

# 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 1260/1290 Infinity II Multicolumn Thermostat (MCT).

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# 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.

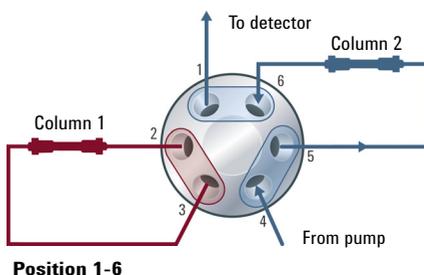
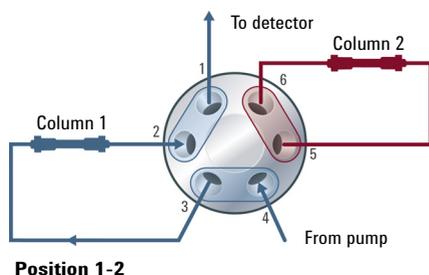
Refer to the table below for further information on which ports are connected to which position.

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:

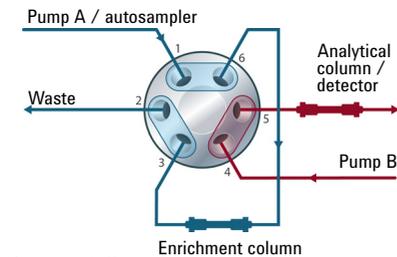
- Increase productivity
- Higher instrument up-time



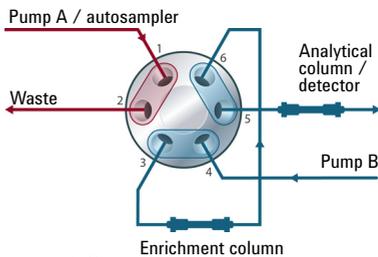
The valve can select either column 1 or column 2, allowing quick changes between two different stationary phases for separation selectivity, or immediate availability of a second and identical stationary phase in case the first column loses efficiency, when dealing with complex matrices for instance.

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

## Sample Enrichment

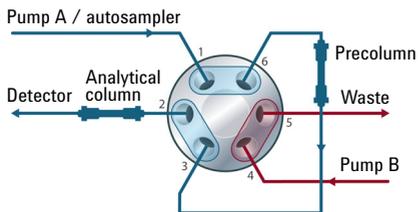


Position 1-6

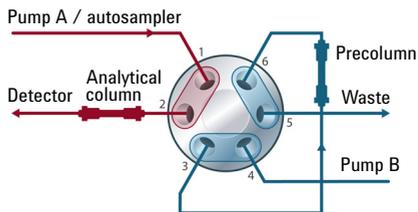


Position 1-2

## 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.

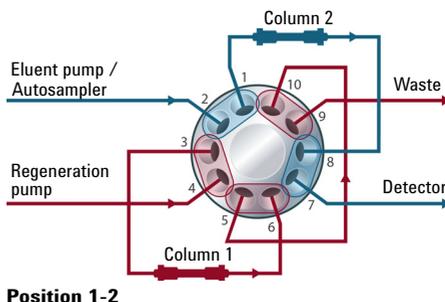
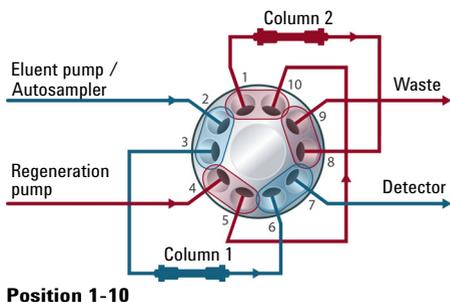
## **Sample cleanup**

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



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:

Item	p/n	Description
1	5067-4282	2 position/6 port valve head, 800 bar
2	5067-4249	2/6 Cap Kit 0.12 mm, incl. QC-HEX (OPTIONAL)
3	5067-6597	2/6 Cap Kit 0.17 mm, incl. QC-HEX (OPTIONAL)
4	5067-4730	2/10 Cap kit 0.17 mm (OPTIONAL)
5	5067-4250	2/6 Cap Kit 0.12 mm, incl. LD-HEX (OPTIONAL)

