Agilent G5632
Valve Kit Instructions

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Typical Applications

In this chapter, the following applications are described:

- Alternating column regeneration
- Dual column selection
- Sample enrichment
- Sample cleanup

NOTE The applications are described for a 2 position/10 port valve or 2 position/6 port valve. How to use a 2 pos/10 port valve as an 2 position/6 port valve, see “Installing the Capillaries” on page 13.

Alternating Column Regeneration (2 position/10 port valves 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 2-position/10-port valve for the 1290 Infinity TCC enable 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.
Figure 1  Alternate Column Regeneration (Time Scheme)

**Dual column selection**

Advantages:
- Increase productivity
- Higher instrument up-time

Quickly change between two different stationary phases to check your separation selectivity, or use two identical stationary phases to have the second column immediately available after the first one loses efficiency, for example with complex matrices.
Sample Enrichment and Sample Cleanup

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.

Sample Enrichment

Sample Cleanup
**Enrichment methods**

Enrichment methods are the technique 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.

**Stripping methods**

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

**Table 1**  
G5632 Bio-inert 2pos/10port Valve Head kit

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 pos/10 port valve bio-inert, 600 bar (5067-4132)</td>
<td>1</td>
<td>ea</td>
<td></td>
</tr>
<tr>
<td>2-10 POD Bio Capillary Kit (5067-5419)</td>
<td>1</td>
<td>ea</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2**  
Content of the 2-10 POD Bio Capillary Kit (P/N 5067-5419)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
<th>Unit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capillary PK 0.18 mm x 1.5 m (0890-1763)</td>
<td>1</td>
<td>EA</td>
<td>column outlet to valve, valve to detector and Port 5 to Port 10 in the Automated Column Regeneration setup</td>
</tr>
<tr>
<td>Fingertight fitting long (5062-8541)</td>
<td>1</td>
<td>PK</td>
<td></td>
</tr>
<tr>
<td>Capillary 700 x 0.17 mm ID, titanium (G5611-60501)</td>
<td>1</td>
<td>EA</td>
<td>Regeneration pump to the valve</td>
</tr>
<tr>
<td>PEEK/SST cap 0.17 mm ID, 300 mm long (G5667-60505)</td>
<td>2</td>
<td>EA</td>
<td>Valve to column inlet</td>
</tr>
<tr>
<td>PEEK/SST capillary (bio-inert) 0.17 mm ID, 400 mm long (G5667-60500)</td>
<td>1</td>
<td>EA</td>
<td>Valve Outlet to Detector</td>
</tr>
<tr>
<td>Waste tubing, 2 m (0890-1713)</td>
<td>2</td>
<td>m</td>
<td>Valve to waste</td>
</tr>
<tr>
<td>Column Holder Clips (2/Pk) for G7116B (G7116-68003)</td>
<td>1</td>
<td>PK</td>
<td></td>
</tr>
<tr>
<td>Plastic fitting (0100-1259)</td>
<td>4</td>
<td>EA</td>
<td></td>
</tr>
</tbody>
</table>
## Specifications

### Table 3  G5632A, bio-inert 2-position/10-port valve head, 600 bar

<table>
<thead>
<tr>
<th>Type</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid contacts</td>
<td>PEEK, ceramic</td>
</tr>
<tr>
<td>Port size</td>
<td>Accepts 10-32 male threaded fittings</td>
</tr>
<tr>
<td>Flow passage diameters</td>
<td>Stator (includes stator face assembly)- 0.38 mm (0.015 in), Rotor Seal- 0.30 mm (0.012 in)</td>
</tr>
<tr>
<td>Volume in flow passage</td>
<td>Stator (includes stator face assembly)- 0.83 µL/hole, Rotor Seal- 0.09 µL/60° groove.</td>
</tr>
<tr>
<td>Port to Port Volume</td>
<td>1.7 µL</td>
</tr>
<tr>
<td>Maximum pressure</td>
<td>600 bar</td>
</tr>
</tbody>
</table>
Install the Valve Heads

The valve drives are factory-installed in the Agilent 1290 Infinity Thermostatted Column Compartment (G1316C), the Agilent InfinityLab LC Multicolumn Thermostat (G7116) and in the Agilent 1290 Infinity Valve Drive. The valve heads are interchangeable and can be easily mounted.

At the first installation, the dummy valve has to be removed from the valve drive. To make this possible, the transportation lock (G1316C) or transportation protection (G7116) have to be removed by unscrewing them from the front. The valve head can be installed by mounting it onto the valve drive 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 9.
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 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.
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.

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.

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.

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

For firmware requirements see Information on new RFID Tag Assembly Version Technical Note (01200-90130) which is included to each valve head.
The following procedure shows the valve head installation with an G7116 (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 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.

