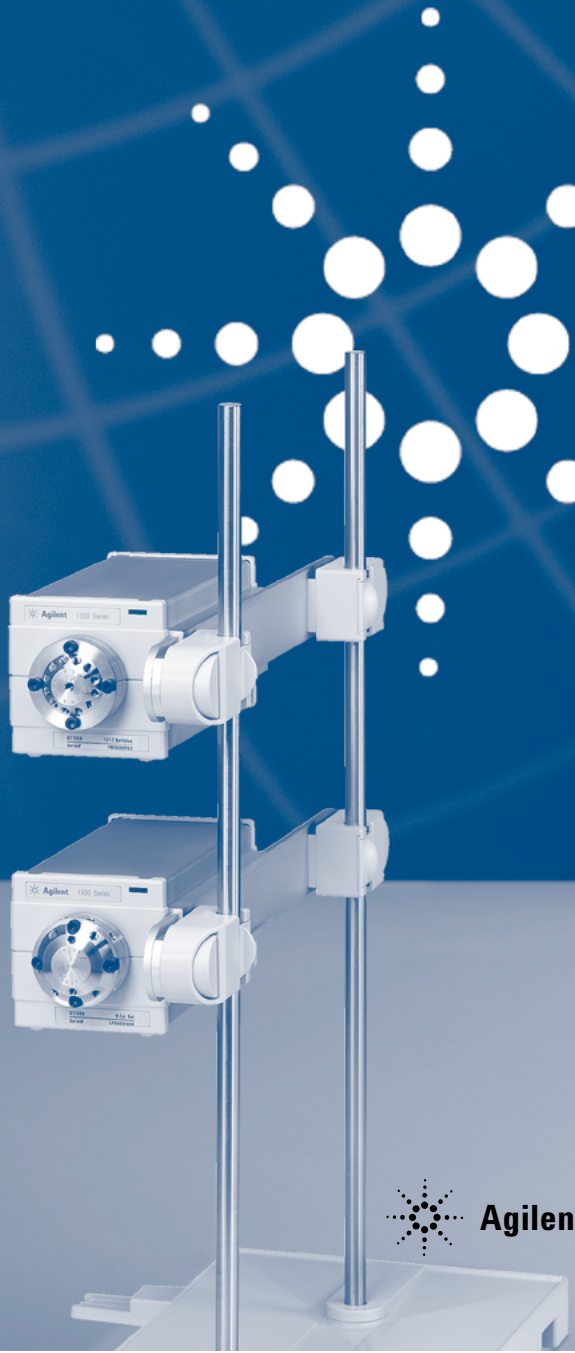
# Agilent 1100 Series Valves

## Operator's Manual



Agilent Technologies

# Notices



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**CAUTION**

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# In this Manual, you will find ...

The Agilent 1100 Series valves provide the user comprehensive solutions for more flexibility through solvent selection and column selection. They offer new automation capabilities for sample preparation as well as higher sample throughput with alternating column regeneration. The Agilent 1100 Series valves are fully integrated in the CAN environment (control area network) of the Agilent 1100 HPLC system and can be controlled by the Agilent ChemStation Software. The following types of valves will be described in this manual:

- G1157A Agilent 1100 Series 2 Position/10 Port Valve
- G1158A Agilent 1100 Series 2 Position/ 6 Port Valve
- G1159A Agilent 1100 Series 6 Position Selection Valve
- G1160A Agilent 1100 Series 12 Position/13 Port Selection Valve

These valves and the corresponding capillary kits for alternating column regeneration, sample enrichment, sample clean-up, column selection or solvent selection will allow you to implement these applications easily.

Chapter 1, “Installation and Configuration,” starting on page 1 will describe how to install and configure the 1100 Series valves.

Chapter 2, “Operation,” starting on page 11 will describe the Agilent ChemStation valve interface and how to setup the valves in your analytical method.

Chapter 3, “Maintenance, Repair, and Troubleshooting,” starting on page 17 will describe recommended maintenance and repair procedures as well as troubleshooting tools.

Chapter 4, “Valve Applications,” starting on page 29 will describe common application, e.g. alternating column regeneration, and how to setup your valves for these applications.

# Contents



# 1
# Installation and Configuration

# Site Requirements

The requirements for the Agilent 1100 Series Valves are displayed Table 1 and Table 2 on page 2. The 24 Volts DC power can be supplied by an external power supply (0950-4422) or by one of the following Agilent 1100 Series modules with DC CAN adapter.

- G1361A Agilent 1100 Series Preparative Pump
- G1364A Agilent 1100 Series Fraction Collector
- G1367A Agilent 1100 Series Well-Plate Autosampler

**Table 1** Site Requirements for Agilent 1100 Series Valves

| Type | Specification |
|---|---|
| • Weight | 1.9 Kg (4.2 lbs) |
| • Dimensions<br>• (height x width x depth) | 92 x 84 x 200 mm<br>(9.2 x 3.3 x 8.0 inches) |
| • Power supply | 24 Volts DC (1.7 amps) |
| • Ambient operating temperature | 4 to 55°C (39 to 131°F) |
| • Humidity | < 95%, non-condensing |

**Table 2** Firmware and Software Requirements

| | Revision |
|---|---|
| • Agilent 1100 Firmware | A.05.04 and higher |
| • Control Module Firmware G1323B | B.03.11 and higher |
| • Agilent ChemStation Software | A.09.03 and higher |

# Unpacking the 1100 Series Valve

## Damaged Packaging

If the delivery packaging shows signs of external damage, please call your Agilent Technologies sales and service office immediately. Inform your service representative that the 1100 Series Valve may have been damaged during shipment.

**CAUTION** If there are signs of damage, please do not attempt to install the valve.

## Delivery Checklist

Ensure all parts and materials have been delivered with the 1100 Series Valve. The delivery checklist is displayed in Table 3. Please report missing or damaged parts to your Agilent Technologies sales and service office.

**Table 3** Delivery checklist for Agilent 1100 Series valves

| Quantity | Description | Part Number |
|---|---|---|
| 1 | 1100 Series Valve | |
| 1 | Declaration of conformity | |
| 1 | Rail assembly for Column Organizer | 5065-4450 |
| **1** | **Accessory kit containing** | |
| 1 | • CAN Cable, 1m long | 5181-1519 |
| 1 | • DC-CAN cable | 5181-1533 |
| 10 | • Fitting Screw long | G1156-22401 |
| 12 | • Fitting Screw extra long | G1156-22402 |
| 1 | • Hex Key 9/64 | 8710-2394 |
| 1 | • Hex Key 3/32 | |
| 1 | • wrench | 8710-0510 |

**Table 3** Delivery checklist for Agilent 1100 Series valves (continued)

| Quantity | Description | Part Number |
|---|---|---|
| 1 | • socket wrench (Rheotool) 1/4 | 8710-2391 |

# Hardware Installation

The Agilent 1100 Series External Valves can be installed in two different ways. They can either be placed on free bench space near the Agilent 1100 Series HPLC system or they can be mounted on the Agilent G1383A Column Organizer as displayed in Figure 1. The column organizer should be located on the right side of the 1100 Series stack, which includes the autosampler.

**Figure 1** Agilent 1100 Series Column Organizer G1383A

In order to install a valve on the G1383A Column Organizer the Organizer Rail Assembly must be installed on the two mounting poles using the clips from the Organizer Rail Assembly. All External Valves have a bracket on the side which slides over the metal part of the Organizer Rail Assembly.

