Agilent

Agilent InfinityLab LC Series

High-Speed Pumps

User Manual



Notices

Document Information

The information in this document also applies to 1260 Infinity II and 1290 Infinity II modules.

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents

In This Book 7

1 Introduction 8

Product Description of the 1290 Infinity III High-Speed Pump (G7120A) 9

Features of the 1290 Infinity III High-Speed Pump (G7120A) 10

Product Description of the 1290 Infinity III Bio High-Speed Pump (G7132A) 11

Features of the 1290 Infinity III Bio High-Speed Pump (G7132A) 12

Operating Principle 13

2 Site Requirements and Specifications 15

Site Requirements 16

Specifications of the 1290 Infinity III High-Speed Pump (G7120A) 20

Specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A) 24

3 Installation 28

Installing Capillaries 29

Handling Leak and Waste 38

Connecting Modules and Control Software 48

4 Using the Module 49

General Information 50

Best Practices 54

Preparation of the System 65

Preparing the Module 73

5 Optimizing the Performance of the Module 83

Recommendations for Biocompatible and Bio-Inert Systems 84

Degasser Usage in PFAS-Analysis (G7120A) 85

Recommendations for Degassers 86

Delay Volume and Extracolumn Volume 87

How to Configure the Optimum Delay Volume 88

How to Achieve Higher Resolution 90
Using Solvent Calibration Tables 93

6 Diagnostics and Troubleshooting 100

User Interfaces for Available Tests and Tools 101
Maintenance and Troubleshooting Tools of the Module 103

7 Error Information 113

What Are Error Messages 115
General Error Messages 116
Module Error Messages 128

8 Maintenance 165

Introduction to Maintenance 167
Safety Information Related to Maintenance 170
Overview of Maintenance 172
Cleaning the Module 173
Installing Fittings and Capillaries 174
Remove and Install Doors 175
Replace the Shutoff Valve Panel 178
Replace the Pressure Sensor 180
Replace the Solvent Selection Valve (SSV) 183
Change Configuration or Replace the Jet Weaver 186
Replace the Seal Wash Pump 189
Replace the Inlet Valve (G7120A) 191
Replace the Inlet Valve (G7132A) 193
Release a Stuck Inlet Valve 195
Remove the Pump Head Assembly (G7120A) 198
Remove the Pump Head Assembly (G7132A) 203
Pump Head Maintenance (Tool Free) 208
Install the Pump Head Assembly (G7120A) 244
Install the Pump Head Assembly (G7132A) 247
Replace the Outlet Valve (G7120A) 250
Replace the Outlet Valve (G7132A) 254

Replace the Purge Valve Head 257
Replace Parts of the Purge Valve Head 260
Replace Parts of the High-Pressure Filter Assembly (G7120A) 262
Replace Parts of the High-Pressure Filter Assembly (G7132A) 265
Replace the Seal Wash Sensor 268
Replace the Module Firmware 271
Prepare the Pump Module for Transport 272

9 Parts and Materials for Maintenance 276

Main Assemblies of the 1290 Infinity III High-Speed Pump (G7120A) 278
Main Assemblies of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option 279
Main Assemblies of the 1290 Infinity III Bio High-Speed Pump (G7132A) 280
Flow Connections of the 1290 Infinity III High-Speed Pump (G7120A) 281
Flow Connections of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option 283
Flow Connections of the 1290 Infinity III Bio High-Speed Pump (G7132A) 285
Pump Heads of the 1290 Infinity III High-Speed Pump (G7120A) 287
Pump Heads of the 1290 Infinity III Bio High-Speed Pump (G7132A) 293
Purge Valve of the 1290 Infinity III High-Speed Pump (G7120A) 297
Purge Valve of the 1290 Infinity III Bio High-Speed Pump (G7132A) 298
Cover Parts 299
Accessory Kit of the 1290 Infinity III High-Speed Pump (G7120A) 300
Accessory Kit of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option 301
Accessory Kit of the 1290 Infinity III Bio High-Speed Pump (G7132A) 302
HPLC System Tool Kit 303

10 Identifying Cables 304

Cable Overview 305
Analog Cables 307
Remote Cables 309

BCD Cables 313
CAN/LAN Cables 315
RS-232 Cables 316
USB 317

11 Hardware Information 318
General Hardware Information 319
Module-Specific Hardware Information 334

12 LAN Configuration 338
What You Have to Do First 339
TCP/IP Parameter Configuration 341
Configuration Switch and Mode Selection 342
Dynamic Host Configuration Protocol (DHCP) 349
Manual Configuration 352
PC and User Interface Software Setup 353

13 Appendix 355
General Safety Information 356
Material Information 365
At-a-Glance Details About Agilent Capillaries 374
Waste Electrical and Electronic Equipment (WEEE) Directive 378
Radio Interference 379
RFID Statement 380
Sound Emission 382
Agilent Technologies on Internet 383

In This Book

This manual covers the following Agilent InfinityLab LC Series modules:

- Agilent 1290 Infinity III High-Speed Pump (G7120A)
- Agilent 1290 Infinity III Bio High-Speed Pump (G7132A)

1 Introduction

This chapter gives an introduction to the module and an instrument overview.

Product Description of the 1290 Infinity III High-Speed Pump (G7120A) 9

Features of the 1290 Infinity III High-Speed Pump (G7120A) 10

Product Description of the 1290 Infinity III Bio High-Speed Pump (G7132A) 11

Features of the 1290 Infinity III Bio High-Speed Pump (G7132A) 12

Operating Principle 13
Overview of the Hydraulic Path 13
Hydraulic Path 14

Product Description of the 1290 Infinity III High-Speed Pump (G7120A)

The Agilent 1290 Infinity III High-Speed Pump can enhance your efficiency through high speed and chromatographic performance. This binary pump is designed for full flexibility when running HPLC and UHPLC applications using narrow-bore columns and sub-2 µm particles.

The 1290 Infinity III High-Speed Pump power range combines ultrahigh pressure up to 1300 bar and high analytical flow rates up to 5 mL/min for maximum UHPLC performance. Exceptionally low delay volumes down to 10 µl and high flow rates enable fast gradients over the entire composition range from 1 to 99% for shortest run times and maximum resolution.

Highest retention time reproducibility and accuracy are achieved through independently controlled high-definition pump drives and active pressure damping.

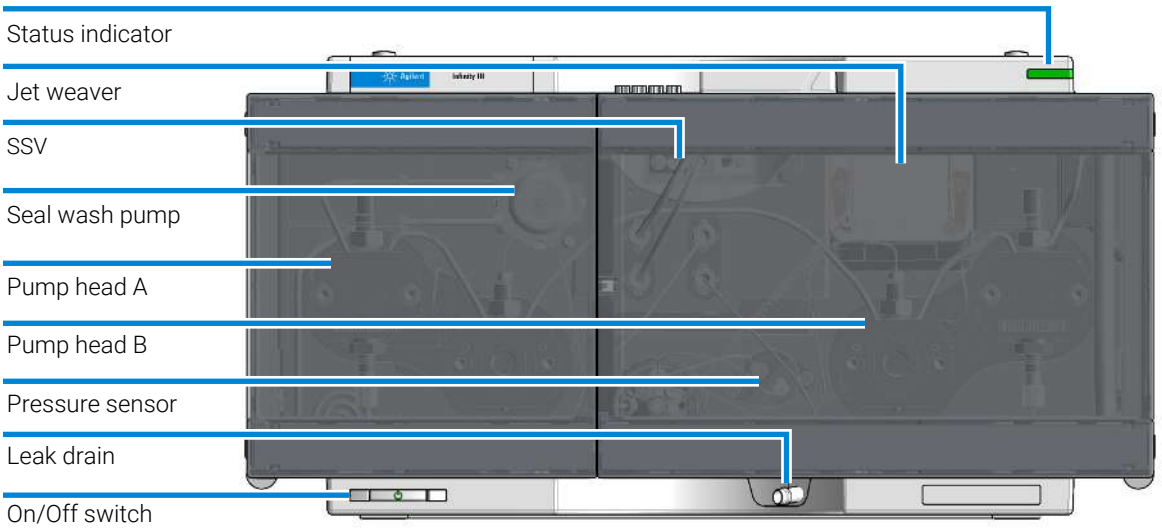


Figure 1: Overview of the High-Speed Pump

Features of the 1290 Infinity III High-Speed Pump (G7120A)

- Power range combines ultrahigh pressure up to 1300 bar and high analytical flow rates up to 5 mL/min for maximum UHPLC performance
- Lowest delay volumes down to 10 µL allow you to run ultrafast gradients on narrow-bore columns, making this pump the ideal front-end for LC/MS applications
- Intelligent System Emulation Technology (ISET) enables emulation of existing Agilent 1100, 1200, and 1260 Infinity Series instruments, as well as Waters Alliance, Waters H-Class, and Shimadzu Prominence instruments facilitating seamless method transfer
- Active damping with independently controllable high-resolution pump drives and firmware-embedded tuning algorithms significantly reduce ripples and associated UV noise
- Multipurpose valve enables automated software-embedded functionality such as switching the optional mixer in and out, flushing back the inline filter or automated purging for reduced manual interaction
- Jet Weaver mixer, based on multilayer microfluidic technology, combines highest efficiency mixing with lowest delay volume for highest UV-detector sensitivity
- Integrated high-efficiency degasser with low internal volume is based on PTFE AF technology and provides for fast change-over of solvents for purging and priming the pump
- Built-in active seal-wash increases instrument uptime
- InfinityLab Level Sensing adds weight controlled level sensing and solvent prediction of the equipped HPLC solvents to avoid downtime by running out solvent
- PFAS analysis option with minimized fluorinated materials in flow path, designed and assembled at manufacturing to reduce system-derived PFAS background and enable reliable ultratrace PFAS analysis without post installation modifications

Product Description of the 1290 Infinity III Bio High-Speed Pump (G7132A)

The Agilent 1290 Infinity III Bio High-Speed Pump is a binary UHPLC pump consisting of biocompatible material for use in biopharma and other applications utilizing high salt and extreme pH conditions. It uses high-pressure blending from up to two solvents at pressures up to 1300 bar and flow rates up to 5 mL/min.

The Bio High-Speed Pump has an exceptionally low delay volume, achieving high throughput and highest resolution for the most demanding applications, giving you highest confidence in your results. It is the ideal front end for LC/MS applications.

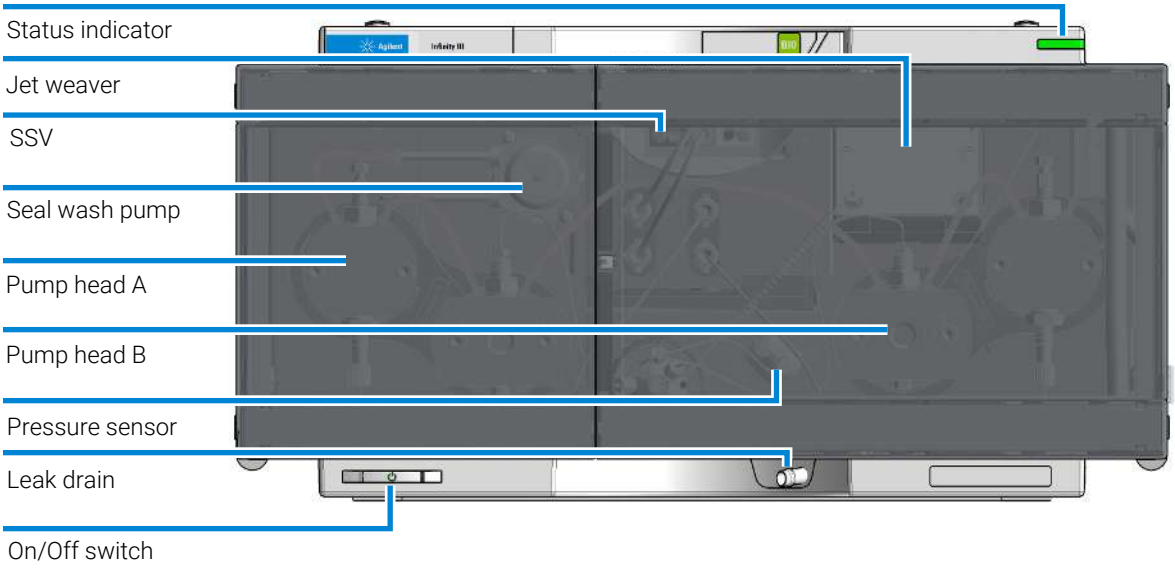


Figure 2: Overview of the Bio High-Speed Pump

Features of the 1290 Infinity III Bio High-Speed Pump (G7132A)

- Biocompatible wetted parts in the solvent delivery unit ensure integrity of biomolecules and minimize unwanted surface interaction while increasing column lifetime.
- Biocompatible pump is resistant to corrosion from high salt concentrations and harsh cleaning.
- High salt tolerance and wide pH range enable increased flexibility.
- Power range combines ultra high pressure up to 1300 bar and high analytical flow rates up to 5 mL/min for maximum UHPLC performance.
- Bio Jet Weaver Mixer, based on multilayer microfluidic technology, combines highest efficieny mixing with lowest delay volume for highest UV-detector sensitivity.
- Multi-purpose valve enables automated software-embedded functionality such as switching the optional mixer in and out, flushing back the inline filter or automated purging for reduced manual interaction.
- Integrated high-efficiency degasser with low internal volume is based on PTFE AF technology and provides fast change-over of solvents for purging and priming the pump.
- InfinityLab Level Sensing adds weight controlled level sensing and solvent prediction of the equipped HPLC solvents to avoid downtime by running out solvent.

Operating Principle

Overview of the Hydraulic Path

High-Speed Pumps feature a dual pump head design for the generation of binary gradients.

The solvent selection valve allows the choice of two solvents per pump head. However, this valve cannot be switched during a run. For PFAS analysis, the solvent selection valve is excluded from the hydraulic path as it contains perfluorinated rubber materials.

Each pump head is equipped with two independently actuated pistons in series.

Delivery cycle:

1. Piston two moves forward to deliver solvent into the flow path. The flow-rate is thereby determined by the speed of the piston.

   At the same time, piston one draws solvent from the solvent reservoir. The two piston chambers are isolated by a check valve (outlet ball valve).
2. Shortly before the end of the delivery stroke of piston two, piston one reverses its direction. The check valve (passive inlet valve) at the inlet of piston chamber one closes while the solvent in piston chamber one gets compressed to system operating pressure.
3. Piston two reverses while piston one delivers the set flow rate into the flow path and re-fills piston chamber two.
4. When piston two has reached the end of its intake stroke it reverses and the delivery cycle starts again with step 1)

Reproducible solvent properties are maintained by an integrated two-channel solvent degasser. It is located between the solvent selection valve and the pump heads. By default, the degasser is included in the hydraulic path. However, if there is a suspesion that degasser leachables affect PFAS analysis it can be excluded from the flow path and other means (e.g., vacuum filtration/degassing or helium sparging) of mobile phase degassing need to be implemented.

The pump automatically compensates for pressure and flow instabilities caused by the complex relationship between solvent compressibility and system pressure.

The only user interaction is selecting the appropriate solvent or solvent mixture per channel from a drop-down list.

Hydraulic Path

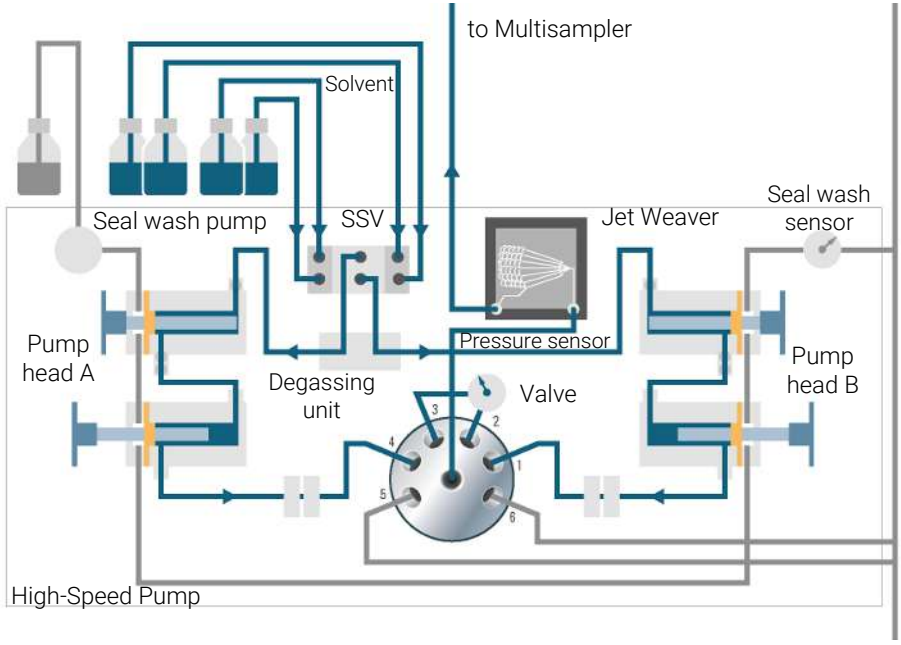


Figure 3: The hydraulic path

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

Site Requirements 16
Power Considerations 16
Power Cords 17
Bench Space 18
Environment 19

Specifications of the 1290 Infinity III High-Speed Pump (G7120A) 20

Specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A) 24

Site Requirements

Power Considerations

The module power supply has wide ranging capability. It accepts any line voltage in the range described in the *Specifications* (see reference below). Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

The specifications of the module are described in:

- Specifications of the 1290 Infinity III High-Speed Pump (G7120A) on page 20
- Specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A) on page 24

WARNING **Inaccessible power plug.**

In case of emergency it must be possible to disconnect the instrument from the power line at any time.

- **Make sure the power connector of the instrument can be easily reached and unplugged.**
- **Provide sufficient space behind the power socket of the instrument to unplug the cable.**

WARNING **Incorrect line voltage at the module**

Shock hazard or damage of your instrument can result if the devices are connected to line voltage higher than specified.

- **Connect your module to the specified line voltage.**

Power Cords

Country-specific power cords are available for the module. The female end of all power cords is identical. It plugs into the power-input socket at the rear. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

Agilent makes sure that your instrument is shipped with the power cord that is suitable for your particular country or region.

WARNING **Unintended use of power cords**

Using power cords for unintended purposes can lead to personal injury or damage of electronic equipment.

- **Never use a power cord other than the one that Agilent shipped with this instrument.**
- **Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.**
- **Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.**

WARNING **Absence of ground connection**

The absence of ground connection can lead to electric shock or short circuit.

- **Never operate your instrumentation from a power outlet that has no ground connection.**

WARNING **Electrical shock hazard**

Solvents may damage electrical cables.

- **Prevent electrical cables from getting in contact with solvents.**
- **Exchange electrical cables after contact with solvents.**

Bench Space

The module dimensions and weight (for specifications, see reference below) allow you to place the module on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench shall carry a complete HPLC system, make sure that the bench is designed to bear the weight of all modules.

The module should be operated in a horizontal position.

NOTE Agilent recommends that you install the HPLC instrument in the InfinityLab Flex Bench rack. This option helps to save bench space as all modules can be placed into one single stack. It also allows to easily relocate the instrument to another lab.

WARNING **Heavy weight**

The module is heavy.

- **Carry the module at least with 2 people.**
- **Avoid back strain or injury by following all precautions for lifting heavy objects.**
- **Ensure that the load is as close to your body as possible.**
- **Ensure that you can cope with the weight of your load.**

The specifications of the module are described in:

- Specifications of the 1290 Infinity III High-Speed Pump (G7120A) on page 20
- Specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A) on page 24

Environment

Your module will work within specifications at ambient temperatures and relative humidity as described in:

- Specifications of the 1290 Infinity III High-Speed Pump (G7120A) on page 20
- Specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A) on page 24

CAUTION

Condensation within the module

Condensation can damage the system electronics.

— Do not store, ship or use your module under conditions where temperature fluctuations could cause condensation within the module.

— If your module was shipped in cold weather, leave it in its box and allow it to warm slowly to room temperature to avoid condensation.

Specifications of the 1290 Infinity III High-Speed Pump (G7120A)

Table 1: Physical specifications of the 1290 Infinity III High-Speed Pump (G7120A)

Type	Specification	Comments
Weight	21.0 kg (46.3 lbs)	
Dimensions (height × width × depth)	200 x 396 x 436 mm (7.9 x 15.6 x 17.2 inches)	
Line voltage	100–240 V~, ±10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ±5%	
Power consumption	210 VA / 180 W	
Ambient operating temperature	4–55 °C (39–131 °F)	
Ambient non-operating temperature	-40–70 °C (-40–158 °F)	
Humidity	< 95% r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Safety standards: IEC, EN, CSA, UL	Overvoltage category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

Table 2: Performance specifications of the 1290 Infinity III High-Speed Pump (G7120A)

Type	Specification	Comments
Hydraulic system	Two dual pistons in series pump with proprietary servo-controlled variable stroke design and smooth motion control for active damping.	
Designed for use with Agilent InfinityLab Assist	Intuitive User Interface, Automated Workflows, Predictive Maintenance & Assisted Troubleshooting	
Pump resolution step size	300 pL	
Flow range	Settable: 0.001 – 5 mL/min, in 0.001 mL/min increments (executed in 300 pL/step increments)	
Flow precision	≤ 0.07 % RSD or 0.005 min SD, whichever is greater	Based on retention time at constant temperature
Flow accuracy	± 1 % or ± 10 µL/min, whichever is greater	
Pressure operating range	Up to 130 MPa (1300 bar) at 0 – 2 mL/min ramping down to 80 MPa (800 bar) at 5 mL/min	
Pressure pulsation	< 1 % amplitude or < 0.5 MPa (5 bar), whichever is greater	
Compressibility compensation	Automatic	
Recommended pH range	1.0 – 12.5	Solvents with pH < 2.3 should not contain acids which attack stainless steel
Gradient formation	High-pressure binary mixing	
Delay volume	As low as 45 µL (10 µL without mixer)	
Composition range	0 – 100 %	
Composition precision	< 0.15 % RSD or 0.01 min SD, whichever is greater	
Composition accuracy	± 0.35 % absolute	
Number of solvents	2 out of maximum 26 solvents	

Type	Specification	Comments
Solvent selection valve	Internal 4-solvent selection valve included. External 2 x 12 solvent valve as option, fully integrated in the pump control interface.	
Integrated degassing unit	Number of channels: 2 Internal volume per channel: 1.5 mL	
Materials in contact with solvent	TFE/PDD copolymer, PFA, PEEK, FEP, ETFE, Stainless Steel, FFKM, Gold, Ruby, Zirconium Oxide-based ceramic, Tantalum, UHMW-PE, Polyimide, DLC Coated Stainless Steel	
Automatic purge valve	Included	
Active seal wash	Included	
Intelligent System Emulation Technology (ISET)	Included	
Instrument control	LC & CE Drivers A.02.11 or above Instrument Control Framework (ICF) A.02.03 or above Lab Advisor software B.02.06 or above InfinityLab Assist (G7180A) with firmware D.07.40 or above Instant Pilot (G4208A) with firmware B.02.17 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC & CE Drivers
Communication	Controller Area Network (CAN), RS232C, APG remote: ready, start, stop, and shutdown signals, LAN	
Safety features and maintenance	Leak detection, safe leak handling, leak output signal for shutdown of the pumping system. Low voltage in major maintenance areas. Extensive diagnostics, error detection and display with Agilent InfinityLab Assist and with Agilent Lab Advisor software.	

Type	Specification	Comments
GLP feature	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of seal wear and volume of pumped mobile phase with pre-defined and user settable limits and feedback messages. Electronic records of maintenance and errors.	
Housing	All materials are recyclable	

Specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A)

Table 3: Physical specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A)

Type	Specification	Comments
Weight	21.0 kg (46.3 lbs)	
Dimensions (height × width × depth)	200 x 396 x 436 mm (7.9 x 15.6 x 17.2 inches)	
Line voltage	100–240 V~, ±10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ±5%	
Power consumption	210 VA / 180 W	
Ambient operating temperature	4–55 °C (39–131 °F)	
Ambient non-operating temperature	-40–70 °C (-40–158 °F)	
Humidity	< 95% r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Safety standards: IEC, EN, CSA, UL	Overvoltage category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

Table 4: Performance specifications of the 1290 Infinity III Bio High-Speed Pump (G7132A)

Type	Specification	Comments
Hydraulic system	Two dual pistons in series pump with proprietary servo-controlled variable stroke design and smooth motion control for active damping.	
Designed for use with Agilent InfinityLab Assist	Intuitive User Interface, Automated Workflows, Predictive Maintenance & Assisted Troubleshooting	
Pump resolution step size	300 pL	
Flow range	Settable: 0.001 – 5 mL/min, in 0.001 mL/min increments (executed in 300 pL/step increments)	
Flow precision	≤ 0.07 % RSD or 0.005 min SD, whichever is greater	Based on retention time at constant temperature
Flow accuracy	± 1 % or ± 10 µL/min, whichever is greater	
Pressure operating range	Up to 130 MPa (1300 bar) at 0 – 2 mL/min ramping down to 80 MPa (800 bar) at 5 mL/min	
Pressure pulsation	< 1 % amplitude or < 0.5 MPa (5 bar), whichever is greater	
Compressibility compensation	Automatic	
Recommended pH range	pH 1 – 12.5 , short term pH 13 (for flushing)	
Gradient formation	High-pressure binary mixing	
Delay volume	As low as 45 µL (10 µL without mixer)	
Composition range	0 – 100 %	
Composition precision	< 0.15 % RSD or 0.01 min SD, whichever is greater	
Composition accuracy	± 0.35 % absolute	
Number of solvents	2 out of maximum 26 solvents	

Type	Specification	Comments
Solvent selection valve	Internal 4-solvent selection valve included. External 2 x 12 solvent valve as option, fully integrated in the pump control interface.	
Integrated degassing unit	Number of channels: 2 Internal volume per channel: 1.5 mL	
Materials in contact with solvent	TFE/PDD copolymer, PFA, PEEK, FEP, ETFE, Stainless Steel with Bio-Compatible Coating, FFKM, Gold, Ruby, MP35N, Tantalum, Gold, Zirconium Oxide-based Ceramic, UHMW-PE, DLC Coated MP35N	
Automatic purge valve	Included	
Active Seal Wash	Included	
Intelligent System Emulation Technology (ISET)	Included	
Instrument control	LC & CE Drivers Rev. 3.3 or above Instrument Control Framework (ICF) A.02.03 or above in Emulation Mode only Instrument Control Framework (ICF) ICF 3.0 Update 1 or above InfinityLab Assist (G7180A) with firmware D.07.40 or above Instant Pilot (G4208A) with firmware B.02.24 or above Lab Advisor software B.02.16 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC & CE Drivers
Communication	Controller Area Network (CAN), RS232C, APG remote: ready, start, stop, and shutdown signals, LAN	
Safety features and maintenance	Leak detection, safe leak handling, leak output signal for shutdown of the pumping system. Low voltage in major maintenance areas. Extensive diagnostics, error detection and display with Agilent InfinityLab Assist and with Agilent Lab Advisor software.	

Type	Specification	Comments
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of seal wear and volume of pumped mobile phase with pre-defined and user settable limits and feedback messages. Electronic records of maintenance and errors.	
Housing	All materials are recyclable.	

3 Installation

The installation of the module will be done by an Agilent service representative. In this chapter, only installation of user-installable options and accessories are described.

Installing Capillaries 29
Install Capillary Connections 30
Installing MP35N Capillaries 34

Handling Leak and Waste 38
Drain Connectors Installation 42
Waste Concept 46
Waste Guidance 46
Leak Sensor 47

Connecting Modules and Control Software 48

Installing Capillaries

This section provides information on how to install capillaries and fittings.

Install Capillary Connections

Capillaries and connections depend on which system is installed.

NOTE As you move to smaller-volume, high-efficiency columns, you will want to use narrow id tubing, as opposed to the wider id tubing used for conventional HPLC instruments.

NOTE Agilent capillaries are color-coded for quick identification, see At-a-Glance Details About Agilent Capillaries on page 374.

Table 5: Capillary connections for 1290 Infinity III systems

p/n	From	To
G7120-60007 (Bottle Head Assembly, long (1730 mm))	Solvent Bottle	Infinity III Pump
5500-1246 (Capillary ST 0.17 mm x 500 mm SI/SI)	Pump	Sampler
5500-1217 (Capillary, ST, 0.17 mm x 900 mm SI/SX)	Pump	Vialsampler with ICC
5500-1157 (Capillary ST 0.12 mm x 500 mm SL/S)	Multisampler	MCT Valve/Heat Exchanger
5500-1251 (Capillary ST 0.12 mm x 400 mm SL/SL)	Vialsampler	MCT Valve/Heat Exchanger
5500-1238 (Capillary ST 0.12 mm x 105 mm SL/SL)	Vialsampler	ICC Heat Exchanger
5500-1249 (Capillary ST 0.12 mm x 120 mm SL/SL, long socket)	ICC Heat Exchanger	Column
5500-1201 (Capillary ST 0.12 mm x 105 mm SL)	MCT Heat Exchanger	Column
5500-1191 (InfinityLab Quick Turn Capillary ST 0.12 mm x 280 mm, long socket) OR 5500-1596 (Quick Turn Capillary MP35N 0.12 mm x 280 mm)	Column/MCT Valve	Detector (DAD or 1290 FLD)
5062-8535 (Waste accessory kit (Flow Cell to waste))	VWD	Waste
5062-2462 (Tube PTFE 0.7 mm x 5 m, 1.6 mm od)	DAD or 1290 FLD	Waste
G5664-68712 (Analytical tubing kit 0.25 mm i.d. PTFE-ESD)	Detector	Fraction Collector

Table 6: Capillary connections for 1290 Infinity III Bio LC

p/n	From	To
G7120-60007 (Bottle Head Assembly, long (1730 mm))	Solvent Bottle	Infinity III Pump
5500-1419 (Capillary MP35N 0.17 mm x 500 mm, SI/SI)	Pump	Multisampler
5500-1279 (Capillary MP35N 0.12 mm x 500 mm SI/SI)	Multisampler	MCT
5500-1578 (Quick Connect Capillary MP35N 0.12 mm x 105 mm)	MCT Heat Exchanger	Column
5500-1596 (Quick Turn Capillary MP35N 0.12 mm x 280 mm)	Column/MCT Valve	Detector (DAD or 1290 FLD)
5500-1598 (Quick Turn Capillary MP35N 0.12 mm x 500 mm)	Column/MCT Valve	Detector (VWD)
5062-8535 (Waste accessory kit (Flow Cell to waste))	VWD	Waste
5062-2462 (Tube PTFE 0.7 mm x 5 m, 1.6 mm od)	DAD or 1290 FLD	Waste
G5664-68712 (Analytical tubing kit 0.25 mm i.d. PTFE-ESD)	Detector	Fraction Collector

Table 7: Capillary connections for 1290 Infinity III PFAS-analysis LC

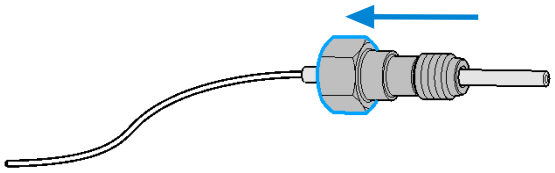
p/n	From	To
5004-0004 (PFC-free bottle head assembly, tubing material: polypropylene)	Solvent Bottle	Infinity III Pump
5500-1231 (InfinityLab Capillary ST 0.17 mm x 500 mm)	Pump	Multisampler
5500-1279 (Capillary MP35N 0.12 mm x 500 mm SI/SI)	Multisampler	MCT
5500-1201 (Capillary ST 0.12 mm x 105 mm SL)	MCT Heat Exchanger	Column

For correct installation of capillary connections it's important to choose the correct fittings, see Syntax for Capillary Description on page 374.

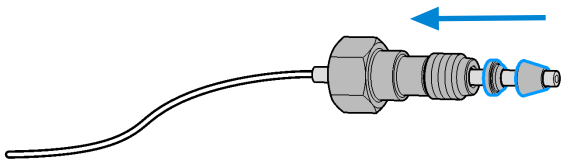
1 Select a nut that is long enough for the fitting you'll be using.



2 Slide the nut over the end of the tubing or capillary.



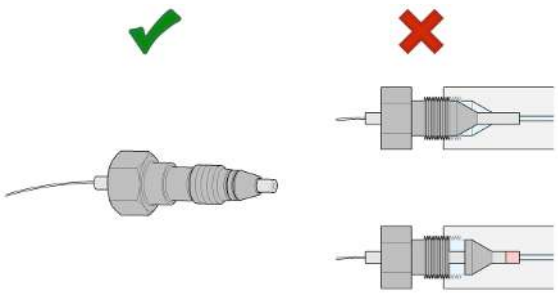
3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.



4 Use a stable port installed to the module to gently tighten the fitting facing to the module. Or use the column to tighten the fitting facing to the column. This measure forces the ferrule to seat onto the tubing or capillary.

NOTE Do not overtighten. Over-tightening will shorten the lifetime of the fitting.

5 Loosen the nut and verify that the ferrule is correctly positioned on the tubing or capillary.



NOTE

The first time that the Swagelok fitting is used on a column or an injection valve, the position of the ferrule is permanently set. If changing from a column or an injection valve to another, the fitting may leak or decrease the quality of the separation by contributing to band broadening.

For Bio and Bio-Inert Systems, the Swagelok instructions do not apply.

Installing MP35N Capillaries

This instruction describes swaging and installing MP35N capillaries.

The Agilent Bio LC systems use MP35N capillaries. These capillaries combine the high-pressure stability and bio-compatibility of MP35N. They are used throughout the complete system, including the flow path before and after sample introduction.

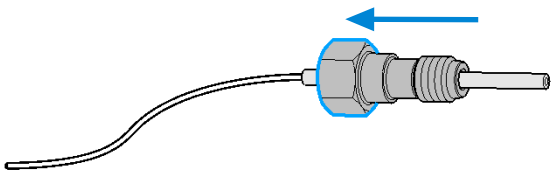
Capillary connections for 1290 Infinity III Bio LC see Table 6 Capillary connections for 1290 Infinity III Bio LC on page 31.

Swage MP35N Capillaries

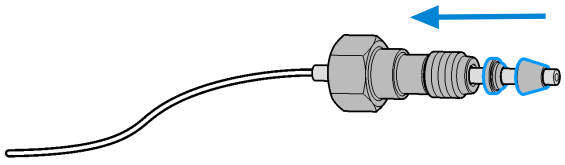
1 Select a nut that is long enough for the fitting you'll be using.



2 Slide the nut over the end of the tubing or capillary.

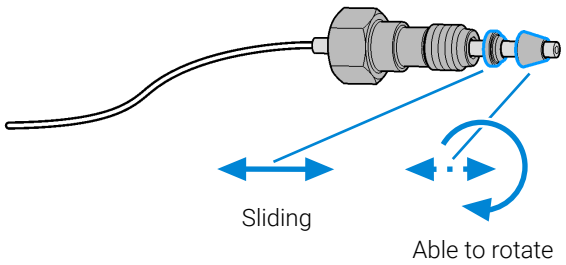


3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.



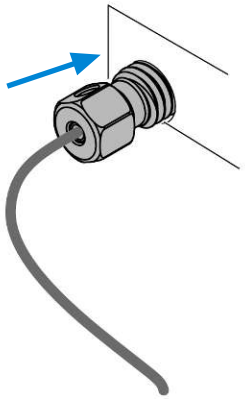
4 Use the wrench to turn the nut 90°.

5 Loosen the nut and verify that the ferrule is correctly positioned on the capillary: the front ferrule sits tight but still can be turned around the central axes, and the back ferrule should be sliding freely. If the front ferrule does not sit tight, repeat the procedure and at step 4 do about 5°-greater turn with the wrench than in the previous attempt.

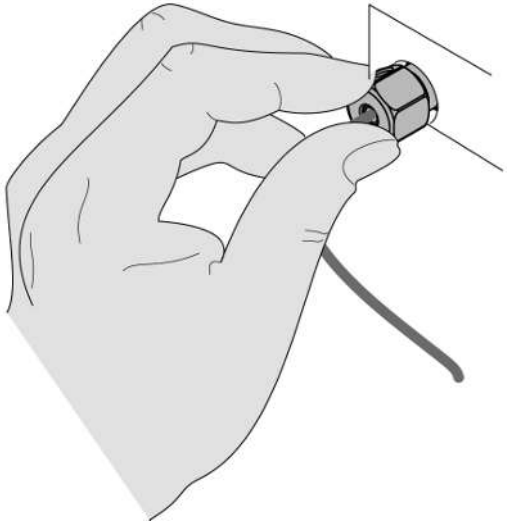


Install MP35N Capillaries

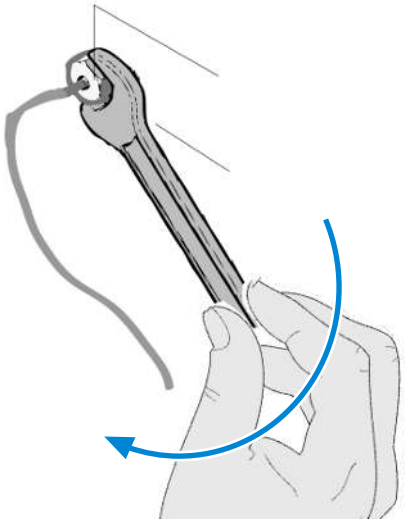
1 Insert the fitting to the receiving port and push the capillary to the bottom of the port.



2 Finger tighten the nut into the port until snug.



3 With the wrench, tighten the nut until the first resistance. Make sure to pull the wrench instead of pushing it. When you can no longer pull the wrench with the fingers the first resistance position is reached.



4 Tighten the nut ¼ of a turn more with the wrench (⅛ of a turn for a second and subsequent installations).

Handling Leak and Waste

The Agilent InfinityLab LC Series has been designed for safe leak and waste handling. It is important that all security concepts are understood and instructions are carefully followed.

The solvent cabinet is designed to store a maximum volume of 8 L solvent. The maximum volume for an individual bottle stored in the solvent cabinet should not exceed 2 L. For details, see the usage guideline for the Agilent Infinity III Solvent Cabinets (a printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available on the Internet).

All leak plane outlets are situated in a consistent position so that all Infinity and Infinity II/III modules can be stacked on top of each other. Waste tubes are guided through a channel on the right hand side of the instrument, keeping the front access clear from tubes.

The leak plane provides leak management by catching all internal liquid leaks, guiding them to the leak sensor for leak detection, and passing them on to the next module below, if the leak sensor fails. The leak sensor in the leak plane stops the running system as soon as the leak detection level is reached.

Solvent and condensate is guided through the waste channel into the waste container:

- from the detector's flow cell outlet
- from the Multisampler needle wash port
- from the Sample Thermostat (condensate)
- from the pump's Seal Wash Sensor (if applicable)
- from the pump's Purge Valve or Multipurpose Valve

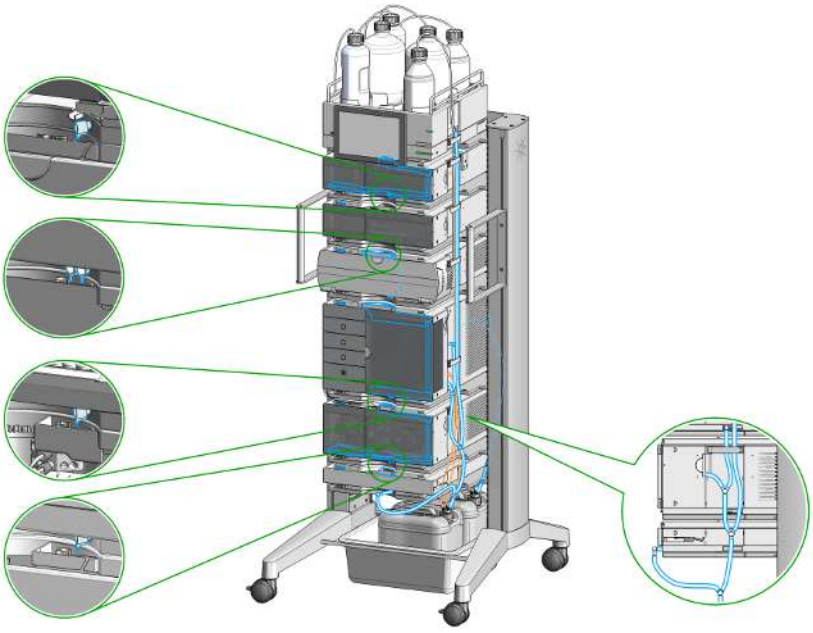


Figure 4: Infinity III Leak Waste Concept (Flex Bench installation)

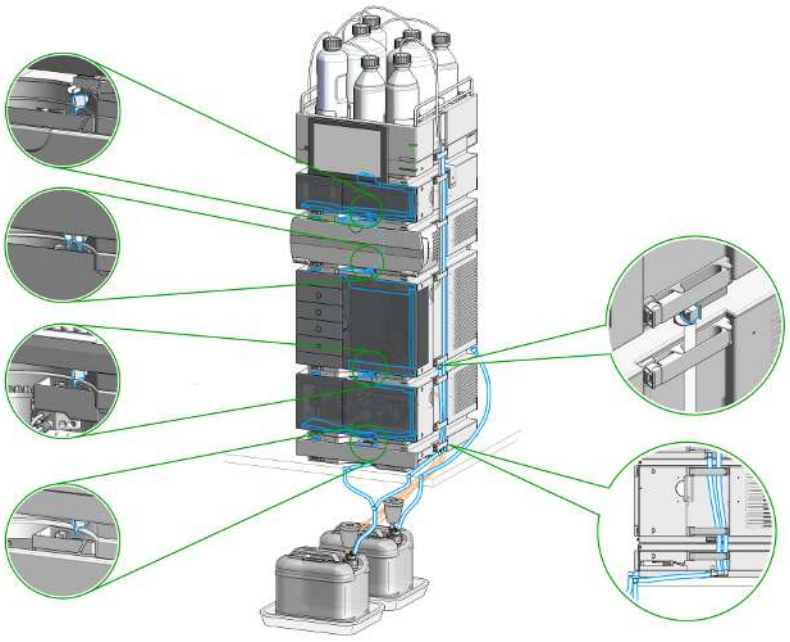


Figure 5: Infinity III Single Stack Leak Waste Concept (bench installation)

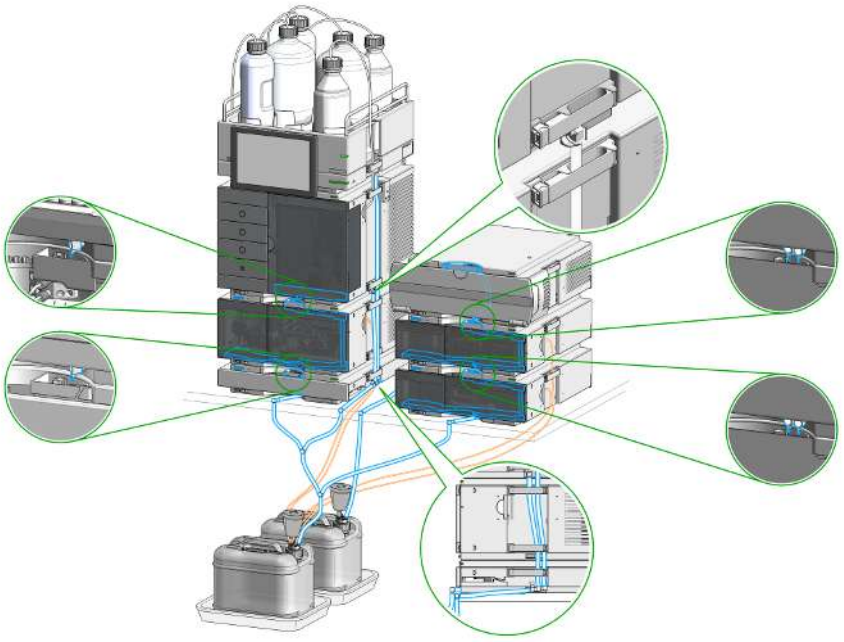


Figure 6: Infinity III Two Stack Leak Waste Concept (bench installation)

The waste tube connected to the leak plane outlet on each of the bottom instruments guides the solvent to a suitable waste container.

Drain Connectors Installation

Drain Connectors have been developed to improve leak drainage for low flow leaks of high viscosity solvents (for example, isopropanol) in Agilent InfinityLab LC Series Systems. Install these parts to modules where they are missing (usually preinstalled).

- Make sure that dripping adapters are correctly installed on each module in the LC stack, excluding lowest module.
- Remove the dripping adapter if it is appeared to be installed on the lowest module in the LC stack and connect waste tube instead.
- Consider 5004-0000 (Drain Connectors Kit) if drain adaptor is missing on some module(s).

For illustration, see Handling Leak and Waste on page 38.

Parts required

Qty.	p/n	Description
1	5004-0000	Drain Connectors Kit

Content of Drain Connectors Kit (p/n 5004-0000)

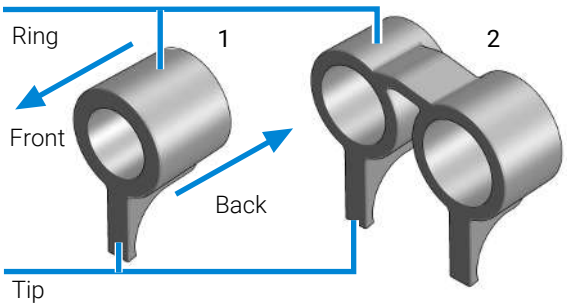


Figure 7: Overview of Drain Connectors: Single (left) and Double (right)

#	Qty.	p/n	Description
Parts can be ordered only as a complete kit.			
1	3	5043-1834	Single Drain Connector ID3.0-Long
2	1	5043-1836	Double Drain Connector-Long

Table 8: Compatibility of drain connectors and modules

Drain Connector Type	Compatible Module	Compatible Module Type
Double	G7116A/B	Column Compartment
Single	G7114A/B	Detector
	G7115A	
	G7117A/B/C	
	G7121A/B	
	G7123B	
	G7162A/B	
	G7165A	
	G7129A/B/C	Sampler
	G7167A/B/C	
	G5668A	
	G7137A/B	
	G7157A	
	G4767A	
	G7122A	Degasser
	G7104A/C	Pump
	G7110B	
	G7111A/B	
	G7112B	
	G7120A	
	G7131A/C	
	G7132A	
	G5654A	
	G4782A	

Prerequisites

- Leak drains of LC modules are clean and free of salt or solvent residuals.

NOTE

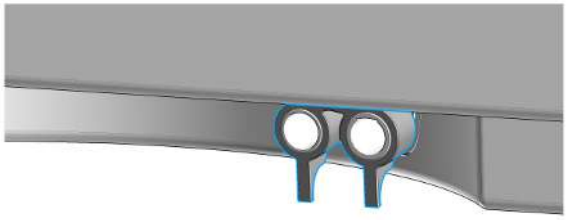
Do not install drain connectors on the bottom modules of the stack. Drain outlet of the bottom module has to be connected via waste tubing to a suitable waste container (see Leak and Waste Handling in the manual for a respective module).

NOTE In case of incorrect installation, drain connectors cannot fully perform the intended function.

NOTE It is not required to power off the HPLC stack to install Single and Double Drain Connectors. The installation of the connectors does not affect the analysis performed during the installation.

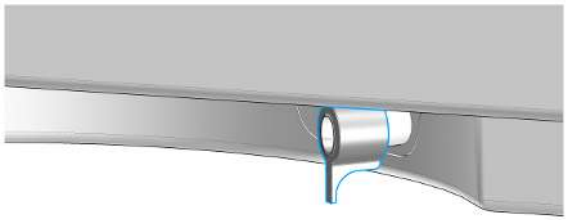
Install the Double Drain Connector on the leak drain of the Multicolumn Thermostat

1 Align the rings with the leak drain outlets of the module, press slightly with the fingers, and slide the connector along the leak drain outlets until it is aligned with the front of the leak drain.



Install Single Drain Connectors on other modules in the LC stack

1 Align the ring with the leak drain outlet of the module, press slightly with the fingers, and slide the connector along the leak drain outlet until it is aligned with the front of the leak drain.

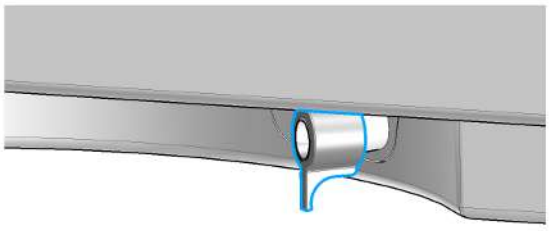


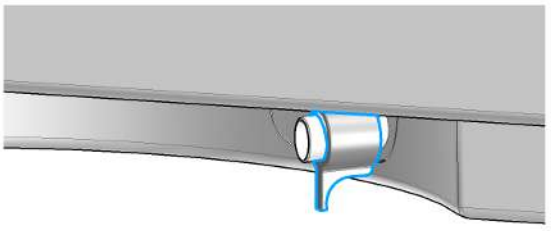
Make sure that the following requirements are covered:

- The tip of the drain connector points straight down.
- The leak drain outlets and the drain connectors are aligned properly.







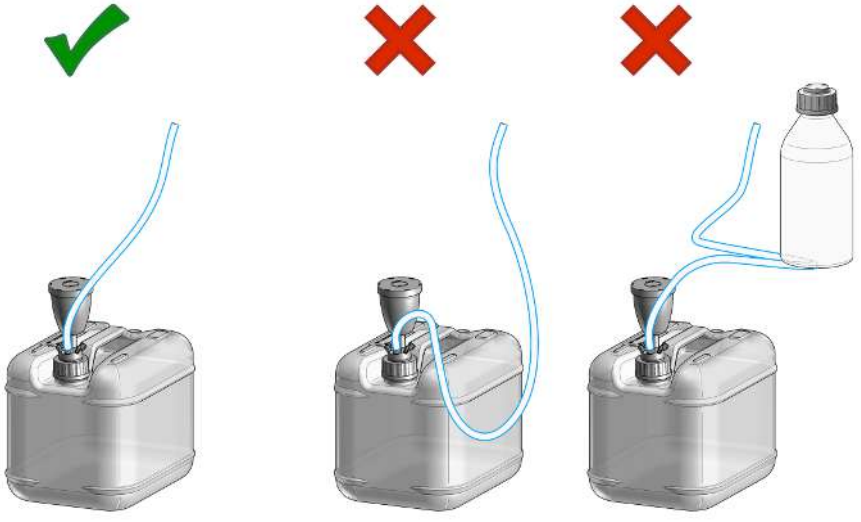


Waste Concept

Agilent recommends using 5043-1221 (6 L waste can with 1 Stay Safe cap GL45 with 4 ports) for optimal and safe waste disposal. If you decide to use your own waste solution, make sure that the tubes don't immerse in the liquid.



Waste Guidance



NOTE The waste drainage must go straight into the waste containers. The waste flow must not be restricted at bends or joints.

Leak Sensor

CAUTION Solvent incompatibility

The solvent DMF (dimethylformamide) leads to corrosion of the leak sensor. The material of the leak sensor, PVDF (polyvinylidene fluoride), is incompatible with DMF.

- Do not use DMF as mobile phase.
- Check the leak sensor regularly for corrosion.
- Do not place metal parts on the leak panel or the leak sensor.

Connecting Modules and Control Software

WARNING Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

— Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

4 Using the Module

This chapter provides information on how to use the module.

General Information 50
Turn On/Off 50
Status Indicators 53

Best Practices 54
Daily / Weekly Tasks 54
Power Up / Shut Down the Pump 54
Solvent Recommendation for Agilent 1290 Infinity, 1290 Infinity II/III, and 1260 Infinity II/III Flexible Pumps 55
Prepare the Pump 60
Seal Wash 63
How to Deal With Solvents 64

Preparation of the System 65
Prepare a Run 65
Prime and Purge the System 72

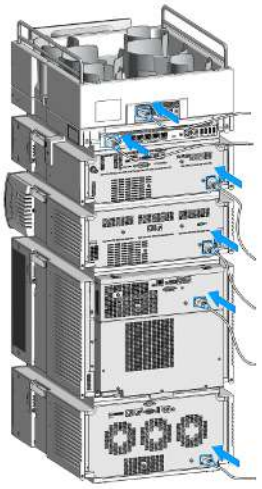
Preparing the Module 73
Purging the Pump 73
Setting Up the Pump with the Instrument Control Interface 74

General Information

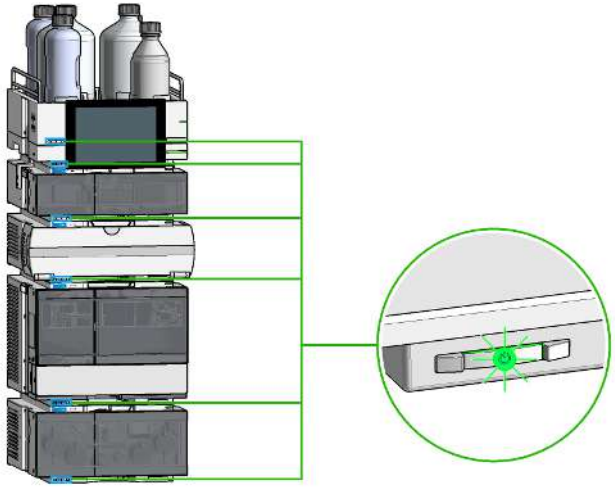
Turn On/Off

This procedure exemplarily shows an arbitrary LC stack configuration.