## G4231C:

Item	p/n	Description
1	5067-4241	2 position/6 port valve head, 1300 bar
2	5067-4249	2/6 Cap Kit 0.12 mm, incl. QC-HEX (OPTIONAL)
3	5067-4250	2/6 Cap Kit 0.12 mm, incl. LD-HEX (OPTIONAL)

## G4232C:

Item	p/n	Description
1	5067-4283	2ps/10pt valve head, 800 bar
2	5067-4251	2/10 Cap Kit 0.12 mm, incl. QC-HEX (OPTIONAL)
3	5067-6598	2/10 Cap Kit 0.17 mm, incl. QC-HEX (OPTIONAL)
4	5067-4730	2/10 Cap kit 0.17 mm (OPTIONAL)
5	5067-4252	2/10 Cap Kit 0.12 mm, incl. LD-HEX (OPTIONAL)

## G4232D:

Item	p/n	Description
1	5067-4240	2 position/10 port valve head, 1300 bar
2	5067-4251	2/10 Cap Kit 0.12 mm, incl. QC-HEX (OPTIONAL)
3	5067-4252	2/10 Cap Kit 0.12 mm, incl. LD-HEX (OPTIONAL)

## Capillary Kits

**Table 1** Capillary kit PN 5067-6597

p/n	Description	Connection	Quantity	Unit
G7116-60051	Quick Connect Heat Exchanger Large ID		1	ea
G7167-68703	Column connection fittings standard		2	ea
5500-1193	Quick Turn Capillary ST 0.17 x 105 mm, long socket	heat exchanger to column	2	ea
5500-1193	Quick Turn Capillary ST 0.17 x 105 mm, long socket	valve to heat exchanger	2	ea
5500-1189	Quick Turn Capillary ST 0.12 x 150 mm, long socket	short column to valve	2	ea
5500-1191	Quick Turn Capillary ST 0.12 x 280 mm, long socket	long column to valve	2	ea
0100-1516	PEEK fittings (2/Pk)	column outlet	3	ea
5065-4454	ST long fittings (10/Pk)		1	ea
5500-1191	Capillary 0.12 x 280 mm, long socket	valve to detector	1	ea
0890-1713	Tube PTFE (2 m)	valve to waste	2	ea
0100-1516	PEEK fittings (2/Pk)	for waste line	1	ea
G7116-68003	Column Holder Clips (2/Pk)		2	ea
5067-6654	Number Kit 1-8 colored		1	ea

**Table 2** Capillary kit PN 5067-4249

p/n	Description	Connection	Quantity	Unit
G7116-60015	Quick Connect Heat Exchanger Standard		1	ea
5067-5957	Quick Connect Assy ST 0.12 x 105 mm	Heat exchanger to column	1	ea
5067-4649	Capillary ST 0.12 x 90 mm S/SX	Valve to heat exchanger	2	ea
5500-1189	Quick Turn Capillary ST 0.12 x 150 mm, long socket	Column (short) to valve	2	ea
5500-1191	Quick Turn Capillary ST 0.12 x 280 mm, long socket	Column (long) to valve	2	ea
5500-1209	Capillary ST 0.12 x 200 mm SX/S	Valve to detector	2	ea
0890-1713	Tube PTFE, 2 m	Valve to waste	2	ea
0100-1516	PEEK fittings (2/Pk)	For waste line	1	ea
G7116-68004	Column Holder Clips (2/Pk)		2	ea
G1314-68703	Capillary Fitting Kit		2	ea
5067-6654	Number Kit 1-8 colored		1	ea

**NOTE**

For column selection with the ICC in 1260/1290 Infinity II Vialsampler the 2ps/6pt valve head (G4231A/C) needs to be hosted on a G1170A, which needs to be attached to the detector.

