Agilent 1120 Compact LC

User Manual

Agilent Technologies

Notices

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1 General Information about the Agilent 1120 Compact LC System

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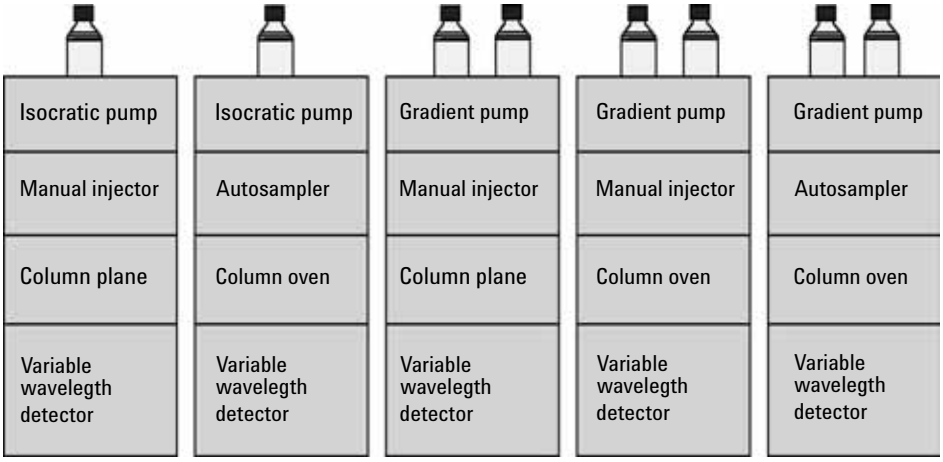
This chapter provides an overview to the Agilent 1120 Compact LC Configurations, Site Requirements and Specifications

System Configurations

Available configurations of Agilent 1120 Compact LC Systems

The Agilent 1120 Compact LC System is provided in 5 different configurations, possible components are isocratic pump, dual channel gradient pump (with degasser), manual injector, autosampler, column oven and detector. EAch configuration comes at least with one pump one injection system and one detector per system including EZ-Chrom Elite Compact Software and Lab Monitoring and Diagnostic Software.



A Solvent Selection Valve (SSV) Upgrade Kit **part number: G4280-68708** is available.

Site Requirements

A suitable environment is important to ensure optimal performance of the System.

Power Consideration

The Agilent 1120 Compact LC power supply has wide ranging capabilities. Consequently, there is no voltage selector at the instrument.

WARNING

Instrument is partially energized when switched off

The power supply still uses some power, even when the power switch on the front panel is turned OFF. Repair work at the detector can lead to personal injuries, e. g. shock hazard, when the detector cover is opened and the instrument is connected to power.

➔ To disconnect the detector from the power line, unplug the power cord.

WARNING

Incorrect line voltage at the Compact LC

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

➔ Connect your instrument only to the specified line voltage.

CAUTION

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

Make sure to have easy access to the power cable of the instrument, in order to disconnect the instrument from line.

➔ Provide sufficient space next to the power socket of the instrument to unplug the cable.

Power Cords

Different power cords are offered as options with the system. The female end of the power cords is identical. It plugs into the power-input socket at the rear left side of the Compact LC. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

WARNING **The absence of ground connection and the use of an unspecified power cord can lead to electric shock or short circuit.**

Electric Shock

- ➔ Never operate your instrumentation from a power outlet that has no ground connection.
- ➔ Never use a power cord other than the Agilent Technologies power cord designed for your region.

WARNING **Use of unsupplied cables**

Using cables which haven't been supplied by Agilent Technologies can lead to damage of the electronic components or personal injury.

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

Bench Space

The Compact LC dimensions and weight allow to place the instrument on almost any desk or laboratory bench. It needs an additional 2.5 cm (1.0 inch) of space on either side and approximately 8 cm (3.1 inches) in the rear for air circulation and electric connections.

If the bench should carry a Agilent 1120 Compact LC system, make sure that the bench is designed to bear the weight of the system.

The Compact LC should be operated upright.

Environment

Your Compact LC will work within specifications at ambient temperatures and relative humidity as described in the following chapters.

ASTM drift tests require a temperature change below 2 °C/hour (3.6 °F/hour) measured over one hour period. Our published drift specification is based on these conditions. Larger ambient temperature changes will result in larger drift.

Better drift performance depends on better control of the temperature fluctuations. To realize the highest performance, minimize the frequency and the amplitude of the temperature changes to below 1 °C/hour (1.8 °F/hour). Turbulences around one minute or less can be ignored.

CAUTION

Condensation within the module

Condensation will damage the system electronics.

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

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

Physical Specification

Table 1 Physical Specifications

Type	Specification	Comments
Weight	30 kg 66 lbs	
Dimensions (height × width × depth)	640×370×420 mm 25.2×14.6×16.5 inches	
Line voltage	100 – 240 VAC, ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5%	
Power consumption	240 VA / 210 W / 717 BTU	Maximum
Ambient operating temperature	0–55 °C (32–131 °F)	
Ambient non-operating temperature	-40–70 °C (-4–158 °F)	
Humidity	< 95%, at 25–40 °C (77–104 °F)	Non-condensing
Operating altitude	Up to 2000 m (6500 ft)	
Non-operating altitude	Up to 4600 m (14950 ft)	For storing the instrument
Safety standards: IEC, CSA, UL, EN	Installation Category II, Pollution Degree 2. For indoor use only.	
Housing	All materials recyclable.	

Performance Specifications

Performance Specifications Agilent 1120 Compact LC System

Table 2 Performance Specification Agilent 1120 Compact LC System

Type	Specification
Safety features	Extensive diagnostics, error detection and display, leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.
Control and data evaluation	Agilent EZChrom Compact, Agilent Lab Monitoring and Diagonostic Software (LMD)
Communications	Controller-area network (CAN), RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN
GLP features	Early maintenance feedback (EMF), electronic records of maintenance and errors

Performance Specifications Agilent 1120 Compact LC Pump

Table 3 Performance Specification Agilent 1120 Compact LC Pump

Type	Specification
Hydraulic system	Dual plunger in series pump with proprietary servo-controlled variable stroke drive, floating plungers and passive inlet valve
Settable flow range	0.001 – 10 ml/min, in 0.001 ml/min increments
Flow range	0.2 – 10.0 ml/min
Flow precision	<0.07% RSD, or < 0.02 min SD whatever is greater, based on retention time at constant room temperature
Flow accuracy	± 1% or 10 µl/min whatever is greater

Table 3 Performance Specification Agilent 1120 Compact LC Pump

Pressure	Operating range 0 – 40 MPa (0 – 400 bar, 0 – 5880 psi) up to 5 ml/min Operating range 0 – 20 MPa (0 – 200 bar, 0 – 2950 psi) up to 10 ml/min
Pressure pulsation	< 2 % amplitude (typically < 1 %), at 1 ml/min isopropanol, at all pressures > 1 MPa (10 bar)
Compressibility compensation	User-selectable, based on mobile phase compressibility
Recommended pH range	1.0 – 12.5, solvents with pH < 2.3 should not contain acids which attack stainless steel
Gradient formation (optional)	Low pressure dual mixing/gradient capability using proprietary high-speed proportioning valve Delay volume 800 – 1100 µl, dependent on back pressure
Composition Range	0 – 95 % or 5 – 100 %, user selectable
Composition Precision	< 0.2 % RSD, at 0.2 and 1 ml/min

Performance Specifications Agilent 1120 Compact LC Autosampler

Table 4 Performance Specifications Agilent 1120 Compact LC Autosampler

Type	Specification
Pressure	Operating range 0 – 40 MPa (0 – 400 bar, 0 – 5900 psi)
Injection range	0.1 – 100 µl in 0.1 µl increments Up to 1500 µl with multiple draw (hardware modification required)
Replicate injections	1 – 99 from one vial
Precision	< 0.25% RSD from 5 – 100 µl, < 1% RSD 1 – 5 µl variable volume
Minimum sample volume	1 µl from 5 µl sample in 100 µl microvial, or 1 µl from 10 µl sample in 300 µl microvial
Carryover	Typically < 0.1%, < 0.05% with external needle cleaning
Sample viscosity range	0.2 – 50 cp

Table 4 Performance Specifications Agilent 1120 Compact LC Autosampler

Sample capacity	100 × 2-ml vials in 1 tray 40 × 2-ml vials in ½ tray 15 × 6-ml vials in ½ tray (Agilent vials only)
Injection cycle time	Typically 50 s depending on draw speed and injection volume

Performance Specifications Agilent 1120 Compact LC VWD

Table 5 Performance Specifications Agilent 1120 Compact LC Variable Wavelength Detector

Type	Specification	Comments
Detection type	Double-beam photometer	
Light source	Deuterium lamp	
Wavelength range	190–600 nm	
Short term noise (ASTM)	± 0.5 × 10-5 AU at 254 nm	See NOTE below the table.
Drift	3 × 10-4 AU/hr at 254 nm	See NOTE below the table.
Linearity	> 2 AU (5%) upper limit	See NOTE below the table.
Wavelength accuracy	± 1 nm	Self-calibration with deuterium lines, verification with holmium oxide filter
Band width	6.5 nm typical	
Flow cells	Standard: 14-µl volume, 10-mm cell path length and 40 bar (588 psi) pressure maximum High pressure: 14-µl volume, 10-mm cell path length and 400 bar (5880 psi) pressure maximum Semi-micro: 5-µl volume, 6-mm cell path length and 40 bar (588 psi) pressure maximum	Can be repaired on component level

NOTE ASTM: “Standard Practice for Variable Wavelength Photometric Detectors Used in Liquid Chromatography”.Reference conditions: cell path length 10 mm, response time 2 s, flow 1 ml/min LC-grade methanol. Linearity measured with caffeine at 272 nm nm.

2 Installing the Agilent 1120 Compact LC

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This chapter provides an overview on shipment content and installation.

NOTE To install the System, it's highly recommended to follow the 'Installation Guide for Agilent 1120 Compact LC System' step by step.

Unpacking your System

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 Compact LC may have been damaged during shipment.

CAUTION

Signs of damage

➔ Do not attempt to install the Compact LC.

Delivery Checklist

Ensure all parts and materials have been delivered with the Compact LC. The delivery checklist is shown below. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 6 Compact LC Checklist

Description	Quantity
Compact LC	1
Power cable	1
Flow cell	installed
Software CD/DVD	2
Installation guide	1
Accessory kit (see below)	1

Compact LC Accessory Kits Contents

Table 7 Accessory Kit for G4290A Contents

Description	Part Number	Quantity
Accessory kit	**G4280-68705**	1
Helium tubing, 5m PTFE 0.057" ID	**0890-1195**	5 m
Corrugated tubing (to waste), re-order 5 m	**0890-1711**	3 m
Wrench open end 1/4 – 5/16 inch	**8710-0510**	2
Wrench open end 14 mm	**8710-1924**	1
Wrench, 1/2 & 9/16	**8720-0025**	1
Mounting tool	**0100-1710**	1
Syringe adapter	**9301-1337**	1
Syringe	**9301-0411**	1
FTG one piece fingertight	**0100-2562**	1
Flow cell outlet tubing	**5062-8535**	1
Cross over cable	**5023-0203**	1
Bottle amber	**9301-1450**	1
Bottle transparent	**9301-1420**	1
Bottle head assy	**G1311-60003**	2
Caffeine standard	**G4218-85000**	1

Table 8 Accessory Kit for G4286A/G4287A Contents

Description	Part Number	Quantity
Accessory kit	**G4286-68705**	1
Helium tubing, 5m PTFE 0.057" ID	**0890-1195**	5 m
Corrugated tubing (to waste), re-order 5 m	**0890-1711**	3 m
Wrench open end 1/4 – 5/16 inch	**8710-0510**	2

Table 8 Accessory Kit for G4286A/G4287A Contents

Description	Part Number	Quantity
Wrench open end 14 mm	**8710-1924**	1
Wrench, 1/2 & 9/16	**8720-0025**	1
Mounting tool	**0100-1710**	1
Syringe adapter	**9301-1337**	1
Syringe	**9301-0411**	1
FTG one piece fingertight	**0100-2562**	1
Flow cell outlet tubing	**5062-8535**	1
Cross over cable	**5183-4649**	1
Bottle transparent	**9301-1420**	1
Bottle head assy	**G1311-60003**	1
Syringe LC, 50µl, FN	**5182-9619**	1
Screw cap vial, clear, 6ml, reorder pack of 100ea	**9301-1377**	1
Screw caps for 6ml vials, reorder pack of 100ea	**9301-1379**	1
PTFE/silicone septa 16mm pre-slit, reorder pack of 100ea	**5188-2758**	1
Caffeine standard	**G4218-85000**	1

Table 9 Accessory Kit for G4288A/G4289A Contents

Description	Part Number	Quantity
Accessory kit	**G4288-68705**	1
Helium tubing, 5m PTFE 0.057" ID	**0890-1195**	5 m
Corrugated tubing (to waste), re-order 5 m	**0890-1711**	3 m
Wrench open end 1/4 – 5/16 inch	**8710-0510**	2
Wrench open end 14 mm	**8710-1924**	1
Wrench, 1/2 & 9/16	**8720-0025**	1

Table 9 Accessory Kit for G4288A/G4289A Contents

Description	Part Number	Quantity
Mounting tool	**0100-1710**	1
Syringe adapter	**9301-1337**	1
Syringe	**9301-0411**	1
FTG one piece fingertight	**0100-2562**	1
Flow cell outlet tubing	**5062-8535**	1
Cross over cable	**5183-4649**	1
Bottel amber	**9301-1450**	1
Bottle transparent	**9301-1420**	1
Bottle head assy	**G1311-60003**	2
Syringe LC, 50µl, FN	**5182-9619**	1
Screw cap vial, clear, 6ml, reorder pack of 100ea	**9301-1337**	1
Screw caps for 6ml vials, reorder pack of 100ea	**9301-1379**	1
PTFE/silicone septa 16mm pre-slit, reorder pack of 100ea	**5188-2758**	1
Caffeine standard	**G4218-85000**	1

LAN Configuration

What you have to do first

The Agilent 1120 Compact LC has an on-board LAN communication interface.

1 Note the MAC (Media Access Control) address for further reference. The MAC or hardware address of the LAN interfaces is a world wide unique identifier. No other network device will have the same hardware address. The MAC address can be found on a label at the rear left side of the Instrument next to the configuration switch.

Figure 1 MAC-Label

2 Connect the instrument's LAN interface to

- the PC network card using a crossover network cable (point-to-point) or
- a hub or switch using a standard LAN cable.

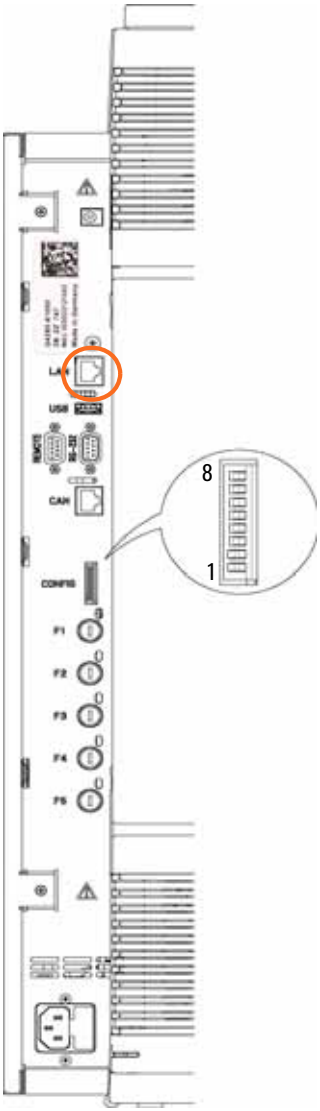


Figure 2 Location of LAN interface and MAC label

TCP/IP parameter configuration

To operate properly in a network environment, the LAN interface must be configured with valid TCP/IP network parameters. These parameters are:

- IP address
- Subnet Mask
- Default Gateway

The TCP/IP parameters can be configured by the following methods:

- by automatically requesting the parameters from a network-based BOOTP Server (using the so-called Bootstrap Protocol)
- by manually setting the parameters using Telnet

The LAN interface differentiates between several initialization modes. The initialization mode (short form 'init mode') defines how to determine the active TCP/IP parameters after power-on. The parameters may be derived from a Bootp cycle, non-volatile memory or initialized with known default values. The initialization mode is selected by the configuration switch.

Configuration Switches

The configuration switch can be accessed at the rear left side of the instrument.

The Compact LC is shipped with switches 7 and 8 set to **ON**. Which means that the instrument is set to a default fix IP address: 192.168.254.11

NOTE To perform any LAN configuration, SW1 and SW2 must be set to **OFF**.

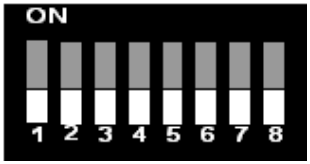
Table 10 Factory Default Settings

Initialization ('Init') Mode	Using Default, switches 7 and 8 set to **ON**.
Link Configuration	Speed and duplex mode determined by auto-negotiation

Initialization mode selection

The following initialization (init) modes are selectable:

Table 11 Initialization Mode Switches

	SW 6	SW 7	SW 8	Init Mode
	OFF	OFF	OFF	Bootp
	OFF	OFF	ON	Bootp & Store
	OFF	ON	OFF	Using Stored
	OFF	ON	ON	Using Default

Bootp

When the initialization mode “Bootp” is selected, the compact LC tries to download the parameters from a Bootp Server. The parameters obtained become the active parameters immediately. They are not stored to the non-volatile memory of the compact LC. Therefore, the parameters are lost with the next power cycle of the compact LC.

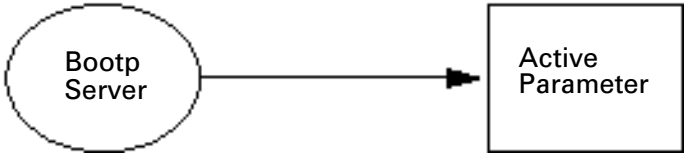


Figure 3 Bootp (Principle)

Bootp & Store

When “Bootp & Store” is selected, the parameters obtained from a Bootp Server become the active parameters immediately. In addition, they are stored to the non-volatile memory of the compact LC. Thus, after a power cycle they are still available. This enables a kind of “bootp once” configuration of the compact LC.

Example: The user may not want to have a Bootp Server be active in his network all the time. But on the other side, he may not have any other configuration method than Bootp. In this case he starts the Bootp Server

temporarily, powers on the compact LC using the initialization mode “Bootp & Store”, waits for the Bootp cycle to be completed, closes the Bootp Server and powers off the compact LC. Then he selects the initialization mode “Using Stored” and powers on the compact LC again. From now on, he is able to establish the TCP/IP connection to the compact LC with the parameters obtained in that single Bootp cycle.

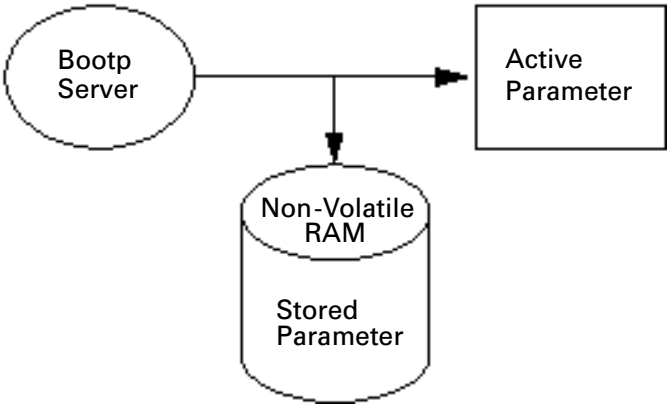


Figure 4 Bootp & Store (Principle)

NOTE Use the initialization mode “Bootp & Store” carefully, because writing to the non-volatile memory takes time. Therefore, when the compact LC shall obtain its parameters from a Bootp Server every time it is powered on, the recommended initialization mode is “Bootp”!

Using Stored

When initialization mode “Using Stored” is selected, the parameters are taken from the non-volatile memory of the compact LC. The TCP/IP connection will be established using these parameters. The parameters were configured previously by one of the described methods.

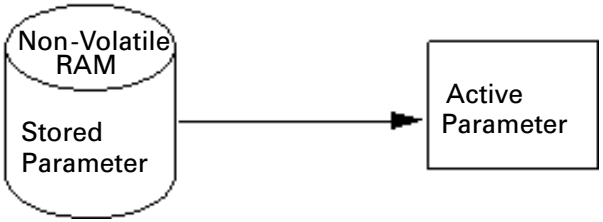


Figure 5 Using Stored (Principle)

Using Default

When “Using Default” is selected, the factory default parameters are taken instead. These parameters enable a TCP/IP connection to the LAN interface without further configuration.

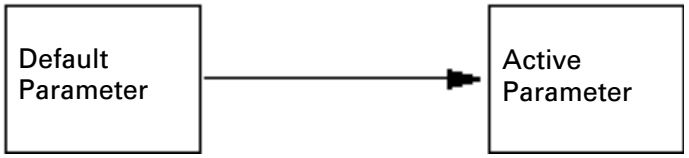


Figure 6 Using Default (Principle)

NOTE Using the default address in your local area network may result in network problems. Take care and change it to a valid address immediately.

Table 12 Using Default Parameters

IP address:	192.168.254.11
Subnet Mask:	255.255.255.0
Default Gateway	not specified

Since the default IP address is a so-called local address, it will not be routed by any network device. Thus, the PC and the compact LC must reside in the same subnet.

The user may open a Telnet session using the default IP address and change the parameters stored in the non-volatile memory of the compact LC. He may then close the session, select the initialization mode “Using Stored”, power-on again and establish the TCP/IP connection using the new parameters.

When the compact LC is wired to the PC directly (e.g. using a cross-over cable or a local hub), separated from the local area network, the user may simply keep the default parameters to establish the TCP/IP connection.

NOTE In the “Using Default” mode, the parameters stored in the memory of the compact LC are not cleared automatically. If not changed by the user, they are still available, when switching back to the mode “Using Stored”.

Link configuration selection

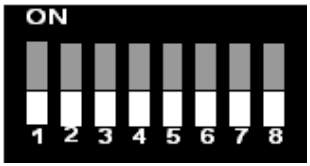
The LAN interface supports 10 or 100 Mbps operation in full- or half-duplex modes. In most cases, full-duplex is supported when the connecting network device - such as a network switch or hub - supports IEEE 802.3u auto-negotiation specifications.

When connecting to network devices that do not support auto-negotiation, the LAN interface will configure itself for 10- or 100-Mbps half-duplex operation.

For example, when connected to a non-negotiating 10-Mbps hub, the LAN interface will be automatically set to operate at 10-Mbps half-duplex.

If the compact LC is not able to connect to the network through auto-negotiation, you can manually set the link operating mode using link configuration switches on the compact LC.

Table 13 Link Configuration Switches

	SW 3	SW 4	SW 5	Link Configuration
	OFF	-	-	speed and duplex mode determined by auto-negotiation
	ON	OFF	OFF	manually set to 10 Mbps, half-duplex
	ON	OFF	ON	manually set to 10 Mbps, full-duplex
	ON	ON	OFF	manually set to 100 Mbps, half-duplex
	ON	ON	ON	manually set to 100 Mbps, full-duplex

Storing the settings permanently with Bootp

If you want to change parameters of the Compact LC using the Bootp follow the instructions below.

1. Turn off the Compact LC.
2. Change the Compact LC's settings of the Configuration Switch to *"Bootp & Store"* mode.
3. Start the Agilent Bootp Service and open its window.
4. If required, modify the parameters for the Compact LC according to your needs using the existing configuration.
5. Press **OK** to exit the Bootp Manager.
6. Now turn on the Compact LC and view the Bootp Server window. After some time the Agilent Bootp Service will display the request from the LAN interface. The parameters are now stored permanently in the non-volatile memory of the Compact LC.
7. Close the Agilent Bootp Service and turn off the Compact LC.
8. Change the settings of the Compact LC's Configuration Switch to *"Using Stored"* mode.

9 Power cycle the Compact LC. The Compact LC can be accessed now via LAN without the Agilent Bootp Service.

Manual Configuration

Manual configuration only alters the set of parameters stored in the non-volatile memory of the Compact LC. It never affects the currently active parameters. Therefore, manual configuration can be done at any time. A power cycle is mandatory to make the stored parameters become the active parameters, given that the initialization mode selection switches are allowing it.

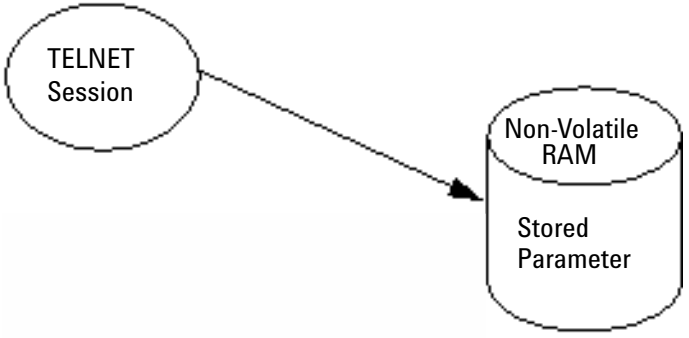


Figure 7 Manual Configuration (Principle)

With Telnet

Whenever a TCP/IP connection to the Compact LC is possible (TCP/IP parameters set by any method), the parameters may be altered by opening a Telnet session.

1 Open the system (DOS) prompt window by clicking on Windows **START** button and select **"Run..."**. Type "cmd" and press OK.

2 Type the following at the system (DOS) prompt:

```
c:\>telnet <IP address>
```

or

- c:\>telnet <host name>

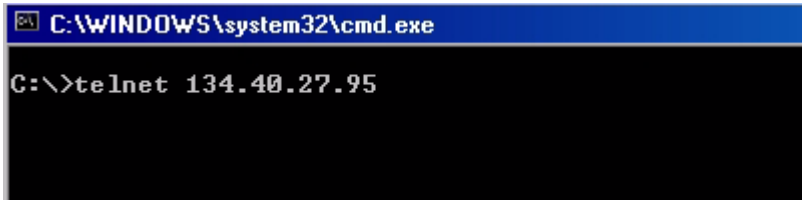


Figure 8 Telnet - Starting a session

where <IP address> may be the assigned address from a Bootp cycle or the default IP address.