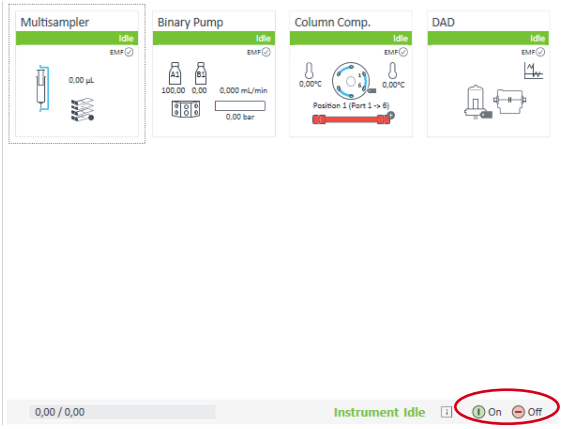
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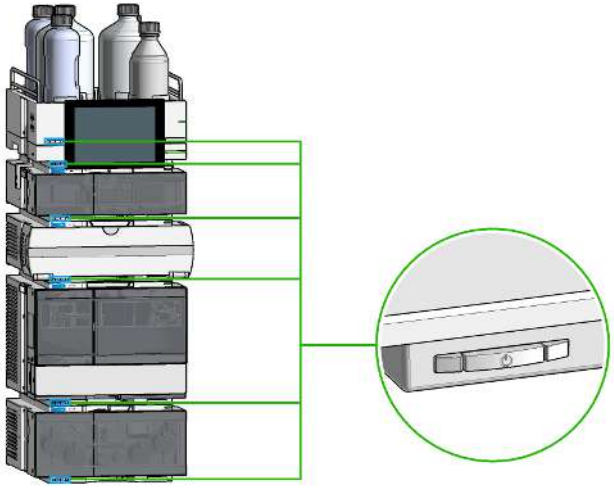
2 On/Off switch: On



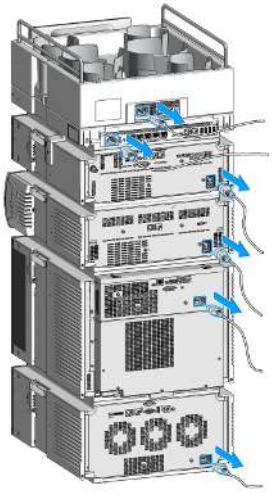
3 Turn instrument **On/Off** with the control software.



4 On/Off switch: Off



5



Status Indicators

The module status indicator indicates one of six possible module conditions.

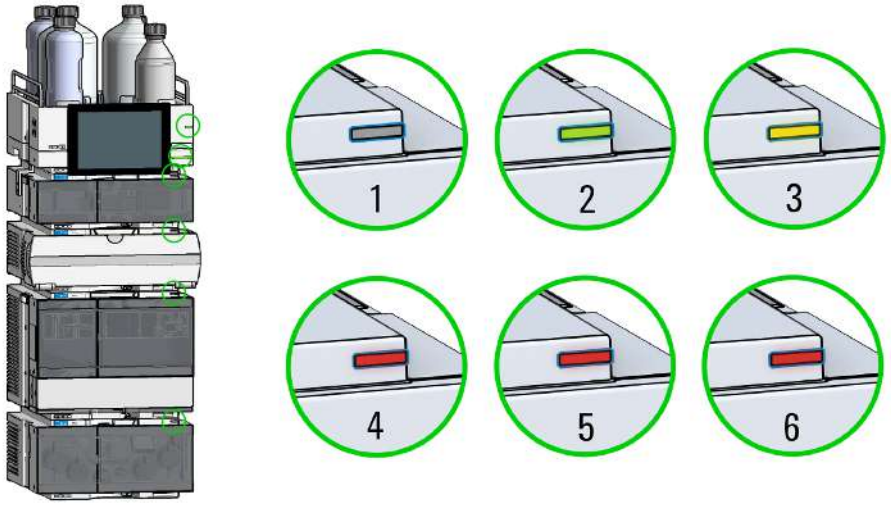


Figure 8: Arbitrary LC stack configuration (example)

1	Idle
2	Run mode
3	Not-ready. Waiting for a specific pre-run condition to be reached or completed.
4	Error mode - interrupts the analysis and requires attention (for example, a leak or defective internal components).
5	Resident mode (blinking) - for example, during update of main firmware.
6	Bootloader mode (fast blinking). Try to re-boot the module or try a cold-start. Then try a firmware update.

InfinityLab Assist Hub Status Indicator

The Assist Hub status indicator displays the status of the entire system. If a module in the system is not ready (yellow), the Assist Hub status indicator also shows not ready (yellow). The same applies for the module conditions **Idle**, **Run mode**, and **Error mode**.

Best Practices

Daily / Weekly Tasks

Daily Tasks

- Replace solvents and solvent bottles for mobile phases based on water/ buffer.
- Replace solvents and solvent bottles for organic mobile phase latest every second day.
- Check presence of seal wash solvent.
- Purge each channel with fresh solvent at 2.5 – 3 mL/min for 5 min before operation.
- Equilibrate the system with composition and flow rate of subsequent method.

Weekly Tasks

- Change seal wash solvent (10 % isopropanol in water) and bottle.
- If applications with salts were used, flush all channels with water and remove possible salt deposits manually.
- Inspect solvent filters for dirt or blockages. Exchange if no flow is coming out of the solvent line when removed from the degasser inlet.

Power Up / Shut Down the Pump

Prepare the Pump

- Use fresh or different mobile phase (as required).
- Purge each channel with 2.5 – 3 mL/min for 5 min. Open the manual purge valve or use the purge command, depending on the pump type.

Shut Down the System

- Flush the column with the appropriate solvents and store it according to column manual instructions (be sure that the flushing solvent is compatible with the solvent present in the system to avoid precipitation).
- Chromatographic columns used for biomolecule separations like size exclusion chromatography or ion-exchange chromatography should be stored in the presence of 0.02 % sodium azide. For more Bio LC Column user guides, see https://www.agilent.com/en/support/liquid-chromatography/kb005960.
- Install a union or a restriction capillary and flush the system extensively with water, especially after using buffers. For details, see Flushing Out Aqueous Buffers Before Switching To Reversed-Phase Applications.
- Flush and store the system in 50 % methanol or 50 % isopropanol in water, without additives.
- Remove all samples from the autosampler and store them according to good laboratory practices.
- Power off all modules.

Solvent Recommendation for Agilent 1290 Infinity, 1290 Infinity II/III, and 1260 Infinity II/III Flexible Pumps

While the Agilent 1290 Infinity, 1290 Infinity II/III, and 1260 Infinity II/III Flexible Pumps guarantee a high performance with a wide variety of solvents, other solvents may cause harm to the pump or to the (U)HPLC system. No modifications are necessary when using standard reversed phase applications with water and other polar protic solvents in combination with most polar aprotic solvents. Normal phase applications work well with the modifications detailed in the section Normal Phase Applications on page 56.

If free halides, hydroperoxides, free radicals or strong, oxidizing acids are present, corrosion can occur in stainless steel systems. There are several solvents with which, under nonideal conditions, reactions can occur and these harmful compounds are generated. Prevent formation of reactive substances when using the following solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride)

- High concentrations of inorganic acids like sulfuric acid and nitric acid, especially at higher temperatures
- Halogenated organic solvents or mixtures, which form radicals and/or acids (for example, chloroform, methylene chloride)
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether)
- Solvents containing strong complexing agents (for example, EDTA).

All these solvents can be used in Agilent (U)HPLC systems. See *Best Practices for Addressing Problems Associated With Unstable Solvents in an (U)HPLC Environment (BestPractices_UnstableSolvents_TN_EN.pdf, SD-29000193)*, for recommendations on how to avoid damage to the instrument or separation column when working with these solvents.

Normal Phase Applications

Valves for Normal Phase Applications (G7104A/C, G7120A)

Current passive inlet valves and outlet ball valves used with Agilent Infinity and Infinity II/III pumps do not work well while running nonpolar solvents for normal phase applications (for example, hexane and heptane). With such applications, pressure drops could be observed. They are the result of particles in insulating solvents, electrostatically charging up, and sticking to the nonconductive ruby balls inside the standard valves, such that the valves no longer close properly (could take just hours). For normal phase applications, a second type of valve is available. These valves use a new material for valve balls, which is a conductive ceramic. The ceramic balls do not charge up electrostatically and show good performance in normal phase applications. The valves are marked with "N" to stand for normal phase. Agilent recommends using these valves for (and only for) normal phase applications.

To avoid changing to the Type N valves when running critical solvents, it is possible to increase the conductivity of the mobile phase, by adding 5 % of a miscible, polar solvent. In general, isopropanol is a good choice.

No design change has been done for active inlet valves, which have already been used successfully for normal phase applications in 1260 Infinity I/II/III pumps.

Seals for Normal Phase Applications

For running normal phase applications on Agilent Infinity III pumps, yellow PE seals are required as piston seals. By default, 1290 Infinity, 1290 Infinity III, and 1260 Infinity III Flexible Pumps use ceramic pistons and yellow PE seals as piston seals. 1260 Infinity I/II/III pumps use sapphire pistons and black PTFE piston seals in a standard configuration. If using black PTFE seals with normal phase applications, the black PTFE seals wear and generate small particles. Such particles can clog valves and other parts in the flow path. When running normal phase applications on 1260 Infinity I/II/III pumps, the piston seals have to be changed to yellow PE seals. For optimum performance, PE seals should be replaced during preventive maintenance.

Table 9: Recommended valves for normal phase applications

	Binary or High-Speed Pumps (G7120A)	Quaternary or Flexible Pumps (G7104A/C)
Inlet valves	G4220-60122 (1290 Inlet Valve Type N)	G4204-60122 (1290 Quat Inlet Valve Type N)
Outlet valves	G4220-60128 (1290 Outlet Valve Type N)	G4220-60128 (1290 Outlet Valve Type N)

CAUTION

Corrosion of valves

Normal phase balls/valves corrode quickly in aqueous solutions and acids (at or below pH 7).

— Do not use normal phase valves in applications running with aqueous solutions.

Solvent Handling

Handling of Normal Phase Solvents

Observe the following recommendations when using normal phase solvents:

- Always use fresh, filtered solvents. Exchange solvents every second day.
- Prevent reactions caused by heat, light, and oxygen. Use brown, firmly closed bottles.
- Whenever possible, use stabilizers, e.g. butylated hydroxytoluene (BHT) for ethyl ether.

- Use isopropanol (IPA) to flush out the previous solvent when converting a system from normal phase to reverse phase, or vice versa.
- Store all unused channels in IPA.
- Don't turn off the pump while it is filled with solvents with low boiling points. Generate a small flow throughout the used channels when the pump is not in use.

Handling of Buffers

The following recommendations should be observed when using buffer solutions:

- Buffers and aqueous solutions are possible sources of algae contamination, for avoiding related problems, please read Algae Growth in HPLC Systems on page 360.
- For buffer concentrations of 0.1 M or higher, using the seal wash function periodically with a runtime of 0.3 min every 3 min is strongly recommended.
- Filter buffer solutions to avoid increased wear or blockages that are caused by undissolved crystals. Always use solvent inlet filters.
- Avoid conditions where mixing of buffers and organic solvents may cause precipitation, as this impairs the reproducibility of chromatographic experiments and may also reduce the system life time. For example in reversed-phase chromatography, avoid buffers (especially phosphate buffers) with a concentration higher than 20 mmol/L. For phosphate buffers, avoid compositions containing more than 65 % acetonitrile or other organic solvents.
- Use a minimum flow rate of 5 µL/min or 1 % composition per solvent channel (whatever is greater) to avoid crossflow. Crossflow can be caused by micro leaks in pump heads and can result in buffer precipitation in pump heads, channel blocking, or reduced pump head life time through wear of seals and pistons.
- Consider using an inline filter, for example G1311-60006 (Inline filter) .
- Never leave buffers in a system without flow. Before shutting down a system, flush it extensively with warm water to avoid clogging of valves, capillaries, or flow cells or reducing the life time of your column. If the system is not used for some time, for example more than a day depending on lab temperature, fill all solvent lines with organic solvent or water with at least 10 % isopropanol.
- Regularly maintain the LC system.

Handling of Acetonitrile

Acetonitrile is a solvent that is frequently used in reversed-phase chromatography. Despite of its common use, it can be a source of issues if not handled correctly.

As Acetonitrile ages, some residue can get stuck on internal pump surfaces that can cause issues with valve performance and therefore affect retention time precision.

When using acetonitrile:

- Use high-quality solvents from renowned suppliers.
- Use fresh solvents and filter them.
- Minimize exposure to light and air/oxygen.
- Choose a bottle size, which fits to your application and use.
- Acids accelerate solvent aging. If possible, avoid such additives or refresh solvents more frequently.
- Pure acetonitrile ages faster. If your application allows, add about 5 % water and adjust gradient compositions.
- Do not leave acetonitrile in unused systems to avoid aging. If not in use, flush all solvent lines with a mixture of water and 10 % isopropanol.
- In case of blocked valves, flush the system with hot water. Knock at valves, flush them (see Release a Stuck Inlet Valve on page 195) or ultrasonicate them, for example in methanol.

Handling of Acids

Acids can corrode stainless steel and other materials in the flow path of LC systems. For stainless steel, the minimum pH is 2.3 for corrosive acids and pH 1 for noncorrosive acids.

Please note that for nonvolatile acids like phosphoric acid or perchloric acid concentrations increase after evaporation of water. This means that originally diluted acids can damage parts over time, e.g. because of liquid, which has left the solvent path through micro leaks. Such systems should be flushed regularly with pure water and may require shorter maintenance cycles. Using the seal wash function should be considered for protecting pump heads.

Please also see *Best Practices for Using an Agilent LC System Technical Note (InfinityLab-BestPractice-en-SD-29000194.pdf, SD-29000194)*, which can be downloaded from our website https://www.agilent.com.

Prepare the Pump

The Agilent 1290 Infinity I/II/III Pumps are equipped with automatic purge valves. This enables many extra functions not available in Agilent Pumps with manual purge valves. It is possible to prepare the pump (set parameters and start the functions **Purge**, **Condition**, or **Prime**) with the software.

Purge

Use the Purge function to:

- Fill the system with fresh or different solvent.
  - Ensure that the new solvent is miscible with the previous solvent.
  - Prevent damage to the degasser or pump by using an intermediate step with a comiscible solvent, if necessary.
- Remove air bubbles in tubes and pump heads.
  - After the pump has been idle for a few hours or more (air may have diffused into the solvent lines).

When the purge procedure ends, the module automatically switches to analytical conditions again.

Condition

If micro air bubbles persist in the pump head, the overall pump performance may be compromised and flow accuracy / precision may be negatively affected. This may be visible as increased pressure and / or detector baseline ripple. A reliable indicator of such situation is a strongly negative but slowly increasing tuning signal value (below –1). To remove the air efficiently, the Condition function can be used. During conditioning, the pump is delivering flow into the system (column) and the last used method settings, like flow, composition and max pressure are used. It is not possible to perform sample analysis while conditioning.

Use a reasonable flow rate (for example 1.5 mL/min), composition setting (for example A: 50 % B: 50 %) and backpressure (> 200 bar) to ensure efficient air bubble removal from all pump heads.

Condition the pump if you see:

- Excessive pressure ripple.

- Excessive composition ripple (baseline noise/mixing noise – noise level changes with the composition), when you are sure that the solvent type is correctly set, and there is no evidence of a leak in the pump.

Conditioning may be necessary:

- After a long period of standby
- After running out of solvent
- After service or repair

CAUTION

Filling empty solvent lines

Damage to the seals

— Use a syringe or the Purge function to fill empty solvent lines.

— Do not use the Prime procedure to fill empty solvent lines.

Prime

The Prime function is helpful if air has entered the pump heads and cannot be removed by conditioning for 15 minutes. The module draws solvent at a high speed with all pump drives simultaneously and dispenses it into the waste position of the automatic purge valve. This is done 20 times and is stressful to the valve and rotor seal. Therefore, it should be performed only as a last resource, before forcefully filling the pump heads with a syringe or attempting to repair the pump heads.

Use the Prime function to:

- Free a potentially stuck valve.

Prepare the Pump using the Driver Interface

The described functions can be triggered from the driver interface:

- 1290 Infinity

NOTE

For parameter settings, see *Best Practices for Using an Agilent LC System Technical Note (InfinityLab-BestPractice-en-SD-29000194.pdf, SD-29000194)*.

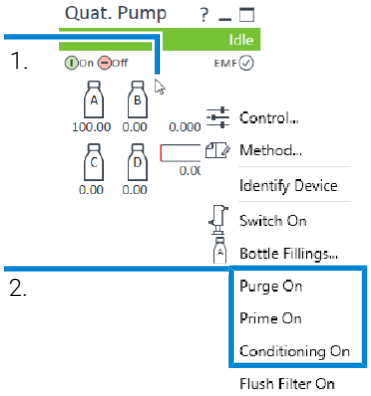


Figure 9: Prepare the pump (1290 Infinity pumps)

1	Right click the module dashboard
2	Select the appropriate function to start the procedure

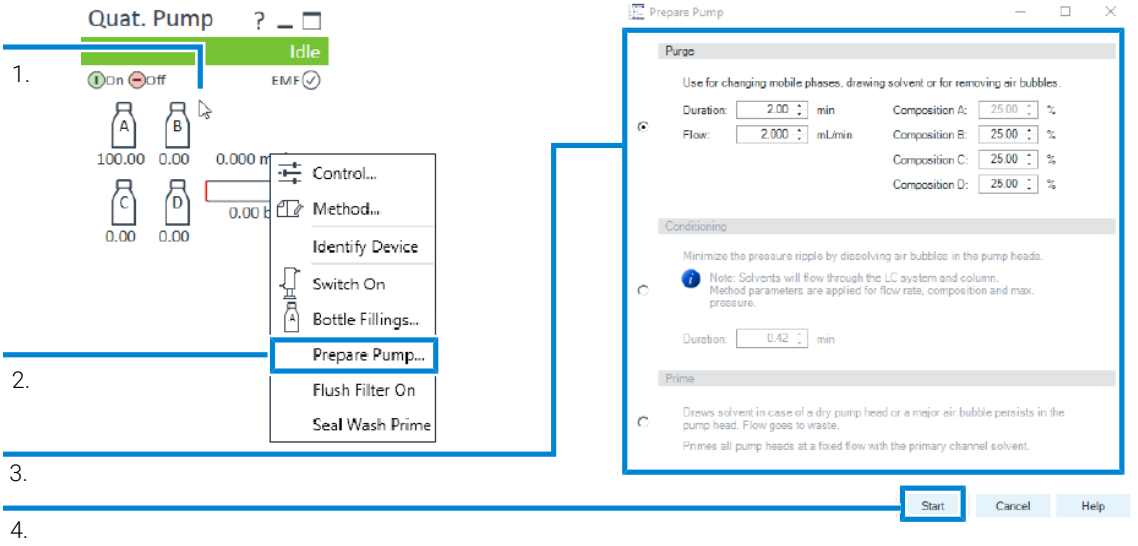


Figure 10: Prepare the pump (1290 Infinity III pumps)

1	Right click the module dashboard
2	Select **Prepare Pump...**
3	Select the procedure and fill in adequate parameters
4	Click **Start** to run the selected procedure

Seal Wash

Seal Wash guarantees a maximum seal life time. Use Seal Wash:

- When using buffers with elevated salt concentrations
- When using volatile solvents with non-volatile additives

CAUTION

Contaminated seal wash solvent

— Do not recycle seal wash solvent to avoid contamination.

— Weekly exchange seal wash solvent.

How to Deal With Solvents

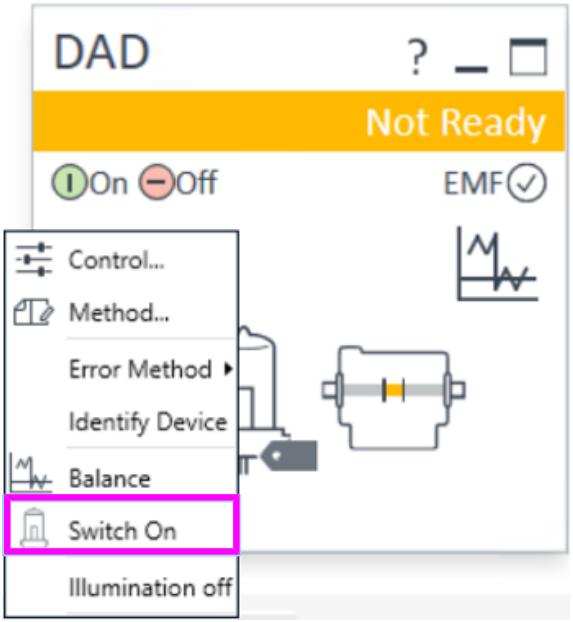
- Use clean bottles only.
- Exchange water-based solvents daily.
- Select solvent volume to be used up within 1 – 2 days.
- Use only HPLC-grade solvents and water filtered through 0.2 µm filters.
- Label bottles correctly with bottle content, and filling date / expiry date.
- Use solvent inlet filters.
- Reduce risk of algae growth: use brown bottles for aqueous solvents, avoid direct sunlight.

Preparation of the System

Prepare a Run

This procedure exemplarily shows how to prepare a run. Parameters as shown in the screenshots may vary, depending on the system installed.

1 Switch on the detector.

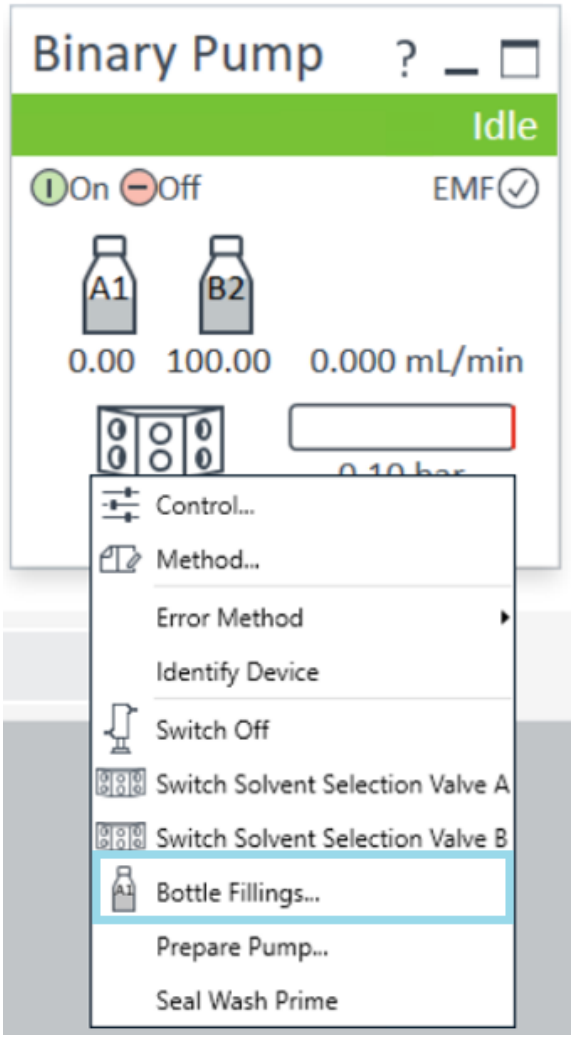


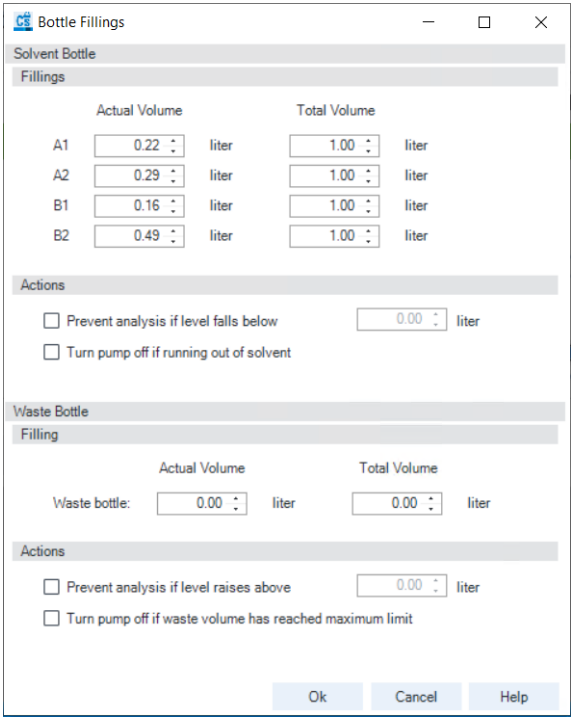
2 Fill the solvent bottles with adequate solvents for your application.

3 Place solvent tubings with bottle head assemblies into the solvent bottles.

4 Place solvent bottles into the solvent cabinet.

5 Solvent bottle filling dialog (in the software).





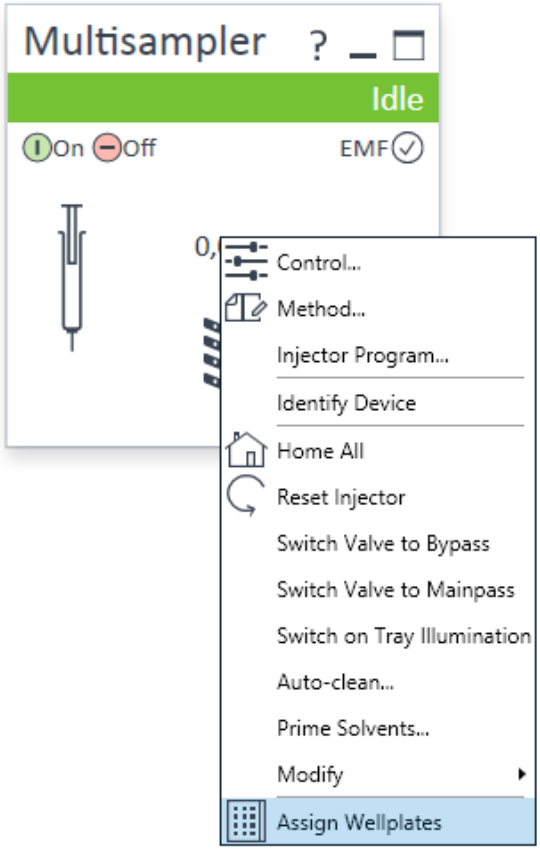
6 Purge the pump.

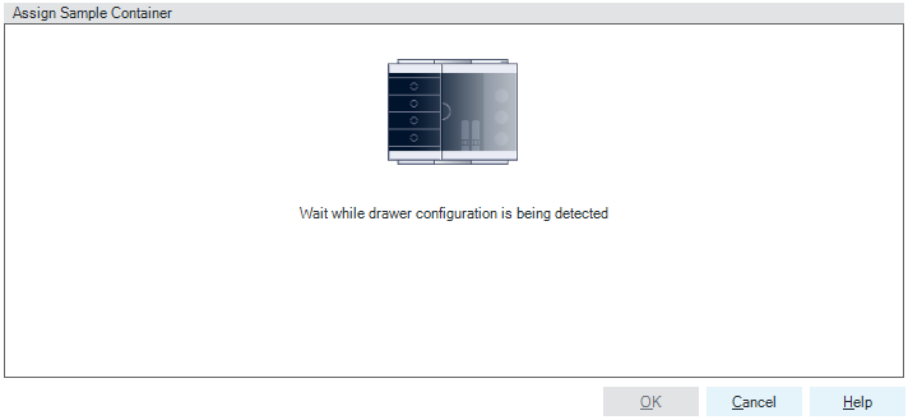
NOTE

For details on priming and purging, refer to the technical note *Best Practices for Using an Agilent LC System Technical Note (InfinityLab-BestPractice-en-SD-29000194.pdf, SD-29000194)*.

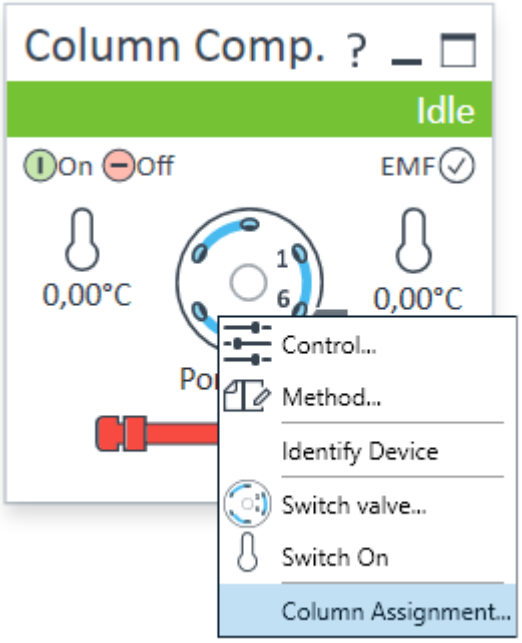
7 Change solvent type if necessary.

8 Choose the tray format of the sampler.

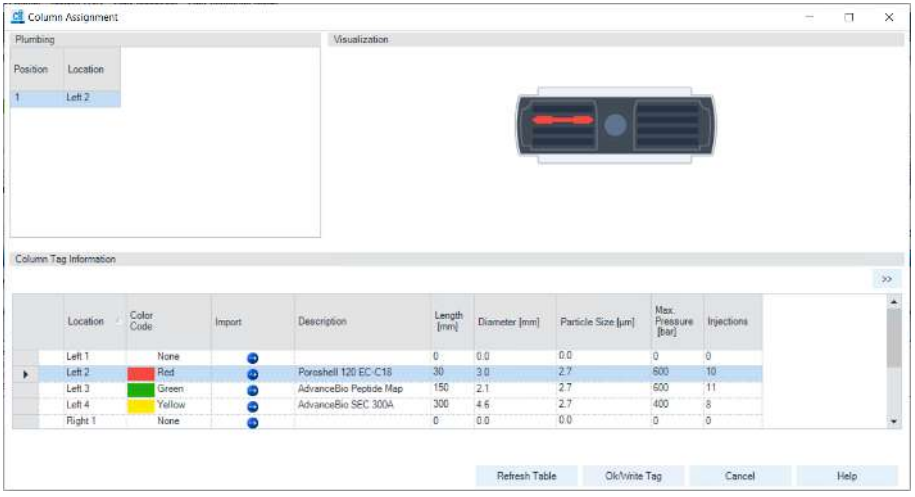




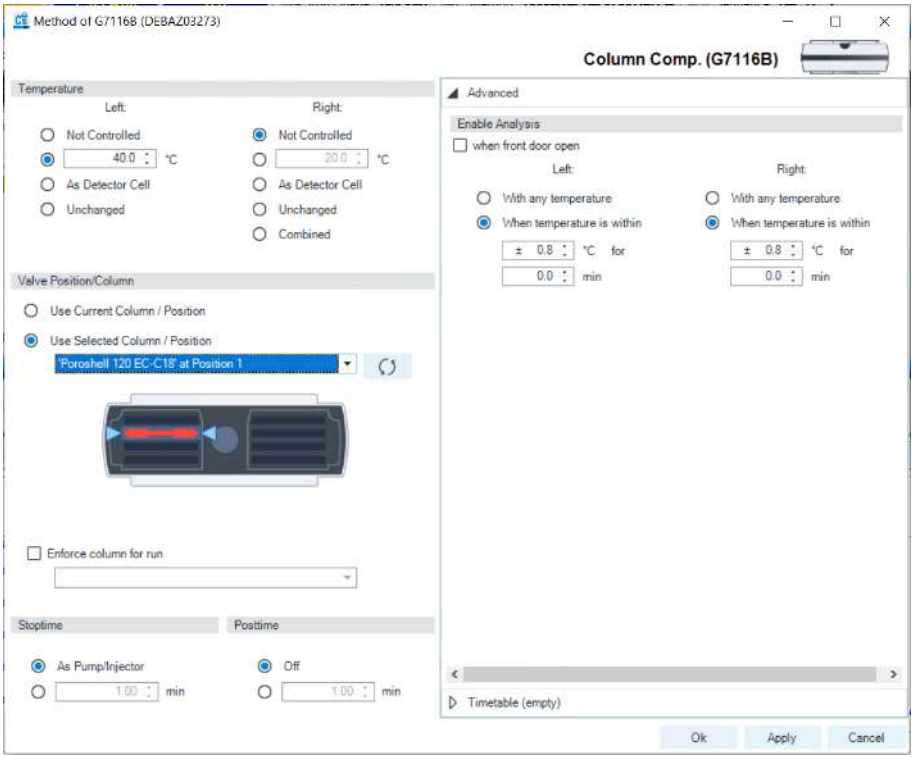
9 Add a new column.



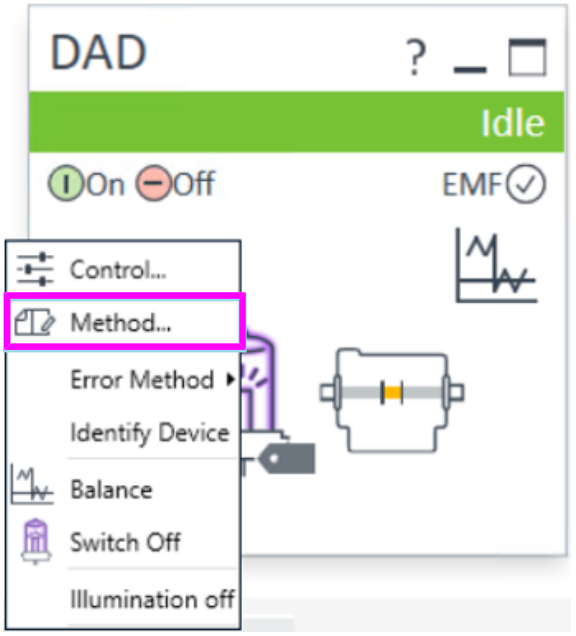
10 Enter the column information.



11 Select the column in the Method settings of the column compartment.



12 Set the detector parameters according to the needs of your method.


DAD
Idle
On
Off
EMF
Control...
Method...
Error Method
Identify Device
Balance
Switch Off
Illumination off

Prime and Purge the System

When the solvents have been exchanged or the pumping system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel between the solvent reservoir, vacuum degasser (when available in the system) and the pump. Solvents containing volatile ingredients will slightly lose these. Therefore priming of the pumping system is required before starting an application.

Table 10: Choice of priming solvents for different purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals
After the installation of normal phase seals (P/N 0905-1420)	Hexane + 5% Isopropanol	Good wetting properties

NOTE The pump should never be used for priming empty tubings (never let the pump run dry). Use a syringe to draw enough solvent for completely filling the tubings to the pump inlet before continuing to prime with the pump.

1 Purge the pump with a flow rate of 3 – 5 mL/min.

2 Flush all tubes with at least 30 mL of solvent.

3 Set flow to required value of your application and close the purge valve.

NOTE Pump for approximately 10 minutes before starting your application.

Preparing the Module

Purging the Pump

When the solvents have been exchanged or the pumping system has been turned off for a certain time (for example, overnight) oxygen will rediffuse into:

- the solvent channel between the solvent reservoir,
- the vacuum degassing unit (if available in the system),
- the pump.

Solvents containing volatile ingredients will slightly lose these components. Therefore, purging of the pumping system is required before starting an application.

1 Start a purge in the controlling software with a purge flow set to 3 mL/min per channel.

2 Flush all tubes with at least 15 mL of solvent.

NOTE

Never use the pump to prime/purge empty tubings (never let the pump run dry). Use a syringe to draw enough solvent for completely filling the tubings to the pump inlet before continuing to purge with the pump.

Table 11: Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Isopropanol is miscible with both normal phase and reverse phase solvents.
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available

Activity	Solvent	Comments
To clean the system when using buffers	Bidistilled water	Best solvent to redissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to redissolve buffer crystals
Before turning off system for an extended period	50 % methanol or 50 % isopropanol in water, without additives	

If the system has been run dry or air has diffused into the pump, it might require extra steps to get rid of the air again. The following procedure will give the best and fastest results.

1 Change solvents to isopropanol.

2 Purge the system with 3 mL/min, composition 50/50 and for 10 min.

3 Attach a column suitable for isopropanol and set the Max. pressure limit to the limit of the column.

4 Run the system at composition 50/50 and a flow rate that gives a pressure close to the limit of the column. Turn on the Conditioning function.

5 Observe the pressure fluctuations. The system is air free when the pressure is stable.

6 Change solvents and column according to the analytical conditions and purge the system to change solvents.

Setting Up the Pump with the Instrument Control Interface

Overview

The instrument control interface offers the parameters described in the following sections, and can usually be accessed through Agilent instrument control software. For details, please see manuals and online help of respective user interfaces.

Instrument Configuration

Use the **Instrument Configuration** dialog box to examine and, if necessary, modify your instrument configuration. The **Configurable Modules** panel contains a list of all modules available for configuration. The **Selected Modules** panel contains the list of configured modules.

Auto Configuration: Under **Communication settings**, select either the **Host Name** option or the **IP address** option and enter the appropriate value for the host computer to enable automatic detection of the hardware configuration. The system configures the instrument automatically with no further manual configuration necessary.

The High-Speed Pump configuration parameters are in two sections:

- Communication
- Options

Communication: The parameters in this dialog box are detected automatically during autoconfiguration.

- Device name,
- Type ID,
- Serial number,
- Firmware revision,
- Button **Connection settings**

Options:

- **Pressure Unit**:

  Select the pressure units from the drop-down list (bar, psi, or MPa).
- **Installed mixer**:

  The installed mixer is detected during auto configuration. For manual configuration, click the down-arrow and select the installed mixer from the list. If you select a **Custom Mixer**, specify the custom mixer type in the **Custom mixer** field.
- **ISET installed**:

  This check box is marked to indicate that ISET is installed. Click **ISET Configurations** to open the **ISET Configuration** dialog box, which allows you to configure a sampler for the ISET emulation.

Configure Solvent Type Catalogs: Displays the Solvent Type Catalogs dialog box, which allows you to import and export solvent calibration data. See How to Import the Latest Solvent Calibration Tables on page 94.

Please see the online help of your user interface for more detailed information.

The Pump User Interface (Dashboard Panel)

Module Graphic

The items in the pump graphic have the following meaning and function:



Indicates that an External Contacts board is installed.



The level of solvent in the bottle is denoted by the green area; when the solvent level falls below the specified volume, the area turns yellow; when the bottle is empty, the area turns red. Clicking on the solvent bottle displays the Bottle Fillings dialog box. The tooltip for the bottle shows the solvent name.





Indicates that the ISET option is installed but with no active method (light gray) or installed and active (dark gray).





Indicates the presence of a solvent selection valve. Click the graphic to switch the valve; the animation shows when the valve is switched.



The pressure setpoints. The red line shows the current maximum pressure limit; the gray area shows the current pressure (also shown as text).

The current solvent flow rate (in mL/min) is displayed above the pressure display.

Instrument Signals

The following pump signals are displayed:

Flow	The current solvent flow rate (in mL/min).
Pressure	The current pump ressure (in bar, psi or MPa, see Instrument Configuration on page 75).
Pressure Limit	The current maximum pressure limit.
Composition A:B	The current solvent composition. When a solvent selection valve is fitted, the channels are shown in the graphic.
Tuning	The signal represents the current effort the pump needs to maintain the current system settings.

Context Menu

The context menu of the dashboard panel contains the following commands:

	Control	Displays the pump's **Control** dialog box.
	Method	Displays the pump's **Method Setup** dialog box.
	Set Error Method	Sets the method that is loaded if an error occurs to the method that is currently available in the hardware.
	Identify Device	Causes the LED on the front of the module to blink for a few seconds.
	Switch Pump On/ Off	Toggles the status of the pump, on or off.
	Switch solvent selection Valve A	allows you to switch the solvent inlet line for channel A from inlet line 1 to 2.
	Bottle Fillings	Displays the **Bottle Fillings** dialog box.
	Prepare Pump	Allows you to control the Purge, Condition or the Prime function.
	Seal Wash Purge	Allows you to refill the Seal Wash lines once the Seal Wash solvent has been changed.

Prepare Pump Dialog

Table 12: Prepare Pump dialog box

Parameter	Limits	Description
Purge	**Time**: 0 – 100.00 min in steps of 0.01 **Flow**: 0.000 – 5.000 mL/min for each channel, in steps of 0.001	Setup and activation of **Purge** parameters. The automatic purge valve can be used for purging the system. The process has been automated for ease of use. • **Off**: Turns off the purge. • **On**: The device is purged. • **Purge Flow**, **Time** and **Composition** during purge have to be defined. As soon as the duration time of the purge ends, the module automatically switches to analytical conditions again.
Prime		Select **On** to start priming, **Off** to turn priming off. The **Prime** function is helpful if air has entered the pump heads. The module draws solvent at high speed with all four pump drives simultaneously, and dispenses it against the waste position of the automatic purge valve. This is done 20 times, before the process comes to an end. It should only be used when purging is not successful in removing stuck air bubbles from the pump head, and under no circumstances to fill the solvent lines when they are completely empty.
Conditioning	at least 200 bar (> 500 bar is better)	Use this function if you see excessive pressure or composition ripple, and you are sure that the solvent type (aqueous/organic or specific solvent/solvent mix) is correctly set, and there is no evidence of leakage in the pump. Conditioning may be necessary if the pump contains air, for example, after running out of solvent, after a long period of standby or after service or repair.

Control Settings

The pump control parameters are in two sections:

- Pump
- Automatic Turn On

Table 13: Pump control parameters

Parameter	Description
Pump	Enables you to switch the pump **On**, **Off** or to a **Standby** condition. In the **Standby** condition, the pump motor is still active, and when the pump is switched on again, it does not need to be re-initialized.
Automatic Turn On	Module can be turned on at a specified date/time. This feature can only be used if the module on/off switch is turned on.

Method Parameter Settings

The High-Speed Pump method setup parameters are in eight sections:

- Flow
- Solvents A and B
- Stoptime
- Posttime
- Pressure Limits
- Timetable
- Advanced
- External Contacts

Table 14: Method parameters

Parameter	Limits	Description
Flow	0.00 – 5.00 mL/min in steps of 0.001. Recommended flow range: 0.05 – 5.00 mL/min.	The flow is the rate of movement of eluent along the column. It is important that the flow rate is kept constant to ensure precise retention time and peak measurements. Variations in flow rate can occur as a result of the partial failure of the pumping system, air in the pumping system, a change in the mobile phase viscosity or a temperature change.
Solvents A and B		For each channel, you can select which of the two solvents to deliver. You can set the percentage of solvent B to any value from 0 through 100 %. Solvent A always delivers the remaining volume: 100 - %B. The solvent B check boxes allow you to turn the solvent B channels on (checked) or off (cleared). When the **Use solvent types** check box in the **Compressibility** section is checked (see Advanced Settings on page 81), you click the down arrow and select either a **Generic** solvent or a calibrated **Solvent**.
Stoptime	0.01 – 99999 min or **As Injector/No Limit** (an infinite run time).	The stoptime sets a time limit for your analysis. After the stoptime, all gradients are stopped and the pump parameters return to their initial values. The pump can be used as a stoptime master for the complete analytical system. The pump also stops the detectors if they have a **No Limit** stoptime setting. If no limit is given, a method will have to be stopped manually.
Posttime	0.01 – 99999 min or **Off** (0.0 min).	Your instrument remains in a not ready state during the posttime to delay the start of the next analysis. You can use the **Posttime** to allow your column to equilibrate after changes in solvent composition (for example, after gradient elution).

Parameter	Limits	Description
Pressure Limits	**Max**: 1300 bar (18850 psi) for flow rates up to 2 mL/min. For flow rates between 2 mL/min and 5 mL/min, the maximum pressure ramps down to 800 bar (11600 psi). **Min**: any value between 0 and the upper pressure limit setting.	Sets the maximum and minimum pressure limits for the pump. • **Max** is the maximum pressure limit at which the pump will switch itself off, protecting the analytical system against over-pressure. • **Min** is the minimum limit at which the pump will switch itself off. For example, if any solvent reservoir is empty, this prevents damage by pumping of air.
Timetable		See Timetable Settings on page 82
Advanced		See Advanced Settings on page 81
External Contacts		The **External Contacts** section enables you to set up the switching of the external contacts. **NOTE:** The **External Contacts** section is present only when a BCD/external contacts board is installed.

Advanced Settings

The High-Speed Pump advanced method setup parameters are in three sections:

- Minimum Stroke
- Compressibility
- Maximum Flow Gradient

Table 15: Advanced method parameters

Parameter	Limits	Description
Minimum Stroke	5 – 100 µL	The stroke volume setting is used for optimizing the performance of the pump. For performance, a low stroke volume is beneficial, as it facilitates better solvent mixing and smoother composition generation, whereas a larger stroke volume might extend the lifetime of the pump seals and/or heads. Automatic setting is optimal for the vast majority of methods. With this setting, the pump optimizes the stroke volume of both channels to achieve the best performance for the momentary composition and flow rate with the least possible stress for the hardware. Synchronized: This option adjusts the piston motion in both pump channels to avoid floating disturbances affecting instrument performance. Unchecking the "Synchronized" check box is strongly deprecated, as it may lead to random and unpredictable artifacts influencing the quality and reliability of chromatography. Disabling piston synchronization can be useful for advanced diagnostics by trained personnel and should not be used within analytical methods.
Compressibility		The compressibility of the mobile phase affects the performance of the pump. For best flow accuracy and mixing performance, you can set the parameter according to the mobile phase being used. Use solvent types: • Clear this check box to display the compressibility fields, which allow you to enter compressibility values. • When the check box is selected, the compressibility fields are not displayed, and the enhanced compressibility calibration is enabled. Select the required calibrated solvents from the drop-down lists using the combo boxes in the Solvents section.
Maximum Flow Gradient	0.100 – 1000.000 mL/min/min in steps of 0.001 mL/min/min Default value: 100.000 mL/min/min	You can set a limit on the rate of change of the solvent flow to protect your analytical column. You can set individual values for Flow ramp up and Flow ramp down.

Timetable Settings

Use the Timetable to program changes in the pump parameters during the analysis by entering a time in the Time field and appropriate values in the following fields of the timetable. Changes in flow rate occur linearly from either time zero or the time of the last defined change; other parameters change instantaneously at the time defined in the timetable.

Show that Advanced Timetable toggles the timetable display between standard mode and advanced mode.

The following parameters can be changed:

- Change Contacts
- Change Flow
- Change Max. Pressure Limit
- Change Solvent Composition - You can only use solvents, which have been enabled in the solvents section.
- Function centric view - This check box allows you to display parameter changes instead of a time table.

5 Optimizing the Performance of the Module

This chapter provides information on how to optimize the module.

Recommendations for Biocompatible and Bio-Inert Systems 84

Degasser Usage in PFAS-Analysis (G7120A) 85

Recommendations for Degassers 86

Delay Volume and Extracolumn Volume 87
Delay Volume 87

How to Configure the Optimum Delay Volume 88

How to Achieve Higher Resolution 90

Using Solvent Calibration Tables 93
How it Works 93
How to Import the Latest Solvent Calibration Tables 94
Recommendations for Setting up Methods Using Salt-Containing Eluents 98

Recommendations for Biocompatible and Bio-Inert Systems

- Make sure all supplies (fittings, capillaries, inline filters, columns, etc.) are bio-inert / biocompatible.
  - Be aware that some columns for bio-related applications have a stainless steel case and can introduce iron and other metal ions in the flow path. This may lead to adsorption of susceptible samples like phosphorylated nucleotides. In this case, use PEEK-lined columns.
- After using the system with high salt concentrations, flush it extensively with water to prevent blockages caused by salt crystals.
- Reliable operation of 1290 pumps during analysis cannot be guaranteed if pressure falls below 20 bar. For optimal results, pressure should be at least 50 bar continuously. Therefore, when using columns that create low backpressure (< 50 bar, such as SEC columns with 1290 LC systems), install a Restriction 5005-0046 (Capillary MP35N 0.12 mm x 2 m) between the pump and the sampler, to achieve at least 50 bar.
- Perform daily flush of the Multisampler with water if the Multiwash option is installed (see *Best Practices for Using an Agilent LC System Technical Note (InfinityLab-BestPractice-en-SD-29000194.pdf, SD-29000194)*)

CAUTION

Agilent Bio-inert and Bio LC systems should not be subject to passivation or similar procedures

This can cause irreversible damage to the system's internal surfaces

— Do not perform passivation or similar procedures on bio-inert and biocompatible systems.

Degasser Usage in PFAS-Analysis (G7120A)

In the configuration optimized for PFAS-analysis, the degasser is included by default in the flow path. Any potential PFAS-related leachables originating from the degasser are expected to be retained by the delay column installed in this configuration.

If there is a suspicion that PFAS interfering with the analysis are originating from the degasser, and replacing the delay column does not resolve the issue, the degasser may be bypassed for troubleshooting purposes. To bypass the degasser, connect the solvent inlet lines directly to the inlet valve of each pump head. Plug the degasser inlet and outlet with flat-bottom plugs (0100-1806). When bypassing the degasser, ensure that the mobile phase is thoroughly degassed using an external method such as helium sparging or vacuum filtration to maintain stable pump performance and chromatographic consistency.

Recommendations for Degassers

CAUTION

Liquid inside the degasser

In case a low boiling point solvent condensates or there is a leak, liquid can accumulate inside the degasser chambers, and this will compromise performance.

When this happens,

— Purge all solvent channels with isopropanol.

— Keep unused channels filled with isopropanol.

- Check compatibility of solvents with degasser and application
  - Use the standalone standard degassers (G1322A or G7122A) for RI applications, flow rates higher than 5 mL/min, with low boiling point solvents (< 60 °C) and with hexane, tetrahydrofuran and any halogenated solvents.
  - Use integrated or a standalone high-performance degasser (G4225A) for all other applications.
- If enough vacuum for the optimal degassing performance cannot be reached or maintained (as indicated by yellow or red status LED in standalone degassers, or specific error messages on integrated degassers), power cycle the module.
- If after power cycling vacuum still cannot be reached or maintained on integrated degassers, use the **Evacuation Mode**, available in the instrument control screen of Agilent Lab Advisor.

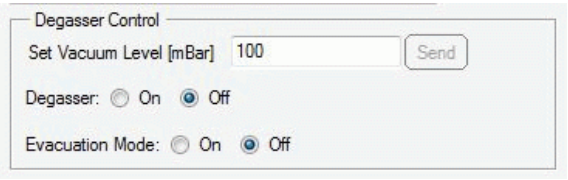


Figure 11: Degasser Control for internal degassers in Agilent Lab Advisor

NOTE

Follow the instructions prompted on the screen when starting the **Evacuation Mode**.

Delay Volume and Extracolumn Volume

The *delay volume* is defined as the system volume between the point of mixing in the pump and the front of the column.

The *extracolumn volume* is defined as the volume between the injection point and the detection point, excluding the volume in the column.

Delay Volume

In gradient separations, this volume causes a delay between the mixture changing in the pump and that change reaching the column. The delay depends on the flow rate and the delay volume of the system. In effect, this means that in every HPLC system there is an additional isocratic segment in the gradient profile at the start of every run. Usually the gradient profile is reported in terms of the mixture settings at the pump and the delay volume is not quoted even though this will have an effect on the chromatography. This effect becomes more significant at low flow rates and small column volumes and can have a large impact on the transferability of gradient methods. It is important, therefore, for fast gradient separations to have small delay volumes, especially with narrow bore columns (e.g., 2.1 mm i.d.) as often used with mass spectrometric detection.

The delay volume in a system includes the volume in the pump from the point of mixing, connections between pump and autosampler, volume of the flow path through the autosampler and connections between autosampler and column.

How to Configure the Optimum Delay Volume

The physical delay volume of the pump depends primarily on the use of the Jet Weaver mixer. For UV detection, the Jet Weaver should always be used but for mass spectrometric detection the user can decide to bypass the Jet Weaver to reduce the delay volume. This only makes sense for ultrafast gradient operation (less than 0.5 min) or for use with very small volume columns. If the Jet Weaver is bypassed, the connection tubing to the autosampler is routed directly from the purge valve.

NOTE

Before disconnecting a Jet Weaver from the flow path, flush it with organic solvent (50 % isopropanol in water). Avoid leaving water or buffers inside the Jet Weaver, which may cause the growth of micro-organisms like algae or bacteria.

Sometimes it may be advisable to increase the delay volume in the pump. Specifically this can be the case when UV detection is employed and a strongly UV-absorbing compound has been added to the mobile phase. This can have the effect of emphasizing any pump noise and the most common example is the use of trifluoroacetic acid (TFA) in the analysis of proteins and peptides. The effect can be mitigated by increasing the mixer volume.

The following different Jet Weaver configurations are available:

- The Jet Weaver (G7120-68135 (Jet Weaver 35 µL/100 µL) or G7132-68135 (Jet Weaver 35 µL/100 µL biocompatible)) has two alternative volumes in the same unit.

  The switch from the lower volume, 35 µL, to the higher volume, 100 µL, is done by uninstalling it, turning it around from front to back and re-installing it, see Change Configuration or Replace the Jet Weaver on page 186. The delay volume increases by approximately 31 µL and the baseline performance with additives like TFA improves. The configuration of the Jet Weaver is logged automatically by an attached RFID tag.
- The 380 µL Jet Weaver high-performance mixer (G7120-68380 (Jet Weaver 380 µL) or G7132-68380 (Jet Weaver 380 µL biocompatible)) is optionally available for demanding applications, which use solvents in different channels (for example A versus B), that differ strongly in their UV-Vis absorption. For example, it can be installed when using trifluoroacetic acid (TFA) as a modifier, which has a high absorbance.

