spike Mix, 100 mL: 1,000 mg/L of Fe, K, Ca, Na, Mg; 100 mg/L of Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn, U; matrix 5% HNO_3	5183-4687



The Agilent Cary range of UV-Vis and UV-Vis-NIR spectrophotometers

Agilent 8453 UV-VIS & Cary UV-VIS-NIR Supplies

Agilent 8453 UV-Vis and Cary UV-Vis and UV-Vis-NIR spectrophotometers are synonymous with excellence and high performance. Our range of consumables for these products includes high quality cuvettes and flow cells, fiber optic probes, lamps and detectors.

The genuine Agilent cells, tubing, fittings and supplies in this section have been tested with the Agilent 8453 and Cary range for reliable and repeatable results. Agilent UV-Vis cells and supplies are manufactured in an ISO 9001-certified environment. Additionally, Agilent UV-Vis cells are supplied with a certificate of analysis, so you can be confident that it will conform to stringent protocols such as NIST, GLP, GMP and NAMAS.

This section will help you identify the cells that fit your unique applications. You will also learn how to enhance your lab's productivity by choosing the correct spectrophotometer equipment, tubing, fittings, and dissolution testing supplies.



Cell tray, 5063-6577

UV-Vis and UV-Vis/NIR Flow Cells and Cuvettes

Cell Materials

Cells are available in four materials. Select the cell material depending on the wavelength range of your measurements.

For applications with a wavelength range of interest in the visible range, use our lower priced Agilent optical quality glass cells, made from exceptionally pure raw materials. Quartz glass gives transmission values of >80% between 200 nm and 2500 nm for an empty cell. Optical glass gives transmission values of >80% between 330 nm and 2500 nm for an empty cell.

Material	Wavelength (nm)
Quartz	170 to 2700
Infrasil Quartz (NIR)	220 to 3800
Optical Glass	334 to 2500
Polystyrene (disposable)	340 to 800

Cell Shapes

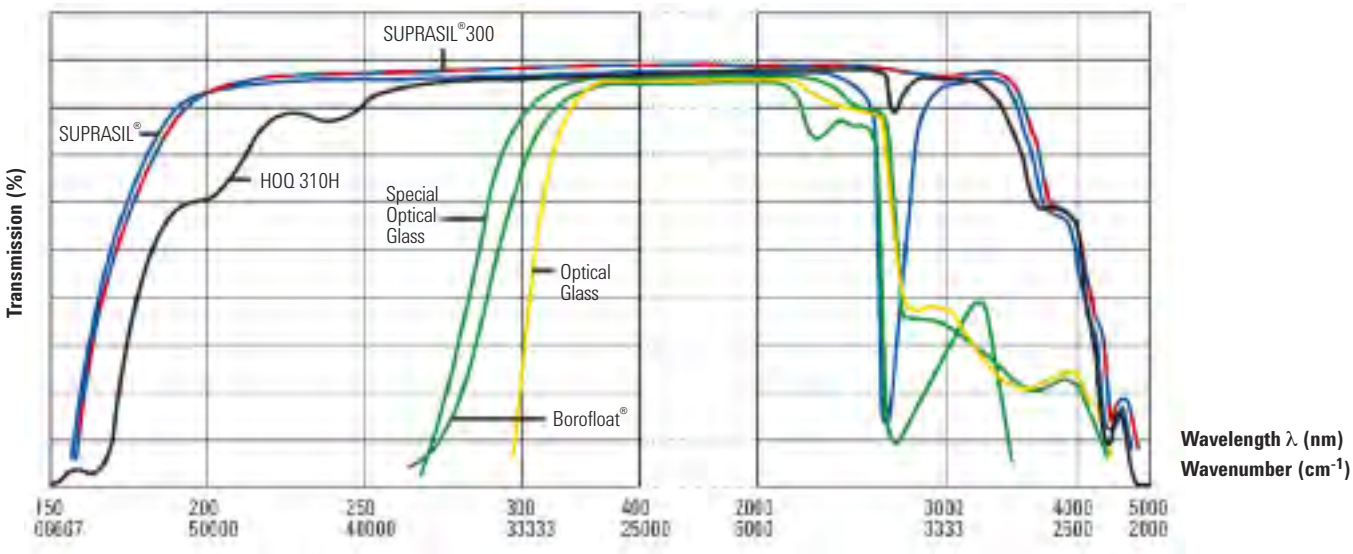
Rectangular Cells

Rectangular cells are the most commonly used cell type and vary in shape from square to longer rectangles, depending on the cell path length. We offer standard cells, semi-micro cells with about 40% of the volume of a standard cell of the same path length, microcells with about 20% of the volume of a standard cell, sub-micro and ultra-micro cells that have microliter volumes, and disposable cells. Semi-micro cells can be used with all Cary 100/300/4000/5000/6000 multicell holders and with all standard single cell holders. In addition, they can be used with the Temperature Probe Accessory for cell temperature monitoring.

Cells sold as matched pairs are used for most UV-Vis and UV-Vis-NIR routine analyses. Matched pairs ensure these cells will give a similar absorbance or transmission reading when empty or filled with water.

Long path length cells are ideal for use when extra sensitivity is needed for low concentration samples. These cells must be used with the long path length rectangular cell holder.

Transmission of empty cells made of different materials





Cell tray, 5063-6577

Cell Volumes

Macro Cells

The macro cell, which is defined by DIN 58963 as a rectangular cell with an inner width greater than 5 mm, has emerged as the standard for photometry. The most widely used macro cell is a rectangular cell with outer dimensions of 45 x 12.5 mm (height x width). The length of the cell is dependent on the desired path length. Macro or standard cells have about the same wall thickness on all sides, and are used for most liquid UV-Vis and UV-Vis-NIR measurements. They require the largest sample size for a given path length.

Semi-micro Cells

Semi-micro cells have an inner width of 4 mm to 2 mm. The thickness of the base is 9 mm. Semi-micro cells also have thicker side walls to reduce the volume to about 40% of the volume of a standard cell of the same path length. These cells are useful when only small sample volumes are available for testing. Cells that are black self-masking are listed with their aperture size. The aperture is located at the correct Z-height for both Agilent 8453 and the Cary UV-Vis and UV-Vis spectrophotometers – but note that the 8453 uses a different Z-height, so check compatibility. Semi-micro cells can be used with Cary 100/300 and 4000/5000/6000 multicell holders and with all standard single cell holders. They can also be used with the Temperature Probe Accessory for cell temperature monitoring. The semi-micro cell, with a stirring well for a magnetic stirring bar, is suitable for all Cary 100/300 and 4000/5000/6000 series Peltier thermostatted multicell and single cell holders.

Microcells

Microcells have thicker sidewalls to reduce the volume to about 20% of the volume of a standard cell of the same path length. These cells are useful when limited sample volumes are available for testing.

Ultra-micro Cells

Ultra-micro cells are specifically designed for use in the µL range (with typical volumes in the 5 to 135 µL range). They fit into any standard cell holder and have the advantage of requiring much smaller sample volumes – so they're ideal for highly concentrated samples, highly absorbing solvents or when sample volumes are very limited. These quartz cells offer low volume, short path length and excellent heat transfer. They are ideal for temperature-controlled work, and all except the 1 mm path length cell can be used with the Temperature Probe. Cells that are black self-masking are listed with their aperture size. The cells are constructed so that filling and emptying can be easily accomplished with commonly available pipette tips. Ultra-micro cells with Eppendorf pipette filling/emptying are designed to handle extremely small volumes. When only a minimum amount of sample is available, these cells provide a filling volume only slightly larger than the measuring chamber volume.