When the connection was established successfully, the Compact LC responds with the following:

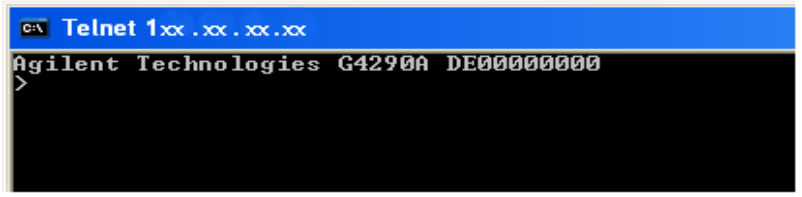


Figure 9 A connection to the module is made

3 Type

?

and press enter to see the available commands.

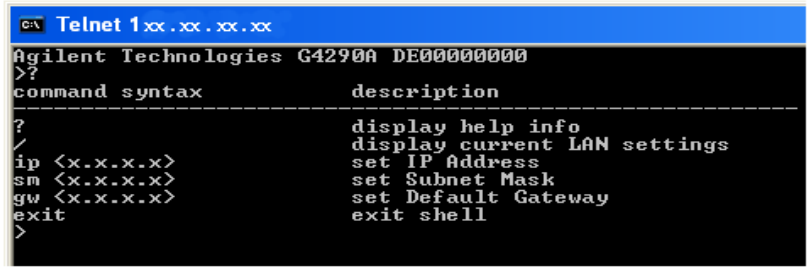


Figure 10 Telnet Commands

Table 14 Telnet Commands

Value	Description
?	displays syntax and descriptions of commands
/	displays current LAN settings
ip <x.x.x.x>	sets new ip address
sm <x.x.x.x>	sets new subnet mask
gw <x.x.x.x>	sets new default gateway
exit	exits shell and saves all changes

4 To change a parameter follows the style:

- parameter value

  for example:
  `ip 134.40.27.230`

Then press [Enter], where parameter refers to the configuration parameter you are defining, and value refers to the definitions you are assigning to that parameter. Each parameter entry is followed by a carriage return.

5 Use the "/" and press Enter to list the current settings.

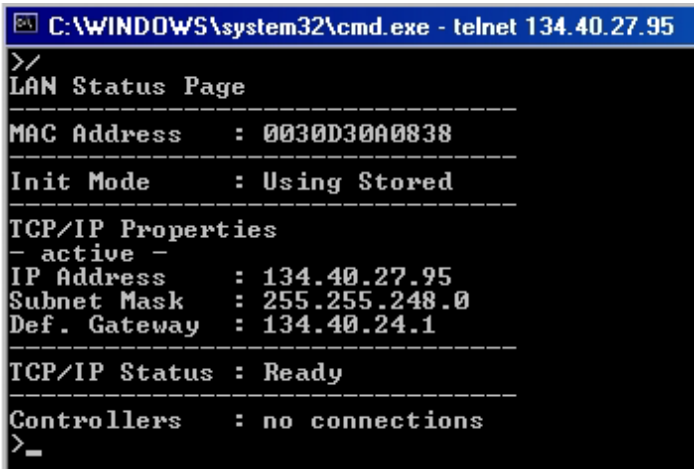


Figure 11 Telnet - Current settings in "Using Stored" mode

6 Change the IP address (in this example 134.40.27.99) and type "/" to list current settings.

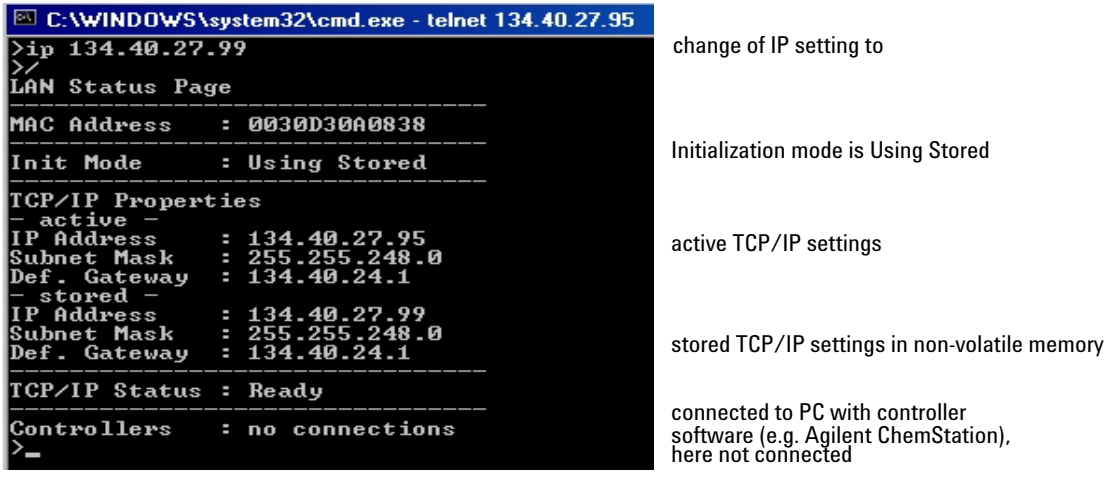


Figure 12 Telnet - Change IP settings

7 When you have finished typing the configuration parameters, type
`exit`
and press [Enter] to exit with storing parameters.

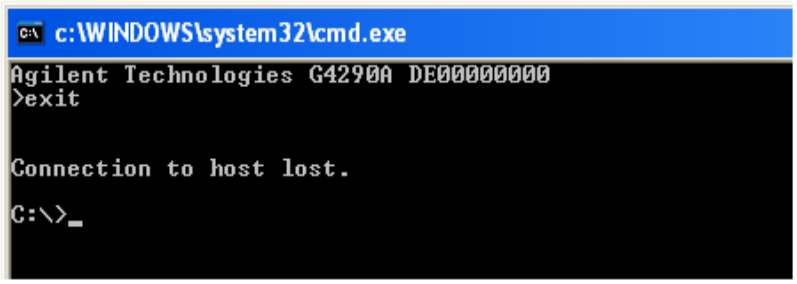


Figure 13 Closing the Telnet Session

NOTE If the Initialization Mode Switch is changed now to “Using Stored” mode, the instrument will take the stored settings when the module is re-booted. In the example above it would be 134.40.27.99.

Automatic configuration with Bootp

When **automatic configuration with Bootp** is selected and the LAN interface is powered on, it broadcasts a BOOTP (Bootstrap Protocol) request that contains its MAC (hardware) address. A BOOTP server daemon searches its database for a matching MAC address, and if successful, sends the corresponding configuration parameters to the compact LC as a BOOTP reply. These parameters become the active TCP/IP parameters immediately and the TCP/IP connection can be established.

Configuring the Agilent Bootp service program

NOTE All examples shown in this chapter will not work in your environment. You need your own IP-, Subnet-Mask- and Gateway addresses.

NOTE Assure that the Compact LC configuration switch is set properly. The setting should be either **Bootp** or **Bootp & Store**.

NOTE Assure that your instrument is powered off.

NOTE If the Agilent Bootp Service program is not already installed on your PC, then install it from your software CD-ROM, located in folder \Bootp.

1. The Agilent Bootp Service is placed in the start-up group and automatically is started during the boot process of the PC.
2. Open the Bootp Settings window and enter the default settings for your setup.
3. Launch the Manager. It will open the Bootp Manager screen. This shows all network hardware that has been added (initially empty).
4. Select **Add** to enter the enter the module specific information:
   - MAC address (from label on the instrument)
   - host name
   - IP address
   - comment (instrument name / location)
   - subnet mask (if different)
   - gateway (if required)
5. Press **OK**. The parameter are added to the Bootp Manager, and added to the TabFile:
6. Press **Exit Manager** and **OK** to exit the Agilent Bootp Service.
7. Now turn on the instrument, wait about 30-60 seconds and view the LogFile, see Figure below. It should display the request from the detector with the hardware (MAC) address.

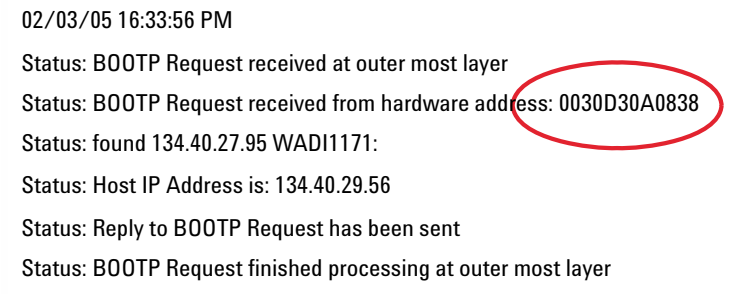


Figure 14 LogFile - the detector has received the parameter

NOTE When using this **Bootp** mode, the parameters are not written into the non-volatile memory of the detector.

3 Introduction and Optimizing Performance

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This chapter provides general information about the use and functionality of the Compact LC System and its components

Overview of the Compact LC system

Algae Growth in HPLC Systems

The presence of algae in HPLC systems can cause a variety of problems that may be incorrectly diagnosed as instrument or application problems. Algae grow in aqueous media, preferably in a pH range of 4-8. Their growth is accelerated by buffers, for example phosphate or acetate. Since algae grow through photosynthesis, light will also stimulate their growth. Even in distilled water small-sized algae grow after some time.

Instrumental problems associated with algae

Algae deposit and grow everywhere within the HPLC system causing:

- Deposits on ball valves, inlet or outlet, resulting in unstable flow or total failure of the pump.
- Small pore solvent inlet filters to plug, resulting in unstable flow or total failure of the pump.
- Small pore high pressure solvent filters, usually placed before the injector to plug resulting in high system pressure.
- Column filters to plug giving high system pressure.
- Flow cell windows of detectors to become dirty resulting in higher noise levels (since the detector is the last module in the flow path, this problem is less common).

Symptoms observed with the Agilent 1120 Compact LC

In contrast to the HP 1090 and HP 1050 Series HPLC systems which use helium degassing, algae have a better chance to grow in systems such as the Agilent 1120 Compact LC where helium is not used for degassing (most algae need oxygen and light for growth).

The presence of algae in the Agilent 1120 Compact LC can cause the following to occur:

- PTFE frits, part number 01018-22707, (purge valve assembly) and column filter blockage causing increased system pressure. Algae appear as white or yellowish-white deposits on filters. Typically black particles from the normal wear of the piston seals do not cause the PTFE frits to block over short-term usage.
- Short lifetime of solvent filters (bottle head assembly). A blocked solvent filter in the bottle, especially when only partly blocked, is more difficult to identify and may show up as gradient performance problems, intermittent pressure fluctuations etc.
- Algae growth may also be the possible source for failures of the ball valves and other components in the flow path.

How to Prevent and/or Reduce the Algae Problem

- Always use freshly prepared solvents, especially use demineralized water which was filtered through about 0.2 µm filters.
- Never leave mobile phase in the instrument for several days without flow.
- Always discard “old” mobile phase.
- Use the amber solvent bottle (part number 9301-1450) supplied with the instrument for your aqueous mobile phase.
- If possible add a few mg/l sodium azide or a few percent organic solvent to the aqueous mobile phase.

Compact LC electronics

All electrical connectors are placed on the rear left side of the instrument.

Available connectors:

- Power connector, female end
- LAN connector (Compact LC to controlling PC)
- CAN connectors (Compact LC to additional Agilent 1200 Series Module)
- USB connector (for future use)
- RS232 connector
- APG Remote connector
- 12V DC Output

- 8 bit configuration switch (see chapter LAN configuration)
- 5 Main Board fuses 250Vac, T3.15A **part number: 2110-1417**
  - Fuse F1 (Degasser, Pump, Injector Motors)
  - Fuse F2 (Injector sensors, Column Oven, Ext 24V Connector)
  - Fuse F3 (Processor Core, +5V, +15V, -15V supply on Mainboard)
  - Fuse F4 (VWD incl. D2-Lamp)
  - Fuse F5 (VWD Heater, FAN)

  Next to each fuse is a LED. Red LED indicates the fuse is blown.

  If one of the fuses is blown the green LED of the power switch is flashing.
- Fuse Netfilter 250Vac, T10AH **part number: 2110-1004**

Solvent Delivery Systems

This chapter provides an overview on the operational principles of the Solvent Delivery System (Pump and optional Degasser).

Overview of the solvent delivery system

The pump is based on a two-channel, dual plunger in-series design which comprises all essential functions a solvent delivery system has to fulfill. Metering of solvent and delivery to the high-pressure side are performed by one pump assembly which can generate pressure up to 400 bar.

Degassing of the solvents is done by a vacuum degasser and solvent compositions are generated on the low-pressure side by a high-speed proportioning valve. The dual channel gradient pump includes a build-in dual channel online vacuum degasser. The isocratic pump goes in the Compact LC without a degasser.

The pump assembly includes a pump head with an inlet valve and an outlet valve. A damping unit is connected between the two plunger chambers. A purge valve including a PTFE frit is fitted at the pump outlet for convenient priming of the pump head.

The Degasser

The dual channel gradient pump comes with a build-in online degasser. The degasser is switched on automatically when the pump is switched on, even if the flow is set to 0 ml/min. In the vacuum chamber of the two channels a constant vacuum of 75 Torr (100 mbar) is created. The solvent flows through a Teflon AF tube with internal volume of 1.5 ml/channel inside the vacuum chamber.

How does the pump work?

The liquid runs from the solvent reservoir through the degasser to the DCGV and from there to the inlet valve. The pump assembly comprises two substantially identical plunger/chamber units. Both plunger/chamber units comprise a ball-screw drive and a pump head with one sapphire plunger for reciprocating movement in it.

A servo-controlled variable reluctance motor drives the two ball-screw drives in opposite directions. The gears for the ball-screw drives have different circumferences (ratio 2:1) allowing the first plunger to move at twice the speed of the second plunger. The solvent enters the pump head close to the bottom limit and leaves it at its top. The outer diameter of the plunger is smaller than the inner diameter of the pump head chamber allowing the solvent to fill the gap in between. The first plunger has a stroke volume in the range of 20–100 µl depending on the flow rate. The microprocessor controls all flow rates in a range of 1 µl–10 ml/min. The inlet of the first plunger/chamber unit is connected to the inlet valve which is opened or closed allowing solvent to be drawn into the first plunger pump unit.

The outlet of the first plunger/chamber unit is connected through the outlet ball valve and the damping unit to the inlet of the second plunger/chamber unit. The outlet of the purge valve assembly is then connected to the following chromatographic system.

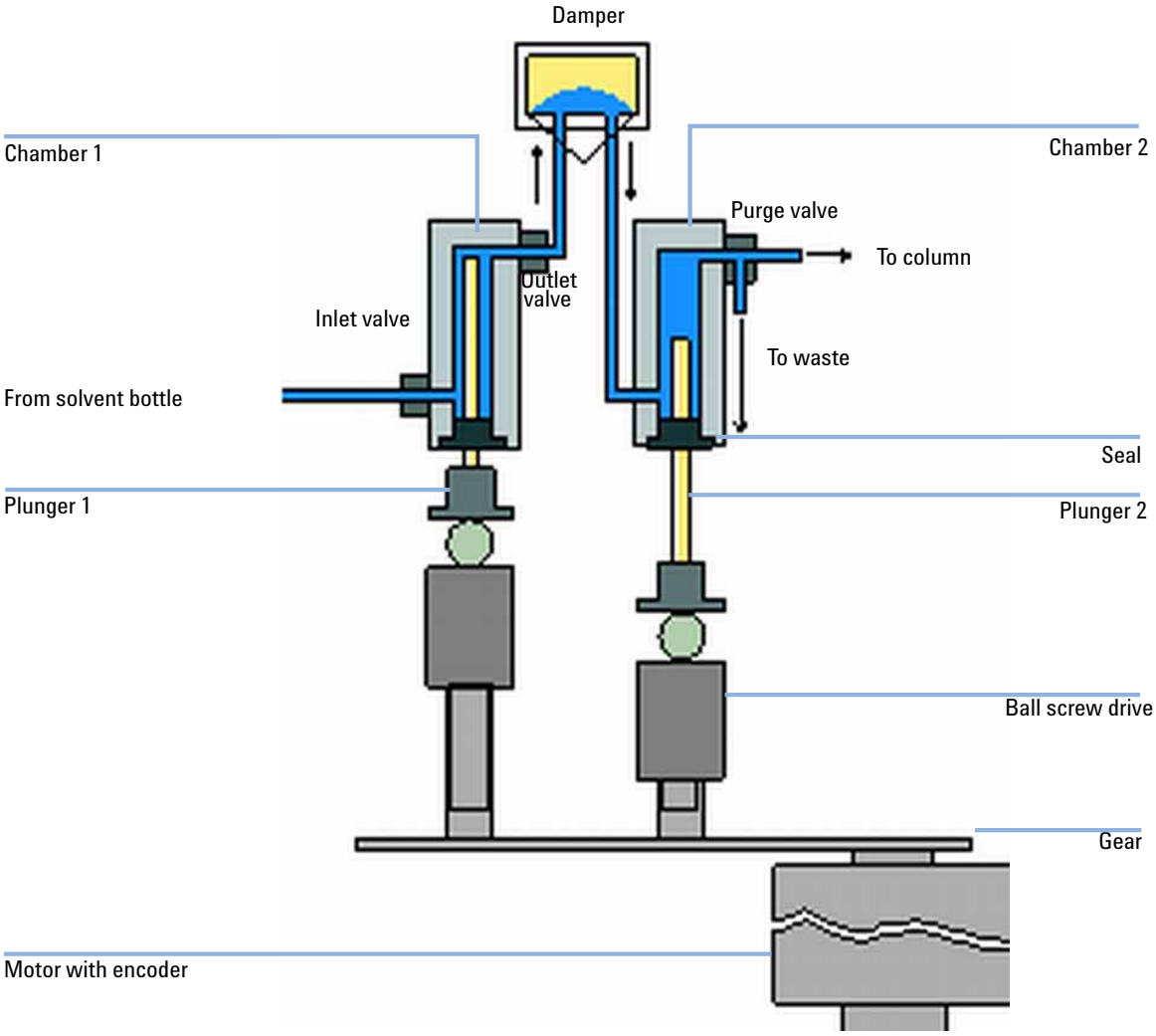

Figure 15 Principle of the pump

When turned on, the pump runs through an initialization procedure to determine the upper dead center of the first plunger. The first plunger moves slowly upwards into the mechanical stop of chamber and from there it moves back a predetermined path length. The controller stores this plunger position in memory. After this initialization the pump starts operation with the set

parameters. The inlet valve is opened and the down-moving plunger draws solvent into the first chamber. At the same time the second plunger is moving upwards delivering into the system. After a controller-defined stroke length (depending on the flow rate) the drive motor is stopped and the inlet valve is closed. The motor direction is reversed and moves the first plunger up until it reaches the stored upper limit and at the same time moving the second plunger downwards. Then the sequence starts again moving the plungers up and down between the two limits. During the up movement of the first plunger the solvent in the chamber is pressed through the outlet ball valve into the second chamber. The second plunger draws in half of the volume displaced by the first plunger and the remaining half volume is directly delivered into the system. During the drawing stroke of the first plunger, the second plunger delivers the drawn volume into the system.

For solvent compositions from the solvent bottles A, B the controller divides the length of the intake stroke in certain fractions in which the gradient valve connects the specified solvent channel to the pump input.

Table 15

Delay volume	800–1100 µl, depends on back pressure
Materials in contact with mobile phase	
DCGV	PEEK, PFA
Pump head	SST, gold, sapphire, ceramic
Inlet valve	SST, gold, sapphire, ruby, ceramic, PTFE
Outlet valve	SST, gold, sapphire, ruby
Adapter	SST, gold
Purge valve	SST, gold, PTFE, ceramic, PEEK

Compressibility Compensation

How does compressibility compensation work?

The compressibility of the solvents in use will affect retention-time stability when the back pressure in the system changes (for example, ageing of column). In order to minimize this effect, the pump provides a compressibility compensation feature which optimizes the flow stability according to the solvent type. The compressibility compensation is set to a default value and can be changed through the user interface.

Without a compressibility compensation the following will happen during a stroke of the first plunger. The pressure in the plunger chamber increases and the volume in the chamber will be compressed depending on backpressure and solvent type. The volume displaced into the system will be reduced by the compressed volume.

With a compressibility value set the processor calculates a compensation volume, that is depending on the backpressure in the system and the selected compressibility. This compensation volume will be added to the normal stroke volume and compensates the previous described *loss* of volume during the delivery stroke of the first plunger.

Optimize the compressibility compensation setting

The compressibility compensation default setting is 46×10^{-6} /bar for the pump. This setting represents an average value. Under normal conditions the default setting reduces the pressure pulsation to values (below 1% of system pressure) that will be sufficient for most applications and for all gradient analyses. For applications using sensitive detectors, the compressibility settings can be optimized by using the values for the various solvents. If the solvent in use is not listed in the compressibility tables, when using isocratic mixtures of solvents and if the default settings are not sufficient for your application the following procedure can be used to optimize the compressibility settings.

NOTE When using mixtures of solvents it is not possible to calculate the compressibility of the mixture by interpolating the compressibility values of the pure solvents used in that mixture or by applying any other calculation. In these cases the following empirical procedure has to be applied to optimize your compressibility setting.

1 Start the pump with the required flow rate.

2 Before starting the optimization procedure, the flow must be stable. Use degassed solvent only. Check the tightness of the system with the pressure test.

3 Your pump must be connected to a control software (e.g. EZChrom, LMD, OL, etc.) with which the pressure and %-ripple can be monitored.

4 The compressibility compensation setting that generates the smallest pressure ripple is the optimum value for your solvent composition.

Table 16 Solvent Compressibility

Solvent (pure)	Compressibility (10^{-6}/bar)
Acetone	126
Acetonitrile	115
Benzene	95
Carbon tetrachloride	110
Chloroform	100
Cyclohexane	118
Ethanol	114
Ethyl acetate	104
Heptane	120
Hexane	150
Isobutanol	100
Isopropanol	100
Methanol	120
1-Propanol	100
Toluene	87
Water	46

How does variable stroke volume work?

Due to the compression of the pump-chamber volume each plunger stroke of the pump will generate a small pressure pulsation, influencing the flow ripple of the pump. The amplitude of the pressure pulsation is mainly dependent on the stroke volume and the compressibility compensation for the solvent in use. Small stroke volumes will generate pressure pulsations of smaller amplitude than higher stroke volumes at same flow rates. In addition the frequency of the pressure pulsations will be higher. This will decrease the influence of flow pulsations on quantitative results.

In gradient mode smaller stroke volumes resulting in less flow ripple will improve composition ripple.

The pump uses a processor-controlled spindle system to drive its plungers. The normal stroke volume is optimized for the selected flow rate. Small flow rates use a small stroke volume while higher flow rates use a higher stroke volume.

The stroke volume for the pump is set to AUTO mode. This means that the stroke is optimized for the flow rate in use. A change to larger stroke volumes is possible but not recommended.

Using the Pump

Hints for successful use of the Compact LC pump

- When using salt solutions and organic solvents in the Agilent 1120 Compact LC Pump it is recommended to connect the salt solution to one of the bottom gradient valve ports and the organic solvent to one of the upper gradient valve port. It is best to have the organic channel directly above the salt solution channel. Regular flushing with water of all DCGV channels is recommended to remove all possible salt deposits in the valve ports.
- Before operating the pump flush the vacuum degasser (optional) with at least two volumes (3 ml), especially when turned off for a certain length of time (for example, during the night) and volatile solvent mixtures are used in the channels.
- Prevent blocking of solvent inlet filters (never use the pump without solvent inlet filter). Growth of algae should be avoided.

- Check purge valve frit and column frit in regular time intervals. A blocked purge valve frit can be identified by black or yellow layers on its surface or by a pressure greater than 10 bar, when pumping distilled water at a rate of 5 ml/min with an open purge valve.
- When using the pump at low flow rates (for example, 0.2 ml/min) check all 1/16-inch fittings for any signs of leaks.
- Whenever exchanging the pump seals the purge valve frit should be exchanged, too.
- When using buffer solutions, flush the system with water before switching it off.
- Check the pump plungers for scratches when changing the plunger seals. Scratched plungers will lead to micro leaks and will decrease the lifetime of the seal.
- Pressurize the system according to the wear in procedure after changing the plunger seals.

Prevent blocking of solvent filters

Contaminated solvents or algae growth in the solvent bottle will reduce the lifetime of the solvent filter and will influence the performance of the pump. This is especially true for aqueous solvents or phosphate buffers (pH 4 to 7). The following suggestions will prolong lifetime of the solvent filter and will maintain the performance of the pump.

- Use a sterile, if possible amber, solvent bottle to slow down algae growth.
- Filter solvents through filters or membranes that remove algae.
- Exchange solvents every two days or refilter.
- If the application permits add 0.0001-0.001M sodium azide to the solvent.
- Place a layer of argon on top of your solvent.
- Avoid exposure of the solvent bottle to direct sunlight.

NOTE Never use the system without solvent filter installed.

Injection System

This chapter provides an overview on the operational principles of the Injection Systems; Manual Injector and Autosampler.

Introduction to the Manual Injector

The Agilent 1120 Compact LC manual injector uses a Rheodyne, 6-port sample injection valve **part number: 5067-4102**. Sample is loaded into the external 20-µl sample loop through the injection port at the front of the valve. The valve has a PEEK™ injection seal. A make-before-break passage in the stator ensures flow is not interrupted when the valve is switched between the INJECT and LOAD positions, and back again.