Solvent packages created by the pump may persist until the solvent reaches the detector flow cell. Absorption fluctuations can then show up as baseline noise, also referred to as mixing noise. Applications like impurity quantitation or lowest level compound detection require minimizing this noise. The 380 µL Jet Weaver strongly improves mixing and therefore reduces baseline noise and improves sensitivity in detection. Patented Agilent microfluidic technology offers high mixing performance at a low internal volume of 380 µL.

How to Achieve Higher Resolution

Increased resolution in a separation will improve the qualitative and quantitative data analysis, allow more peaks to be separated or offer further scope for speeding up the separation. This section explains how resolution can be increased by examining the following points:

- Optimizing selectivity
- Smaller particle-size packing
- Longer Columns
- Shallower gradients, faster flow
- Minimal extra-column volume
- Optimize injection solvent and volume
- Fast enough data collection

Resolution between two peaks is described by the resolution equation:

$$Rs = \frac{1}{4}\sqrt{N}\,\frac{(\alpha - 1)}{\alpha}\,\frac{(k_2 + 1)}{k_2}$$

where

- R_s=resolution,
- N=plate count (measure of column efficiency),
- α=selectivity (between two peaks),
- k_2=retention factor of second peak (formerly called capacity factor).

The term that has the most significant effect on resolution is the selectivity, α, and practically varying this term involves changing the type of stationary phase (C18, C8, phenyl, nitrile etc.), the mobile phase and temperature to maximize the selectivity differences between the solutes to be separated. This is a substantial piece of work which is best done with an automated method development system which allows a wide range of conditions on different columns and mobile phases to be assessed in an ordered scouting protocol. This section considers how to get higher resolution with any chosen stationary and mobile phases. If an automated method development system was used in the decision on phases it is likely that short columns were used for fast analysis in each step of the scouting.

The resolution equation shows that the next most significant term is the plate count or efficiency, N, and this can be optimized in a number of ways. N is inversely proportional to the particle size and directly proportional to the length of a column and so smaller particle size and a longer column will give a higher plate number. The pressure rises with the inverse square of the particle size and proportionally with the length of the column. Resolution increases with the square root of N so doubling the length of the column will increase resolution by a factor of 1.4. What is achievable depends on the viscosity of the mobile phase as this relates directly to the pressure. Methanol mixtures will generate more back pressure than acetonitrile mixtures. Acetonitrile is often preferred because peak shapes are better and narrower in addition to the lower viscosity but methanol generally yields better selectivity (certainly for small molecules less than about 500 Da). The viscosity can be reduced by increasing the temperature but it should be remembered that this can change the selectivity of the separation. Experiments will show if this leads to increase or decrease in selectivity. As flow and pressure are increased it should be remembered that frictional heating inside the column will increase and that can lead to slightly increased dispersion and possibly a small selectivity change both of which could be seen as a reduction in resolution. The latter case might be offset by reducing the temperature of the thermostat by a few degrees and again experiment will reveal the answer.

The van Deemter curve shows that the optimum flow rate through an STM column is higher than for larger particles and is fairly flat as the flow rate increases. Typical, close to optimum, flow rates for STM columns are: 2 ml/min for 4.6 mm i.d.; and 0.4 ml/min for 2.1 mm i.d. columns.

In isocratic separations, increasing the retention factor, k, results in better resolution because the solute is retained longer. In gradient separations the retention is described by k^* in the following equation:

$$k^* = \frac{t_G}{\Delta\%B} \cdot \frac{F}{V_m} \cdot \frac{100}{S}$$

where:

- k^* = mean k value,
- t_G = time length of gradient (or segment of gradient) (min),
- F = flow (ml/min),
- V_m = column delay volume,
- Δ%B = change in fraction of solvent B during the gradient,
- S = constant (ca. 4-5 for small molecules).

This shows that k and hence resolution can be increased by having shallower gradients (2 to 5 %/min change is a guideline), higher flow rates and smaller volume columns. This equation also shows how to speed up an existing gradient – if the flow is doubled but the gradient time is halved, k^* remains constant and the separation looks the same but happens in half the time. Recently published research has shown how a shorter STM column (at temperatures above 40 °C) can generate higher peak capacity than a longer STM column by virtue of running it faster. (Refer to *Petersson et al., J.Sep.Sci, 31, 2346-2357, 2008, Maximizing peak capacity and separation speed in liquid chromatography*).

Any reduction in extra-column volume will reduce dispersion and give better resolution. This is already optimized in the 1290 Infinity LC system with narrow bore (0.12 mm i.d.) capillaries (check that the shortest length is used between column and detector) and the Max-light cartridge flow cell.

Finally, any gains in resolution must be preserved by having data collection which is fast enough to accurately profile the narrow peaks.

Using Solvent Calibration Tables

Agilent Solvent Calibration Tables provide an algorithm for the pump to automatically determine the correct compressibility associated with the current system pressure.

Solvent definition tables for most common solvents are now available for download.

https://www.agilent.com/en-us/firmwareDownload?whid=62265.

How it Works

The compressibility of the mobile phase has an effect on the performance of the pump. For best flow accuracy and mixing performance, the compressibility parameter in the Method Settings of the pump shall be chosen according to the mobile phase being used. This method setting activates the algorithm associated with the Agilent Solvent Calibration Tables.

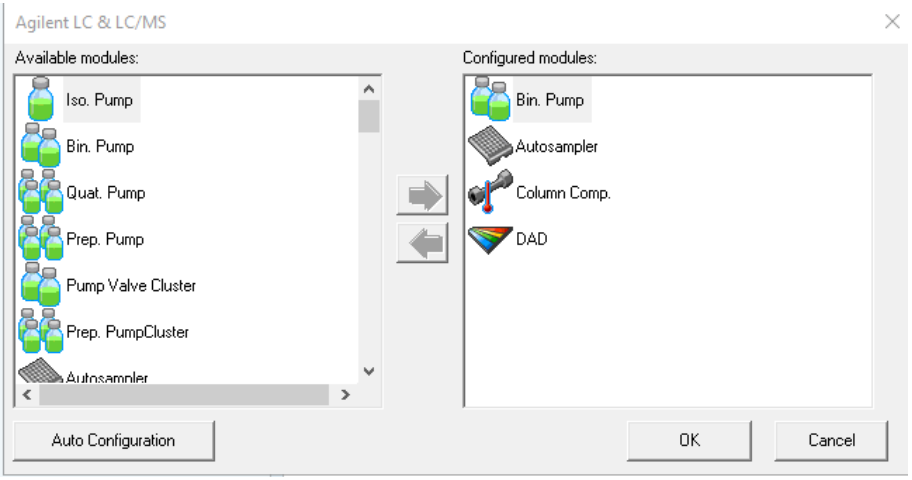
If your solvent is neither available in the user interface nor in the library, please use generic solvents. "Generic aqueous" gives good results for most solvent mixtures with at least 50 % water, which have similar properties as pure water. For other solvents with high organic percentage, "Generic organic" gives a good approximation.

How to Import the Latest Solvent Calibration Tables

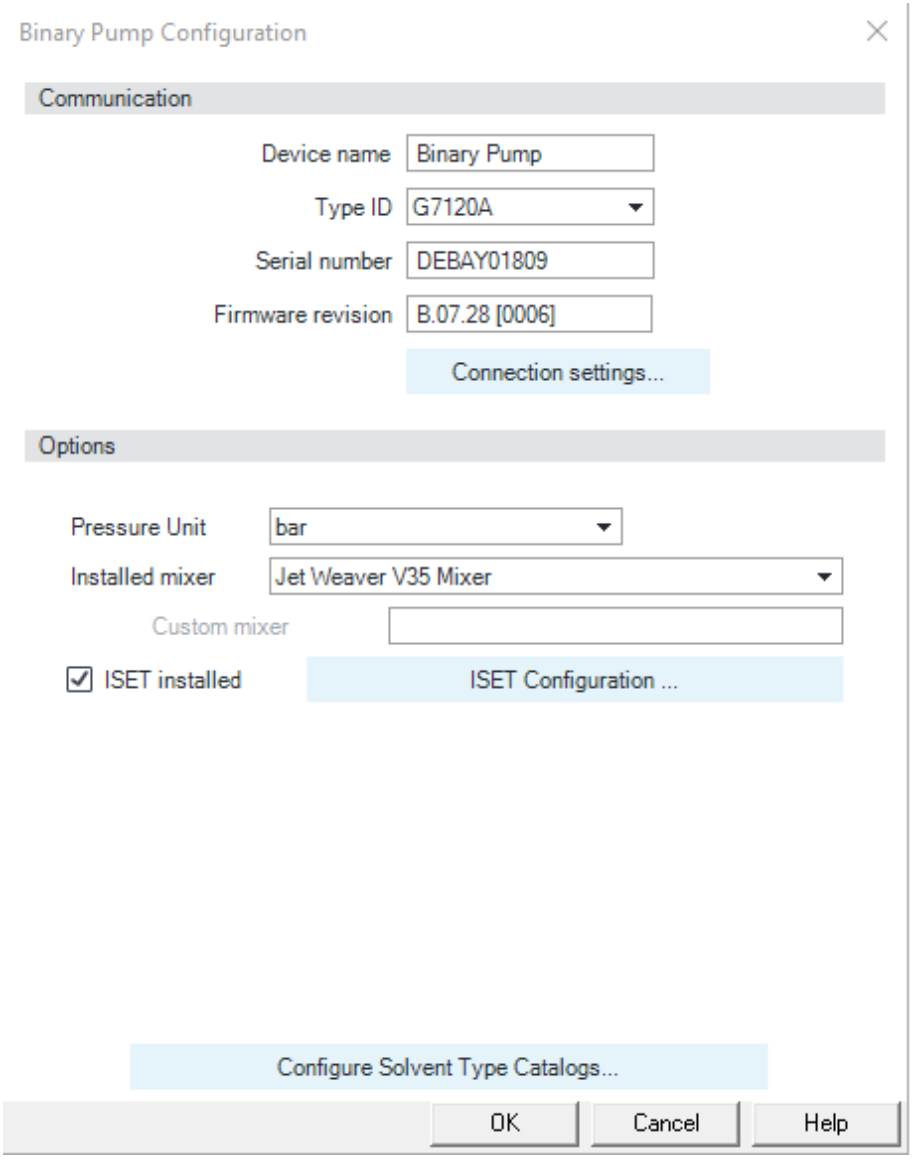
It might be necessary to import new Agilent Solvent Calibration tables that were not previously available with the system. This will then provide the most accurate algorithm in determining the compressibility of the mobile phase.

The procedure for importing the latest solvent calibration tables is as follows:

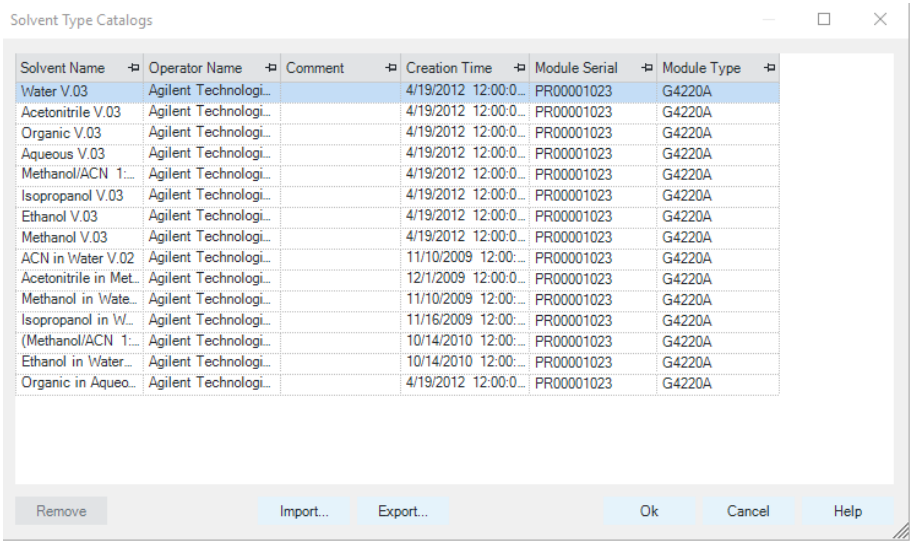
1 Enter the Instrument configuration of the Agilent LC Driver.



2 Click on the module that needs the latest solvent calibration table (ie G7120A). Then choose configure, launching the additional configuration of the pump module.

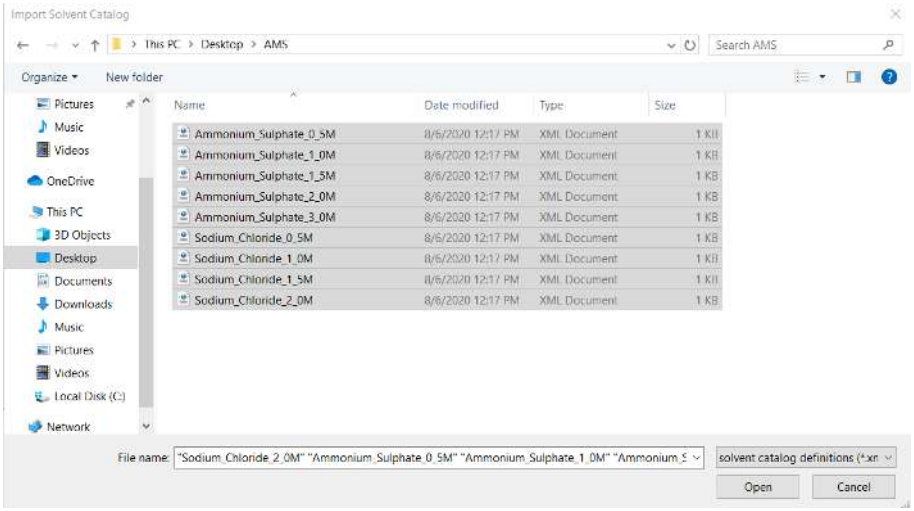


3 In the additional configuration of the pump module, choose Configure Solvent Type Catalogs...

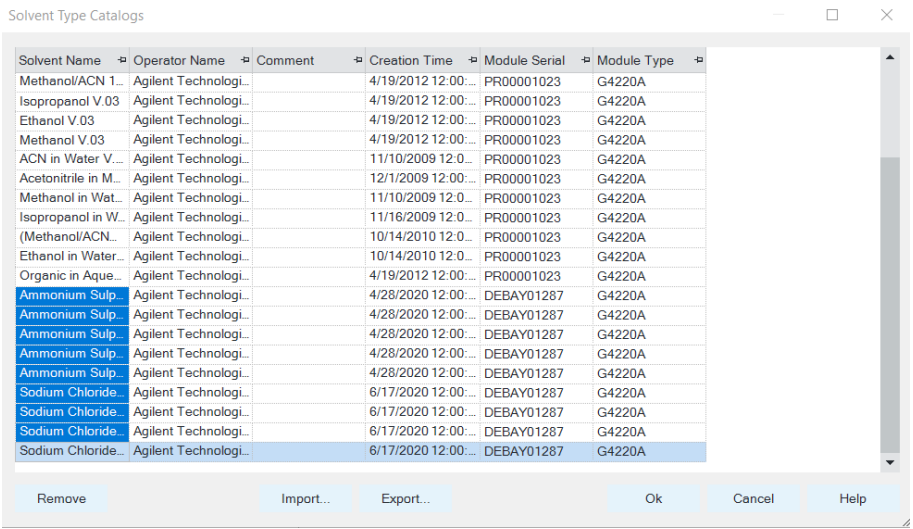


4 In the Solvent Type Catalogs, press the Import button.

5 Navigate to the location of the downloaded **Agilent Solvent Calibration Table** and click the **Open** button. Keep in mind multiple solvent calibration tables may be imported at the same time.



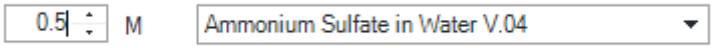
6 The imported solvent table will now appear in the **Solvent Type Catalogs**.



The imported solvent table is now available for selection in the Method Settings of the pump module.

Recommendations for Setting up Methods Using Salt-Containing Eluents

For LC Drivers 3.4 or newer, please use Ammonium Sulfate in Water V.04 and Sodium Chloride in Water V.04 and manually input the molarity (0.5 M - 3.0 M or 0.5 M - 2.0 M respectively) as shown in the example below.

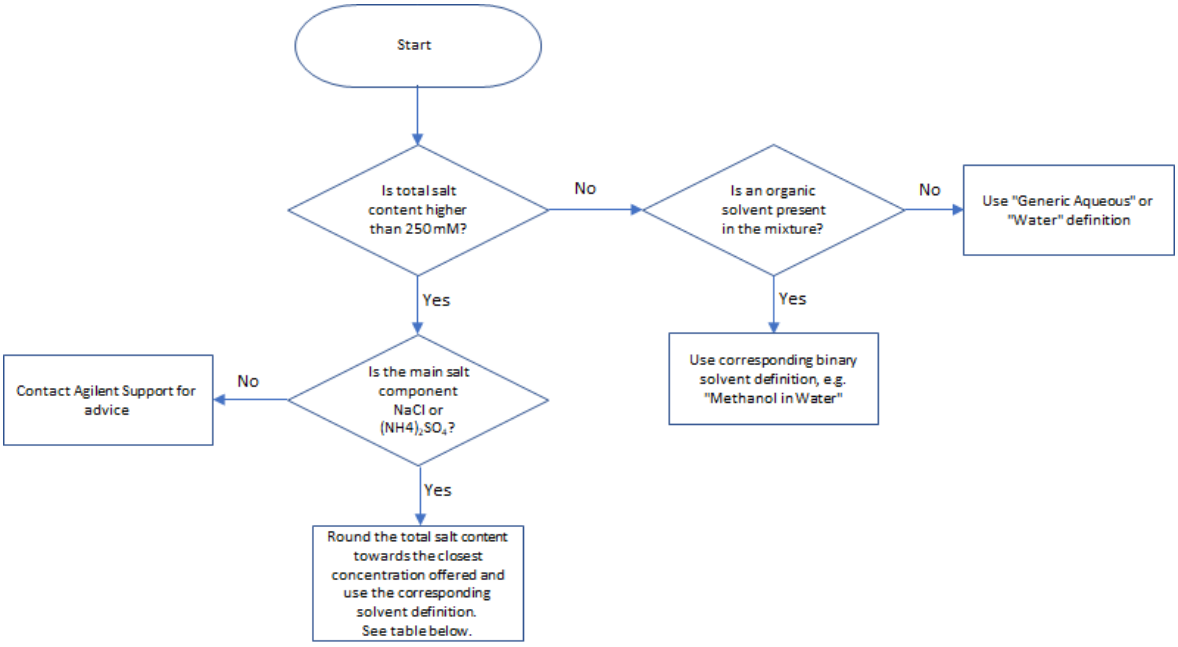


With the 1290 Infinity III Bio LC System, Agilent offers a dedicated instrument for running applications that are typical for the (Bio)pharma market, such as IEX (Ion Exchange Chromatography) or HIC (Hydrophobic Interaction Chromatography), and applications in Academia, Government and Applied Markets, using concentrated salt solutions as eluents.

For LC Drivers 3.3 or older, please choose the solvent definition most suitable for the application according to the chart below.

NOTE

Ammonium Sulphate V.03 and Sodium Chloride V.03 only properly characterize the G7132A High-Speed Pump. Do not use these with any quaternary/flexible pump configurations.



Main salt component	Total salt content (c, mol/L)	Select solvent definition
NaCl	0.25 < c ≤ 0.75	Sodium Chloride 0.5 M V.03
	0.75 < c ≤ 1.25	Sodium Chloride 1.0 M V.03
	1.25 < c ≤ 1.75	Sodium Chloride 1.5 M V.03
	c > 1.75	Sodium Chloride 2.0 M V.03
$(NH_4)_2SO_4$	0.25 < c ≤ 0.75	Ammonium Sulphate 0.5 M V.03
	0.75 < c ≤ 1.25	Ammonium Sulphate 1.0 M V.03
	1.25 < c ≤ 1.75	Ammonium Sulphate 1.5 M V.03
	1.75 < c ≤ 2.5	Ammonium Sulphate 2.0 M V.03
	c >2.5	Ammonium Sulphate 3.0 M V.03

6 Diagnostics and Troubleshooting

This chapter gives an overview of the maintenance, troubleshooting, and diagnostic features available.

User Interfaces for Available Tests and Tools 101
InfinityLab Assist 101
Agilent Lab Advisor Software 101
HPLC Advisor 102

Maintenance and Troubleshooting Tools of the Module 103
Pump Leak Rate Test 104
System Pressure Test 109
Diagnostic Signals 110

User Interfaces for Available Tests and Tools

InfinityLab Assist



InfinityLab Assist provides you with assisted troubleshooting and maintenance at your instrument.
If the system in use supports the InfinityLab Assist, follow the instructions provided. Else, the preferred solution is to use Agilent Lab Advisor Software. To find out, if you instrument is supported, check the InfinityLab Assist User Manual.

If using an InfinityLab Assist, navigate to **Health** > **Troubleshooting** to help solve baseline, peak shape, pressure, and retention related issues.

Agilent Lab Advisor Software

The Agilent Lab Advisor Software is a standalone product that can be used side by side with a chromatographic data system. Agilent Lab Advisor helps to manage the lab for high-quality chromatographic results by providing a detailed system overview of all connected analytical instruments with instrument status, Early Maintenance Feedback counters (EMF), instrument configuration information, and diagnostic tests. With the push of a button, a detailed diagnostic report can be generated. Upon request, the user can send this report to Agilent for a significantly improved troubleshooting and repair process.

The Agilent Lab Advisor software is available in two versions:

- Lab Advisor Basic
- Lab Advisor Advanced

Lab Advisor Basic is included with every Agilent 1200 Infinity Series and Agilent InfinityLab LC Series instrument.

The Lab Advisor Advanced features can be unlocked by purchasing a license key, and include real-time monitoring of instrument actuals, all various instrument signals, and state machines. In addition, all diagnostic test results, calibration results, and acquired signal data can be uploaded to a shared network folder. The Review Client included in Lab Advisor Advanced makes it possible to load and

examine the uploaded data no matter on which instrument it was generated. This makes Data Sharing an ideal tool for internal support groups and users who want to track the instrument history of their analytical systems.

The optional Agilent Maintenance Wizard Add-on provides an easy-to-use, step-by-step multimedia guide for performing preventive maintenance on Agilent 1200 Infinity LC Series instrument.

The tests and diagnostic features that are provided by the Agilent Lab Advisor software may differ from the descriptions in this manual. For details, refer to the Agilent Lab Advisor software help files.

HPLC Advisor



Avoid the time and frustration of searching for answers to your HPLC questions in many locations. Get the tools and information you need conveniently in the palm of your hand with HPLC Advisor. This one comprehensive app provides answers for any HPLC, regardless of brand and model.
HPLC Advisor also works offline. Get the HPLC Advisor app for iOS and Android.
More information under Agilent InfinityLab HPLC Advisor.

If using the HPLC Advisor App, check **Troubleshooting** to find information how to solve baseline, peak shape, pressure, retention related issues.

Maintenance and Troubleshooting Tools of the Module

All tests in the following section are described based on Agilent LabAdvisor Software B.02.06 or above. Other user interfaces may not provide any test or just a few.

- For an overview on available interfaces, see User Interfaces for Available Tests and Tools on page 101.
- For details on the use of the interface refer to the interface documentation.

Pump Leak Rate Test

The Pump Leak Rate Test is a diagnostic test to check the integrity and tightness of the pump components. The test is started from the Services & Diagnostics section in the Agilent Lab Advisor Software. The test is first evaluating the tightness from the outlet valve downstream to the purge valve. First, the pistons are positioned; afterwards, the purge valve is switched to the closed position. By moving the secondary piston into the pump chamber, the system is pressurized to 1000 bar (or 800 bar for G7104C/G7131C). The flow rate to keep the pressure stable is the corresponding leak rate.

The second part of the test is designed to verify the tightness along the piston. Any irregularity on the piston surface (for example, scratches or deposits) will be detected. During this test, all components from the inlet valve downstream to the blocked purge valve are tested.

Now the primary piston is moving to deliver and generate pressure, and the secondary piston is retracting. The pressure is kept constant at 800 bar. The process is repeated for the second pump head, if applicable.

The Pump Leak Rate Test can also be performed at various pressures comparable to the pressure used during analysis. The procedure above describes the test using High Pressure. Other pressures available for the Pump Leak Rate Test are: Mid Pressure (600 bar secondary leak rate test, 600 bar primary leak rate test (N/A for G7104C/G7131C)) and Low Pressure (200 bar secondary leak rate test, 200 bar primary leak rate test).

Preparations:

1. Flush the system with HPLC grade water for several minutes from any solvent channel.
2. Start the Pump Leak Rate Test from Lab Advisor.
3. Choose the channel with HPLC grade water and if you want to include or skip an additional purging step.
4. Click OK and follow the instructions.

   The test runs automatically without any further user interaction.

Evaluation:

The result as well as the applied limits are displayed after the automatic evaluation. The limits are:

- The allowed leak limit for the secondary piston is ≤ 3 µL/min
- The allowed leak limit for the primary piston is ≤ 30 µL/min

A report can be displayed, saved or printed by opening it with the **Print Result** button at the lower right of the screen.

If the test does not pass, check the system for leaks or call a local Agilent representative.

Figure 12 on page 105 and Figure 13 on page 106 show a typical test run.

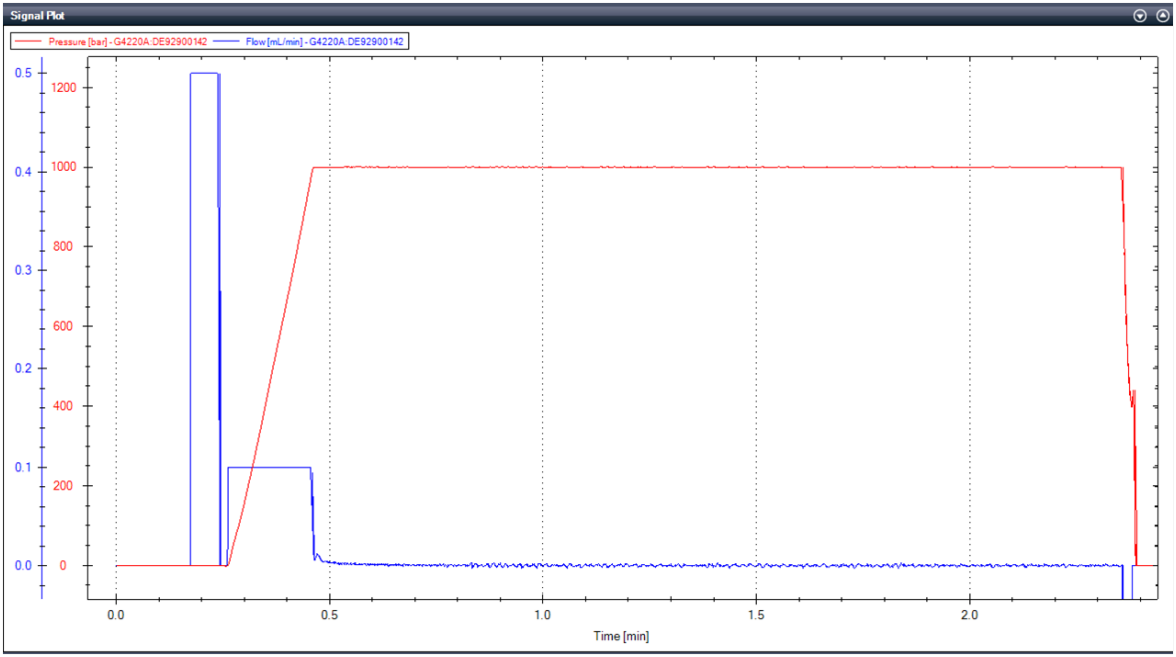


Figure 12: Static (secondary) Leak Test

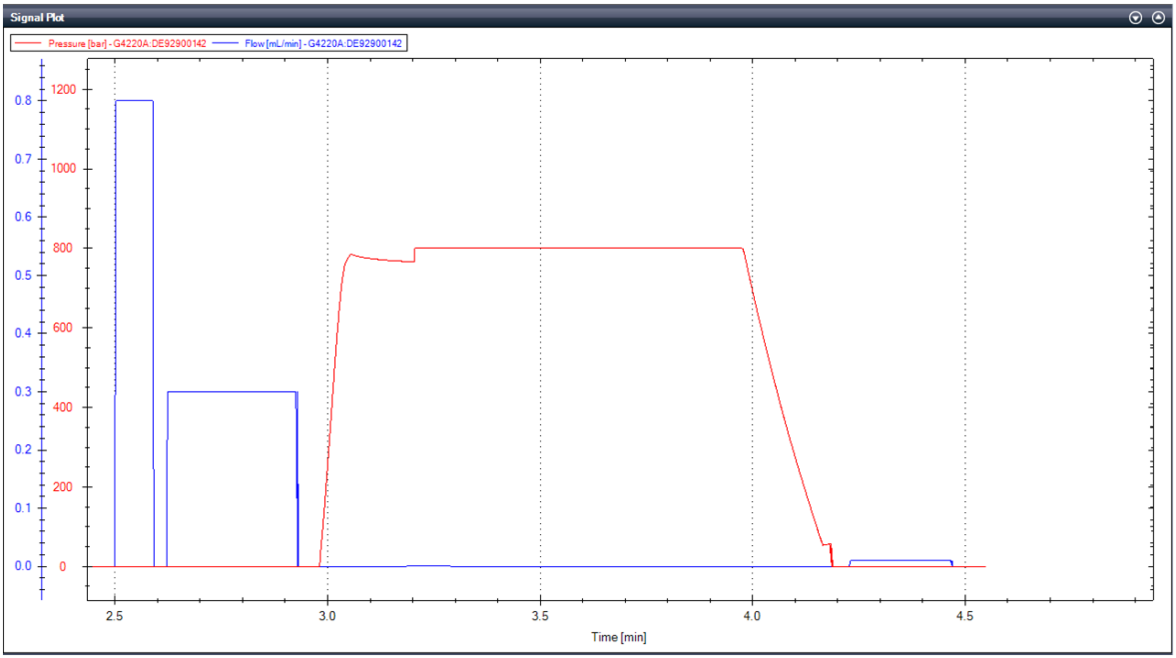


Figure 13: Dynamic (primary) Leak Test

Troubleshooting the Pump Leak Rate Test

Secondary Leak > 3 µL/min

If a secondary leak is found, the following reasons are possible:

Probable cause		Suggested actions
1	Leak between the OBV and automatic purge valve	• Check for visible leaks on fittings and connectors: • Connector not fixed/tight enough • Connector damaged • Leaky filter frit assembly • Remove the seal wash tubes from the support ring and check for leak into the seal wash path: • Main seal leaking/damaged • Piston damaged • Remove waste lines from the automatic purge valve: • Damage to rotor seal and/or stator head
2	Outlet valve not properly assembled	• Check if outlet valve is properly assembled: • Re-tighten the outlet valve • Check the position of the gold seal

Dynamic Leak > 30 µL/min or Dynamic Leak Rate Test fails

Probable cause		Suggested actions
1	ProbableCause Air in the primary pump chamber	• • Check for air in the solvent inlet lines and the Tuning signal: • Purge the lines, condition and if necessary prime the pump head
2	ProbableCause Abort due to over pressure	• • Check solvent and solvent settings • Purge and condition the pump head with water
3	ProbableCause Leak in inlet valve	• • Check for moving air bubbles in tubing directly to the inlet valve: • Purge the lines with water to remove dirt • Knock at the valve, clean it or replace it
4	ProbableCause Outlet valve not properly assembled	• • Retighten the outlet valve • Check the position of the gold seal
5	ProbableCause Leaky piston seals and/or position-dependent leaks on the piston	• • Remove the SW tubes from the support ring and check for leaks • • Replace the piston seals and clean the pistons: • Ensure that seals are lubricated when pushed in • Use abrasive mesh > 5000 grit

System Pressure Test

The System Pressure Test is performed to evaluate the leak tightness of the system up to the point where the system is capped off. The test is started from the Services & Diagnostics section in the Agilent Lab Advisor Software or in the Local Controller. Modules such as pump, sampler, column compartments as well as accessories like valves or columns can be included into the flow path for this test.

Preparations:

1. Flush the system with HPLC grade water for several minutes from any solvent channel.
2. Start the System Pressure Test and choose the pressure you want to test the system with. Consider pressure limits of modules or accessories included into the flow path.
3. Choose the channel with HPLC grade water and if you want to include or skip an additional purging step.
4. Click OK and follow the instructions: Place a blank nut into the port up to which you want to test the leak tightness of the system.

   The test runs automatically without any further user interaction.

Evaluation:

The result as well as the applied limits are displayed after the automatic evaluation. The limits are:

- For a pressure setting ≤ 1000 bar, the allowed leak limit is ≤ 5 µL/min
- For a pressure setting > 1000 bar, the allowed leak limit is ≤ 15 µL/min

A report can be displayed, saved or printed by opening it with the Print Result button at the lower right of the screen.

If the test does not pass, check the system for leaks or call a local Agilent representative.

Figure 14 on page 110 shows a typical test run.

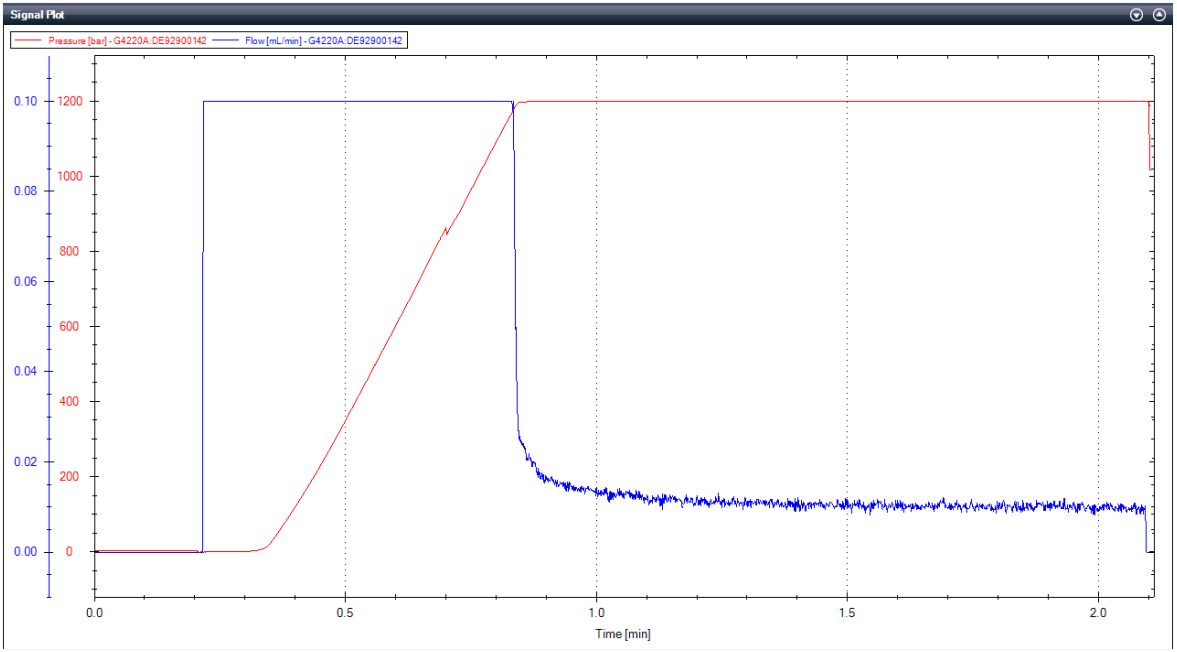


Figure 14: System Pressure Test

Diagnostic Signals

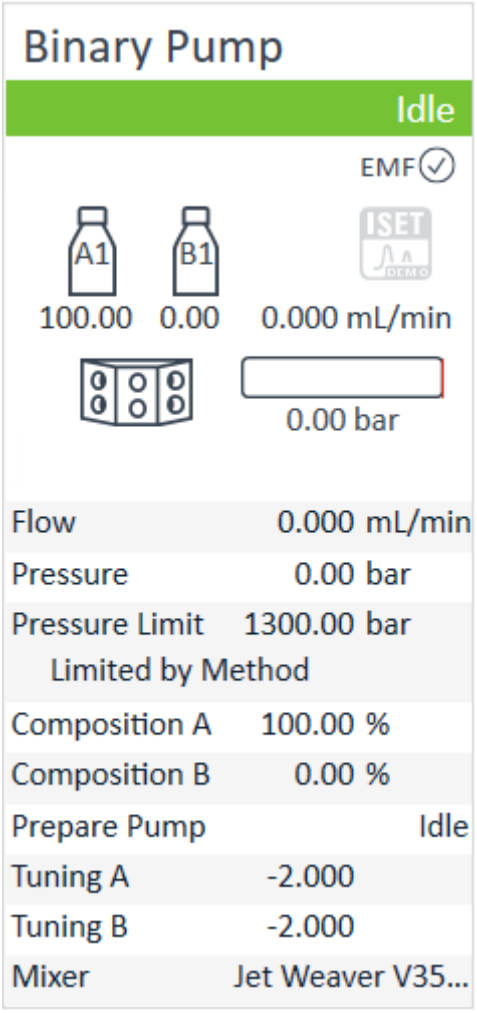
Tuning

For pumps operating as expected, the signal should stay in a range of –1 to +1 within the full scale of –2 to +2. Ideal performance is at 0.

Causes for changed behavior could be:

- Gas bubbles in primary chamber
- Suboptimal compressibility settings
- Major leaks in seals or fittings
- Problems with the valves
- Blockage of filters or capillaries

NOTE The tuning value does not change during the functions **Prime** or **Conditioning**.



Symptom	Possible Source	Possible Fix
Tuning signal is negative (about –2), pressure signal is unstable.	Air in primary pump chamber.	Use a syringe to fill the solvent lines with solvent and use the prime function from your CDS. Afterwards load an appropriate method and condition the system.
Tuning signal is negative (about –1.5), pressure signal is stable.	Micro air bubbles in the primary pump chamber.	Load an appropriate method and condition the system.
	Wrong solvent is set in the CDS or wrong solvent is connected.	Check solvents and solvent settings.
Tuning signal is negative after Priming and Conditioning.	Back flow in inlet valve.	Clean and check the valves, see maintenance section in the manual. Call Agilent service if the problem persists.
	Outlet valve not properly assembled.	Clean and check the valves, see maintenance section in the manual. Call Agilent service if the problem persists.
	Leaky piston seals and/or position-dependent leaks on the piston.	Change seals in the pump head. Call Agilent service if the problem persists.
Tuning signal is gradually decreasing over a time period.	Air is introduced into the primary pump chamber.	Check performance of the degasser.
	Filters are starting to block.	Change filters in the system.
Tuning signal is positive (about +1.5), pressure signal is stable.	Wrong solvent is set in the CDS or wrong solvent is connected.	Check solvents and solvent settings.

7 Error Information

This chapter describes the meaning of error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

What Are Error Messages 115

General Error Messages 116
Timeout 116
Shutdown 117
Remote Timeout 118
Lost CAN Partner 119
Leak 120
Leak Sensor Open 121
Leak Sensor Short 122
Compensation Sensor Open 123
Compensation Sensor Short 124
Fan Failed 125
Open Cover 126
Cover Violation 127

Module Error Messages 128
Pressure of Binary Pump Above Upper Limit 128
Pressure Below Lower Limit 129
Target Pressure Not Reached for Binary Pump Degasser 130
Degasser's Pressure Limit Violation 131
Solvent Counter Exceeded Limit 132
Waste Counter Limit Exceeded 133
Flow Rate Limit Exceeded 134
Binary Pump Shutdown During Analysis 135
Reading the Pump Encoder Tag Failed 136
Writing the Pump Encoder Tag Failed 137
Pump Drive Blocked or Encoder Failed 138
Drive Current Too Low 139

Drive Encoder Failed 140
Drive Current Too High 141
Drive Timeout 142
Overcurrent of Pump Drive 143
Overcurrent of Solvent Selection Valve (SSV) 144
Deliver Underrun 145
Defect Connection Between Main Board and Pump Drive Encoder 146
Pump Drive Encoder Defect 147
Purge Valve Failed 148
Reading of Purge Valve Tag Failed 149
Pump Drive Encoder Rollover 150
Drive Position Limit 151
Insufficient Power of Drive Encoder LED 152
Drive Encoder Error 153
Writing the Purge Valve Tag Failed 154
Current of Primary Pump Drive Too High 155
Current of Secondary Pump Drive Too High 156
Unknown Purge Valve Type 157
Pump Drive Encoder Error 158
Pump Drive Error 159
Pump Drive Stroke Blocked 160
Pump Drive Stop Not Found 161
Pressure Sensor Calibration Wrong or Missing 162
Seal Wash Pump Was Missing when Tried to Turn On 163
Invalid Degasser Pressure Signal 164

What Are Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs that requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the module is switched on, and an entry is written into the module logbook.

If an error occurs outside a method run, other modules will not be informed about this error. If it occurs within a method run, all connected modules will get a notification, all LEDs get red and the run will be stopped. Depending on the module type, this stop is implemented differently. For example, for a pump, the flow will be stopped for safety reasons. For a detector, the lamp will stay on in order to avoid equilibration time. Depending on the error type, the next run can only be started if the error has been resolved, for example liquid from a leak has been dried. Errors for presumably single time events can be recovered by switching on the system in the user interface.

Special handling is done in case of a leak. As a leak is a potential safety issue and may have occurred at a different module from where it has been observed, a leak always causes a shutdown of all modules, even outside a method run.

In all cases, error propagation is done via the CAN bus or via an APG/ERI remote cable (see documentation for the APG/ERI interface).

If using the InfinityLab Assist, instrument errors will generate a notification. To view the probable causes and recommended actions for this error, click on Help button displayed on the notification.

General Error Messages

General error messages are generic to all Agilent series HPLC modules and may show up on other modules as well.

Timeout

Error ID: 62

The timeout threshold was exceeded.

Probable cause		Suggested actions
1	The analysis was completed successfully The analysis was completed successfully, and the timeout function switched off the module as requested.	• • Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
2	A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	• • Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

Error ID: 63

An external instrument has generated a shutdown signal on the remote line.

The module continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable cause		Suggested actions
1	Leak detected in another module with a CAN connection to the system.	• • Fix the leak in the external instrument before restarting the module.
2	Leak detected in an external instrument with a remote connection to the system.	• • Fix the leak in the external instrument before restarting the module.
3	Shut-down in an external instrument with a remote connection to the system.	• • Check external instruments for a shut-down condition.
4	The degasser failed to generate sufficient vacuum for solvent degassing.	• Check the external vacuum degasser module (if installed) for an error condition. Refer to the Service Manual for the degasser or the pump that has the degasser built-in.

Remote Timeout

Error ID: 70

A not-ready condition is still present on the remote input. When an analysis is started, the system expects all not-ready conditions (for example, a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable cause		Suggested actions
1	Not-ready condition in one of the instruments connected to the remote line.	• Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2	Defective remote cable.	• Exchange the remote cable.
3	Defective components in the instrument showing the not-ready condition.	• Check the instrument for defects (refer to the instrument's documentation).

Lost CAN Partner

Error ID: 71

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed.

The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable cause		Suggested actions
1	CAN cable disconnected.	• Ensure all the CAN cables are connected correctly. • Ensure all CAN cables are installed correctly.
2	Defective CAN cable.	• Exchange the CAN cable.
3	Defective main board in another module. Defective mainboard in another module.	• Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak

Error ID: 64

A leak was detected in the module.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak sensor circuit on the mainboard.

Probable cause		Suggested actions
1	Loose fittings.	• • Ensure all fittings are tight.
2	Broken capillary.	• Exchange defective capillaries.
3	Loose or leaking purge valve Loose or leaking purge valve, inlet valve, or outlet valve.	• • Ensure pump components are seated correctly. If there are still signs of a leak, exchange the appropriate seal (purge valve, inlet valve, outlet valve).
4	Defective pump seals.	• • Exchange the pump seals.

Leak Sensor Open

Error ID: 83

The leak sensor in the module has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

Probable cause		Suggested actions
1	Leak sensor not connected to the on/off switch board Leak sensor not connected to the on/off switch board.	• Please contact your Agilent service representative.
2	Defective leak sensor Defective leak sensor.	• Please contact your Agilent service representative.
3	Leak sensor incorrectly routed Leak sensor incorrectly routed, being pinched by a metal component.	• Please contact your Agilent service representative.
4	On/Off switch assembly defective On/Off switch assembly defective.	• Please contact your Agilent service representative.

Leak Sensor Short

Error ID: 82

The leak sensor in the module has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable cause		Suggested actions
1	Defective leak sensor Defective leak sensor.	• Please contact your Agilent service representative.
2	Leak sensor incorrectly routed Leak sensor incorrectly routed, being pinched by a metal component.	• Please contact your Agilent service representative.
3	On/Off switch assembly defective On/Off switch assembly defective.	• Please contact your Agilent service representative.
4	ProbableCause Cable or contact problem.	• Please contact your Agilent service representative.

Compensation Sensor Open

Error ID: 81

The ambient-compensation sensor (NTC) on the on/off switch board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the on/off switch board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable cause		Suggested actions
1	Ribbon cable disconnected Loose connection between the on/off switch board and the mainboard.	• Please contact your Agilent service representative.
2	Defective on/off switch assembly Defective on/off switch assembly.	• Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 80

The ambient-compensation sensor (NTC) on the on/off switch board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the on/off switch board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable cause		Suggested actions
1	Ribbon cable disconnected Loose connection between the on/off switch board and the mainboard.	• Please contact your Agilent service representative.
2	Defective on/off switch assembly Defective on/off switch assembly.	• Please contact your Agilent service representative.

Fan Failed

Error ID: 68

The cooling fan in the module has failed.

The hall sensor on the fan shaft is used by the mainboard to monitor the fan speed. If the fan speed falls below a certain limit for a certain length of time, the error message is generated.

This limit is given by 2 revolutions/second for longer than 5 seconds.

Depending on the module, assemblies (e.g. the lamp in the detector) are turned off to assure that the module does not overheat inside.

Probable cause		Suggested actions
1	Fan cable disconnected.	• Please contact your Agilent service representative.
2	Defective fan.	• Please contact your Agilent service representative.
3	Defective main board Defective mainboard.	• Please contact your Agilent service representative.

Open Cover

Error ID: 205

The top foam has been removed.

The sensor on the main board detects when the top foam is in place. If the foam is removed, the fan is switched off, and the error message is generated.

Probable cause		Suggested actions
1	The top foam was removed during operation.	• Please contact your Agilent service representative.
2	Foam not activating the sensor.	• Please contact your Agilent service representative.
3	Dirty or defective sensor. Defective sensor or main board.	• Please contact your Agilent service representative.
4	Rear of the module is exposed to strong direct sunlight.	• • Ensure that the rear of module is not directly exposed to strong sunlight.

Cover Violation

Error ID: 7461

The top foam has been removed.

The sensor on the main board detects when the top foam is in place. If the foam is removed while the lamps are on (or if an attempt is made to switch on for example the lamps with the foam removed), the lamps are switched off, and the error message is generated.

Probable cause		Suggested actions
1	The top foam was removed during operation.	• Please contact your Agilent service representative.
2	Foam not activating the sensor.	• Please contact your Agilent service representative.

Module Error Messages

These errors are pump specific.

Pressure of Binary Pump Above Upper Limit

Error ID: 22014

The pressure has exceeded the upper pressure limit.

- Parameter: Measured pressure

Probable cause		Suggested actions
1	Blockage in flow path after the pressure sensor Blockage in flow path after the pressure sensor.	• Check for blockages in the LC system, e.g. purge valve, Jet Weaver, degraded column, column frits, needle, needle seat, capillaries etc. • Check for particles in the solvent.
2	Inappropriate settings (pressure limit, flow rate).	• Decrease flow rate. • Increase pressure limit.

Pressure Below Lower Limit

Error ID: 22015

The pressure has dropped below the lower limit.

- Parameter: None

Probable cause		Suggested actions
1	Leak	• Check for leaks.
2	Bottle empty	• Check bottle filling. • Fill solvent bottle.
3	Wrong solvent (viscosity)	• • Check solvent.
4	Inappropriate setting	• Check flow rate and lower pressure limit.
5	Column degradation	• Replace column.

Target Pressure Not Reached for Binary Pump Degasser

Error ID: 22031

The target pressure of the binary pump degasser has not been reached within the expected time.

- Parameter: Pressure in mbar

Probable cause		Suggested actions
1	Condensation in degasser chamber due to temperature fluctuation Condensation in degasser chamber due to temperature fluctuation.	• • Equilibrate and restart module. Use Evacuation Mode if necessary.
2	Degasser is defect Degasser is defect.	• Please contact your Agilent service representative.

Degasser's Pressure Limit Violation

Error ID: 22032

Pressure too far above the limit.

Probable cause		Suggested actions
1	ProbableCause Leak in degasser chamber or degasser tubing.	• Please contact your Agilent service representative.
2	Defect vacuum pump Defect vacuum pump.	• Please contact your Agilent service representative.
3	Degasser chamber empty or connected to air Degasser chamber empty or connected to air.	• Block unused degasser channels.

Solvent Counter Exceeded Limit

Error ID: 22055

The counter for the solvent volume has exceeded the limit, which has been set in the user interface.

Parameter:

- Without Solvent Selection Valve:

  0 for channel A, 1 for channel B
- With Solvent Selection Valve:

  2 for channel A1, 3 for channel B1, 4 for channel A2, 5 for channel B2

Probable cause		Suggested actions
1	No solvent present No solvent present.	• Refill solvent bottle.
2	Inappropriate setting Inappropriate setting.	• Check solvent counter setting in user interface.

Waste Counter Limit Exceeded

Error ID: 22056

The counter for the waste volume has exceeded the limit, which has been set in the user interface.

- Parameter: None

Probable cause		Suggested actions
1	The waste container is full The waste container is full.	• Empty waste container.
2	Inappropriate setting for waste counter Inappropriate setting for waste counter.	• Reset waste counter. • Adjust waste counter limit.

Flow Rate Limit Exceeded

Error ID: 22064

The flow rate of the binary pump has exceeded the limit, while the pump runs in pressure controlled mode, e.g. during a pressure test.

- Parameter: None

Probable cause		Suggested actions
1	Leak	• Check for leaks in the pump and flow path.
2	Bottle empty	• Check bottle filling. • Fill solvent bottle.
3	Shutoff valve closed Shutoff valve closed.	• Open shutoff valve.
4	Drift of pressure sensor (unlikely for short tests taking some minutes) Drift of pressure sensor (unlikely for short tests taking only minutes).	• Replace pressure sensor.

Binary Pump Shutdown During Analysis

Error ID: 22065

The binary pump has been shut down by the control software or control module during an analysis.

- Parameter: 0 for off, 1 for standby.

Probable cause		Suggested actions
1	Pump has been shut down Pump has been shut down.	• Restart pump.

Reading the Pump Encoder Tag Failed

Error ID: 22402

Reading the pump encoder tag has failed.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Defect connection between encoder and main board Defect connection between encoder and main board.	• Please contact your Agilent service representative.
2	Missing or defect tag Defect connection between tag and encoder Missing or defect tag Defect connection between tag and encoder.	• Please contact your Agilent service representative.

Writing the Pump Encoder Tag Failed

Error ID: 22405

Writing the pump encoder tag has failed.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Defect connection between encoder and main board Defect connection between encoder and main board.	• Please contact your Agilent service representative.
2	Defect tag Defect tag.	• Please contact your Agilent service representative.

Pump Drive Blocked or Encoder Failed

Error ID: 22406

Pump drive blocked or encoder failed.

- Parameter: None

Probable cause		Suggested actions
1	Blockage of system before pressure sensor Blockage of system before pressure sensor.	• Check for blockage of e.g. outlet valve filter frit, purge valve, heat exchanger.
2	Drive encoder failed Drive encoder failed.	• Please contact your Agilent service representative.

Drive Current Too Low

Error ID: 22407

The current consumption of the pump drive is too low.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Drive motor defect Drive motor defect.	• Please contact your Agilent service representative.
2	Wrong/missing connection of pump drive to main board Wrong/missing connection of pump drive to main board.	• Please contact your Agilent service representative.

Drive Encoder Failed

Error ID: 22408

Drive encoder failed during pump drive calibration.

Probable cause		Suggested actions
1	Internal error Internal error.	• Please contact your Agilent service representative.

Drive Current Too High

Error ID: 22409

The current consumption of the pump drive is too high.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Blockage of system before pressure sensor Blockage of system before pressure sensor.	• Check for blockage of e.g. outlet valve filter frit, purge valve, heat exchanger.
2	Drive motor defect Drive motor defect.	• Please contact your Agilent service representative.

Drive Timeout

Error ID: 22410

Drive is blocked mechanically, fails during initialization.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Blockage of system before pressure sensor Blockage of system before pressure sensor.	• Check for blockage of e.g. outlet valve filter frit, purge valve, heat exchanger.
2	Drive encoder failed Drive encoder failed.	• Please contact your Agilent service representative.

Overcurrent of Pump Drive

Error ID: 22411

The current consumption of the pump drive is too high.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Blockage of system before pressure sensor Blockage of system before pressure sensor.	• Check for blockage of e.g. outlet valve filter frit, purge valve, heat exchanger.
2	Drive motor defect Drive motor defect.	• Please contact your Agilent service representative.