Two CAN connectors and one DC-CAN connector are located at the back panel of the 1100 Series Valve Assemblies as displayed in Figure 2.

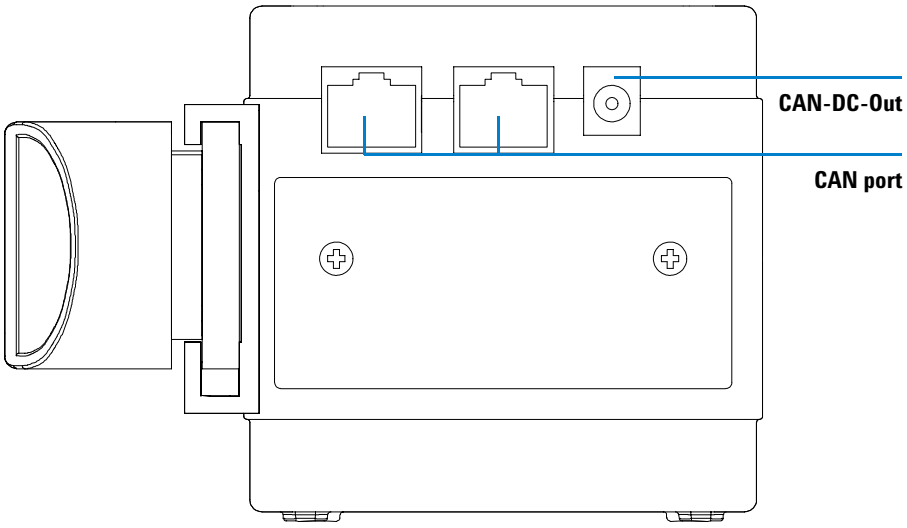


**Figure 2** Back Panel of the Agilent 1100 Series Valves

## Setting up the CAN connection

Connect the CAN-Cable (PN 5181-1519) to one of the CAN ports at back panel of the 1100 Series valve and to a free CAN-Port on another Agilent 1100 Series module. The second CAN-Port can be used to add additional valves or modules to the HPLC system.

## Setting up the power connection to other Agilent 1100 Series Modules

The power for the Agilent 1100 Series External Valves can be supplied by one of the following 1100 Series modules:

- **G1361A Agilent 1100 Series Preparative Pump**
- **G1364A Agilent 1100 Series Fraction Collector**
- **G1367A Agilent 1100 Series Well-Plate Autosampler**

Connect the DC-CAN Cable (PN 5181-1533) to the DC-CAN connector at the back panel of the valve and to the DC-CAN connector on one of the Agilent 1100 Series modules listed above.

## Setting up the power connection to the external power supply

If none of the Agilent 1100 Series modules from the list above is part of your HPLC system, you have to supply the power through an external power supply (P/N 0950-4422). Plug the DC-CAN adapter from the power supply into the DC-CAN connector on the back panel of your 1100 Series External Valve.

# Software Configuration

The 1100 Series Valves can be controlled by the Agilent ChemStation Rev. A.09.03 or higher.

To configure the 1100 Series Valves

| Step | Note |
|---|---|
| **1** Start the Agilent ChemStation Software. | |
| **2** Select **Configure 1100 Access** in the **Instrument** menu. | |
| **3** In the upcoming **Configuration** dialog box select one or multiple valves and click **Add.** | The selected green valve icon now moves from the left **Available Modules** panel to the right **Configured Modules** panel as displayed in Figure 3 on page 9. |
| **4** Click **OK** to leave the Configuration dialog box. | |
| **5** After a **Restart** the Agilent ChemStation Software a new menu item **Setup Valve** now appears in the **Instrument** menu. | |

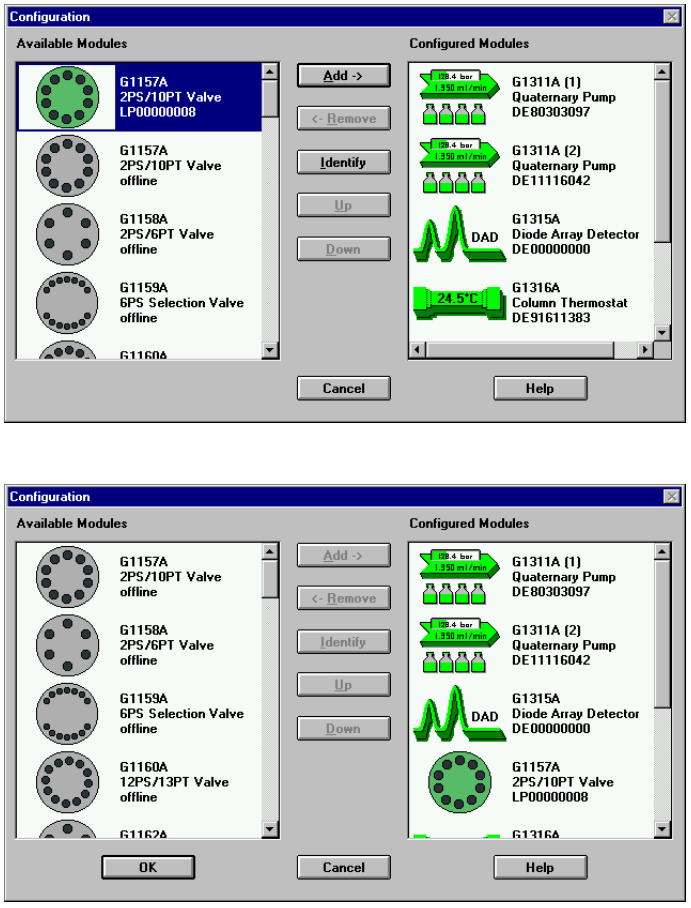


**Figure 3** Valve configuration

# 2
# Operation

# Operating the Valve using Agilent ChemStation

After the Agilent 1100 Series Valves have been installed and configured, the valve parameters can be edited in the Agilent ChemStation. Choose **Setup Valve** from the **Instrument** menu to open the valve dialog box as displayed in Figure 4.

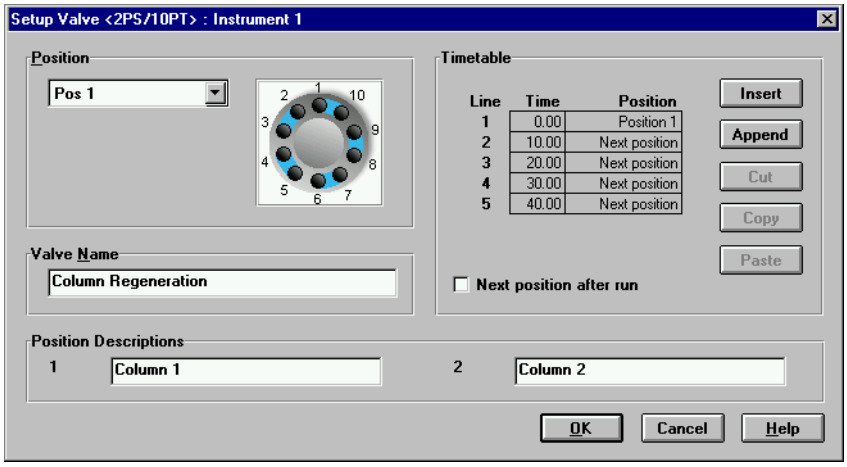


**Figure 4** Valve Setup dialog box

NOTE The example displays the valve setup for the 2 position/10 port valve (G1157A). The interface for the other valves are similar.