Macro Cells



Macro cell with PTFE lid

Macro Cells with PTFE Lid

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µL)	Part No. Glass	Part No. Quartz
Use with 8453 UV-Vis					
1	45 x 12.5 x 3.5	44.5 x 9.5	350	5063-6546	
					5061-3384
2	45 x 12.5 x 4.5	44.5 x 9.5	700	5063-6547	
					5061-3385
5	45 x 12.5 x 7.5	44.5 x 9.5	1750	5063-6548	
					5061-3386
10	45 x 12.5 x 12.5	44.5 x 9.5	3500	5063-6549	
					5061-3387
10	45 x 12.5 x 12.5	44.5 x 9.5	3500	5063-6550*	
					1000-0544*
20	45 x 12.5 x 22.5	44.5 x 9.5	7000	5063-6551	
					5063-6553
50	45 x 12.5 x 52.5	44.5 x 9.5	17500	5063-6552	
					5063-6554
Use with Cary 50/60/100/300/4000/5000/6000i					
10	45 x 12.5 x 12.5	44.5 x 10	3500	6610008800*	
					6610000800*
					6618000100 (Infrasil Quartz)
20	45 x 12.5 x 22.5	44.5 x 10	7000	6610016500	6610016200
50	45 x 12.5 x 52.5	42 x 9.5	17500	6610016400	
					6610016100
100	45 x 12.5 x 102.5	42 x 9.5	35000		6610016000
				6610016300	

*Matched pair



Macro cell with PTFE lid, 6610000800

Macro Cells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µL)	Part No. Glass	Part No. Quartz
Use with 8453 UV-Vis					
5	48 x 12.5 x 7.5	42 x 9.5	1750		5063-6557
10	48 x 12.5 x 12.5	42 x 9.5	3500	5063-6556	
					5062-2477
Use with Cary 50/60/100/300/4000/5000/6000i					
10	48 x 12.5 x 12.5	44.5 x 10	3500		6610001100*

Spacers are required for cells with an outer depth of less than 12.5 mm to hold them securely in the cell holder.

*Matched pair



Macro cell with PTFE stopper

Disposable Polystyrene Cells

Disposable polystyrene cells are useable from 340 to 800 nm, are economical, can be used with magnetic stirrers, but cannot be used at elevated temperatures.

Disposable Cells

Description	Cell Type	Cell Material	Volume (mL)	Path Length (mm)	Sample Chamber Width (mm)	Unit	Part No.
Standard cell	Rectangular	Polystyrene	3.5	10	10	500/pk	6610018800
Microcell	Rectangular	Polystyrene	1.5	10	4	500/pk	6610018700



Standard cell, disposable, 6610018800



Microcell, polystyrene, 6610018700

Agilent high-precision cells are tested to meet the highest optical standards. Every Agilent cell comes with a test certificate, ensuring that the following areas have been tested and are within specifications:



- Homogeneity of the raw material
- Dimensional and angle tolerances of the component parts
- Flatness of the optical surfaces
- Transmission of the cells

Semi-micro Cells



Semi-micro cell with PTFE lid



Semi-micro cell with PTFE stopper

Semi-micro Cells with PTFE Lid

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µL)	Part No. Glass	Part No. Quartz
Use with 8453 UV-Vis					
10	45 x 12.5 x 12.5	41.8 x 2	700		5061-3391
		36 x 4	1000	5063-6558	
					5063-6559
Use with Cary 50/60 only **Top section features two black walls and two translucent side walls**					
10	45 x 12.5 x 12.5	2 x 2	40		6610019500
5	45 x 12.5 x 12.5	0.8 x 0.8	5		6610019400

Semi-micro Cells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µL)	Part No. Glass	Part No. Quartz
Use with 8453 UV-Vis					
10	46 x 12.5 x 12.5	37 x 4	1000	5063-6560	
					5063-6561
Use with Cary 50/60/100/300/4000/5000/6000i **Self masking black walls**					
5	45 x 12.5 x 12.5	33 x 4	450		6610019800*
2	45 x 12.5 x 12.5	33 x 4	180		6610019700*
1	45 x 12.5 x12.5	33 x 4	90		6610019600*
10	48 x 12.5 x 12.5	44.5 x 4	1400		6610001800
			1300		6610015400**
		33 x 4	900		6610012700*
Use with Cary 50/60 only **Top section features two black walls and two translucent side walls**					
10	48 x 12.5 x 12.5	2 x 2	135		6610021100***
10	48 x 12.5 x 12.5	2 x 2	135		6610021000***

*Matched pair

**Use with magnetic stirrer bars (P/N 6610018900)

***2 mm aperture

Sub-micro Cells



Sub-micro cell, black wall

Sub-micro Cells

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (µL)	Part No. Quartz
Use with Cary 50/60/100/300/4000/5000/6000i				
5	45 x 12.5 x 12.5	2 x 2	40	6610024000***
10	45 x 12.5 x 12.5	2 x 2	80	6610024100***
	45 x 12.5 x 12.5	2 x 2.5	50	6610010400***[I]

***2 mm aperture

[I]Features 2 black walls and 2 translucent side walls

Ultra-micro Cells



Ultra-micro cell with PTFE stopper

Ultra-micro Cells with PTFE Stopper

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µL)	Filling Volume (µL)	Part No. Quartz
Use with 8453 UV-Vis						
2	45 x 12.5 x 12.5	2.5 x 2	15	10	20	5062-2497
10	45 x 12.5 x 12.5	2.5 x 2	15	50	70	5062-2496
Use with Cary 50/60/100/300/4000/5000/6000i						
1	45 x 12.5 x 12.5	1 x 1	20	8		6610023900
10	48 x 12.5 x 12.5	1 x 1	20	10		6610013800



Ultra-micro cell with Eppendorf filling

Ultra-micro Cells with Eppendorf Pipette Filling/Emptying

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µL)	Filling Volume (µL)	Part No. Quartz
Use with 8453 UV-Vis						
0.1	40 x 12.5 x 12.5	1 x 5	15	0.5	5	5063-6562
1	40 x 12.5 x 12.5	1 x 5	15	5.0	10	5063-6563
5	40 x 12.5 x 12.5	0.8 round	15	2.5	5	5063-6564
10	40 x 12.5 x 12.5	0.8 round	15	5.0	10	5063-6565

Cylindrical Cells

A cylindrical cell is a cell with plane-parallel optical surfaces whose inner volume is cylindrical in shape, and has a longitudinal axis parallel to the direction of the radiation beam. They are recommended when sample volume is not a limitation and when very short to long path lengths are needed. All cylindrical cells can be used with the cylindrical cell holder or the thermostatted cylindrical cell holder. Cylindrical cells are available as standard cells, long path length cells for extra sensitivity when measuring low concentrations, and microcells, suitable for concentrated samples, or to overcome solvent absorbance (e.g. water in the NIR or low UV regions).



Cylindrical cell with PTFE stoppers, 6610002300

Cylindrical Cells with 2 PTFE Stoppers

Path Length (mm)	Ext. Dimensions (mm)	Int. Dimensions (mm)	Volume (mL)	Part No. Glass	Part No. Quartz
Use with 8453 UV-Vis					
100	102.5 x 22	19	28	5063-6566	
					5061-3392
Use with Cary 50/60/100/300/4000/5000/6000i					
10	12.5 x 22	19	2.8		6618000600[1]
50	52.5 x 22	19	14.1		6610002200
100	102.5 x 22	19	28.2		6610002300

[1]Has only a single PTFE stopper

Flow-through Cells

Flow cells allow the sample to pass through the cell and are connected to the sample source via tubing. Long path length flow cells are useful for low concentration samples and require the long path length rectangular cell holder. They can be used with a Cary 100/300 series Routine Sampler Accessory or a Cary 50/60 series Sipper. Sub-micro flow cells are suitable for use with the Cary 100/300 series Routine Sampler Accessory.

Until recently, flow-through cells had measuring chambers that were either rectangular or circular in shape. These shapes were dictated by limitations in the manufacturing process and did not offer the best geometry for clean flushing and reduction of contamination. Agilent has developed oval aperture cells that combine low volume with excellent flow characteristics. These oval flow cells are strongly recommended for automated analyses such as dissolution testing. Black quartz is used in the vicinity of the aperture to ensure that no light passes through the side walls of the cell.



Round aperture flow cell

Flow-through Cells with Round Aperture and Screw Fitting Connection

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µL)	Part No. Quartz
Use with 8453 UV-Vis					
10	35 x 12.5 x 12.5	2	15	30	0100-1224
	35 x 12.5 x 12.5	3	15	80	0100-1225
Use with Cary 50/60/100/300/4000/5000/6000i					
10	35 x 12.5 x 12.5	3	20	80	6610008900

NOTES:

Flow-through cells do not include tubing/fittings.