![Image](image1.png)

**NOTE**
Fasten the nut manually. Do not use any tools.

3 Install all required capillary connections to the valve.

![Image](image2.png)

4 Push the valve head until it snaps in and stays in the rear position.

![Image](image3.png)

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

The 2pos/10port valve can be used here in the same way as a 2pos/6port valve; just follow the re-routing diagram below. The red arrows mean that you have to take the according installation diagram of the 2pos/6port valve but have to mount for example the capillary connected to port 6 of the 2pos/6port valve at port 2 of the 2pos/10port valve. The ports 1 and 8 have to be connected with a high pressure suitable capillary connection (SST, Titanium or PEEK coated SST) and the ports 9 and 10 need to be plugged with Plastic fittings (0100-1259).

![Capillary Diagram]

Installation of Stainless Steel Cladded PEEK Capillaries

The Agilent 1260 Infinity Bio-inert LC System uses PEEK capillaries, which are cladded with stainless steel. These capillaries combine the high pressure stability of steel with the inertness of PEEK. They are used in the high pressure flow path after sample introduction (needle seat capillary) through the TCC/heat exchangers to the column. Such capillaries need to be installed carefully in order to keep them tight without damaging them by overtightening.

**CAUTION**

- Strong force/torque will damage SST cladded PEEK capillaries
- Be careful when installing stainless steel cladded PEEK capillaries.
- For correct installation see Agilent 1260 Infinity Bio-inert Quaternary LC System Manual.
Connecting the capillaries

Flow Diagram

A schematic of the valve flow switching pattern is shown below. The numbered circles represent the ports in the valve stator and stator face assembly. The slots represent the connecting passages in the rotor seal.

The following table give you an overview about the different connection setups with and without installed Bio-Inert Solvent Heating Devices (9 µL internal volume, 600 bar max pressure) (G5616-81000) or Quick-Connect Heat Exchanger Bio-inert (G7116-60041).
<table>
<thead>
<tr>
<th>Port</th>
<th>Connection without additional heat exchangers</th>
<th>Connection with additional heat exchangers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Column 2 inlet (PEEK/SST cap 0.17 mm ID, 300 mm long (G5667-60505))</td>
<td>Right heat exchanger inlet connection (directly or with PEEK/SST cap 0.17 mm ID, 300 mm long (G5667-60505) connected to bio-inert union)</td>
</tr>
<tr>
<td>2</td>
<td>Capillary from Eluent pump / Autosampler</td>
<td>Capillary from Eluent pump / Autosampler</td>
</tr>
<tr>
<td>3</td>
<td>Column 1 inlet (PEEK/SST cap 0.17 mm ID, 300 mm long (G5667-60505))</td>
<td>Left heat exchanger inlet connection (directly or with PEEK/SST cap 0.17 mm ID, 300 mm long (G5667-60505) connected to bio-inert union)</td>
</tr>
<tr>
<td>4</td>
<td>Regeneration Pump (Capillary 700 x 0.17 mm ID, titanium (G5611-60501))</td>
<td>Regeneration Pump (Capillary 700 x 0.17 mm ID, titanium (G5611-60501))</td>
</tr>
<tr>
<td>5</td>
<td>Connection to Port 10 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
<td>Connection to Port 10 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
</tr>
<tr>
<td>6</td>
<td>Outlet Column 1 (PEEK tubing 1/16”, p/n 0890-1763)</td>
<td>Outlet Column 1 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
</tr>
<tr>
<td>7</td>
<td>Detector (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
<td>Detector (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
</tr>
<tr>
<td>8</td>
<td>Outlet Column 2 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
<td>Outlet Column 2 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
</tr>
<tr>
<td>9</td>
<td>Waste (Waste tubing, 2 m (0890-1713))</td>
<td>Waste (Waste tubing, 2 m (0890-1713))</td>
</tr>
<tr>
<td>10</td>
<td>Connection to Port 5 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
<td>Connection to Port 5 (Capillary PK 0.18 mm x 1.5 m (0890-1763))</td>
</tr>
</tbody>
</table>
# Replacement Parts

<table>
<thead>
<tr>
<th>p/n</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5068-0040</td>
<td>Stator head assembly</td>
</tr>
<tr>
<td>5068-0041</td>
<td>Rotor seal</td>
</tr>
<tr>
<td>5068-0095</td>
<td>Stator face seal</td>
</tr>
<tr>
<td>1535-4045</td>
<td>Bearing ring</td>
</tr>
<tr>
<td>5068-0059</td>
<td>Stator screws</td>
</tr>
</tbody>
</table>