Agilent InfinityLab Quick Change Valves G4231A/C and G4232C/D

Instructions

This technical note describes the installation and application of the Agilent InfinityLab Quick Change 2ps/6pt Valve Heads G4231A/C and 2ps/10pt Valve Heads G4232C/D in a 1290 Infinity Thermostatted Column Compartment (TCC) (G1316C).

Contents

Agilent Technologies

Typical Applications

NOTE The interconnection of ports at particular valve position strongly depends on the combination of valve and module. The software user interface always displays the correct situation. A method modification or re-plumbing of the connections is typically required if transferring methods from G1316A/B/C to G7116A/B, G1170A or G4227A.

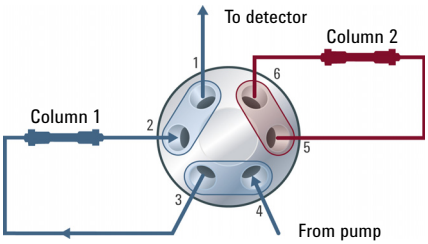
Refer to the table below for further information on which ports are connected to which position.

Modules	Valve	Position 1	Position 2
G1316A/B/C	2ps/6pt	1-2	1-6
G7116A/B, G1170A, G4227A	2ps/6pt	1-6	1-2
G1316A/B/C	2ps/10pt	1-2	1-10
G7116A/B, G1170A, G4227A	2ps/10pt	1-10	1-2

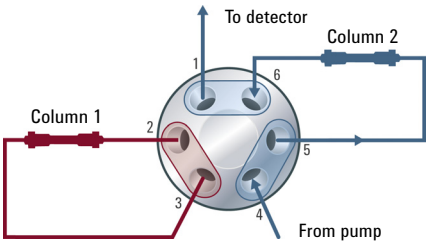
Dual column selection (2ps/6pt or 2ps/10pt valve heads)

Advantages:

- Increase productivity
- Higher instrument up-time



Position 1-2

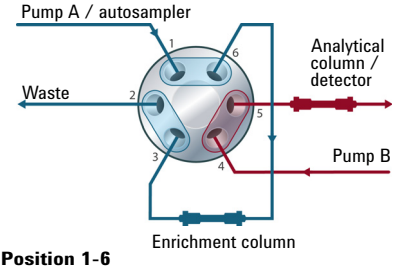


Position 1-6

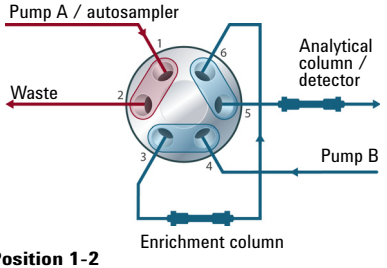
The valve can select either column 1 or column 2, allowing quick changes between two different stationary phases for separation selectivity, or immediate availability of a second and identical stationary phase in case the first column loses efficiency, when dealing with complex matrices for instance.

Sample enrichment and sample cleanup (2ps/6pt or 2ps/10pt valve heads)

Sample Enrichment

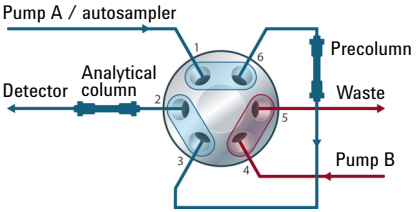


Position 1-6

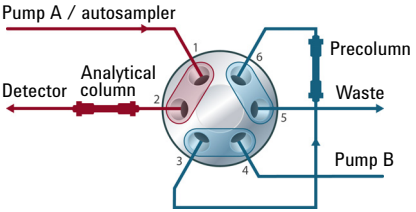


Position 1-2

Sample Cleanup



Position 1-6



Position 1-2

Advantages:

- Easy automation of sample preparation
- Higher reproducibility
- Increased productivity and sensitivity

Sample cleanup is essential for samples with complex matrices, such as biological fluids, food extracts and waste water. Before injection into a LC or LC/MS system, the sample matrix must be separated from the analytes of interest. Otherwise, contaminants can disrupt separation and detection or even damage the analytical column.

Enrichment methods

Enrichment methods are the techniques of choice to obtain highest sensitivity and to remove the sample matrix in such applications as proteomics, drug metabolism and environmental trace analysis. The analytes are retained and concentrated onto the pre-column, while the sample matrix is passed to waste. After the valve switch, a second pump backflushes the analytes out of the pre-column onto the separation column. This allows injection of large volumes onto the pre-column, significantly expanding sensitivity in the range of ten to several thousands.

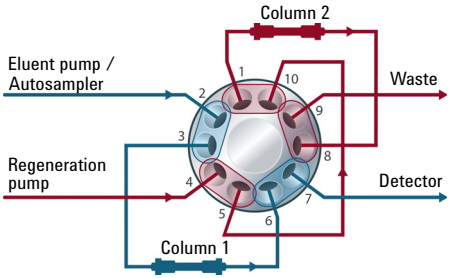
Sample cleanup

Cleanup methods handle analytes and matrices in the opposite way to enrichment methods. Matrix components are retained on the precolumn while the analytes pass through to the separation column. After the valve switches, an additional pump backflushes the matrix components out of the precolumn to waste, while the analytes are separated on the main column. Backflushing prepares the precolumn for the next injection.