**Table 3** Capillary Kit PN 5067-6707 Column Select ICC (G4231A/C valve hosted on a G1170A)

p/n	Description	Connection	Quantity	Unit
5500-1236	Quick Turn Capillary ST 0.17 mm × 400 mm Long Socket	Vialsampler to valve	1	ea
5500-1236	Quick Turn Capillary ST 0.17 mm × 400 mm Long Socket	Valve to ICC	2	ea
5067-6166	Quick Connect Fitting Assembly 0.17 mm × 105 mm	Quick Connect Fitting, Capillary, Rear End Fitting	2	ea
5500-1192	Quick Turn Capillary ST 0.12 mm × 500 mm Long Socket	Column to valve	2	ea
5067-5966	Quick Turn Fitting	Single Quick Turn Fitting	2	ea
5065-4454	Long fittings and ferrules, SS, 10/Pk		1	ea
5500-1251	Capillary ST 0.12 x 400 mm SL/SL Long Socket	Valve to detector	1	ea

**Table 4** Capillary Kit PN 5067-6708 Column Select ICC (G4231A/C valve hosted on a G1170A)

p/n	Description	Connection	Quantity	Unit
5500-1251	Capillary ST 0.12 mm × 400 mm SL/SL Long Socket	Vialsampler to valve	1	ea
5500-1251	Capillary ST 0.12 mm × 400 mm SL/SL Long Socket	Valve to ICC	2	ea
5067-5957	Quick Connect Fitting Assembly 0.12 mm × 105 mm	Quick Connect Fitting, Capillary, Rear End Fitting	2	ea
5500-1192	Quick Turn Capillary ST 0.12 mm × 500 mm Long Socket	Column to valve	2	ea
5067-5966	Quick Turn Fitting	Single Quick Turn Fitting	2	ea
5065-4454	Long fittings and ferrules, SS, 10/Pk		1	ea
5500-1251	Capillary ST 0.12 x 400 mm SL/SL Long Socket	Valve to detector	1	ea

**Table 5** Capillary kit PN 5067-4251

<b>p/n</b>	<b>Description</b>	<b>Connection</b>	<b>Quantity</b>	<b>Unit</b>
G7116-60015	Quick Connect Heat Exchanger Standard		1	ea
5067-5957	Quick Connect Assy ST 0.12 x 105 mm	Heat Exchanger to column	1	ea
5500-1189	Quick Turn Capillary ST 0.12 x 150 mm, long socket	Column (short) to valve	2	ea
5500-1191	Quick Turn Capillary ST 0.12 x 280 mm, long socket	Column (long) to valve	2	ea
G1314-68703	Cap fitting kit special	Column to valve (above capillaries)	2	ea
5067-4688	Capillary ST 0.12 x 120 mm SX/SX	Valve to valve bypass line	1	ea
5500-1209	Capillary ST 0.12 x 200 mm SX/S	Valve to detector	1	ea
5500-1210	Capillary ST 0.12 x 500 mm SX/SX	ALS to valve	1	ea
5067-4648	Capillary ST 0.17 x 700 mm S/SX	Pump to valve (Alternate Column Regeneration setup only)	1	ea
5067-4685	Capillary ST 0.12 x 90 mm S/SX	Valve to Heat Exchanger, (long screw fitting used at valve)	2	ea
0100-1516	PEEK fittings (2/Pk)	Waste line connector	1	ea
0890-1713	Tube PTFE, 2 m	Waste line	1	ea
G7116-68004	Column Holder Clips (2/Pk)		2	ea
5067-6654	Number Kit 1-8 colored		1	ea