### Position

When loading a method the valve is switched to the position, that is displayed in the **Position** dropdown box. If you select **Use Current**, the valve remains in the current position, when a new method is loaded.

If you select a new position in the dropdown box and click **OK**, the Setup Valve dialog box will be closed and the valve switches to the new position.

### Valve Name

Define the **Valve Name** that is used for the method report and the **Instrument actuals**. The **Valve Name** is limited to 20 characters.

### Position Descriptions

Define the **Position Description** that is used for the method report and the instrument actuals. The Position Description is limited to 19 characters.

**Table 4** Available valve positions

| Valve Description | Product Number | # of Positions Descriptions |
|---|---|---|
| 2 position / 10 port valve | G1157A | 2 |
| 2 position / 6 port valve | G1158A | 2 |
| 6 position selection valve | G1159A | 6 |
| 12 position / 13 port selection valve | G1160A | 12 |

### Time Table

The **Time Table** can be used to edit and run a valve program during a sequence of sample runs. The Time Table contains 3 columns (**Line, Time and Position**). The Time Table is limited to 20 lines. The number of selection in the Position column depends on the valve that has been configured.

**Position X** switches the valve to the selected position. The number of available positions for the 1100 series valves is displayed in Table 4.

**Next Position** switches to the next available position. If the valve is on the highest position it will switch to position 1.

**Insert** Inserts a line in the **Time Table** above the selected position.

**Append** Appends a line at the end of the **Time Table**.

**Cut** Cuts the selected line(s) out of the **Time Table** and saves it to the clipboard.

**Copy** Copies the selected line(s) from the table to the clipboard.

**Paste** Pastes line(s) from the Clipboard to the **Time Table**.

### Next position after run

If **Next position after run** is checked, the valve will switch to the next available position after the run is completed. You also have to select **Use Current** in the position dropdown list, otherwise the position defined in the **Position** dropdown list will overwrite the setting in the time table.

### Display instrument actuals

In order to display the current status of your 1100 Series Valve choose **Instrument Actuals** form the **View** menu in the Agilent ChemStation to open the Valve Status dialog box (Figure 5).

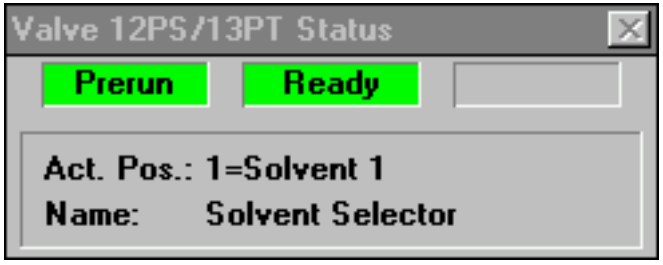


**Figure 5** Instrument Actuals

# Handheld Controller functions

With firmware revision B.03.11 or higher the following valve functions with the Agilent 1100 Series handheld controller G1323B are available. Complete control of an 1100 Series Valve during an LC analysis requires ChemStation Revision A.09.03 or higher.

### Switching the Valve

1 From the startup screen of the 1100 Series Handheld Control Module select **System (F5)**

2 Select **Control (F5)** and then **Valve** to open the screen that is displayed in Figure 6. Use the arrow keys (up and down) to switch the valve to the next position.

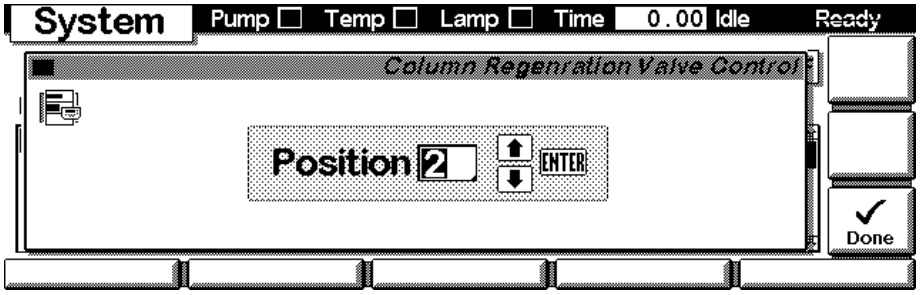


**Figure 6** Switching the 1100 Series Valve

### Valve Synchronization

1 From the startup screen of the 1100 Series Handheld Control Module select **System (F5)**

2 Select **Tests (F3)** and **Valve** to open the Synchronization screen as displayed in Figure 7.

3 Press **Synchronize (F7)** and select the position for the valve synchronization. Please also read the section “Valve Synchronization" on page 27.

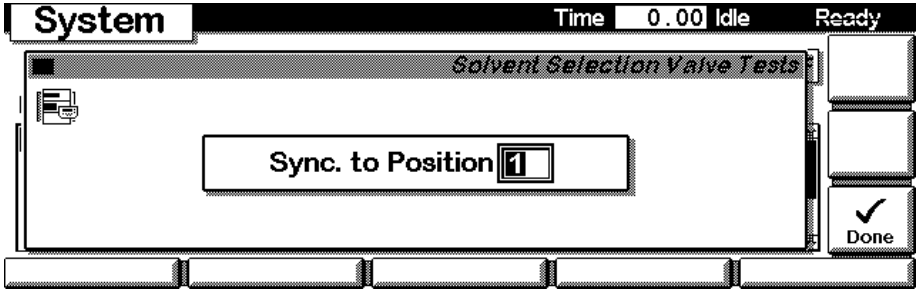


**Figure 7** Valve Synchronization

### Setting the EMF limit and switch counter

1 From the startup screen of the Agilent 1100 Series Handheld Control Module select **System (F5)**

2 Select **Records (F4)** and scroll through the displayed module list and select the Agilent 1100 Series Valve.

3 Press **EMF (F1)** and then select **1 Setup Limits.**

4 In the upcoming dialog (Figure 8) edit the EMF limit. If this limiting number of switches has been reached, you will get an `Early Maintenance Feedback` signal on your Handheld controller and in the Graphical User Interface of the Agilent ChemStation Software. After you have done an maintenance action, press **Reset (F7)** to reset the switch counter. Also refer to the section "Early Maintenance Feedback (EMF)" on page 22.

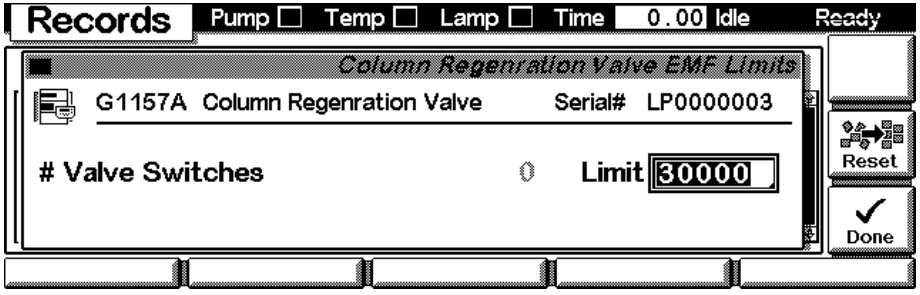


**Figure 8** Early Maintenance Feedback (EMF) Screen

# 3
# Maintenance, Repair, and Troubleshooting

# Maintenance and Repair

The maintenance of the Agilent 1100 Series Valves includes the exchange of the stator face and the rotor seal. In addition it might be necessary to exchange the stator head, if the threads are worn out or if a fitting is broken and cannot be removed from the stator head. The Valve head assembly is displayed in Figure 9 on page 19 and Figure 10 on page 20. Part numbers of the rebuild kits, rotor seals and stator heads are listed in Table 5 on page 21.