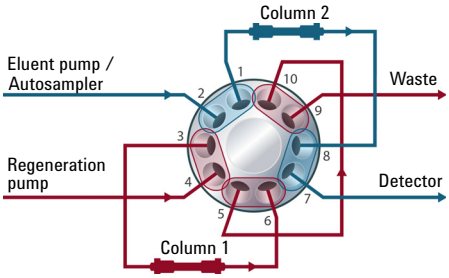
Alternating column regeneration (2ps/10pt valve heads only)

Advantages:

- High sample throughput
- Increased productivity
- High efficiency



Position 1-10



Position 1-2

Gradient elution is frequently used for fast separation of complex samples in LC. Since the gradient elution requires the column to regenerate before subsequent runs, an automated column regeneration system saves valuable analysis time. Agilent's InfinityLab Quick Change 2ps/10pt valve head enables the simultaneous analysis of one sample on one LC column while a second, identical column is flushed and equilibrated by an additional regeneration pump. At the end of the run, the valve switches to the second position and the next sample is separated on the previously flushed and equilibrated column, while the first column is now flushed and equilibrated by the regeneration pump. Up to 50 % of analysis time is often required to equilibrate columns. Using alternating column regeneration saves time and provides higher sample throughput.

Delivery Checklist

Check the content of the delivery. You should have received the following:

G4231A:

p/n	Description
5067-4282	2 position/6 port valve head, 800 bar
5067-4250	2/6 Cap Kit 0.12 mm, incl. LD-HEx (OPTIONAL)
5067-4730	2/10 Cap kit 0.17 mm (OPTIONAL)

G4231C:

p/n	Description
5067-4241	2 position/6 port valve head, 1300 bar
5067-4250	2/6 Cap Kit 0.12 mm, incl. LD-HEx

G4232C:

p/n	Description
5067-4283	2ps/10pt valve head, 800 bar
5067-4252	2/10 Cap Kit 0.12 mm, incl. LD-HEx (OPTIONAL)
5067-4730	2/10 Cap kit 0.17 mm (OPTIONAL)

G4232D:

p/n	Description
5067-4240	2 position/10 port valve head, 1300 bar
5067-4252	2/10 Cap Kit 0.12 mm, incl. LD-HEx

Capillary kit PN 5067-4250

The capillary kit PN 5067-4250 contains the following parts:

#	p/n	Description
1	0890-1713	Tube PTFE, 2 m Valve to Waste
1	5042-9918	Column clip set, 8 colors
1	5067-4647	Capillary ST 0.12 mm x 340 mm S/SX Autosampler to Valve
1	5067-4648	Capillary ST 0.17 mm x 700 mm S/SX Pump to Valve (ACR only)
2	5067-4649	Capillary ST 0.12 mm x 90 mm S/SX Valve to Heat Exchanger
2	5067-4650	Capillary ST 0.12 mm x 150 mm SL/SX Short Column to Valve
2	5067-4651	Capillary ST 0.12 mm x 280 mm SL/SX Long Column to Valve
1	5067-4652	Capillary ST 0.12 mm x 120 mm SX/SX Valve to Valve (bypass)
1	5067-4653	Capillary ST 0.12 mm x 200 mm S/SX Valve to Detector
1	G1316-60005	Low Dispersion Heat Exchanger Double Assy
3	0515-1052	Screw 2.5 mm hex
2	5500-1188	Quick Turn Capillary ST 0.12 mm x 105 mm, long socket
4	G1314-68703	Capillary fitting kit special

Capillary kit PN 5067-4730

The capillary kit PN 5067-4730 contains the following parts:

#	p/n	Description
1	5067-4723	Capillary ST 0.17 mm x 340 mm SL/SX Autosampler to Valve
1	5067-4648	Capillary ST 0.17 mm x 700 mm S/SX Pump to Valve (ACR only)
4	5067-4724	Capillary ST 0.17 mm x 90 mm S/SX Valve to Heat Exchanger and Heat Exchanger to Column
2	5067-4720	Capillary ST 0.17 mm x 150 mm SL/SX Short Column to Valve
2	5067-4722	Capillary ST 0.17 mm x 280 mm SL/SX Long Column to Valve
1	5067-4719	Capillary ST 0.17 mm x 120 mm SX/SX Valve to Valve (bypass)
1	5067-4721	Capillary ST 0.17 mm x 200 mm S/SX Valve to Detector
1	0890-1713	Tube PTFE, 2 m Valve to Waste
1	5042-9918	Column clip set, eight colors

Capillary kit PN 5067-4252

The capillary kit PN 5067-4252 contains the following parts:

#	p/n	Description
1	5067-4688	Capillary ST 0.12 mm x 120 mm SX/SX Valve to Valve (bypass)
2	5067-4686	Capillary ST 0.12 mm x 150 mm SL/SX Short Column to Valve
1	5067-4689	Capillary ST 0.12 mm x 200 mm S/SX Valve to Detector
2	5067-4687	Capillary ST 0.12 mm x 280 mm SL/SX Long Column to Valve
1	5067-4684	Capillary ST 0.12 mm x 340 mm S/SX Autosampler to Valve
1	5067-4648	Capillary ST 0.17 mm x 700 mm S/SX Pump to Valve (ACR only)
2	5067-4685	Capillary ST 0.12 mm x 90 mm S/SX Valve to Heat Exchanger
4	0100-1259	Plastic fitting
2	0890-1713	Tube PTFE, 2 m Valve to Waste
1	5042-9918	Column clip set, eight colors
1	G1316-60005	Low Dispersion Heat Exchanger Double Assy
2	5021-1820	Flex capillary, 0.12 mm x 105 mm, no fittings
4	G1314-68703	Capillary fitting kit special

Valve Specifications

Table 1 G4231A (5067-4282), 2ps/6pt Valve head, 800 bar

Type	Specification
Maximum pressure	800 bar
Typical application	Any two-way switching, e.g. between two detectors, between waste and detector, between two columns
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless Steel
pH range	0 – 14*

* incompatible with some mineral acids. For more information see Solvent Information.

Table 2 G4231C (5067-4241), 2ps/6pt Valve head, 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	Any two-way switching, e.g. between two detectors, between waste and detector, between two columns
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless Steel
pH range	0 – 14*

* incompatible with some mineral acids. For more information see Solvent Information.

Table 3 G4232C (5067-4283), 2ps/10pt Valve head, 800 bar

Type	Specification
Maximum pressure	800 bar
Typical application	Anything a 2ps/6pt valve can do plus alternating column regeneration
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless Steel
pH range	0 – 14*

* incompatible with some mineral acids. For more information see Solvent Information.

Table 4 G4232D (5067-4240), 2ps/10pt Valve head, 1300 bar

Type	Specification
Maximum pressure	1300 bar
Typical application	Anything a 2ps/6pt valve can do plus alternating column regeneration
Port size	Accepts 10-32 male threaded fittings
Liquid contacts	PEEK, Stainless Steel
pH range	0 – 14*

* incompatible with some mineral acids. For more information see Solvent Information.

Installation

Installation of the Valve Heads

The valve drives are factory-installed in the Thermostatted Column Compartments, in the 1290 Infinity Flexible Cube, and in the 1290 Infinity Universal Valve Drive. The valve heads are interchangeable and can be easily mounted.

At the first installation, the transportation lock (TCC only) and the dummy valve have to be removed, see "Removing the transportation lock and the valve dummy" on page 13. The valve heads can be installed by mounting the valve heads onto the valve drives and fastening the nut manually (do not use any tools).

Be sure that the guide pin snaps into the groove of the valve drive thread.

NOTE

TCC only:

The valves are mounted on pull-out rails to allow easy installation of capillaries. Push the valve gently into its housing until it snaps into the inner position, push it again and it slides out.

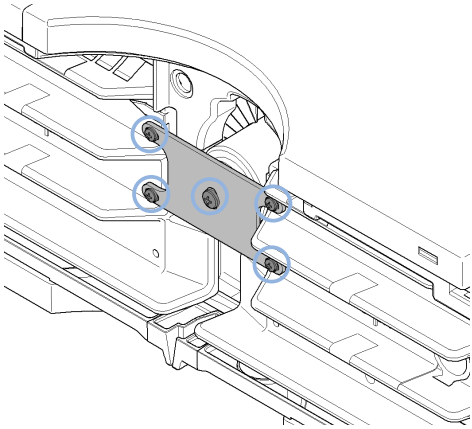
If all capillaries are installed, push the valve back into its housing, see section *Installing the Valve Head and Connecting Capillaries* in the TCC-Manual.

Removing the transportation lock and the valve dummy

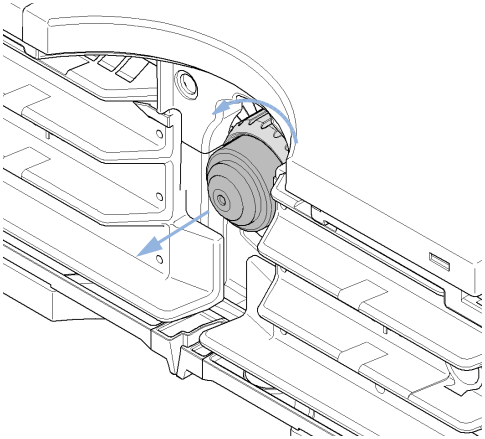
The following procedure demonstrates the necessary steps for installing the valve head to the valve drive of a TCC.

For the installation of a valve head to a G1170A 1290 Infinity Valve Drive or G4227A 1290 Infinity Flexible Cube you can ignore the steps that describe the TCC features of the transportation lock and spring loaded valve drive.