Flow-through Cells with Rectangular Aperture and Screw Fitting Connection

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µL)	Part No. Quartz
Use with 8453 UV-Vis					
0.1	35 x 12.5 x 12.5	17.5 x 3.5	15	6.2	5188-8003
0.2	35 x 12.5 x 12.5	17.5 x 3.5	15	12.4	5188-8004
0.5	35 x 12.5 x 12.5	17.5 x 3.5	15	31	5188-8005
1	35 x 12.5 x 12.5	17.5 x 3.5	15	62	5061-3396
2	35 x 12.5 x 12.5	17.5 x 3.5	15	124	5061-3397
5	35 x 12.5 x 12.5	12.5 x 3.5	15	230	5065-9918
10	35 x 12.5 x 12.5	11 x 3.5	15	390	5061-3398
10	35 x 12.5 x 12.5	8 x 2	15	160	5062-2476
Use with Cary 50/60/100/300/4000/5000/6000i					
10	35 x 12.5 x 12.5	4 x 11	20	390	6610012600
50	35 x 12.5 x 12.5	3 x 6	20	1000	6610010000
100	45 x 12.5 x 12.5	3 x 6	20	2100	6610010100
Use with Cary 50/60 only					
1	40 x 12.5 x 12.5	6.5 x 11	20	113	6610019900
2	40 x 12.5 x 12.5	6.5 x 11	20	227	6610020000
5	40 x 12.5 x 12.5	6.5 x 11	20	568	6610020100
10	40 x 12.5 x 12.5	6.5 x 11	20	715	6610020200
Use with Cary 100, 300					
1	40 x 12.5 x 12.5	6.5 x 11	20	113	6610014100
2	40 x 12.5 x 12.5	6.5 x 11	20	227	6610014200
10	40 x 12.5 x 12.5	6.5 x 11	20	715	6610015200



Rectangular aperture flow cell

Flow-through Cells with Oval Aperture and Screw Fitting Connection

Path Length (mm)	Ext. Dimensions (mm)	Aperture (mm)	Center Height (mm)	Volume (µL)	Part No. Quartz
Use with 8453 UV-Vis					
1	39 x 12.5 x 12.5	8 x 3	15	40	5063-6570
1	40 x 12.5 x 12.5	8 x 3	15	40	5065-9907
2	39 x 12.5 x 12.5	8 x 3	15	80	5063-6571
5	39 x 12.5 x 12.5	8 x 3	15	200	5063-6572
10	39 x 12.5 x 12.5	8 x 3	15	430	5063-6573



Oval aperture flow cell

Cell Holders and Accessories



Standard cell holder, 08451-60104



Long path-length cell holder, 89076C



Thermostattable cell holder, 89054A

Cell Holders and Bases

Description	Use With	Part No.
Standard cell holder	8453	08451-60104
Long path-length cell holder	8453	89076C
Thermostattable cell holder	8453	89054A
Cell stirring module for thermostattable cell holder	8453	89055A
Cell base	Cary 50/60	110648190
Cell holder, spare	Cary 50/60	110645090
Cell holder base	Cary 400 and 500	10048100
Cell holder base	Cary 4000/5000/6000i	110716190
Standard cell holder, 10 mm Includes cell lifter and cell height adjustment screw. Supplied as standard with Cary 100/300 and Cary 5000/6000i	All Cary	110260190
Standard cell holder, 10 mm, with Z-height adjustment from 0-20 mm Supplied as standard with Cary 4000	All Cary except Cary 50/60	110721900
Test Tube Holder allows use of 16 mm od test tubes in the sample compartment instead of conventional cuvettes	Cary 50/60	7910033500
Long pathlength rectangular cell holder Holds 20, 50 and 100 mm rectangular cells and rectangular flowcells	All Cary	110059900

(Continued)



Cell stirring module, 89055A



Standard cell holder, 10 mm, 110260190



Cell holder base, 110716190



Cell base, 110648190



Cary 50/60 cell holder, spare, 110645090



Standard cell holder, 110721900

Cell Holders and Bases

Description	Use With	Part No.
Variable pathlength cell holder For use with rectangular cells of 5, 10, 20, 30, 40 and 50 mm pathlength and a Solid Sample Holder. Must be fitted in slide-mount Solid Sample Holder kit in Cary 50/60 (P/N 10072300) or Cary 100/300 (P/N 10046500)	All Cary	210125300
Variable pathlength cell holder For use with rectangular cells up to 100 mm pathlength and a Solid Sample Holder. Must be fitted in slide-mount Solid Sample Holder kit in Cary 50/60 (P/N 10072300) or Cary 100/300 (P/N 10046500)	All Cary	6610014000
Dual rectangular thermostattable cell holder Allows thermostatting of standard 10 mm pathlength cuvettes with height 45 mm. Requires the Ext. Sample Compartment and an external water bath	All Cary	10046800
Cylindrical single cell holder, ambient Allows use of cylindrical cells with up to 100 mm pathlength	All Cary	110026900
Dual cylindrical thermostattable cell holder Allows use of cylindrical cells with up to 100 mm pathlength. Requires Ext. Sample Compartment and an external water bath	All Cary	10046700



Variable pathlength cell holder, 210125300



Cylindrical single cell holder, ambient, 110026900



Spacer for 2 mm cell, 5061-3389

Spacers*

Description	Part No.
Spacer for 1 mm cell	5061-3388
Spacer for 2 mm cell	5061-3389
Spacer for 5 mm cell	5061-3390

*Spacers are required to hold cells with an outer depth of less than 12.5 mm in the cell holder



Spacer for 5 mm cell, 5061-3390

Miscellaneous

Description	Unit	Part No.
Magnetic stirring bar*	2/pk	9301-1161
Magnetic stirrer bar, PTFE, star type		7418000400
Magnetic stirrer bars, 7 x 2 mm	10/pk	6610018900
Cell cleaning solution	1 L	5062-8529
Lens cleaning paper, lint free	50/pk	9300-0761
Tray for 16 cells	10 mm	5063-6577

*For use with Agilent 89054A cell-stirring multicell transport and Agilent 89090A Peltier temperature controller. Stirring bars are used with cells having internal dimensions of 10 x 10 mm (W x D) and cell holders with magnetic stirring capability.



Lens cleaning paper, lint free, 9300-0761



Magnetic stirring bar, 9301-1161



Cell tray, 5063-6577



Cell cleaning solution, 5062-8529

Agilent 8453 UV-Vis Supplies

8453 Tubings and Fittings

Description	Unit	Part No.
PTFE tubing, 1.6 mm od	10 m	5041-2191
Pump tubing, 2.06 mm id	12/pk	5041-2166
Pump tubing, 1.3 mm id	12/pk	5041-2184
Pump tubing, 2.8 mm id	12/pk	5041-2185
Tefzel ferrules and stainless steel lock rings, 1/16 in	10/pk	5022-2154
Union, 1/4-28 thread, polypropylene	10/pk	5022-2155
Cell fittings, black (4 short and 4 long)	8/pk	5022-2156
Conical adapter kit	2/pk	5022-2157
PTFE nuts for 1/16 in od tubing	10/pk	5022-2158
Tubing, heat exchanger, FEP	12 cm	5042-1336
1/16 in PEEK fittings and ferrules for 8-port valve	10/pk	5042-1337
Mounting tool for flangeless nut		0100-1710



8453A UV-Visible Spectrophotometer



Union, 5022-2155



Cell fittings (black), 5022-2156



Conical adapter kit, 5022-2157



PTFE nuts, 5022-2158



PEEK fittings and ferrules, 5042-1337

8453 Instrument Parts and Supplies



Deuterium lamp assembly, 2140-0605



Tungsten lamp assembly, G1103-60001



Deuterium lamp assembly, 08452-60104



Optical filter kit, G1120-68707



Stirring module kit, G1120-60006

Spectrophotometer Lamps

Description	Part No.
Deuterium lamp assembly, 8453	2140-0605
Tungsten lamp assembly	G1103-60001

G1120A 8-Position Multicell Transport Supplies

Description	Part No.
Optical filter kit Set of three optical filters to prevent photosensitive samples from being irradiated by UV light (265 and 295 nm cut-off and UV roll-off filter)	G1120-68707
Stirring module kit Stirrer is driven by circulating water from water bath (not included)	G1120-60006
Magnetic stirring bar for use with 10 x 10 mm (W x D) cells, 2/pk	9301-1161
Multicell transport adjustment tool	89075-23800
Plastic cover kit	G1120-68708

89090A Peltier Temperature Controller Supplies

Description	Part No.
Union, cell holder	5021-1870
Flow cell, 10 mm, 8 x 2 mm aperture, 160 µL	5062-2476
Quartz cuvette, 10 mm, with PTFE stopper	5062-2477
Tubing, heat exchanger, FEP	5042-1336
Magnetic stirring bar	9301-1161