Overcurrent of Solvent Selection Valve (SSV)

Error ID: 22412

Overcurrent of solvent selection valve (SSV).

- Parameter: None

Probable cause		Suggested actions
1	Valve defect Valve defect.	• Replace the solvent selection valve.

Deliver Underrun

Error ID: 22413

Internal error.

- Parameter: None

Probable cause		Suggested actions
1	Internal error Internal error.	• Please contact your Agilent service representative.

Defect Connection Between Main Board and Pump Drive Encoder

Error ID: 22414

Defect connection between main board and pump drive encoder.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Defect connection between main board and pump drive encoder Defect connection between main board and pump drive encoder.	• Please contact your Agilent service representative.
2	Defect encoder Defect encoder.	• Please contact your Agilent service representative.

Pump Drive Encoder Defect

Error ID: 22415

Defect pump drive encoder.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Defect encoder Defect encoder.	• Please contact your Agilent service representative.

Purge Valve Failed

Error ID: 22417

Lost steps of the purge valve encoder.

- Parameter: None

Probable cause		Suggested actions
1	Purge valve drive mechanically blocked or defect Purge valve drive mechanically blocked or defect.	• • Check installation of purge valve head. • Please contact your Agilent service representative.

Reading of Purge Valve Tag Failed

Error ID: 22420

Reading the purge valve tag failed.

- Parameter: None

Probable cause		Suggested actions
1	Reading of purge valve tag failed Reading of purge valve tag failed.	• Check cable connection.
2	Purge valve head tag defect or empty Purge valve head tag defect or empty.	• Replace purge valve head.
3	Purge valve tag reader is defect Purge valve tag reader is defect.	• Please contact your Agilent service representative.

Pump Drive Encoder Rollover

Error ID: 22424

Invalid pump drive encoder signals have been detected.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Pump drive encoder is defect Pump drive encoder is defect.	• Please contact your Agilent service representative.

Drive Position Limit

Error ID: 22425

Internal error.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Internal error Internal error.	• Please contact your Agilent service representative.

Insufficient Power of Drive Encoder LED

Error ID: 22426

Insufficient power of drive encoder LED.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Pump drive encoder is defect Pump drive encoder is defect.	• Please contact your Agilent service representative.

Drive Encoder Error

Error ID: 22427, 22428, 22429, 22430

An error has occurred for the pump drive encoder.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Pump drive encoder is defect Pump drive encoder is defect.	• Please contact your Agilent service representative.

Writing the Purge Valve Tag Failed

Error ID: 22431

Writing the purge valve tag failed.

- Parameter: None

Probable cause		Suggested actions
1	Purge valve head tag defect Purge valve head tag defect.	• Replace purge valve head.
2	Purge valve tag reader is defect Purge valve tag reader is defect.	• Please contact your Agilent service representative.

Current of Primary Pump Drive Too High

Error ID: 22433

The current of the primary pump drive is too high.

- Parameter: 1 or 4 referring to pump drive.

Probable cause		Suggested actions
1	Blockage of flow path between primary pump head and pressure sensor Blockage of flow path between primary pump head and pressure sensor, e.g. of the heat exchanger.	• Check for blockages in the flow path. • Please contact your Agilent service representative.
2	Primary pump drive is defect Primary pump drive is defect.	• Please contact your Agilent service representative.

Current of Secondary Pump Drive Too High

Error ID: 22434

The current of the secondary pump drive is too high.

- Parameter: 2 or 3 referring to pump drive

Probable cause		Suggested actions
1	Blockage of flow path between secondary pump head and pressure sensor Blockage of flow path between secondary pump head and pressure sensor, e.g. of the heat exchanger.	• Check for blockages in the flow path. • Please contact your Agilent service representative.
2	Secondary pump drive is defect Secondary pump drive is defect.	• Please contact your Agilent service representative.

Unknown Purge Valve Type

Error ID: 22435

The type information of the purge valve is invalid.

- Parameter: None

Probable cause		Suggested actions
1	Wrong valve head installed Wrong valve head installed.	• Check or replace purge valve head.
2	Valve head has invalid RFID tag content Valve head has invalid RFID tag content.	• Check or replace purge valve head.

Pump Drive Encoder Error

Error ID: 22437

The pump drive encoder has generated no signal.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Pump drive encoder is defect Pump drive encoder is defect.	• Please contact your Agilent service representative.

Pump Drive Error

Error ID: 22438, 22439

The pump drive failed during calibration.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Pump drive motor defect or mechanically blocked Pump drive motor defect or mechanically blocked.	• Please contact your Agilent service representative.

Pump Drive Stroke Blocked

Error ID: 22441

During initialization the pump defines the operation position of the pump drives and therefore the pistons. First the pump drive moves backwards to find a mechanical stop within the ball screw. Afterwards, pistons move forwards for finding the maximum available stroke volume. These values are expected within a pre-defined range. "Maximum stroke too short" means that the outer drive position is too close. This can be caused by a drive initialization without pump head or if the pump head has not been installed properly (screws are loose).

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Wiper shifted	• Please contact your Agilent service representative.
2	Pump head blocks piston movement	• Replace, clean or repair pump head.
3	Pump drive motor is mechanically blocked Pump drive motor is mechanically blocked.	• Please contact your Agilent service representative.

Pump Drive Stop Not Found

Error ID: 22442

The maximum stroke is too long.

- Parameter: 1 – 4 referring to pump drive

Probable cause		Suggested actions
1	Wiper shifted	• Please contact your Agilent service representative.
2	Pump drive spindle is defect Pump drive spindle is defect.	• Please contact your Agilent service representative.

Pressure Sensor Calibration Wrong or Missing

Error ID: 22443

Pressure sensor calibration wrong or missing.

- Parameter: None

Probable cause		Suggested actions
1	Pressure sensor calibration wrong or missing Pressure sensor calibration wrong or missing.	• Replace pressure sensor. • Calibrate pressure sensor. • Please contact your Agilent service representative.

Seal Wash Pump Was Missing when Tried to Turn On

Error ID: 22449

The seal wash pump has not been detected (while being configured or detected before)

Probable cause		Suggested actions
1	Defect cable connection to seal wash pump Defect cable connection to seal wash pump.	• Check cable connection.
2	Defect seal wash pump motor Defect seal wash pump motor.	• Please contact your Agilent service representative.
3	Defective main board Defective mainboard.	• Please contact your Agilent service representative.

Invalid Degasser Pressure Signal

Error ID: 29253

The degasser pressure signal is invalid.

Probable cause		Suggested actions
1	Degasser might be disconnected	• Please contact your Agilent service representative.
2	Pressure sensor might be defective	• Please contact your Agilent service representative.

8 Maintenance

This chapter provides general information on maintenance of the module.

Introduction to Maintenance 167

Safety Information Related to Maintenance 170

Overview of Maintenance 172

Cleaning the Module 173

Installing Fittings and Capillaries 174

Remove and Install Doors 175

Replace the Shutoff Valve Panel 178

Replace the Pressure Sensor 180

Replace the Solvent Selection Valve (SSV) 183

Change Configuration or Replace the Jet Weaver 186

Replace the Seal Wash Pump 189

Replace the Inlet Valve (G7120A) 191

Replace the Inlet Valve (G7132A) 193

Release a Stuck Inlet Valve 195

Remove the Pump Head Assembly (G7120A) 198

Remove the Pump Head Assembly (G7132A) 203

Pump Head Maintenance (Tool Free) 208
Disassemble Long Life Pump Heads (G7120A) 209
Disassemble Long Life Pump Heads (G7132A) 215
Replace the Heat Exchanger (G7120A) 221
Replace the Heat Exchanger (G7132A) 224
Assemble Long Life Pump Heads (G7120A) 227

Assemble Long Life Pump Heads (G7132A) 235

Install the Pump Head Assembly (G7120A) 244

Install the Pump Head Assembly (G7132A) 247

Replace the Outlet Valve (G7120A) 250

Replace the Outlet Valve (G7132A) 254

Replace the Purge Valve Head 257

Replace Parts of the Purge Valve Head 260

Replace Parts of the High-Pressure Filter Assembly (G7120A) 262

Replace Parts of the High-Pressure Filter Assembly (G7132A) 265

Replace the Seal Wash Sensor 268

Replace the Module Firmware 271

Prepare the Pump Module for Transport 272

Introduction to Maintenance

Figure 15 on page 167 and Figure 16 on page 168 show the main user accessible assemblies of the Agilent 1290 Infinity III High-Speed Pump (G7120A) and Agilent 1290 Infinity III Bio High-Speed Pump (G7132A). These parts can be accessed from the front (simple repairs) and don't require to remove the pump from the system stack.

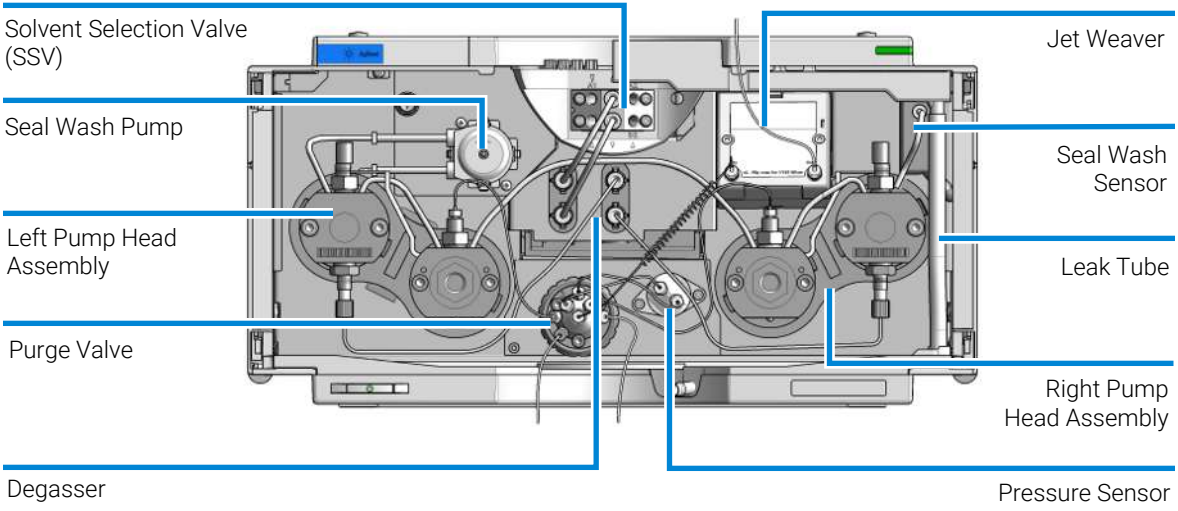


Figure 15: Main user accessible assemblies (G7120A)

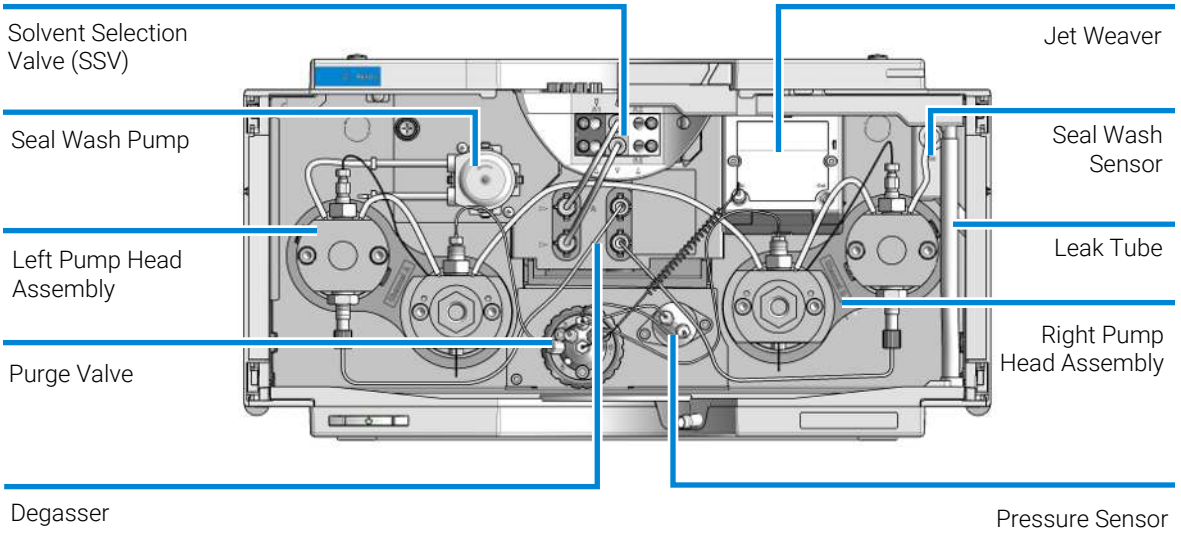


Figure 16: Main user accessible assemblies (G7132A)

Figure 17 on page 169 shows the flow connections between these main assemblies.

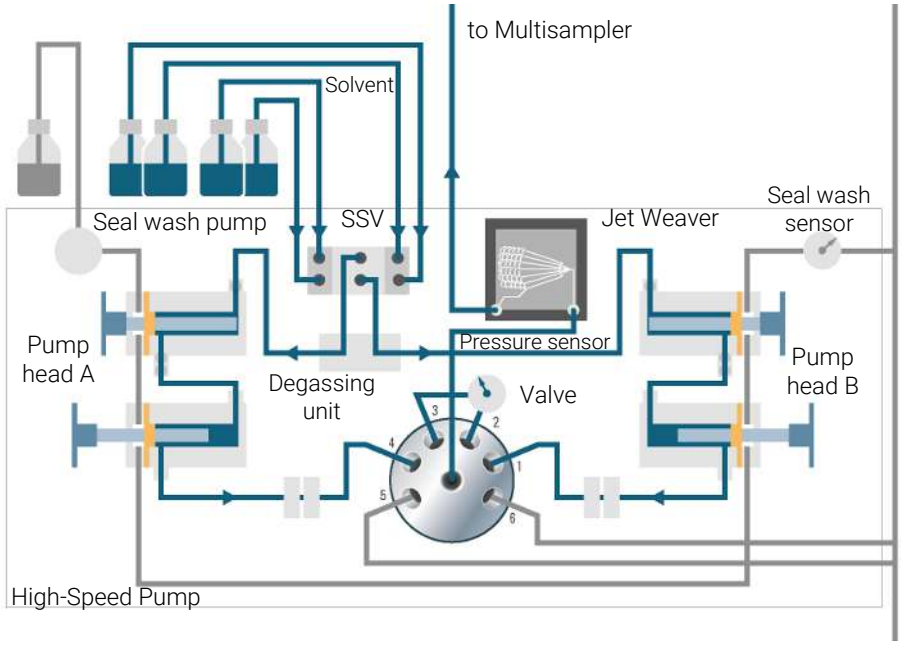


Figure 17: The hydraulic path

Recommended Interval for Preventive Maintenance

The recommended interval for preventive maintenance is:

- 100 L (150 L for Long Life Technology) or 1 year (whichever comes first).

This recommendation is valid for LC instruments on which “typical” applications are running.

A “typical” application can be characterized as follows:

- pressure range 100 – 800 bar,
- flow rates 0.5 – 3.5 mL/min,
- typical solvents used in reversed phase LC.

Safety Information Related to Maintenance

WARNING Fire and damage to the module

Wrong fuses

- Make sure that only fuses with the required rated current and of the specified type (super-fast, fast, time delay etc) are used for replacement.
- The use of repaired fuses and the short-circuiting of fuse-holders must be avoided.

WARNING Heavy weight

The module is heavy.

- Carry the module at least with 2 people.
- Avoid back strain or injury by following all precautions for lifting heavy objects.
- Ensure that the load is as close to your body as possible.
- Ensure that you can cope with the weight of your load.

WARNING Personal injury or damage to the product

Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

- Use your Agilent products only in the manner described in the Agilent product user guides.

WARNING Electrical shock

Repair work at the module can lead to personal injuries, e.g. shock hazard, when the cover is opened.

- Do not remove the cover of the module.
- Only certified persons are authorized to carry out repairs inside the module.

WARNING Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

— To prevent personal injury, be careful when getting in contact with sharp metal areas.

WARNING Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

— When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.

— The volume of substances should be reduced to the minimum required for the analysis.

— Do not operate the instrument in an explosive atmosphere.

CAUTION Safety standards for external equipment

— If you connect external equipment to the instrument, make sure that you only use accessory units tested and approved according to the safety standards appropriate for the type of external equipment.

Overview of Maintenance

It is necessary to perform periodic inspection of the instrument to ensure its safe use. It is possible to have these periodic inspections performed by Agilent service representatives on a contractual basis. For information regarding the maintenance inspection contract, contact your Agilent representative.

The following pages describe maintenance (simple repairs) of the module that can be carried out without opening the main cover.

Cleaning the Module

To keep the module case clean, use a soft cloth slightly dampened with water, or a solution of water and mild detergent. Avoid using organic solvents for cleaning purposes. They can cause damage to plastic parts.

WARNING **Liquid dripping into the electronic compartment of your module can cause shock hazard and damage the module**

- **Do not use an excessively damp cloth during cleaning.**
- **Drain all solvent lines before opening any connections in the flow path.**

NOTE A solution of 70 % isopropanol and 30 % water might be used if the surface of the module needs to be disinfected.

Installing Fittings and Capillaries

WARNING **Solvent can spray under high pressure.**

— **Observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing), when opening flow path.**

CAUTION Deformation of fittings and seals

Liquid drops under high pressure act like solid parts. Tightening connections under high pressure can deform or destroy fittings and seals.

— Never tighten flow connections under pressure.

NOTE The lifetime of a fitting depends on how firmly it has been tightened; firm tightening reduces the lifetime.
If fitting has been overtightened, replace it.

1 Install fittings and capillaries.

2 Tighten fittings and capillaries.

Remove and Install Doors

When

- The instrument doors or the hinges are broken.

Tools required

Qty.	p/n	Description
1	5023-3138	Reversible Screwdriver + Blade 1,0 x 5,5

Parts required (Infinity III)

Qty.	p/n	Description
1	5004-3200	Door Kit Infinity III 200mm

Parts required (Infinity II)

Qty.	p/n	Description
1	5004-0200	Door Kit Infinity II 200mm

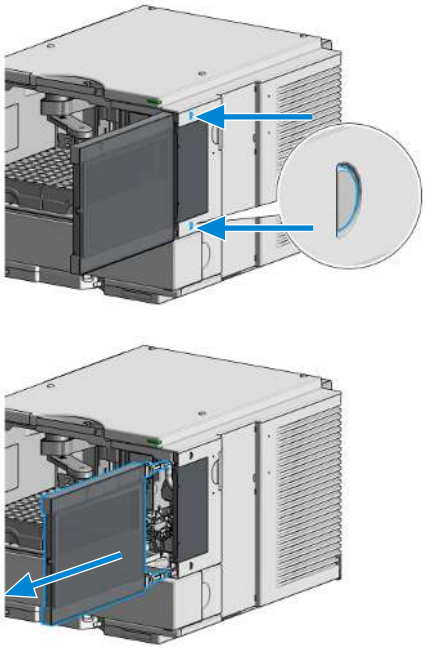
Prerequisites

- Finish any pending acquisition job.

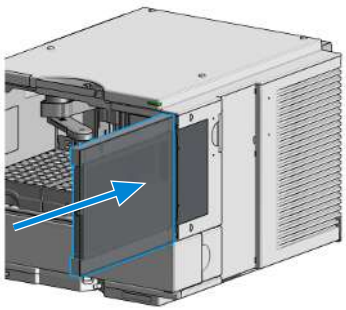
NOTE

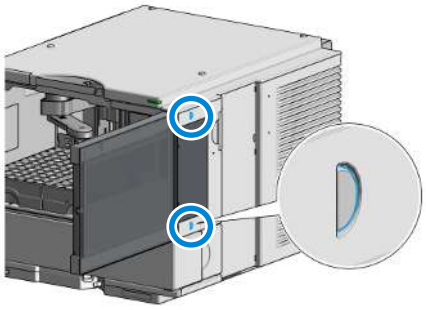
The figures shown in this procedure exemplarily show the Infinity III Vialsampler module. The principle of how to remove and/or install doors works in the same way for all Infinity III modules.

1 Press the release buttons and pull the front door out.



2 For the Installation of the front door, insert the hinges into their guides and push the door in until the release buttons click into their final position.





Replace the Shutoff Valve Panel

When

- If a shutoff valve is damaged or the panel needs to be removed for other repair procedures.

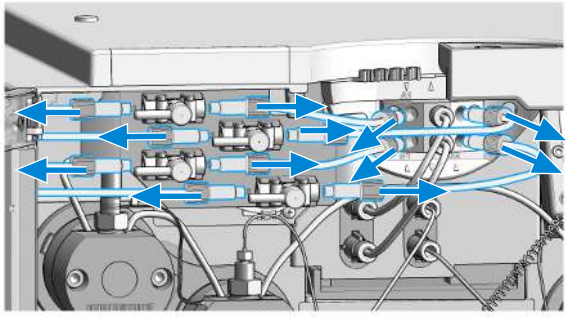
Parts required

Qty.	p/n	Description
4	5067-4124	Shutoff valve
1	G7120-40004	Valve Holder Left
1	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit

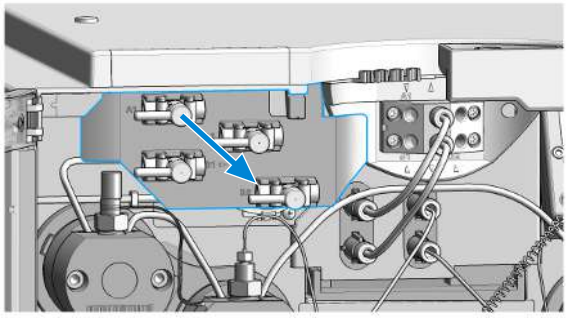
Prerequisites

- Remove tubings from the solvent bottles to avoid leaks.

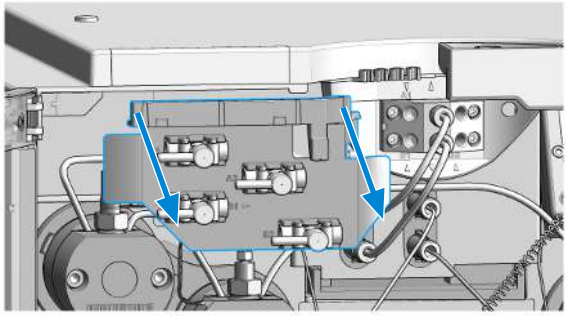
1 Unscrew tubing connections between shutoff valves, solvent bottles and the solvent selection valve.



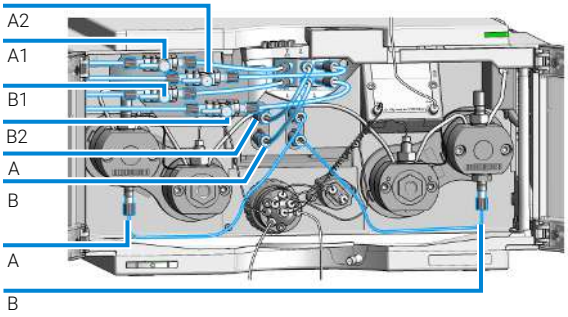
2 If a single valve shall be replaced, it can be pulled to the front for removing it from its mounting.



3 Remove the shutoff valve panel by pulling it downwards.



4 After replacing the panel or after completion of other maintenance, re-install the panel and all flow connections.



Replace the Pressure Sensor

When

- No or invalid pressure signal

Tools required

Qty.	p/n	Description
1	8710-2412	Hex key 2.5 mm, 15 cm long, straight handle
1	8710-0510	Open-end wrench 1/4-5/16 inch
1		Screwdriver

Parts required

Qty.	p/n	Description
1	5067-6791	Pressure sensor 1300 bar
1	5067-7010	Pressure sensor biocompatible 1300 bar

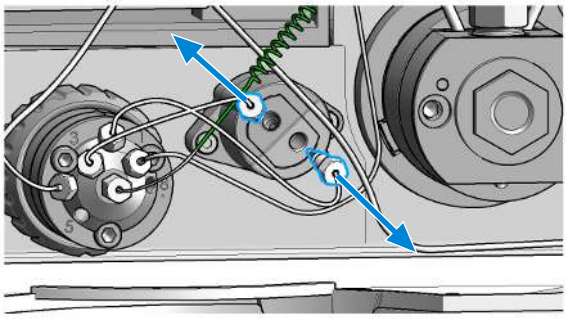
Prerequisites

- Turn off pump flow, switch off pump

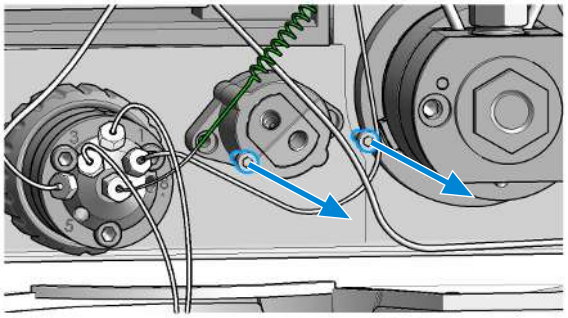
NOTE

This procedure describes how to replace the pressure sensor.
In case the cable to the sensor shall be replaced as well, please contact your Agilent service representative.

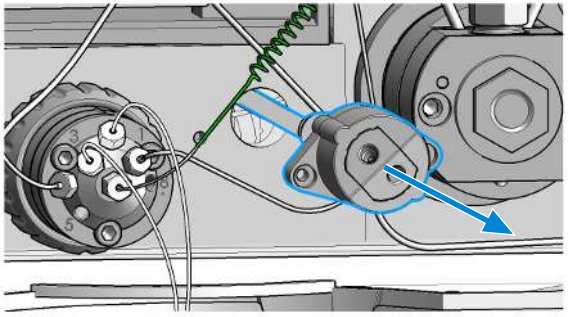
1 Remove capillary connections between the pressure sensor and purge valve.



2 Remove the screws that fix the pressure sensor to the chassis.



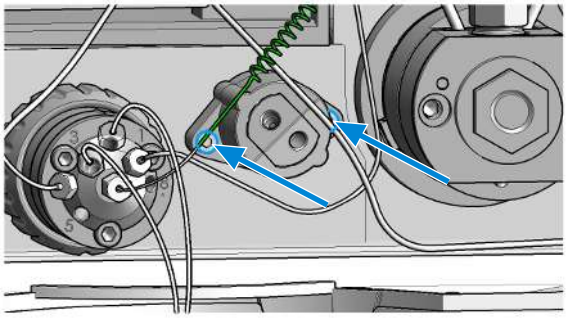
3 Carefully pull out the pressure sensor for about 2 cm. Then unscrew the cable from the pressure sensor.



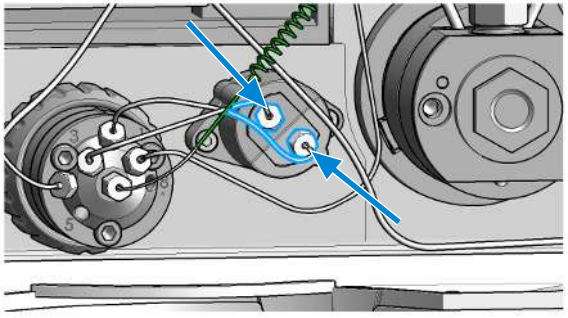
4 Connect the new pressure sensor to the pressure sensor connector.



5 Fix the pressure sensor to the instrument chassis.



6 Connect the capillaries from the valve to the pressure sensor: connect port 3 to the pressure sensor inlet and port 2 to the outlet.



Replace the Solvent Selection Valve (SSV)

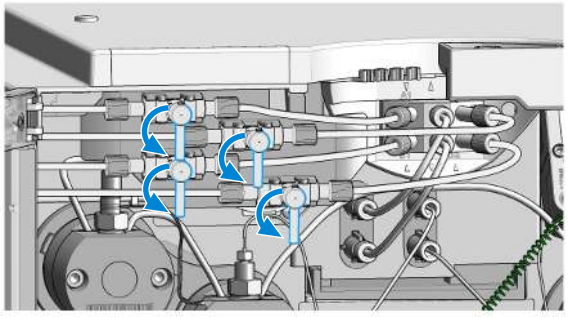
When

- In case of problems with the solvent selection valve

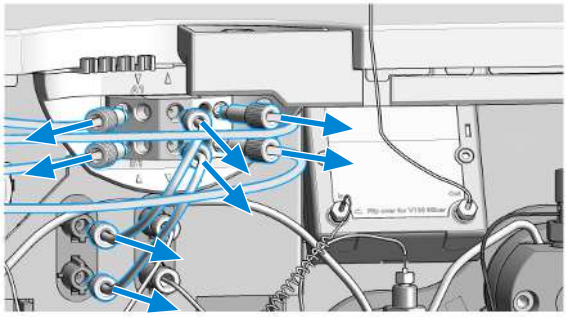
Parts required

Qty.	p/n	Description
1	G7120-60029	SSV Valve Assembly
2	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit

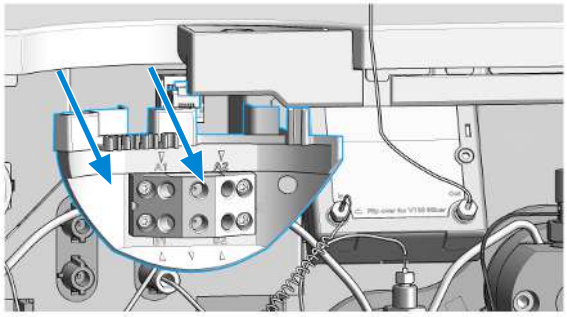
1 Close the shutoff valves.



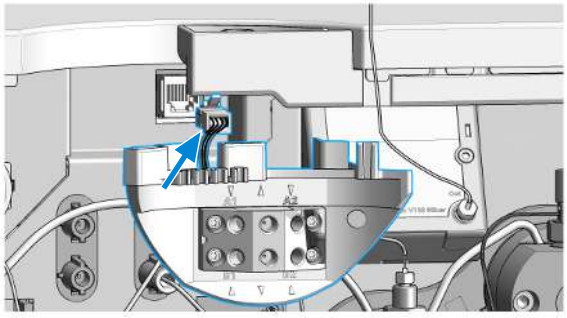
2 Remove tubing connections between the SSV and the solvent shutoff valves and between the SSV and the degassing unit inlets.



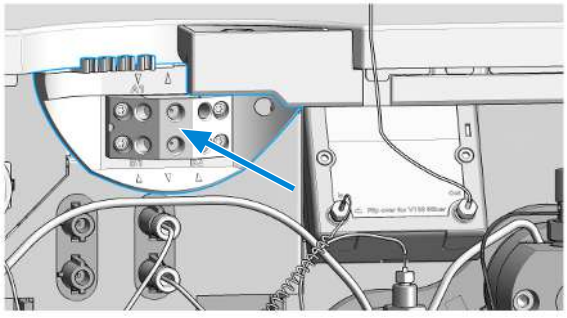
3 Push down the SSV panel for removing it.



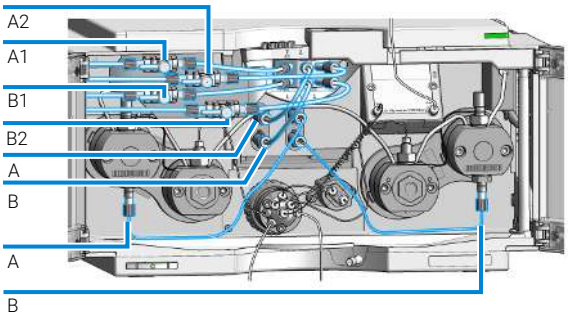
4 Remove the connector by pushing up the small clip at the bottom of the connector.



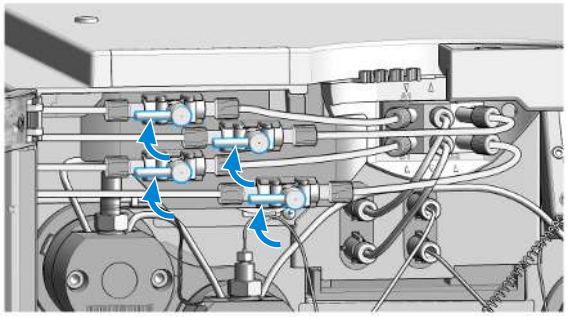
5 Install a new SSV by inserting the connector and clipping the SSV panel to the module top panel.



6 Reinstall all tubing connections.



7 Open the shutoff valves (if present) or put down solvent filters inside solvent bottles to enable solvent flow again.



Change Configuration or Replace the Jet Weaver

When

- For optimizing the pump configuration to mixing performance or low delay volumes/fast gradients, see chapter Optimizing the Performance of the Module on page 83.

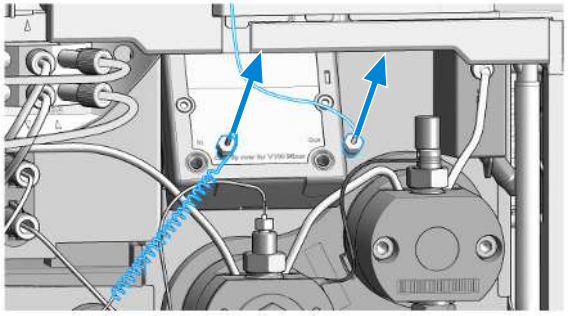
Tools required

Qty.	p/n	Description
1	8710-0510	Open-end wrench 1/4-5/16 inch
1		3 mm hex key

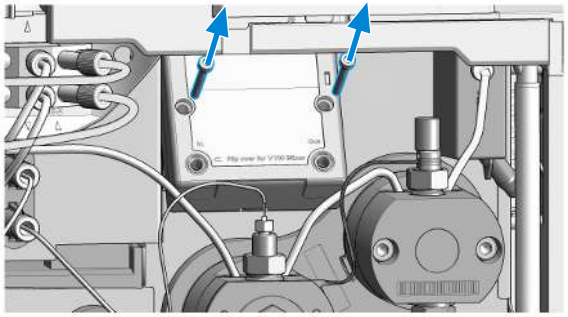
Parts required

Qty.	p/n	Description
1	G7120-68135	Jet Weaver 35 µL/100 µL
1	G7120-68380	Jet Weaver 380 µL (Optional for G7120A)
1	G7132-68135	Jet Weaver 35 µL/100 µL biocompatible
1	G7132-68380	Jet Weaver 380 µL biocompatible (Optional for G7132A)
1	G4220-87000	Capillary ST 0.17 mm x 350 mm Valve to Jet Weaver
1	G7132-60002	Biocompatible capillary MP35N 0.17 mm x 350 mm Valve to Jet Weaver

1 Remove capillary connections from the Jet Weaver.



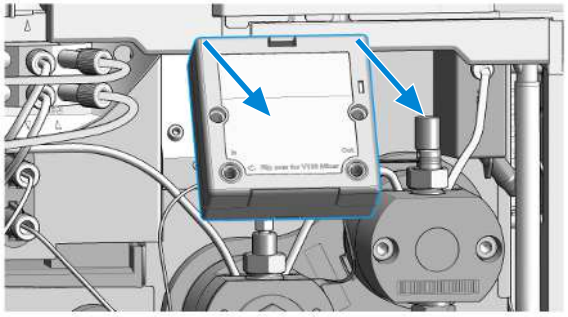
2 Remove the hex screws that fix the Jet Weaver to the pump housing.



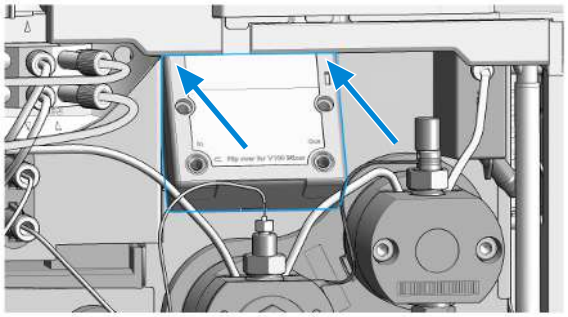
NOTE

The standard Jet Weavers (G7120-68135 (Jet Weaver 35 µL/100 µL) and G7132-68135 (Jet Weaver 35 µL/100 µL biocompatible)) have a front and a rear side with different internal volumes (35 / 100 µL) that are optimized for a low delay volume or best mixing performance.
The optional Jet Weaver (G7120-68380 (Jet Weaver 380 µL) , not to be used with Bio pumps, or G7132-68380 (Jet Weaver 380 µL biocompatible)) is recommended for applications, which are challenging regarding mixing noise (e.g. TFA applications) and has just one side.

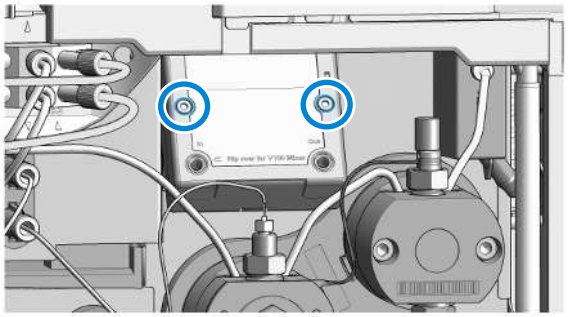
3 Remove the Jet Weaver



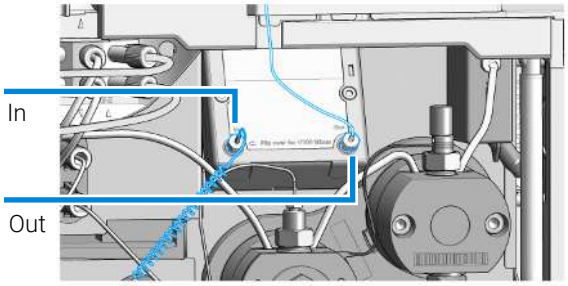
4 Install the new Jet Weaver or flip the Jet Weaver to the other side.



5 Fix the Jet Weaver with the screws.



6 Reinstall the capillary connections.



The inlet at the left side of the Jet Weaver is connected to the central port of the pump valve by a capillary (length 300 mm, 0.17 mm i.d.). The outlet at the right side is connected to the autosampler.

Replace the Seal Wash Pump

When

- In case of seal wash pump wear

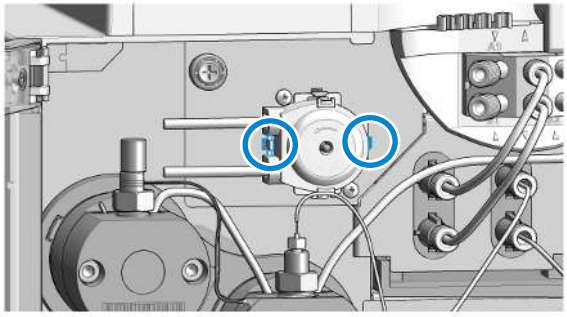
Parts required

Qty.	p/n	Description
1	5065-4445	Peristaltic pump cartridge
1	5065-9978	Silicone tubing, 1 mm i.d., 3 mm o.d., 5 m, re-order number

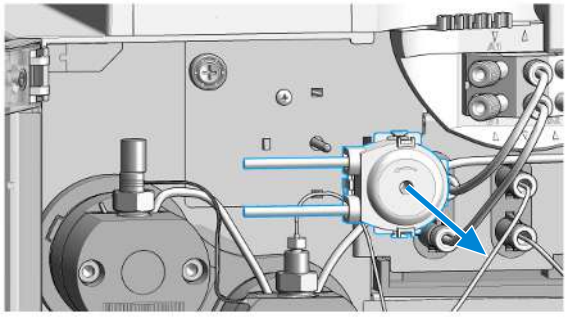
Prerequisites

- Remove the flow connections from and to the seal wash pump

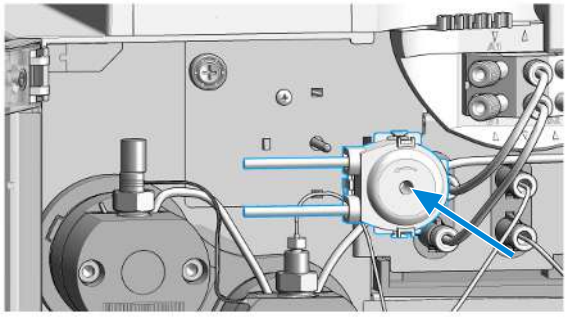
1 Press the clips.



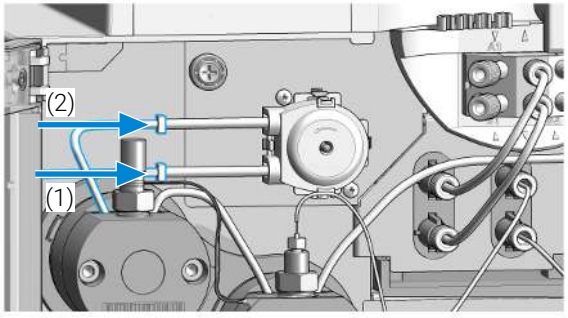
2 Pull the pump to the front.



3 Insert the pump clips to the holes in the pump housing.



4 Fix the seal wash tubings to the peristaltic pump inlet (1) and from the peristaltic pump outlet to the primary pump head inlet (2).



Replace the Inlet Valve (G7120A)

When

- If Inlet valve is defective.

Tools required

Qty.	p/n	Description
1		Wrench, 14 mm
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench

Parts required

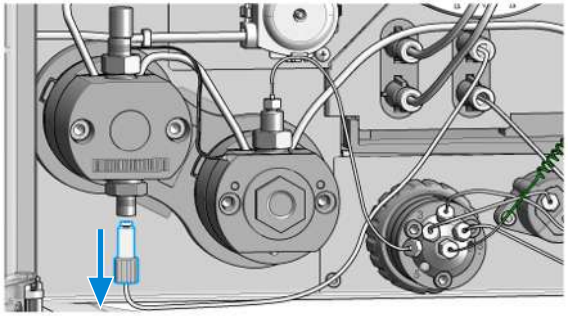
Qty.	p/n	Description
1	G4220-60022	Inlet valve (primary pump head), **OR**
1	G7120-60022	Inlet Valve, gold-reduced (PFAS-optimized pump head)

NOTE

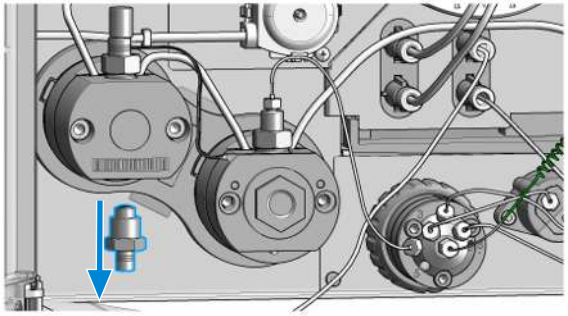
For best performance, lifetime and to avoid leaks, use a torque wrench set to approx. 10 Nm for fixing the inlet valve.

1 Close the shutoff valves (if present) or lift up solvent filters inside solvent bottles to avoid solvent leaks.

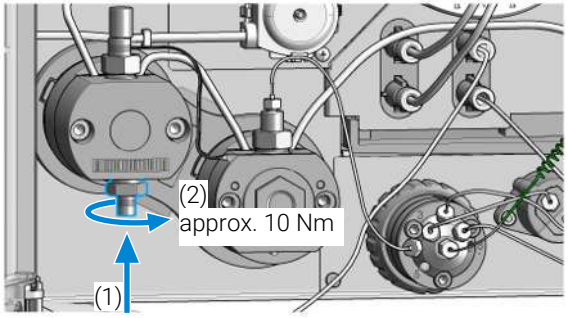
2 Unscrew the tubing at the inlet valve.



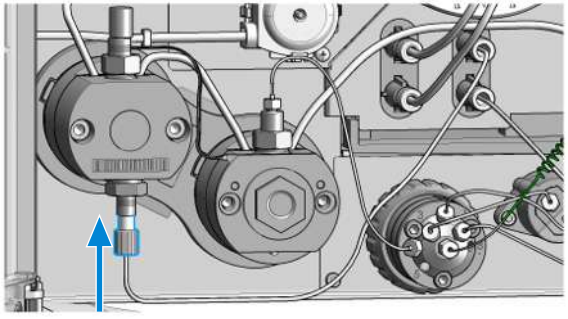
3 With a 14 mm wrench, unscrew the inlet valve and remove it.



4 Install inlet valve and tighten it at approx. 10 Nm with a torque wrench (14 mm).



5 Attach the inlet tubing to the inlet valve.



6 Open the shutoff valves and purge the system to remove air.

Replace the Inlet Valve (G7132A)

When

- If Inlet valve is defective.

Tools required

Qty.	p/n	Description
1		Wrench, 14 mm
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench

Parts required

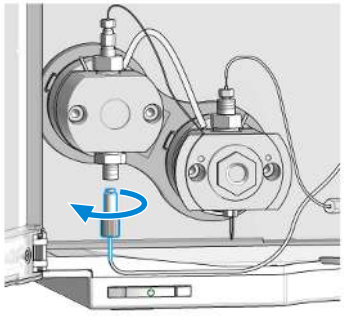
Qty.	p/n	Description
1	G7131-60021	Inlet Valve biocompatible (primary pump head)

NOTE

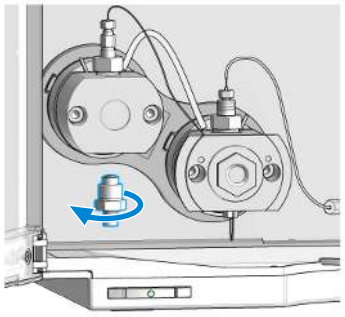
For best performance, lifetime and to avoid leaks, use a torque wrench set to approx. 10 Nm for fixing the inlet valve.

1 Close the shut off valves (if present) or lift up solvent filters inside solvent bottles to avoid solvent leaks.

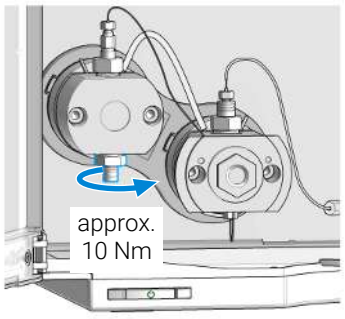
2 Unscrew the tubing at the inlet valve.



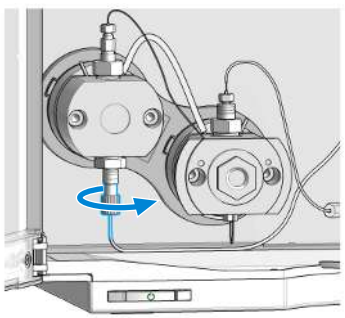
3 With a 14 mm wrench, unscrew the inlet valve and remove it.



4 Install inlet valve and tighten it at approx. 10 Nm with a torque wrench (14 mm).



5 Attach the inlet tubing at the inlet valve.



6 Open the shut off valves and purge the system to remove air.

Release a Stuck Inlet Valve

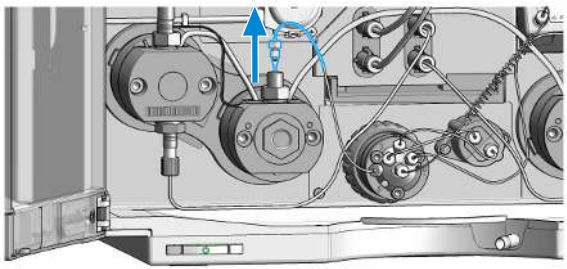
When

- If inlet valve is stuck, or if pump is not generating pressure after being turned off for an extended period of time.

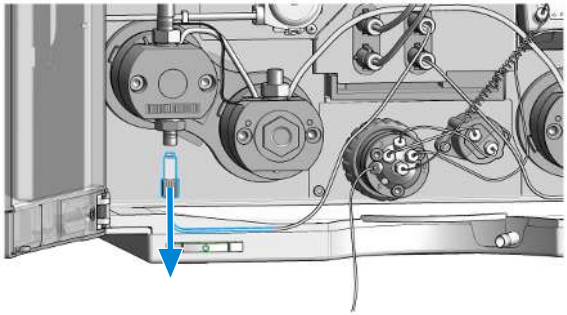
NOTE

Before the system is turned off for an extended period of time, it should be flushed with at least 10 % isopropanol to prevent inlet valves from getting stuck.

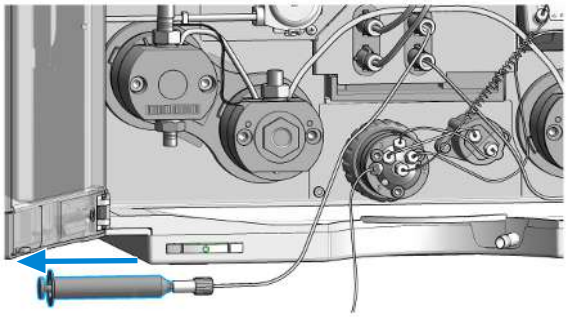
1 Remove the capillary connection from the outlet of the secondary pump head.



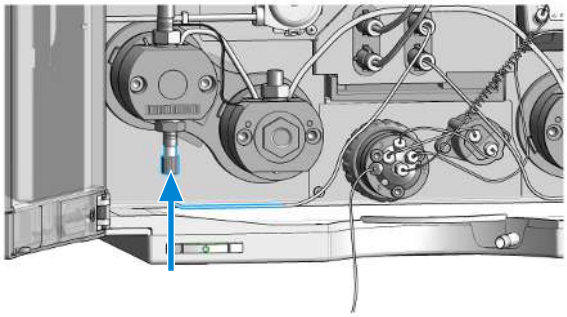
2 Unscrew the tubing from the inlet valve.



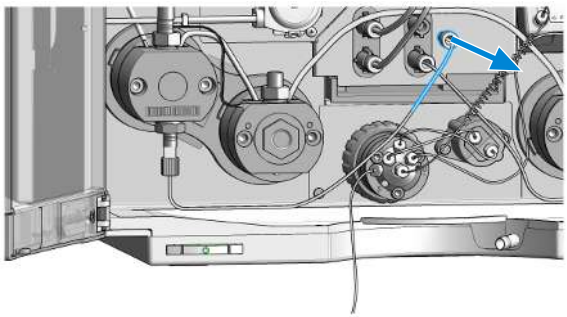
3 Attach a Luer lock syringe with adapter to the tubing and fill it with solvent.



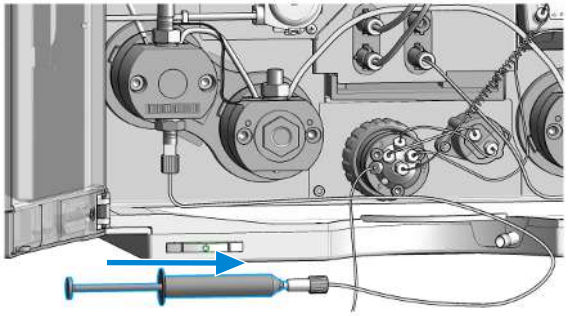
4 Reconnect tubing to inlet valve.



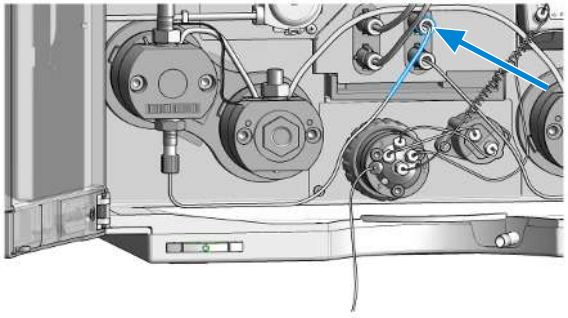
5 Unscrew tubing at degassing unit and attach the syringe to it.



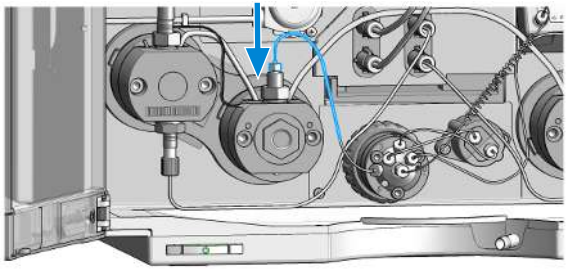
6 Push solvent with syringe until it comes out at the top of the high-pressure filter assembly.



7 Detach the syringe and reconnect the tubing into the degassing unit.



8 Reinstall the capillary connection to the high-pressure filter assembly.



9 Purge the system to remove air.

Remove the Pump Head Assembly (G7120A)

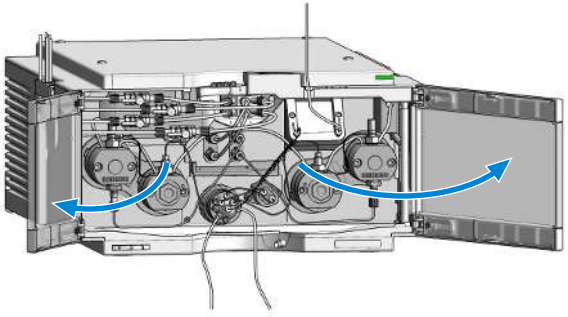
Tools required	Qty.	p/n	Description
	1	G7120-68708	InfinityLab System Tool kit

NOTE

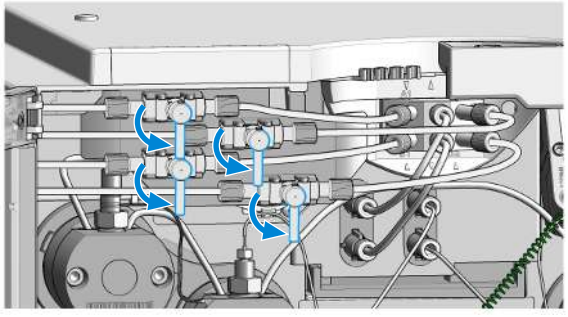
This procedure describes the replacement of the left pump head assembly (channel A). Similarly, the right pump head assembly (channel B) can be replaced. One pump head assembly consists of two pump heads, which are both removed at the same time.