**Table 6** Capillary kit PN 5067-6598

<b>p/n</b>	<b>Description</b>	<b>Connection</b>	<b>Quantity</b>	<b>Unit</b>
G7116-60051	Quick Connect Heat Exchanger Large ID		1	ea
G7167-68703	Column connection fittings standard		2	ea
5500-1193	Quick Turn Capillary ST 0.17 x 105 mm, long socket	heat exchanger to column	2	ea
5500-1193	Quick Turn Capillary ST 0.17 x 105 mm, long socket	valve to heat exchanger	2	ea
5500-1189	Quick Turn Capillary ST 0.12 x 150 mm, long socket	short column to valve	2	ea
5500-1191	Quick Turn Capillary ST 0.12 x 280 mm, long socket	long column to valve	2	ea
5067-4719	Capillary ST 0.17 x 120 mm SL-SL	bypass	1	ea
0100-1516	PEEK fittings (2/Pk)	column outlet	3	ea
5065-4454	ST long fittings (10/Pk)		1	ea
5067-4648	Capillary ST 0.17 x 700 mm pre-swaged	pump to valve	1	ea
5500-1191	Quick Turn Capillary 0.12 x 280 mm long socket	valve to detector	1	ea
0890-1713	Tube PTFE (2 m)	valve to waste	2	ea
0100-1516	PEEK fittings (2/Pk)	for waste line	1	ea
G7116-68003	Column Holder Clips (2/Pk)		2	ea
5067-6654	Number Kit 1-8 colored		1	ea

# Specifications

**Table 7** 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 8** 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 9** 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 10** 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 Multicolumn Thermostat. The valve heads are interchangeable and can be easily mounted.

At the first installation, the transportation lock and the dummy valve have to be removed, see [“Remove the Transportation Lock and the Valve Dummy”](#) on page 15. 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

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.

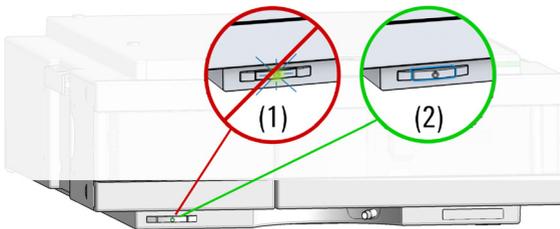
When all capillaries are installed, push the valve back into its housing, see [“Install the Valve Head and Connect Capillaries”](#) on page 17.

## Remove 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 Multicolumn Thermostat (MCT).

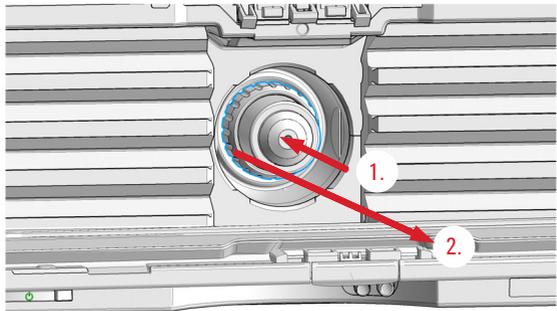
For the installation of a valve head to a G1170A Valve Drive you can ignore the steps that describe the MCT features of the transportation lock and spring loaded valve drive.

- 1 Switch off the module.

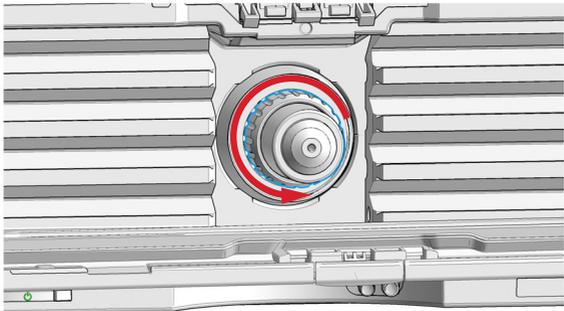


- 2 When unscrewing the transportation lock, push it back until the last screw is removed - the valve rail is spring-loaded.