1 When unscrewing the transportation lock (TCC only), push it back until the last screw is removed - the valve rail is spring-loaded



2 To remove the valve dummy, loosen the nut manually.



Installing the valve head and connecting capillaries

CAUTION

The valve actuator contains sensitive optical parts, which need to be protected from dust and other pollutions. Pollution of these parts can impair the accurate selection of valve ports and therefore bias measurement results.

➔ Always install a valve head for operation and storage. For protecting the actuator, a dummy valve head can be used instead of a functional valve. Do not touch parts inside the actuator.

CAUTION

Column Damage or Bias Measurement Results

Switching the valve to a wrong position can damage the column or bias measurement results.

➔ Fit the lobe to the groove to make sure the valve is switched to the correct position.

CAUTION

Valve Damage

Using a low pressure valve on the high pressure side can damage the valve.

➔ When using multiple column compartments as part of a method development solution, make sure that the high pressure valve head is connected to the autosampler and the low pressure valve head is connected to the detector.

NOTE

For information about the compatibility mode of 800 bar valve heads see Information on RFID Tag Technical Note (01200-90134).

NOTE

The tag reader reads the valve head properties from the valve head RFID tag during the initialization of the module. The valve properties will not be updated if the valve head is replaced while the module is on. Selection of valve port positions can fail if the instrument does not know the properties of the installed valve.

NOTE

The Agilent 1290 Infinity Valve Drive recognizes the valve correctly, only if the valve drive was powered off for at least 10 s.

NOTE

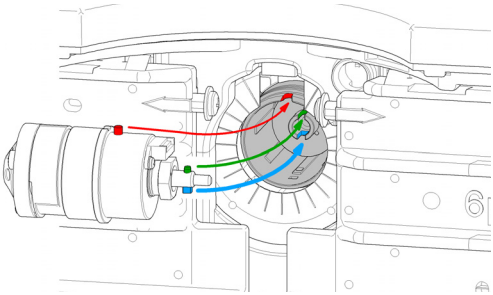
For a correct installation of the valve head, the outside pin (red) must completely fit into the outside groove on the valve drive's shaft (red). A correct installation is only possible if the two pins (green and blue) on the valve head fit into their corresponding grooves on the valve drive's actuator axis. Their match depends on the diameter of the pin and groove.

NOTE

For firmware requirements see Information on RFID Tag Technical Note (01200-90134) which is included to each valve head.

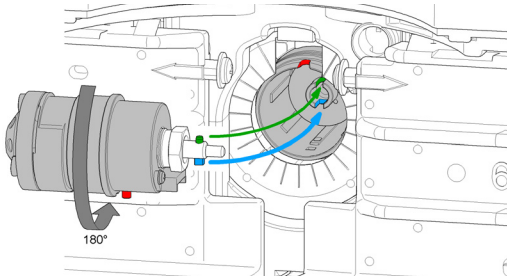
The following procedure demonstrates the necessary steps for installing the valve head to the valve drive of a TCC. For the installation of a valve head to a 1290 Infinity Valve Drive or 1290 Infinity Flexible Cube, you can ignore the steps that describe the TCC features of the spring loaded valve drive.

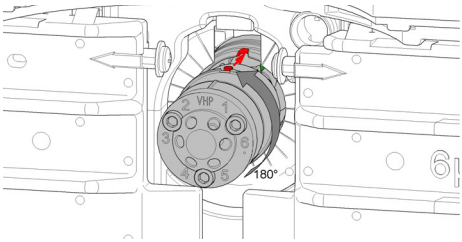
1 Insert the valve head into the valve shaft.



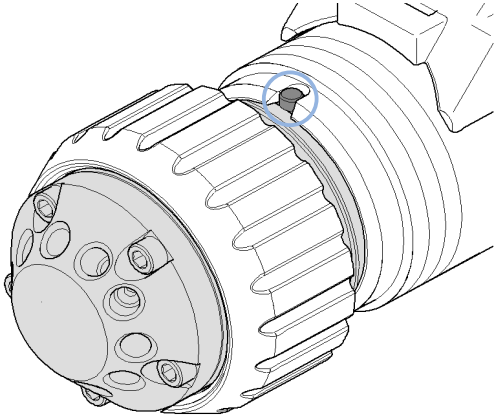
OR

If the outside pin does not fit into the outside groove, you have to turn the valve head until you feel that the two pins snap into the grooves. Now you should feel additional resistance from the valve drive while continue turning the valve head until the pin fits into the groove.





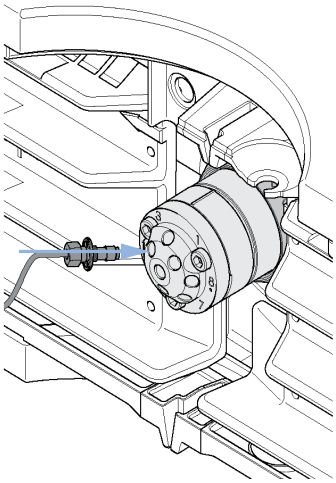
2 When the outer pin is locked into the groove, manually screw the nut onto the valve head.