**CAUTION** Always rinse the valve with water after using aqueous buffers or salt solutions to prevent crystal formation which may damage the valve.

## Replacing the stator face and the rotor seal

### Disassembling the valve head

1. Use the Hex Key to remove the Stator Screws (1) from the Stator Head (2).
2. Disassemble the Stator Head and Stator Face (5) from the Stator Ring (4). The Stator Face usually remains on the Stator Head.
3. Remove the three Stator Ring Screws (3) and take off the Stator Ring (4).
4. Remove the Rotor Seal(6) from the Valve Body(7). The Rotor Seal is mounted on three pins, and can be pulled off.

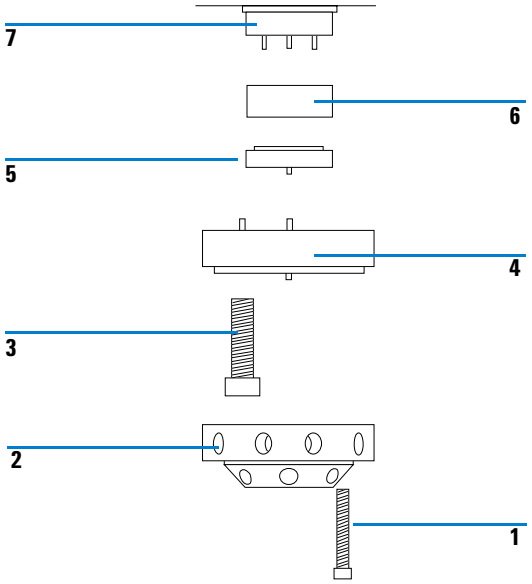


**Figure 9** Valve head assembly

### Reassembling the valve head

1 Mount the new Rotor Seal (6) with the slots facing the Stator Head (2). The three pins (8) on the Shaft Assembly fit into the matching holes(9) in the Rotor Seal only one way.

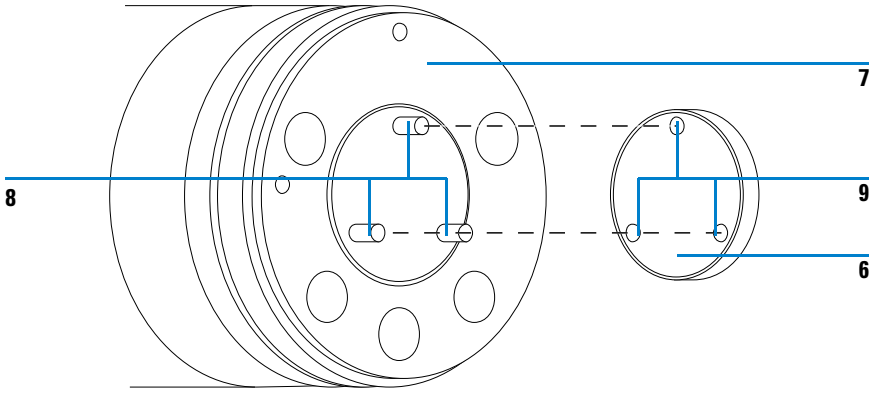


**Figure 10** Valve body (7) and Rotor seal (6)

2 Align the Stator Ring (4) that the two short pins on the ring enter the matching holes in the body (7).

3 Insert the three Stator Ring Screws (3). Turn each of the screws an equal amount until the they are finger-tight, then tighten them another half turn.

4 Mount the new Stator Face (5) onto the Stator Head (2). The pins on the Stator face must fit into the matching holes of the Stator Head.

5 Assemble the Stator Head (2) and Stator Face(5) that the pin in the Stator Ring enters the matching hole in the Stator Head.

6 Insert the Stator Screws (1). Turn each of the screws an equal amount until the they are finger-tight, then tighten them another half turn.

**Table 5** Rebuild kits and repair parts for Agilent 1100 Series Vales

| Description | | part number |
|---|---|---|
| • Rebuilt kits and rotor seals | Rebuild kit for G1157 (2 position/10 port valve) | 0101-1359 |
| | Rebuild kit for G1158 (2 position/6 port valve) | 0101-1358 |
| | Rebuild kit for G1159 (6 position selection valve) | 0101-1290 |
| | Rebuild kit for G1160 (12 position/13 port valve) | 0101-1288 |
| | Rotor seals for G1158 (2 position/6 port valve) | 0100-1855 (Vespel)<br>0100-1854 (Tefzel)<br>0100-2233 (PEEK) |
| • Stator heads | Stator head for G1157 (2 position/10 port valve | 0101-1362 |
| | Stator head for G1158 (2 position/6 port valve) | 0100-1850 |
| | Stator head for G1159 (6 position selection valve) | 0101-1364 |
| | Stator head for G1160 (12 position/13 port valve) | 0101-1365 |

## Early Maintenance Feedback (EMF)

Depending on the application the valve will perform many thousands of actuations without any visible signs of wear. In order to minimize downtime the Agilent ChemStation offers *Early Maintenance Feedback (EMF)* for the 1100 Series Valves. EMF monitors the number of switches of the 1100 Series valves, and provides feedback when a user-settable limit is exceeded. The visual feedback in the graphical user interface provides an indication, that the exchange of the stator face and/or the rotor seal should be scheduled.

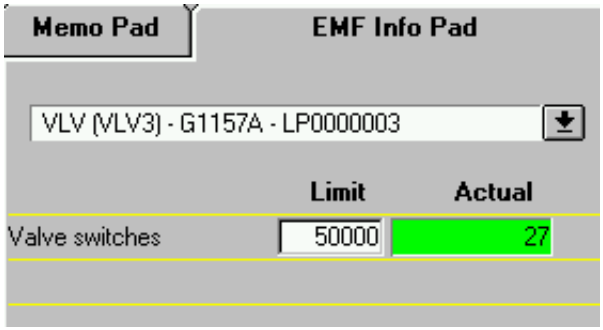


**Figure 11** Early Maintenance Feedback (EMF)

In the **Diagnostics** view you can define, after how many valve switches the stator face and/or the rotor seal should be replaced. The setting for the EMF limit depends on analytical conditions, e.g. use of buffer solutions. Hence the setting should be optimized over one or two maintenance cycles.

### Setting the EMF limit

1. Switch to the **Diagnostics** View of the ChemStation.
2. Click on the **EMF** icon. The **EMF Info Pad** (Figure 11) will appear on the right panel of the user interface.
3. Select a valve on the dropdown list of the **EMF Info Pad.**
4. Enter the EMF limit and click on the **Send Changes** button.

### Resetting the EMF counter

1 Switch to the **Diagnostics** View of the ChemStation.

2 Select **Valve** from the **Maintenance** menu.

3 In the upcoming dialog box click on **Reset Counter** (see also Figure 16 on page 27).

The procedure to reset the EMF counter with the 1100 Series handheld controller is described on page 16.