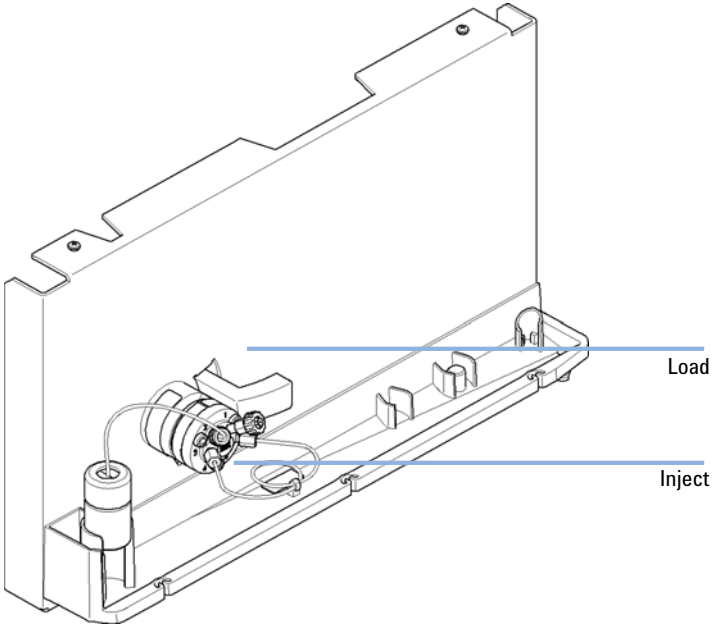

Figure 16 Rheodyne 6-port sample injection valve

Introduction to the Autosampler

Introduction to the Autosampler

Three sample-rack sizes are available for the autosampler. The standard full-size rack holds 100 × 1.8 ml vials, while the two half-size racks provide space for 40 × 1.8 ml vials and 15 × 6 ml vials respectively. Any two half-size rack trays can be installed in the autosampler simultaneously. The analytical head device provides injection volumes from 0.1 – 100 µl.

The autosamplers transport mechanism uses an X-Z-Theta movement to optimize vial pick-up and return. Vials are picked up by the gripper arm, and positioned below the sampling unit. The gripper transport mechanism and sampling unit are driven by motors. Movement is monitored by optical sensors and optical encoders to ensure correct operation. The metering device is always flushed after injection to ensure minimum carry-over.

The six-port injection valve unit (only 5 ports are used) is driven by a high-speed hybrid stepper motor. During the sampling sequence, the valve unit bypasses the autosampler, and directly connects the flow from the pump to the column. During injection and analysis, the valve unit directs the flow through the autosamplers which ensures that the sample is injected completely into the column, and that any sample residue is removed from the metering unit and needle from before the next sampling sequence begins.

Sampling Sequence

The movements of the autosampler components during the sampling sequence are monitored continuously by the processor. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sampling sequence can't be completed successfully, an error message is generated.

Solvent is bypassed from the autosamplers by the injection valve during the sampling sequence. The sample vial is selected by a gripper arm from a static sample rack. The gripper arm places the sample vial below the injection needle. The required volume of sample is drawn into the sample loop by the metering device. Sample is applied to the column when the injection valve returns to the mainpass position at the end of the sampling sequence.

The sampling sequence occurs in the following order:

1 The injection valve switches to the bypass position.

2 The plunger of the metering device moves to the initialization position.

3 The gripper arm selects the vial. At the same time, the needle lifts out of the seat.

4 The gripper arm places the vial below the needle.

5 The needle lowers into the vial.

6 The metering device draws the defined sample volume.

7 The needle lifts out of the vial.

8 If the automated needle wash is selected, the gripper arm replaces the sample vial, positions the wash vial below the needle, lowers the needle into the vial, then lifts the needle out of the wash vial.

9 The gripper arm checks if the safety flap is in position.

10 The gripper arm replaces the vial. Simultaneously, the needle lowers into the seat.

11 The injection valve switches to the mainpass position.

Injection Sequence

Before the start of the injection sequence, and during an analysis, the injection valve is in the mainpass position. In this position, the mobile phase flows through the autosamplers metering device, sample loop, and needle, ensuring all parts in contact with sample are flushed during the run, thus minimizing carry-over.

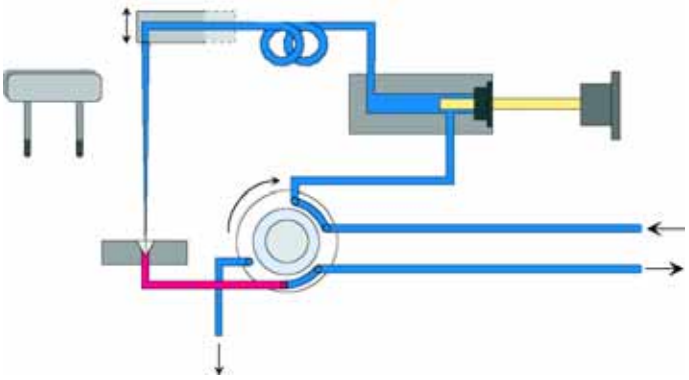

Figure 17 Mainpass Position

When the sample sequence begins, the valve unit switches to the bypass position. Solvent from the pump enters the valve unit at port 1, and flows directly to the column through port 6.

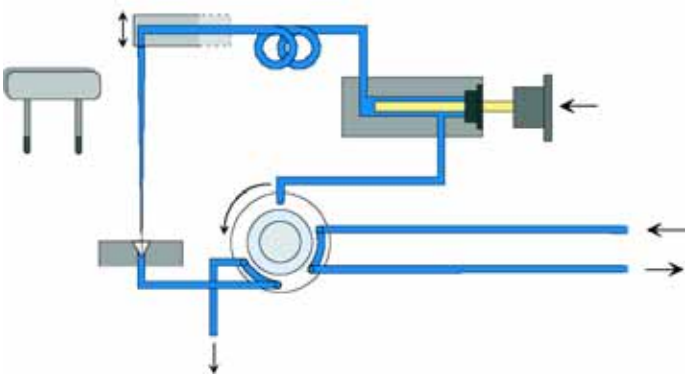

Figure 18 Bypass Position

Next, the needle is raised, and the vial is positioned below the needle. The needle moves down into the vial, and the metering unit draws the sample into the sample loop.

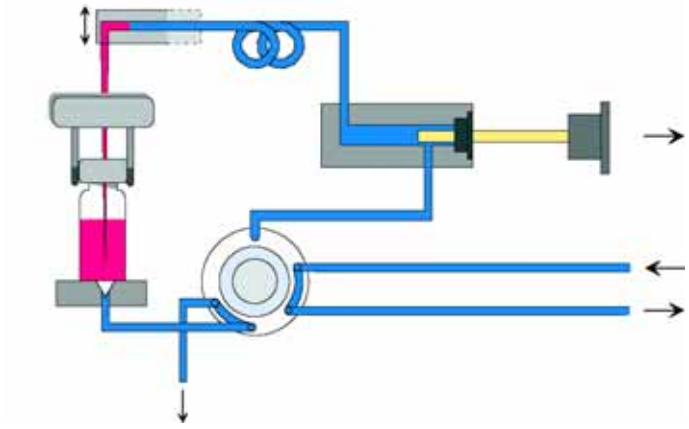

Figure 19 Drawing the Sample

When the metering unit has drawn the required volume of sample into the sample loop, the needle is raised, and the vial is replaced in the sample tray. The needle is lowered into the needle seat, and the injection valve switches back to the mainpass position, flushing the sample onto the column .

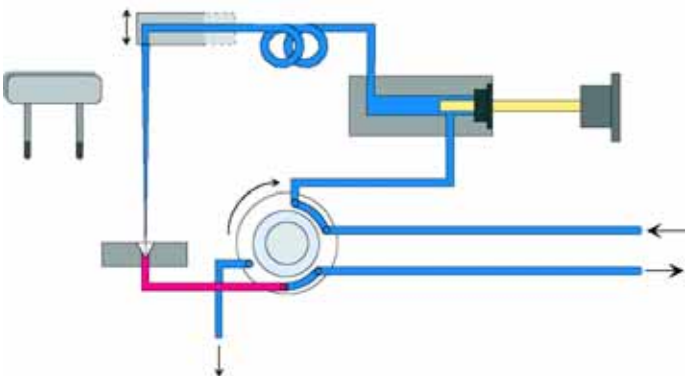

Figure 20 Mainpass Position (Sample Injection)

Sampling Unit

The sampling unit comprises three main assemblies: needle drive, metering device, and injection valve.

NOTE The replacement sampling unit excludes the injection valve and metering head assemblies.

Needle-Drive

The needle movement is driven by a stepper motor connected to the spindle assembly by a toothed belt. The circular motion of the motor is converted to linear motion by the drive nut on the spindle assembly. The upper and lower needle positions are detected by reflection sensors on the sampling unit flex board, while the needle-in-vial position is determined by counting the motor steps from the upper needle-sensor position.

Analytical head

The analytical head is driven by the stepper motor connected to the drive shaft by a toothed belt. The drive nut on the spindle converts the circular movement of the spindle to linear motion. The drive nut pushes the sapphire plunger against the tension of the spring into the analytical head. The base of the plunger sits on the large bearing of the drive nut, which ensures the plunger is always centered. A ceramic ring guides the movement of the plunger in the analytical head. The home position of the plunger is sensed by an infra-red sensor on the sampling unit flex board, while the sample volume is determined by counting the number of steps from the home position. The backward movement of the plunger (driven by the spring) draws sample from the vial.

Table 17 Analytical Head Technical Data

	Standard (100 µl)
Number of steps	15000
Volume resolution	7 nl/motor step
Maximum stroke	100 µl
Pressure limit	600 bar
Plunger material	Sapphire

Injection-Valve

The two-position 6-port injection valve is driven by a stepper motor. Only five of the six ports are used (port 3 is not used). A lever/slider mechanism transfers the movement of the stepper motor to the injection valve. Two microswitches monitor switching of the valve (bypass and mainpass end positions).

No valve adjustments are required after replacing internal components.

Table 18 Injection-Valve Technical Data

	Standard
Motor type	4 V, 1.2 A stepper motor

Table 18 Injection-Valve Technical Data

Seal material	Vespel™ (Tefzel™ available)
Number of ports	6
Switching time	< 150 ms

Transport Assembly

The transport unit comprises an X-axis slide (left-right motion), a Z-axis arm (up-down motion), and a gripper assembly (rotation and vial-gripping).

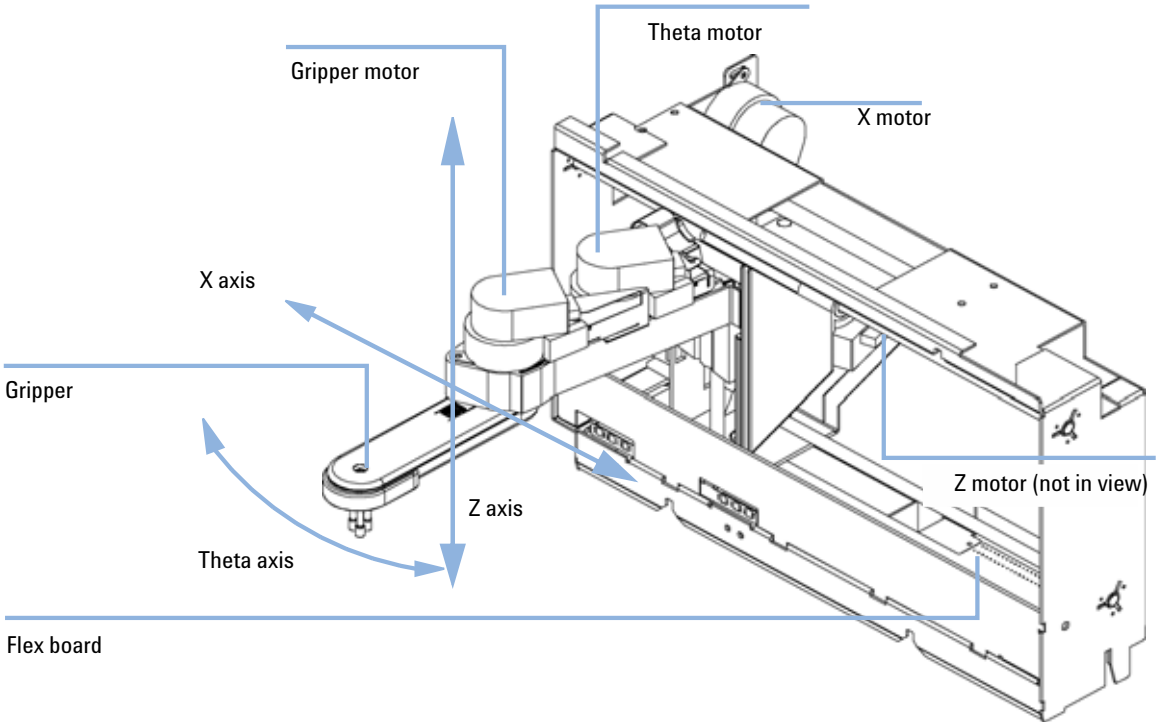

Figure 21 Transport Assembly

The transport assembly uses four stepper motors driven in closed-loop mode for accurate positioning of the gripper assembly for sample-vial transport. The rotational movement of the motors is converted to linear motion (X- and

Z-axes) by toothed belts connected to the drive spindles. The rotation (theta axes) of the gripper assembly is transferred from the motor by a toothed belt and series of gears. The opening and closing of the gripper fingers are driven by a stepper motor linked by a toothed belt to the planetary gearing inside the gripper assembly.

The stepper motor positions are determined by the optical encoders mounted onto the stepper-motor housing. The encoders monitor the position of the motors continually, and correct for position errors automatically (e.g. if the gripper is accidentally moved out of position when loading vials into the vial tray). The initialization positions of the moving components are sensed by reflection sensors mounted on the flex board. These positions are used by the processor to calculate the actual motor position. An additional six reflection sensors for tray recognition are mounted on the flex board at the front of the assembly.

Using the Manual Injector

The Injection Seal

The manual injector is supplied with a PEEK™ injection seal as standard.

Needles

CAUTION

Needle can damage valve

➔ Always use the correct size needle.

The manual injector is not supplied with syringes or needles.

Use needles with 0.028-inch outer diameter (22 gauge) × 2-inch long needle, without electro-taper, and with 90° point style (square tip).

Injecting Sample

WARNING

Ejection of mobile phase

When using sample loops larger than 100 µl, mobile phase may be ejected from the needle port as the mobile phase in the sample loop decompresses.

➔ Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

LOAD Position

In the LOAD position (see Figure 22 on page 55), the pump is connected directly to the column (ports 2 and 3 connected), and the needle port is connected to the sample loop. At least 2 to 3 sample-loop volumes (more if better precision is required) of sample should be injected through the needle port to provide good precision. The sample fills the loop, and excess sample is expelled through the vent tube connected to port 6.

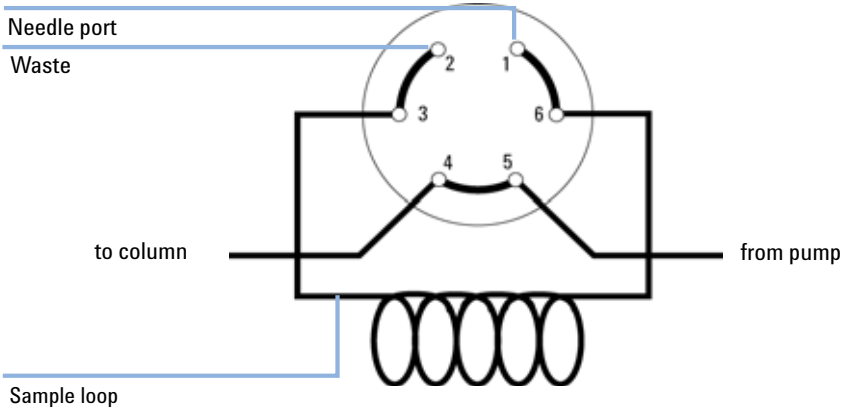

Figure 22 LOAD Position

INJECT Position

In the INJECT position (see Figure 23 on page 56), the pump is connected to the sample loop (ports 1 and 2 connected). All of the sample is washed out of the loop onto the column. The needle port is connected to the vent tube (port 5).

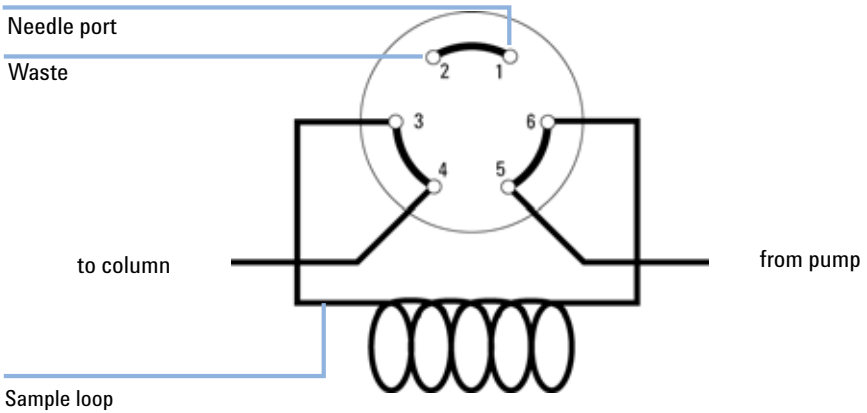

Figure 23 INJECT Position

Using the Autosampler

Supported trays for the autosampler

Table 19 Supported trays for the Autosampler

Description	Part Number
Tray for 100 x 2 ml vials	G1313-44510
Halftray for 15 x 6 ml vials	G1313-44513
Halftray for 40 x 2 ml vials	G1313-44512

Half-tray combinations

Half-trays can be installed in any combination enabling both 2 ml-and 6 ml-vials to be used simultaneously.

Numbering of vial positions

The standard 100-vial tray has vial positions 1 to 100. However, when using two half-trays, the numbering convention is slightly different. The vial positions of the right-hand half tray begin at position 101 as follows:

Left-hand 40-position tray: 1 - 40

Left-hand 15-position tray: 1–15

Right-hand 40-position tray: 101–140

Right-hand 15-position tray: 101–115

Choice of Vials and Caps

For reliable operation vials used with the Agilent 1120 Compact LC autosampler must not have tapered shoulders or caps that are wider than the body of the vial. The vials and caps in shown in below table (shown with their Part numbers) have been successfully tested using a minimum of 15,000 injections with the Agilent 1120 Compact LC autosampler.

Table 20 Crimp Top Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5181-3375	5183-4491	
Clear glass, write-on spot	2	5182-0543	5183-4492	5183-4494
Amber glass, write-on spot	2	5182-3376	5183-4493	5183-4495
Polypropylene, wide opening	1	5182-0567		5183-4496
Polypropylene, wide opening	0.3		9301-0978	

Table 21 Snap Top Vials (continued)

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0544	5183-4504	5183-4507
Clear glass, write-on spot	2	5182-0546	5183-4505	5183-4508
Amber glass, write-on spot	2	5182-0545	5183-4506	5183-4509

Table 22 Screw Top Vials

Description	Volume (ml)	100/Pack	1000/Pack	100/Pack (silanized)
Clear glass	2	5182-0714	5183-2067	5183-2070
Clear glass, write-on spot	2	5182-0715	5183-2068	5183-2071
Amber glass, write-on spot	2	5182-0716	5183-2069	5183-2072

Table 23 Crimp Caps

Description	Septa	100/Pack
Silver aluminum	Clear PTFE/red rubber	5181-1210
Silver aluminum	Clear PTFE/red rubber	5183-4498 (1000/Pack)
Blue aluminum	Clear PTFE/red rubber	5181-1215
Green aluminum	Clear PTFE/red rubber	5181-1216
Red aluminum	Clear PTFE/red rubber	5181-1217

Table 24 Snap Caps

Description	Septa	100/Pack
Clear polypropylene	Clear PTFE/red rubber	5182-0550
Blue polypropylene	Clear PTFE/red rubber	5182-3458
Green polypropylene	Clear PTFE/red rubber	5182-3457
Red polypropylene	Clear PTFE/red rubber	5182-3459

Table 25 Screw Caps

Description	Septa	100/Pack
Blue polypropylene	Clear PTFE/red rubber	5182-0717
Green polypropylene	Clear PTFE/red rubber	5182-0718
Red polypropylene	Clear PTFE/red rubber	5182-0719
Blue polypropylene	Clear PTFE/silicone	5182-0720
Green polypropylene	Clear PTFE/silicone	5182-0721
Red polypropylene	Clear PTFE/silicone	5182-0722

Column Oven

Introduction to the column oven

The column oven is based on a resistor heater matt with two thermal sensors to provide constant temperature in the whole column area. A build in over temperature cut off fuse inhibits overheating.

The inner volume of the oven capillary is 6µl.

Maximum column length is 25cm (10 inch).

Operational range is 5 degree above ambient, at least 10 °C up to 60 °C, max specified flow rate is 5ml/min at 60 °C.

NOTE Never operate the column oven with open front cover, to ensure a correct column temperature always operate with closed front cover. The counterpart of the oven isolation is fixed at the inner side of the front cover.

Detector

Introduction to the Detector

The Agilent 1120 Compact LC variable wavelength detector is designed for highest optical performance, GLP compliance and easy maintenance with:

- Deuterium lamp for highest intensity and lowest detection limit over a wavelength range of 190 to 600 nm,
- Optional flow-cell cartridges (standard 10 mm 14 µl, high pressure 10 mm 14 µl, micro 5 mm 1 µl, semi-micro 6 mm 5 µl) are available and can be used depending on the application needs,
- Easy front access to lamp and flow cell for fast replacement, and
- Built-in holmium oxide filter for fast wavelength accuracy verification.

The detector has a variety of parameters that can be used to optimize performance.

The information below will guide you on how to get the best detector performance. Follow these rules as a start for new applications. It gives a rule-of-thumb for optimizing the detector parameters.

Match the Flow Cell to the Column

The Figure below recommends the flow cell that matches the column used. If more than one selection is appropriate, use the larger flow cell to get the best detection limit. Use the smaller flow cell for best peak resolution.

Column length	Typical peak width	Recommended flow cell			
<= 5 cm	0.025 min				
10 cm	0.05 min		Semi-micro flow cell		
20 cm	0.1 min			Standard flow cell	
>= 40 cm	0.2 min				
	Typical flow rate	0.2 ml/min	0.2 - 0.4 ml/min	0.4 - 0.8 ml/min	1 - 5 ml/min
Internal column diameter		1.0 mm	2.1 mm	3.0 mm	4.6 mm

Figure 24 Choosing a Flow Cell

Flow Cell Path Length

Lambert-Beer's law shows a linear relationship between the flow cell path

$$\text{Absorbance} = -\log T = \log\frac{I_0}{I} = \varepsilon \cdot C \cdot d$$

where

T is the transmission, defined as the quotient of the intensity of the transmitted light I divided by the intensity of the incident light, I_0,

e is the extinction coefficient, which is a characteristic of a given substance under a precisely-defined set of conditions of wavelength, solvent, temperature and other parameters,

C is the concentration of the absorbing species (usually in g/l or mg/l), and

d is the path length of the cell used for the measurement.

Therefore, flow cells with longer path lengths yield higher signals. Although noise usually increases little with increasing path length, there is a gain in signal-to-noise ratio. For example, the noise increased by less than 10 % but a 70 % increase in signal intensity was achieved by increasing the path length from 6 mm to 10 mm.

When increasing the path length, the cell volume usually increases – in our example from 5 – 13 µl. Typically, this causes more peak dispersion. As Figure 25 on page 63 demonstrates, this did not affect the resolution in the gradient separation in our example.

As a rule-of-thumb the flow cell volume should be about 1/3 of the peak volume at half height. To determine the volume of your peaks, take the peak width as reported in the integration results multiply it by the flow rate and divide it by 3).

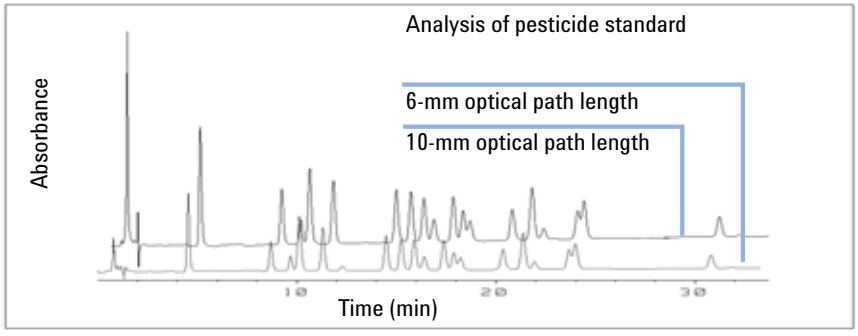

Figure 25 Influence of Cell Path Length on Signal Height

Traditionally LC analysis with UV detectors is based on comparing measurements with internal or external standards. To check photometric accuracy of the Agilent 1120 Compact LC VWD it is necessary to have more precise information on path lengths of the VWD flow cells.

The correct response is:

expected response * correction factor

Please find below the details of the Agilent 1120 Compact LC VWD flow cells:

Table 26 Correction factors for Agilent VWD flow cells

Flow cell type	Cell volume	Part number	Path length (nominal)	Path length (actual)	Correction factor
Standard flow cell	14 µl	G1314-60086	10 mm	10.15 ± 0.19 mm	10/10.15
Semi-micro flow cell	5 µl	G1314-60083	6 mm	6.10 ± 0.19 mm	6/6.10
Micro flow cell	2 µl	G1314-60087	3 mm	2.80 ± 0.19 mm	3/2.8
High Pressure flow cell	14 µl	G1314-60082	10 mm	10.00 ± 0.19 mm	6/5.75

NOTE Be aware that there are additional tolerance of gasket thickness and its compression ratio which is supposed to be very small in comparison with the machining tolerance.

4 Preventive Maintenance and Repair

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Preventive Maintenance (PM) is an Agilent Technologies recommended procedure designed to reduce the likelihood of electro-mechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of your 1120 Compact LC.

Preventive Maintenance Scope of Work and Checklist

Preventive Maintenance Scope of Work and Checklist

To perform a preventive maintenance (PM) the PM Scope of Work and PM checklist has to be followed step by step. The PM Scope of Work and PM Checklist documents can be found in the on the DVD for the Lab Monitoring and Diagnostic (LMD) Software.

Early Maintenance Feedback (EMF)

EMF counters for the pump

The user-settable EMF limits for the EMF counters enable the early maintenance feedback to be adapted to specific user requirements. The wear of pump components is dependent on the analytical conditions. Therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

The Compact LC pump provides a series of EMF counters for the pump head. Each counter increments with pump use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Each counter can be reset to zero after maintenance has been done. The quaternary pump provides the following EMF counters:

- Pump liquimeter
- Pump seal wear

Pump liquimeter

The pump liquimeter displays the total volume of solvent pumped by the pump head since the last reset of the counters. The pump liquimeter can be assigned an EMF (maximum) limit. When the limit is exceeded, the EMF flag in the user interface is displayed.