Tubing, heat exchanger, FEP, 5042-1336

Needle, beveled edge for G1811A, G1811-23200

Autosampler Supplies

Description	Part No.
Needle, beveled edge for G1811A	G1811-23200
Test tubes, 12 x 100 mm, 250/pk	5022-6531
Autosampler tubing and fittings kit	5042-1334



Sipper tubing kit, 5042-1333

Sipper Supplies

Description	Part No.
Sipper tubing kit	5042-1333
Flow cell, 10 mm, 80 µL	0100-1225
Cassette, fixed pressure	5041-2167
Cassette, variable pressure	5042-1356



Autosampler tubing and fittings kit, 5042-1334



Cassette, fixed pressure, 5041-2167



Cassette, variable pressure, 5042-1356



Multicell tubing kit, 5042-1330



Valve tubing kit, 5042-1331



Dissolution probes kit, 5042-1332



PEEK fittings and ferrules, 5042-1337



8 port valve for dissolution system, 5063-6575



Dissolution filters for 1/8 in probe, 5181-1246

8453 Dissolution Testing Supplies

Dissolution Testing Supplies for 8453A

Description	Part No.
Multicell system tubing kit	5042-1330
Valve tubing kit for one bath	5042-1331
Dissolution probes kit, 0.9 mm id, tubes with fittings	5042-1332
1/16 in PEEK fittings and ferrules for 8-port valve, 10/pk	5042-1337
8-port valve for dissolution system	5063-6575
Rotor seal for 5063-6575 valve (UV-Vis) dissolution system	5067-1539
Dissolution filters for 1/8 in probe, 45 µm pore size, 1000/pk	5181-1246

Agilent Cary UV-Vis & UV-Vis-NIR Supplies

Cary Fiber Optic Probes



Cary 5000 UV-Vis-NIR Spectrophotometer

Fiber Optic Probes

Use With	Description	Part No.
Cary 50/60 Wavelength range 200-1100 nm	Fiber optic dip probe, stainless steel, body only Requires stainless steel tip	7910035700
	Fiber optic dip probe, stainless steel, fixed 10 mm path tip	7910036400
	Fiber optic dip probe, stainless steel, replaceable 10 mm path tip	7910036500
	Fiber optic dip probe, Torlon Probe, 7.9 mm in diameter by 159 mm length	7910029900
	Fiber optic dip probe, Torlon, body only Probe is 7.9 mm in diameter by 144 mm length (excluding tip). Not recommended for use with solutions that would attack epoxy, requires torlon tip	7910032600
	Fiber optic dip probe, 7.9 mm in diameter by 159 mm in length Torlon, replaceable 10 mm path tip	7910035100
	Fiber optic dip probe, 12.7 mm in diameter by 70 mm in length, quartz construction for use with corrosive samples, fixed 10 mm path length	7910030300
	Fiber optic micro probe, 3.05 mm diameter by 140 mm length, fixed 10 mm path length. Not recommended for use with strong acids	7910035600
	Hand-held fiber optic remote read probe, 6.35 mm in diameter by 104 mm in length, stainless steel, replaceable 10 mm path tip	7910030200

(Continued)



Cary 60 UV-Vis Spectrophotometer



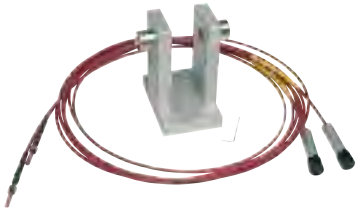
Fiber optic dip probe, fixed 10 mm path length, 7910036400



Fiber optic dip probe, Torlon, body only, 7910032600



Hand-held fiber optic probe with replaceable tip, 9910076600



Transmission probe and holder, 9910076700

Fiber Optic Probes

Use With	Description	Part No.
Cary 100/300	Hand-held fiber optic probe, quartz, long body 265 mm length, 10 mm pathlength. Suitable for use up to 150 °C and with corrosive acids	7910032100
	UV-Vis reflectance probe and probe holder for measuring total reflectance from a sample surface. Illumination area is 1 mm	7910036200
	Absorbance dip probe with switch, stainless steel, 10 mm path length	9910085000
	Absorbance dip probe with switch and coupler, stainless steel, 10 mm path length	9910085100
	UV-Vis reflectance probe	7910035500
Cary 50/60/100/300	Hand-held fiber optic probe, 6.35 mm diameter by 104 mm length. Includes shield	9910076600
	Hand-held fiber optic probe, quartz, corrosion resistant, 12.7 mm diameter, 10 mm path length	9910080800
	Transmission probe and holder. Suitable for transmission measurements on solid translucent materials e.g. glass	9910076700
	Versi remote read fiber optics probe with replaceable quartz tips. Can be hand held or mounted on the Cary Fiber Optic Dip Probe Coupler. Ideally suited for samples that are corrosive, toxic, radioactive or cross contamination	190055700
Cary 4000/5000/6000i	UV-Vis reflectance probe, 2 m for measuring total reflectance from a sample surface. Illumination area is 2 mm	9910069300
	UV-Vis absorption probe, stainless steel, 2 m, 10 mm path length	9910069400
	UV-Vis transmission probe and holder, 2 x 3 m fibers	9910069600
	UV-Vis & Vis-NIR transmission probes and holder kit, 2 x 3 m fibers	9910076500
	UV-Vis-NIR transmission probe and holder, 2 x 3 m fibers	9910076400
	UV-Vis-NIR absorption probe, stainless steel, 2 m, 10 mm path length	9910069500

Replaceable Tips and Miscellaneous Supplies

The stainless steel probe tips are suitable for use with the two stainless steel dip probes – either the stainless steel probe body (P/N 7910035700) or the stainless steel probe with the replaceable tip (P/N 7910036500).

The Torlon probe tips are suitable for use with the Torlon probe body (P/N 7910032600) or the Torlon fiber optic dip probe with the replaceable tip (P/N 7910035100). They feature a single arm design to reduce bubble formation. The tip is 7.9 mm in diameter and is suitable for operation in temperatures up to 85 °C.



Replaceable tip, stainless steel, 10 mm path length, 7910035800



Replaceable tip, Torlon, 20 mm path length, 7910034600

Replaceable Tips and Miscellaneous Supplies

Use With	Description	Part No.
Cary 50/60	Replaceable tip, stainless steel, 2 mm path length	7910036000*
	Replaceable tip, stainless steel, 5 mm path length	7910035900*
	Replaceable tip, stainless steel, 10 mm path length	7910035800*
	Replaceable tip, stainless steel, 40 mm path length	7910036100*
	Replaceable tip, Torlon, 2 mm path length	7910032800**
	Replaceable tip, Torlon, 5 mm path length	7910032900**
	Replaceable tip, Torlon, 10 mm path length	7910033000**
	Replaceable tip, Torlon, 20 mm path length	7910034600**
	Replaceable tip, Torlon, 40 mm path length	7910034500**
All Cary	10 mm pathlength tips to suit the Versi remote fiber optics probe p/n 190055700	190055900
	Fiber optic alignment loop	7910027200
	Fiber optic probe light shield. Provides light immunity for fiber optic probes used with Cary 100/300	7910028900
	UV-Vis reflectance probe holder, spare	9910068500

*For use with stainless steel dip probe body p/n 7910035700 or 7910036500

**For use with Torlon probe body p/n 7910032600 or 7910035100

Kits and Supplies for UV-Vis and UV-Vis-NIR Accessories



Cary temperature probe accessory

Accessory Supplies

Description	Part No.
Temperature Probe Accessory Supplies	
Probe holder Rectangular end probes (4 ea) are supplied, suitable for use in standard 10 mm rectangular cuvettes	9910066800
Probe holder, tapered end Tapered end probes (4 ea) are supplied, suitable for use in microcells	9910066900
Short extension lead for probe holder Required for mounting the probe inside the sample compartment	110381100
Long extension lead for probe holder Required for mounting the probe outside the sample compartment	110380500
O-ring kit for the probe holder	9910067000
Cary 50/60 Solid Sample Holder Accessory Supplies	
End holder Side mounting support for the Solid Sample Holder for Cary 50/60, Used to position the polarizer/depolarizer or other accessories	810137000
Solid Sample Holder Spares Kit #2 Includes 2 x V plate 3 x 45 mm, 2 x V plate 6 x 45 mm plus assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910056200
Cary 100/300 Solid Sample Holder Accessory Supplies	
Film Holder Spares Kit #1 Includes 4 x magnetic strips, 20 x V plates, gel-boat holders, 2 x resting plates, 8 x masks and 4 x clamps	9910064600
Solid Sample Holder Spares Kit #1 Includes 10 mm aperture sample slide holder, 5 mm aperture sample slide holder, 1 mm aperture sample slide holder, 2 x V plate 3 x 45 mm, 2 x V plate 6 x 45 mm plus assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910059400
Solid Sample Holder Spares Kit #2 Includes 2 x V plate 3 x 45 mm, 2 x V plate 6 x 45 mm plus assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910056200