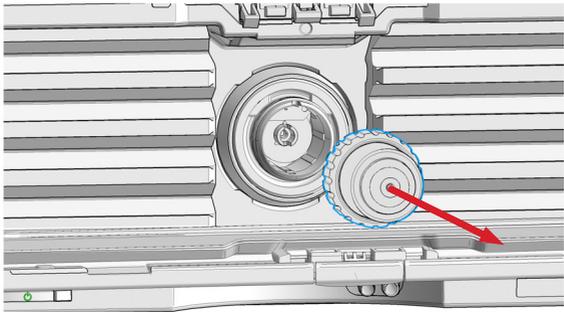
**3** Press on the valve dummy (1.) to release it (2.) (spring-loaded valve rail).



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## Install the Valve Head and Connect Capillaries



For bio-inert modules use bio-inert parts only!

### CAUTION

The valve actuator contains sensitive optical parts, which need to be protected from dust and other pollution. 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.
-

**CAUTION**

Sample degradation and contamination of the instrument

Metal parts in the flow path can interact with the bio-molecules in the sample leading to sample degradation and contamination.

- For bio-inert applications, always use dedicated bio-inert parts, which can be identified by the bio-inert symbol or other markers described in this manual.
- Do not mix bio-inert and non-inert modules or parts in a bio-inert system.

**CAUTION**

Wrong combination of fitting with valve

The InfinityLab Quick Turn Fitting (5067-5966) is not compatible with the G5639A Bio-inert 4-Column Selector Valve. Misuse can lead to extra dead volume and leaks.

- As fitting, use UHP fitting (5067-5403) instead.

**NOTE**

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

**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**

The tag reader reads the valve head properties from the valve head RFID tag during initialization of the module. 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**

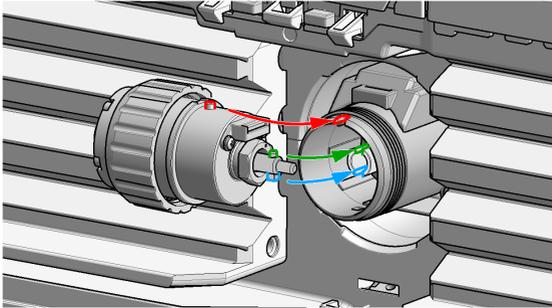
To allow correct valve identification, power off the valve drive for at least 10 s.

**NOTE**

For firmware requirements see Information on new RFID Tag Assembly Version Technical Note (01200-90133) which is included to each valve head.

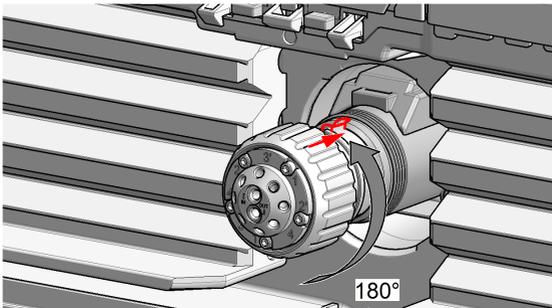
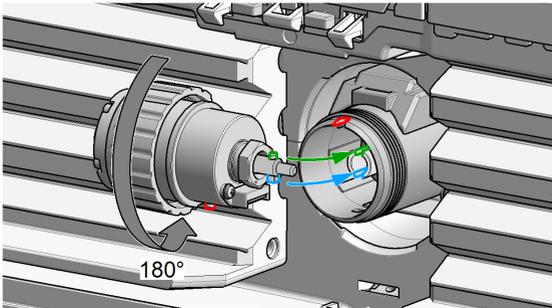
**The following procedure shows the valve head installation with an G7116A/B (MCT) module as an example. For other modules it is similar.**

**1** Insert the valve head into the valve shaft.

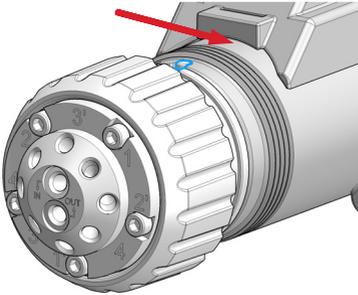


OR

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 continuously turning the valve head until the pin fits into the groove.