Seal wear counters

The seal wear counters display a value derived from pressure and flow (both contribute to seal wear). The values increment with pump usage until the counters are reset after seal maintenance. Both seal wear counters can be assigned an EMF (maximum) limit. When the limit is exceeded, the EMF flag in the user interface is displayed.

EMF Counters for the autosampler

The user-setable EMF limits for the EMF counters enable the early maintenance feedback to be adapted to specific user requirements. The wear of autosampler components is dependent on the analytical conditions, therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

The autosampler provides two EMF counters. Each counter increments with autosampler use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Each counter can be reset to zero after maintenance has been done. The autosampler provides the following EMF counters:

Injection valve counter

This counter display the total number of switches of the injection valve since the last reset of the counter.

Needle movements counter

This counter displays the total number of movements of the needle into the seat since the last reset of the counter.

EMF counter for the variable wavelength detector

The user-settable EMF limits for the EMF counter enables the early maintenance feedback to be adapted to specific user requirements. The useful lamp burn time is dependent on the requirements for the analysis (high or low sensitivity analysis, wavelength, and so on), therefore, the definition of the maximum limits need to be determined based on the specific operating conditions of the instrument.

The detector module provides a EMF counter for the lamp. The counter increments with lamp use, and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. The counter can be reset to zero after the lamp is exchanged. The detector provides the following EMF counters:

- Deuterium Lamp On-Time

Solvent Delivery System

Introduction and Overview to simple repairs of the pump

The Compact LC pump is designed for easy repair. The procedures described in this section can be done with the pump in place in the rack.

The most frequent repairs such as plunger seal change and purge valve seal change can be done from the front of the pump.

Table 27 Simple repair procedures - overview

Procedure	Typical frequency	Notes
Checking and cleaning the solvent filter	If solvent filter is blocked	Gradient performance problems, intermittent pressure fluctuations
Exchanging the Passive Inlet Valve	If internally leaking	Pressure ripple unstable, run leak test for verification
Exchanging the Outlet Ball Valve	If internally leaking	Pressure ripple unstable, run leak test for verification
Exchanging the Purge Valve Frit or the Purge Valve	If internally leaking	Solvent dripping out of waste outlet when valve closed
Exchanging the Purge Valve Frit or the Purge Valve	If the frit shows indication of contamination or blockage	A pressure drop of > 10 bar across the frit (5 ml/min H_2O with purge open) indicates blockage
Exchanging the Pump Seals	If pump performance indicates seal wear	Leaks at lower pump head side, unstable retention times, pressure ripple unstable — run leak test for verification
Exchanging the Seal Wear-in Procedure	If pump performance indicates seal wear	Run leak test for verification
Removing the pump head assembly	Before exchanging the seals, or plungers	
Exchanging the Plungers	If scratched	Seal life time shorter than normally expected — check plungers while changing the seals

WARNING

Instrument is partially energized when switched off.

The power supply still uses some power, even if the switch on the front panel is turned off.

➔ To disconnect the Compact LC pump from line, unplug the power cord.

WARNING

Sharp metal edges

Sharp-edged parts of the equipment may cause injury.

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

WARNING

When opening capillary or tube fittings solvents may leak out.

The handling of toxic and hazardous solvents and reagents can hold health risks.

➔ Please observe appropriate safety procedures (for example, goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the solvent vendor, especially when toxic or hazardous solvents are used.

CAUTION

Electronic boards and components are sensitive to electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ In order to prevent damage always use an ESD protection when handling electronic boards and components.

Checking and Cleaning the Solvent Filter

WARNING

Small particles can permanently block the capillaries and valves of the pump.

Damage of the Compact LC pump

➔ Always filter solvents.

➔ Never use the pump without solvent inlet filter.

NOTE

If the filter is in good condition the solvent will freely drip out of the solvent tube (hydrostatic pressure). If the solvent filter is partly blocked only very little solvent will drip out of the solvent tube.

Cleaning the Solvent Filter

When

If solvent filter is blocked

Parts required

Description
Concentrated nitric acid (65%)
Bidistilled water
Beaker

Preparations

Remove solvent inlet tube from the Inlet Valve.

1 Remove the blocked solvent filter from the bottle-head assembly and place it in a beaker with concentrated nitric acid (65%) for one hour.

2 Thoroughly flush the filter with bidistilled water (remove all nitric acid, some capillary columns can be damaged by nitric acid).

3 Replace the filter.

Exchanging the Passive Inlet Valve

When If internally leaking (backflow)

Tools required Wrench 14 mm (flat)
Pair of tweezers

Parts required

#	Part number	Description
1	G4280-60005	Passive Inlet Valve

Preparations Place the solvent bottles under the pump.

1. Remove the upper front cover.
2. Disconnect the solvent inlet tube at the inlet valve (be aware that solvent may leak out of the tube due to hydrostatic flow).
3. Unscrew the adapter from the inlet valve (optional).
4. Using a 14 mm wrench loosen the inlet valve and remove the valve from pump head.

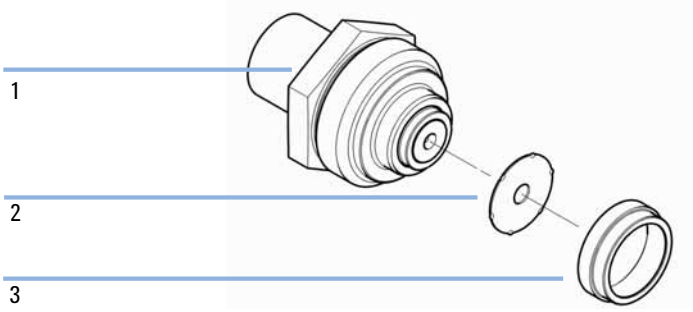


Figure 26 Passive Inlet Valve Parts

	Passive Inlet Valve: part number **G4280-60005**
1	O-Ring: part number **0905-1684**
2	Gold Seal: part number **5001-3707**
3	Cap (pack of 4): part number **5062-2485**

5 Check that the new valve is assembled correctly and that the gold seal is present (if the gold seal is deformed, it should be replaced).

6 Insert the new valve into the pump head.

7 Using the 14 mm wrench turn the nut until it is hand tight.

8 Reconnect the adapter at the inlet valve (optional).

9 Reconnect the solvent inlet tube to the adapter.

10 Reinstall the front cover.

NOTE After an exchange of the valve it may take several ml of pumping with the solvent used in the current application, before the flow stabilizes at a %-ripple as low as it used to be when the system was still working properly.

Exchanging the Outlet Ball Valve

When If internally leaking

Tools required Wrench 1/4 inch

Parts required

#	Part number	Description
1	G1311-60012	Outlet ball valve

Preparations Switch off pump at the main power switch
Remove the upper front cover

NOTE Before exchanging the outlet ball valve you can try to clean it in a sonic bath for 5 – 10 minutes. Place the valve in an upright position in a small beaker with alcohol.

1 Using a 1/4 inch wrench disconnect the valve capillary from the outlet ball valve.

2 Using the 14 mm wrench loosen the valve and remove it from the pump body.

3 Check that the new valve is assembled correctly and that the gold seal is present (if the gold seal is deformed, it should be replaced).

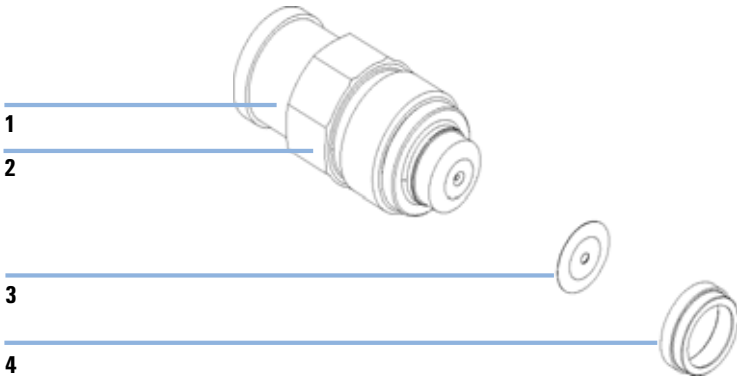


Figure 27 Outlet Ball Valve Parts

	Outlet ball valve—complete assembly **G1311-60012**
1	Socket cap **5042-1345**
2	Outlet valve housing screw**01018-22410**
3	Gold Seal **5001-3707**
4	Cap (pack of 4) **5062-2485**

4 Reinstall the outlet ball valve and tighten the valve.

5 Reconnect the valve capillary.

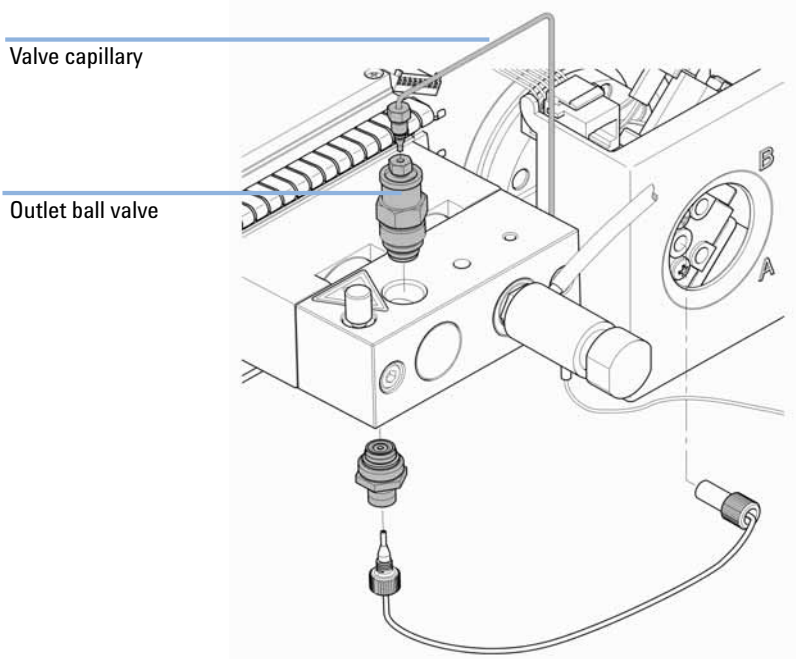


Figure 28 Exchanging the Outlet Ball Valve

Exchanging the Purge Valve Frit or the Purge Valve

When

Frit – when plunger seals are exchanged or when contaminated or blocked (pressure drop of > 10 bar across the frit at a flow rate of 5 ml/min of H_20 with purge valve opened)

Purge valve – if internally leaking

Tools required

Wrench 1/4 inch

Wrench 14 mm

Pair of tweezers or toothpick

Parts required

#	Part number	Description
5	01018-22707	PTFE frit (pack of 5)
1	G4280-60031	Purge valve

Preparations

Switch off pump at the main power switch

Remove the upper front cover

1. Using a 1/4 inch wrench disconnect the pump outlet capillary at the purge valve.
2. Disconnect the waste tube. Beware of leaking solvents due to hydrostatic pressure.
3. Using the 14 mm wrench unscrew the purge valve and remove it.
4. Remove the plastic cap with the gold seal from the purge valve.
5. Using a pair of tweezers or a toothpick remove the frit.

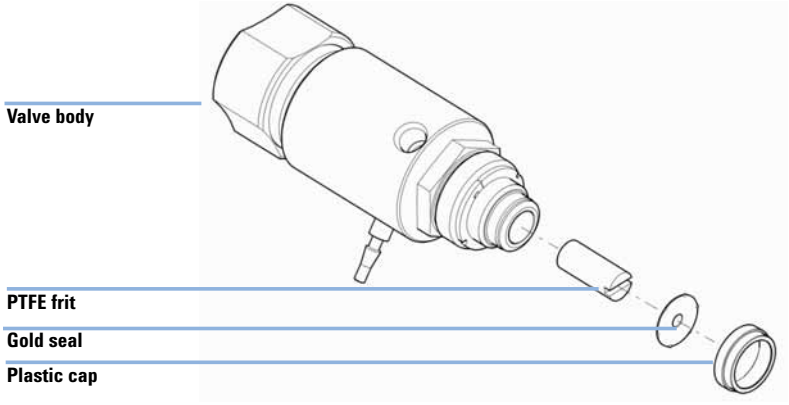


Figure 29 Purge Valve Parts

6 Place a new frit into the purge valve with the orientation of the frit as shown above.

7 Reinstall the cap with the gold seal.

NOTE Before reinstallation always check the gold seal. A deformed seal should be exchanged.

8 Insert the purge valve into the pump head and locate the pump outlet capillary and the waste tube.

9 Tighten the purge valve and reconnect outlet capillary and waste tubing.

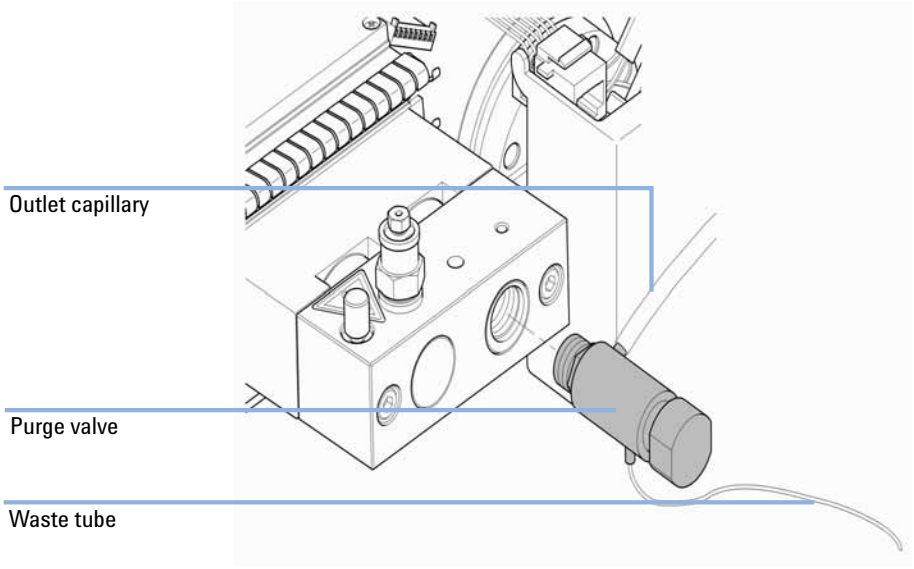


Figure 30 Exchanging the Purge Valve

Removing the Pump Head Assembly

When	Before exchanging the seals Before exchanging the plungers
Tools required	Wrench 1/4 inch 4-mm hexagonal key **8710-2392**
Preparations	Switch off pump at the main power switch

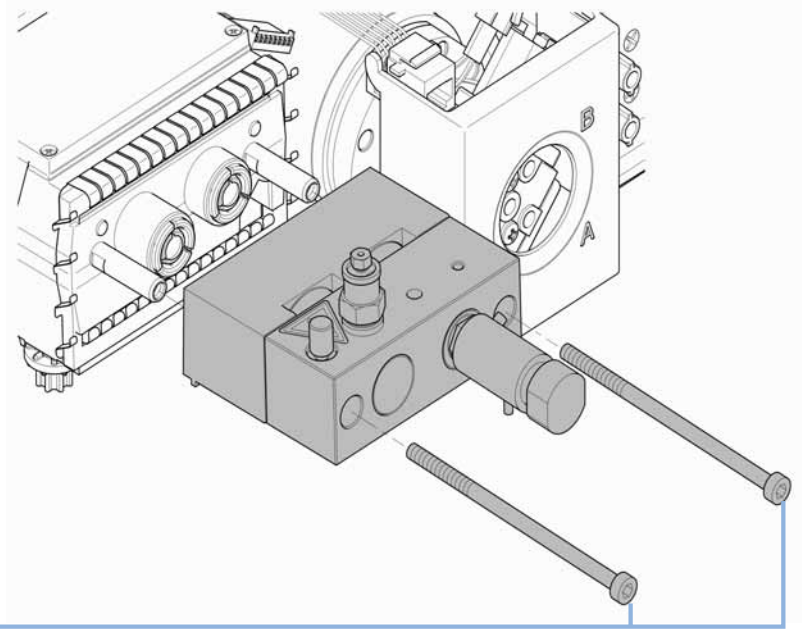
WARNING

Starting the pump when the pump head is removed may damage the pump drive.

Damage of the pump drive

➔ Never start the pump when the pump head is removed.

1 Remove the upper front cover.
2 Using a 1/4 inch wrench remove the outlet capillary.
3 Disconnect the capillary from the outlet ball valve.
4 Remove the waste tubing and disconnect the inlet valve tubing.
5 Remove the capillary at the bottom of the pumphead.
6 Using a 4 mm hexagonal key, stepwise loosen the two pumphead screws and remove the pumphead from the pump drive.



Pump head screws

Exchanging the pump seals and seal wear-in procedure

When Seal leaking, if indicated by the results of the leak test.

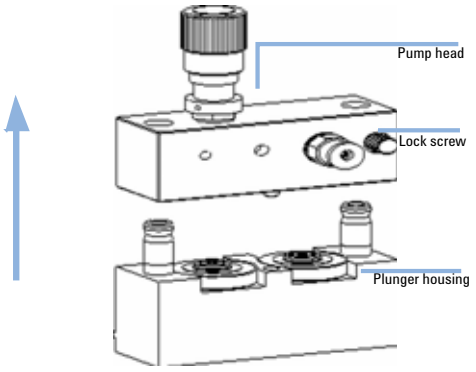
Tools required Wrench 1/4 inch
4-mm hexagonal key

Parts required

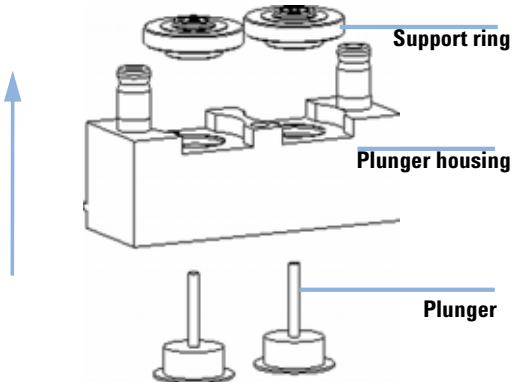
#	Part number	Description
2	5063-6589 or	standard Seals (pack of 2)
or	0905-1420	seals for normal phase applications
1	5022-2159	Restriction capillary

Preparations Switch off pump at the main power switch
Remove the upper front cover

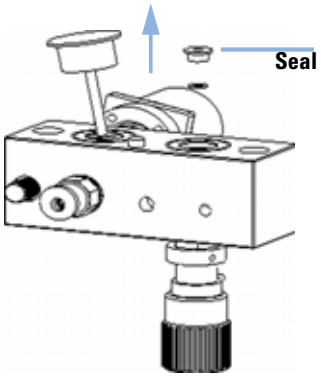
1 Place the pump head on a flat surface. Loosen the lock screw (two revolutions) and while holding the lower half of the assembly carefully pull the pump head away from the plunger housing.



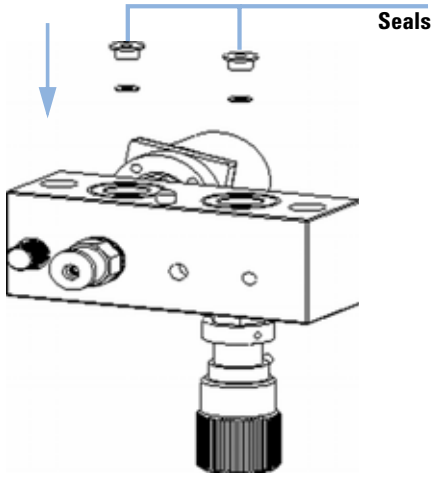
2 Remove the support rings from the plunger housing and lift the housing away from the plungers.



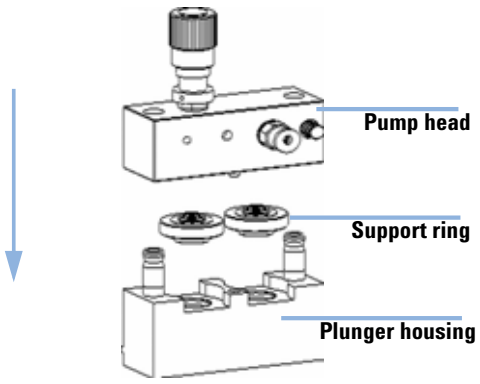
3 Using one of the plungers carefully remove the seal from the pump head (be careful not to break the plunger). Remove wear retainers, if still present.



4 Insert new seals into the pump head.



5 Reassemble the Pumphead assembly.



Seal Wear-in Procedure

CAUTION

This procedure is required for standard seals only (5063-6589).

It will damage the normal phase application seals (0905-1420).

➔ Never perform the seal wear-in procedure with normal phase application seals

1. Place a bottle with 100 ml of Isopropanol in the solvent cabinet and place a tubing (including bottle head assembly) in the bottle.
2. Connect the inlet tube from the bottle head directly to the Inlet Valve.
3. Connect the restriction capillary (5022-2159) to the purge valve. Insert its other end into a waste container.
4. Open the purge valve and purge the system for 5 minutes with isopropanol at a flow rate of 2 ml/min.
5. Close the purge valve, set the flow to a rate adequate to achieve a pressure of 350 bar. Pump 15 minutes at this pressure to wear in the seals.
6. Turn OFF the pump, slowly open the purge valve to release the pressure from the system, disconnect the restriction capillary and reinstall the bottle with the solvent for your application.
7. Rinse your system with the solvent used for your next application.

Exchanging the Plungers

When When scratched

Tools required
- Wrench 1/4 inch
- 4-mm hexagonal key

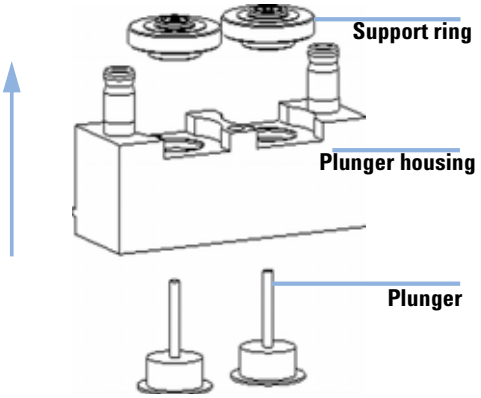
Parts required

#	Part number	Description
1	5063-6586	Plunger

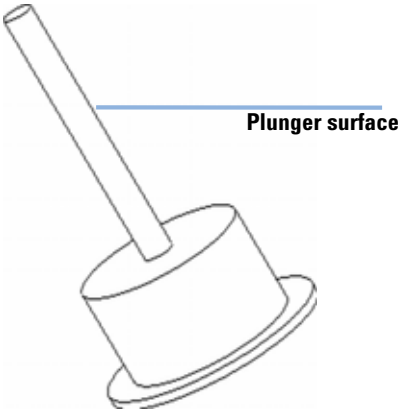
Preparations Switch off pump at the main power switch

Remove the upper front cover

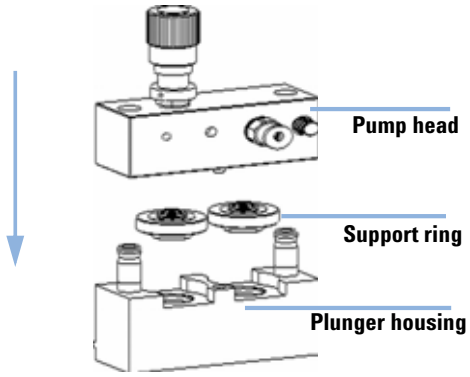
1 Disassemble the Pumphead assembly.



2 Check the plunger surface and remove any deposits or layers. Cleaning can be done with alcohol or tooth paste. Replace plunger if scratched.



3 Reassemble the Pumphead assembly.



Reinstalling the Pump Head Assembly

When When reassembling the pump

Tools required 4-mm hexagonal key

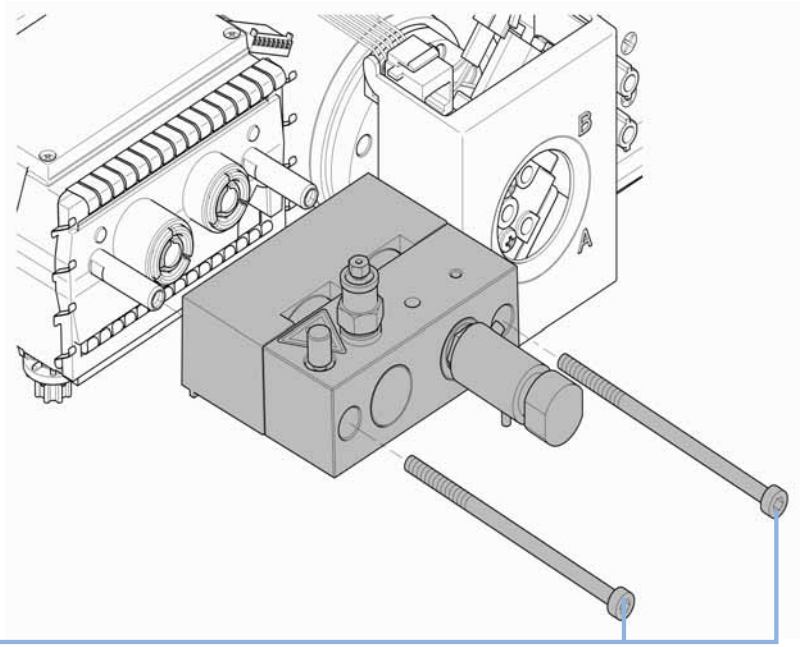
Parts required

#	Description
79846-65501	Pump head grease

1 Apply a small amount of grease on the back of the pistons.

2 Slide the Pumphead Assembly onto the Pumpdrive.

3 Using a 4 mm hexagonal key tighten the Pumphead screws stepwise with increasing torque.



Pump head screws

4 Reconnect the capillaries and tubing.

5 Reinstall the front cover.

Exchanging the Dual-Channel Gradient Valve (DCGV)

Tools required Pozidriv #1

Parts required

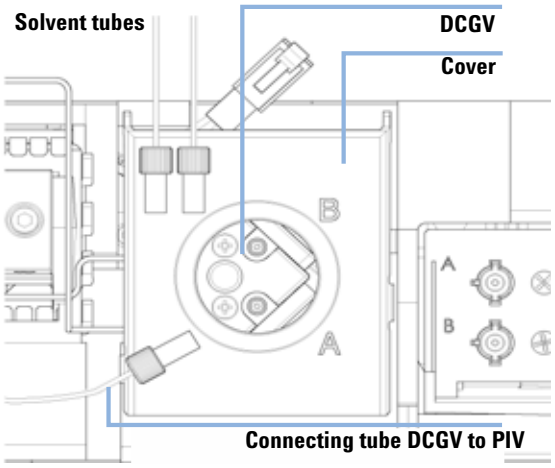
#	Part number	Description
1	G4280-60004	Dual-channel gradient valve

Preparations Switch the pump off at the power switch.