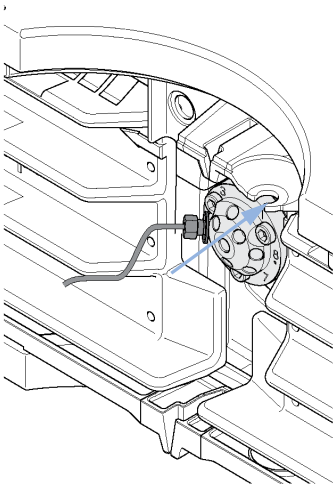
NOTE

Fasten the nut manually. Do not use any tools.

3 Install all required capillary connections to the valve.



4 Push the valve head until it snaps in and stays in the rear position. (TCC only)



5 Power on or power-cycle your module, so the valve head gets recognized during module initialization.

NOTE

Power Off the Infinity valve drive for at least 10 s.

Connecting Valves, Heat Exchanger and Columns

Installation of the Low Dispersion Heat Exchanger Double Assemblies

The device is typically mounted into the center location of either the left or the right heater element where it can support two columns.

The additional heater can be arranged in the G1316C in various locations depending on the application needs. Some examples are shown in Figure 1 on page 19.

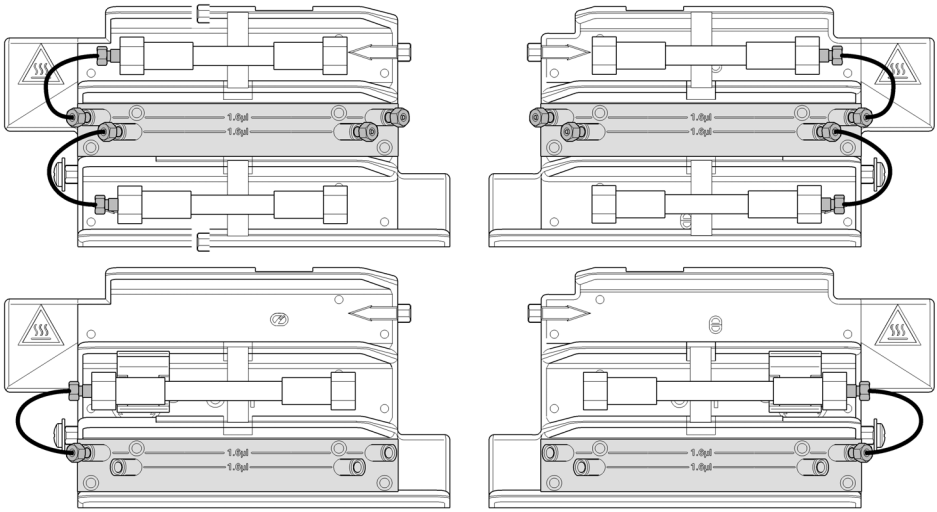


Figure 1 Arrangements of Heating and Cooling Devices (G1316C)

NOTE If the additional heating and cooling devices are used as shown in Figure 1 on page 19 (top), the column identification system cannot be used. If the column identification system is required, fix the heating and cooling devices in the upper or lower locations or fix them right/left of the current location.

NOTE The maximum flow rate to be used with the Low Dispersion Heat Exchangers is 2.5 mL/min at 100 °C and 20 °C ambient.

Delivery Checklist (G1316-80022):

#	p/n	Description
1	G1316-60005	Low Dispersion Heat Exchanger Double Assembly Incl. 3 screws for mounting
2	5500-1188	Quick Turn Capillary ST 0.12 mm x 105 mm, long socket Heat Exchanger to Column
4	G1314-68703	Capillary fitting kit special Heat Exchanger Outlet Port and Column Inlet Port (alternative fittings shown below)

Tools Required:

p/n	Description
8710-2412	Hex key 2.5 mm, 15 cm long, straight handle Required for fixing the Low Dispersion Heat Exchanger to the Heater Assembly
5023-2502	Hex driver SW-6.35, slitted Recommended for tightening the fitting nuts