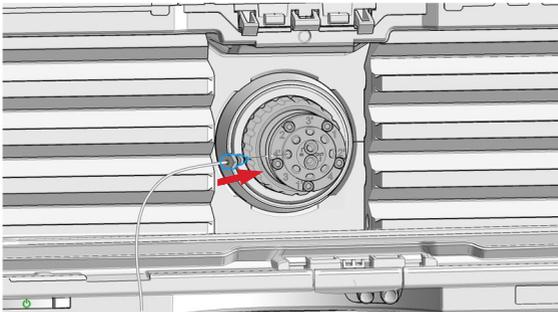
- 2** When the outer pin is locked into the groove, manually screw the nut onto the valve head.



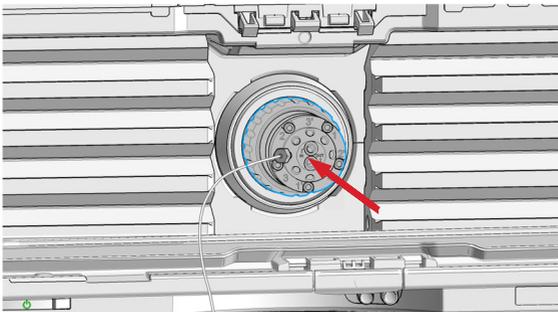
**NOTE**

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.

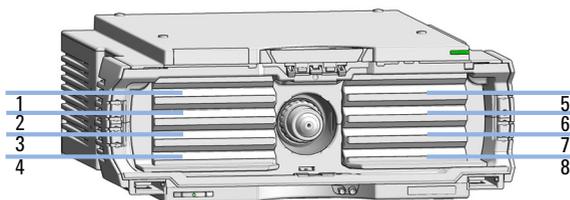


- 5** Power on or power-cycle your module, so the valve head gets recognized during module initialization.

## Install Heat Exchanger

<b>Tools required</b>	<b>p/n</b>	<b>Description</b>
	5043-0915	Fitting mounting tool
OR	5023-2502	Hex driver SW-6.35, slitted
	8710-0510	Open-end wrench 1/4 — 5/16 inch
<b>Parts required</b>	<b>p/n</b>	<b>Description</b>
		For 1290:
	G7116-60015	Quick Connect Heat Exchanger Standard
	G7116-60021	Quick Connect Heat Exchanger Ultra Low Dispersion
	G7116-60031	Quick Connect Heat Exchanger High Flow
	5067-5957	InfinityLab Quick Connect Assy ST 0.12 mm x 105 mm
	G7116-68003	Column Holder Clips (2/Pk)
		For 1260:
	G7116-60061	Quick Connect Heat Exchanger Large ID High Flow
	G7116-60051	Quick Connect Heat Exchanger Large ID
	5500-1193	Capillary ST 0.17 mm x 105 mm, long socket
	5067-5966	InfinityLab Quick Turn Fitting

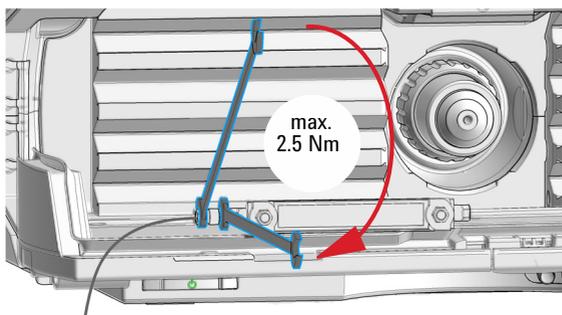
- 1 Possible positions for heat exchangers. If only one column is used, the preferred positions are 2,3,6, or 7.



- 2 Connect the column connection capillary of the InfinityLab Quick Connect Fitting to the outlet port of the heat exchanger.