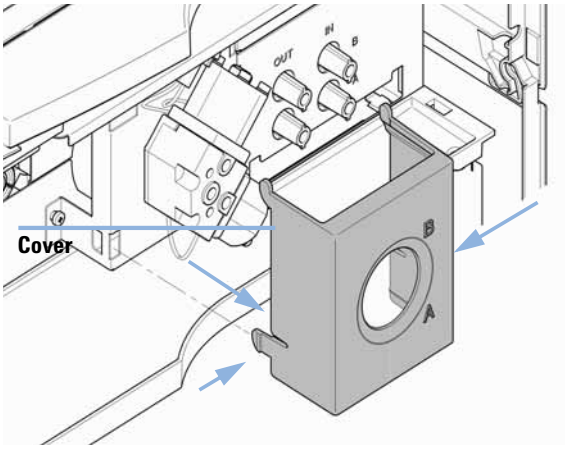
Remove the upper front cover to have access to the pump mechanics.

NOTE The lifetime of the dual-channel gradient valve can be maintained by regularly flushing the valve, especially when using buffer solutions. If using buffer solutions, flush all channels of the valve with water to prevent precipitation of the buffer. Salt crystals can be forced into an unused channel and form plugs that may lead to leaks of that channel. Such leaks will interfere with the general performance of the valve. When using buffer solutions and organic solvents in the Agilent 1120 Compact LC Pump it is recommended to connect the buffer solution to the bottom port and the organic solvent to the upper gradient valve port. It is best to have the organic channel directly above the salt solution channel (A - salt solution, B - organic solvent).

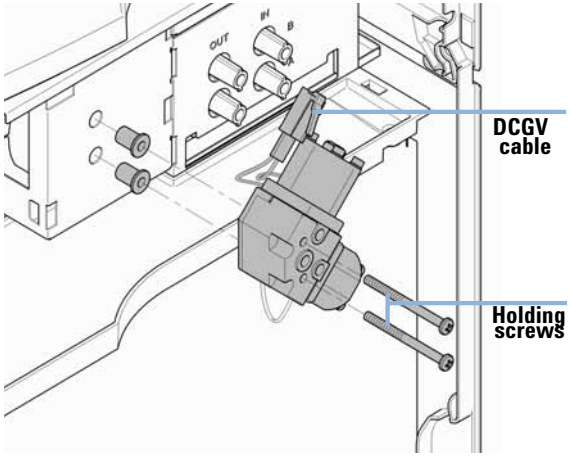
1 Disconnect the connecting tube, waste tube and the solvent tubes from the DCGV, unclip them from the tube clips and place them into the solvent cabinet to avoid flow by hydrostatic pressure.



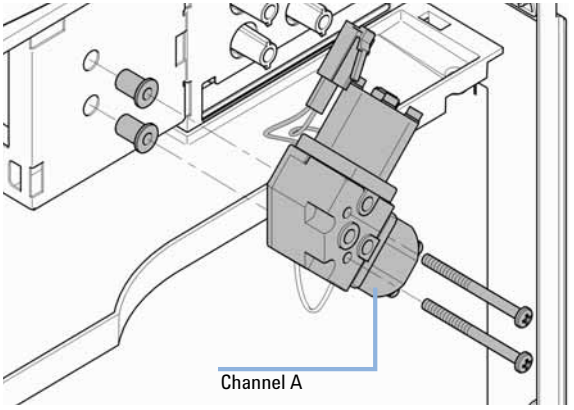
2 Press the lower sides of the cover to unclip it. Remove the cover.



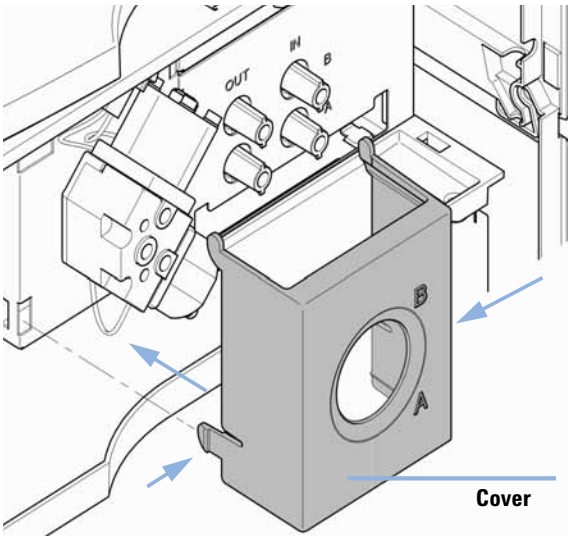
3 Disconnect the DCGV cable, unscrew the two holding screws and remove the valve.



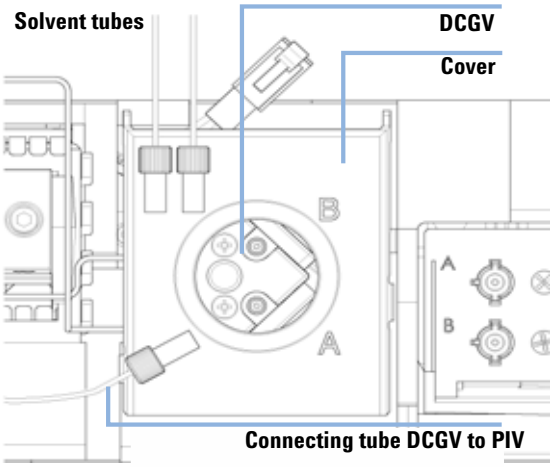
4 Place the new DCGV into position. Make sure that the valve is positioned with the A-channel at the bottom-right position. Tighten the two holding screws and connect the cable to its connector.



5 Replace the DCGV cover. Reconnect the waste funnel with the waste tube holder in the top cover. Insert waste tube in the holder in the waste pan and clip tube to the DCGV cover.



6 Reconnect the tube from the inlet valve to the middle position of the DCGV and then the solvent tubes at channel A and B of the DCGV.



Manual Injector

Overview of Maintenance

Table 28 Overview of Repair Procedures

Procedure	Typical Frequency	Time Required
Flushing the injector	After using aqueous buffers or salt solutions	5 minutes
Exchanging the stator face	When visibly scratched, or when the valve performance shows indication of leakage or wear	10 minutes
Exchanging the injection-valve seal	After approximately 10000 to 20000 injections, or when the valve performance shows indication of leakage or wear	10 minutes

Flushing the manual injector

CAUTION

The use of aqueous buffers or salt solutions can lead to crystal formation.

Crystal formation may cause scratches on the injection seal.

➔ Always rinse the valve with water after using aqueous buffers or salt solutions.

1 Switch the valve to the INJECT position.

2 Use the pump to flush the sample loop and seal grooves.

3 Use the needle-port cleaner (supplied with the valve) and syringe to flush the needle port and vent capillary.

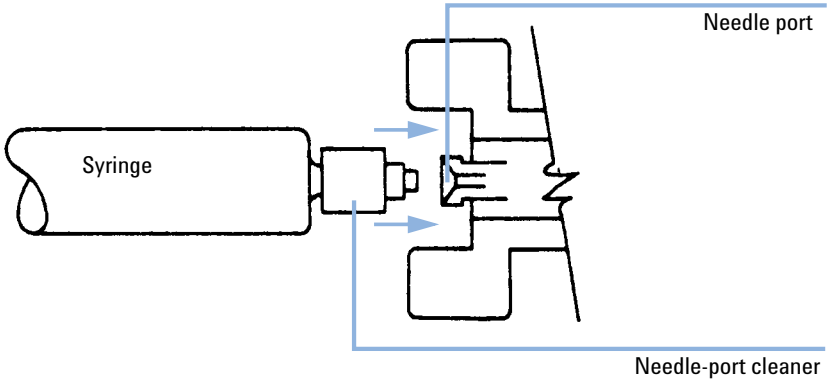


Figure 31 Needle-port cleaner

Injection-Valve Seal

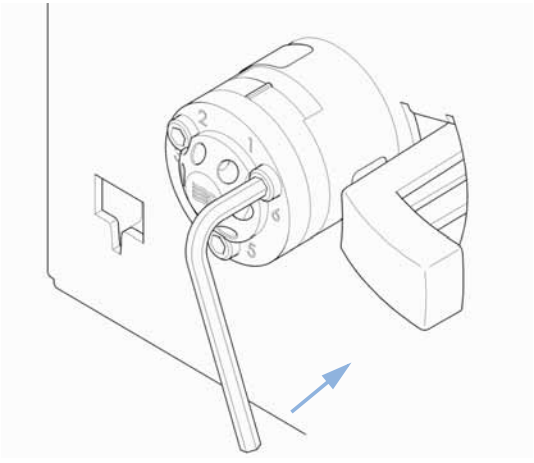
When Poor injection-volume reproducibility
Leaking injection valve

Tools required Hex key, 9/64 inch **8710-2394**

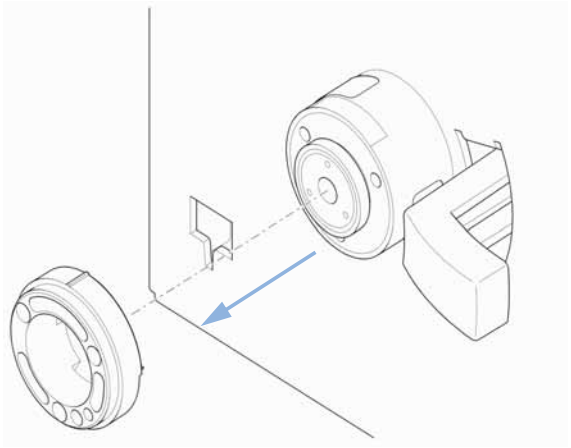
Parts required

#	Part number	Description
1	5067-4105 (Vespel™)	Rotor seal

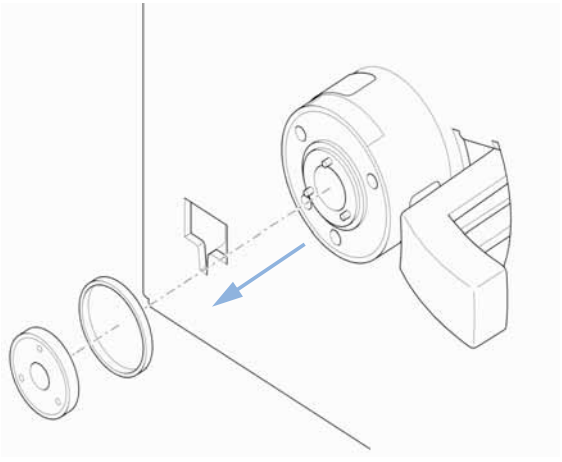
1 Loosen the three stator screws. Remove the stator head.



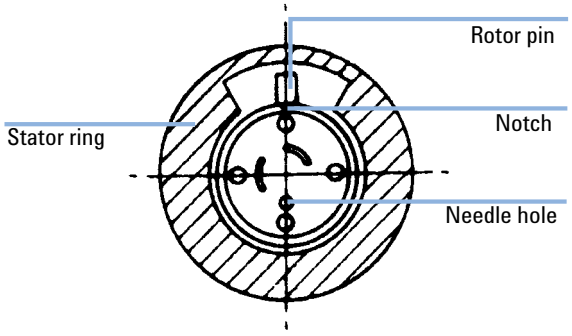
2 Remove the stator ring.



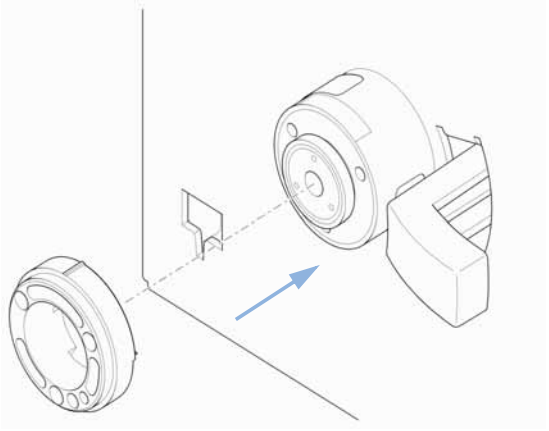
3 Remove the seal.



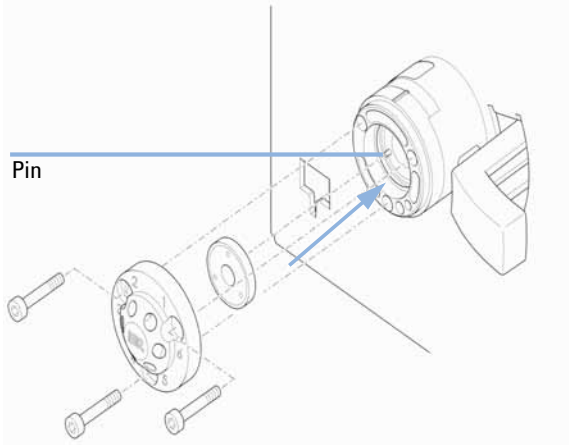
4 Install the new seal.



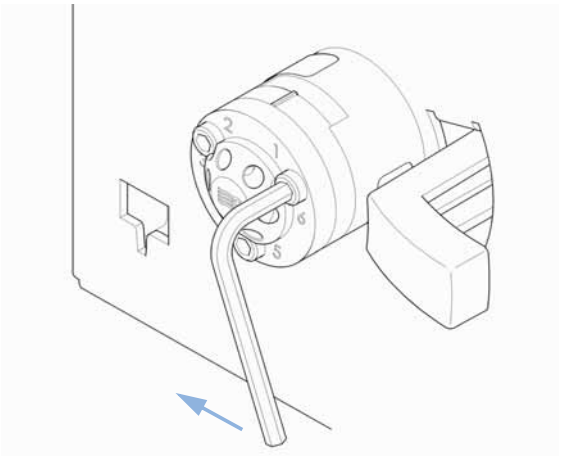
5 Install the stator ring. Ensure the pin in the stator ring is aligned with the hole in the valve body.



6 Install the stator head onto the valve. Ensure the pin in the stator ring is aligned with the hole in the stator head.



7 Secure stator head in place with the stator screws. Tighten each screw alternately ¼-turn until the stator head is secure.



Autosampler

Introduction into Maintenance and Repair

The autosampler is designed for easy repair. The most frequent repairs such as change and needle assembly change can be done from the front of the instrument with the instrument in place in the Compact LC. These repairs are described in following chapters.

Overwiew of procedures

Procedure	Typical Frequency	Time Required
Exchanging the needle assembly	When needle shows indication of damage or blockage	15 minutes
Exchanging the seat assembly	When the seat shows indication of damage or blockage	10 minutes
Exchanging the rotor seal	After approximately 30000 to 40000 injections, or when the valve performance shows indication of leakage or wear	30 minutes
Exchanging the metering seal	When autosampler reproducibility indicates seal wear	30 minutes
Exchanging the gripper arm	When the gripper arm is defective	10 minutes

WARNING

The power supplies still use some power, even if the power switch on the front panel is turned off.

Repair work at the autosampler can lead to personal injuries, e.g. shock hazard, when the autosampler cover is opened and the instrument is connected to power.

➔ Make sure that it is always possible to access the power plug.

➔ Remove the power cable from the instrument before opening the cover.

➔ Do not connect the power cable to the Instrument while the covers are removed.

Exchanging internal parts

Some repairs may require exchange of defective internal parts. Exchange of these parts requires removing the autosampler unit out of the Compact LC, these repairs have to be done by trained service personal only.

Safety flap, flex board

It is strongly recommended that the exchange of the safety flap, and flex board is done by Agilent-trained service personnel.

Transport assembly parts

The adjustment of the motors, and the tension on the drive belts are important for correct operation of the transport assembly. It is strongly recommended that exchange of drive belts, and the gripper assembly is done by Agilent-trained service personnel. There are no other field-replaceable parts in the transport assembly. If any other component is defective (flex board, spindles, plastic parts) the complete unit must be exchanged.

Cleaning the autosampler

WARNING

Electrical shock hazard

Liquid dripping into the autosampler could cause shock hazard and damage to the autosampler.

➔ Drain all solvent lines before opening any fittings.

The autosampler covers should be kept clean. Clean with a soft cloth slightly dampened with water or a solution of water and a mild detergent. Do not use an excessively damp cloth that liquid can drip into the autosampler.

Maintenance Functions

Certain maintenance procedures require the needle arm, metering device, and gripper assembly to be moved to specific positions to enable easy access to components. The maintenance functions move these assemblies into the appropriate maintenance position.

Exchanging the Needle Assembly

When

When the needle is visibly damaged

When the needle is blocked

Tools required

¼ inch wrench (supplied in accessory kit)

2.5 mm Hex key **8710-2412**

A pair of pliers

Parts required

#	Part number	Description
1	G1314-60200	Cuvette Holder
1		Cuvette with the “standard”, e.g. NIST certified holmium oxide sample
1	G1313-87201	Needle

Preparations

Select “Start” in the Tools function in the LMD Software “Change Needle” .

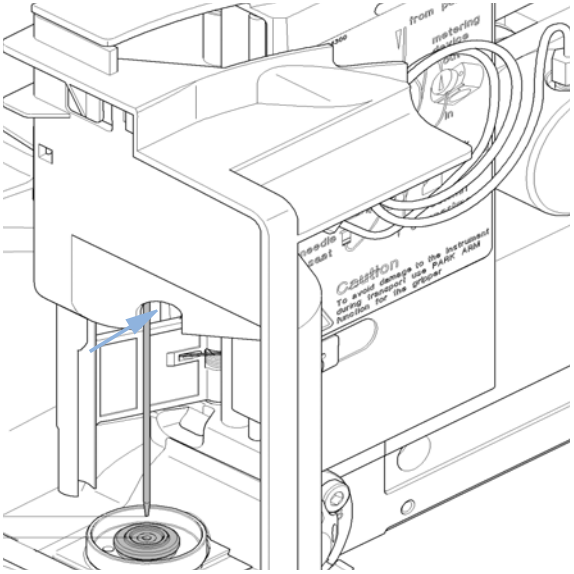
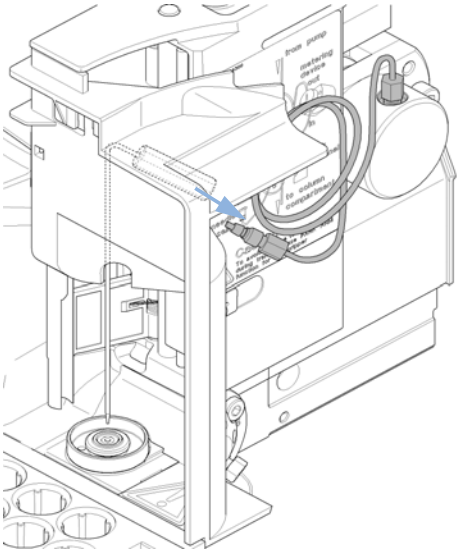
When the needle is positioned approx.15 mm above the needle seat, remove the upper front cover.

WARNING

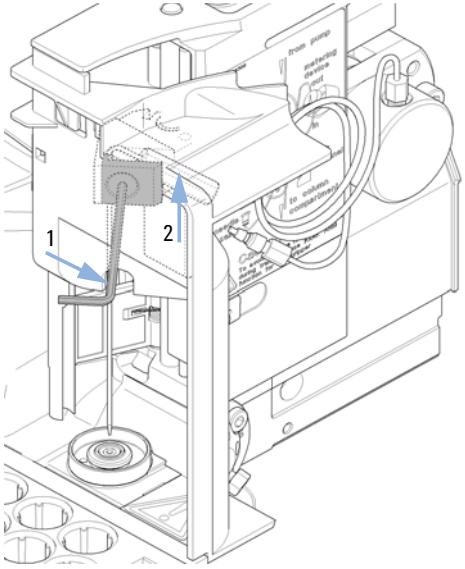
Personal injury

To avoid personal injury, keep fingers away from the needle area during autosampler operation.

➔ Do not bend the safety flap away from its position, or attempt to insert or remove a vial from the gripper when the gripper is positioned below the needle.

1 Select **Needle Down** until the needle screw is aligned with the hole in the safety cover. 	**2** Remove the sample-loop fitting from the needle fitting. 

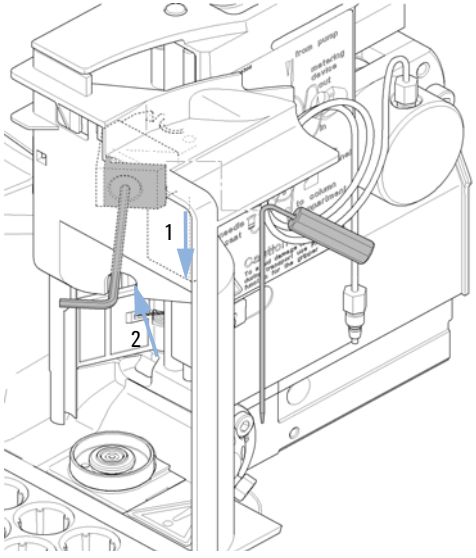
3 Loosen the fixing screw (1), and lift out the needle (2).



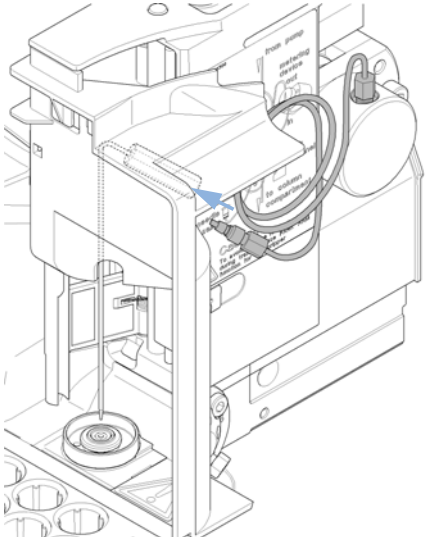
4 Select **Needle Down** to move the needle arm to its lowest position.

- The needle arm must be in its lowest position before installing the new needle, otherwise leaks at the needle seat will occur due to incorrect needle installation.

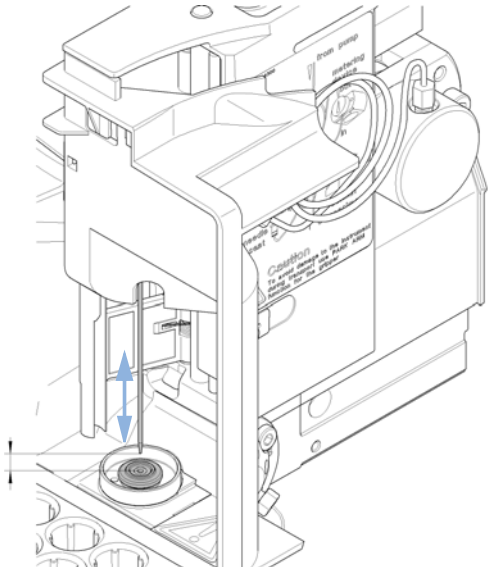
5 Insert the new needle (1). Align the needle in the seat, then tighten the screw firmly (2).



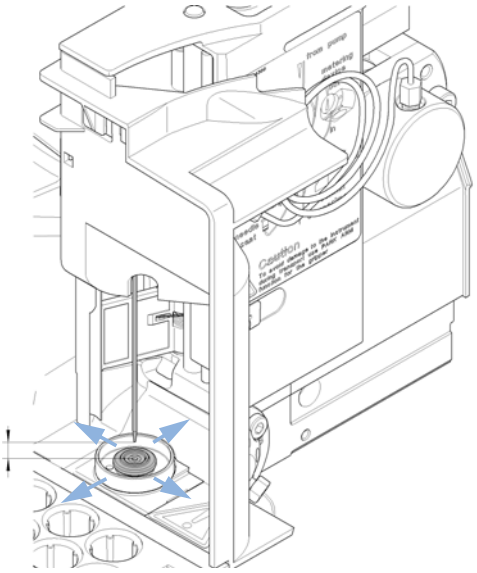
6 Reconnect the sample-loop fitting to the needle fitting.



7 Use **Needle Up** to lift the needle to a position approximately 2mm above the seat.



8 Ensure the needle is aligned with the seat.



Next Steps:

9 On completion of this procedure: Install the front cover.

10 Select “**End**” in the Tools function “**Change Needle**” .

Needle-Seat Assembly

When
When the seat is visibly damaged
When the seat capillary is blocked

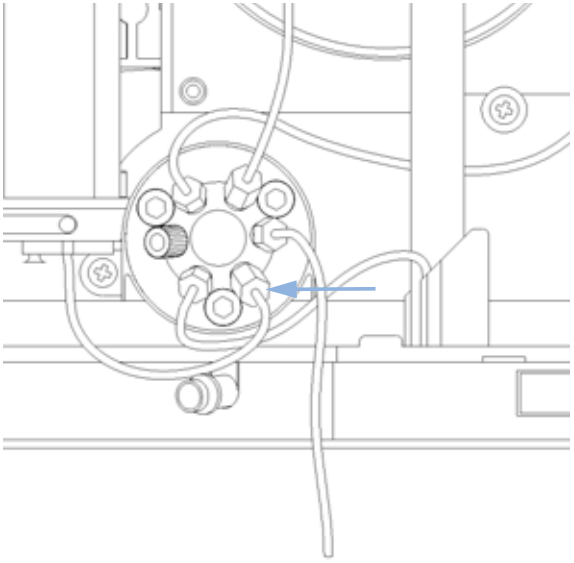
Tools required
1/4 inch wrench (supplied in accessory kit).
Flat-head screwdriver.