(Continued)

Accessory Supplies

Description	Part No.
Cary 4000/5000/6000 Solid Sample Holder Accessory Supplies	
Film Holder Spares Kit #1 Includes 4 x magnetic strips, 20 x V plates, gel-boat holders, 2 x resting plates, 8 x masks and 4 x clamps	9910064600
Solid sample end support Solid sample mount for the attachment of polarizers, depolarizers or apertures to the standard Solid Sample Mounting accessory for the Cary 4000/5000/6000	5810008100
Solid sample masking aperture 1 mm Replacement aperture plate with 1 mm hole	410204100
Solid sample masking aperture 5 mm Replacement aperture plate with 5 mm hole	410204300
Solid sample masking aperture 10 mm Replacement aperture plate with 10 mm hole	410203900
Solid sample mounting plate Provides attachment points for solid sample supports	410204500
Solid Sample Holder Spares Kit #1 Includes 10 mm aperture sample slide holder, 5 mm aperture sample slide holder, 1 mm aperture sample slide holder, 2 x V plate 3 x 45 mm, 2 x V plate 6 x 45 mm plus assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910059400
Solid Sample Holder Spares Kit #2 Includes 2 x V plate 3 x 45 mm, 2 x V plate 6 x 45 mm plus assorted screws and nuts for fixing samples onto the sliding plates on the sample holder	9910056200
Diffuse Reflectance Accessory (DRA) Supplies	
Cary 100/300 Internal DRA Supplies	
Powder cell holder kit Includes a pre-packed PTFE powder cell for use as a reflectance standard and powder cell holder. Quartz window covers sample so holder can be positioned at port of sphere	7910036600
10 mm pathlength cuvette holder for DRA-CA-30I Suitable for positioning 10 mm pathlength cells in the transmittance port	7910028200
50 mm pathlength cuvette holder for DRA-CA-30I Suitable for positioning 50 mm pathlength cells in the transmittance port	7910028300
Fabric sample holder for DRA-CA-30 I Includes UG11 filter	7910027900
Light trap (for performing 0% T baseline correction)	7910028100
Transmittance sample holder for DRA-CA-30I	7910028000
Calibrated 1 inch diameter 99% Spectralon reflectance standard for DRA-CA-30I	7910036900

(Continued)



Cary 100/300 diffuse reflectance accessory



Cary 4000/5000/6000 solid sample holder

Accessory Supplies

Description	Part No.
Diffuse Reflectance Accessory (DRA) Supplies	
Cary 100/300 External DRA Supplies	
Powder cell holder kit for DRA-CA-30 Includes a pre-packed PTFE powder cell for use as a reflectance standard and powder cell holder. Quartz window covers sample so holder can be positioned at port of sphere	7910037000
Transmission cuvette holder for DRA-CA-30 Suitable for positioning 10 mm pathlength cells in the transmittance port	7910037100
Reflectance cuvette holder for DRA-CA-30 Suitable for positioning 10 mm pathlength cells in the reflectance port	7910037200
Variable angle center mount sample holder, clip type Allows samples to be positioned at the center of the DRA for measurement. The clip style holder is suitable for mounting thin and flexible samples. The holder incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest 1 degree	7910037400
Variable angle center mount sample holder, jaw type Allows samples to be positioned at the center of the DRA for measurement. The jaw style holder is suitable for mounting rigid, opaque samples such as mirrors and painted samples. The holder incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest 1 degree	7910037300
Variable angle center mount cuvette holder Suitable for mounting a standard 10 mm pathlength cuvette inside the sphere. The holder incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest 1 degree	7910037500
Cary 4000/5000/6000 Internal DRA Supplies	
Small reference disk PTFE packed diffuse reflectance disk 2 inches in diameter	410198890
Cuvette holder Suitable for both transmission and reflectance measurements using 10 mm pathlength cells	210187900
Powder cell kit Includes a pre-packed PTFE powder cell for use as a reflectance standard, powder cell holder, funnel and small sample holder	9910111400

(Continued)

Accessory Supplies

Description	Part No.
Diffuse Reflectance Accessory (DRA) Supplies	
Cary 4000/5000/6000 External DRA Supplies	
Large reference disk PTFE packed diffuse reflectance disk 2 inches in diameter	410143990
Center mount cuvette holder Suitable for mounting a standard 10 mm pathlength cuvette inside the sphere normal to the incident beam. Ideal for measuring turbid samples such as proteins and other biological solutions	7910038700
External mount cuvette holder Suitable for measuring the transmission or absorbance of liquid samples using standard 10 mm pathlength cuvettes. Mounts on the transmission holder and can be positioned in either the sample or reference beams	7910038300
Center mount holder clip type Allows samples to be positioned at the center of the DRA for measurement. The clip style holder is suitable for mounting thin and flexible samples. The holder incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest 1 degree	7910047600
Center mount holder jaw type Allows samples to be positioned at the center of the DRA for measurement. The jaw style holder is suitable for mounting rigid, opaque samples such as mirrors and painted samples. The holder incorporates a rotating dial so the user can quickly set the desired incidence angle to the nearest 1 degree	7910047500
Powder cell holder Allows reflectance measurements of powdered samples and samples. Mounts on the standard sample holder against the reflectance port. Includes a pre-packed PTFE powder cell for use as a reflectance standard and an empty powder cell holder for sample. Sample is retained by a plunger	7910047700
Small spot kit Consists of an iris, mirror assembly and 3 lens options to focus the beam to a smaller diameter spot at the selected measurement location. The beam size is ~ 3 mm diameter at the transmission position and 3.5 mm tall by 1.5 mm wide at the reflectance position	7910047200
Miscellaneous Accessory Supplies	
Powder cell holder for Reflectance Accessory Stainless steel cell with removable quartz window for containing loose powders for diffuse reflectance measurements	110374900
Aperture mask kit for the Variable Angle Specular Reflectance Accessory Contains 2 each of the 2, 10 and 20 mm sample holder and 2 x 1 inch disk holder	9910064700
Attenuation filter kit for the Variable Angle Specular Reflectance Accessory	9910047700



Cary 4000/5000/6000
diffuse reflectance accessory



Deuterium lamp, 5610021800



Xenon lamp module, 110639690



D2 UV lamp, 110713990



Visible source lamp, 5610021700

Cary Source Lamps

Agilent offers high quality lamps that produce top level performance for your Cary spectrophotometer.

Source Lamps

Description	Use With	Part No.
Deuterium UV lamp	Cary 100/300	5610021800
Visible source lamp	Cary 100/300	5610021700
Xenon lamp module	Cary 50/60	110639690
UV source lamp, less than 190 nm	Cary 400	5610135500
Deuterium UV lamp	Cary 4000 to 6000i	110713990
Visible QI lamp	Cary 4000 to 6000i	5610013900

Cary Tubing

Tubing

Description	Part No.
Silicon pump tubing, 3/16 in id x 5/16 in od, per m Tubing only, no connectors	2410023800
Peristaltic pump tubing replacement kit for the Routine Sampler Accessory. Includes silicon pump tubing and fittings	9910052900
PTFE tubing (to sample) for Routine Sampler Accessory, per m	3710030800
Silicon tubing, used to connect Routine Sampler Accessory to flow cells, per m	3710026400
Dissolution tubing spares kit, Cary 50	6610020500
Dissolution tubing spares kit, Cary 100/300	6610020600

UV Filters, Standards and Reagents

Optical Filters

Description	Part No.
Attenuator filter kit with neutral density screens and blue filter Includes two blue glass filters, three neutral density screens of 0.5, 1.0 and 1.5 Abs, and holder	9910047700
Holmium oxide filter	118020790
Holmium oxide/didymium glass filter kit Includes one each holmium oxide and didymium glass filters in a 10 mm rectangular cell holder	10030200
Certified holmium glass filter Holmium glass filter mounted in a 10 mm rectangular holder with certificate	2010094300
Certified didymium glass filter Didymium glass filter mounted in a 10 mm rectangular holder with certificate	2010094400
Photometric linearity neutral density filter kit Contains one tandem cell holder and two each neutral density filters of 0.3, 0.5, 1.0 and 1.5 absorbance	9910056100



Photometric linearity neutral density filter kit, 9910056100



OQ/PV chemical standards kit I, 5063-6503



OQ/PV chemical standards kit II, 5063-6521



OQ/PV hardware kit, 5063-6523



Tubing kit for UV-Vis OQ/PV test, 5063-6522



Caffeine OQ/PV sample for dissolution test, 5042-6476

Standards & Reagents

Our chemical standards and accessory kits provide an inexpensive and time-saving solution for operational qualification and performance verification (OQ/PV) of UV-Vis spectrophotometers. The kits are designed for analysts who need to conform closely to both quality and regulatory requirements when performing UV-Vis measurements.