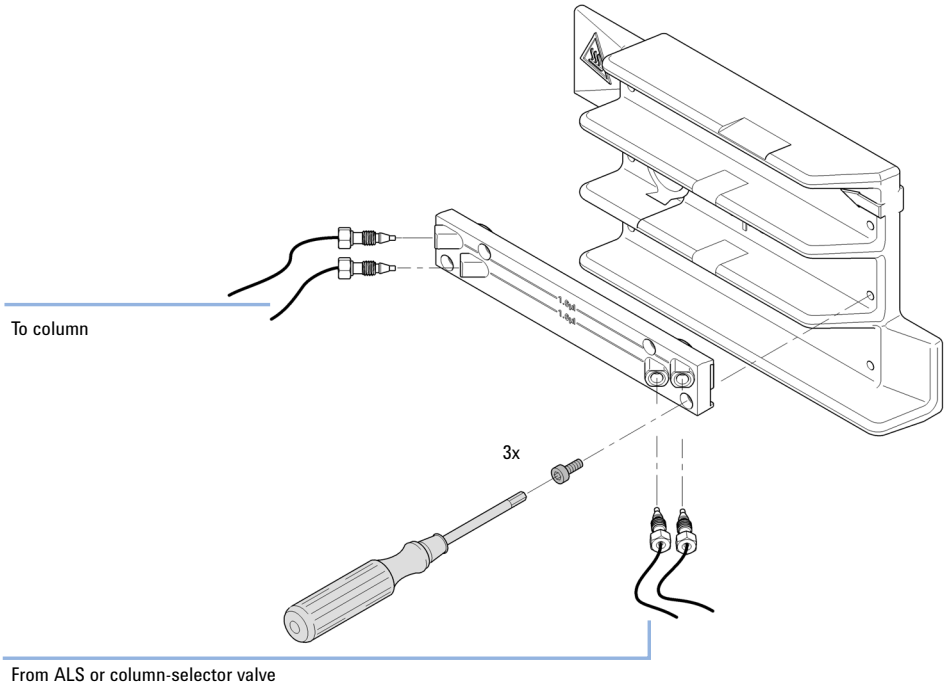


Figure 2 Fixing Heating or Cooling Devices (G1316C)

Installing the capillaries

You can use the 2ps/10pt valve head in the same way as a 2ps/6pt valve head; just follow the re-routing diagram below.

Map the ports from the 2ps/6pt valve head to the corresponding ports of the 2ps/10pt valve head according to the red arrows. For example, mount the capillary connected to port 6 (2ps/6pt) at port 2 instead.

Connect port 1 and port 8 with a 120 mm length capillary (0.12 mm i.d. or 0.17 mm i.d. depending on the capillary kit) (5067-4652). Plug Plastic fittings (0100-1259) into ports 9 and 10.

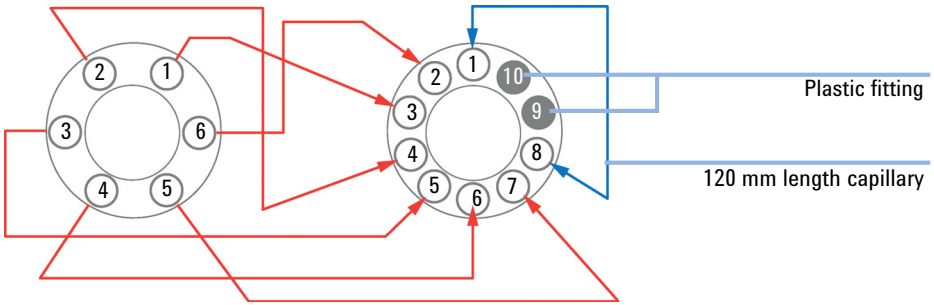


Figure 3 Re-routing of 2 position/10 port valve to match 2 position/6 port valve

1. First identify the required capillaries in your capillary kits ("Delivery Checklist" on page 6).
2. Choose the plumbing scheme depending on your application:
   - Dual column selection, see "Configuration for dual column selection" on page 24
   - Sample Enrichment, see "Configuration for sample enrichment/loading position and column re-conditioning" on page 25
   - Sample Clean-up, see "Configuration for sample enrichment/loading position and column re-conditioning" on page 25
   - Alternating Column Regeneration (only 2pos/10port valve), see "Configuration for alternating column regeneration" on page 26

NOTE Use outmost care to avoid any void volumes caused by poor connections.

3 Connect the capillaries connected directly to a column and fasten them immediately with a spanner.

4 Finger-tighten all remaining capillaries.

5 Use the column clamps to clip the columns into the heat exchangers of the Thermostatted Column Compartment/Multicolumn Thermostat.

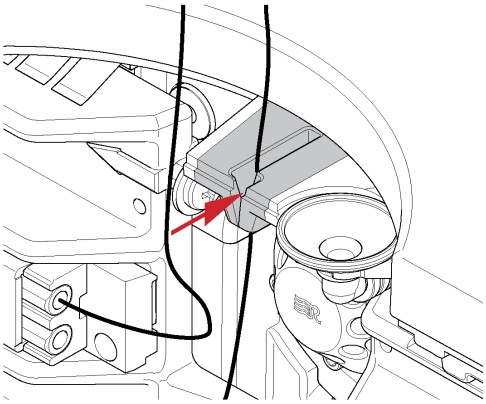
6 Fasten the fittings on the heat exchanger with a spanner.

7 Starting from position one through six (ten, respectively), fasten the fittings on the valve head.

8 Fasten all fittings on attached modules (autosampler, detector, additional pumps). Fit all unused valve ports with a plastic plug.

9 Push the valve into the rear position.

10 Place the capillaries that go to another module or waste into the capillary guides to prevent squeezing them when closing the front cover.