Parts required

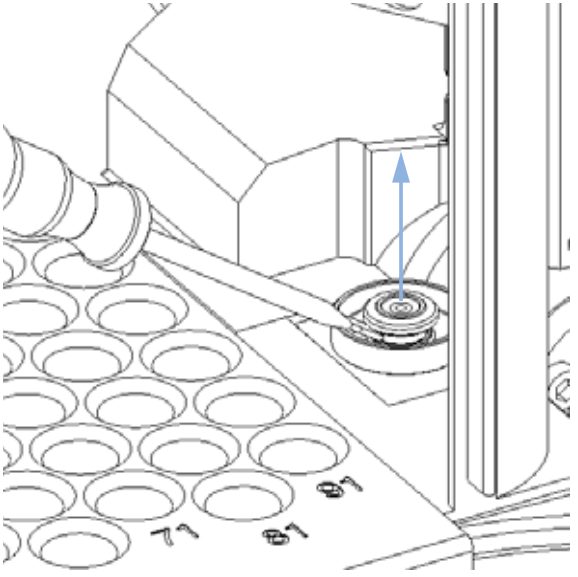
#	Part number	Description
1	G1313-87101	Needle-seat assy (0.17 mm i.d 2.3 µl)

Preparations
Select "Start" in the Tools function in LMD Software "Change Needle"
Remove the upper front cover.
Use the “Needle Up” command in the “Change Needle” function to lift the needle an addition 1 cm.

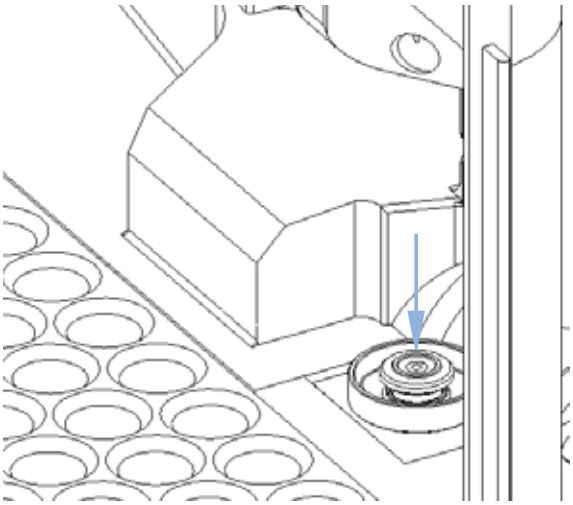
1 Disconnect the seat-capillary fitting from the injection valve (port 5).



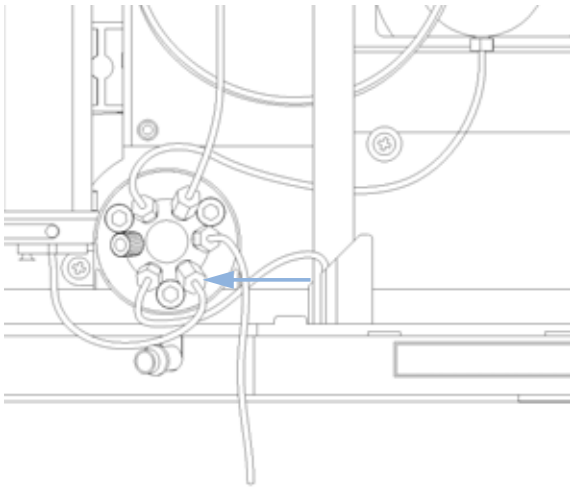
2 Use a small flat-head screwdriver to ease out the needle seat.



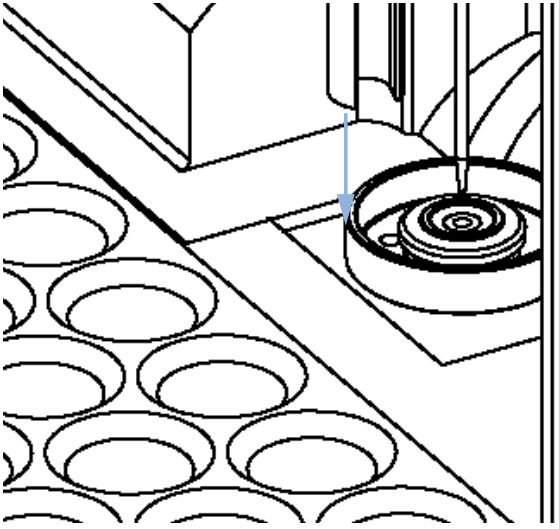
3 Insert the new needle-seat assembly. Press the seat firmly into position.



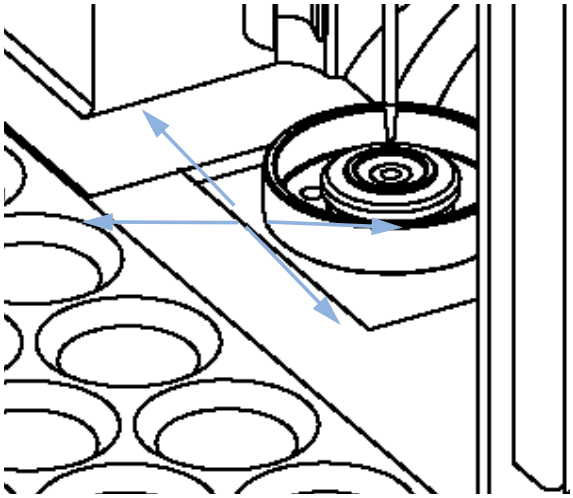
4 Connect the seat-capillary fitting to port 5 of the injection valve.



5 Use “**Down**” to position the needle approximately 2 mm above the seat



6 Ensure the needle is aligned with the seat. If required, bend the needle slightly until the needle is aligned correctly.



Next Steps:

7 On completion of this procedure: Install the front cover.

8 Select "**End**" in the Tools function "**Change Needle**".

Stator Face

When Poor injection-volume reproducibility
Leaking injection valve

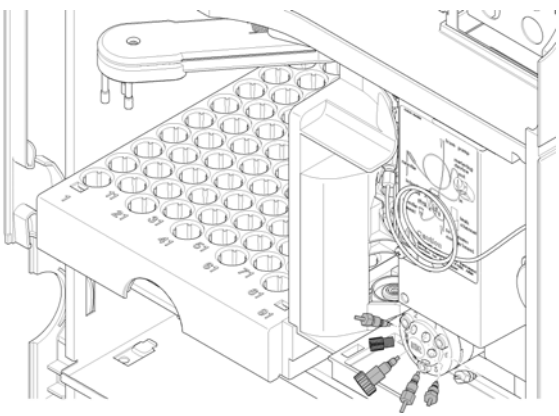
Tools required 1/4 inch wrench (supplied in accessory kit)
Hex key, 9/64 inch (supplied in accessory kit)

Parts required

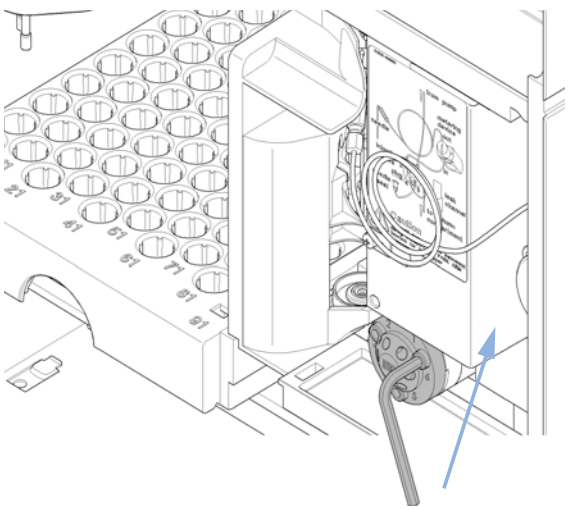
#	Part number	Description
1	0100-1851	Stator face for injection valve

Preparations Remove the upper front cover.

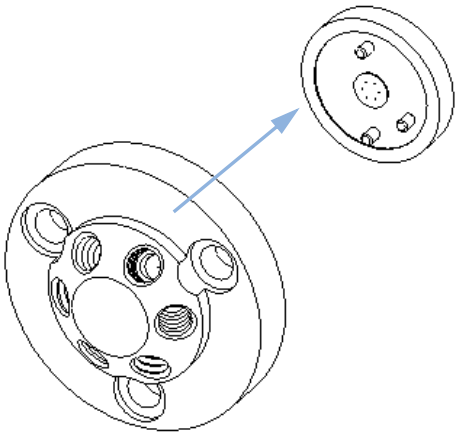
1 Remove all capillary fittings from the injection valve ports.



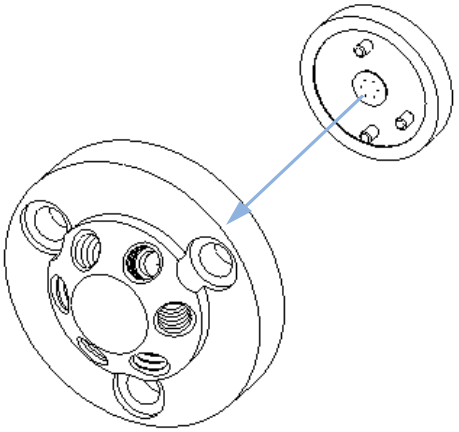
2 Loosen each fixing bolt two turns at a time. Remove the bolts from the head.



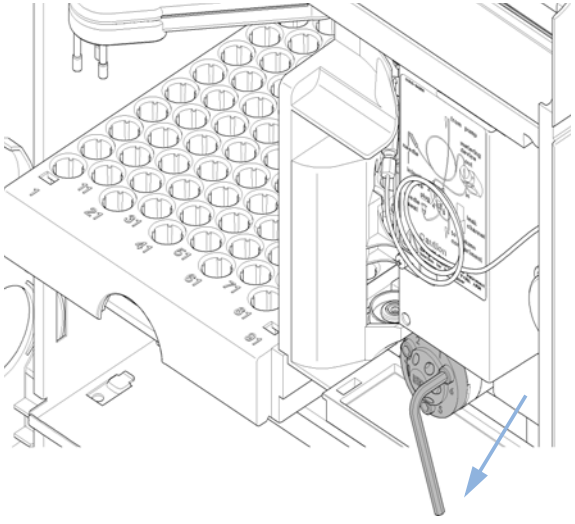
3 Remove the stator head and stator face. The stator face is held in place by the stator head. When removing the stator head, ensure the stator face does not fall out of the valve.



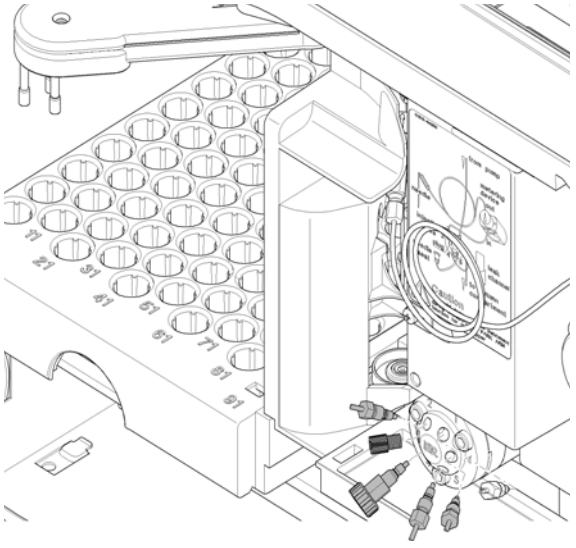
4 Place the stator face in place on the stator head. Ensure the pins on the stator engage in the holes in the stator head.



5 Install stator head and stator face. Tighten the bolts alternately two turns at a time until the stator head is secure.



6 Reconnect the pump capillaries to the valve ports.



Next Steps:

7 Slide the waste tube into the waste holder in the leak tray.

8 On completion of this procedure: Install the front cover.

Exchanging the Rotor Seal

When

Poor injection-volume reproducibility

Leaking injection valve

Tools required

- 1/4 inch wrench (supplied in accessory kit).
- Hex key, 9/64 inch (supplied in accessory kit).

Parts required

#	Part number	Description
1	0100-1853	Rotor seal (Vespel)
1	0100-1849	Rotor seal (Tefzel)
1	0101-1416	Rotor seal (PEEK)

Preparations

- Remove upper front cover.
- Remove the leak tubing (if necessary).

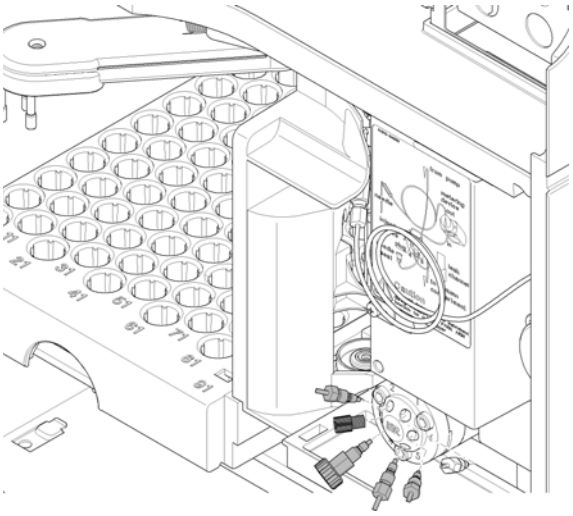
CAUTION

Removing the stator head

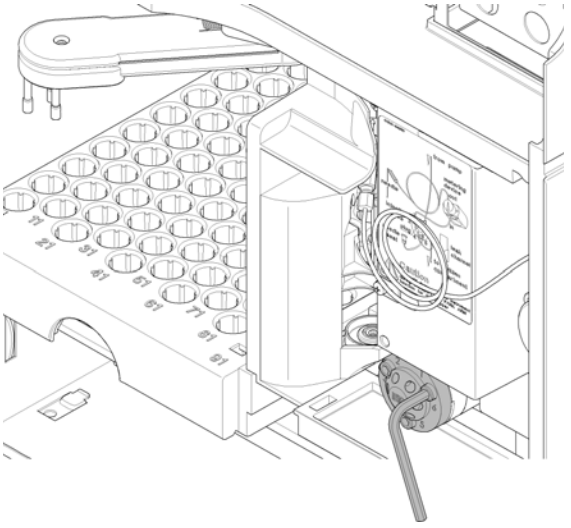
The stator face is held in place by the stator head. When you remove the stator head, the stator face can fall out of the valve.

→ Carefully handle the valve to prevent damage to the stator face

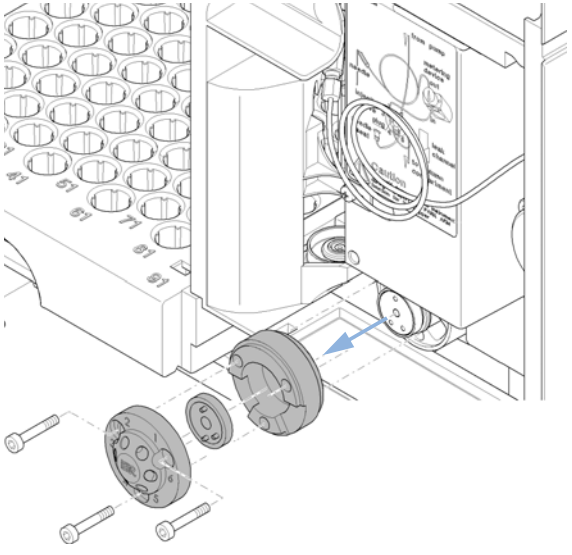
1 Remove all capillary fittings from the injection-valve ports.



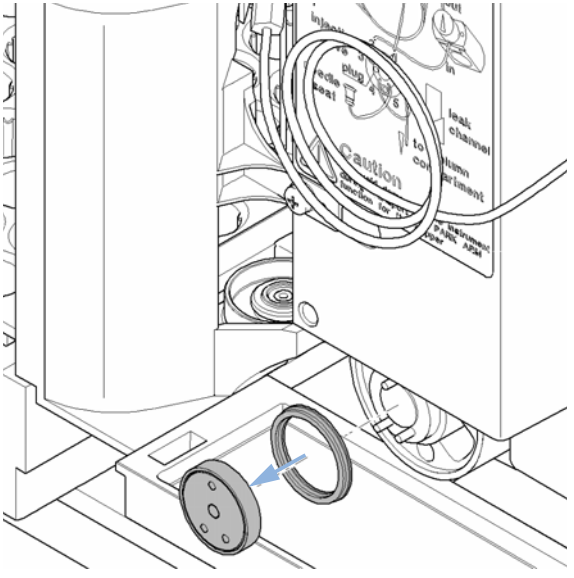
2 Loosen each fixing bolt two turns at a time. Remove the bolts from the head.



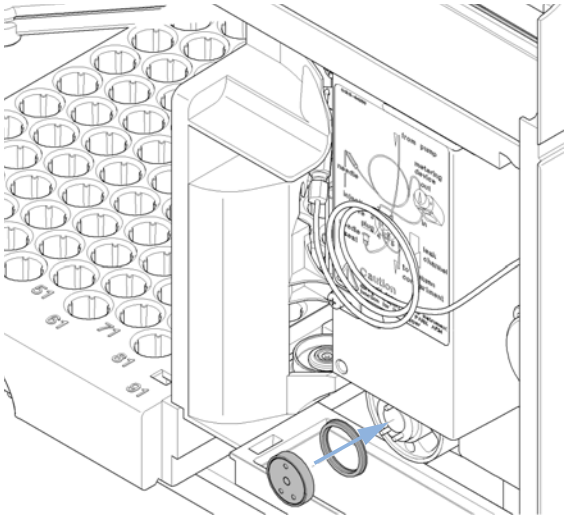
3 Remove the stator head, stator face and stator ring.



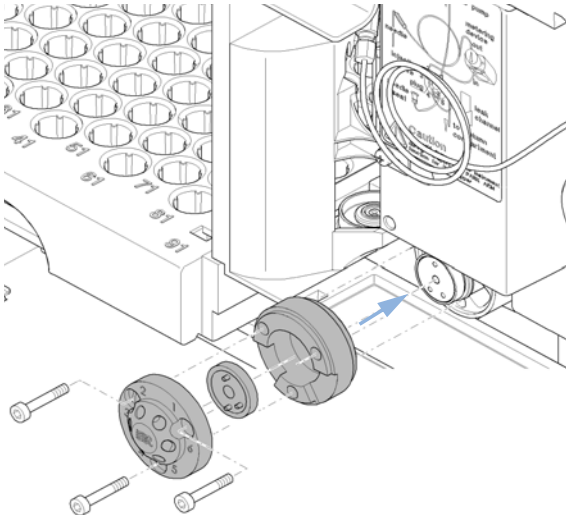
4 Remove the rotor seal and isolation seal.



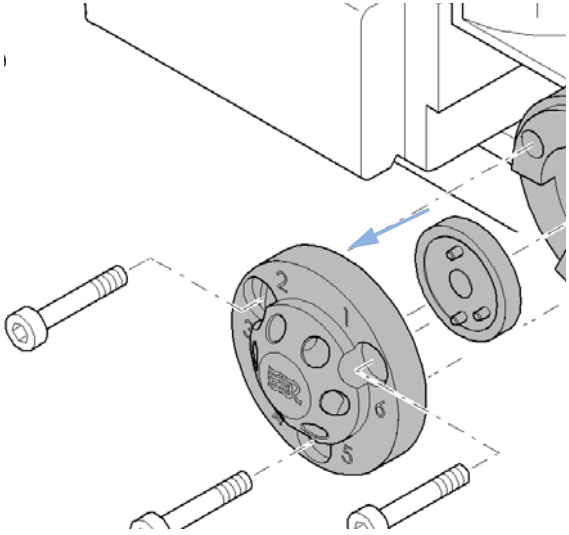
5 Install the new rotor seal and isolation seal. Ensure the metal spring inside the isolation seal faces towards the valve body.



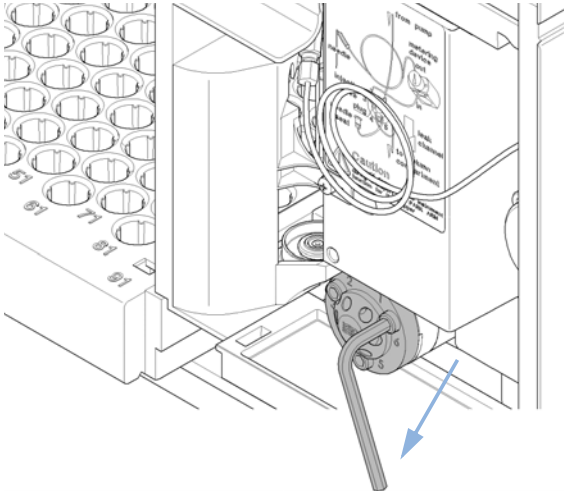
6 Install the stator ring with the short of the two pins facing towards you at the 12 O'Clock position. Ensure the ring sits flat on the valve body.



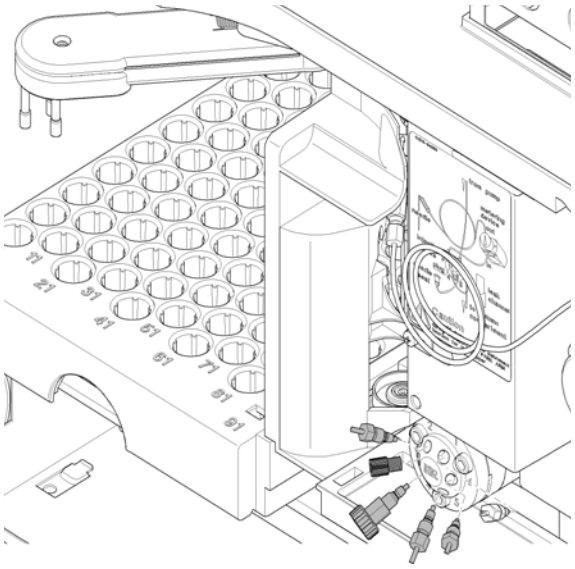
7 Place the stator face in place on the stator head.



8 Install stator head and stator face. Tighten the bolts alternately two turns at a time until the stator head is secure.



9 Reconnect the pump capillaries to the valve ports.



Next Steps:

10 Slide the waste tube into the waste holder in the leak tray.

11 On completion of this procedure: Install the front cover.

Metering Seal and Plunger

When Poor injection-volume reproducibility
Leaking metering device

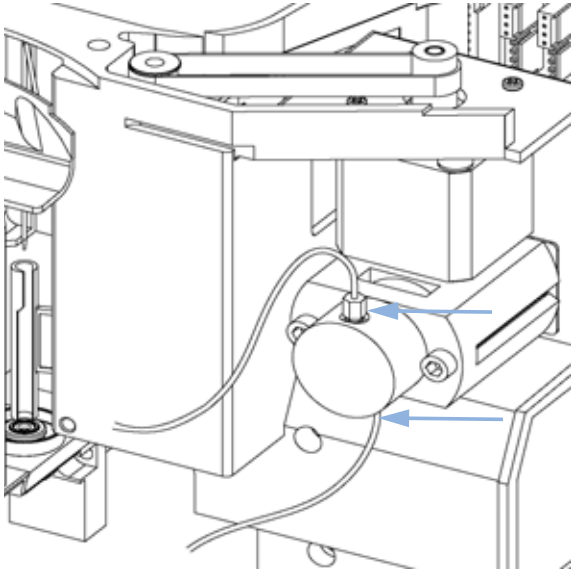
Tools required 1/4 inch wrench (supplied in accessory kit).
4 mm hex key (supplied in accessory kit).
3 mm hex key (supplied in accessory kit).

Parts required

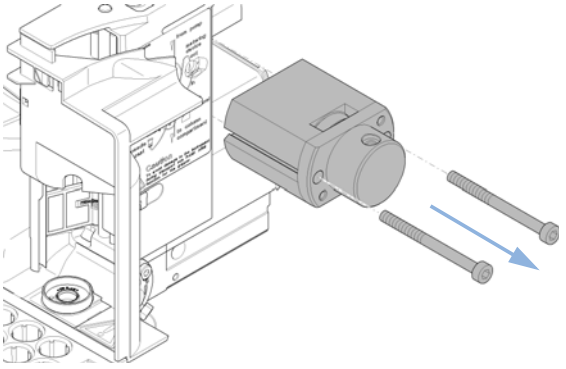
#	Part number	Description
1	5063-6589	Metering seal (pack of 2) for 100 µl analytical head
1	5063-6586	Metering plunger for 100 µl analytical head

Preparations Select **Start** in the Tools function in the LMD Software *Change piston*.
Remove the upper front cover.

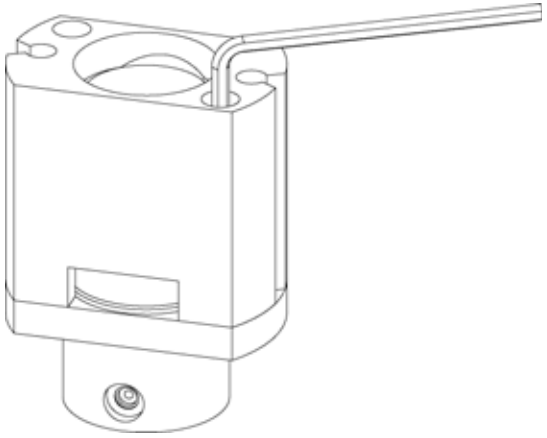
1 Remove the two capillaries from the metering-head assembly.



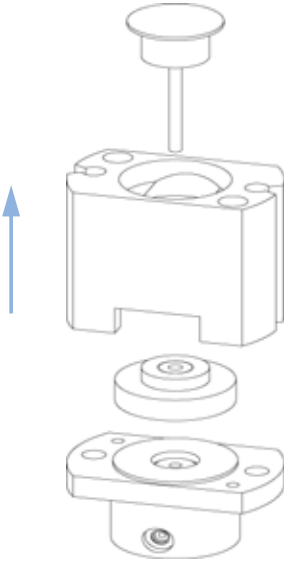
2 Remove the two fixing bolts, and pull the head assembly away from the sampler. Notice that the closed side of the metering head faces upwards.