#### NOTE

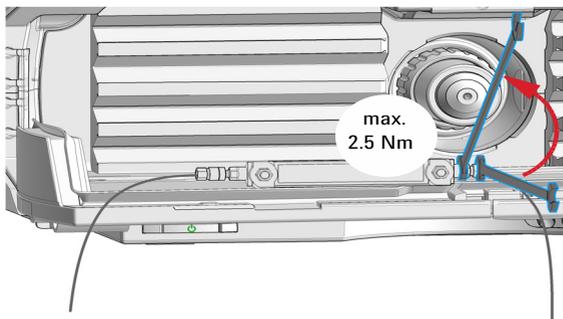
The Pre-Column Heat Exchanger can be damaged if excessive torque is applied to the port. Always use a wrench to counter the Pre-Column Heat Exchanger port while tightening the capillary fitting.



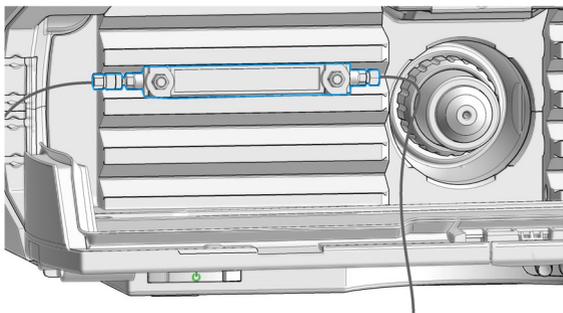
**3** Connect the sampler outlet capillary to the inlet port of the heat exchanger.

### NOTE

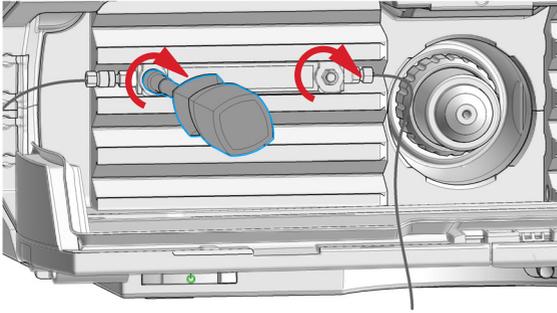
The Pre-Column Heat Exchanger can be damaged if excessive torque is applied to the port. Always use a wrench to counter the Pre-Column Heat Exchanger port while tightening the capillary fitting.



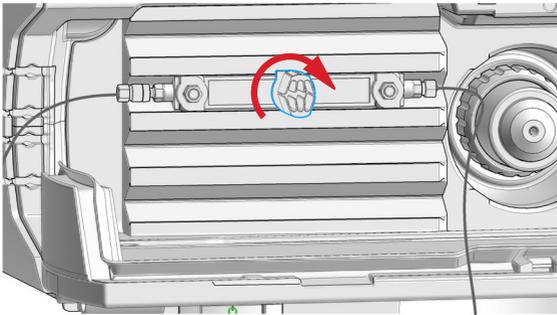
**4** Position the heat exchanger as shown.



5



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**NOTE**

The column holder clip can be mounted at any free spot on top of the heat exchanger.

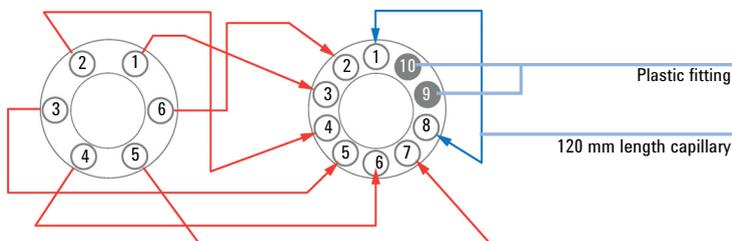
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## Install the Capillaries

The 2ps/10pt valve can be used here in the same way as a 2ps/6pt valve; just follow the re-routing diagram below.