The chemical kits can be used with any UV-Vis spectrophotometer and consist of pre-prepared solutions in sealed ampoules. The solutions are traceable to NIST standards and specified by the European Pharmacopeia (EP) and include holmium oxide for wavelength accuracy measurement; potassium dichromate for photometric accuracy measurement; sodium nitrite, sodium iodide and potassium chloride for stray light measurements at 340, 220 and 198 nm; and toluene in hexane for resolution measurement. Each standard includes a Certificate of Analysis for traceability.

8453 Certified Calibration Standards and Accessory Kits

Description	Part No.
OQ/PV Chemical Standards Kit I (for photometric accuracy, stray light and resolution measurements) Contains 10 ampoules 10 mL each of 2 dichromate, 2 sulfuric acid, 1 sodium nitrite, 1 sodium iodide, 1 potassium chloride, 1 toluene in hexane, 2 hexane	5063-6503
OQ/PV Chemical Standards Kit II (for wavelength accuracy) Contains three ampoules 10 mL each of 2 perchloric acid, 1 holmium oxide in perchloric acid	5063-6521
OQ/PV Hardware Kit Contains two flow cells, cell passivating fluid, tubing kit, MCT adjustment tool, temperature sensor support, syringes and OQ/PV manual	5063-6523
Tubing Kit for UV-Vis OQ/PV Test Contains tubings, fittings and adapter to flush flow cell	5063-6522
Caffeine OQ/PV sample for dissolution test, 150 mg/L caffeine in water, 500 mL	5042-6476

8453 Checkout Samples

Description	Part No.
Test sample for UV-Vis (caffeine solution, 10 µg/mL in water)	5063-6524

Cary Standards

Description	Notes	Part No.
Calibrated solution standards kit	Solution validation test kit. Includes Potassium dichromate 60 mg/L plus perchloric acid blank, Holmium Perchlorate 4% in 10% perchloric acid, Potassium Chloride solution 12 g/L Sodium Iodide – 1% solution plus water blank for stray light solutions, Toluene/Hexane Mixture plus a Hexane Blank. Each solution is sealed in a quartz cuvette. A certificate of traceability and performance is included for each solution.	9910085200
Calibrated color standard, 2 in od, 4 per set	Includes four colored standards with values traceable to NIST. Certified values are in 10 nanometer increments from 380-830 nm.	9910084300
Certified diffuse reflectance wavelength and wave number standard	Wavelength/wavenumber accuracy standard that contains a mixture of rare earth oxides of known wavelengths/wavenumbers. Certificated values are given in wavelengths/ wavenumbers.	9910081100
Certified diffuse reflectance wavelength standard	Wavelength accuracy standard that contains a mixture of rare earth oxides of known wavelengths. Certificated values are given in wavelengths	9910080900
Certified diffuse reflectance wavenumber standard	Wavelength accuracy standard that contains a mixture of rare earth oxides of known wavenumbers. Certificated values are given in wavenumbers	9910081000
Certified reference standard 1404 for USP certification	NIST traceable standards for USP testing. The set contains solution of Holmium Oxide wavelength standard; three neutral density glass transmission standards nominal 10%, 20%, and 30% T; and a solution of Potassium Dichromate as a photometric standard, nominal 1 AU at 235 nm	190034200
Certified reference standard, full certification	Certification standards for full performance testing includes p/n 110820790 Holmium Oxide Filter, P/N 9910056000 Cary Double Aperture Kit, P/N 9910056100 Neutral Density Photometric Linearity Filter Kit, P/N 9910085200 Calibrated Solution Standards Kit and P/N 190032100 CRM 400 Neutral Density Standards	190034300
Certified specular reflectance standard, 1 in od	First surface mirror 1" x 1" square	190012800
Certified Neutral Density standards, set of 3	Includes set of three neutral density glass filters required for the determination of photometric accuracy. Traceable to NIST.	190032100
Certified ND diffuse reflectance standard, set of 8	Certified neutral gray diffuse reflectance standards 2 inch in diameter. NIST traceable over the wavelength range 250-2500 nm	190061700
Certified Neutral Density standards, set of 3	Set of three neutral density glass filters required for the determination of photometric accuracy. Traceable to NIST.	190032100



The Agilent Cary Eclipse
fluorescence spectrophotometer

Agilent Cary Eclipse Fluorescence Supplies

Agilent's fluorescence spectrophotometers are augmented by a wide range of accessories and supplies, including a fast filter accessory, solid sampler holder, 96- and 384-well microplates, and fiber optic probes and couplers.

Kits and Supplies for Fluorescence Accessories



Fura-2 filters for Ca^{++} measurements,
7910043800



Indo-1 filters for Ca^{++} measurements,
7910043900

Fast Filter Accessory Supplies

The Fast Filter Accessory quickly adapts the Cary Eclipse to a filter based instrument for measurement of rapid intracellular ion movements into and out of cells using ratiometric fluorescent probes. Such measurements are used in processes exhibiting fast kinetics that cannot be measured using high-speed scanning monochromators. A pair of bandpass filters appropriate to the fluorophore under investigation must be mounted in the fast filter accessory. Agilent offers filter pairs appropriate for measurement of the calcium binding dyes Fura-2 and Indo-1. The filters are 25 mm in diameter and are mounted in a black anodized aluminum ring.

Fast Filter Accessory Supplies

Description	Part No.
Fura-2 filters for Ca^{++} measurements (340 and 380 nm bandpass filters, 20 nm SBW) Requires fast filter accessory	7910043800
Indo-1 filters for Ca^{++} measurements (405 and 495 nm bandpass filters, 20 nm SBW) Requires fast filter accessory	7910043900

Description	Part No.
Solid Sample Holder Accessory Supplies	
Edge Mounting Sample Holder Used with Solid Sample Holder accessory. Allows measurement of optical components including optical filters and other samples that cannot be mounted using the standard solid sample holder kit. Consists of an adjustable sample clamp plate, 2 additional sample brackets, a sliding bracket, ball driver and positioning screws (4 ea)	9910102900
Powder Cell and Single Crystal Holder Used with Solid Sample Holder accessory. Allows measurement of powders and a variety of small crystals, gems and rocks. Consists of a mounting bracket, positioning screws (4 ea), cylindrical powder holder shell and powder holder lid, sample cups (2 ea), silica disks and a crystal holder bracket	9910103000
Cuvette Sample Holder Used with Solid Sample Holder accessory. Allows measurement of liquid samples located in traditional cuvettes. Consists of a cuvette holder for standard 10 mm pathlength cuvettes and mounting screws (2 ea) to secure the cuvette holder to the solid sample holder mounting plate. Allows for flexible front face cuvette measurements at a variety of angles for highly scattering or absorbing samples	9910103100
Temperature Probe Accessory Supplies	
Probe holder Rectangular end probes (4 ea) are supplied, suitable for use in standard 10 mm rectangular cuvettes	9910066800
Probe holder, tapered end Tapered end probes (4 ea) are supplied, suitable for use in microcells	9910066900
Short Extension Lead for Probe holder Required for mounting the probe inside the sample compartment	110381100
Long Extension Lead for Probe holder Required for mounting the probe outside the sample compartment	110380500



Cary 4000/5000/6000 solid sample holder

Base Plate for Custom Accessories

This base plate incorporates locating holes and the Cary Eclipse rapid lockdown mechanism common to most Eclipse accessories. It can be used to mount custom accessories in the Eclipse sample compartment.