3 Remove the two fixing bolts from the base of the metering head assembly.

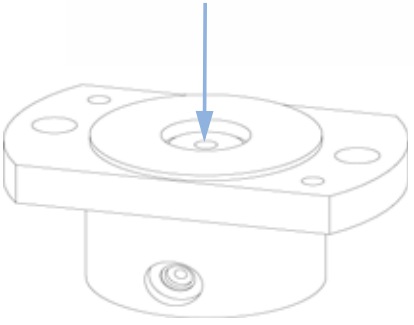


4 Disassemble the metering head assembly.

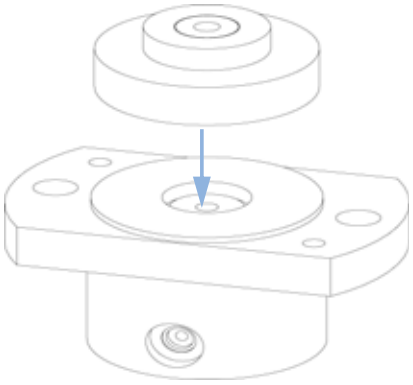


5 Use a small screwdriver to carefully remove the seal. Clean the chamber with lint-free cloth. Ensure all particular matter is removed.

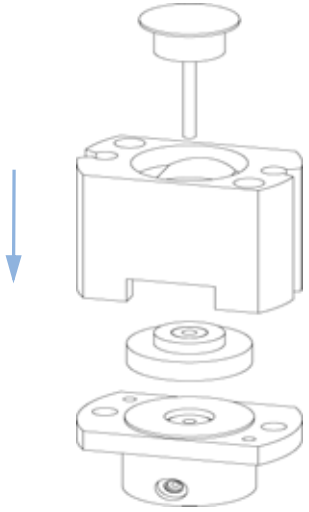
6 Install the new seal. Press the seal firmly into position.



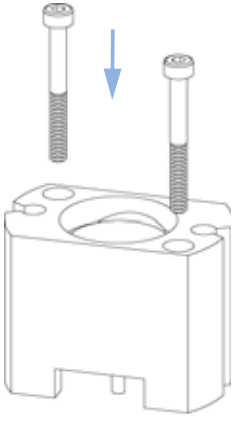
7 Place the piston guide on top of the seal.



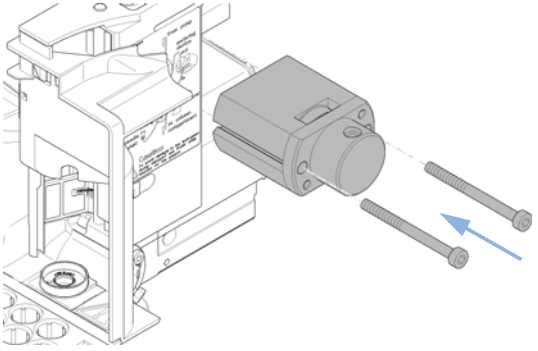
8 Reassemble the metering head assembly. Carefully insert the plunger into the base. The closed side of the metering head must be on the same side as the lower one of the two capillary drillings.



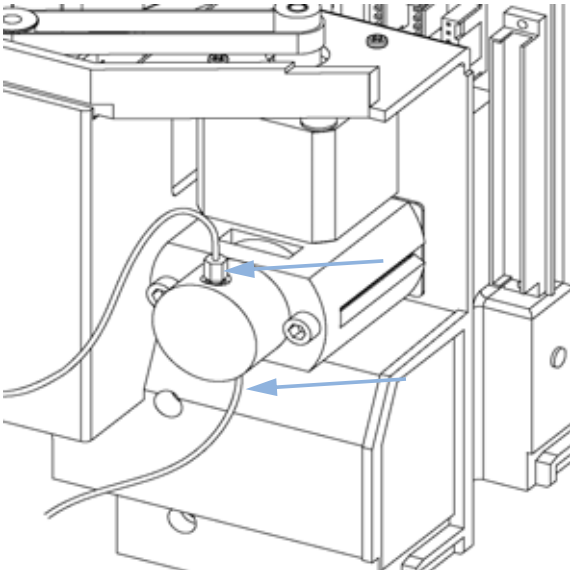
9 Install the fixing bolts. Tighten the bolts securely.



10 Install the metering head assembly in the autosampler. Ensure the large hole in the metering head is facing downwards.



11 Reinstall the capillaries.



Next Steps:

12 On completion of this procedure: Install the front cover.

13 Select “**End**” in the Tools function in the LMD Software “**Change piston**” .

Gripper Arm

When Defective gripper arm

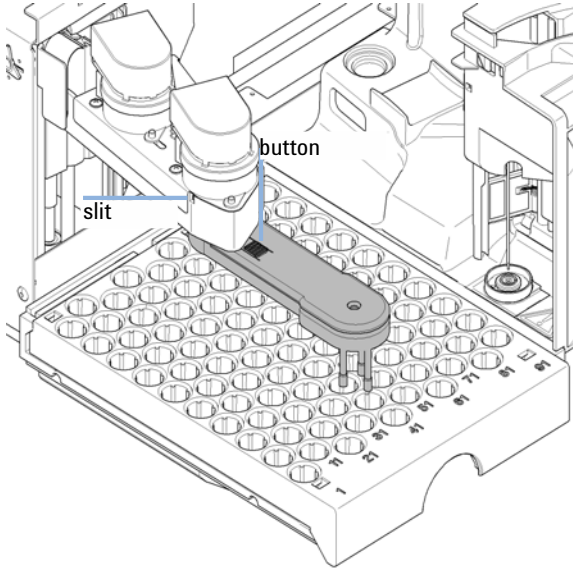
Tools required Straightened paper clip.

Parts required

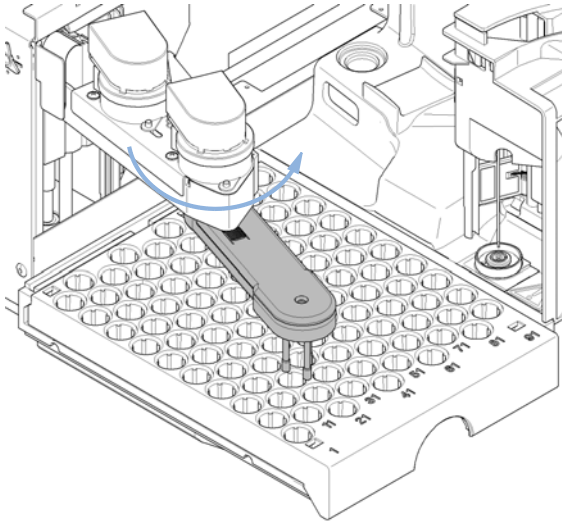
#	Part number	Description
1	G1313-60010	Gripper assembly

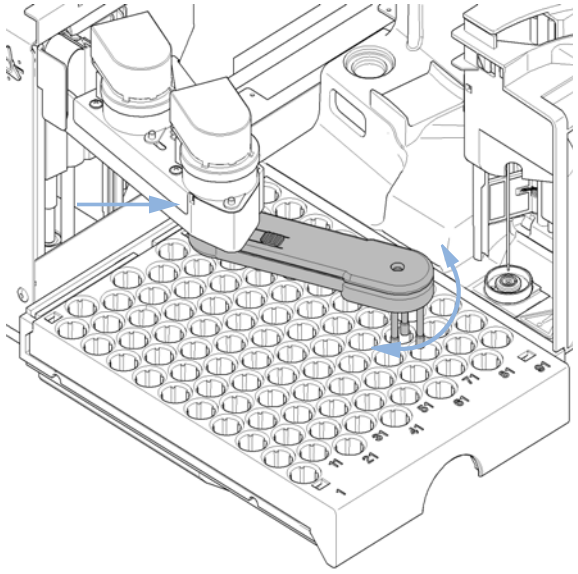
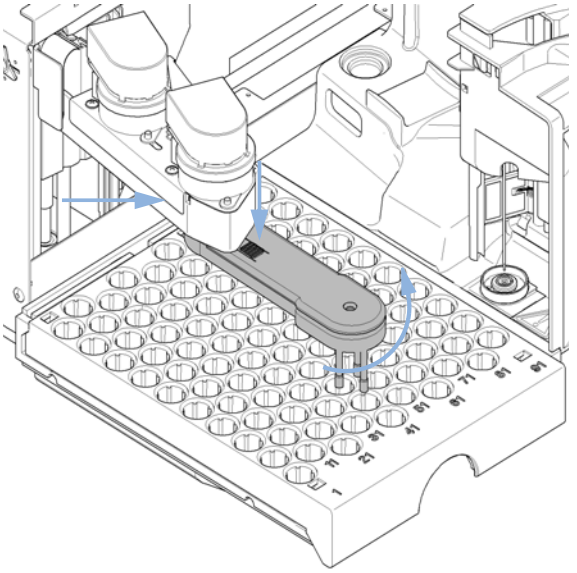
Preparations Select "Start" in the Tools function in the LMD Software "ChangeGripper".
Turn off the power to the Instrument.
Remove the upper front cover.

1 Identify the slit below the gripper motor and the gripper arm release button.

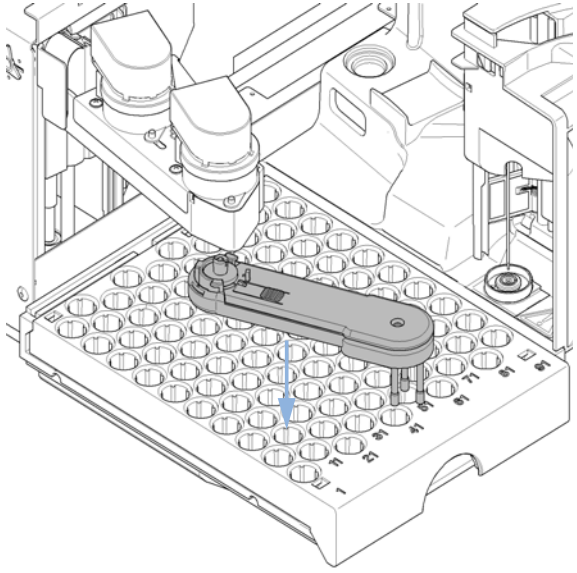


2 Rotate the arm approximately 2.5cm (1 inch) to the left and insert the straightened paper clip into the slit.

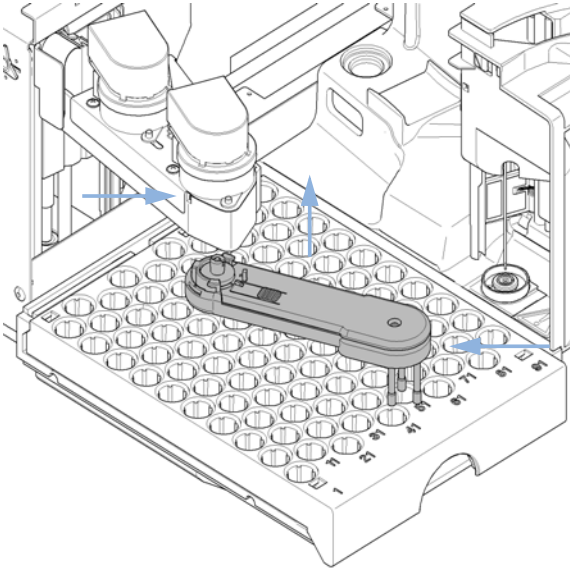


3 Rotate the gripper arm slowly from left to right and apply a gentle pressure to the paper clip. The clip will engage on an internal catch and the rotation of the arm will be blocked. 	**4** Hold the paper clip in place, press the gripper release button and rotate the gripper arm to the right. 

5 The gripper arm will come off.



6 Replace the gripper arm by holding the paper clip in place, pushing the gripper arm into the holder and rotating the gripper arm to the left.



Next Steps:

7 On completion of this procedure: Install the front cover.

8 Turn the power to the Instrument ON.

Detector

Overview of VWD Maintenance

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

Table 29 Simple Repairs

Procedures	Typical Frequency	Notes
Deuterium lamp exchange	If noise and/or drift exceeds your application limits or lamp does not ignite.	A VWD test should be performed after replacement.
Flow cell exchange	If application requires a different flow cell type.	A VWD test should be performed after replacement.
Cleaning flow cell parts cleaning or exchange	If leaking or if intensity drops due to contaminated flow cell windows.	A pressure tightness test should be done after repair.
Leak sensor drying	If leak has occurred.	Check for leaks.
Leak handling system replacement	If broken or corroded.	Check for leaks.

Exchanging a Lamp

When If noise or drift exceeds application limits or lamp does not ignite.

Tools required Screwdriver POZI 1 PT3

Parts required

#	Part number	Description
1	G1314-60100	Deuterium lamp

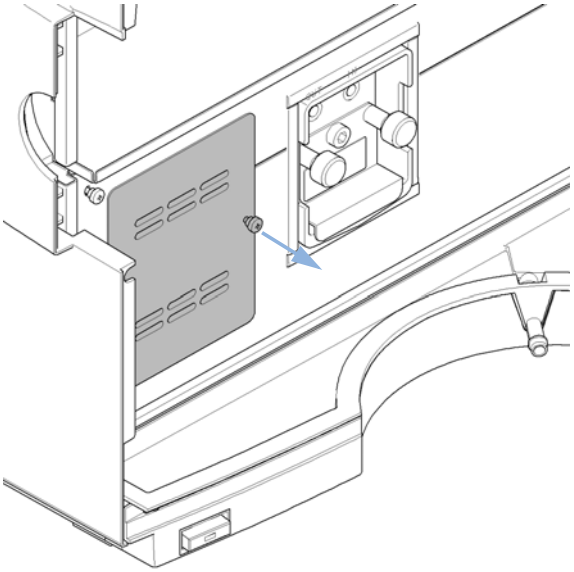
Preparations Turn the lamp OFF.

WARNING

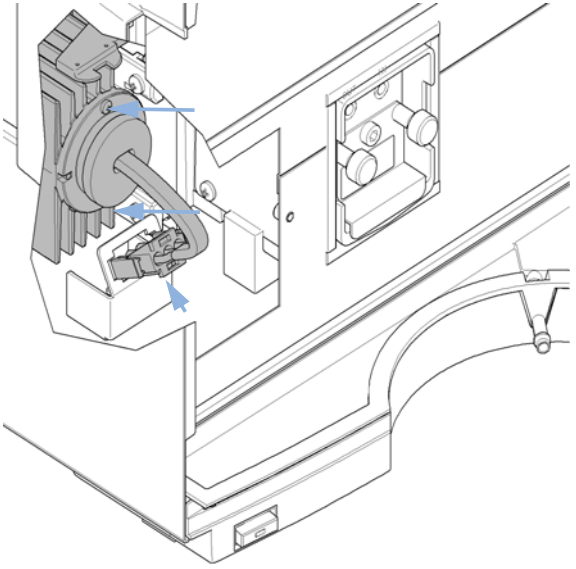
- Injury by touching hot lamp
- If the detector has been in use, the lamp may be hot.
- If so, wait five minutes for lamp to cool down.

1 Press the release buttons and remove the lower front cover to have access to the lamp area.

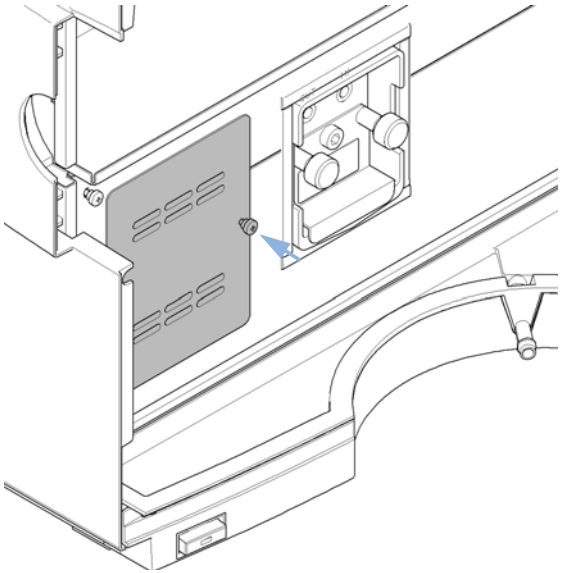
2 Unscrew the lamp cover and remove it.



3 Unscrew, disconnect and replace the lamp. Insert, fix and reconnect the lamp.



4 Replace the lamp cover.



Next Steps:

5 Replace the front cover.

6 Reset the lamp counter as described in the LMD Software documentation.

7 Turn the lamp ON.

8 Give the lamp more than 10 minutes to warm-up.

9 Perform Wavelength Calibration to check the correct positioning of the lamp.

Exchanging a Flow Cell

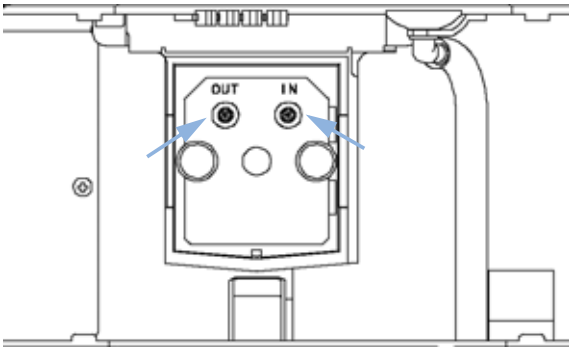
When If application needs a different type of flow cell or the flow cell needs repair.

Tools required Two 1/4 inch wrenches for capillary connections

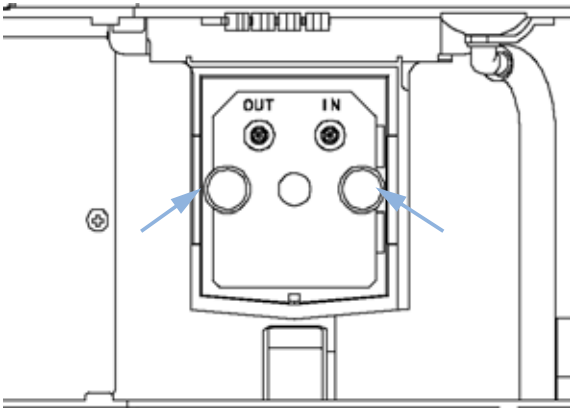
Preparations Turn the lamp OFF.

1 Press the release buttons and remove the lower front cover to have access to the flow cell area.

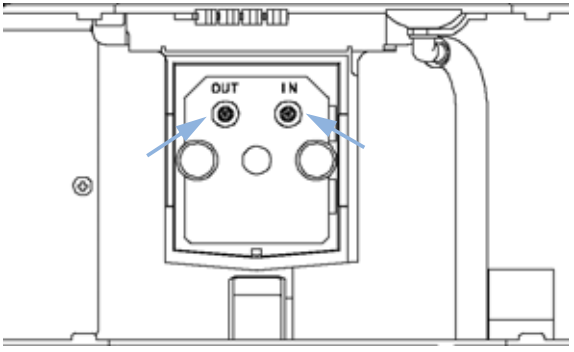
2 Disconnect the inlet and outlet capillaries.



3 Unscrew the thumb screws parallel and remove the flow cell.



4 Replace the flow cell and fix the thumb screws. Reconnect the inlet and outlet capillaries to the flow cell.



Next Steps:

5 Replace the front cover.

6 To check for leaks, establish a flow and observe the flow cell (outside of the cell compartment) and all capillary connections.

7 Insert the flow cell.

8 Check the correct positioning of the flow cell.

9 Replace the front cover.

Using the Cuvette Holder

This cuvette holder can be placed instead of a flow cell in the variable wavelength detector. Standard cuvettes with standards in it, for example, National Institute of Standards & Technology (NIST) holmium oxide solution standard, can be fixed in it.

This can be used for wavelength verifications.

When If your own standard should be used to checkout the instrument.

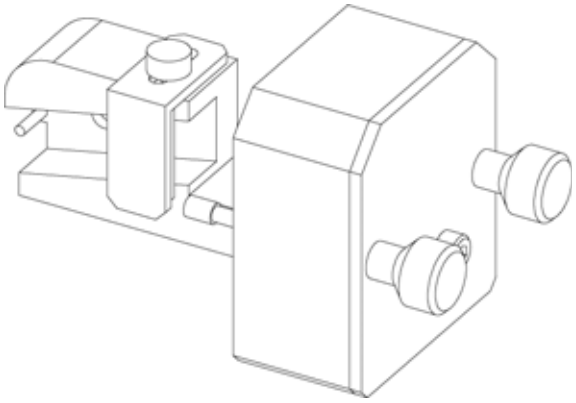
Tools required None

Parts required

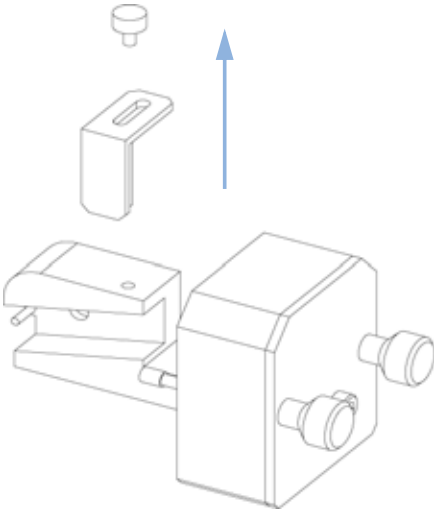
#	Part number	Description
1	G1314-60200	Cuvette Holder
1		Cuvette with the “standard”, e.g. NIST certified holmium oxide sample

Preparations Remove the normal flow cell.
Have cuvette with standard available.

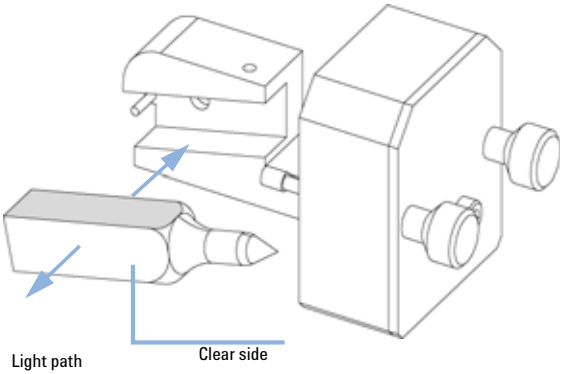
1 Locate the cuvette holder on the desk.



2 Unscrew the bracket.



3 Insert the cuvette with the sample into the holder. The clear side of the cuvette must be visible.

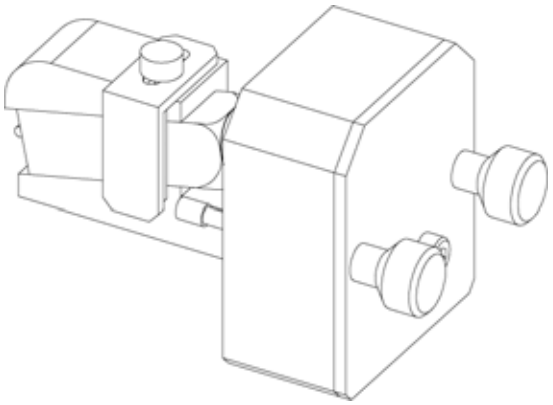


4 Reset the lamp counter as described in the User Interface documentation.

5 Turn the lamp ON.

6 Give the lamp more than 10 minutes to warm-up.

7 Perform Wavelength Verification/Calibration to check the correct positioning of the lamp.

8 Replace the bracket and fix the cuvette. 	**Next Steps:** **9** Install the cuvette holder in the instrument. **10** Perform your verification.

Correcting Leaks

When If a leakage has occurred in the flow cell area or at the capillary connections.

Tools required Tissue

Two 1/4 inch wrenches for capillary connections

Parts required

Description
None

1 Remove the lower front cover.

2 Use tissue to dry the leak sensor area.

3 Observe the capillary connections and the flow cell area for leaks and correct, if required.

4 Replace the front cover.

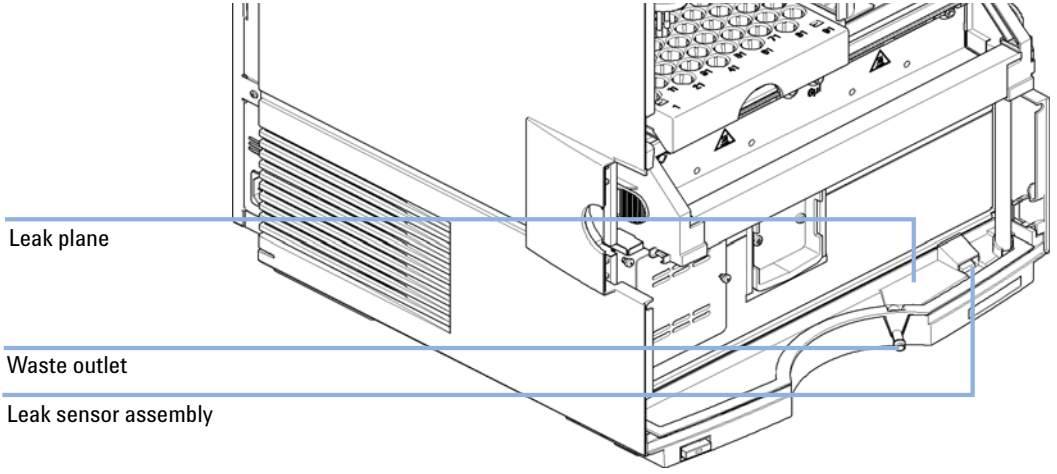


Figure 32 Drying the Leak Sensor

Tests & Calibrations

The following tests are required after maintenance of lamps and flow cells:

- Intensity Test.
- Wavelength Verification/Calibration.
- Holmium Oxide Test.

Intensity Test

The intensity test measures the intensity of the deuterium lamp over the full VWD wavelength range (190 – 600 nm). The test can be used to determine the performance of the lamp, and to check for dirty or contaminated flow cell windows. When the test is started, the gain is set to zero. To eliminate effects due to absorbing solvents, the test should be done with water in the flow cell. The shape of the intensity spectrum is primarily dependent on the lamp, grating, and diode characteristics. Therefore, intensity spectra will differ slightly between instruments. Picture shows a typical intensity test spectrum.