1 In Lab Advisor go to Service & Diagnostics > Remove/Install Pump Head and follow instructions given on the screen.

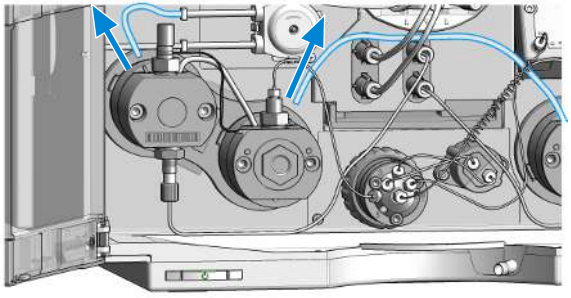
2 Open the doors.



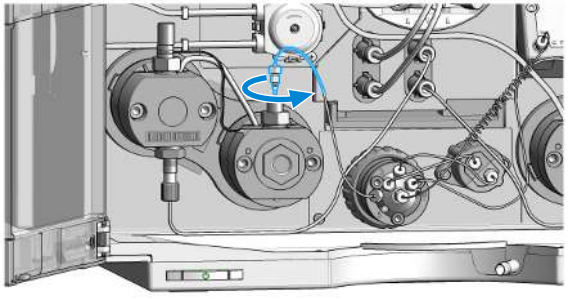
3 Close all shutoff valves (if present) or lift up solvent filters inside solvent bottles to avoid solvent leaks.



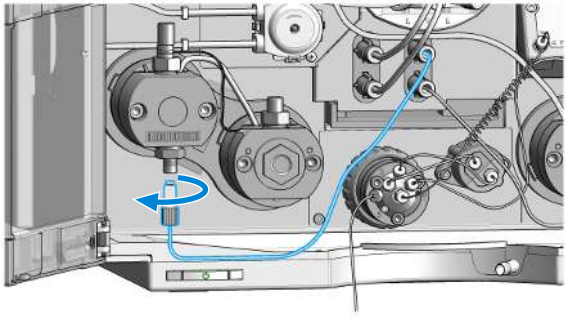
4 Remove the seal wash tubes.



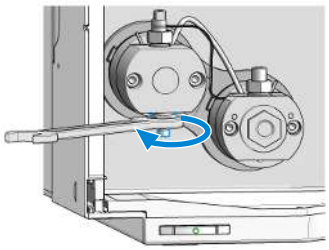
5 Remove the capillary connection at the top of the secondary pump head to the pump valve.



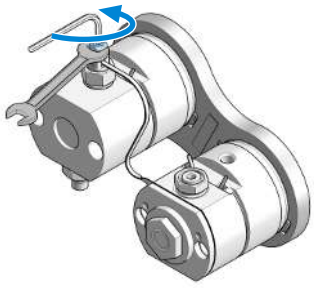
6 Remove the flow connection between the degassing unit and the primary pump head inlet.



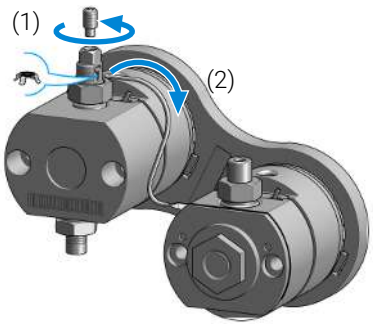
7 Loosen the inlet valve. Keep the inlet valve installed to the pump head assembly.



8 Counter the outlet valve with a 1/4 inch wrench while opening the lock screw of the heat exchanger with an L-shaped T10 Torx Key.

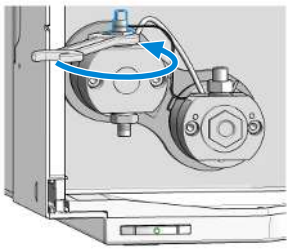


9 Remove the heat exchanger capillary by pushing the connector up and pulling it out of the valve.

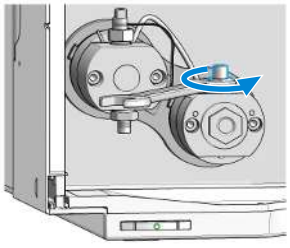


NOTE A gold seal between outlet valve and heat exchanger capillary is used for a tight connection.

10 Loosen the outlet valve. Keep the outlet valve installed to the pump head assembly.



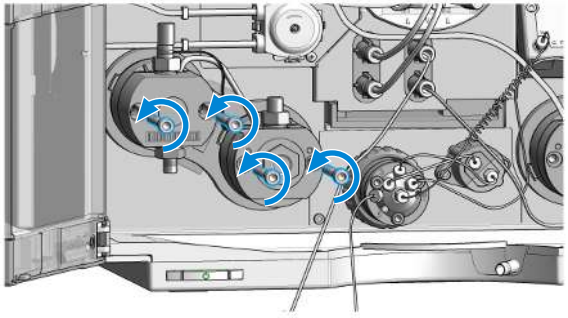
11 Loosen the high-pressure filter. Keep the filter installed to the pump head assembly.



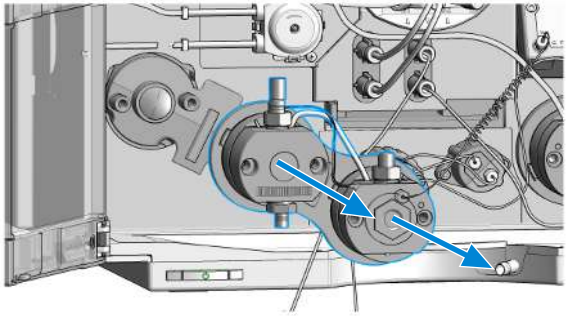
12 Open the four screws holding the pump heads.

NOTE

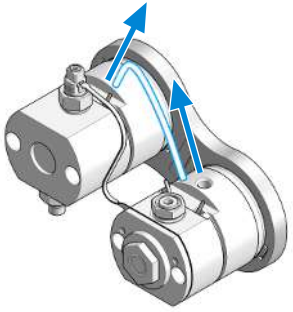
Open the screws step by step, not screw by screw.



13 Remove the complete pump head assembly by holding both heads and pulling it to the front.



14 Remove the seal wash tubing interconnecting the two pump heads.



Remove the Pump Head Assembly (G7132A)

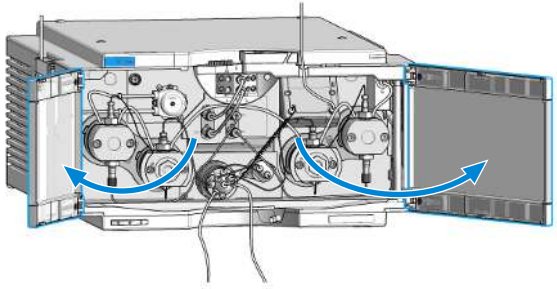
Tools required	Qty.	p/n	Description
	1	G7120-68708	InfinityLab System Tool kit

NOTE

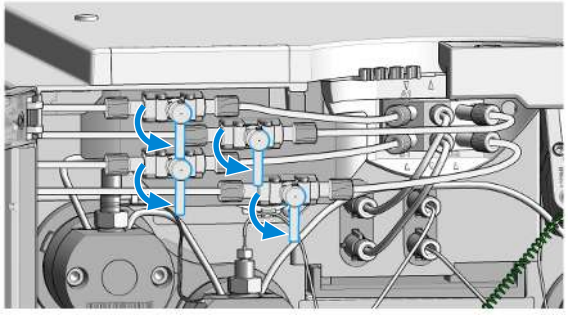
This procedure describes the replacement of the left pump head assembly (channel A). Similarly, the right pump head assembly (channel B) can be replaced. One pump head assembly consists of two pump heads, which are both removed at the same time.

1 In Lab Advisor go to Service & Diagnostics > Remove/Install Pump Head and follow instructions given on the screen.

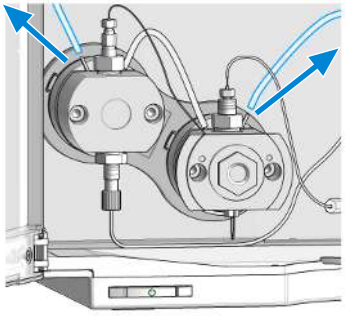
2 Open the doors.



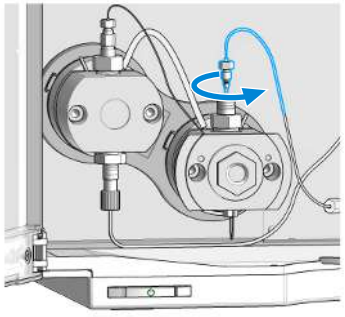
3 Close all shutoff valves (if present) or lift up solvent filters inside solvent bottles to avoid solvent leaks.



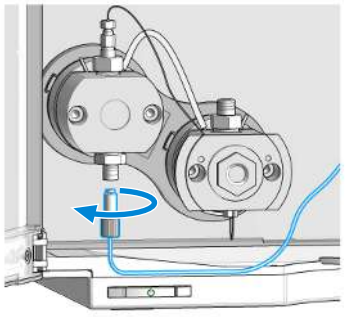
4 Remove the sealwash tubes.



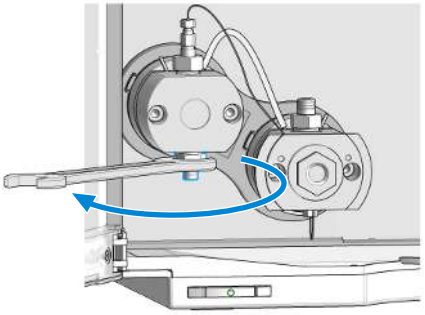
5 Remove the capillary connection at the top of the secondary pump head to the pump valve.



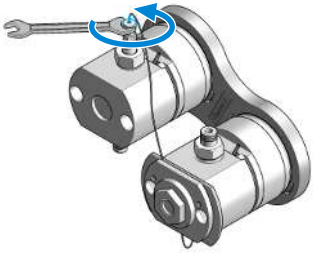
6 Remove the flow connection between the degassing unit and the primary pump head inlet.



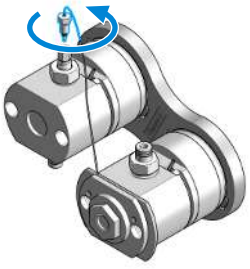
7 Loosen the inlet valve. Keep the inlet valve installed to the pump head assembly.



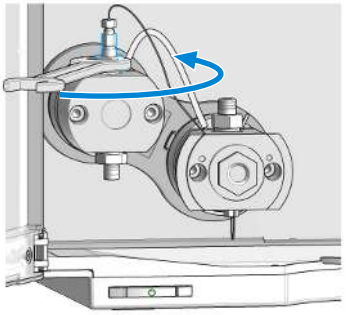
8 Counter the outlet valve at the top with a 1/4 inch wrench while opening the heat exchanger capillary with another 1/4 inch wrench.



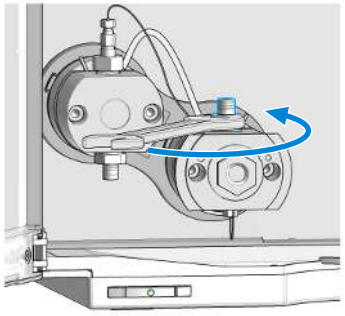
9 Remove the heat exchanger capillary from the valve.



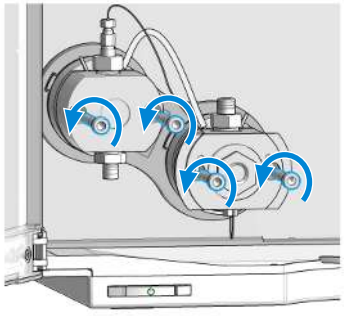
10 Loosen the outlet valve. Keep the outlet valve installed to the pump head assembly.



11 Loosen the high-pressure filter. Keep the filter installed to the pump head assembly.

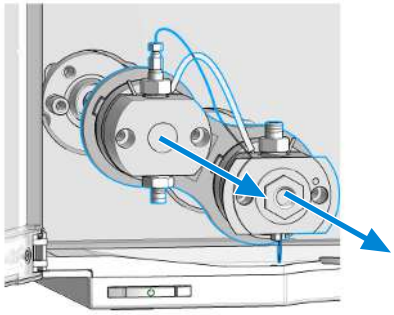


12 Open the four screws holding the pump heads.

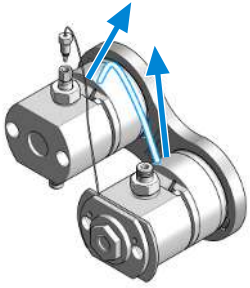


NOTE Open the screws step by step, not screw by screw.

13 Remove the complete pump head assembly by holding both heads and pulling it to the front.



14 Remove the seal wash tubing interconnecting the two pump heads.



Pump Head Maintenance (Tool Free)

Flexible Pumps (G7104A/C and G7131A/C) and High-Speed Pumps (G7120A and G7132A) are equipped with Long Life Pump Heads.

Long Life Pump Heads offer a significantly increased lifetime of pistons and seals compared to other pump heads.

Maintenance of Long Life Pump Heads requires no special tool.

The following procedures explain the maintenance of Long Life Pump Heads.

Please refer to *Agilent 1290 Infinity II Easy Maintenance Pump Head Technical Note (1290IF-IF2_EM-PumpHead_TN.pdf, SD-29000158)* for instructions on maintenance of Easy Maintenance Pump Heads, or to *Agilent 1290 Infinity Pump Head Maintenance Technical Note (1290IF_PumpHeadMaintenance_TN.pdf, SD-29000403)* for instructions on maintenance of classical pump heads.

Disassemble Long Life Pump Heads (G7120A)

This procedure shows how to open the pump head assembly, exchange seals, and clean pistons.

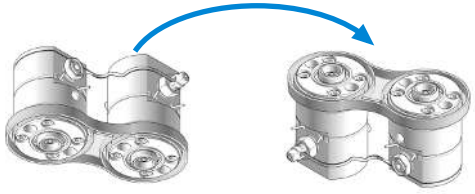
Exchanging seals and cleaning pistons is exemplarily shown for the primary pump head, but works in the same way for the secondary pump head.

Tools required

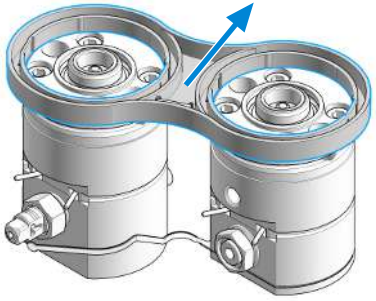
Qty.	p/n	Description
1	G7120-68708	InfinityLab System Tool kit
1	5043-1400	Pump Head Holder
1	5067-6197	Seal Handling Device
1	8660-0852	Abrasive Mesh (Micro-Grit Paper)
1		Isopropanol

NOTE Seals must be exchanged and pistons must be cleaned in both primary and secondary pump heads.

1 Turn the pump head assembly upside down.

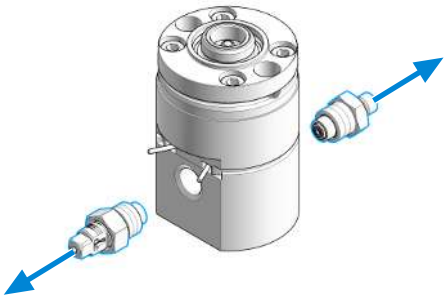


2 Remove the link plate by gently pulling it off the pump head assembly.



The two pump chambers are now isolated.

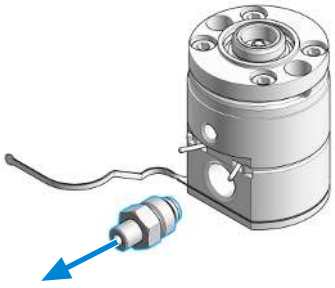
3 Remove the inlet valve and the outlet valve from the primary pump head.



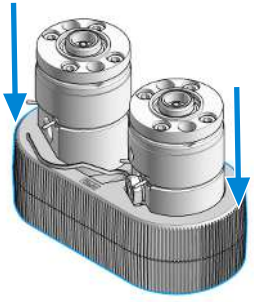
NOTE

Clean the valves by sonication, if appropriate. A good cleaning solution is 50 % isopropanol in water.

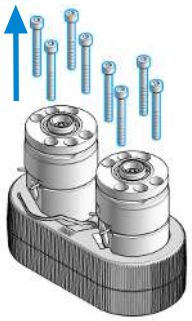
4 Binary/High-Speed Pumps only: Remove the high-pressure filter from the secondary pump head.



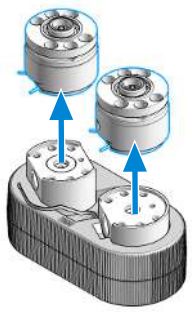
5 Place the two pump heads in the Pump Head Holder.



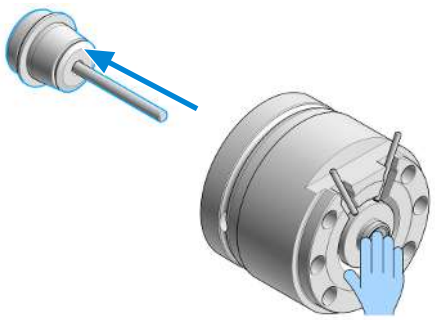
6 Remove the pump head screws from the back of the pump heads.



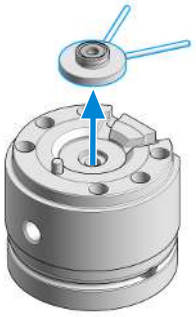
7 Open the pump heads and remove the piston housings from the pump chambers.



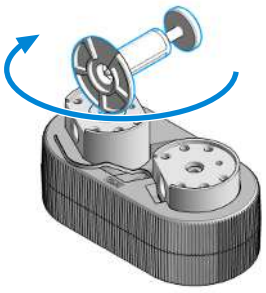
8 Remove the piston by pressing it out of the seal holder with a finger.



9 Remove the seal holder from the spring housing.



10 Screw the pin of the Seal Handling Device into the piston seal.



11 Pull out the Seal Handling Device with the piston seal in a straight movement with only gentle force.

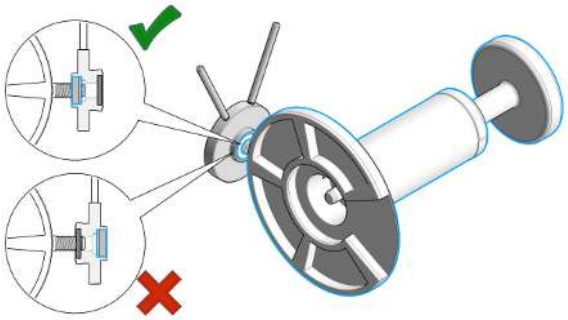


12 Repeat for the other pump chamber.

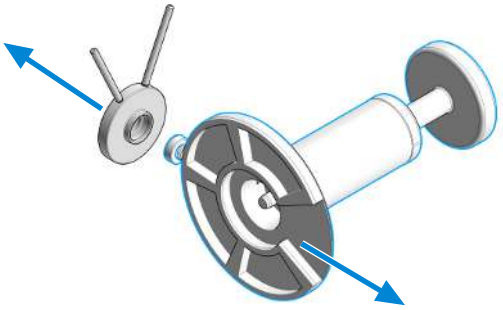
13 Screw the pin of the Seal Handling Device into the wash seal.

NOTE

The seal holder has two different sides. The black backup ring is supporting the piston seal and must not be removed. The side with the backup ring has a bigger diameter and a sharp edge to hold the piston seal. The other side has no sharp edge and holds the smaller wash seal.

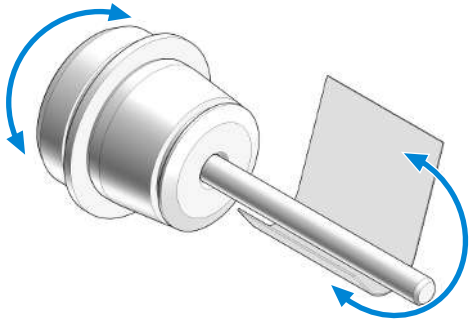


14 Pull out the Seal Handling Device with the wash seal in a straight movement with only gentle force.



15 Repeat for the other seal holder.

16 Clean the piston with abrasive paper.



17 Rinse pump heads and pistons with isopropanol.

Disassemble Long Life Pump Heads (G7132A)

This procedure shows how to open the pump head assembly, exchange seals, and clean pistons.

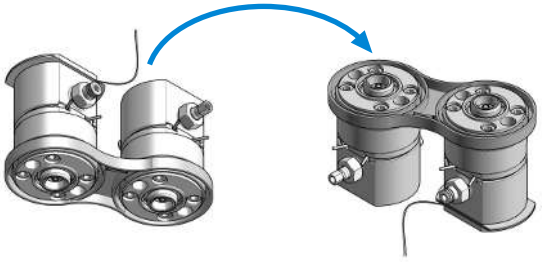
Exchanging seals and cleaning pistons is exemplarily shown for the primary pump head, but works in the same way for the secondary pump head.

Tools required

Qty.	p/n	Description
1	G7120-68708	InfinityLab System Tool kit
1	G7132-42000	Bio Pump Head Holder
1	5067-6197	Seal Handling Device
1	8660-0852	Abrasive Mesh (Micro-Grit Paper)
1		Isopropanol

NOTE Seals must be exchanged and pistons must be cleaned in both primary and secondary pump heads.

1 Turn the pump head assembly upside down.



2 Remove the link plate by gently pulling it off the pump head assembly.



The two pump chambers are now isolated.

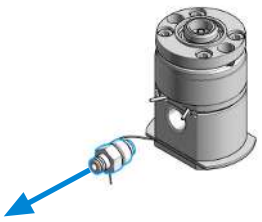
3 Remove the inlet valve and the outlet valve from the primary pump head.



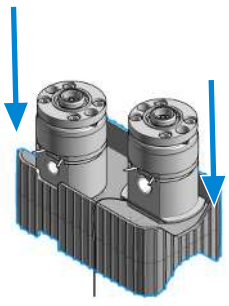
NOTE

Clean the valves by sonication, if appropriate. A good cleaning solution is 50 % isopropanol in water.

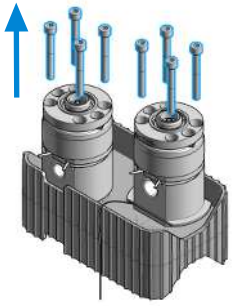
4 Binary/High-Speed Pumps only: Remove the high-pressure filter from the secondary pump head.



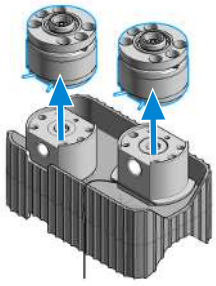
5 Place the two pump heads in the pump head holder.



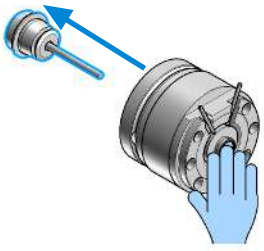
6 Remove the pump head screws from the back of the pump heads.



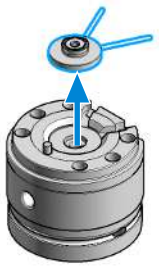
7 Open the pump heads and remove the piston housings from the pump chambers.



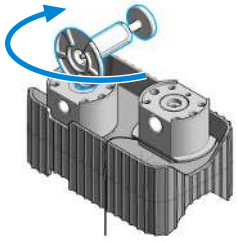
8 Remove the piston by pressing it out of the seal holder with a finger.



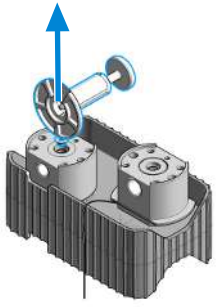
9 Remove the seal holder from the spring housing.



10 Screw the pin of the Seal Handling Device into the piston seal.



11 Pull out the Seal Handling Device with the piston seal in a straight movement with only gentle force.

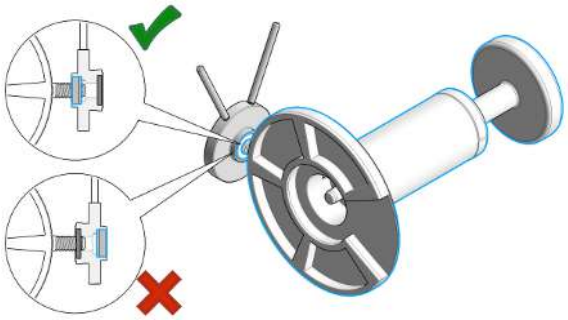


12 Repeat for the other pump chamber.

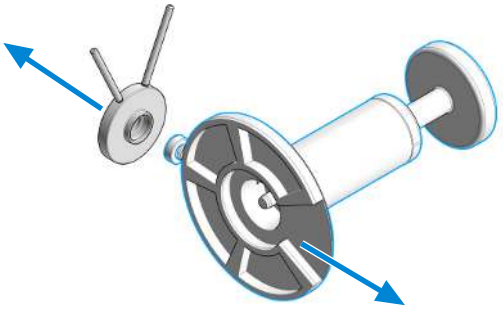
13 Screw the pin of the Seal Handling Device into the wash seal.

NOTE

The seal holder has two different sides. The black backup ring is supporting the piston seal and must not be removed. The side with the backup ring has a bigger diameter and a sharp edge to hold the piston seal. The other side has no sharp edge and holds the smaller wash seal.

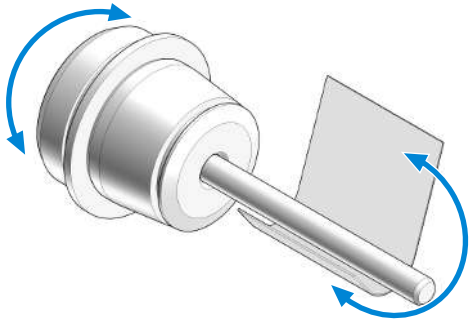


14 Pull out the Seal Handling Device with the wash seal in a straight movement with only gentle force.



15 Repeat for the other seal holder.

16 Clean the piston with abrasive paper.



17 Rinse pump heads and pistons with isopropanol.

Replace the Heat Exchanger (G7120A)

Tools required

Qty.	p/n	Description
1		Wrench, 19 mm
1	5023-2501	Screwdriver Torx-T10
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	G4220-20013	4 mm hex bit
1	G4220-20015	Adapter ¼ in square to hex
1	G4220-20041	Bit Torx 10x25 mm

Parts required

Qty.	p/n	Description
1	G4220-81013	Heat Exchanger Channel A (secondary pump head only), **OR**
1	G4220-81012	Heat Exchanger Channel B (secondary pump head only)

Prerequisites

- Remove the pump head assembly from the pump
- Remove the secondary pump head from the link plate

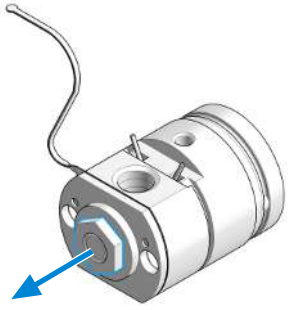
CAUTION

Loss of small spacer fitting

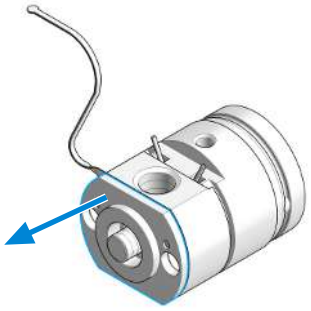
Inside the secondary pump head is a small spacer fitting, which can be dropped easily when removing the heat exchanger.

— The heat exchanger does not need to be removed for pump head maintenance.

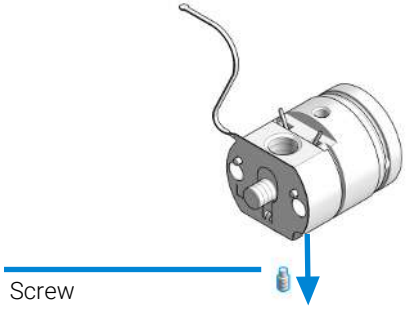
1 Remove the 19 mm screw at the front of the secondary pump head.



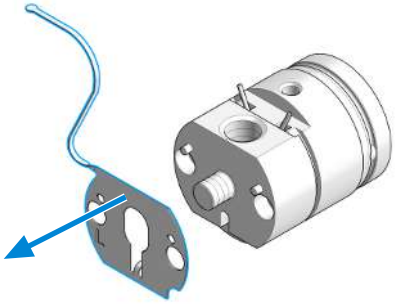
2 Remove the front plate.



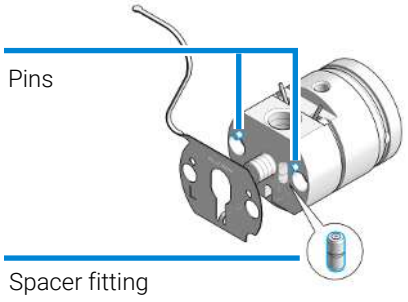
3 Remove the screw at the bottom of the pump head. Do not drop the golden spacer fitting.



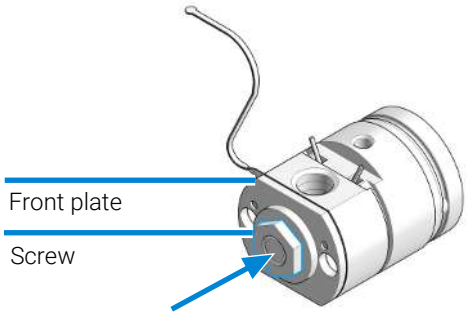
4 Lift out the heat exchanger.



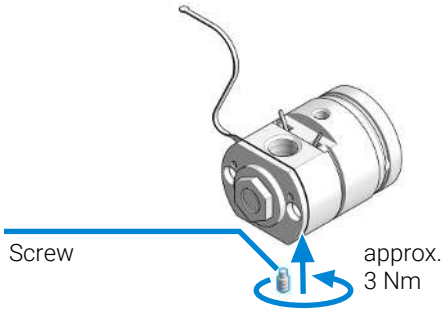
5 If removed, first insert the spacer fitting. Then insert the new heat exchanger to the opening in the pump head and lift it over the pins.



6 Use the 19 mm screw for fixing the front plate.



7 Insert and fix the screw.



Replace the Heat Exchanger (G7132A)

BIO

For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

Tools required

Qty.	p/n	Description
1		Wrench, 19 mm
1	5023-2501	Screwdriver Torx-T10
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	G4220-20013	4 mm hex bit
1	G4220-20015	Adapter ¼ in square to hex
1	G4220-20041	Bit Torx 10x25 mm

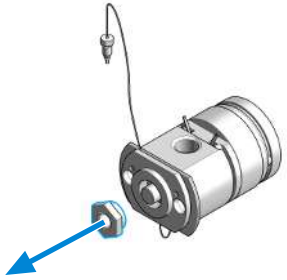
Parts required

Qty.	p/n	Description
1	G7131-60005	Heat Exchanger for biocompatible Pump

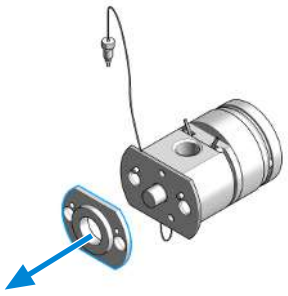
Prerequisites

- Remove the pump head assembly from the pump
- Remove the secondary pump head from the link plate

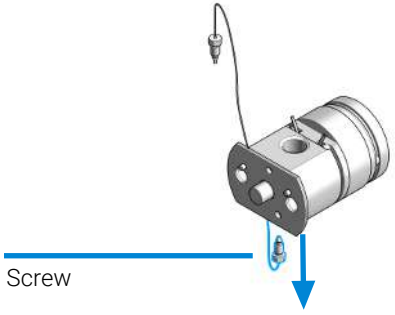
1 Remove the 19 mm screw at the front of the secondary pump head.



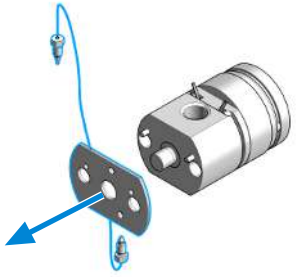
2 Remove the front plate.



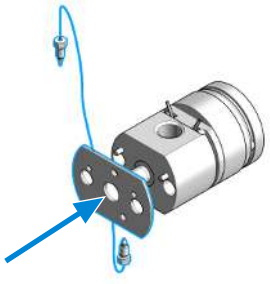
3 Remove the screw at the bottom of the pump head.



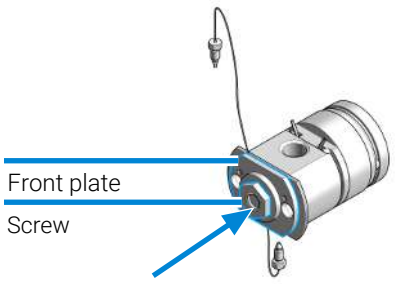
4 Lift out the heat exchanger.



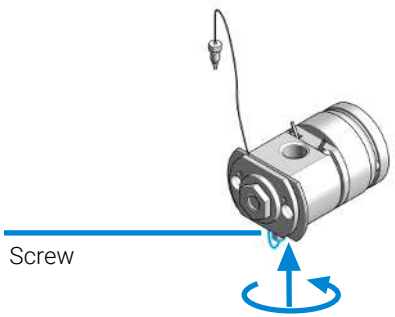
5 Insert the new heat exchanger into the opening of the pump head and lift it over the pins.



6 Use the 19 mm screw for fixing the front plate.



7 Insert and fix the screw.



Assemble Long Life Pump Heads (G7120A)

This procedure shows how to exchange seals, and reassemble the pump head assembly.

Exchanging seals is exemplarily shown for the primary pump head, but works in the same way for the secondary pump head.

Tools required

Qty.	p/n	Description
1	G7120-68708	InfinityLab System Tool kit
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	G4220-20013	4 mm hex bit
1	G4220-20015	Adapter ¼ in square to hex
1	G4220-20041	Bit Torx 10x25 mm
1	5043-1400	Pump Head Holder
1	5067-6197	Seal Handling Device
1		Isopropanol

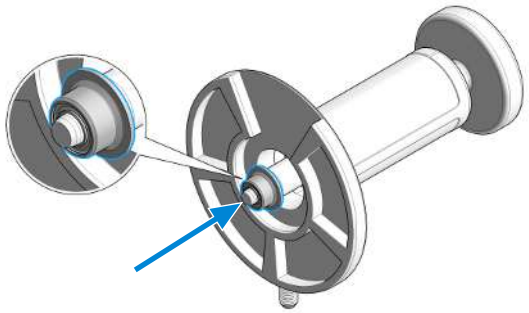
Parts required

Qty.	p/n	Description
2	0905-1719	PE Seal
2	0905-1175	Wash seal (PTFE)

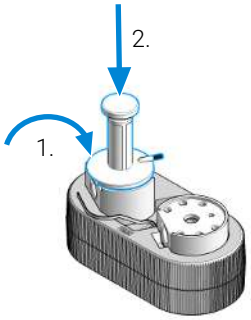
NOTE Seals must be exchanged in both primary and secondary pump heads.

1 Lubricate the seals, the seal holder, and the pump chambers with isopropanol.

2 Place the piston seal onto the designated nose of the Seal Handling Device. The metal spring of the piston seal must be visible.

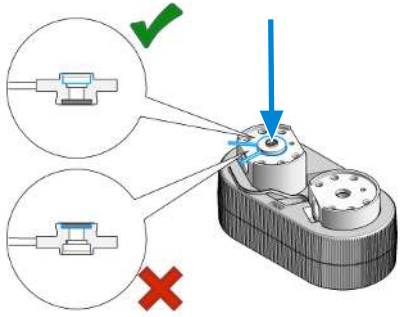


3 Take care that the Seal Handling Device is seating flush and press the seal into the pump chamber.



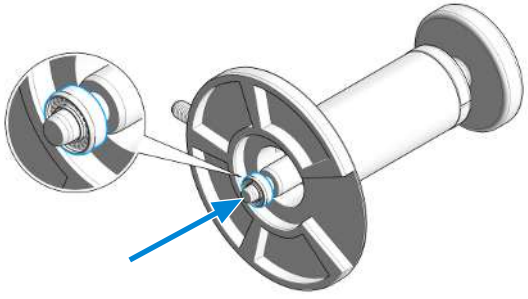
4 Repeat for the other pump chamber.

5 Place the seal holder onto the pump chamber.

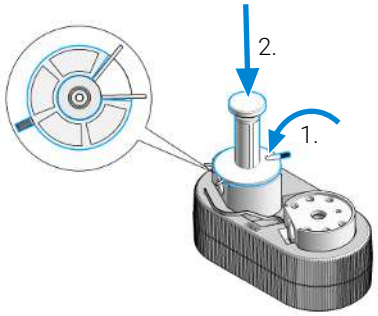


NOTE Mind the correct orientation of the seal holder. The backup ring must face down.

6 Place the wash seal onto the designated nose of the Seal Handling Device. The metal spring of the wash seal must be visible.



7 Take care that the Seal Handling Device is seating flush and press the wash seal into the seal holder.

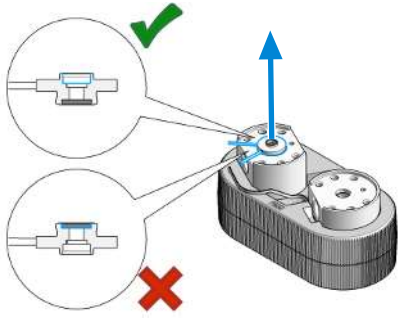


NOTE

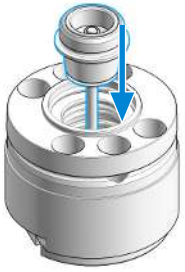
The Seal Handling Device has a cavity to fit over the pins of the seal wash tubings.

8 Repeat for the other seal holder.

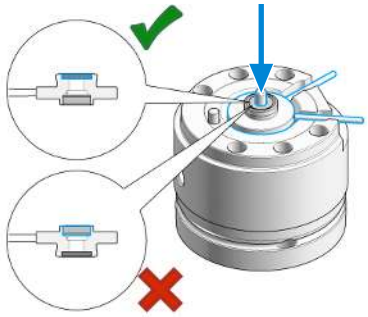
9 Remove the seal holders from the pump chambers.



10 Lubricate the piston with isopropanol and place it into the spring housing.

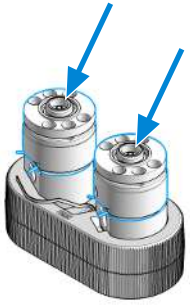


11 Place the seal holder onto the spring housing.



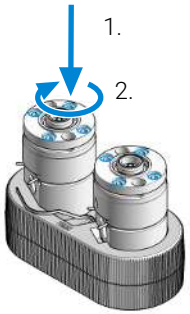
NOTE Mind the correct orientation: The backup ring must face upwards and the seal holder must sit correcly.

12 Place the assembled spring housings on top of the pump chambers.



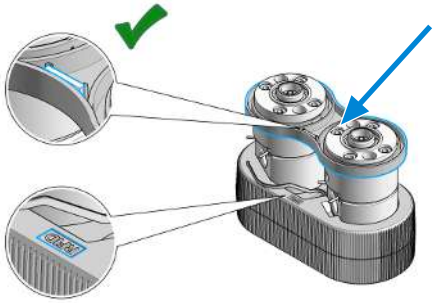
NOTE Both spring housings are identical, there is no risk when mixing them, but make sure that the seal holder is oriented correctly.

13 Place the screws into the pump heads and loosely tighten them in a crosswise manner.



NOTE The spring housing will tilt slightly when the first screw is hand tightened. Stop at this point and continue to tighten the three other screws in a crosswise manner.

14 Mind the correct orientation of the link plate and click it into place.



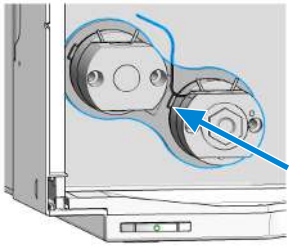
NOTE The Pump Head Holder has a marker to illustrate the correct placement of the link plate. The link plate holds an identification tag; this has to be placed onto the correct position to be readable by the pump.

15 Tighten the pump head screws with a torque wrench set to approx. 5 Nm in a crosswise manner.

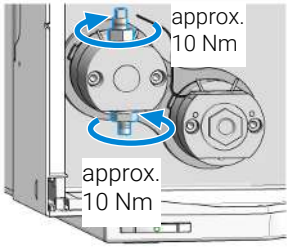


NOTE When the wrench clicks, the set torque is reached. Do not overtighten the screws.

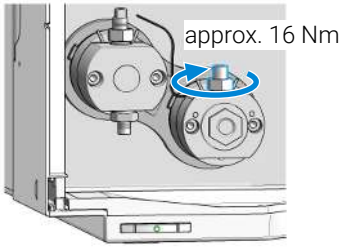
16 Mount the pump head to the module. Do not fix the screws at this stage!



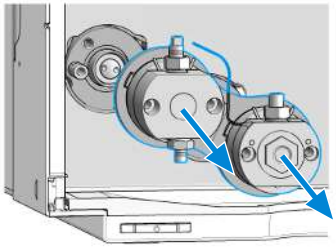
17 Screw in the inlet valve and the outlet valve and fix them with a torque wrench set to approx. 10 Nm.



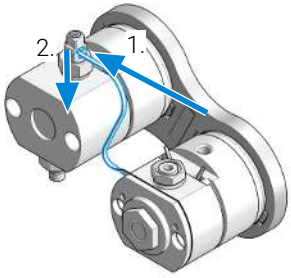
18 Binary/High-Speed Pumps only: Screw in the high-pressure filter and fix it with a torque wrench set to approx. 16 Nm.



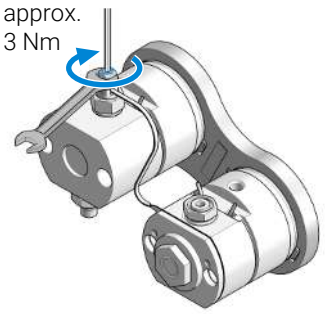
19 Remove the pump head from the module again.



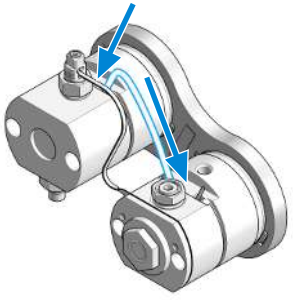
20 Position the entrance slit for the heat exchanger capillary to face exactly to it, and then seat the heat exchanger capillary back into the outlet valve by moving it into the valve and pressing it down.



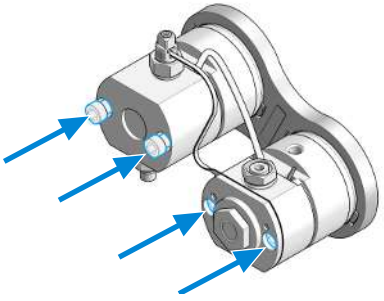
21 Counter the outlet valve and tighten the lock screw of the heat exchanger capillary with a torque wrench set to approx. 3 Nm.



22 Attach the seal wash tubing interconnecting the two pump heads.



23 Insert the screws that later fix the pump head assembly to the module housing.



Assemble Long Life Pump Heads (G7132A)



For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

This procedure shows how to exchange seals, and reassemble the pump head assembly.

Exchanging seals is exemplarily shown for the primary pump head, but works in the same way for the secondary pump head.

Tools required

Qty.	p/n	Description
1	G7120-68708	InfinityLab System Tool kit
1	G4220-20013	4 mm hex bit
1	G4220-20015	Adapter ¼ in square to hex
1	G4220-20041	Bit Torx 10x25 mm
1	G7132-42000	Bio Pump Head Holder
1	5067-6197	Seal Handling Device
1		Isopropanol

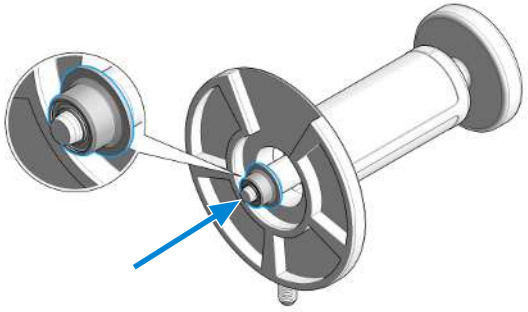
Parts required

Qty.	p/n	Description
2	G7131-20009	Seal PE (Bio), 100 µL
2	0905-1731	Bio-Inert Wash Seal

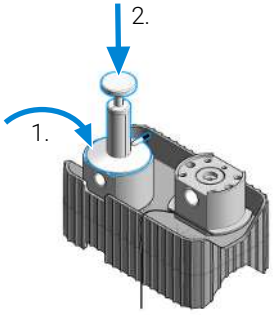
NOTE Seals must be exchanged in both primary and secondary pump heads.

1 Lubricate the seals, the seal holder, and the pump chambers with isopropanol.

2 Place the piston seal onto the designated nose of the Seal Handling Device. The metal spring of the piston seal must be visible.

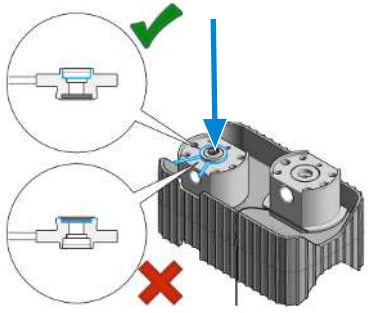


3 Take care that the Seal Handling Device is seating flush and press the seal into the pump chamber.



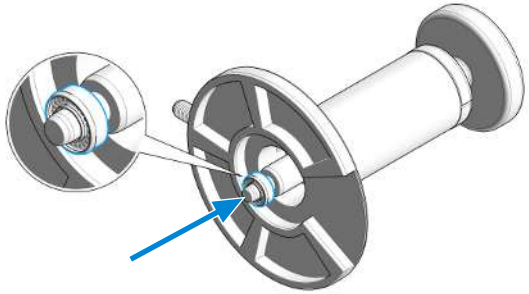
4 Repeat for the other pump chamber.

5 Place the seal holder onto the pump chamber.

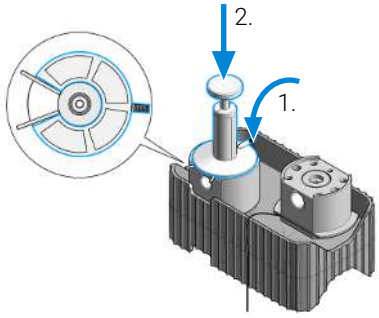


NOTE Mind the correct orientation of the seal holder. The backup ring must face down.

6 Place the wash seal onto the designated nose of the Seal Handling Device. The metal spring of the wash seal must be visible.



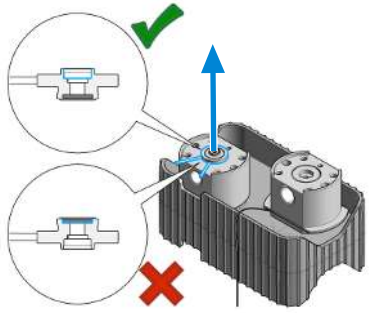
7 Take care that the Seal Handling Device is seating flush and press the wash seal into the seal holder.



NOTE The Seal Handling Device has a cavity to fit over the pins of the seal wash tubings.

8 Repeat for the other seal holder.

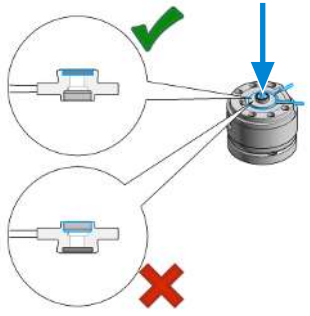
9 Remove the seal holders from the pump chambers.



10 Lubricate the piston with isopropanol and place it into the spring housing.



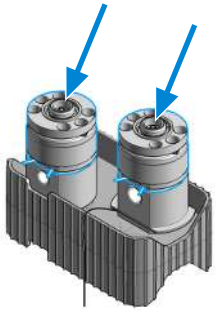
11 Place the seal holder onto the spring housing.



NOTE

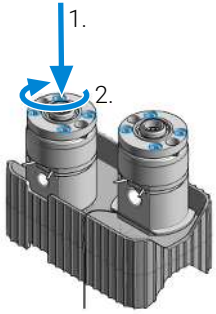
Mind the correct orientation: The backup ring must face upwards and the seal holder must sit correctly.

12 Place the assembled spring housings on top of the pump chambers.



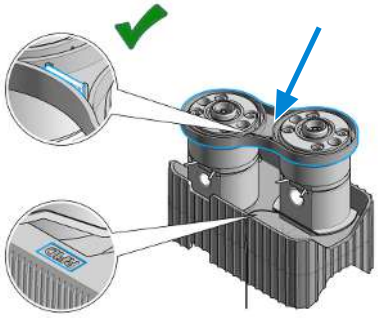
NOTE Both spring housings are identical, there is no risk when mixing them, but make sure that the seal holder is oriented correctly.

13 Place the screws into the pump heads and loosely tighten them in a crosswise manner.



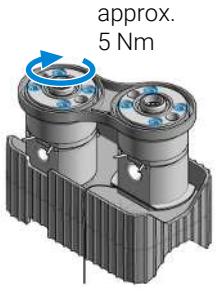
NOTE The spring housing will tilt slightly when the first screw is hand tightened. Stop at this point and continue to tighten the three other screws in a crosswise manner.

14 Mind the correct orientation of the link plate and click it into place.



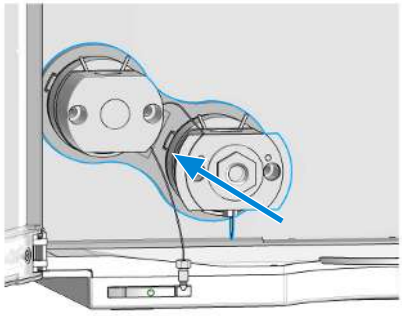
NOTE The pump head holder has a marker to illustrate the correct placement of the link plate. The link plate holds an identification tag that has to be placed onto the correct position to be readable by the pump.

15 Tighten the pump head screws with a torque wrench set to approx. 5 Nm in a crosswise manner.

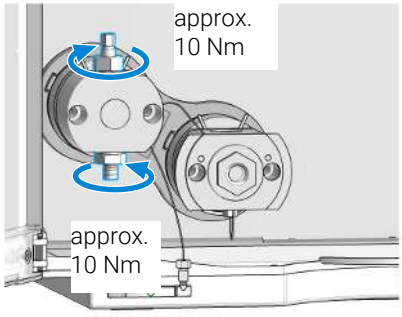


When the wrench clicks, the set torque is reached. Do not overtighten the screws.

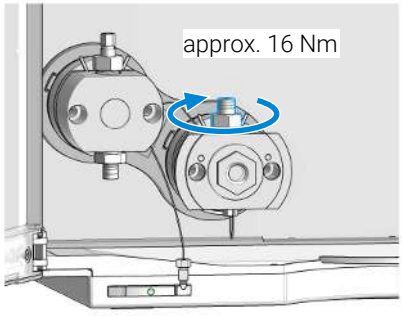
16 Mount the pump head to the module. Do not fix the screws at this stage!



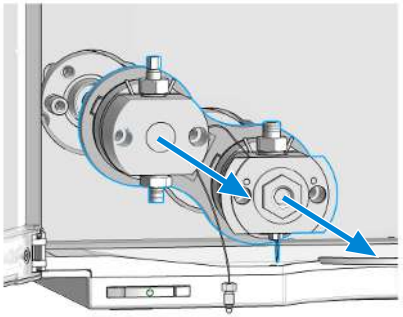
17 Screw in the inlet valve and the outlet valve and fix them with a torque wrench set to approximately 10 Nm.



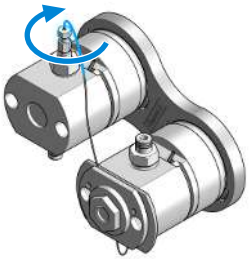
18 Binary/High-Speed Pumps only: Screw in the high-pressure filter and fix it with a torque wrench set to approximately 16 Nm.



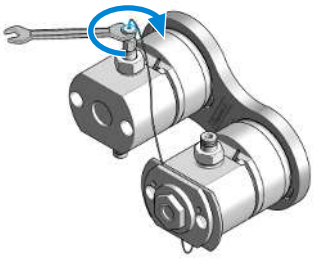
19 Remove the pump head from the module again.



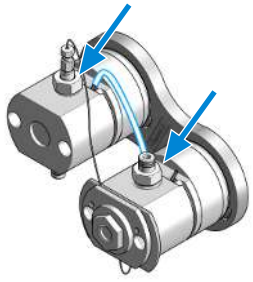
20 Seat the heat exchanger capillary back into the outlet valve.



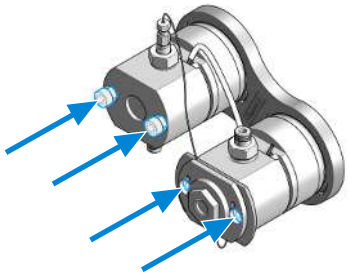
21 Counter the outlet valve at the top with a 1/4 inch wrench while reconnecting the heat exchanger capillary with another 1/4 inch wrench.