Base Plate for Custom Accessories

Description	Part No.
Base plate for custom accessories, fluorescence	210167490



Base plate for custom accessories, fluorescence, 210167490

Fluorescence Cuvettes and Flow Cells



Flow cell, 2 x 2 mm emission window, 6610023700



Triangular Microcell, stoppered, square base, 6610021200



Triangular Microcell, open top, square base, 6610021300

Rectangular cells are the most commonly used cell type. We offer standard cells, sub-micro cells with about 40% of the volume of a standard cell of the same path length and microcells with about 20% of the volume of a standard cell. Low volume triangular cells that fit directly into the standard 10 mm cuvette holder are also available. The microcell cuvettes are ideal for use when you have only a small amount of sample.
All the listed cuvettes have the optimum Z-height (the distance between the base of the cell and the center of the light beam) for the Cary Eclipse fluorescence spectrophotometer.

Cuvettes and Flow Cells

Cell Type	Description	Cell Material	Volume	Path Length (mm)	Part No.
Flow Cell	Flow cell, 2 x 2 mm emission window	Far UV quartz	40 µL	10	6610023700
Rectangular	Fluorescence cell, open top, pair	Far UV quartz	3.5 mL	10	6610000900*
	Fluorescence cell, stoppered, pair	Far UV quartz	3.5 mL	10	6610001200*
	Fluorescence cell, anaerobic	Far UV quartz	3 mL	10	6610021400
	Fluorescence cell, two sides mirrored with black-backed mirrored sides	Far UV quartz	3 mL	10	6610023500
	Sub-micro cell, 4 x 10 mm window	Far UV quartz	400 µL	10	6610021500
	Sub-micro cell, 2 x 2 mm window	Far UV quartz	40 µL	10	6610021600
	Sub-micro cell, low head space, stoppered	Far UV quartz	40 µL	10	6610024200
Triangular	Microcell, stoppered, square base	Far UV quartz	1.7 mL	10	6610021200
	Microcell, open top, square base	Far UV quartz	1.7 mL	10	6610021300

*Matched pair

Cell Holder and Base

Description	Part No.
Cell holder, fluorescence	110664700
Cell holder base, fluorescence	210167200

Microplates

Our microplates are available in white for best overall well-to-well reproducibility, or black for the lowest background signal levels. Both types have high binding surfaces that bind medium and large biomolecules (greater than 10 kDa) that have hydrophobic and/or ionic groups. These microplates are recommended for the Cary Eclipse Microplate Reader Accessory.

96-well Microplates

Surface Treatment	Sterile	Color	Unit	Part No.
High binding	No	White	10/pk	6610022400
High binding	No	Black	10/pk	6610022500
High binding	No	White	100/pk	6610022800
High binding	No	Black	100/pk	6610022900
Untreated	Yes	White	10/pk	6610022300



96-well microplate, 6610022300

384-well Microplates

Surface Treatment	Sterile	Color	Unit	Part No.
High binding	No	White	10/pk	6610022600
High binding	No	Black	10/pk	6610022700
High binding	No	White	100/pk	6610023000
High binding	No	Black	50/pk	6610023100

Fiber Optic Probes and Couplers

Fiber Optic Probes and Couplers

Description	Notes	Part No.
Fiber optic dip probe coupler accessory, fluorescence	Allows a fiber optic dip probe to be connected using SMA 906 connectors. Includes a remote read connection to enable read triggering from the probe mounting arm. Requires the fiber optic dip probe (P/N 7910043100)	10076800
Fiber optic coupler accessory, fluorescence	Allows a remote read fiber optic probe to be connected using SMA 906 connectors. Allows remote sample measurement. Requires the remote read fiber optic probe (P/N 7910043000)	10076700
Fiber optic dip probe, fluorescence	Stainless steel fiber optic dip probe. For use with Fiber Optic Dip Probe Coupler Accessory. Probe tips must be ordered separately. Select from the Fluorescence fiber optic liquid tips kit for quantitative work and the Fluorescence fiber optic probe tip for solids	7910043100
Fiber optic remote read 2 m probe, fluorescence	Hand-held stainless steel fiber optic probe with remote read switch. For use with Fiber Optic Coupler Accessory. Probe tips must be ordered separately. Select from the Fluorescence fiber optic liquid tips kit for quantitative work and the Fluorescence fiber optic probe tip for solids	7910043000

Tips for Fiber Optic Probes

Description	Kit Contents	Part No.
Fluorescence fiber optic liquid tips kit	Includes two stainless steel liquid probe tips with black quartz bases, angled to minimize back-scattering. 10 and 20 mm pathlengths	9910104500
Fluorescence fiber optic solid tip kit	Includes stainless steel probe tip for solids designed to bring the light into the sample at 30 degrees to minimize back-scattered excitation	7910043200



Fiber optic dip probe coupler accessory, fluorescence, 10076800



Transmission probe and holder, 10076700



Fiber optic remote read 2 m probe, fluorescence, 7910043000



Fluorescence fiber optic liquid tips kit, 9910104500



Fluorescence fiber optic solid tip kit, 7910043200

Standards and Reference Materials

Standards and Reference Materials

Description	Part No.
Water filled fluorescence cuvette, sealed Used for signal-to-noise measurements of Raman band of water	6610021800
Silica Diffuser, spare	110674800
Neutral density attenuator 1.5 Abs, spare	110677500
Rhodamine B in polymer block	6610021900
Europium in polymer block	6610022200
Rhodamine B, concentrated solution sealed in triangular cuvette Saturated Rhodamine B solution in triangle cell for collecting excitation correction factors	6610021700
Holmium perchlorate 4% in perchloric acid, sealed in a quartz cuvette Sealed cell used to measure wavelength accuracy on the emission monochromator. Requires cell holder P/N 110678600. Includes certificate of traceability and performance	6610022100
Cell holder for holmium perchlorate cuvette Special cell holder for mounting a cuvette before the standard cell holder. This accessory is used for mounting the Holmium Perchlorate for the wavelength accuracy test. This allows the diffuser to be positioned in the standard cell holder and the Perchlorate cell to be positioned in this cell holder. Required for Cary Eclipse wavelength accuracy test using holmium perchlorate solution	110678600
Fluorescence samples, set of six hydrocarbons in polymer blocks Four have broad fluorescence bands for 300-700 nm, and two have sharp emission bands for wavelength calibration and bandpass checking; Samples include Anthracence/Napthalene, Ovalene, p-Terphenyl, Tetraphenyl butadiene, Compound 610 and Rhodamine B in PMMA block	6610010300
Fluorescence demonstration kit Includes Europium in polymer block, ovalene in polymer block, a sealed water cuvette, and an empty 10 x 10 mm fluorescence cuvette	9910101900



Silica Diffuser, spare, 110674800



Rhodamine B, concentrated solution sealed in triangular cuvette, 6610021700



The Agilent Cary 610/620 FTIR

Agilent Cary Series FTIR Supplies

Agilent's world-renowned Cary product line now encompasses both portable and inlab routine and research grade FTIR, in addition to the traditional UV-Vis and UV-Vis-NIR and Fluorescence techniques. With this addition, Agilent can now offer you a comprehensive range of molecular spectroscopy solutions. Agilent's FTIR products are engineered to help you discover, characterize, and test a variety of solid, liquid, organic and inorganic materials. Take advantage of powerful analysis routines for reliable results with built-in ease-of-use to ensure your productivity. Our range of consumables for these products includes desiccant, replacement windows and sources, filters, crystals and high quality reference sources such as polystyrene test films.