# System Errors and Troubleshooting

## System Errors

### No line power

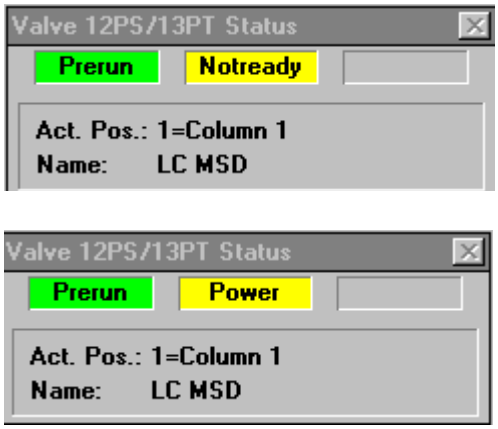


**Figure 12** Display of instrument actuals at a no line power state

**Error Cause** If the 24 volt DC line power is not available, the yellow **Notready** status is displayed in the instrument actuals. If you try to switch the valve, this status changes to **Power**.

#### Actions

1. Check power cable to external power supply or to another 1100 Series module
2. If the valve power is supplied by another 1100 module, check if this particular module is switched on.
3. Restart the ChemStation

### CAN failure

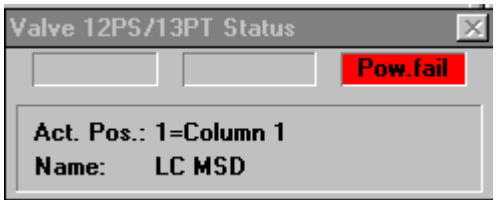


**Figure 13** CAN failure

**Error Cause** If the red **Pow. fail** status is visible the CAN communication is interrupted.

#### Actions

1 Check the CAN connection at the valve and at all other modules.

2 Check that the maximum number of 15 1100 Series modules (CAN slaves) is not exceeded.

3 Restart the ChemStation.

### Switch failure

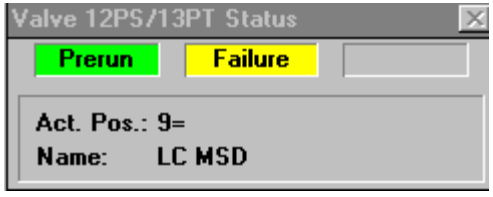


**Figure 14** Switch failure

**Error Cause** The yellow failure status indicates, that the valve didn't switch correctly

#### Actions

1 Synchronize the valve as described on page 27

2 Restart the ChemStation

3 Disconnect and replug the CAN cable

### Unknown Position

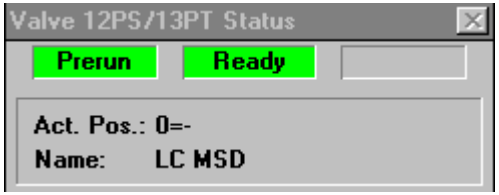


**Figure 15** Unknown Position

**Error Cause** An unknown position is indicated **Act. Pos.: 0=-**

**Actions**

1. Synchronize the valve as described on page 27.
2. Restart the ChemStation.
3. Disconnect and replug the CAN cable.

## Valve Synchronization

If the valve failed to switch or if the current position of the valve is unknown, it might be necessary to synchronize the valve.

To synchronize the valve

| Step | Note |
|---|---|
| **1** Switch to the **Diagnostics** view. | |
| **2** Select **Valve** from the **Maintenance** menu. | The valve should now display the **Current Position** as displayed in Figure 16. If the current position is 0, it is unknown |
| **3** To synchronize the valve, choose any position from the **Synchronize to position** dropdown list and click **OK.** | |

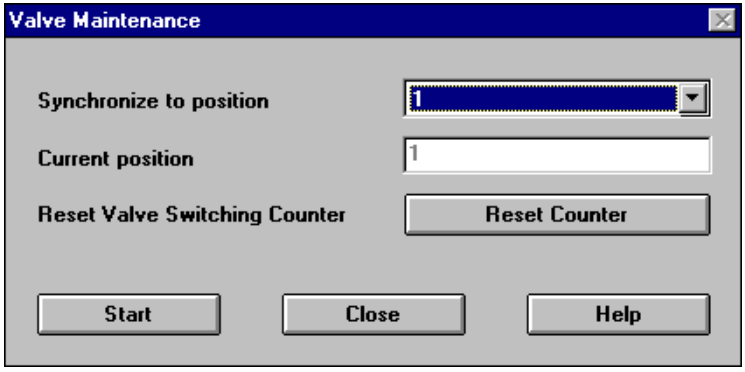


**Figure 16** Valve Synchronization

# 4
# Valve Applications



In this chapter selected applications for the Agilent 1100 Series Valves will be described. This description will contain:

- short description
- flow diagrams
- part numbers of capillaries, fittings and capillary kits

# Alternating Column Regeneration

Alternating column regeneration is a convenient way to increase the sample throughput. The Agilent 1100 Series 2 position/ 10 port valve (G1157A) can be used in combination with the Agilent LC and LC/MS modules to increase the efficiency in laboratories running large amounts of samples.

Gradient elution is a common technique for separation of complex samples in liquid chromatography, which requires column regeneration before the subsequent run is started. Using alternating column regeneration valuable time for the analysis is saved. Core of the alternating column regeneration is the 1100 Series 2 position / 10 port valve, which allows simultaneous analysis on one column while a second identical column is flushed and equilibrated. The schematic setup is displayed in Figure 17.

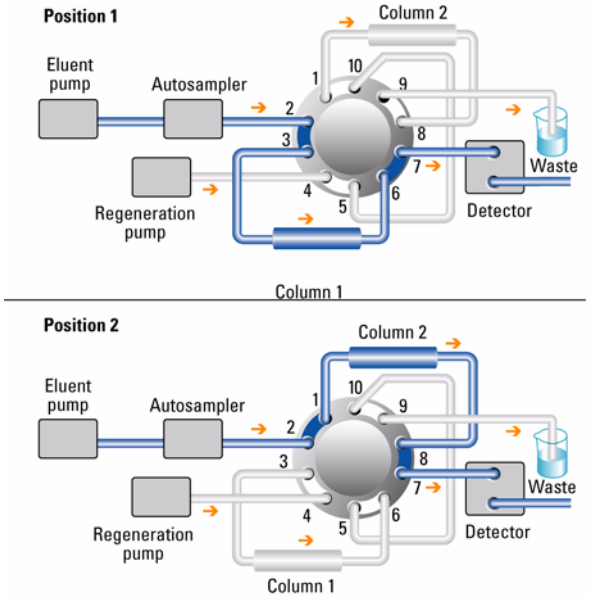


**Figure 17** Alternating Column Regeneration (Setup)

If the valve is switched to position 1 the eluent pump delivers the mobile phase through the injection loop of the autosampler into port 2 of the 1100 Series Valve. The sample is separated on column 1 and analyzed by the detector. Simultaneously a second regeneration pump flushes and equilibrates column 2.

After the analysis of the sample is finished on column 1, column 2 is prepared for an immediate injection. The 2 position/ 10 port valve is switched and the sample can be injected and analyzed. While the analysis is running on column 2, column 1 is now regenerated and will be ready to use immediately after the sample run on column 2 is finished.

The advantage of this technique is visualized in Figure 18, where the time of analysis with sequential column regeneration is compared to time of analysis using alternating column.

A detailed description how to setup alternating column regeneration with an 1100 Series LC system is provided in the application notes with the publication numbers 5988-7831EN and 5988-7895EN.