11 Stow any excess lengths of the capillaries.

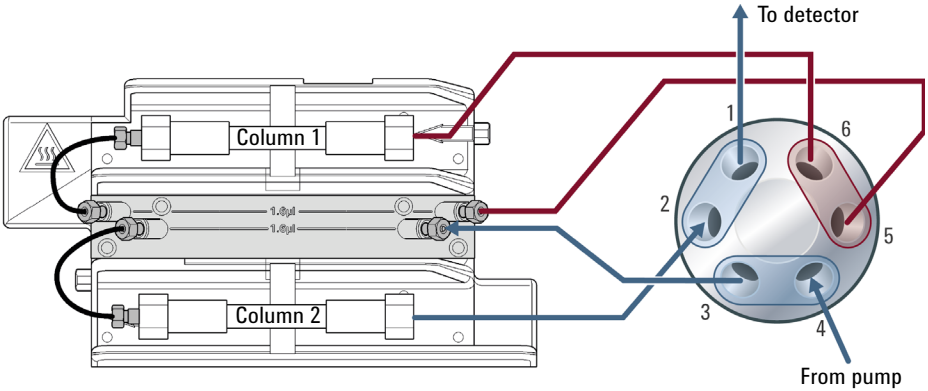
12 Perform a final leak check.

Configurations and Capillary Set-up

Configuration for dual column selection

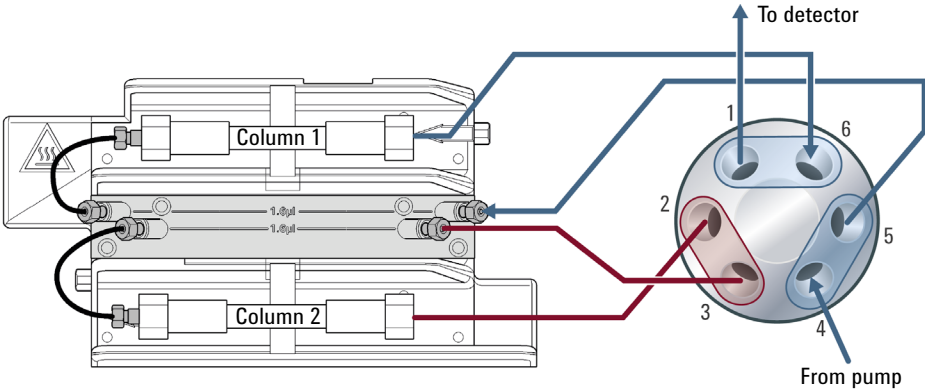
Valve position 1-2:

- Column 1 inactive
- Column 2 active



Valve position 1-6:

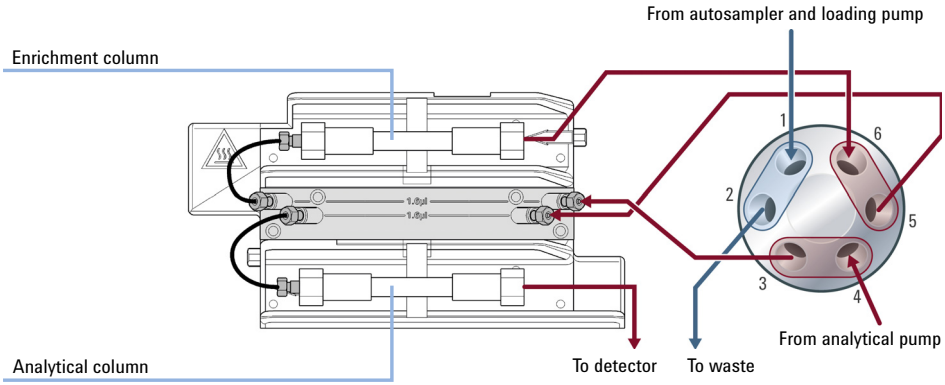
- Column 1 active
- Column 2 inactive



Configuration for sample enrichment/loading position and column re-conditioning

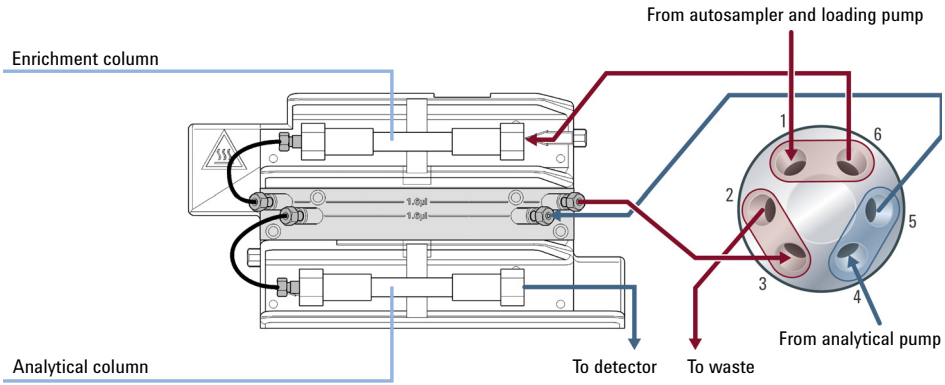
Valve position 1-2:

Analysis



Valve position 1-6:

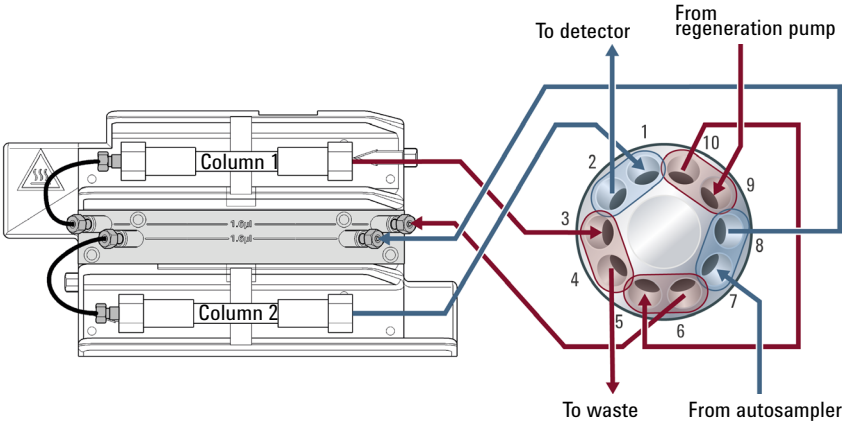
- Loading enrichment column
- Re-conditioning analytical column



Configuration for alternating column regeneration

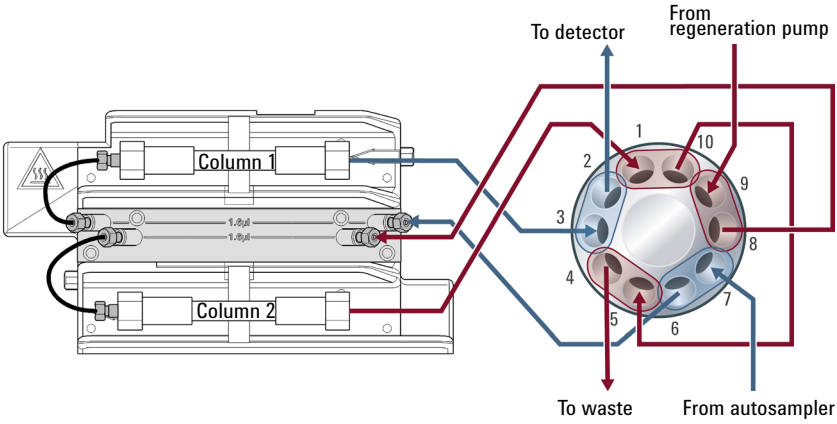
Valve position 1-2:

- Column 1: regeneration
- Column 2: analysis



Valve position 1-10:

- Column 1: analysis
- Column 2: regeneration



Valve Parts

Replacement Parts

Table 5 Replacement Parts

Valve	Rotor Seal	Stator Head	Bearing Ring	Stator Screws(Pack of 10)	Stator Ring
G4231A **5067-4282** 2ps/6pt, 800 bar	0101-1409	0101-1417	1535-4045	1535-4857	5068-0120
G4231C **5067-4241** 2ps/6pt, 1300 bar	5068-0207	5068-0006	1535-4045	1535-4857	5068-0127
G4232C **5067-4283** 2ps/10pt, 800 bar	0101-1415	5068-0165	1535-4045	5068-0019	n.a.
G4232D **5067-4240** 2ps/10pt, 1300 bar	5068-0205	5068-0011	1535-4045	5068-0019	n.a.

Valve Head Parts

NOTE The figure below illustrates replacement parts for the valve heads, with the 12ps/13pt selector valve as an example. The valves can vary in their appearance and do not necessarily include all of the illustrated parts. Neither, every spare part is available for each flavor of the valve.

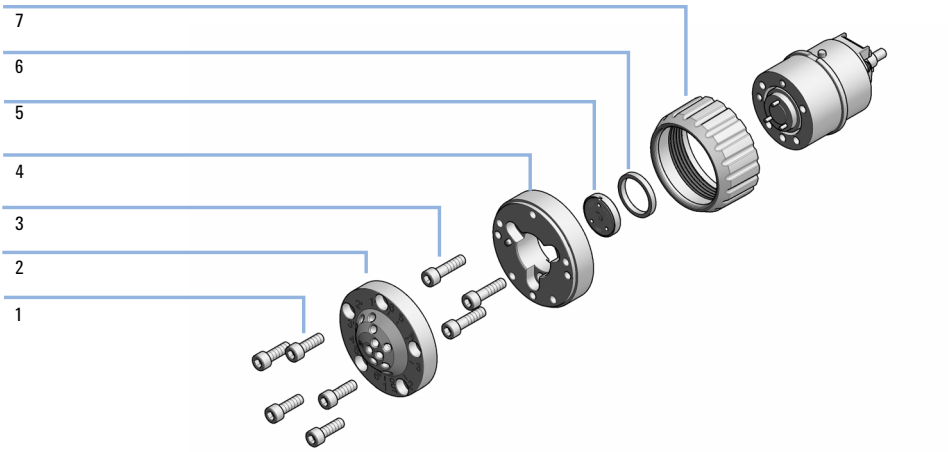


Figure 4 Valve Head Parts (example)

1	Stator screws
2	Stator head assembly
3	Stator ring screws (not available)
4	Stator ring (available for service only)
5	Rotor seal
6	Bearing ring
7	Spanner nut (available for service only)

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