Replacement desiccant cartridge for spectrometer, 899-1794



Funnel for liquid nitrogen, 013-4422



KBr window assembly for sample compartment, 110834990



Window retaining ring, 810207300

Cary Series FTIR Instrument Supplies and Sources

Cary Series FTIR Instrument Supplies and Sources

Description	Part No.
Replacement desiccant cartridge for spectrometer Used to prevent water vapor diffusing into the spectrometer enclosure. Replace when the indicator crystals turn pink	899-1794
Funnel for liquid nitrogen Used for pouring liquid nitrogen when cryogenically cooled detectors (MCT or InSb) are installed	013-4422
Sample compartment filter kit Includes 12.5%, 25% and 50% filters	9910141100
KBr window assembly for sample compartment	110834990
Window retaining ring	810207300
KRS5 window assembly for sample compartment	110835000
Simple polystyrene test card (uncertified)	883-9120
Source assembly Mid-IR	110805990
NIR source lamp	5610136500

Agilent Cary 610/620 FTIR Imaging Supplies

Description	Part No.
Replacement Ge crystal for Slide-on ATR accessory	099-1925-1
Replacement Diamond crystal for Slide-on ATR accessory	099-1925-3

Agilent Cary 630 FTIR System Supplies

Description	Part No.
Replacement infrared source with purge fitting	G8043-67400
Replacement dessicant cartridge with purge fitting	G8043-67401
KBr window with removal tool and purge fitting	G8043-67402
ZnSe window with removal tool and purge fitting	G8043-67403
Polystyrene disks for Diffuse Reflectance sampling accessory	G8043-67404
Polystyrene film for Diamond ATR/Transmission sampling accessory	G8043-67405
Polystyrene film for TumbIIR/DialPath sampling accessory	G8043-67406
Replacement flat tip for Diamond ATR	G8043-67483
Replacement pellet tip for Diamond ATR	G8043-67484

Agilent 4200 FlexScan FTIR System Supplies

Description	Part No.
Diffuse gold reflectance reference cap for diffuse reflectance	0023-300
Polystyrene frequency reference cap for diffuse reflectance	0023-301
Diffuse gold reflectance reference cap for external reflectance	0023-304
Polystyrene frequency reference cap for external reflectance	0023-305
Mirrored stainless steel reflectance reference cap for external reflectance	0023-307



Agilent Cary 630 FTIR



Replacement infrared source with purge fitting, G8043-67400



KBr window with removal tool and purge fitting, G8043-67402



Replacement ZnSe sample cell assembly, 013-5353



Viton pump tubing, 815-0631

Replacement Batteries for Hand-held FTIR System Supplies

Description	Part No.
Hand-held PC battery Used with Agilent 4100 ExoScan, 4200 FlexScan and 4500 Series Portable FTIR systems	800-2004
Lithium-ion battery Used with Agilent 4100 ExoScan and 4200 FlexScan FTIR systems	800-2005

Agilent Oil Analyzer Supplies

Description	Part No.
24 Bottle Autosampler Rack Holds bottles of up to 2 in diameter in a 3 row by 8 column configuration	697-5392-1
40 Bottle Autosampler Rack Holds bottles of up to 1 5/8 in diameter in a 4 row by 10 column configuration	697-5392-2
55 Bottle Autosampler Rack Holds bottles of up to 1 1/16 in diameter in a 5 row by 11 column configuration	697-5392-3
Replacement ZnSe sample cell assembly	013-5353
Polystyrene card	884-2829
Replacement pump head, easy load	899-1599
Viton pump tubing	815-0631
Tygon fuel tubing	815-0639
PTFE tubing	815-0616
Tool/Parts Kit for Oil Analyzer Includes 2 x 400 mesh stainless steel filters, 2 foot length of 3/32 in x 5/32 in PTFE tubing, 2 foot length of Viton pump tubing, 4 foot length of Tygon fuel tubing, wash bottle, 3 x 1 gallon capacity plastic bottle, 2 x 3/8 in id Viton O-rings, wrenches for filter holder and probe fittings	013-4825-1

FTIR Standards

Description	Part No.
Polystyrene test film, NIST traceable Set of 2 polystyrene test films each mounted to 2 in x 4 in cardstock holder that fit in the universal slide mount. Inc. certificate of traceability to five (5) NIST 1921b frequencies	925-0128
KBr powder, spectroscopic grade, 100 g	HARRICK-KBR-100

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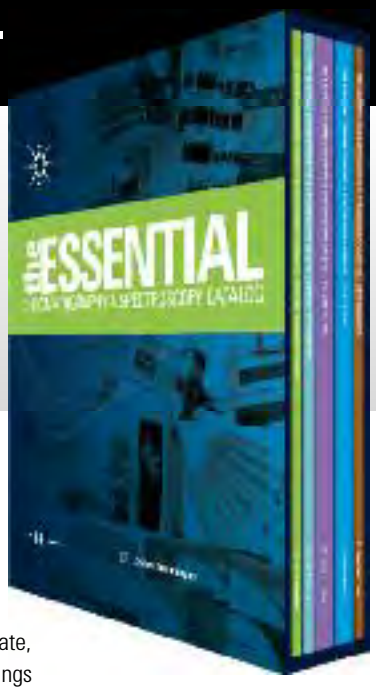
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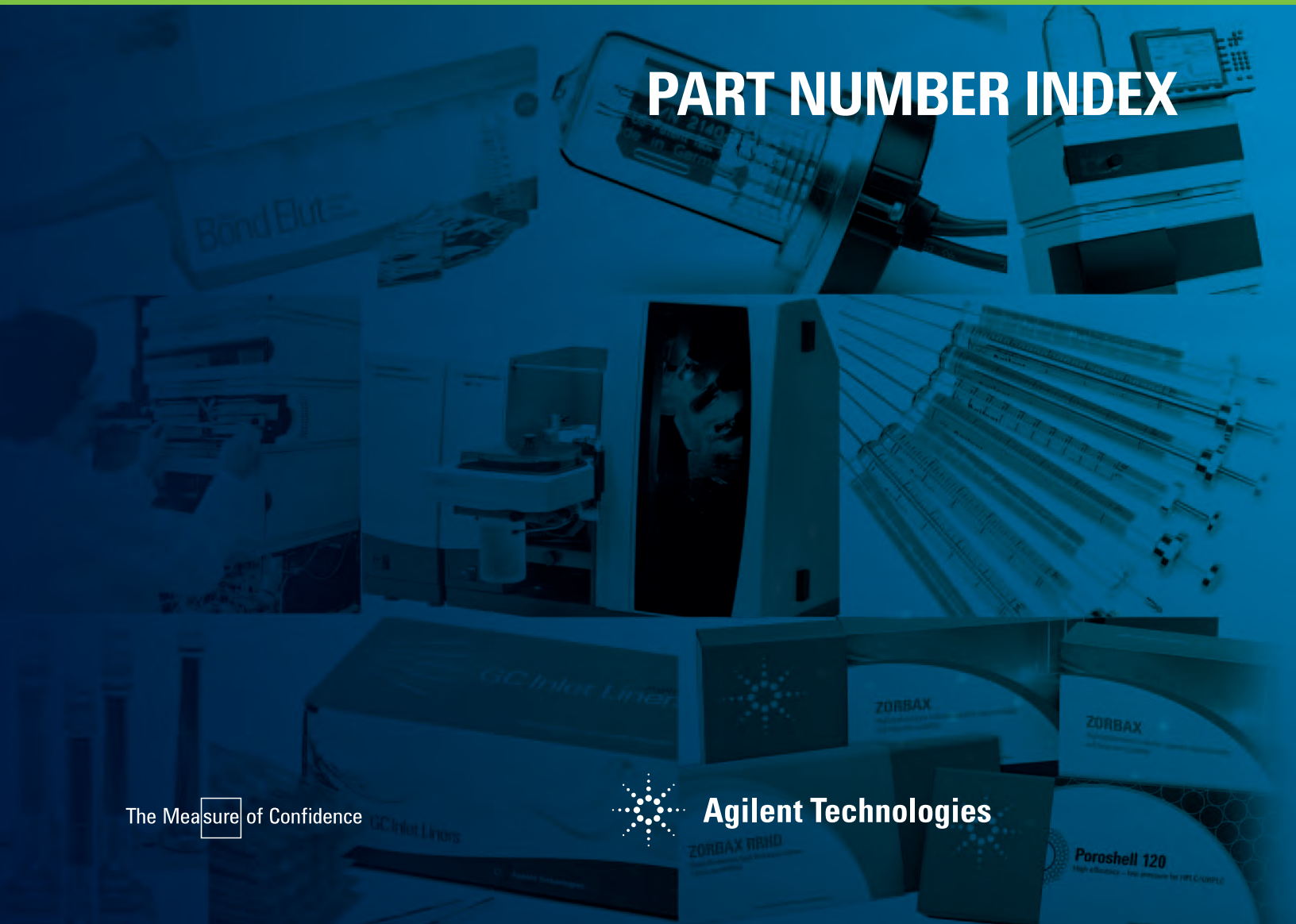
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