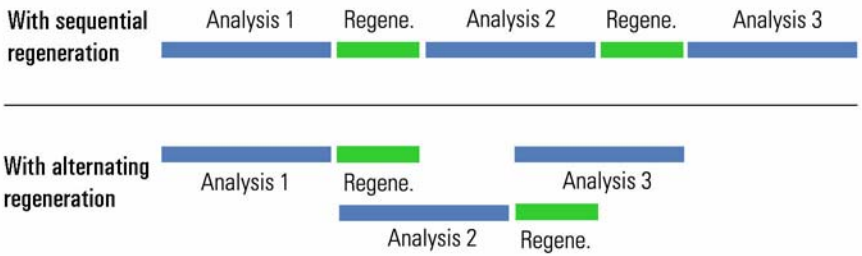


**Figure 18** Alternating column regeneration (time scheme)

We recommend to use the Agilent Technologies Capillary kits for Alternating Column Regeneration. These kits contain all capillaries, fittings and ferrules that are required for the setup displayed in Figure 17 on page 30. Agilent Technologies offers one kit for analytical scale applications (flow rates < 10 ml/min), that contain the capillaries listed in Table 6 on page 32 and fittings listed in Table 7 on page 32. Another kit is suited for preparative scale applications (flow rates < 100 ml/min). Its capillaries are listed in Table 8 on page 33 and its fitting are listed in Table 9 on page 33.

## Capillary Kit (G1156-68711) for alternating column regeneration with G1157A (analytical scale)

**Table 6** Capillaries

| From | To | ID/mm | Length/mm | part number |
|---|---|---|---|---|
| Injector/Autosampler | Valve (port 2) | 0.17 | 500 | G1328-87600 |
| Valve (port 3) | Column 1 | 0.17 | 400 | 5021-1819 |
| Column 1 | Valve (port 6) | 0.17 | 600 | 5065-9933 |
| Valve (port 7) | Detector | 0.17 | 600 | 5065-9933 |
| Valve (port 8) | Column 2 | 0.17 | 400 | 5021-1819 |
| Column 2 | Valve (port 1) | 0.17 | 600 | 5065-9933 |
| Valve (port 5) | Valve (port 10) | 0.17 | 105 | 5021-1816 |
| Regeneration Pump | Valve (port 4) | 0.25 | 800 | 5065-9930 |
| Valve (port 9) | Waste | 0.6 (PTFE) | 2000 | 0890-1713 |

**Table 7** Fittings, screws, and ferrules

| Description | Qty | part number |
|---|---|---|
| 1/16” fittings and ferrules 10/pk | 1 | 5062-2418 |
| fingertight fitting (long) | 1 | 01000-1816 |
| fitting screw (long) | 10 | G1156-22401 |
| fitting screw (extra long) | 4 | G1156-22402 |
| front ferrule 10/pk | 1 | 5180-4108 |
| back ferrule 10/pk | 1 | 5180-4114 |
| ZDV fitting | 1 | 0100-0900 |
| 0.18 ID PEEK tubing (1.5 m) | 1 | 0890-1763 |
| Plastic tubing cutter | 1 | 8710-1930 |

## Capillary Kit (G1156-68713) for alternating column regeneration with G1157A (preparative scale)

**Table 8 Capillaries**

| From | To | ID/mm | Length/mm | part number |
|---|---|---|---|---|
| Injector/Autosampler | Valve (port 2) | 0.5 | 600 | G2260-87300 |
| Valve (port 3) | Column 1 | 0.5 | 400 | G2260-87301 |
| Column 1 | Valve (port 6) | 0.5 | 600 | G2260-87300 |
| Valve (port 7) | Detector | 0.5 | 600 | G2260-87300 |
| Valve (port 8) | Column 2 | 0.5 | 400 | G2260-87301 |
| Column 2 | Valve (port 1) | 0.5 | 600 | G2260-87300 |
| Valve (port 5) | Valve (port 10) | 0.5 | 105 | 5065-9927 |
| Regeneration Pump | Valve (port 4) | 0.5 | 800 | 5065-9926 |
| Valve (port 9) | Waste | 0.6 (PTFE) | 2000 | 0890-1713 |

**Table 9** Fittings, screws, and ferrules

| Description | Qty | part number |
|---|---|---|
| 1/16” fittings and ferrules 10/pk | 1 | 5062-2418 |
| fingertight fitting (long) | 1 | 0100-1816 |
| fitting screw (long) | 10 | G1156-22401 |
| fitting screw (extra long) | 4 | G1156-22402 |
| front ferrule 10/pk | 1 | 5180-4108 |
| back ferrule 10/pk | 1 | 5180-4114 |
| Union Prep | 1 | 5022-2133 |
| 0.5 ID PEEK tubing (1.5 m) | 1 | 0890-1761 |
| Plastic tubing cutter | 1 | 8710-1930 |

# Sample enrichment and Sample stripping

Sample enrichment and sample stripping methods can be used to separate samples from complex matrices, such as biological fluids, food extracts or wastewater. This might be necessary to avoid interference of the matrix during separation and detection or even damage of the column. You can use the 1100 Series 2 position/ 6 port valve (G1158A) to automate these techniques for LC and LC/MS analysis.

## Sample enrichment

Sample enrichment is used to increase the sensitivity and to remove the sample matrix. The technique is displayed in Figure 19 on page 34. This technique allows the injection of large volumes onto the precolumn, where the sample matrix is separated from the analytes in order to increase sensitivity.

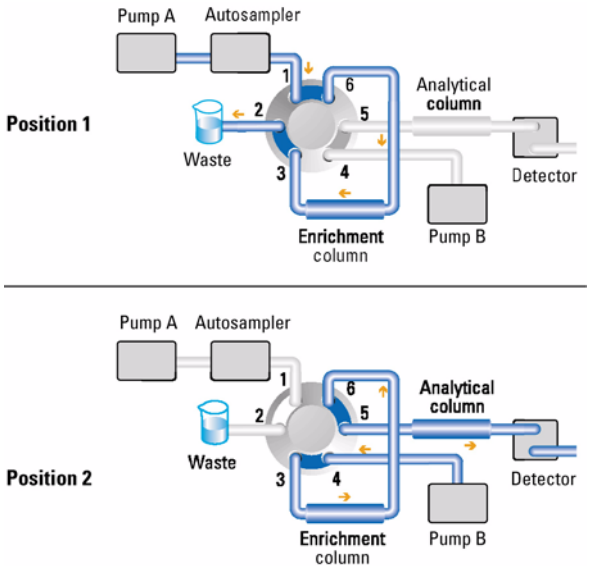


**Figure 19** Sample enrichment

For the sample enrichment phase the valve is switched to position 1. The eluent Pump A transfers the injected sample onto the enrichment column. The sample is retained and enriched on this column, whereas the sample matrix is flushed into the waste. At the same time the second eluent pump B is equilibrating the analytical column.

After the valve is switched to position 2 pump B is backflushing the sample on the analytical column for separation and subsequent detection by LC/MS or optical detectors.

Agilent Technologies offers capillary kit for sample enrichment and sample stripping. The content is listed in Table 10 on page 36 and Table 11 on page 37.

## Sample stripping

Sample stripping is another method to remove complex sample matrices. In difference to sample enrichment the matrix is trapped on the pre-column while the analytes pass through onto the analytical column.