22 Attach the seal wash tubing interconnecting the two pump heads.



23 Insert the screws that later fix the pump head assembly to the module housing.



Install the Pump Head Assembly (G7120A)

Tools required

Qty.	p/n	Description
1	G7120-68708	InfinityLab System Tool kit
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	G4220-20013	4 mm hex bit
1	G4220-20015	Adapter ¼ in square to hex

1 Bring the pump drive to the maintenance position using the Lab Advisor user interface: Go to **Service & Diagnostics** > **Remove/Install Pump Head** and follow instructions given on the screen. Both pump drives must be retracted.

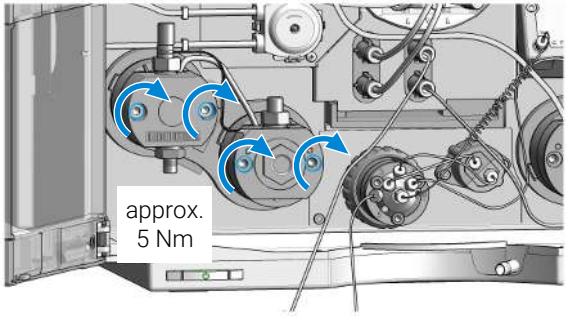
CAUTION

Damage to the pump head

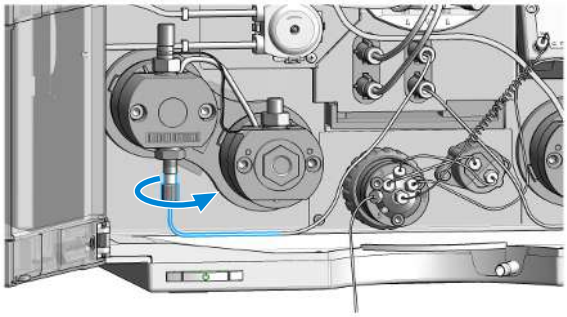
Using a wrong torque will damage the pump head.

— For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.

2 Install the pump head assembly by tightening the screws step by step to approx. 5 Nm.



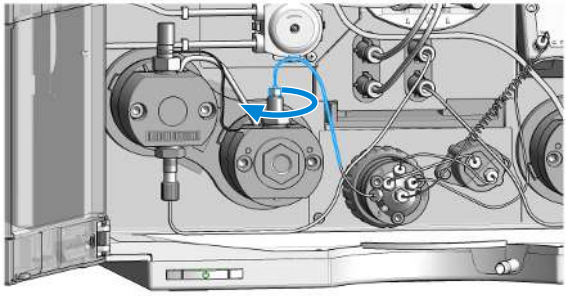
3 Connect the degassing unit outlet to the inlet of the primary pump head.



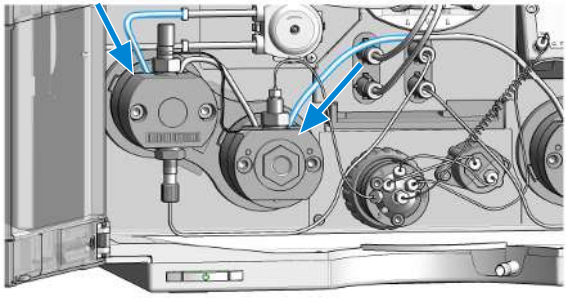
4 Connect the outlet of the secondary pump head to the inlet of the purge valve.

NOTE

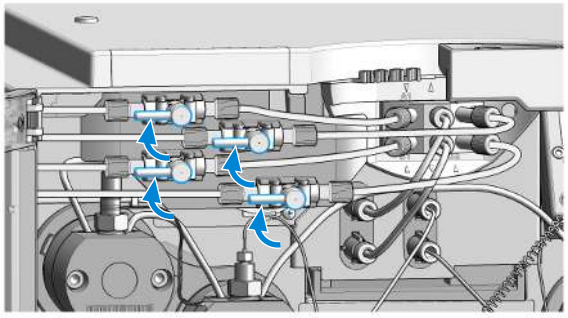
Channel A (left pump head assembly) is connected to port 4, channel B (right pump head assembly) to port 1 of the purge valve.



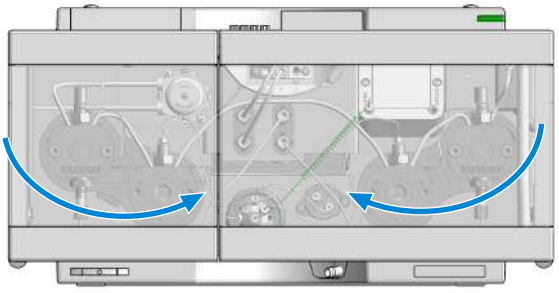
5 Reinstall the seal wash tubes.



6 Open the shutoff valves (if present) or put down solvent filters inside solvent bottles to enable solvent flow again.



7 Close the doors.



8 Perform a Pump Leak Rate Test.

Install the Pump Head Assembly (G7132A)

BIO

For biocompatible modules use bio / biocompatible parts only!

Do not mix with bio-inert parts.

Tools required

Qty.	p/n	Description
1	G7120-68708	InfinityLab System Tool kit
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	G4220-20013	4 mm hex bit
1	G4220-20015	Adapter ¼ in square to hex

1 Bring the pump drive to the maintenance position using the Lab Advisor user interface: Go to **Service & Diagnostics** > **Remove/Install Pump Head** and follow instructions given on the screen. Both pump drives must be retracted.

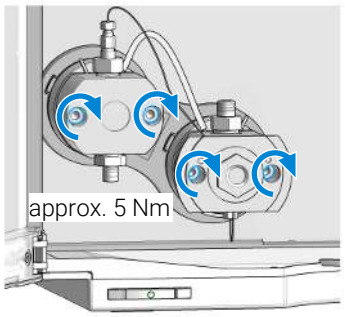
CAUTION

Damage to the pump head

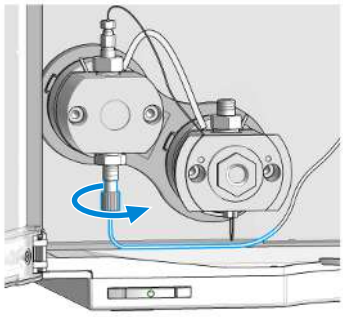
Using a wrong torque will damage the pump head.

— For handling the torque wrench, setting and applying the right torque, consult the manual of your torque wrench.

2 Install the pump head assembly by tightening the screws step by step to approx. 5 Nm.



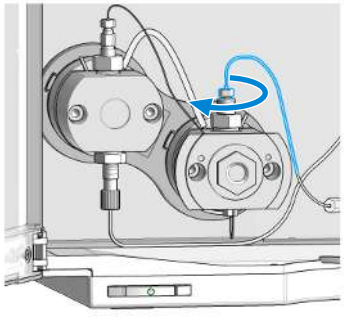
3 Connect the degassing unit outlet to the inlet of the primary pump head.



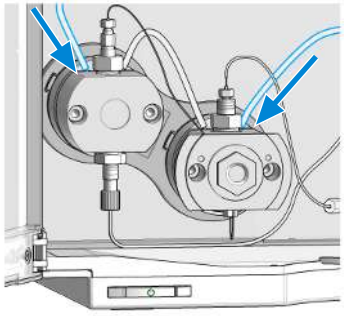
4 Connect the outlet of the secondary pump head to the inlet of the purge valve.

NOTE

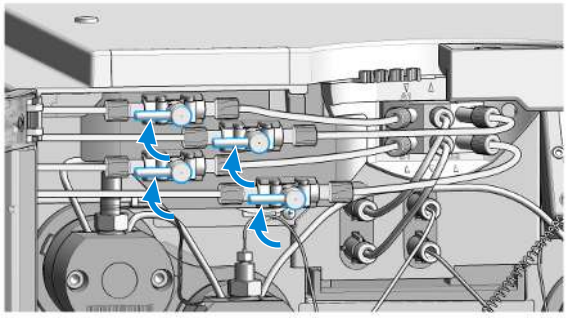
Channel A (left pump head assembly) is connected to port 4, channel B (right pump head assembly) to port 1 of the purge valve.



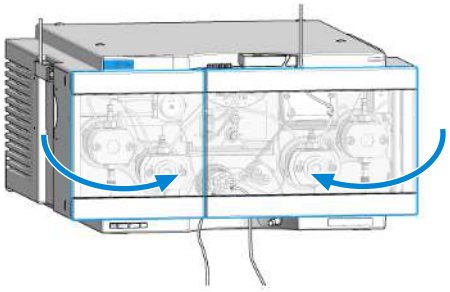
5 Replace the sealwash tubes.



6 Open the shutoff valves (if present) or put down solvent filters inside solvent bottles to enable solvent flow again.



7 Close the doors.



8 Perform a Pump Leak Rate Test.

Replace the Outlet Valve (G7120A)

When

- If Outlet valve is defective.

Tools required

Qty.	p/n	Description
1	8710-0510	Open-end wrench 1/4-5/16 inch
1		Open-end wrench 14 mm

Parts required

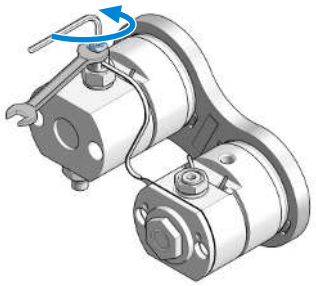
Qty.	p/n	Description
1	G4220-60028	Oulet valve (primary pump head), **OR**
1	G7120-60028	Outlet Valve, gold-reduced (PFAS-optimized primary pump head)
1	G4220-20020	Internal gold seal for Outlet Valve

Prerequisites

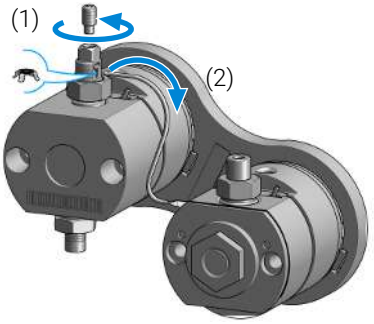
- Remove the pump head assembly.

1 Remove the cap from the outlet valve.

2 Counter the outlet valve with a 1/4 inch wrench while opening the lock screw of the heat exchanger with an L-shaped T10 Torx Key.

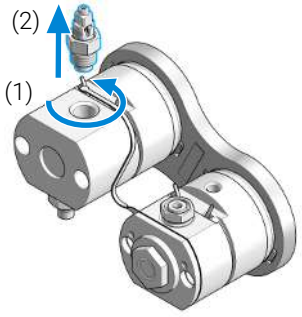


3 Remove the heat exchanger capillary by pushing the connector up and pulling it out of the valve.

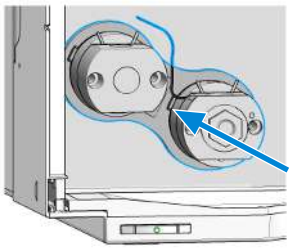


NOTE A gold seal between outlet valve and heat exchanger capillary is used for a tight connection.

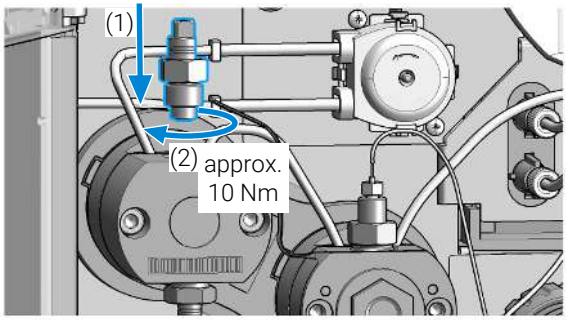
4 Unscrew the outlet valve with a 14 mm wrench (1) and remove it (2).



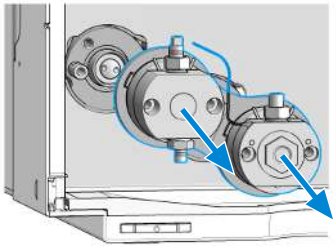
5 Mount the pump head to the module. Do not fix the screws at this stage!



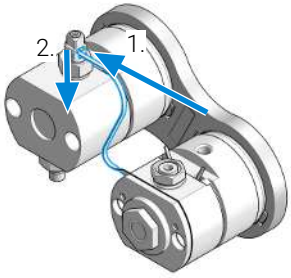
6 Insert the outlet valve into the pump head (1). Using a torque wrench, set approx. 10 Nm and close the outlet valve (2).



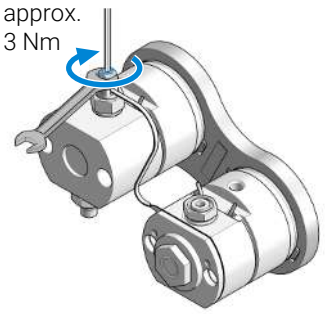
7 Remove the pump head from the module again.



8 Position the entrance slit for the heat exchanger capillary to face exactly to it, and then seat the heat exchanger capillary back into the outlet valve by moving it into the valve and pressing it down.



9 Counter the outlet valve and tighten the lock screw of the heat exchanger capillary with a torque wrench set to approx. 3 Nm.



10 Place the cap on the Outlet Valve.

11 Install the pump head assembly, reconnect all hydraulic connections, and power up the pump.

12 Open the shutoff valves (if present) or put down solvent filters inside solvent bottles to enable solvent flow again and purge the system to remove air.

Replace the Outlet Valve (G7132A)

When

- If Outlet valve is defective.

Tools required

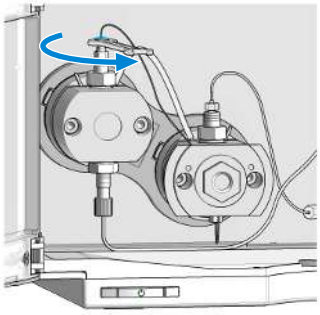
Qty.	p/n	Description
2	8710-0510	Open-end wrench 1/4-5/16 inch
1		Open-end wrench 14 mm

Parts required

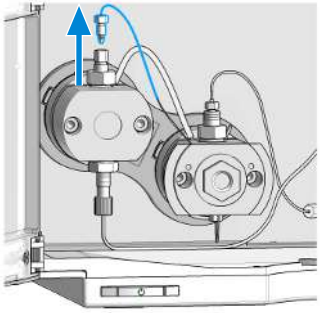
Qty.	p/n	Description
1	G7131-60028	Outlet Valve biocompatible

1 Close the shut off valves (if present) or lift up solvent filters inside solvent bottles to avoid solvent leaks.

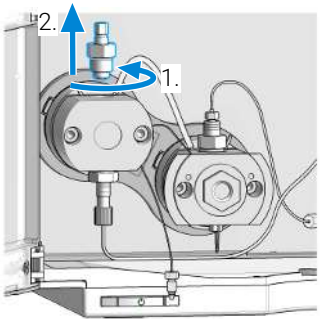
2 Counter the outlet valve at the top with a 1/4 inch wrench while opening the heat exchanger capillary with another 1/4 inch wrench.



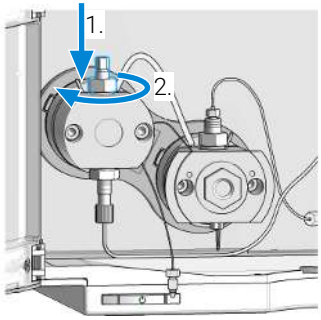
3 Remove the heat exchanger capillary from the outlet valve.



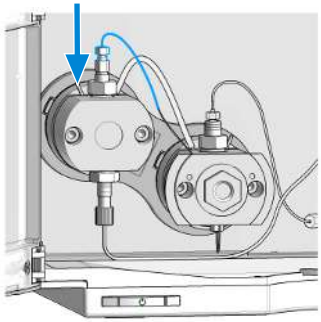
4 Unscrew the outlet valve with a 14 mm wrench (1) and remove it (2).



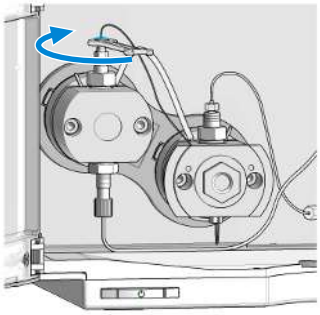
5 Insert the outlet valve into the pump head (1). Using a torque wrench, set approx. 10 Nm and close the outlet valve (2).



6 Seat the heat exchanger capillary back into the outlet valve.



7 Counter the outlet valve with a 1/4 inch wrench while reconnecting the heat exchanger capillary with another 1/4 inch wrench.



8 Reconnect all hydraulic connections, and power up the pump.

9 Open the shutoff valves (if present) or put down solvent filters inside solvent bottles to enable solvent flow again and purge the system to remove air.

Replace the Purge Valve Head

When

- In case of problems with the purge valve

Parts required

Qty.	p/n	Description
1	5067-4236	Purge valve head
1	5067-4655	Capillary ST 0.25 mm x 250 mm
1	G4220-87000	Capillary ST 0.17 mm x 350 mm
1	01090-87308	Capillary ST 0.25 mm x 130 mm
1	5067-6736	Biocompatible purge valve head
1	5500-1420	Biocompatible capillary MP35N 0.25 mm x 250 mm
1	G7132-60002	Biocompatible capillary MP35N 0.17 mm x 350 mm
1	5500-1421	Biocompatible capillary MP35N 0.25 mm x 130 mm

Prerequisites

- Remove all capillary connections to the purge valve

CAUTION

Potential damage of valve head or malfunction of valve

When the pump is switched on, the valve tag is accessed (read/write) and used for correctly positioning the valve.

If the valve head is replaced while the pump is on, invalid information may be written to the valve head making it unusable, or positioning may be wrong resulting in wrong flow connections inside the valve potentially damaging parts.

— Switch off the pump before working on the purge valve.

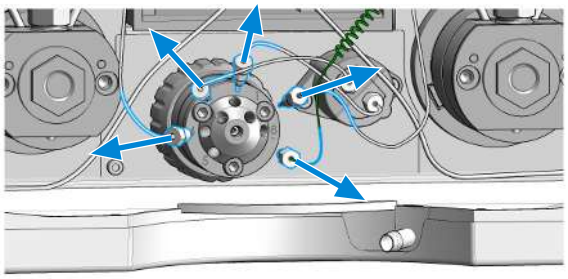
CAUTION

Bias measurement results

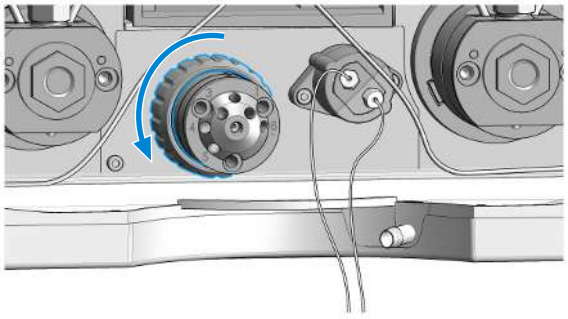
The valve drive contains sensitive optical parts. Pollution of these parts can impair the accurate selection of valve ports and therefore bias measurement results.

— Protect the optical parts from dust and other pollutions.

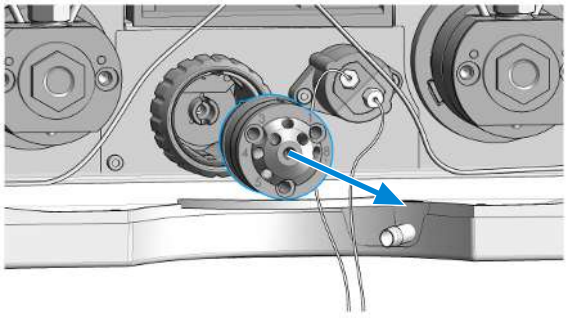
1 Remove all capillary connections.



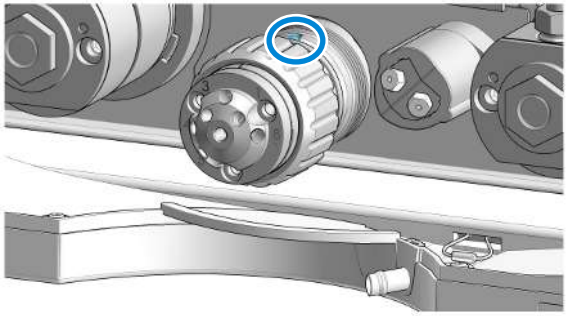
2 Unscrew the black union nut.



3 Remove the head of the purge valve by pulling it to the front.

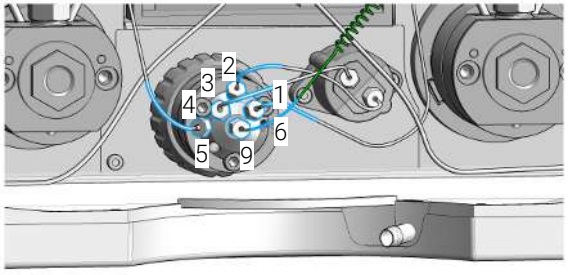


4 Put the new valve head onto the valve drive such that the lobe fits to the groove. Screw the valve head onto the valve drive using the union nut.



5 Install all flow connections:

- Port 1: Channel B
- Port 2: Pressure sensor, out
- Port 3: Pressure sensor, in
- Port 4: Channel A
- Ports 5 and 6: Waste capillaries, channels A and B
- Port 9: Central port, connected to the Jet Weaver inlet

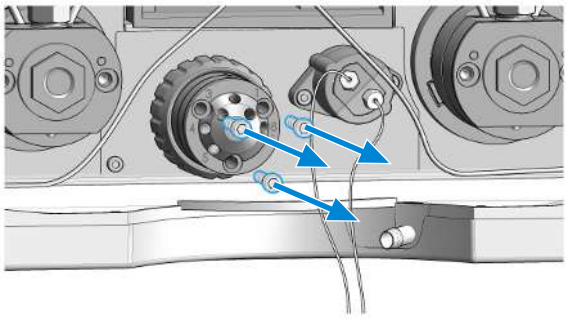


Replace Parts of the Purge Valve Head

Prerequisites

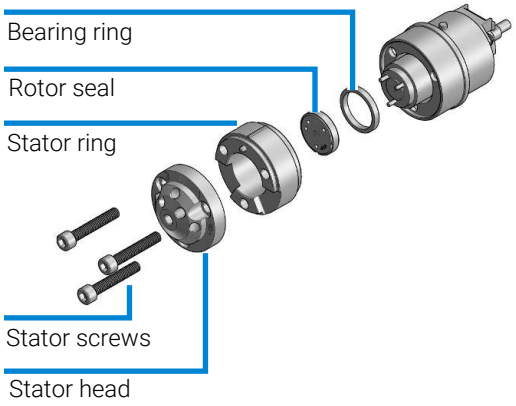
- Remove all capillary connections from the purge valve head.

1 Use the 9/64 inch hex key for opening the valve head.

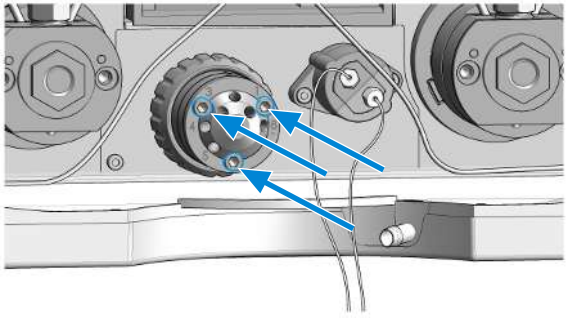


2 Replace parts as required.

3 Reassemble the valve head and mount it to the valve drive.



4 Fix the valve head with the screws.



Replace Parts of the High-Pressure Filter Assembly (G7120A)

When

- For removing blockages and repairing leaks in the high-pressure filter assembly. The filter frit in the outlet valve should be replaced regularly depending on the system usage.

Tools required

Qty.	p/n	Description
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	8710-0510	Open-end wrench 1/4-5/16 inch

Parts required

Qty.	p/n	Description
1	5067-4728	Seal cap assembly
1	01018-22707	PTFE Frit (5/Pk)

CAUTION

Leakage or damaged connection

Opening the outlet of the primary pump head may cause leaks or damage the connection between the pump heads.

— Do not open the outlet of the primary pump head.

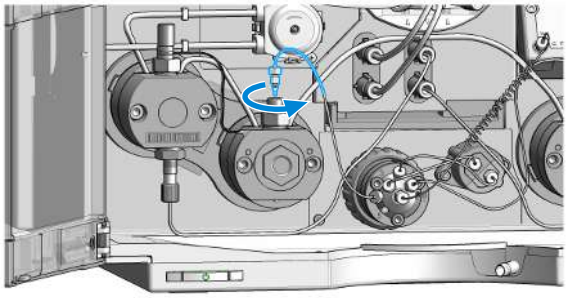
NOTE

This procedure describes replacements for channel A (left pump head assembly) and can be applied accordingly to channel B. In both cases, maintenance is done only at the secondary pump head outlet, which hosts the filter frit.

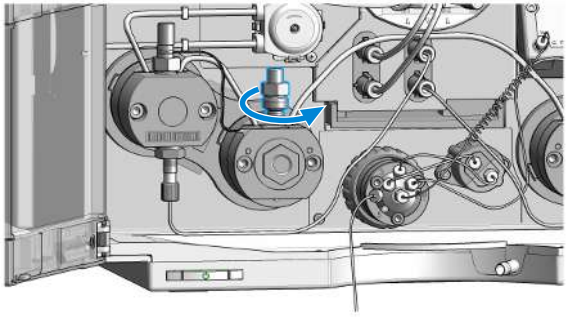
NOTE

This procedure is not applicable to the G7120A PFAS-analysis option. The PTFE filters are removed from the flow path and pump head adapters are used in place of the PTFE filter holders. Filtering function is performed by InfinityLab Quick Change inline filter assembly located between the purge valve outlet and the Jet Weaver inlet.

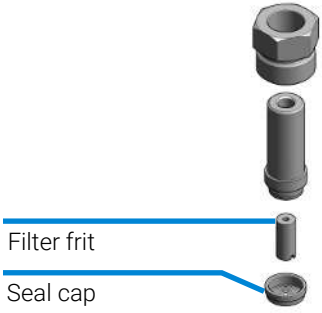
1 Remove the capillary connection from the outlet of the secondary pump head.



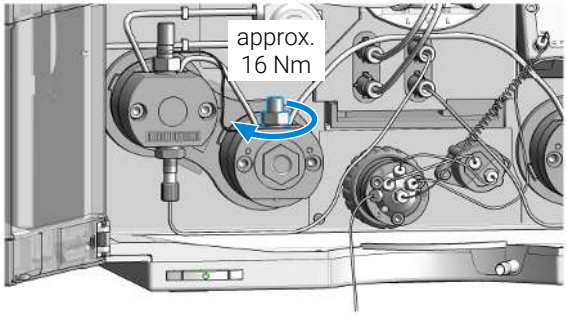
2 Use a 14 mm hex wrench for opening the filter assembly of the secondary pump head.



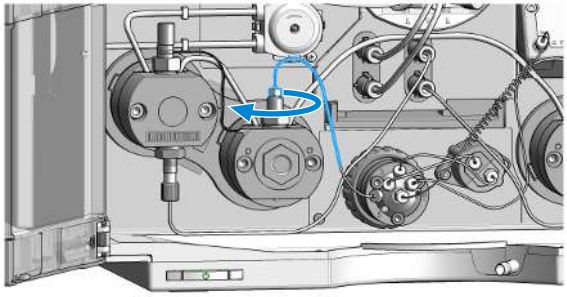
3 Replace the filter frit and seal cap as desired. Please note the correct orientation of the filter frit.



4 Re-install the filter assembly using the torque wrench (14 mm) set to approx. 16 Nm.



5 Reconnect the capillary from the purge valve to the high-pressure filter assembly.



Replace Parts of the High-Pressure Filter Assembly (G7132A)

When

- For removing blockages and repairing leaks in the high-pressure filter assembly. The filter frit in the outlet valve should be replaced regularly depending on the system usage.

Tools required

Qty.	p/n	Description
1	5067-5688	Torque wrench 1 - 25 Nm with 14 mm wrench
1	8710-0510	Open-end wrench 1/4-5/16 inch

Parts required

Qty.	p/n	Description
1	5067-4728	Seal cap assembly
1	01018-22707	PTFE Frit (5/Pk)

CAUTION

Leakage or damaged connection

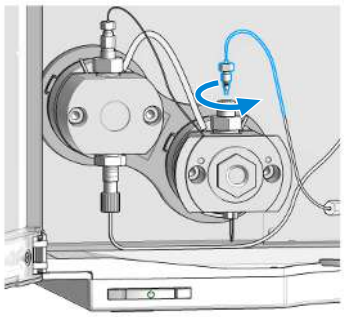
Opening the outlet of the primary pump head may cause leaks or damage the connection between the pump heads.

— Do not open the outlet of the primary pump head.

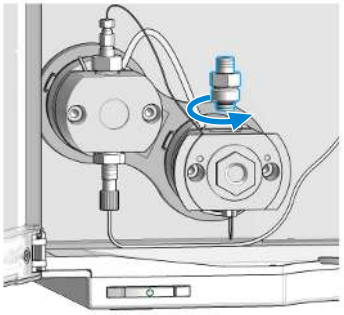
NOTE

This procedure describes replacements for channel A (left pump head assembly) and can be applied accordingly to channel B. In both cases, maintenance is done only at the secondary pump head outlet, which hosts the filter frit.

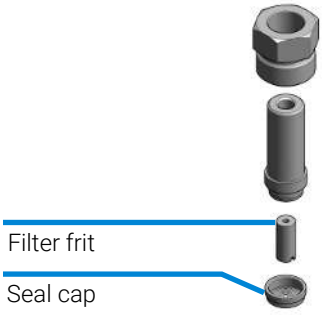
1 Remove the capillary connection from the outlet of the secondary pump head.



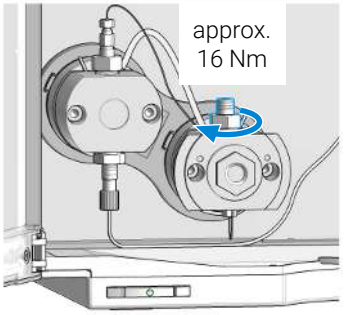
2 Use a 14 mm hex wrench for opening the filter assembly of the secondary pump head.



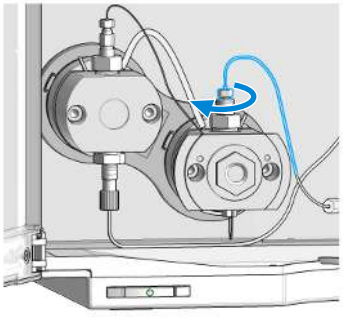
3 Replace the filter frit and seal cap as desired. Please note the correct orientation of the filter frit.



4 Reinstall the filter assembly using the torque wrench (14 mm hex bit) set to approx. 16 Nm.



5 Reconnect the capillary from the purge valve to the high-pressure filter assembly.



Replace the Seal Wash Sensor

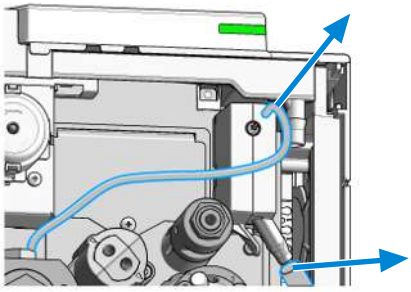
Parts required

Qty.	p/n	Description
1	5067-6172	Seal Wash Sensor Pre Assembly

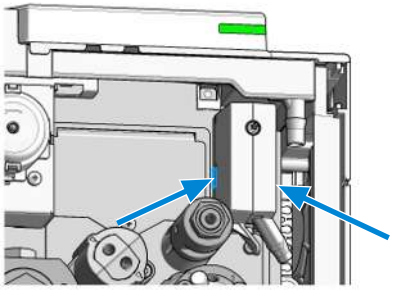
Prerequisites

- Shut-down the pump.
- Remove the seal wash tubing from the seal wash solvent bottle.

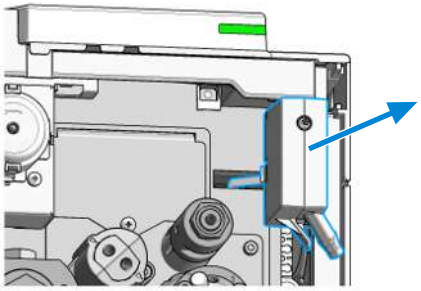
1 Remove the solvent inlet and outlet tubes from the seal wash sensor.



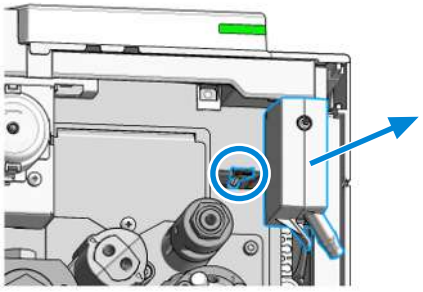
2 Press at the sides of the seal wash sensor.



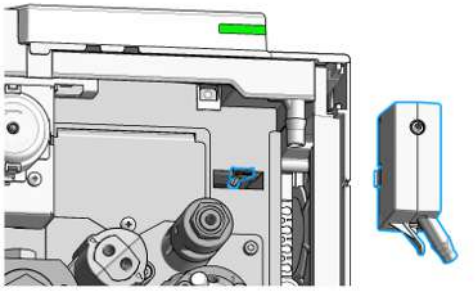
3 Remove the seal wash sensor from the module chassis.



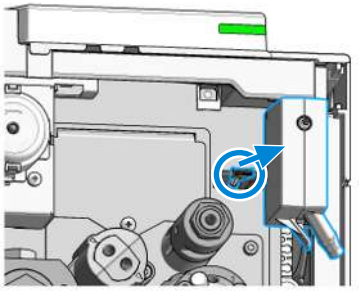
4 Remove the cable.



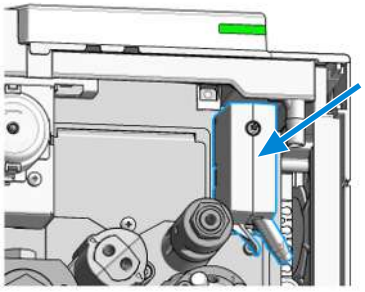
5 Remove the seal wash sensor completely.



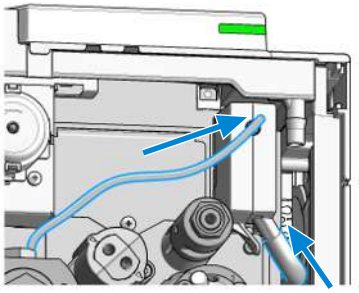
6 Connect the cable to the new seal wash sensor.



7 Install the new sensor to the module chassis.



8 Install the solvent inlet and outlet tubes to the seal wash sensor.



Replace the Module Firmware

When

Install a newer firmware

- It fixes known problems of older versions, or
- It introduces new features, or
- It ensures keeping all systems at the same (validated) revision

When

Install an older firmware

- It ensures keeping all systems at the same (validated) revision, or
- It ensures compatibility after adding a new module to the system, or
- A third-party control software requires a special version

Software required

- Agilent Lab Advisor software

Tools required

Qty.	p/n	Description
1		Firmware, tools and documentation from Agilent web site

Prerequisites

- For further information about minimum firmware requirements, firmware compatibilities and emulation for backward compatibility with specific software environments, please check the latest Firmware Bulletin.

To upgrade/downgrade the module's firmware carry out the following steps:

1 Download the required module firmware, the latest FW Update Tool and the documentation from the Agilent web.
https://www.agilent.com/en-us/firmwareDownload?whid=69761

2 For loading the firmware into the module follow the instructions in the documentation.

Prepare the Pump Module for Transport

When

- If the module shall be transported or shipped.

Parts required

Qty.	p/n	Description
1	9301-0411	Syringe, Plastic
1	9301-1337	Syringe adapter
1	G7120-44000	Protective Foam

Prerequisites

- Flush both solvent channels with isopropanol, see *Best Practices for Using an Agilent LC System Technical Note (InfinityLab-BestPractice-en-SD-29000194.pdf, SD-29000194)*.

WARNING

Heavy weight

The module is heavy.

- **Carry the module at least with 2 people.**
- **Avoid back strain or injury by following all precautions for lifting heavy objects.**
- **Ensure that the load is as close to your body as possible.**
- **Ensure that you can cope with the weight of your load.**

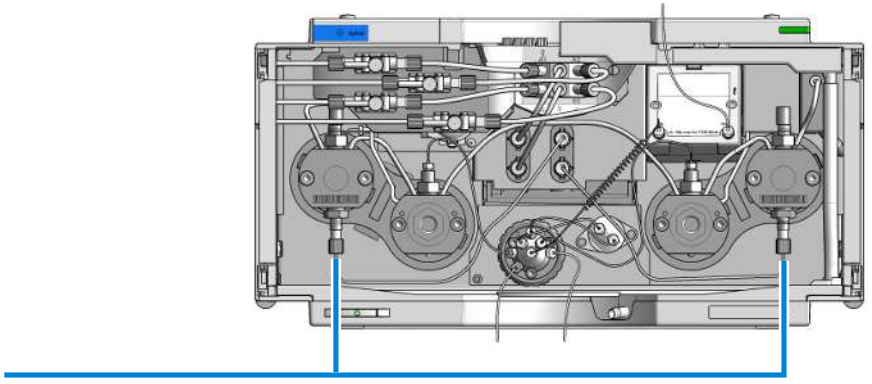
CAUTION

Mechanical damage

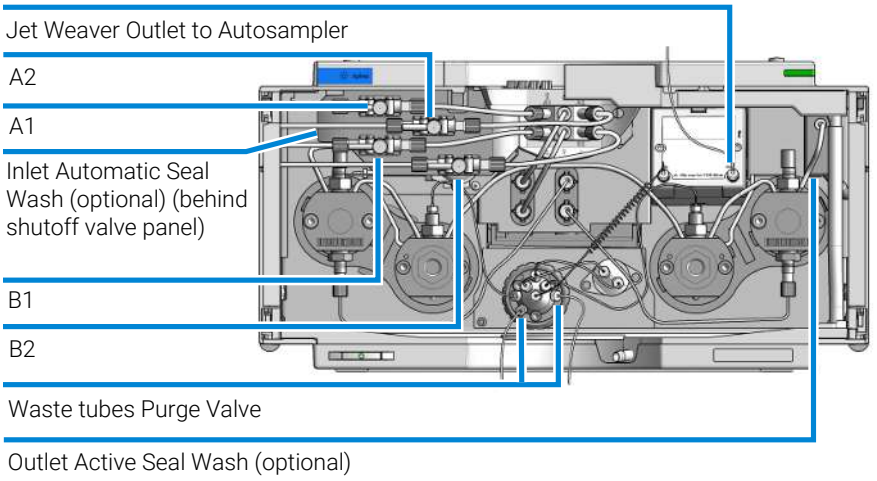
- For shipping the module, insert the Protective Foam to protect the module from mechanical damage.
- Be careful not to damage tubing or capillary connections while inserting the module in the Protective Foam.

1 Flush system with appropriate storage solution, for example 20 % isopropanol in water.

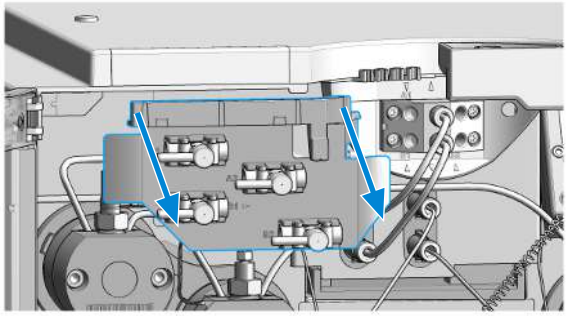
2 Remove solvent inlets from solvent reservoirs. Disconnect the solvent tubing from the inlet of primary pump heads for both solvent channels. Use a syringe for removing liquid from the solvent tubings between solvent reservoir, shutoff valve panel, solvent selection valve, degassing unit and pump inlets.



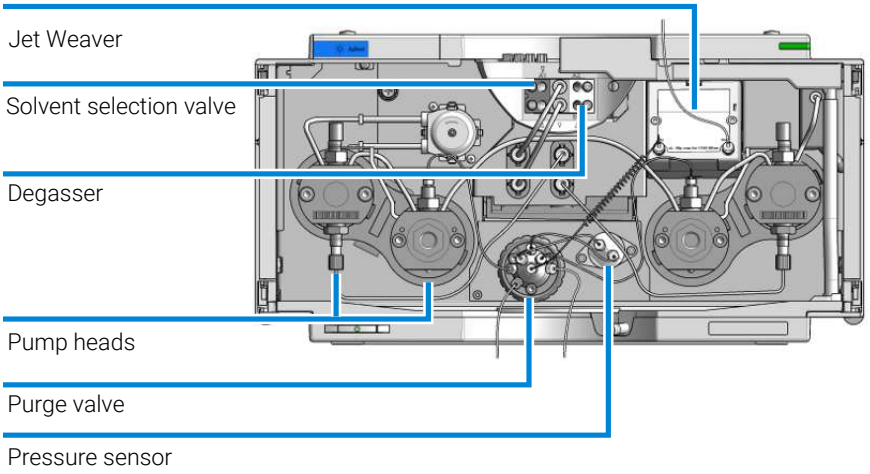
3 Remove tubing and capillary connections to other modules and the solvent cabinet.



4 Remove the shutoff valve panel by pulling it downwards.

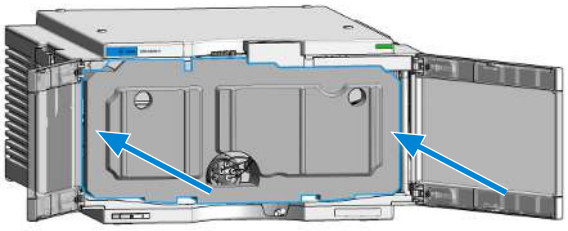


5 You may keep internal tubing and capillary connections.



6 Remove cable connections to other modules. Remove the module from the stack.

7 Carefully insert the Protective Foam to the front part of the instrument. Do not damage any tubing or capillary connections.



8 Close the front cover.

9 For transport or shipment, put the module and accessory kit in the original shipment box.

9 Parts and Materials for Maintenance

This chapter provides information on parts and materials for maintenance.

Main Assemblies of the 1290 Infinity III High-Speed Pump (G7120A) 278

Main Assemblies of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option 279

Main Assemblies of the 1290 Infinity III Bio High-Speed Pump (G7132A) 280

Flow Connections of the 1290 Infinity III High-Speed Pump (G7120A) 281

Flow Connections of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option 283

Flow Connections of the 1290 Infinity III Bio High-Speed Pump (G7132A) 285

Pump Heads of the 1290 Infinity III High-Speed Pump (G7120A) 287
Pump Head Assembly Parts 288
Primary Pump Head Parts 291
Secondary Pump Head Parts 292

Pump Heads of the 1290 Infinity III Bio High-Speed Pump (G7132A) 293
Pump Head Assembly Parts 293
Primary Pump Head Parts 295
Secondary Pump Head Parts 296

Purge Valve of the 1290 Infinity III High-Speed Pump (G7120A) 297

Purge Valve of the 1290 Infinity III Bio High-Speed Pump (G7132A) 298

Cover Parts 299

Accessory Kit of the 1290 Infinity III High-Speed Pump (G7120A) 300

Accessory Kit of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option 301

Accessory Kit of the 1290 Infinity III Bio High-Speed Pump (G7132A) 302

HPLC System Tool Kit 303

Main Assemblies of the 1290 Infinity III High-Speed Pump (G7120A)

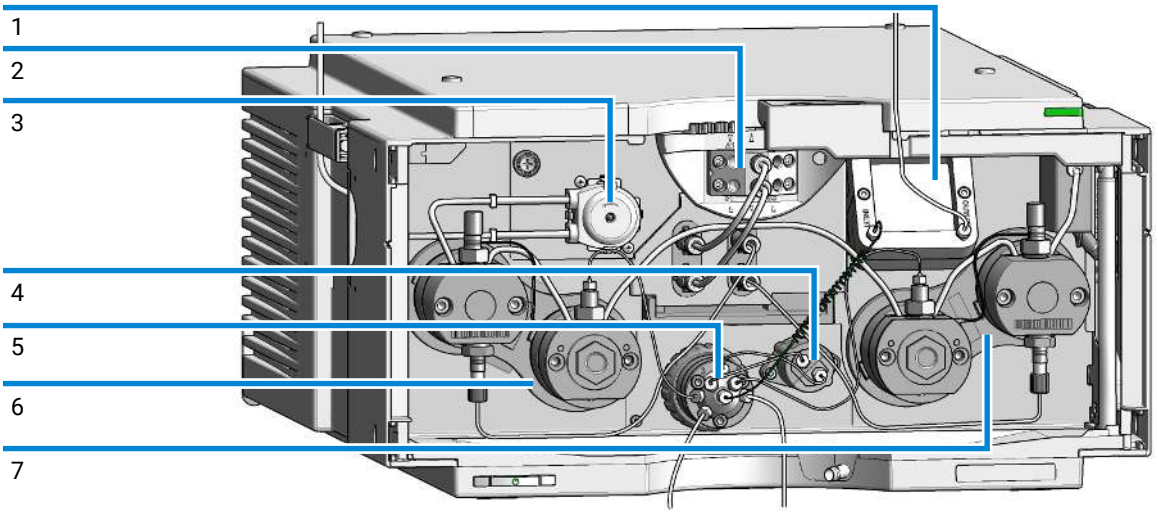


Figure 18: Overview of main assemblies (G7120A)

#	Qty.	p/n	Description
1	1	G7120-68135	Jet Weaver 35 µL/100 µL
1	1	G7120-68380	Jet Weaver 380 µL
2	1	G7120-60029	SSV Valve Assembly
3	1	5065-4445	Peristaltic pump cartridge
4	1	G7104-60001	Pressure sensor 1300 bar
5	1	5067-4236	Purge valve head
6	1	G4220-60350	Long Life Pump Head Channel A
7	1	G4220-60360	Long Life Pump Head Channel B

Main Assemblies of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option

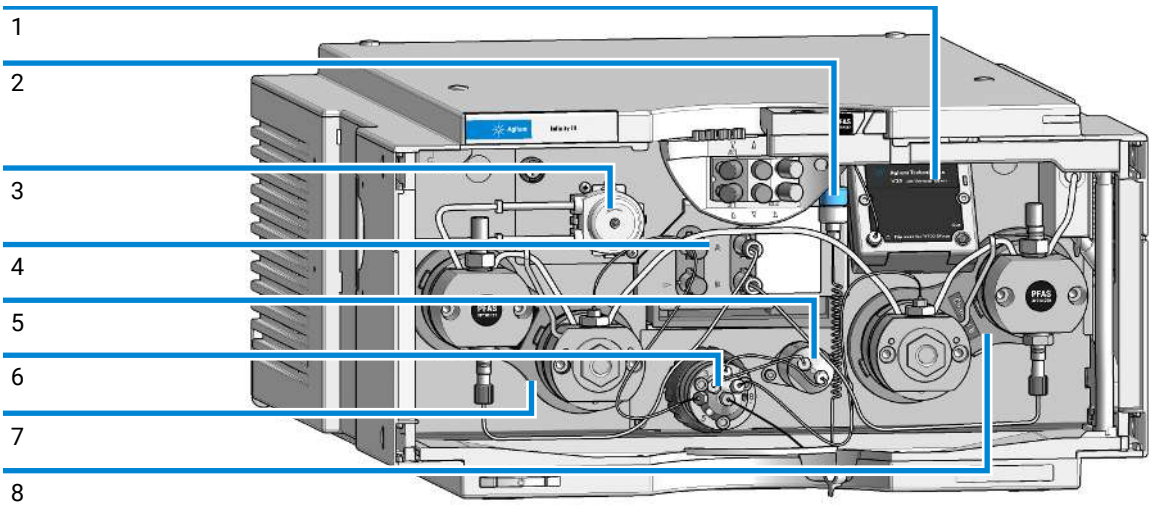


Figure 19: Overview of main assemblies (G7120A PFAS-analysis option)

#	Qty.	p/n	Description
1	1	G7120-68135	Jet Weaver 35 µL/100 µL
1	1	G7120-68380	Jet Weaver 380 µL
2	1	5067-1602	InfinityLab Quick Change inline filter assembly, material: stainless steel
3	1	5065-4445	Peristaltic pump cartridge
4	1	G4280-60070	Degassing unit
5	1	G7104-60001	Pressure sensor 1300 bar
6	1	5067-4236	Purge valve head
7	1	G7120-60350	Long Life Pump Head Channel A, PFAS-optimized
8	1	G7120-60360	Long Life Pump Head Channel B, PFAS-optimized

Main Assemblies of the 1290 Infinity III Bio High-Speed Pump (G7132A)

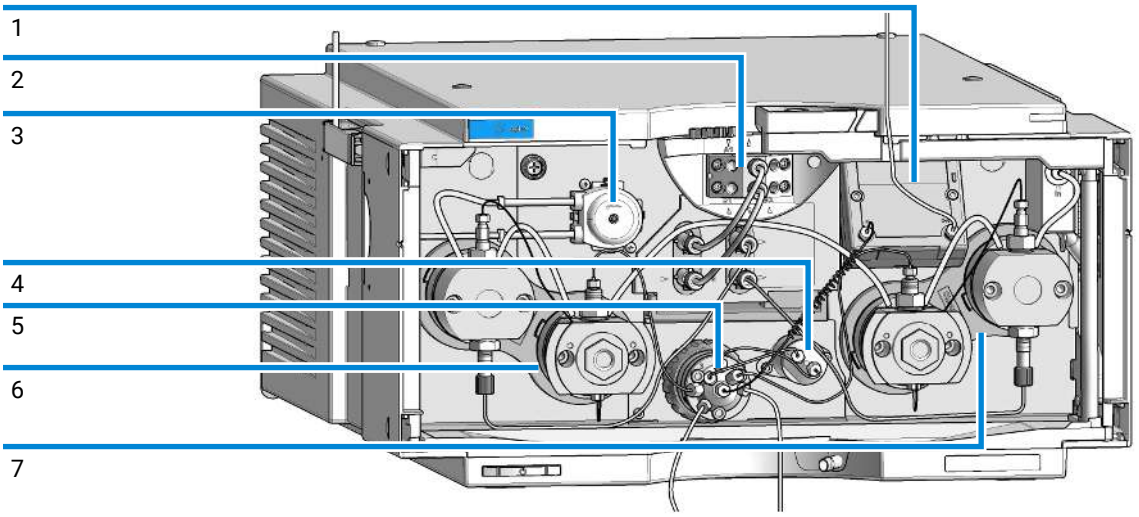


Figure 20: Overview of main assemblies (G7132A)

#	Qty.	p/n	Description
1	1	G7132-68135	Jet Weaver 35 µL/100 µL biocompatible
2	1	G7120-60029	SSV Valve Assembly
3	1	5065-4445	Peristaltic pump cartridge
4	1	5067-7010	Pressure sensor biocompatible 1300 bar
5	1	5067-6736	Biocompatible purge valve head
6	1	G4220-60350	Long Life Pump Head Channel A
7	1	G4220-60360	Long Life Pump Head Channel B

Flow Connections of the 1290 Infinity III High-Speed Pump (G7120A)

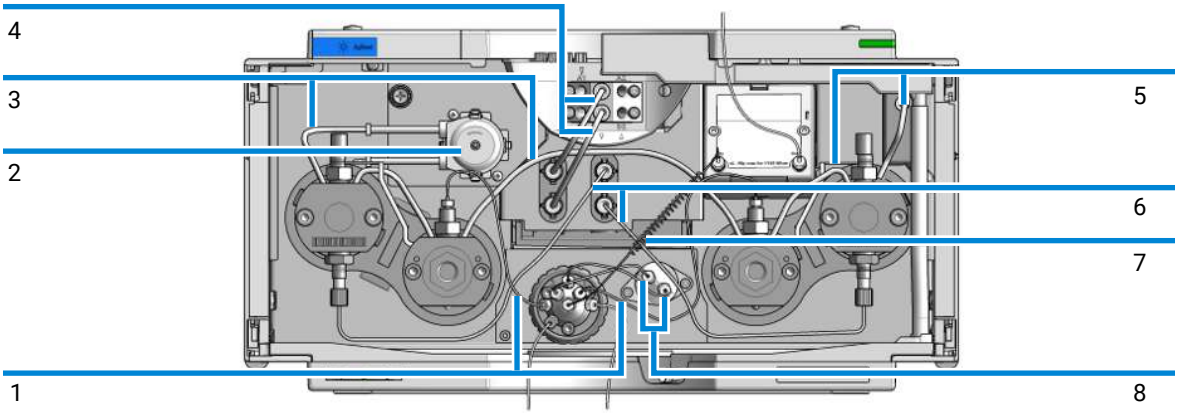


Figure 21: Flow connections of the High-Speed Pump (G7120A)

#	Qty.	p/n	Description
1	2	5067-4655	Capillary ST 0.25 mm x 250 mm purge valve to pump head assemblies channel A and B
2	1	5065-4445	Peristaltic pump cartridge
3, 5	1	5065-9978	Silicone tubing, 1 mm i.d., 3 mm o.d., 5 m, re-order number
4	2	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit
6	1	5067-4661	Tubing kit 270 mm, 2/pk
7	1	G4220-87000	Capillary ST 0.17 mm x 350 mm Valve to Jet Weaver
8	2	01090-87308	Capillary ST 0.25 mm x 130 mm purge valve to pressure sensor
	1	G7120-40004	Valve Holder Left (not shown)
	4	5067-4124	Shutoff valve (not shown)