Map the ports from the 2ps/6pt valve to the corresponding ports of the 2ps/10pt valve 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. Plug plastic fittings into ports 9 and 10.



**Figure 1** Re-routing of 2 position/10 port valve to match 2 position/6 port valve

### NOTE

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

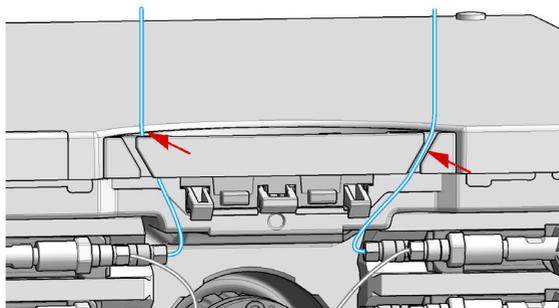
### 1 Install the capillaries.

### NOTE

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

- 2 Connect the capillaries connected directly to a column and fasten them immediately with a spanner.
- 3 Finger-tighten all remaining capillaries.
- 4 Clip the unions into the corresponding clips of the low dispersion heat exchangers.
- 5 Fasten all fittings with a spanner.

- 6** Starting from position one through six (ten, respectively), fasten the fittings on the heat exchanger.
- 7** Fasten all fittings on attached modules (autosampler, detector, additional pumps). Fit all unused valve ports with a plastic plug.
- 8** Push the valves into the rear positions.
- 9** Place the capillaries that go to another module or waste into the capillary guides to prevent squeezing them when closing the front cover.



- 10** Stow any excess lengths of the capillaries.
- 11** Perform a final leak-check.

# Valve Parts

## Replacement Parts

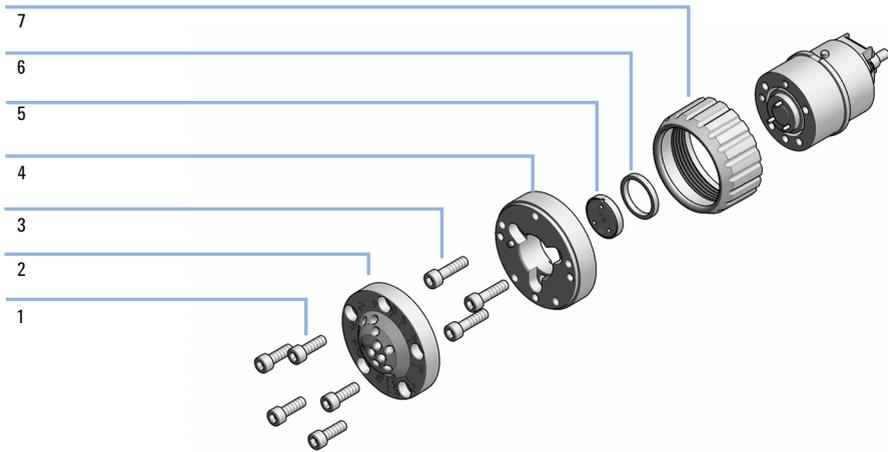
**Table 11** Replacement Parts

<b>Valve</b>	<b>Rotor Seal</b>	<b>Stator Head</b>	<b>Bearing Ring</b>	<b>Stator Screws(Pack of 10)</b>	<b>Stator Ring</b>
<b>G4231A</b> <b>5067-4282</b> 2ps/6pt, 800 bar	0101-1409	0101-1417	1535-4045	1535-4857	5068-0120
<b>G4231C</b> <b>5067-4241</b> 2ps/6pt, 1300 bar	5068-0207	5068-0006	1535-4045	1535-4857	5068-0120
<b>G4232C</b> <b>5067-4283</b> 2ps/10pt, 800 bar	0101-1415	5068-0165	1535-4045	5068-0019	n.a.
<b>G4232D</b> <b>5067-4240</b> 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 2** 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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Agilent Technologies, Inc  
Hewlett-Packard-Strasse 8  
76337 Waldbronn, Germany