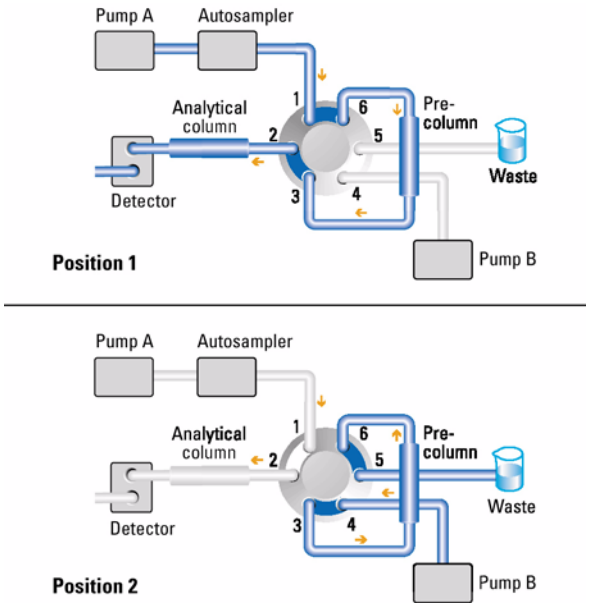


**Figure 20** Sample stripping

Figure 20 on page 35 illustrates how the Agilent 1100 Series 2 position/ 6 port valve can be used for sample stripping. In valve position 1 Pump A transfers the complete sample matrix onto the pre-column 1, where the matrix is trapped while the analytes are eluted and flushed to column 2 for analysis. Then the valve switches to position 2. Now pump B backflushes the matrix to the waste, while pump A continues to deliver solvent to the analytical column, where the the analytes are separated and analyzed.

Agilent Technologies offers a capillary kit for sample enrichment and stripping as displayed in Table 10 on page 36 and Table 11 on page 37.

### Capillary kit for sample enrichment/stripping (G1156-68714) with G1158A (analytical scale)

**Table 10** Capillaries

| From | To | ID/mm | Length/mm | part number |
|---|---|---|---|---|
| **Sample Enrichment** | | | | |
| Injector/Autosampler | Valve (port 1) | 0.17 | 500 | G1328-87600 |
| Valve (port 2) | Waste | 0.6 (PTFE) | 2000 | 0890-1713 |
| Valve (port 3) | Enrichment Column | 0.17 | 400 | 5021-1819 |
| Enrichment Column | Valve (port 6) | 0.17 | 600 | 5065-9933 |
| Pump B | Valve (port 4) | 0.25 | 800 | 5065-9030 |
| Valve (port 5) | Analytical Column | 0.17 | 400 | 5021-1819 |
| Analytical Column | Detector | 0.17 | 600 | 5065-9933 |
| **Stripping** | | | | |
| Injector/Autosampler | Valve (port 1) | 0.17 | 500 | G1328-87600 |
| Valve (port 2) | Analytical Column | 0.17 | 400 | 5021-1819 |
| Analytical Column | Detector | 0.17 | 600 | 5065-9933 |
| Valve (port 3) | Pre-Column | 0.17 | 400 | 5021-1819 |
| Pre-Column | Valve (port 6) | 0.17 | 600 | 5065-9933 |
| Pump B | Valve (port 4) | 0.25 | 800 | 5065-9930 |
| Valve (port 5) | Waste | 0.6 (PTFE) | 2000 | 0890-1713 |

**Table 11** Fittings, screws, and ferrules

| Description | Qty | part number |
|---|---|---|
| 1/16” fittings and ferrules 10/pk | 1 | 5062-2418 |
| fingertight fitting (long) | 1 | 0100-1816 |
| fitting screw (long) | 5 | G1156-22401 |
| front ferrule 10/pk | 1 | 5180-4108 |
| back ferrule 10/pk | 1 | 5180-4114 |
| ZDV fitting | 1 | 0100-0900 |
| 0.18 ID PEEK tubing (1.5 m) | 1 | 0890-1763 |
| Plastic tubing cutter | 1 | 8710-1930 |

# Column Selection

With the Agilent 1100 Series 6 position selection valve (G1159A) and the capillary kit for Column Selection (Table 12 and Table 13 on page 39) you can set up your Agilent 1100 Series LC or LC/MS system for use with up to 6 columns as displayed in Figure 21. Or you can use the system with 5 columns and one flow path for flow injection analysis or for flushing the system. This setup allows you to switch between these columns for faster method development or method validation. The multi-column setup might also be used, if several operators are using the LC or LC/MS system.

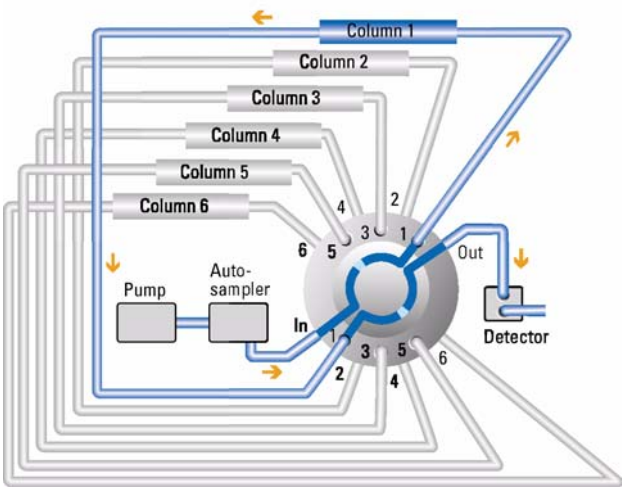


**Figure 21** Column selection

## Capillary Kit (G1156-68712) for column selection with G1159A (analytical scale)

**Table 12** Capillaries

| From | To | Qty. | ID/mm | Length/mm | part number |
|---|---|---|---|---|---|
| Injector/Autosampler | Valve (IN) | 1 | 0.17 | 500 | G1328-87600 |
| Valve (X) | Column X | 6 | 0.17 | 400 | 5021-1819 |
| Column X | Valve (X') | 6 | 0.17 | 400 | 5021-1819 |
| Valve (OUT) | Detector | 1 | 0.17 | 600 | G1328-87600 |

**Table 13** Fittings, screws, and ferrules

| Description | Qty | part number |
|---|---|---|
| 1/16" fittings and ferrules 10/pk | 2 | 5062-2418 |
| fitting screw (long) | 15 | G1156-22401 |
| front ferrule 10/pk | 1 | 5180-4108 |
| back ferrule 10/pk | 1 | 5180-4114 |
| ZDV fitting | 1 | 0100-0900 |
| 0.18 ID PEEK tubing (1.5 m) | 1 | 0890-1763 |
| Plastic tubing cutter | 1 | 8710-1930 |

# Solvent Selection

The 1100 Series 12 position / 13 port valve can be used for solvent selection (flow rate < 10 ml/min) as illustrated in Figure 22. It offers automated access to 12 different eluents.