#	Qty.	p/n	Description
	4	G7120-60007	Bottle Head Assembly, long (1730 mm) (not shown)
	1	G7120-68070	Ultra Clean Tubing Kit (includes bottle head assemblies and tubing connections within the pump)
	2	G4220-60070	Tubing Kit 140 mm - Ultra Clean Tubing (tubes from SSV to shutoff valve or degassing unit to MCGV)
	4	G7120-60017	Bottle Head Assembly, long (1730 mm), Ultra Clean Tubing (bottle heads and tubing to shutoff panel / degasser)
	1	5067-6871	Solvent Cabinet Kit (not shown)
	4	G7122-60007	Bottle Head Assembly, extra long (2280 mm) (not shown)
	1	G7122-68070	Ultra Clean Tubing Kit Extra Long (2280 mm) (includes bottle head assemblies and tubing connections within the pump)
	4	G7122-60017	Bottle Head Assembly, extra long (2280 mm), Ultra Clean Tubing (bottle heads and tubing to shutoff panel / degasser)

Flow Connections of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option

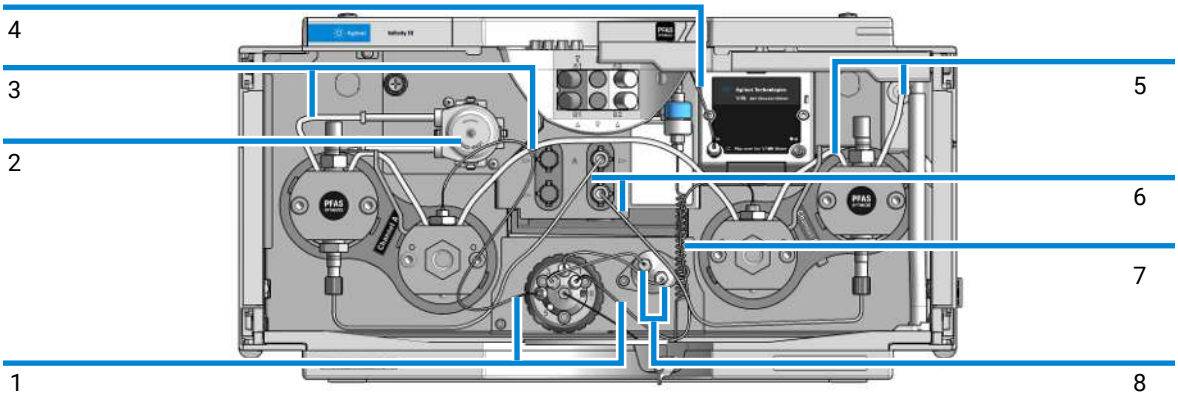


Figure 22: Flow connections of the High-Speed Pump (G7120A PFAS-analysis option)

#	Qty.	p/n	Description
1	2	5067-4655	Capillary ST 0.25 mm x 250 mm purge valve to pump head assemblies channel A and B
2	1	5065-4445	Peristaltic pump cartridge
3, 5	1	5065-9978	Silicone tubing, 1 mm i.d., 3 mm o.d., 5 m, re-order number
4	1	5067-4748	Capillary ST, 0.17 mm x 90 mm Quick Change inline filter to Jet Weaver
6	1	5067-4661	Tubing kit 270 mm, 2/pk
7	1	G4220-87000	Capillary ST 0.17 mm x 350 mm Valve to Jet Weaver
8	2	01090-87308	Capillary ST 0.25 mm x 130 mm purge valve to pressure sensor
	2	5004-0004	PFC-free bottle head assembly, tubing material: polypropylene Bottle Head Assembly for PFAS analysis (not shown)

#	Qty.	p/n	Description
	1	5067-6167	InfinityLab Quick Connect Assy ST 0.17 mm x 150 mm Jet Weaver to delay column (not shown)
	1	5067-6871	Solvent Cabinet Kit (not shown)

Flow Connections of the 1290 Infinity III Bio High-Speed Pump (G7132A)

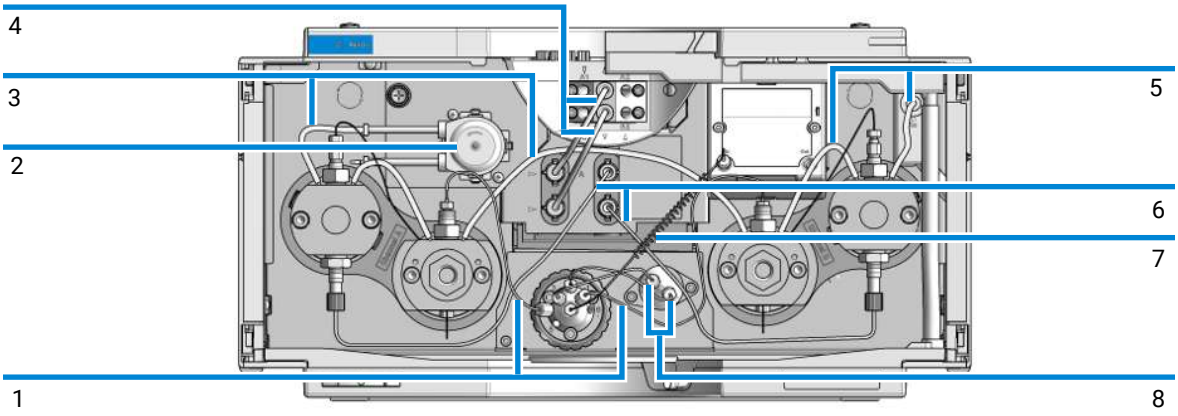


Figure 23: Flow connections of the Bio High-Speed Pump (G7132A)

#	Qty.	p/n	Description
1	2	5500-1420	Biocompatible capillary MP35N 0.25 mm x 250 mm purge valve to pump head assemblies channel A and B
2	1	5065-4445	Peristaltic pump cartridge
3, 5	1	5065-9978	Silicone tubing, 1 mm i.d., 3 mm o.d., 5 m, re-order number
4	2	G4220-60035	Tubing kit 140 mm, 2/pk SSV to shutoff valve or degassing unit
6	1	5067-4661	Tubing kit 270 mm, 2/pk
7	1	G7132-60002	Biocompatible capillary MP35N 0.17 mm x 350 mm Valve to Jet Weaver
8	2	5500-1421	Biocompatible capillary MP35N 0.25 mm x 130 mm purge valve to pressure sensor
	1	G7120-40004	Valve Holder Left (not shown)
	4	5067-4124	Shutoff valve (not shown)

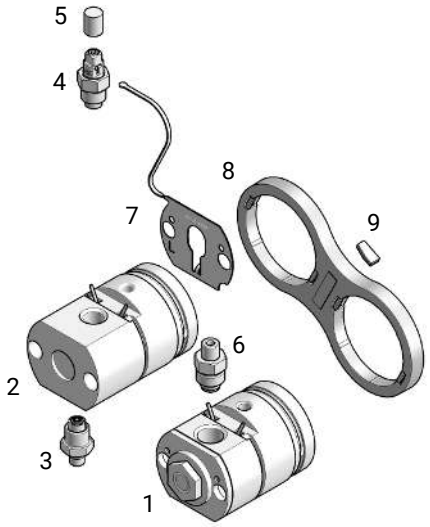
#	Qty.	p/n	Description
	4	G7120-60007	Bottle Head Assembly, long (1730 mm) (not shown)
	1	G7120-68070	Ultra Clean Tubing Kit (includes bottle head assemblies and tubing connections within the pump)
	2	G4220-60070	Tubing Kit 140 mm - Ultra Clean Tubing (tubes from SSV to shutoff valve or degassing unit to MCGV)
	4	G7120-60017	Bottle Head Assembly, long (1730 mm), Ultra Clean Tubing (bottle heads and tubing to shutoff panel / degasser)
	1	5067-6871	Solvent Cabinet Kit (not shown)
	4	G7122-60007	Bottle Head Assembly, extra long (2280 mm) (not shown)
	1	G7122-68070	Ultra Clean Tubing Kit Extra Long (2280 mm) (includes bottle head assemblies and tubing connections within the pump)
	4	G7122-60017	Bottle Head Assembly, extra long (2280 mm), Ultra Clean Tubing (bottle heads and tubing to shutoff panel / degasser)

Pump Heads of the 1290 Infinity III High-Speed Pump (G7120A)

The following pages contain parts information for Long Life Pump Heads.

For parts information on other pump head types, please refer to *Agilent 1290 Infinity II Easy Maintenance Pump Head Technical Note (1290IF-IF2_EM-PumpHead_TN.pdf, SD-29000158)* and to *Agilent 1290 Infinity Pump Head Maintenance Technical Note (1290IF_PumpHeadMaintenance_TN.pdf, SD-29000403)*.

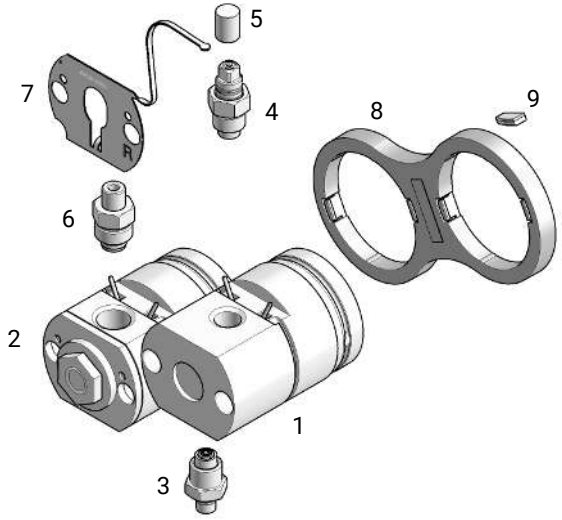
Pump Head Assembly Parts



G4220-60350 (Long Life Pump Head Channel A) , **OR**
G7120-60350 (Long Life Pump Head Channel A, PFAS-optimized)

#	p/n	Description
1	G4220-60660	Secondary Pump Head Assembly Pendulum (not orderable), **OR**
	G7120-60660	Secondary Pump Head Assembly Pendulum, gold-reduced (PFAS-optimized, not orderable)
2	G4220-60661	Primary Pump Head Assembly Pendulum (not orderable)
3	G4220-60022	Inlet valve (primary pump head), **OR**
3	G7120-60022	Inlet Valve, gold-reduced (PFAS-optimized primary pump head)
4	G4220-60028	Oulet valve (primary pump head), **OR**
4	G7120-60028	Outlet Valve, gold-reduced (PFAS-optimized primary pump head)
	G4220-20020	Internal gold seal for Outlet Valve (not shown)

#	p/n	Description
	5023-3119	Screw M5x10 Planar Front (not shown)
5	5042-9966	Cap Outlet Valve
6	G4280-60026	High-Pressure Filter Assembly (secondary pump head), **OR**
6	G1312-60001	Pump head adapter assembly, material: stainless steel (PFAS-optimized secondary pump head)
7	G4220-81013	Heat Exchanger Channel A
	5023-3119	Screw M5x10 Planar Front (not shown)
8	G4220-40001	Link Plate
9	0960-2971	RF Transponder

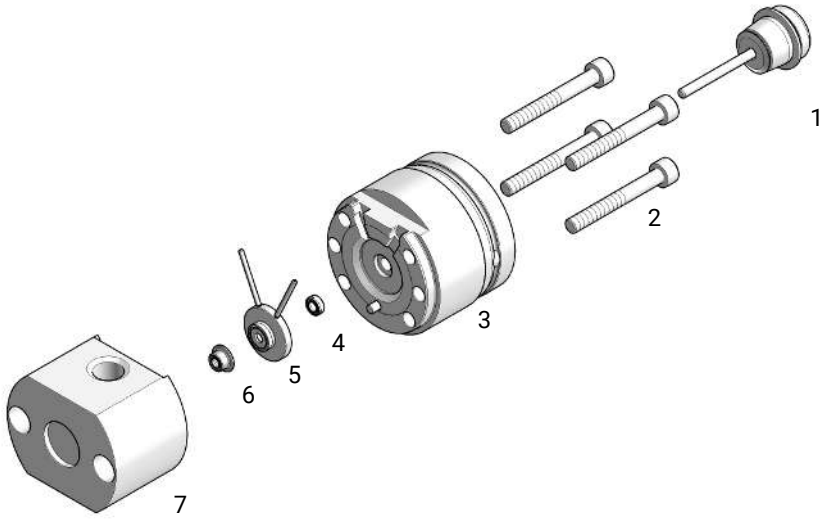


G4220-60360 (Long Life Pump Head Channel B) , **OR**
G7120-60360 (Long Life Pump Head Channel B, PFAS-optimized)

#	p/n	Description
1	G4220-60661	Primary Pump Head Assembly Pendulum (not orderable)

#	p/n	Description
2	G4220-60660	Secondary Pump Head Assembly Pendulum (not orderable), **OR**
	G7120-60660	Secondary Pump Head Assembly Pendulum, gold-reduced (PFAS-optimized, not orderable)
3	G4220-60022	Inlet valve (primary pump head), **OR**
3	G7120-60022	Inlet Valve, gold-reduced (PFAS-optimized primary pump head)
4	G4220-60028	Oulet valve (primary pump head), **OR**
4	G7120-60028	Outlet Valve, gold-reduced (PFAS-optimized primary pump head)
	G4220-20020	Internal gold seal for Outlet Valve (not shown)
	5023-3119	Screw M5x10 Planar Front (not shown)
5	5042-9966	Cap Outlet Valve
6	G4280-60026	High-Pressure Filter Assembly (secondary pump head), **OR**
6	G1312-60001	Pump head adapter assembly, material: stainless steel (PFAS-optimized secondary pump head)
7	G4220-81012	Heat Exchanger Channel B
	5023-3119	Screw M5x10 Planar Front (not shown)
8	G4220-40001	Link Plate
9	0960-2971	RF Transponder

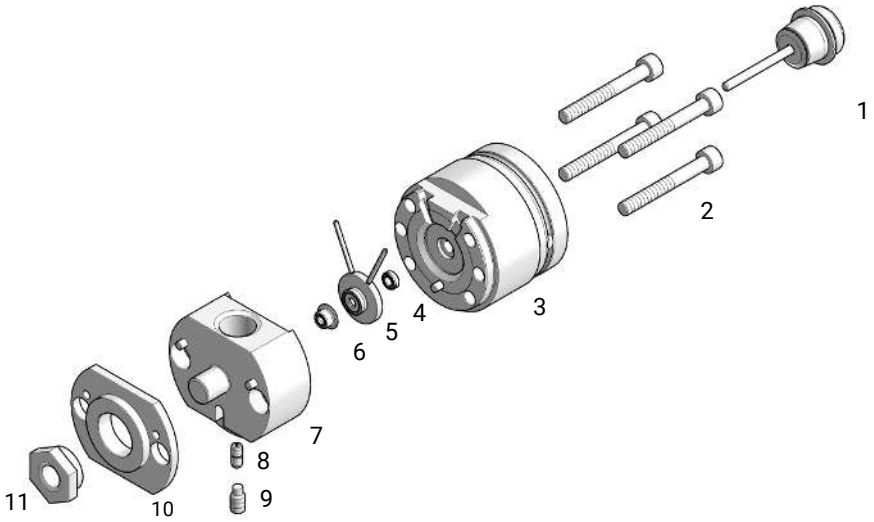
Primary Pump Head Parts



G4220-60661 (Primary Pump Head Assembly Pendulum)

#	p/n	Description
1	5067-5975	Plunger Assy ZrO2 LL
2	5810-0009	Screw M5x40 A4-80 Lubric Silver
3	G4220-60046	Preload-Support Assembly LL
4	0905-1175	Wash seal (PTFE)
5	G4220-60616	Seal Holder Integrated Assembly EM/LL
6	0905-1719	PE Seal
7	G4220-60533	Body Head Primary EM/LL

Secondary Pump Head Parts

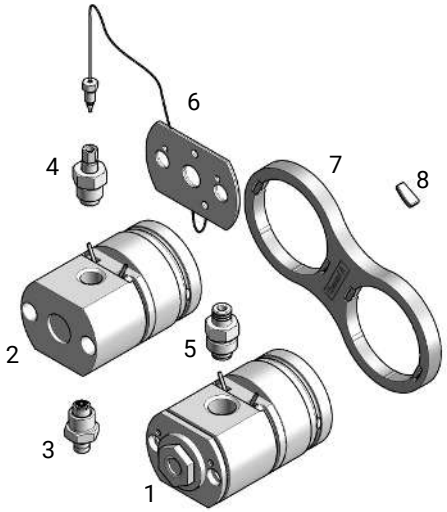


G4220-60660 (Secondary Pump Head Assembly Pendulum) , **OR**
G7120-60660 (Secondary Pump Head Assembly Pendulum, gold-reduced)

#	p/n	Description
1	5067-5975	Plunger Assy ZrO2 LL
2	5810-0009	Screw M5x40 A4-80 Lubric Silver
3	G4220-60046	Preload-Support Assembly LL
4	0905-1175	Wash seal (PTFE)
5	G4220-60616	Seal Holder Integrated Assembly EM/LL
6	0905-1719	PE Seal
7	G4220-25513	Body Head Secondary EM/LL
8	G4220-20001	Spacer Fitting, **OR**
8	G4220-20093	Spacer Fitting, gold-reduced
9	5023-3119	Screw M5x10 Planar Front
10	G4220-20000	LID
11	G4220-20003	Pump Head Screw

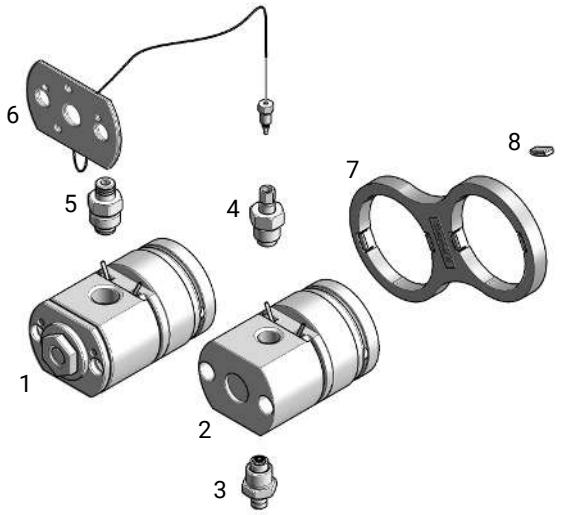
Pump Heads of the 1290 Infinity III Bio High-Speed Pump (G7132A)

Pump Head Assembly Parts



G7132-60350 (Biocompatible Pump Head Channel A)

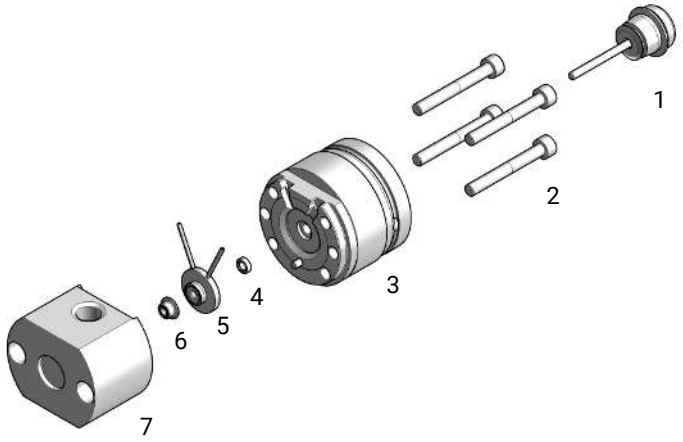
#	p/n	Description
1	G7132-60640	Secondary Pump Head Assembly biocompatible
2	G7131-60641	Primary Pump Head Assembly biocompatible
3	G7131-60021	Inlet Valve biocompatible (primary pump head)
4	G7131-60028	Outlet Valve biocompatible (primary pump head)
5	G7132-60026	High-Pressure Filter Assembly biocompatible (secondary pump head)
6	G7131-60005	Heat Exchanger for biocompatible Pump
7	G4220-40001	Link Plate
8	0960-2971	RF Transponder



G7132-60360 (Biocompatible Pump Head Channel B)

#	p/n	Description
1	G7132-60640	Secondary Pump Head Assembly biocompatible
2	G7131-60641	Primary Pump Head Assembly biocompatible
3	G7131-60021	Inlet Valve biocompatible (primary pump head)
4	G7131-60028	Outlet Valve biocompatible (primary pump head)
5	G7132-60026	High-Pressure Filter Assembly biocompatible (secondary pump head)
6	G7131-60005	Heat Exchanger for biocompatible Pump
7	G4220-40001	Link Plate
8	0960-2971	RF Transponder

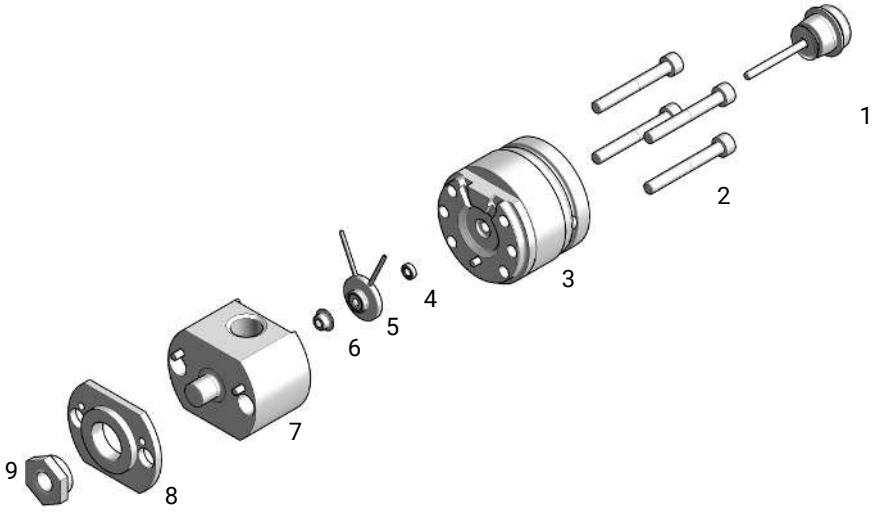
Primary Pump Head Parts



G7131-60641 (Primary Pump Head Assembly biocompatible)

#	p/n	Description
1	5067-5975	Plunger Assy ZrO2 LL
2	5810-0009	Screw M5x40 A4-80 Lubric Silver
3	G4220-60046	Preload-Support Assembly LL
4	0905-1731	Bio-Inert Wash Seal
5	G7131-60616	Seal Holder Integrated Assembly biocompatible
6	G7131-20009	Seal PE (Bio), 100 µL
7	G7131-60533	Body Head Primary biocompatible

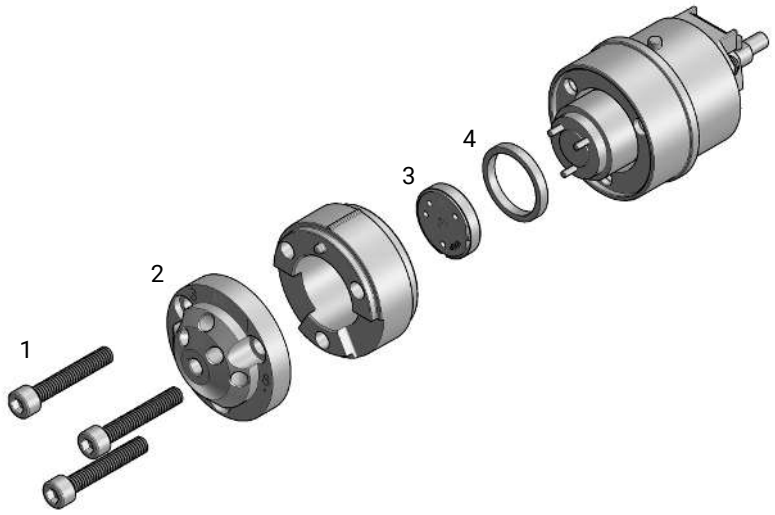
Secondary Pump Head Parts



G7132-60640 (Secondary Pump Head Assembly biocompatible)

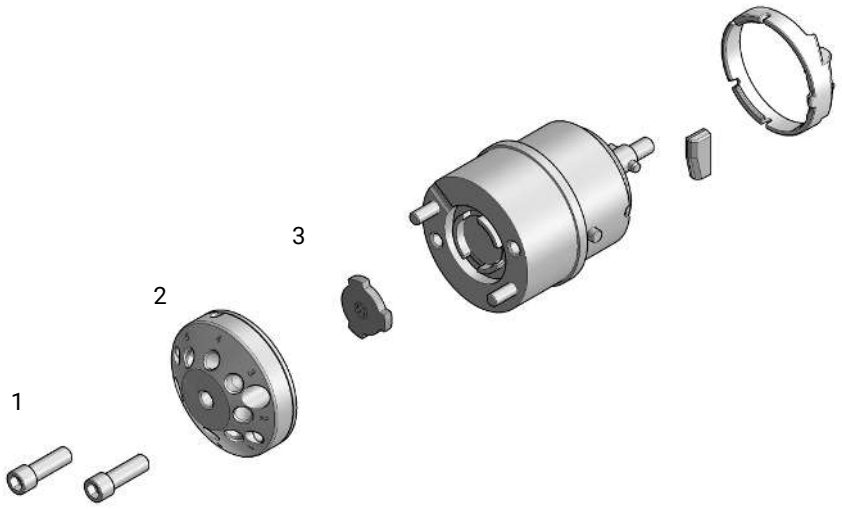
#	p/n	Description
1	5067-5975	Plunger Assy ZrO2 LL
2	5810-0009	Screw M5x40 A4-80 Lubric Silver
3	G4220-60046	Preload-Support Assembly LL
4	0905-1731	Bio-Inert Wash Seal
5	G7131-60616	Seal Holder Integrated Assembly biocompatible
6	G7131-20009	Seal PE (Bio), 100 µL
7	G7132-60000	Body Head Secondary biocompatible
8	G4220-20000	LID
9	G4220-20003	Pump Head Screw

Purge Valve of the 1290 Infinity III High-Speed Pump (G7120A)



#	p/n	Description
	5067-4236	Purge valve head
1	1535-4857	Stator screws, 10/pk
2	5068-0004	Purge Valve Stator
3	5068-0201	Purge Valve Rotor Seal, PEEK, 1300 bar
4	1535-4045	Rulon Bearing Ring

Purge Valve of the 1290 Infinity III Bio High-Speed Pump (G7132A)



#	p/n	Description
	5067-6736	Biocompatible purge valve head
1	5428-0006	Stator screws biocompatible
2	5068-0376	Purge Valve Stator Bio-Compatible
3	5068-0377	Purge Valve Rotor Seal, MP35N, 1300 bar biocompatible

Cover Parts

p/n	Description
G7120-68713	Infinity II & III Cabinet Kit 200 (including top, bottom, and side + 1260 and 1290 Name Plates)
5043-0856	Leak Adapter (not shown)
5004-3200	Door Kit Infinity III 200mm
5004-0200	Door Kit Infinity II 200mm

Accessory Kit of the 1290 Infinity III High-Speed Pump (G7120A)

G7120-68705 (Accessory kit) contains the following parts:

p/n	Description
G4220-67000	Waste Tubing with Fitting
5043-1013	Tubing Clip
5067-4124	Shutoff valve
5500-1246	Capillary ST 0.17 mm x 500 mm SI/SI
5181-1519	CAN cable, Agilent module to module, 1 m
5500-1155	Tube Connector, 90 degree, ID 6.4
9301-1337	Syringe adapter
9301-0411	Syringe, Plastic
G4220-60035	Tubing kit 140 mm, 2/pk
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6 mm/9 mm
5500-1156	T-Tube Connector ID6.4
5500-1169	Tubing connector, Y-shaped, ID 6.4 mm
5500-1217	Capillary, ST, 0.17 mm x 900 mm SI/SX
G7120-60005	Valve Holder left assembly
01200-90091	1290 Infinity Pump Quick Reference Sheet
5067-6197	Seal Handling Device
5043-1400	Pump Head Holder

Accessory Kit of the 1290 Infinity III High-Speed Pump (G7120A) PFAS-Analysis Option

G7120-68765 (Accessory kit) contains the following parts:

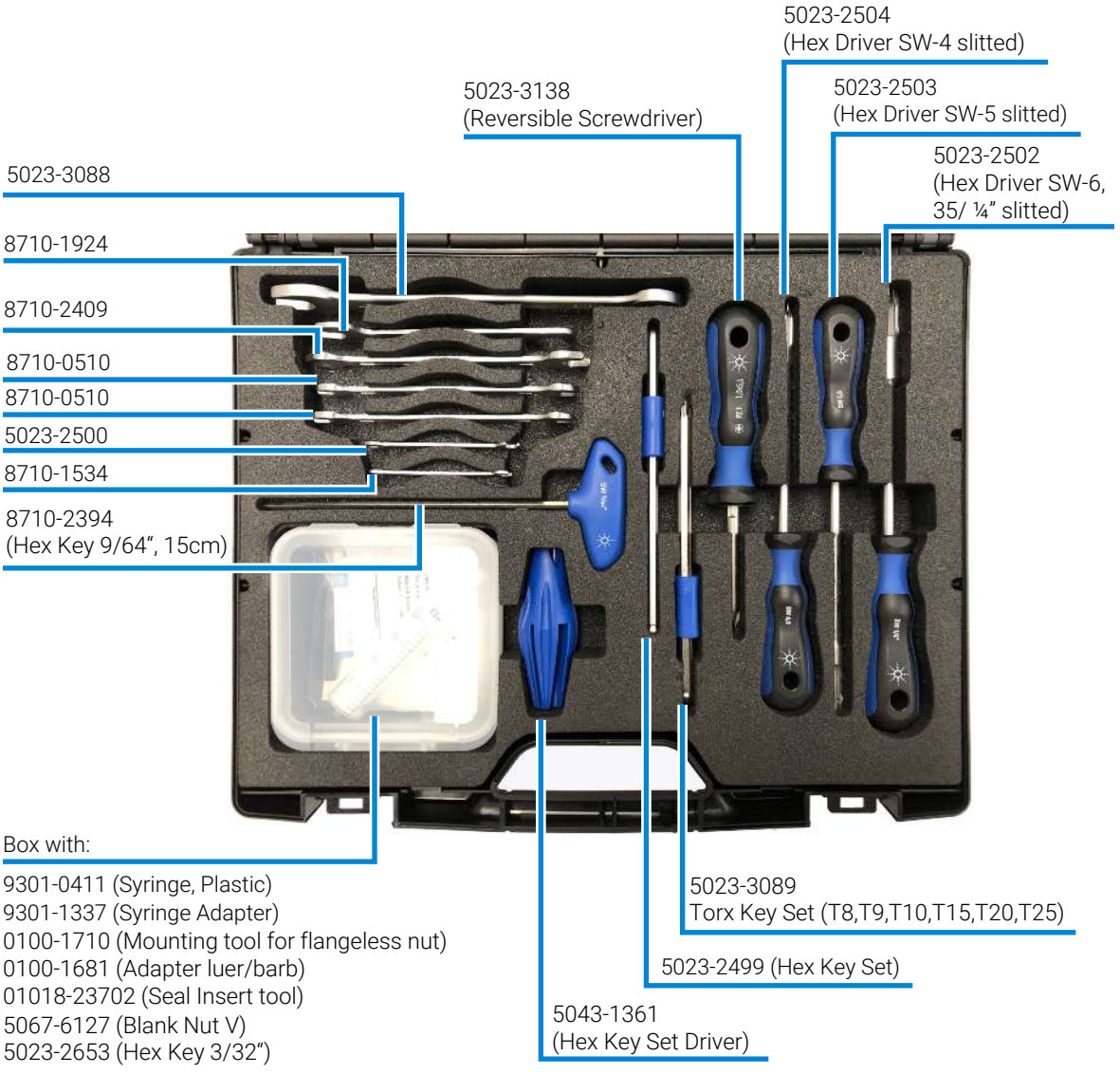
p/n	Description
G4220-67000	Waste Tubing with Fitting
5043-1013	Tubing Clip
5181-1519	CAN cable, Agilent module to module, 1 m
5500-1155	Tube Connector, 90 degree, ID 6.4
9301-1337	Syringe adapter
9301-0411	Syringe, Plastic
G4220-60035	Tubing kit 140 mm, 2/pk
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6 mm/9 mm
5500-1156	T-Tube Connector ID6.4
5500-1169	Tubing connector, Y-shaped, ID 6.4 mm
5500-1217	Capillary, ST, 0.17 mm x 900 mm SI/SX
01200-90091	1290 Infinity Pump Quick Reference Sheet
5067-6197	Seal Handling Device
5043-1400	Pump Head Holder
5022-2184	Union, stand LC flow, no fitting
5062-8100	InfinityLab PFC Delay Column, 4.6 × 30 mm
5067-1613	Quick Change Filter Disk, 4.6 mm id, frit 0.5 µm, 5/pk
5067-5965	InfinityLab Quick Connect LC fitting
5067-6167	InfinityLab Quick Connect Assy ST 0.17 mm x 150 mm
5432-0062	InfinityLab Cartridge Holder Clip
5500-1231	InfinityLab Capillary ST 0.17 mm x 500 mm

Accessory Kit of the 1290 Infinity III Bio High-Speed Pump (G7132A)

G7132-68705 (Accessory kit biocompatible) contains the following parts:

p/n	Description
G4220-67000	Waste Tubing with Fitting
5043-1013	Tubing Clip
5067-4124	Shutoff valve
5500-1419	Capillary MP35N 0.17 mm x 500 mm, SI/SI
5181-1519	CAN cable, Agilent module to module, 1 m
5500-1155	Tube Connector, 90 degree, ID 6.4
9301-1337	Syringe adapter
9301-0411	Syringe, Plastic
G4220-60035	Tubing kit 140 mm, 2/pk
5063-6527	Tubing, Silicon Rubber, 1.2 m, ID/OD 6 mm/9 mm
5500-1156	T-Tube Connector ID6.4
5500-1169	Tubing connector, Y-shaped, ID 6.4 mm
5500-1282	Biocompatible Capillary, MP35N, 0.17 mm x 900 mm SI/SX
G7120-60005	Valve Holder left assembly
01200-90091	1290 Infinity Pump Quick Reference Sheet
5067-6197	Seal Handling Device
G7132-42000	Bio Pump Head Holder

HPLC System Tool Kit



10 Identifying Cables

This chapter provides information on cables used with the modules.

Cable Overview 305

Analog Cables 307

Remote Cables 309

BCD Cables 313

CAN/LAN Cables 315

RS-232 Cables 316

USB 317

Cable Overview

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Analog cables

p/n	Description
35900-60750	Agilent 35900A A/D converter
01046-60105	Analog cable (BNC to general purpose, spade lugs)

Remote cables

p/n	Description
5188-8029	ERI to general purpose
5188-8044	Remote Cable ERI – ERI
5188-8045	Remote Cable APG – ERI
5188-8059	ERI-Extension-Cable 1.2 m
5061-3378	Remote Cable to 35900 A/D converter
01046-60201	Agilent module to general purpose
5188-8057	Fraction Collection ERI remote Y-cable

CAN cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

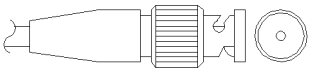
RS-232 cables

p/n	Description
RS232-61601	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It is also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

USB cables

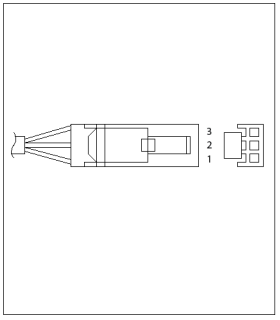
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

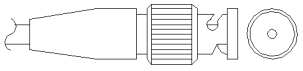


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

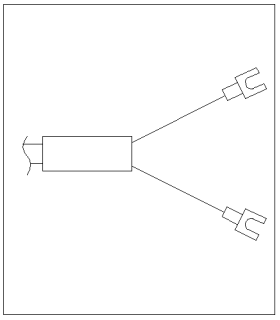
Agilent Module to 35900 A/D converters

p/n 35900-60750	35900	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

Agilent Module to BNC Connector

p/n 8120-1840	Pin BNC	Pin Agilent module	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

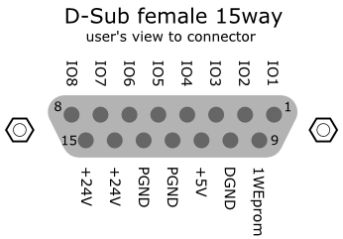
Agilent Module to General Purpose

p/n 01046-60105	Pin	Pin Agilent module	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables

ERI (Enhanced Remote Interface)

- 5188-8029 ERI to general purpose (D-Sub 15 pin male - open end)
- 5188-8044 ERI to ERI (D_Sub 15 pin male - male)
- 5188-8059 ERI-Extension-Cable 1.2 m (D-Sub15 pin male / female)



p/n 5188-8029	pin	Color code	Enhanced Remote	Classic Remote	Active (TTL)
	1	white	IO1	START REQUEST	Low
	2	brown	IO2	STOP	Low
	3	green	IO3	READY	High
	4	yellow	IO4	PEAK DETECT	Low
	5	grey	IO5	POWER ON	High
	6	pink	IO6	SHUT DOWN	Low
	7	blue	IO7	START	Low
	8	red	IO8	PREPARE	Low
	9	black	1wire DATA		
	10	violet	DGND		
	11	grey-pink	+5V ERI out		
	12	red-blue	PGND		
	13	white-green	PGND		
	14	brown-green	+24V ERI out		
	15	white-yellow	+24V ERI out		
	NC	yellow-brown			

NOTE Configuration is different with old firmware revisions.
The configuration for IO4 and IO5 is swapped for modules with firmware lower than D.07.10.

NOTE Peak Detection is used for LCMS systems connected with the Fraction Collection Remote Y-Cable (5188-8057).

- 5188-8045 ERI to APG (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG))

p/n 5188-8045	Pin (ERI)	Signal	Pin (APG)	Active (TTL)
	10	GND	1	
	1	Start Request	9	Low
	2	Stop	8	Low
	3	Ready	7	High
	5	Power on	6	High
	4	Future	5	
	6	Shut Down	4	Low
	7	Start	3	Low
	8	Prepare	2	Low
	Ground	Cable Shielding	NC	

- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

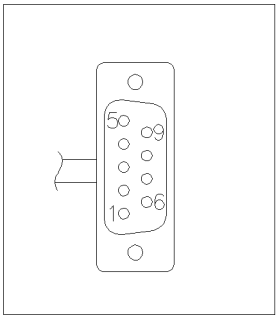
Table 16: 5188-8057 ERI to APG and RJ45

p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trigger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shielding	NC		

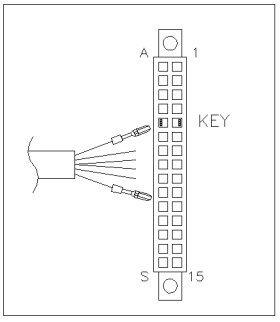


One end of these cables provides an Agilent Technologies APG (Auxiliary Port Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

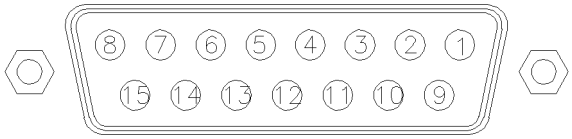
Agilent Module to Agilent 35900 A/D Converters

p/n 5061-3378	Pin 35900 A/D	Pin Agilent module	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent Module to General Purpose

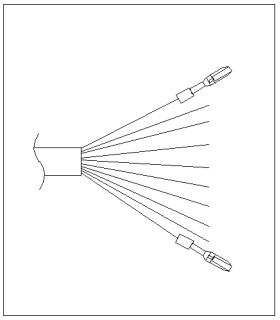
p/n 01046-60201	Wire Color	Pin Agilent module	Signal Name	Active (TTL)
	White	1	Digital ground	
	Brown	2	Prepare run	Low
	Gray	3	Start	Low
	Blue	4	Shut down	Low
	Pink	5	Not connected	
	Yellow	6	Power on	High
	Red	7	Ready	High
	Green	8	Stop	Low
	Black	9	Start request	Low

BCD Cables

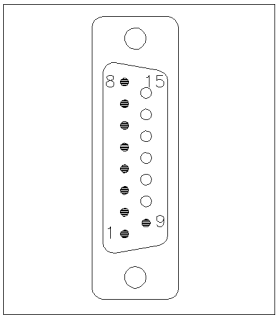


One end of these cables provides a 15-pin BCD connector to be connected to the Agilent modules. The other end depends on the instrument to be connected to

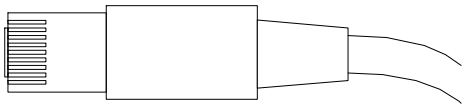
Agilent Module to General Purpose

p/n G1351-81600	Wire Color	Pin Agilent module	Signal Name	BCD Digit
	Green	1	BCD 5	20
	Violet	2	BCD 7	80
	Blue	3	BCD 6	40
	Yellow	4	BCD 4	10
	Black	5	BCD 0	1
	Orange	6	BCD 3	8
	Red	7	BCD 2	4
	Brown	8	BCD 1	2
	Gray	9	Digital ground	Gray
	Gray/pink	10	BCD 11	800
	Red/blue	11	BCD 10	400
	White/green	12	BCD 9	200
	Brown/green	13	BCD 8	100
	not connected	14		
	not connected	15	+ 5 V	Low

Agilent Module to 3396 Integrators

p/n 03396-60560	Pin 3396	Pin Agilent module	Signal Name	BCD Digit
	1	1	BCD 5	20
	2	2	BCD 7	80
	3	3	BCD 6	40
	4	4	BCD 4	10
	5	5	BCD0	1
	6	6	BCD 3	8
	7	7	BCD 2	4
	8	8	BCD 1	2
	9	9	Digital ground	
	NC	15	+ 5 V	Low

CAN/LAN Cables



Both ends of this cable provide a modular plug to be connected to Agilent modules CAN or LAN connectors.

Can Cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN Cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

RS-232 Cables

p/n	Description
RS232-61601	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It is also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

USB

To connect a USB Flash Drive use a USB OTG cable with Mini-B plug and A socket.

p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

11 Hardware Information

This chapter describes the module in more detail on hardware and electronics.

General Hardware Information 319
Firmware Description 319
Electrical Connections 322
Interfaces 324
Overview Interfaces 327
Instrument Layout 332
Early Maintenance Feedback (EMF) 333

Module-Specific Hardware Information 334
Setting the 8-bit Configuration Switch (On-Board LAN) 334

General Hardware Information

This section provides detailed hardware information on firmware that is valid for this module.

Firmware Description

The firmware of the instrument consists of two independent sections:

- a non-instrument specific section, called *resident system*
- an instrument specific section, called *main system*

Resident System

This resident section of the firmware is identical for all Agilent 1100/1200/1220/1260/1290 series modules. Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- memory management
- ability to update the firmware of the 'main system'

Main System

Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- memory management
- ability to update the firmware of the 'resident system'

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG/ERI remote,
- error handling,
- diagnostic functions,

- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.

Firmware Updates

Firmware updates can be done with the Agilent Lab Advisor software with files on the hard disk (latest version should be used).

Required tools, firmware and documentation are available from the Agilent web: https://www.agilent.com/en-us/firmwareDownload?whid=69761

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

- PPPP is the product number, for example, 1315B for the G1315B DAD,
- R the firmware revision, for example, A for G1315B or B for the G1315C DAD,
- VVV is the revision number, for example 650 is revision 6.50,
- XXX is the build number of the firmware.

For instructions on firmware updates refer to section *Replacing Firmware* in chapter *Maintenance* or use the documentation provided with the *Firmware Update Tools*.

NOTE

Update of main system can be done in the resident system only. Update of the resident system can be done in the main system only.
Main and resident firmware must be from the same set.

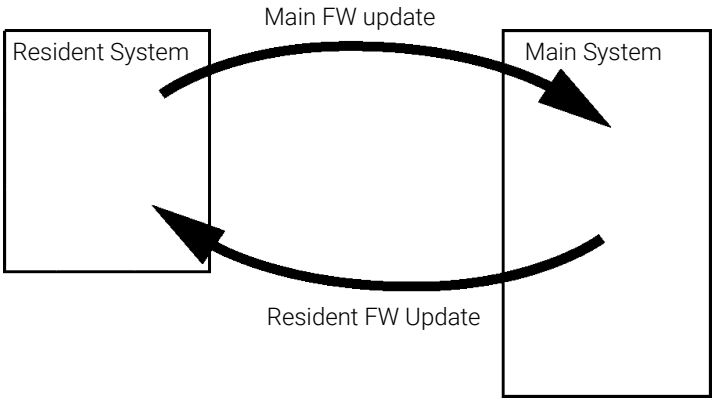


Figure 24: Firmware update mechanism

For further information about minimum firmware requirements, firmware compatibilities and emulation for backward compatibility with specific software environments, please check the latest Firmware Bulletin.

The firmware update tools, firmware and documentation are available from the Agilent web.

- https://www.agilent.com/en-us/firmwareDownload?whid=69761

Electrical Connections

- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.
- One analog output provides signals for integrators or data handling systems.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the RS-232C connector may be used to control the module from a computer through a RS-232C connection. This connector is activated and can be configured with the configuration switch.
- With the appropriate software, the LAN connector may be used to control the module from a computer through a LAN connection. This connector is activated and can be configured with the configuration switch.
- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses because automatic electronic fuses are implemented in the power supply.

WARNING **Electric shock due to insufficient insulation of connected instruments**

Personal injury or damage to the instrument

— **Any other instruments connected to this instrument shall be approved to a suitable safety standard and must include reinforced insulation from the mains.**

NOTE Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

Rear View of the Module

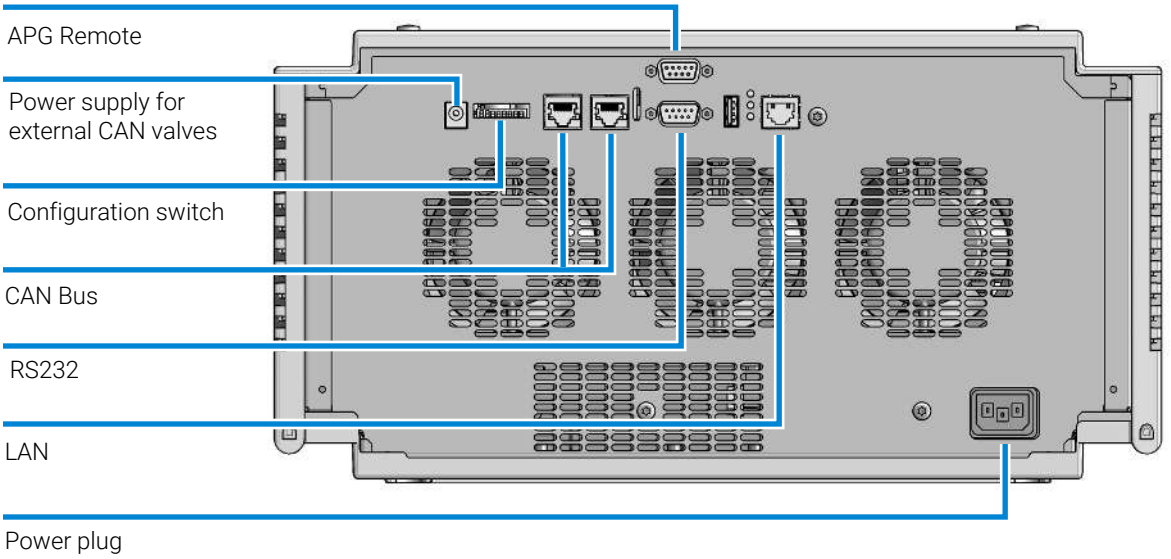


Figure 25: Rear view of the High-Speed Pump

Serial Number Information

The serial number information on the instrument labels provide the following information:

CCXZZ00000	Format
CC	Country of manufacturing • DE = Germany • JP = Japan • CN = China • RO = Romania
X	Alphabetic character A-Z (used by manufacturing)
ZZ	Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)
00000	Serial number

Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

Table 17: Agilent InfinityLab LC Series interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Pumps							
G7104A/C, G7131A/C	2	No	Yes	Yes	1	A	
G7110B	2	Yes	Yes	No	No	E	
G7111A/B, G5654A	2	Yes	Yes	No	No	E	
G7112B	2	Yes	Yes	No	No	E	
G7120A, G7132A	2	No	Yes	Yes	1	A	
G7161A/B	2	Yes	Yes	No	No	E	
Samplers							
G7129A/B/C	2	Yes	Yes	No	No	E	
G7167A/B/C, G7137A/B, G5668A, G3167A/B	2	Yes	Yes	No	No	E	
G7157A	2	Yes	Yes	No	No	E	
Detectors							
G7114A/B	2	Yes	Yes	No	1	E	
G7115A	2	Yes	Yes	No	1	E	
G7117A/B/C	2	Yes	Yes	No	1	E	
G7121A/B	2	Yes	Yes	No	1	E	
G7123B	2	Yes	Yes	No	1	E	
G7162A/B	2	Yes	Yes	No	1	E	
G7165A	2	Yes	Yes	No	1	E	
Fraction Collectors							
G7158B	2	Yes	Yes	No	No	E	
G7159B	2	Yes	Yes	No	No	E	

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
G7166A	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card
G1364E/F, G5664B	2	Yes	Yes	No	No	E	THERMOSTAT for G1330B
Others							
G1170A	2	No	No	No	No	No	Requires a host module with on-board LAN or with additional G1369C LAN Card.
G7116A/B	2	No	No	No	No	No	Requires a host module with on-board LAN or with additional G1369C LAN Card.
G7122A	No	No	No	Yes	No	A	
G7170B	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card
G7175A	2	No	No	No	No	No	Requires a host module with on-board LAN or with additional G1369C LAN Card.

NOTE

LAN connection is made between at least one of the Agilent modules and the Control PC.

- If an Assist Hub is installed, connect the laboratory (or Control PC) LAN to the Lab LAN port of the Assist Hub.
- If an Assist Hub is installed, connect additional LAN connections from the detectors and pumps to the Module LAN ports of the Assist Hub.
- If an Assist Hub is NOT installed and a detector is installed, connect the LAN to this detector.
- If an Assist Hub is NOT installed and there are multiple detectors with spectral capabilities, consider using additional LAN connections for each detector.

- CAN connectors as interface to other modules
- LAN connector as interface to the control software
- RS-232C as interface to a computer
- USB (Universal Series Bus) for service workflows
- REMOTE connector as interface to other Agilent products
- Analog output connector for signal output

Overview Interfaces

CAN

The CAN is inter-module communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

LAN

The modules have either an interface slot for a LAN card (e.g. Agilent G1369B/C LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a PC with the appropriate control software. Some modules have neither on-board LAN nor an interface slot for a LAN card (e.g. G1170A Valve Drive or G4227A Flexible Cube). These are hosted modules and require a Host module with firmware B.06.40 or later or with additional G1369C LAN Card.

NOTE

LAN connection is made between at least one of the Agilent modules and the Control PC.

- If an Assist Hub is installed, connect the laboratory (or Control PC) LAN to the Lab LAN port of the Assist Hub.
- If an Assist Hub is installed, connect additional LAN connections from the detectors and pumps to the Module LAN ports of the Assist Hub.
- If an Assist Hub is NOT installed and a detector is installed, connect the LAN to this detector.
- If an Assist Hub is NOT installed and there are multiple detectors with spectral capabilities, consider using additional LAN connections for each detector.

RS-232C (Serial)

NOTE

There is no configuration possible on main boards with on-board LAN. These are pre-configured for
19200 baud,
8 data bit with no parity and
one start bit and one stop bit are always used (not selectable).

The RS-232C is designed as DCE (data communication equipment) with a 9-pin male SUB-D type connector. The pins are defined as:

Table 18: RS-232C Connection Table

Pin	Direction	Function
1	In	DCD
2	In	RxD
3	Out	TxD
4	Out	DTR
5		Ground
6	In	DSR
7	Out	RTS
8	In	CTS
9	In	RI

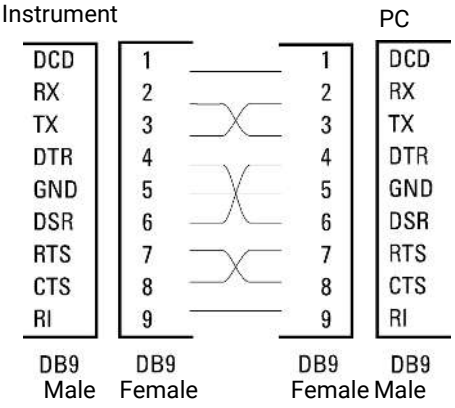


Figure 26: RS-232 Cable

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module's mainboard.

APG Remote

The APG Remote connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features as common shut down, prepare, and so on.

Remote control allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired- or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to SHUT DOWN the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the POWER ON state of all connected modules. Control of analysis is maintained by signal readiness READY for next analysis, followed by START of run and optional STOP of run triggered on the respective lines. In addition PREPARE and START REQUEST may be issued. The signal levels are defined as:

- standard TTL levels (0 V is logic true, + 5.0 V is false),
- fan-out is 10 ,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

NOTE

All common TTL circuits operate with a 5 V power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5.0 V (with respect to the ground terminal).

Table 19: Remote Signal Distribution

Pin	Signal	Description
1	DGND	Digital ground
2	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.

Pin	Signal	Description
3	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
4	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.
5		Not used
6	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
7	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
8	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
9	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.

USB (Universal Serial Bus)

The USB replaced the RS-232 and is used for service workflows, only.

For the InfinityLab Assist, the USB connector supports USB storage media of type exFAT, FAT32, EXT4. It can be used to perform software updates, data storage, back up, or Import/Export of Tasks & Settings.

Special Interfaces

The module includes a DC-Out (24 VDC) power line that is intended to be used with certain modules that operate as CAN slaves, for example external valves. The line has a limited output of 1.7 A and is self resetting.

Instrument Layout

The industrial design of the module incorporates several innovative features. It uses Agilent's E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers of foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components that are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of use of the module and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the use of specific components in the instrument, and provides feedback when the user-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

EMF counters increment with use and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Some counters can be reset to zero after the required maintenance procedure.

The detector provides the following EMF counters:

- Hg-Xe lamp On-Time
- Number of Hg-Xe lamp ignitions

Using the EMF Counters

The user-settable EMF limits for the EMF Counters enable the early maintenance feedback to be adapted to specific user requirements. The useful maintenance cycle is dependent on the requirements for use. Therefore, the definition of the maximum limits needs to be determined based on the specific operating conditions of the instrument.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially the default EMF limits should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by the EMF counters. Enter these values (or values slightly less than the displayed values) as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

Module-Specific Hardware Information

Setting the 8-bit Configuration Switch (On-Board LAN)

The 8-bit configuration switch is located at the rear of the module. Switch settings provide configuration parameters for LAN, serial communication protocol and instrument specific initialization procedures.

All modules with on-board LAN:

- Default is ALL switches DOWN (best settings).
  - 19200 baud, 8 data bit / 1 stop bit with no parity for RS-232
- For specific LAN modes switches 3-8 must be set as required.
- For boot/test modes switches 1+2 must be UP plus required mode.

NOTE For normal operation use the default (best) settings.

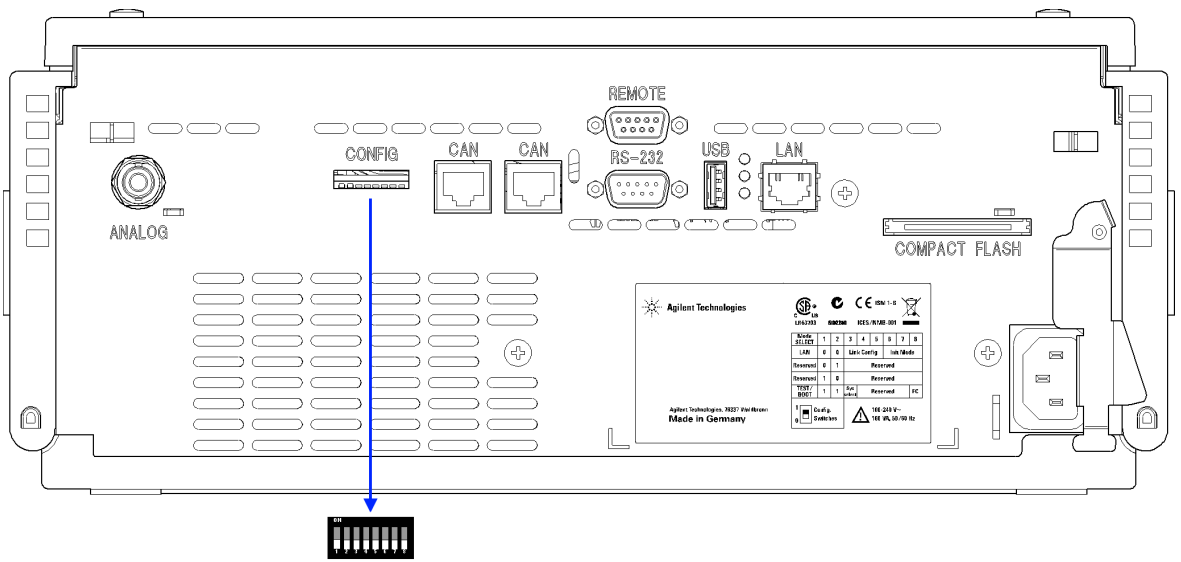


Figure 27: Location of Configuration Switch (example shows a G4212A DAD)

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF. For details on the LAN settings/configuration refer to chapter LAN Configuration.

Table 20: 8-bit Configuration Switch (with on-board LAN)

	Mode		Function					
	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
LAN	*0*	*0*	Link Configuration			Init Mode Selection		
Auto-negotiation			*0*	x	x	x	x	x
10 MBit, half-duplex			1	*0*	*0*	x	x	x
10 MBit, full-duplex			1	*0*	1	x	x	x
100 MBit, half-duplex			1	1	*0*	x	x	x
100 MBit, full-duplex			1	1	1	x	x	x
Using Stored			x	x	x	*0*	1	*0*
DHCP			x	x	x	1	*0*	*0*
Using Default			x	x	x	*0*	1	1
Test	1	1	System					NVRAM
Boot Resident System			1					x
Revert to Default Data (Coldstart)			x	x	x			1

Legend:

0 (switch down), 1 (switch up), x (any position), SW (switch)

NOTE When selecting the mode Test, the LAN settings are: Auto-Negotiation & Using Stored.

NOTE For explanation of "Boot Resident System" and "Revert to Default Data (Coldstart)" refer to Special Settings on page 335.

Special Settings

The special settings are required for specific actions (normally in a service case).

NOTE The tables include both settings for modules – with on-board LAN and without on-board LAN. They are identified as LAN and no LAN.

Boot-Resident

Firmware update procedures may require this mode in case of firmware loading errors (main firmware part).

If you use the following switch settings and power the instrument up again, the instrument firmware stays in the resident mode. It is not operable as a module. It only uses basic functions of the operating system for example, for communication. In this mode the main firmware can be loaded (using update utilities).

Table 21: Boot Resident Settings (On-board LAN)

Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
TEST/BOOT	1	1	1	0	0	0	0	0

Legend:

0 (switch down), 1 (switch up), SW (switch)

Forced Cold Start

A forced cold start can be used to bring the module into a defined mode with default parameter settings.

CAUTION Loss of data

Forced cold start erases all methods and data stored in the non-volatile memory. Exceptions are calibration settings, diagnosis and repair log books which will not be erased.

— Save your methods and data before executing a forced cold start.

If you use the following switch settings and power the instrument up again, a forced cold start has been completed.

Table 22: Forced Cold Start Settings (On-board LAN)

Mode Select	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
TEST/BOOT	1	1	0	0	0	0	0	1

Legend:

0 (switch down), 1 (switch up), SW (switch)

12 LAN Configuration

This chapter provides information on connecting the module to the control software.

What You Have to Do First 339

TCP/IP Parameter Configuration 341

Configuration Switch and Mode Selection 342

Dynamic Host Configuration Protocol (DHCP) 349
General Information (DHCP) 349
Setup (DHCP) 350

Manual Configuration 352

PC and User Interface Software Setup 353
PC Setup for Local Configuration 353

What You Have to Do First

The module has an on-board LAN communication interface.

NOTE

This chapter is generic and may show figures that differ from your module. The functionality is the same.

1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear of the module (see Figure 29 on page 340, or Figure 30 on page 340).



Part number of the mainboard
Revision Code, Vendor, Year and Week of assembly
MAC address
Country of Origin

Figure 28: MAC label (example)

2 Connect the instrument's LAN interface to

- the PC network card using a crossover network cable (point-to-point) or
- a hub or switch using a standard LAN cable.

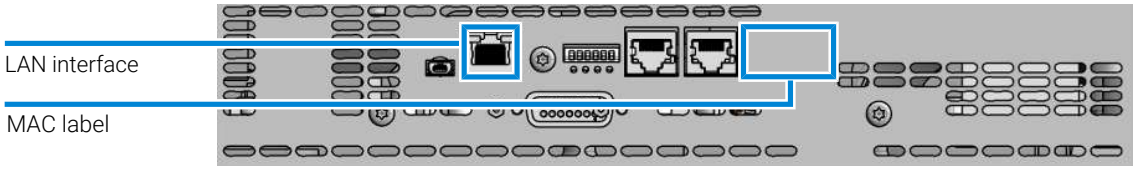


Figure 29: Location of LAN interfaces and MAC label (board with 6-bit configuration switch)

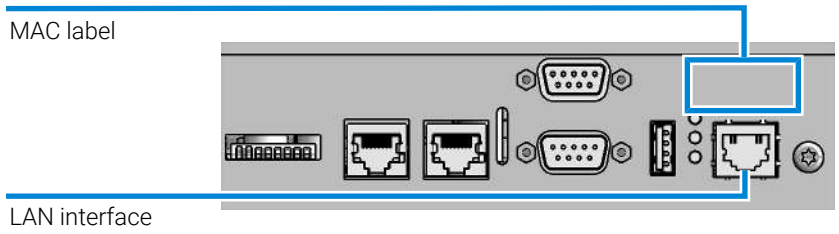


Figure 30: Location of LAN interfaces and MAC label (board with 8-bit configuration switch)

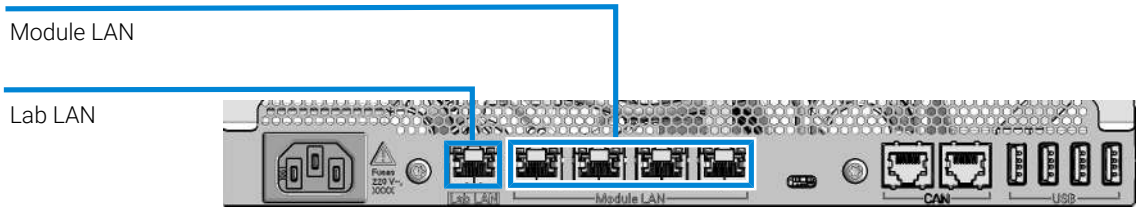


Figure 31: Location of LAN interfaces (InfinityLab Assist Hub)

TCP/IP Parameter Configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet Mask
- Default Gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based DHCP Server (using the so-called Dynamic Host Configuration Protocol). This mode requires a LAN-onboard Module or a G1369C LAN Interface card, see Setup (DHCP) on page 350
- by manually setting the parameters using the Local Controller

The LAN interface differentiates between several initialization modes. The initialization mode (short form 'init mode') defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch, see on page 343.

Configuration Switch and Mode Selection

The module is shipped with all switches (SW) set to OFF.

NOTE To perform any LAN configuration, SW1 and SW2 must be set to OFF.

Configuration Switch (8-Bit)

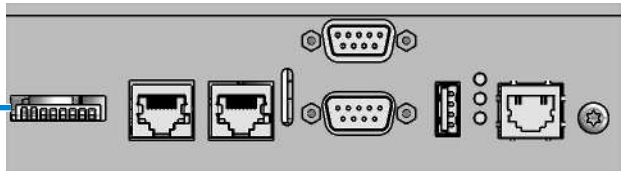


Figure 32: Location of configuration switch (8-bit) at the rear of the module

Table 23: Overview of 8-bit configuration switch settings

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	Mode	Init Mode
0	0	0	x	x	x	x	x	Link config	Speed and duplex mode determined by autonegotiation [1]
0	0	1	0	0	x	x	x	Link config	10 MBit, half-duplex [1]
0	0	1	0	1	x	x	x	Link config	10 MBit, full-duplex [1]
0	0	1	1	0	x	x	x	Link config	100 MBit, half-duplex [1]
0	0	1	1	1	x	x	x	Link config	100 MBit, full-duplex [1]
0	0	x	x	x	0	1	0	Init Mode Selection	Using stored
0	0	x	x	x	1	0	0	Init Mode Selection	USE DHCP to request IP Address (Host name will be the MAC address) [2]
0	0	x	x	x	0	1	1	Init Mode Selection	Use Default IP Address (192.168.254.11, Subnet mask: 255.255.255.0)
1	1	1	0	0	0	0	0	Test	Boot Resident System
1	1	0	0	0	0	0	1	Test	Revert to Default Data (Coldstart)

[1] The LAN interface supports 10 or 100 Mbps operation in full- or half-duplex modes. In most cases, full-duplex is supported when the connecting network device - such as a network switch or hub - supports IEEE 802.3u auto-negotiation specifications.
When connecting to network devices that do not support auto-negotiation, the LAN interface will configure itself for 10- or 100-Mbps half-duplex operation.
For example, when connected to a non-negotiating 10-Mbps hub, the LAN interface will be automatically set to operate at 10-Mbps half-duplex.
If the module is not able to connect to the network through auto-negotiation, you can manually set the link operating mode using link configuration switches on the module.

[2] Requires firmware B.06.40 or above. Modules without LAN on board, see G1369C LAN Interface Card



Legend:
- SW = switch
- 0 = off (SW down)
- 1 = on (SW up)
- x = optional setting

Configuration Switch (6-Bit)

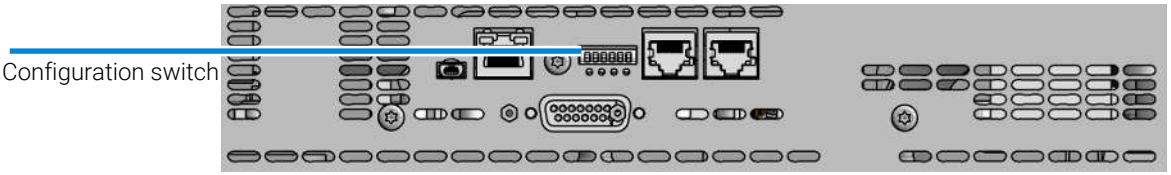
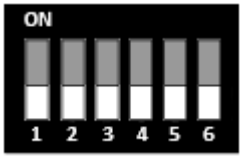


Figure 33: Location of configuration switch (6-bit) at the rear of the module

Table 24: Overview of 6-bit configuration switch settings

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	Mode	Init Mode
0	0	0	0	0	0	-	-	COM	Use Default IP Address (192.168.254.11, Subnet mask: 255.255.255.0)
0	0	0	0	1	0	-	-	COM	Use Stored IP Address
0	0	0	1	0	0	-	-	COM	USE DHCP to request IP Address (Host name will be the MAC address)
1	0	0	0	0	0	-	-	Test	Boot Main System/Keep Data
1	1	0	0	0	0	-	-	Test	Boot Resident System/Keep Data
1	0	0	0	0	1	-	-	Test	Boot Main System/Revert to Default Data
1	1	0	0	0	1	-	-	Test	Boot Resident System/Revert to Default Data



Legend:
- SW = switch
- - = not available
- 0 = off (SW down)
- 1 = on (SW up)

Configuration Switch (2-Bit)

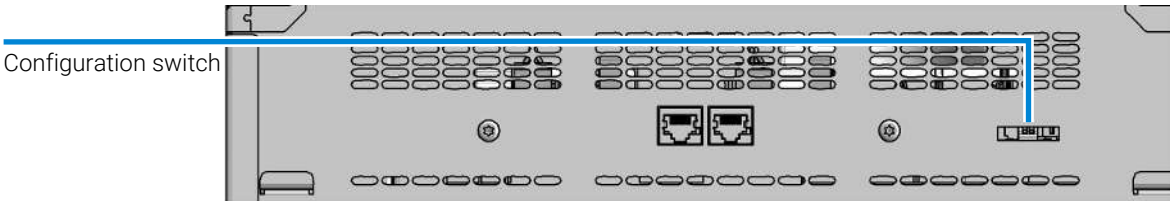


Figure 34: Location of configuration switch (2-bit) (G7116A/B) at the rear of the module

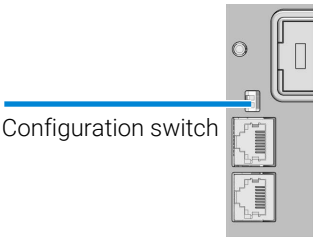


Figure 35: Location of configuration switch (2-bit) (G1170A, G7166A, G7170B) at the rear of the module

Table 25: Overview of 2-bit configuration switch settings (G1170A, G7116A/B, G7166A, G7170B)

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	Mode	Init Mode
0	0	-	-	-	-	-	-	COM	Default
0	1	-	-	-	-	-	-	Test	Coldstart
1	0	-	-	-	-	-	-	Test	Boot resident
1	1	-	-	-	-	-	-	Not supported	Not supported

Legend:
- SW = switch
- - = not available
- **G7116A/B:**
  - 0 = off (SW up)
  - 1 = on (SW down)
- **G1170A, G7166A, G7170B:**
  - 0 = off (SW right)
  - 1 = on (SW left)

Configuration Switch (1-Bit)

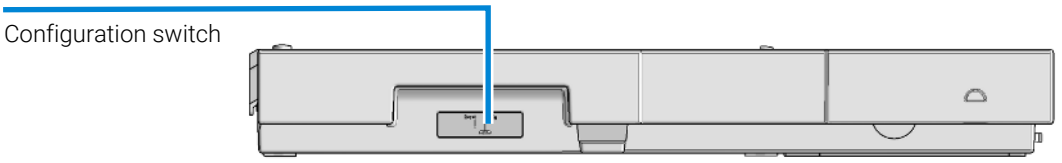


Figure 36: Location of configuration switch (InfinityLab Assist Hub) at the side of the module

Table 26: Overview of 1-bit configuration switch settings (G7180A)

SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	Mode	Init Mode
0	-	-	-	-	-	-	-	Not supported	Configure the IP address (by using specific data or automatically with DHCP server)
1	-	-	-	-	-	-	-	Not supported	Configure default IP address (192.168.254.11)

Legend:
- SW = switch
- - = not available
- 0 = off (SW front = right)
- 1 = on (SW back = left)

Using Stored

When initialization mode **Using Stored** is selected, the parameters are taken from the non-volatile memory of the module. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

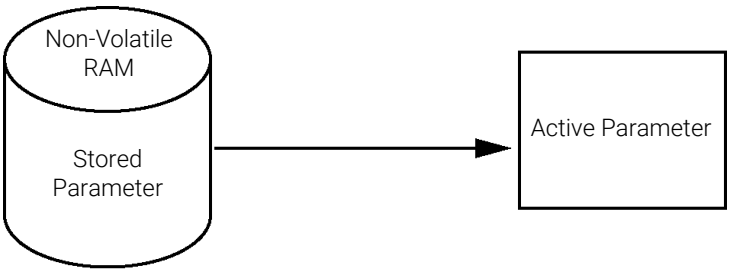


Figure 37: Using Stored (principle)

Using Default

When **Using Default** is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration, see Table 27 Using default parameters on page 347.

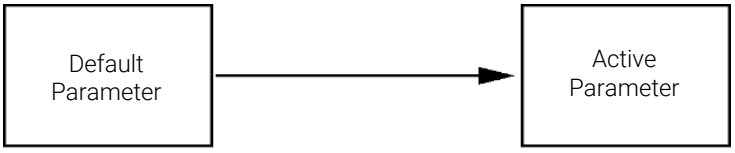


Figure 38: Using Default (principle)

NOTE Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately.

Table 27: Using default parameters

IP address:	192.168.254.11
Subnet Mask:	255.255.255.0
Default Gateway	not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the module must reside in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the module. He may then close the session, select the initialization mode Using Stored, power-on again and establish the TCP/IP connection using the new parameters.

When the module is wired to the PC directly (e.g. using a cross-over cable or a local hub), separated from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE

In the **Using Default** mode, the parameters stored in the memory of the module are not cleared automatically. If not changed by the user, they are still available, when switching back to the mode Using Stored.

Dynamic Host Configuration Protocol (DHCP)

General Information (DHCP)

The Dynamic Host Configuration Protocol (DHCP) is an auto configuration protocol used on IP networks. The DHCP functionality is available on all Agilent HPLC modules with on-board LAN Interface or LAN Interface Card G1369C, and “B”-firmware (B.06.40 or above) or modules with "D"-firmware. All modules should use latest firmware from the same set.

When the initialization mode “DHCP” is selected, the card tries to download the parameters from a DHCP Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the card.

Besides requesting the network parameters, the card also submits its hostname to the DHCP Server. The hostname equals the MAC address of the card, e.g. *0030d3177321*. It is the DHCP server's responsibility to forward the hostname/address information to the Domain Name Server. The card does not offer any services for hostname resolution (e.g. NetBIOS).

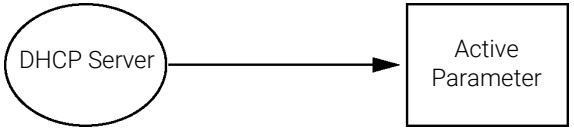


Figure 39: DHCP (principle)

NOTE

- It may take some time until the DHCP server has updated the DNS server with the hostname information.
- It may be necessary to fully qualify the hostname with the DNS suffix, e.g. *0030d3177321.country.company.com*.
- The DHCP server may reject the hostname proposed by the card and assign a name following local naming conventions.

Setup (DHCP)

The DHCP functionality is available on all Agilent HPLC modules with on-board LAN Interface or LAN Interface Card G1369C, and “B”-firmware (B.06.40 or above) or modules with "D"-firmware. All modules should use latest firmware from the same set.

1 Note the MAC address of the LAN interface (provided with G1369C LAN Interface Card or mainboard). This MAC address is on a label on the card or at the rear of the mainboard, for example, *0030d3177321*.

On the Local Controller the MAC address can be found under **Details** in the LAN section.

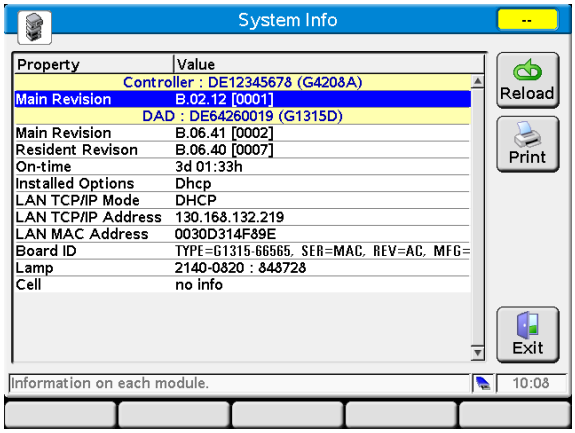


Figure 40: LAN setting on Instant Pilot

2 Set the configuration switch to DHCP either on the G1369C LAN Interface Card or the mainboard of above mentioned modules.

Table 28: G1369C LAN Interface Card (configuration switch on the card)

SW 4	SW 5	SW 6	SW 7	SW 8	Initialization Mode
ON	OFF	OFF	OFF	OFF	DHCP

3 Turn on the module that hosts the LAN interface.

4 Configure your Control Software (e.g. OpenLAB CDS ChemStation Edition, Lab Advisor) and use MAC address as host name, e.g. *0030d3177321*.

The LC system should become visible in the control software (see Note in section General Information (DHCP) on page 349).

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the module. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, given that the initialization mode selection switches are allowing it.

PC and User Interface Software Setup

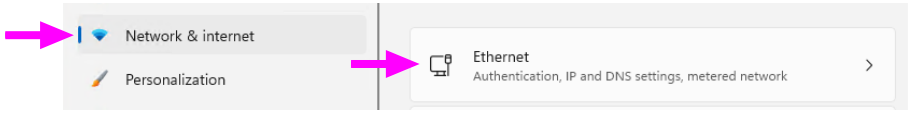
PC Setup for Local Configuration

This procedure describes the change of the TCP/IP settings on your PC to match the module's default parameters in a local configuration (see Table 27 Using default parameters on page 347).

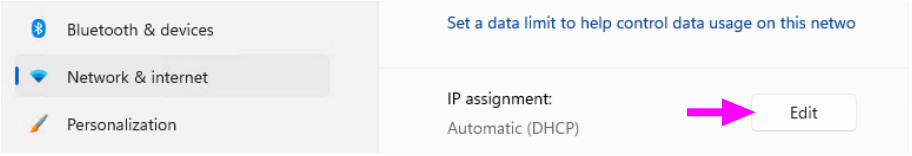
The individual steps may vary depending on the operating system. Below you can find the steps to set up a static IP address in Windows 11.

1 Navigate to the settings on your PC (Windows **Start** menu > **Settings**).

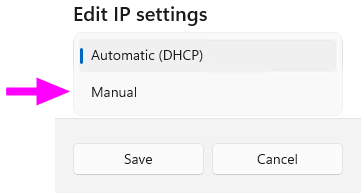
2 Under **Network and internet**, select **Ethernet**.



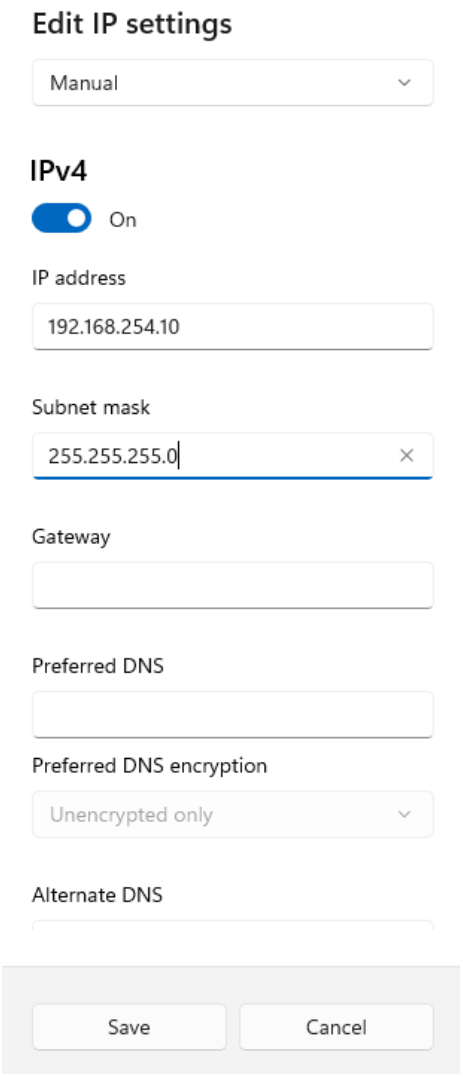
3 In section **IP assignment**, click **Edit**.



4 To edit the IP settings, select **Manual** from the drop-down list.



5 Enable (toggle) the **IPv4** connection and enter the following IP address settings:



6 Save your configuration settings.

13 Appendix

This chapter provides additional information on safety, legal and web.

General Safety Information 356
Safety Standards 356
General 356
Before Applying Power 357
Ground the Instrument 357
Do Not Operate in an Explosive Atmosphere 358
Do Not Remove the Instrument Cover 358
Do Not Modify the Instrument 358
In Case of Damage 358
Solvent Information 359
Algae Growth in HPLC Systems 360
Magnets 362
Safety Symbols 363

Material Information 365
Materials Used in the Bio LC System 365
Materials in Flow Path (G7120A) 366
Materials in Flow Path (G7132A) 367
General Information About Solvent/Material Compatibility 368

At-a-Glance Details About Agilent Capillaries 374

Waste Electrical and Electronic Equipment (WEEE) Directive 378

Radio Interference 379

RFID Statement 380

Sound Emission 382

Agilent Technologies on Internet 383

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

WARNING

Ensure the proper usage of the equipment.

The protection provided by the equipment may be impaired.

- **The operator of this instrument is advised to use the equipment in a manner as specified in this manual.**

Safety Standards

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

WARNING Wrong voltage range, frequency or cabling

Personal injury or damage to the instrument

- Verify that the voltage range and frequency of your power distribution matches to the power specification of the individual instrument.
- Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.
- Make all connections to the unit before applying power.

WARNING Use of unsupplied cables

Using cables not supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

- Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.

NOTE Note the instrument's external markings described under Safety Symbols on page 363.

Ground the Instrument

WARNING Missing electrical ground

Electrical shock

- If your product is provided with a grounding type power plug, the instrument chassis and cover must be connected to an electrical ground to minimize shock hazard.
- The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

- **Do not operate the instrument in the presence of flammable gases or fumes.**

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

- **Do not remove the instrument cover.**
- **Only Agilent authorized personnel are allowed to remove instrument covers. Always disconnect the power cables and any external circuits before removing the instrument cover.**

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

- **Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.**

Solvent Information

WARNING **Toxic, flammable and hazardous solvents, samples and reagents**

The handling of solvents, samples and reagents can hold health and safety risks.

- **When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.**
- **Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).**
- **Avoid high vapor concentrations. Keep the solvent temperature at least 40 °C (72 °F) below the boiling point of the solvent used. This includes the solvent temperature in the sample compartment. For the solvents methanol and ethanol keep the solvent temperature at least 25 °C (45 °F) below the boiling point.**
- **Do not operate the instrument in an explosive atmosphere.**
- **Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).**
- **Reduce the volume of substances to the minimum required for the analysis.**
- **Do not use bottles that exceed the maximum permissible volume (2.5 L).**
- **Ground the waste container.**
- **Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.**
- **To achieve maximal safety, regularly check the tubing for correct installation.**

NOTE For details, see the usage guideline for the solvent cabinet. A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available in the InfinityLab LC Series User Documentation or via the Internet.

Recommendations on the Use of Solvents

Observe the following recommendations on the use of solvents.

- Brown glass ware can avoid growth of algae.

- Follow the recommendations for avoiding the growth of algae, see Algae Growth in HPLC Systems on page 360
- Small particles can permanently block capillaries and valves. Therefore, always filter solvents through 0.22 µm filters.
- Avoid or minimize the use of solvents that may corrode parts in the flow path. Consider specifications for the pH range given for different materials such as flow cells, valve materials etc. and recommendations in subsequent sections.
- Avoid the use of the following steel-corrosive solvents:
  - solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on),
  - high concentrations of inorganic acids like sulfuric acid and nitric acid, especially at higher temperatures (if your chromatography method allows, replace by phosphoric acid or phosphate buffer which are less corrosive against stainless steel),
  - halogenated solvents or mixtures which form radicals and/or acids, for example:

    $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

    This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol,
  - chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, diisopropyl ether) should be filtered through dry aluminium oxide which adsorbs the peroxides,
  - solvents containing strong complexing agents (e.g. EDTA),
  - mixtures of carbon tetrachloride with 2-propanol or THF.
- Avoid the use of dimethyl formamide (DMF). Polyvinylidene fluoride (PVDF), which is used in leak sensors, is not resistant to DMF.

Algae Growth in HPLC Systems

The presence of algae in HPLC systems can cause many problems that may be incorrectly diagnosed as instrument or application problems. Algae grow in aqueous media, preferably in a pH range from 4 to 8. Their growth is accelerated by buffers, for example phosphate or acetate. Since algae grow through photosynthesis, light will also stimulate their growth. Even in distilled water small-sized algae grow after some time.

Instrumental Problems Associated With Algae

Algae deposit and grow everywhere within the HPLC system, causing the following problems:

- Blocked solvent filters, or deposits on inlet or outlet valves, resulting in unstable flow, composition or gradient problems, or a complete failure of the pump.
- Plugging of small-pore, high-pressure solvent filters, usually placed before the injector, resulting in high system pressure.
- Blockage of PTFE frits, leading to increased system pressure.
- Plugging of column filters, giving high system pressure.
- Dirty flow cell windows of detectors, resulting in higher noise levels (since the detector is the last module in the flow path, this problem is less common).

How to Prevent and/or Reduce the Algae Problem

- Always use freshly prepared solvents, especially use demineralized water, which was filtered through 0.2 µm filters.
- Never leave mobile phase in the instrument for several days without flow.
- Always discard old mobile phase.
- Use 9301-6526 (Solvent bottle, amber, 1000 mL) supplied with the instrument for your aqueous mobile phase.
- If possible add a few mg/L sodium azide or a few percent organic solvent to the aqueous mobile phase.

Magnets

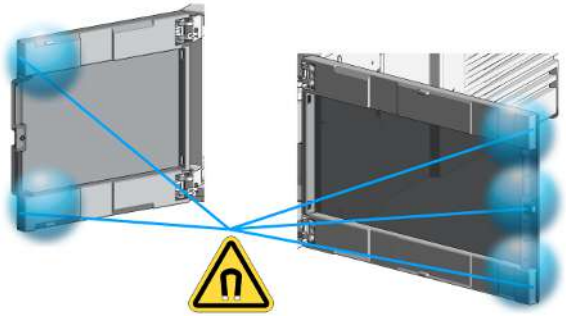


Figure 41: Magnets in doors of pumps, autosamplers, detectors, and fraction collectors

Safety Symbols

Table 29: Symbols

	The apparatus is marked with this symbol when the user shall refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.
	Indicates flammable material used. Consult the InfinityLab LC Series User Documentation / User Manual before attempting to install or service this equipment. Follow all safety precautions.
	Confirms that a manufactured product complies with all applicable European Community directives. The European Declaration of Conformity is available at: http://regulations.corporate.agilent.com/DoC/search.htm
	Manufacturing date.
	Product Number
	Serial Number
	Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the on/off switch is in the Off position
	Pacemaker Magnets could affect the functioning of pacemakers and implanted heart defibrillators. A pacemaker could switch into test mode and cause illness. A heart defibrillator may stop working. If you wear these devices keep at least 55 mm distance to magnets. Warn others who wear these devices from getting too close to magnets.

	Magnetic field Magnets produce a far-reaching, strong magnetic field. They could damage TVs and laptops, computer hard drives, credit and ATM cards, data storage media, mechanical watches, hearing aids and speakers. Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.
	Indicates a pinching or crushing hazard
	Indicates a piercing or cutting hazard.
	UV radiation hazard

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

- **Do not proceed beyond a warning until you have fully understood and met the indicated conditions.**

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

- Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Material Information

This section provides detailed information about materials used in the HPLC system and general information about solvent/material compatibility.

Materials Used in the Bio LC System

For the Bio LC System, Agilent Technologies uses highest-quality materials in the flow path (also referred to as wetted parts). Life scientists accept these materials, as they are known for optimum inertness to biological samples and ensure best compatibility with common samples and solvents over a wide pH range. To enable chromatography at very high pressures, while maintaining inertness the metal alloy MP35N is used instead of stainless steel throughout the system.

The MP35N is a nonmagnetic, nickel-cobalt-chromium-molybdenum alloy with an excellent resistance to sulfation, oxidation, saline solutions, and most mineral acids. Its superior properties guaranty reliable performance, even under UHPLC conditions.

Table 30: Used biocompatible materials

Module	Materials
Agilent 1290 Infinity III Bio High-Speed Pump (G7132A)	MP35N, gold, ceramic, ruby, PTFE, PEEK, UHMW-PE, tantalum, TFE/PDD copolymer, PFA, FEP, FFKM, ETFE, DLC coated MP35N
Agilent 1290 Infinity III Bio Flexible Pump (G7131A)	MP35N, gold, ceramic, ruby, PEEK, UHMW-PE, tantalum, TFE/PDD copolymer, PFA, FEP, titanium, DLC coated MP35N, FFKM, ETFE
Agilent 1290 Infinity III Bio Multisampler (G7137A)	Standard: MP35N, gold, DLC coated MP35N, PEEK, UHMW-PE Multi Wash: PEEK, FFKM, titanium, PTFE, PPS, MP35N, gold, DLC coated MP35N, UHMW-PE
Agilent 1290 Infinity III Bio Online Sample Manager	PEEK, FFKM, titanium, PTFE, PPS, MP35N, gold, DLC coated MP35N, UHMW-PE
Biocompatible Flow Cells:	

Module	Materials
G7117-60020 (Max-Light Cartridge Cell LSS (10 mm, V(σ) 1.0 µL)) (for Agilent 1290 Infinity III DAD (G7117A/B))	MP35N, fused silica, PEEK
G1314-60188 (Bio standard flow cell VWD, 10 mm, Cell Vol. 14 µl, Sapphire, MP35N) (for Agilent 1290 Infinity III VWD (G7114B))	Sapphire, MP35N, FEP
G1314-60189 (Bio micro flow cell VWD, 3 mm, Cell Vol. 2 µl, Sapphire, MP35N) (for Agilent 1290 Infinity III VWD (G7114B))	Sapphire, MP35N, FEP
Biocompatible Heat Exchangers, Valves and Capillaries:	
G7116-60071 (Quick Connect Bio Heat Exchanger Standard Flow), G7116-60081 (Quick Connect Bio Heat Exchanger High Flow), G7116-60091 (Quick Connect Bio Heat Exchanger Ultra Low Dispersion) (for Agilent 1290 Infinity III Multicolumn Thermostat (G7116B))	MP35N
G5641A (2-position/10-port valve, bio 1300 bar)	MP35N coated with DLC, PEEK
G4235A (12-position/13-port solvent selection valve)	PEEK, ceramic (Al_2O_3 based)
Bio connection capillaries	MP35N

NOTE To ensure optimum biocompatibility of your Bio LC System, do not include non-Bio standard modules or parts to the flow path. Do not use any parts that are not labeled as Agilent "Bio". For solvent compatibility of these materials, see General Information About Solvent/Material Compatibility on page 368.

Materials in Flow Path (G7120A)

Following materials are used in the flow path of this module:

Table 31: Materials in flow path (G7120A)

Part	Materials
Degasser chamber	TFE/PDD copolymer, PFA (internal tubings); PEEK (inlets); FEP (tubings); ETFE (fittings)
Ultra clean tubings [1]	PFA (tubings) or PP (tubing for PFAS-analysis option), PEEK (fittings)

Part	Materials
Microfluidic structures [2]	SST
SSV	FFKM, PEEK
Passive inlet valve	SST, gold, ruby, ZrO_2-based ceramic, tantalum
Outlet valve	SST, gold, ruby, ZrO_2-based ceramic, tantalum
Pump head	SST
Pistons	ZrO_2-based ceramic
Piston/wash seals	UHMW-PE, PTFE, SST
Pressure sensor	SST
Automatic purge valve	Polyimide, SST, DLC

[1] Ultra clean tubings are available for the use with high-end MS detectors. They are also compatible with THF.

[2] Jet Weaver, Heat Exchanger

Materials in Flow Path (G7132A)

Following materials are used in the flow path of this module:

Table 32: Materials in flow path (G7132A)

Part	Materials
Degasser chamber	TFE/PDD copolymer, PFA (internal tubings); PEEK (inlets); FEP (tubings); ETFE (fittings)
Ultra clean tubings [1]	PFA (tubings), PEEK (fittings)
Microfluidic structures [2]	SST and biocompatible coating
Solvent Selection Valve	FFKM and PEEK
Passive inlet valve	Gold, Ruby, MP35N, tantalum
Outlet valve	Gold, Ruby, MP35N, tantalum
Pump heads	MP35N
Heat exchanger	MP35N and Gold (fittings)
Pistons	ZrO_2 ceramic
Piston/wash seals	UHMW-PE, Gold, PTFE, Titanium

Part	Materials
Pressure sensor	MP35N
Purge valve	DLC coated MP35N and PEEK-based rotor seal

[1] Ultra clean tubings are available for the use with high-end MS detectors. They are also compatible with THF.

[2] Jet Weaver, Heat Exchanger

General Information About Solvent/Material Compatibility

Materials in the flow path are carefully selected based on Agilent's experiences in developing highest-quality instruments for HPLC analysis over several decades. These materials exhibit excellent robustness under typical HPLC conditions. For any special condition, please consult the material information section or contact Agilent.

Disclaimer

Subsequent data was collected from external resources and is meant as a reference. Agilent cannot guarantee the correctness and completeness of such information. Data is based on compatibility libraries, which are not specific for estimating the long-term life time under specific but highly variable conditions of UHPLC systems, solvents, solvent mixtures, and samples. Information also cannot be generalized due to catalytic effects of impurities like metal ions, complexing agents, oxygen etc. Apart from pure chemical corrosion, other effects like electro corrosion, electrostatic charging (especially for nonconductive organic solvents), swelling of polymer parts etc. need to be considered. Most data available refers to room temperature (typically 20 – 25 °C, 68 – 77 °F). If corrosion is possible, it usually accelerates at higher temperatures. If in doubt, please consult technical literature on chemical compatibility of materials.

MP35N

MP35N is a nonmagnetic, nickel-cobalt-chromium-molybdenum alloy demonstrating excellent corrosion resistance (for example, against nitric and sulfuric acids, sodium hydroxide, and seawater) over a wide range of

concentrations and temperatures. In addition, this alloy shows exceptional resistance to high-temperature oxidation. Due to excellent chemical resistance and toughness, the alloy is used in diverse applications: dental products, medical devices, nonmagnetic electrical components, chemical and food processing equipment, marine equipment. Treatment of MP35N alloy samples with 10 % NaCl in HCl (pH 2.0) does not reveal any detectable corrosion. MP35N also demonstrates excellent corrosion resistance in a humid environment. Although the influence of a broad variety of solvents and conditions has been tested, users should keep in mind that multiple factors can affect corrosion rates, such as temperature, concentration, pH, impurities, stress, surface finish, and dissimilar metal contacts.

Polyphenylene Sulfide (PPS)

Polyphenylene sulfide has outstanding stability even at elevated temperatures. It is resistant to dilute solutions of most inorganic acids, but it can be attacked by some organic compounds and oxidizing reagents. Nonoxidizing inorganic acids, such as sulfuric acid and phosphoric acid, have little effect on polyphenylene sulfide, but at high concentrations and temperatures, they can still cause material damage. Nonoxidizing organic chemicals generally have little effect on polyphenylene sulfide stability, but amines, aromatic compounds, and halogenated compounds may cause some swelling and softening over extended periods of time at elevated temperatures. Strong oxidizing acids, such as nitric acid (> 0.1 %), hydrogen halides (> 0.1 %), peroxy acids (> 1 %), or chlorosulfuric acid degrade polyphenylene sulfide. It is not recommended to use polyphenylene sulfide with oxidizing material, such as sodium hypochlorite and hydrogen peroxide. However, under mild environmental conditions, at low concentrations and for short exposure times, polyphenylene sulfide can withstand these chemicals, for example, as ingredients of common disinfectant solutions.

PEEK

PEEK (Polyether-Ether Ketones) combines excellent properties regarding biocompatibility, chemical resistance, mechanical and thermal stability. PEEK is therefore the material of choice for UHPLC and biochemical instrumentation.

It is stable in the specified pH range (for the Bio-Inert LC system: pH 1 – 13 , see bio-inert module manuals for details), and inert to many common solvents.

There are still some known incompatibilities with chemicals such as chloroform, methylene chloride, THF, DMSO, strong acids (nitric acid > 10 %, sulfuric acid > 10 %, sulfonic acids, trichloroacetic acid), halogens or aqueous halogen solutions, phenol and derivatives (cresols, salicylic acid, and so on).

When used above room temperature, PEEK is sensitive to bases and various organic solvents, which can cause it to swell. Under such conditions, normal PEEK capillaries are sensitive to high pressure. Therefore, Agilent uses stainless steel clad PEEK capillaries in bio-inert systems. The use of stainless steel clad PEEK capillaries keeps the flow path free of steel and ensures pressure stability up to 600 bar. If in doubt, consult the available literature about the chemical compatibility of PEEK.

Polyimide

Agilent uses semi-crystalline polyimide for rotor seals in valves and needle seats in autosamplers. One supplier of polyimide is DuPont, which brands polyimide as Vespel, which is also used by Agilent.

Polyimide is stable in a pH range between 1 and 10 and in most organic solvents. It is incompatible with concentrated mineral acids (e.g. sulphuric acid), glacial acetic acid, DMSO and THF. It is also degraded by nucleophilic substances like ammonia (e.g. ammonium salts in basic conditions) or acetates.

Polyethylene (PE)

Agilent uses UHMW (ultra-high molecular weight)-PE/PTFE blends for yellow piston and wash seals, which are used in 1290 pumps, the G7104C and for normal phase applications in 1260 pumps.

Polyethylene has a good stability for most common inorganic solvents including acids and bases in a pH range of 1 to 12.5 . It is compatible with many organic solvents used in chromatographic systems like methanol, acetonitrile and isopropanol. It has limited stability with aliphatic, aromatic and halogenated hydrocarbons, THF, phenol and derivatives, concentrated acids and bases. For normal phase applications, the maximum pressure should be limited to 200 bar.

Tantalum (Ta)

Tantalum is inert to most common HPLC solvents and almost all acids except fluoric acid and acids with free sulfur trioxide. It can be corroded by strong bases (e.g. hydroxide solutions > 10 %, diethylamine). It is not recommended for the use with fluoric acid and fluorides.

Stainless Steel (SST)

Stainless steel is inert against many common solvents. It is stable in the presence of acids and bases in a pH range of 1 to 12.5 . It can be corroded by acids below pH 2.3 . It can also corrode in following solvents:

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride) and aqueous solutions of halogens.
- High concentrations of inorganic acids like nitric acid, sulfuric acid, and organic solvents especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer, which are less corrosive against stainless steel).
- Halogenated solvents or mixtures, which form radicals and/or acids, for example:

  $2\ CHCl_3 + O_2 \rightarrow 2\ COCl_2 + 2\ HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, diisopropyl ether). Such ethers should be filtered through dry aluminum oxide, which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1 % solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylenediaminetetraacetic acid).
- Mixtures of carbon tetrachloride with isopropanol or THF.

Titanium (Ti)

Titanium is highly resistant to oxidizing acids (for example, nitric, perchloric and hypochlorous acid) over a wide range of concentrations and temperatures. This is due to a thin oxide layer on the surface, which is stabilized by oxidizing compounds. Non-oxidizing acids (for example, hydrochloric, sulfuric and phosphoric acid) can cause slight corrosion, which increases with acid concentration and temperature. For example, the corrosion rate with 3 % HCl (about pH 0.1) at room temperature is about 13 µm/year. At room temperature, titanium is resistant to concentrations of about 5 % sulfuric acid (about pH 0.3). Addition of nitric acid to hydrochloric or sulfuric acids significantly reduces corrosion rates. Titanium is sensitive to acidic metal chlorides like $FeCl_3$ or $CuCl_2$.

Titanium is subject to corrosion in anhydrous methanol, which can be avoided by adding a small amount of water (about 3 %). Slight corrosion is possible with ammonia > 10 %.

Diamond-Like Carbon (DLC)

Diamond-Like Carbon is inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Fused Silica and Quartz (SiO_2)

Fused silica is used in Max Light Cartridges. Quartz is used for classical flow cell windows. It is inert against all common solvents and acids except hydrofluoric acid and acidic solvents containing fluorides. It is corroded by strong bases and should not be used above pH 12 at room temperature. The corrosion of flow cell windows can negatively affect measurement results. For a pH greater than 12, the use of flow cells with sapphire windows is recommended.

Gold

Gold is inert to all common HPLC solvents, acids, and bases within the specified pH range. It can be corroded by complexing cyanides and concentrated acids like aqua regia.

Zirconium Oxide (ZrO_2)

Zirconium Oxide is inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Platinum/Iridium

Platinum/Iridium is inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

Fluorinated Polymers (PTFE, PFA, FEP, FFKM, PVDF)

Fluorinated polymers like PTFE (polytetrafluorethylene), PFA (perfluoroalkoxy), and FEP (fluorinated ethylene propylene) are inert to almost all common acids, bases, and solvents. FFKM is perfluorinated rubber, which is also resistant to most chemicals. As an elastomer, it may swell in some organic solvents like halogenated hydrocarbons.

TFE/PDD copolymer tubings, which are used in all Agilent degassers except G1322A/G7122A, are not compatible with fluorinated solvents like Freon, Fluorinert, or Vertrel. They have limited life time in the presence of hexafluoroisopropanol (HFIP). To ensure the longest possible life with HFIP, it is best to dedicate a particular chamber to this solvent, not to switch solvents, and not to let dry out the chamber. For optimizing the life of the pressure sensor, do not leave HFIP in the chamber when the unit is off.

Prolonged exposure to hexafluoroisopropanol (HFIP) may reduce the lifespan of parts that come into contact with it. To ensure the longest possible lifespan of these parts, fittings must be leak-free. If a leak occurs, clean the surface as soon as possible.

The tubing of the leak sensor is made of PVDF (polyvinylidene fluoride), which is incompatible with the solvent DMF (dimethylformamide).

Sapphire, Ruby, and Al_2O_3-Based Ceramics

Sapphire, ruby, and ceramics based on aluminum oxide Al_2O_3 are inert to almost all common acids, bases, and solvents. There are no documented incompatibilities for HPLC applications.

At-a-Glance Details About Agilent Capillaries

The following section provides useful information about Agilent capillaries and its characteristics.

Syntax for capillary description

Type - Material - Capillary dimensions - Fitting Left/Fitting right

Table 33: Example for a capillary description

Code provided with the part	Meaing of the code
Color code: 	Material of the product is MP35N, the inner diameter is 0.20 or 0.25 mm
Capillary	The part is a connection capillary
MP35N	Material of the part is MP35N
0.25 x 80 mm	The part has an inner diameter of 0.25 mm and a length of 80 mm
SI/SI	Left fitting: Swagelok + 1.6 mm Port id, Intermediate Right fitting: Swagelok + 1.6 mm Port id, Intermediate

To get an overview of the code in use, see

- Color: Table 34 Color-coding key for Agilent capillary tubing on page 375
- Type: Table 35 Type (gives some indication on the primary function, like a loop or a connection capillary) on page 375
- Material: Table 36 Material (indicates which raw material is used for the capillary) on page 376
- Dimension: Table 37 Capillary dimensions (indicates inner diameter (id), length, and volume of the capillary) on page 376
- Fittings: Table 38 Fitting left/fitting right (indicates which fitting is used on both ends of the capillary) on page 377

Color Coding Guide

Table 34: 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
0.075	MP35N	Black with orange stripe
0.1		Purple
0.12		Red
0.12	MP35N	Red with orange stripe
0.17		Green
0.17	MP35N	Green with orange stripe
0.20 /0.25		Blue
0.20 /0.25	MP35N	Blue with orange stripe
0.3		Grey
0.50		Bone White

NOTE 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.

Abbreviation Guide for Type

Table 35: Type (gives some indication on the primary function, like a loop or a connection capillary)

Key	Description
Capillary	Connection capillaries
Loop	Loop capillaries
Seat	Autosampler needle seats

Key	Description
Tube	Tubing
Heat exchanger	Heat exchanger

Abbreviation Guide for Material

Table 36: Material (indicates which raw material is used for the capillary)

Key	Description
ST	Stainless steel
Ti	Titanium
PK	PEEK
FS/PK	PEEK-coated fused silica [1]
PK/ST	Stainless steel-coated PEEK [2]
PFFE	PTFE
FS	Fused silica
MP35N	Nickel-cobalt-chromium-molybdenium alloy

[1] Fused silica in contact with solvent

[2] Stainless steel-coated PEEK

Abbreviation Guide for Capillary Dimensions

Table 37: Capillary dimensions (indicates inner diameter (id), length, and volume of the capillary)

Description
id (mm) x Length (mm)
Volume (µL)

Abbreviation Guide for Fitting Left/Fitting Right

Table 38: Fitting left/fitting right (indicates which fitting is used on both ends of the capillary)

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
N	Small head SW 5
F	Finger-tight
V	1200 bar
B	Bio
P	PEEK
I	Intermediate

Waste Electrical and Electronic Equipment (WEEE) Directive

This product complies with the European WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.



NOTE

Do not dispose of in domestic household waste
To return unwanted products, contact your local Agilent office, or see https://www.agilent.com for more information.

Radio Interference

Cables supplied by Agilent Technologies are screened to provide optimized protection against radio interference. All cables are in compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with unscreened cables, or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

RFID Statement

Brasil

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para mais informações, consulte o site da Anatel: https://www.gov.br/anatel/pt-br.

Este produto não é apropriado para uso em ambientes domésticos, pois poderá causar interferências eletromagnéticas que obrigam o usuário a tomar medidas necessárias para minimizar estas interferências.

Canada

Statement according to RSS GEN Issue 5:

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil contient des émetteurs / récepteurs exemptés de licence conformes aux RSS (RSS) d'Innovation, Sciences et Développement économique Canada. Le fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas causer d'interférences
2. Cet appareil doit accepter toutes les interférences, y compris celles susceptibles de provoquer un fonctionnement indésirable de l'appareil.

Mexico

La operación de este equipo está sujeta a las siguientes dos condiciones:

1. es posible que este equipo o dispositivo no cause interferencia perjudicial y
2. este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

Thailand

เครื่องโทรคมนาคมและอุปกรณ์นี้มีความสอดคล้องตามมาตรฐานหรือข้อกำหนดทางเทคนิคของ กสทช.

This telecommuinication equipment conforms to NTC/NBTC technical requirement.

USA

1. User Information according to FCC 15.21:Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
2. Part 15 Statement according to FCC 15.19:

   This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

   - This device may not cause interference.
   - This device must accept any interference, including interference that may cause undesired operation.

CAUTION Do not change or modify the equipment.

Changes or modifications not expressly approved by Agilent could void your authority to operate the equipment.

NOTE This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Table 39: Operating frequencies and maximum power levels

Technology	Operating Frequencies/ Bands	Maximum Transmit Power Level
RFID	125 kHz	26.8 dBm

Sound Emission

Sound Pressure

Sound pressure L_p < 55 dB(A) according to DIN EN ISO 7779

Schalldruckpegel

Schalldruckpegel L_p < 55 dB(A) nach DIN EN ISO 7779

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In This Book

This manual contains technical reference information about the Agilent 1290 Infinity III High-Speed Pump (G7120A) and Agilent 1290 Infinity III Bio High-Speed Pump (G7132A).

The manual describes the following:

- introduction,
- site requirements and specifications,
- installation,
- using the module,
- optimizing performance,
- troubleshooting and diagnostics,
- error information,
- maintenance,
- parts and materials,
- hardware information,
- LAN configuration,
- safety and related information.

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