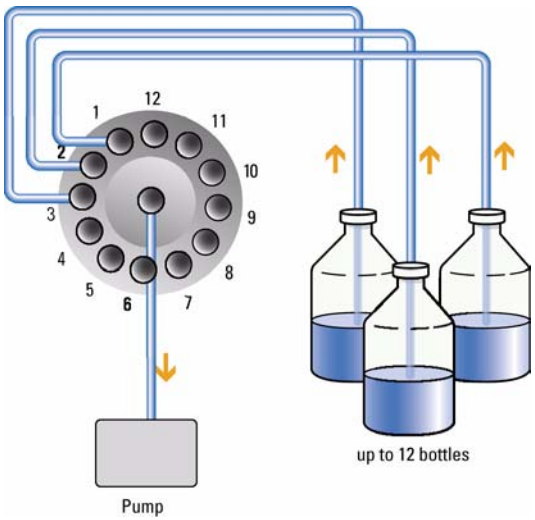


**Figure 22** Solvent selection

### Tubing Kit (G1160-68706) for solvent selection (4 solvents) with G1160A, degasser and isocratic pump (flow rate < 10 ml/min)

**Table 14 Tubing**

| From | To | Qty. | ID/mm | Length/mm | part number |
|---|---|---|---|---|---|
| Solvent Bottle | Degasser | 4 | 1.5 | 1000 | G1311-60003 |
| Degasser | Valve (pos.1-12) | 4 | 1.5 | 600 | G1160-67300 |
| Valve (OUT) | Pump Inlet | 1 | 1.5 | 600 | G1160-67300 |

**Table 15 Finger-tight fittings**

| Description | Qty | part number |
|---|---|---|
| Adapter long external | 5 | 0100-2298 |

# 5 Parts

The following tables summarize the available repair parts and consumables.

**Table 16** General parts

| Description | part number |
|---|---|
| • CAN cable, 1m long | 5181-1519 |
| • DC-Can cable | 5181-1533 |
| • External Power Supply | 0950-4422 |
| • Rail assembly for Column Organizer | 5065-4450 |

**Table 17** Exchange valve assemblies

| Description | part number |
|---|---|
| • 2 position/10 port valve (exchange) | G1157-69001 |
| • 2 position/6 port valve (exchange) | G1158-69001 |
| • 6 position selction valve (exchange) | G1159-69001 |
| • 12 position/13 port selection valve (exchange) | G1160-69001 |

**Table 18** Rebuild kits and repair parts for Agilent 1100 Series Valves

| Description | | part number |
|---|---|---|
| • Rebuilt kits and rotor seals | Rebuild kit for G1157 (2 position/10 port valve) | 0101-1359 |
| | Rebuild kit for G1158 (2 position/6 port valve) | 0101-1358 |
| | Rebuild kit for G1159 (6 position selection valve) | 0101-1290 |
| | Rebuild kit for G1160 (12 position/13 port valve) | 0101-1288 |
| | Rotor seals for G1158 (2 position/6 port valve) | 0100-1855 (Vespel)<br>0100-1854 (Tefzel)<br>0100-2233 (PEEK) |
| • Stator heads | Stator head for G1157 (2 position/10 port valve | 0101-1362 |
| | Stator head for G1158 (2 position/6 port valve) | 0100-1850 |
| | Stator head for G1159 (6 position selection valve) | 0101-1364 |
| | Stator head for G1160 (12 position/13 port valve) | 0101-1365 |

**Table 19** Capillary and tubing kits

| Description | part number |
|---|---|
| • Capillary kit: alternating column regeneration (analytical) for valve G1157A (for details see Table 6 and Table 7 on page 32) | G1156-68711 |
| • Capillary kit alternating column regeneration (preparative) for valve G1157A (for details see Table 8 and Table 9 on page 33) | G1156-68713 |
| • Capillary kit: alternating Sample enrichment/stripping (analytical) for valve G1158A (for details see Table 10 and Table 11 on page 37) | G1156-68714 |
| • Capillary kit: column selection (analytical) for 6 columns with valve G1159A (for details see Table 12 and Table 13 on page 39) | G1156-68712 |
| • Tubing kit: solvent selection for 4 solvents (< 10 ml/min) for valve G1160A (for details see Table 14 and Table 15 on page 41) | G1156-68706 |

**Table 20** Part Numbers for flexible SST capillaries without fittings (µl volume in parentheses)

| length in mm | 0.12 mm ID | 0.17 mm ID | 0.25 mm ID | 0.50 mm ID |
|---|---|---|---|---|
| 105 | 5021-1820 (1.2) | 5021-1816 (2.4) | | 5065-9927 (20.6) |
| 150 | 5021-1821 (1.7) | 5021-1817 (3.4) | | 5022-6509 (29.5) |
| 200 | | 5065-9931 (4.6) | | |
| 280 | 5021-1822 (3.2) | 5021-1818 (6.4) | 5062-6508 (13.8) | 5022-6510 (55.0) |
| 400 | 5021-1823 (4.5) | 5021-1819 (9.1) | | G2260-87301 (78.5) |
| 500 | | G1328-87600 (11.4) | | |
| 600 | | 5065-9933 (13.6) | | G2260-87300 (117.8) |
| 700 | | 5065-9932 (15.9) | | |
| 800 | | | 5065-9930 (39.3) | 5065-9926 (157) |

# 5 Parts

# 6 Specifications

**Table 21** G1157A Agilent 1100 Series 2 position / 10 port valve

| | |
|---|---|
| • Liquid contacts: | Stainless Steel and PEEK |
| • Port size: | Accepts 10-32 male threaded fittings |
| • Flow passage diameters: | Stator and stator face assembly 0.6-mm (0.024"), rotor seal 0.6-mm (0.024") |
| • Volume in flow passage: | Stator (includes stator face seal) 2.1 µl/hole, rotor seal 0.7 µl/groove |
| • Maximum pressure: | 41 MPa (408 bar, 6000 psi) |

**Table 22** G1158A Agilent 1100 Series 2 position / 6 port valve

| | |
|---|---|
| • Liquid contacts: | Stainless steel, PEEK, and alumina ceramic |
| • Port size: | Accepts 10-32 male threaded fittings |
| • Flow passage diameters: | Stator and stator face assembly 0.4-mm (0.015"), rotor seal 0.5-mm (0.018") |
| • Volume in flow passage: | Stator (includes stator face seal) 0.7 µl/hole, rotor seal 0.3 µl/groove |
| • Maximum pressure: | 41 MPa (408 bar, 6000 psi) |

**Table 23** G1159A Agilent 1100 Series 6 position selection valve

| | |
|---|---|
| • Liquid contacts: | Stainless steel and PEEK |
| • Port size: | Accepts 10-32 male threaded fittings |
| • Flow passage diameters: | Stator 0.6-mm (0.024”), stator face assembly and rotor seal 0.4-mm (0.015”) |
| • Volume in flow passage | Angled ports 1, 2, 5 (15.6 µl)<br>Radial ports 2, 4, 6 (18,8 µl) |
| • Maximum pressure: | 35 MPa (345 bar, 5000 psi) |

**Table 24** G11160A Agilent 1100 Series 12 position/ 13 port selection valve

| | |
|---|---|
| • Liquid contacts: | Stainless steel and PEEK |
| • Port size: | Accepts 10-32 male threaded fittings |
| • Flow passage diameters: | 1.0-mm (0.040”) |
| • Volume in flow passage: | Stator (includes stator face seal) 6.4 µl/hole, rotor seal 4.0 µl/groove |
| • Maximum pressure: | 21 MPa (207 bar, 3000 psi) |

# Index

## U



## V

Agilent Technologies

## In This Book

This operators manual describes common applications as well as installation, operation and maintenance of the following Agilent 1100 series valves:

- G1157A Agilent 1100 Series 2 Position/10 Port Valve
- G1158A Agilent 1100 Series 2 Position/ 6 Port Valve
- G1159A Agilent 1100 Series 6 Position Selection Valve
- G1160A Agilent 1100 Series 12 Position/13 Port Selection Valve

In additon parts and specifications of these valves are listed.

G1156-90000