Intensity Test Evaluation

The Agilent LMD Software evaluates three values automatically and displays the limits for each value, the average, the minimum and the maximum of all data points and *passed* or *failed* for each value.

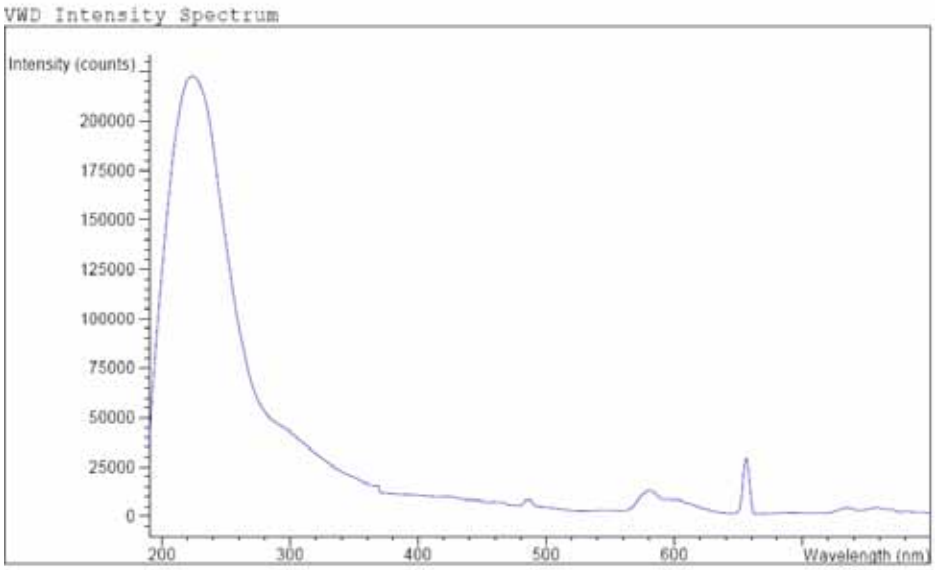
Test Failed

Probable Causes

- Absorbing solvent in flow cell.
- Dirty or contaminated flow cell.
- Dirty or contaminated optical components (source lens, mirrors, grating).
- Old or non-Agilent lamp.

Suggested Actions

- ✔ Ensure the flow cell is filled with water.
- ✔ Repeat the test with the flow cell removed. If the test passes, exchange the flow cell windows.
- ✔ Clean/replace optical components.
- ✔ Exchange the lamp.



VWD Intensity Test Results

	Specification	Measured	Result
Accumulated lamp on time		94.35 h	
Highest intensity	> 320000 cts	7123680 cts	Passed
Average intensity	> 160000 cts	951488 cts	Passed
Lowest intensity	> 6400 cts	36384 cts	Passed

Wavelength Verification/Calibration

Wavelength calibration of the detector is done using the zero-order position and 656 nm (alpha-emission line) and beta-emission line at 486 nm emission-line positions of the deuterium lamp. The calibration procedure involves three steps. First the grating is calibrated on the zero-order position. The stepper-motor step position where the zero-order maximum is detected is stored in the detector. Next, the grating is calibrated against the deuterium emission-line at 656 nm, and the motor position at which the maximum occurs is stored in the detector. Finally, the grating is clabrated against the deuterium emission-line at 486 nm, and the motor position at which the maximum occurs is stored in the detector.

NOTE The wavelength verification/calibration takes about 2.5 minutes and is disabled within the first 10 minutes after ignition of the lamp because initial drift may distort the measurement.

When the lamp is turned ON, the 656 nm emission line position of the deuterium lamp is checked automatically.

Holmium Oxide Test

This test verifies the calibration of the detector against the three wavelength maxima of the built-in holmium oxide filter. The test displays the difference between the expected and measured maxima. Picture shows a holmium test spectrum.

The test uses the following holmium maxima:

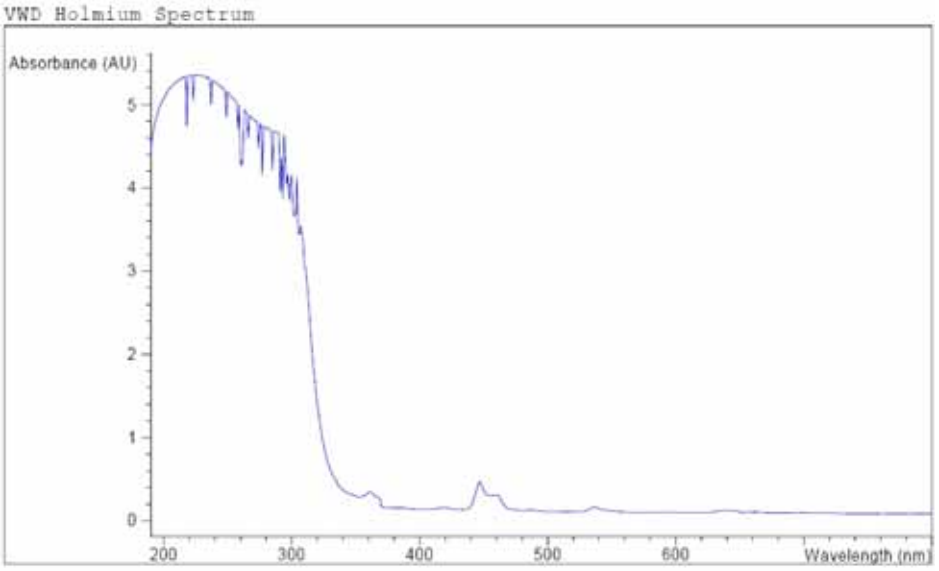
- 360.8 nm
- 418.5 nm
- 536.4 nm

When to do the Test

- after recalibration,
- as part of the Operational Qualification/Performance Verification procedure, or
- after flow cell maintenance or repair.

Interpreting the Results

The test is passed successfully when all three wavelengths are within ± 1 nm of the expected value. This indicates the detector is calibrated correctly.



VWD Holmium Test Results

	Specification	Measured	Result
Deviation from wavelength 1: 360.8 nm	-1..1 nm	0.0 nm	Passed
Deviation from wavelength 2: 418.5 nm	-1..1 nm	0.1 nm	Passed
Deviation from wavelength 3: 536.4 nm	-1..1 nm	0.0 nm	Passed

Holmium Oxide Test Failed

Probable Causes

- Detector not calibrated.
- Dirty or defective flow cell.
- Dirty or defective holmium oxide filter.
- Optical misalignment.

Suggested Actions

✔ Re-calibrate the detector.

✔ Repeat the test with the flow cell removed. If the test is OK, exchange the flow cell components.

✔ Run the holmium oxide filter test. If the test fails, exchange the filter assembly.

✔ Realign the optical components.

5 Parts for Maintenance and Repair

Parts for Compact LC System 130
Parts for Solvent Delivery System Maintenance 131
- Pump Head Assembly 131
- Outlet Ball Valve Assembly 133
- Purge Valve Assembly 134
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This chapter provides information about Assemblies and Part Numbers.

Parts for Compact LC System

Table 30 System part numbers

Description	Part Number
Power supply	**0950-4997**
Compact LC mainboard	**G4280-65000**
Cabinet kit	**G4280-68703**
Mainboard fuses 3.15AT	**2110-1417**
Netfilter fuses 10AT	**2110-1004**

Parts for Solvent Delivery System Maintenance

Pump Head Assembly

Table 31 Pump Head Assembly

Item	Description	Part Number
	Complete assembly, including items marked with *	**G1311-60004**
1*	Sapphire plunger	**5063-6586**
2*	Plunger housing (including spring)	**G1311-60002**
3*	Support ring	**5001-3739**
4*	Seal (pack of 2) or Seal (pack of 2), for normal phase applications	**5063-6589** **0905-1420**
5*	Pump chamber housing	**G1311-25200**
6	Passive inlet valve	**G4280-60005**
7	Outlet ball valve	**G1311-60012**
8*	Screw lock	**5042-1303**
9	Purge valve assembly	**G4280-60031**
10	Screw M5, 60 mm lg	**0515-2118**

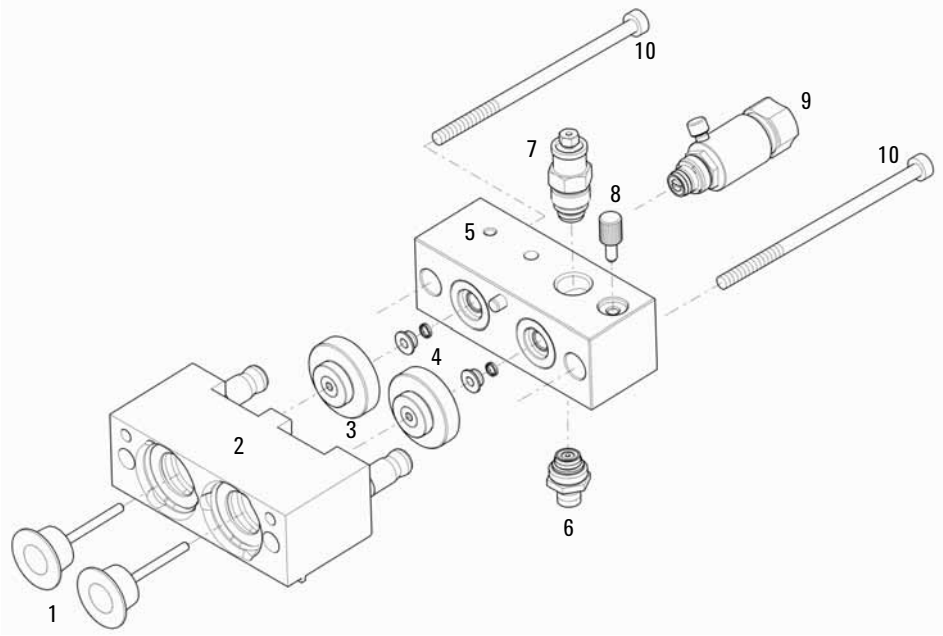

Figure 33 Pump head assembly

Outlet Ball Valve Assembly

Table 32 Outlet Ball Valve Assembly

Item	Description	Part Number
	Outlet ball valve — complete assembly	**G1311-60012**
1	Socket cap	**5042-1345**
2	Outlet valve housing screw	**01018-22410**
3	Gold seal, outlet	**5001-3707**
4	Cap (pack of 4)	**5062-2485**

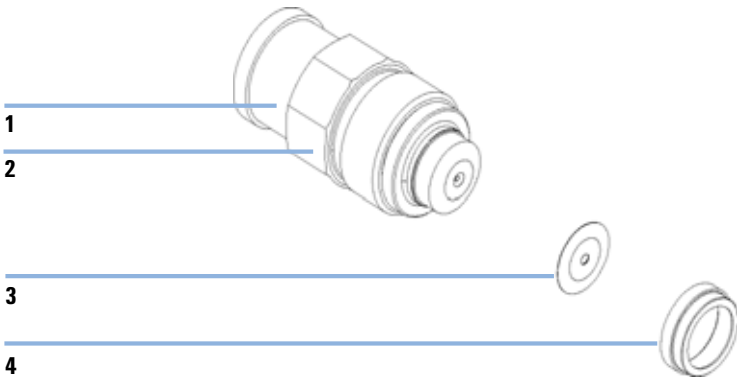

Figure 34 Outlet Ball Valve Assembly

Purge Valve Assembly

Table 33 Purge-Valve Assembly

Item	Description	Part Number
	Purge valve — complete assembly	**G4280-60031**
1	Valve body	No part number
2	PTFE frit (pack of 5)	**01018-22707**
3	Gold seal	**5001-3707**
4	Cap (pack of 4)	**5062-2485**

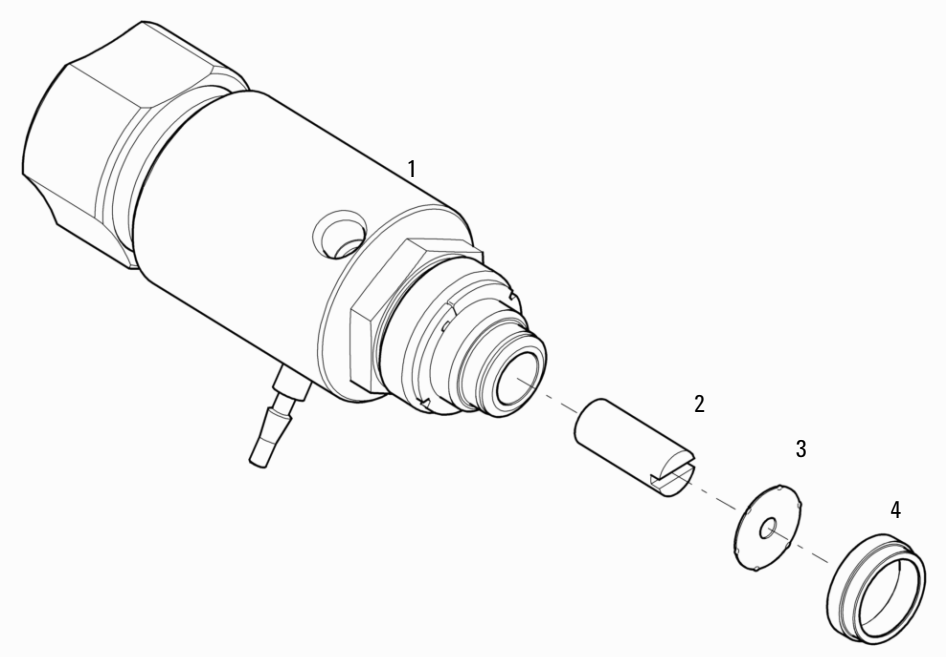

Figure 35 Purge-Valve Assembly

Passive Inlet Valve

Table 34 Passive Inlet Valve

Item	Description	Part Number
	Passive inlet valve	**G4280-60005**
1	O-Ring 7.5-MM-ID	**0905-1684**
2	Gold seal	**5001-3707**
3	Cap (pack of 4)	**5062-2485**

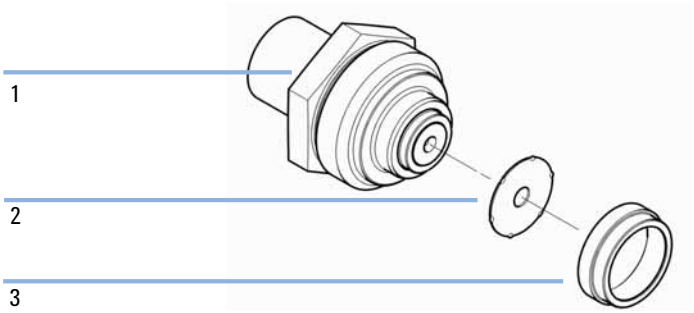

Figure 36 Passive Inlet Valve Assembly

Parts for Injection System Maintenance

Injection-Valve Assembly

Table 35 Manual Injection-Valve assembly

Item	Description	Part Number
	Manual injection valve (complete assembly), including loop capillary (20µl) and needle port	**5067-4102**
	Manual Injection Valve, excluding loop capillary and needle port	**5067-4104**
1	Bearing ring	**1535-4859**
3	Rotor seal (PEEK™)	**5067-4105**
5	Stator head	**0100-1850**
	Needle Port	**5067-1581**
6	Stator screws	**1535-4857**
7	Hex key 9/64 inch (for stator screws — not shown)	**8710-0060**

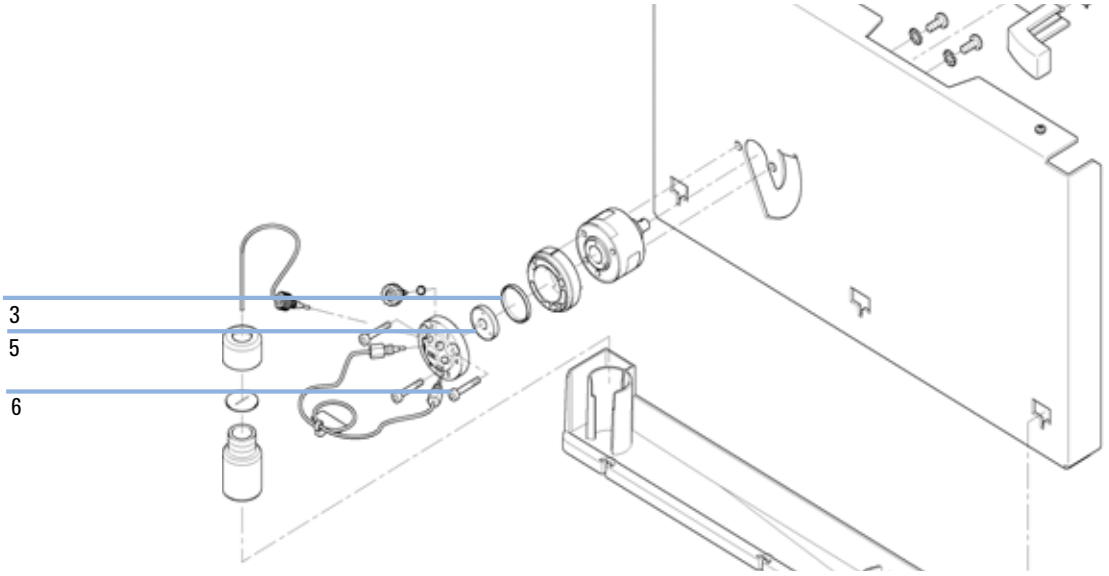

Figure 37 Injection-Valve Assembly

Table 36 Sample loops manual injector

Description	Stainless Steel loops	PEEK loops
Sample loop 5 µl	0101-1248	**0101-1241**
Sample loop 10 µl	0100-1923	**0101-1240**
Sample loop 20 µl	0100-1922	**0101-1239**
Sample loop 50 µl	0100-1924	**0101-1238**
Sample loop 100 µl	0100-1921	**0101-1242**
Sample loop 200 µl	0101-1247	**0101-1227**
Sample loop 500 µl	0101-1246	**0101-1236**
Sample loop 1 ml	0101-1245	**0101-1235**
Sample loop 2 ml	0101-1244	**0101-1234**
Sample loop 5 ml	0101-1243	**0101-1230**

Autosampler

Table 37 Autosampler Main Assemblies

Item	Description	Part Number
1	Transport assembly	**G1329-60009**
2	Sampling unit assembly (The assy comes without injection valve and analytical head)	**G4280-60027**
3	Analytical head assembly (100 µl)	**01078-60003**
4	Injection valve assembly	**0101-0921**
5	Vial tray	**G1313-44510**
6	Gripper assembly	**G1313-60010**

Analytical-Head Assembly

Table 38 Analytical-Head Assembly (100 µl)

Item	Description	Part Number
	Analytical head assembly, includes items 1 – 6	**01078-60003**
1	Screws	**0515-0850**
2	Plunger assembly	**5063-6586**
3	Adapter	**01078-23202**
4	Support seal assembly	**5001-3739**
5	Metering seal (pack of 2)	**5063-6589**
6	Head body	**01078-27710**
7	Screw M5, 60 mm lg, for mounting of assembly	**0515-2118**

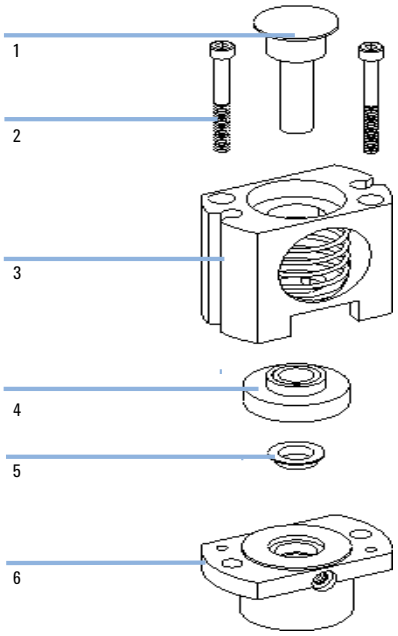

Figure 38 Analytical-Head Assembly

Column Oven

Column Oven Assy **part number: G4280-60040**

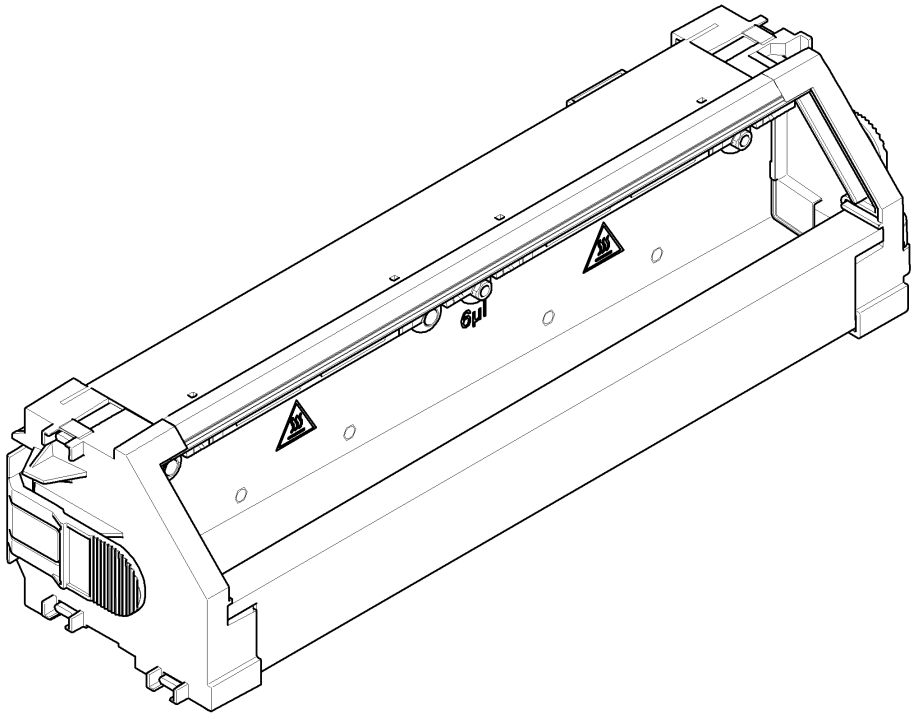

Figure 39 Column Oven Assy

Parts for Detector Maintenance

Standard Flow Cell

Table 39 Standard Flow Cell Assembly

Item	Description	Part Number
	Standard Flow Cell, 10 mm, 14 µl, 40 bar	**G1314-60086**
1	Cell screw kit, quantity=2	**G1314-65062**
2	Conical spring kit, quantity=10	**79853-29100**
3	Ring #1 PEEK kit, quantity=2	**G1314-65065**
4	Gasket #1 (small hole), KAPTON, quantity=10	**G1314-65063**
5	Window quartz kit, quantity=2	**79853-68742**
6	Gasket #2 (large hole), KAPTON, quantity=10	**G1314-65064**
7	Ring #2 PEEK kit, quantity=2	**G1314-65066**

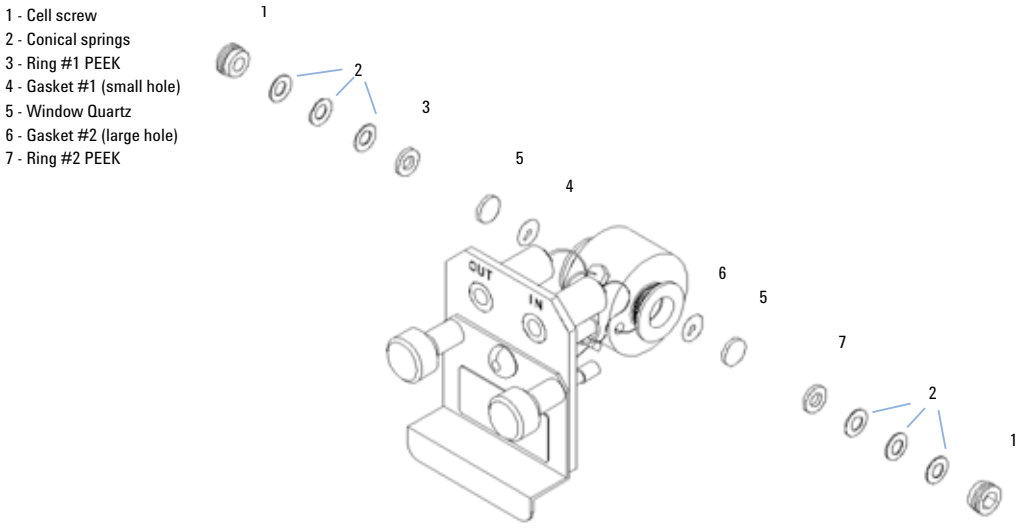

Figure 40 Standard Flow Cell

Detector Lamp

Variable detector lamp **part number: G1314-60100**

Parts for Repair

Degasser Unit

Degasser Unit **part number: G4280-60070**

Solvent Delivery System

Bottle Head Assembly

Table 40 Bottle-Head Assembly Parts

Item	Description	Part Number
	Complete assembly	**G1311-60003**
1	Ferrules with lock ring	**5063-6598** (10x)
2	Tube screw	**5063-6599** (10x)
3	Wire marker	No part number
4	Solvent tubing, 5 m	**5062-2483**
5	Frit adapter (pack of 4)	**5062-8517**
6	Solvent inlet filter, 20 µm	**5041-2168**

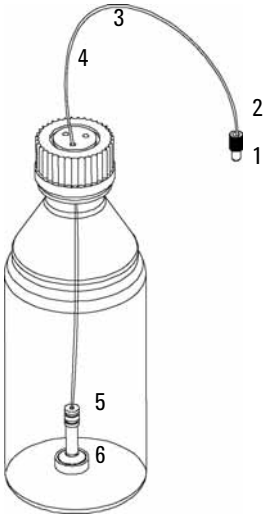

Figure 41 Bottle-Head Assembly Parts

Hydraulic Path

Table 41 Hydraulic Path

Item	Description	Part Number
1	Outlet capillary, pump to injector device	**G1312-67305**
	Bottle-head assembly, bottle to PIV or vacuum degasser.	**G1311-60003**
2	Solvent tube, vacuum degasser to DCGV	**G4280-60034**
3	Capillary, plunger 1 to damper	**G4280-67301**
4	Capillary, damper to plunger 2	**G4280-67300**
5	Connecting tube, DCGV to PIV	**G4280-67304**
6	Waste tube, reoder pack, 5 m	**5062-2461**

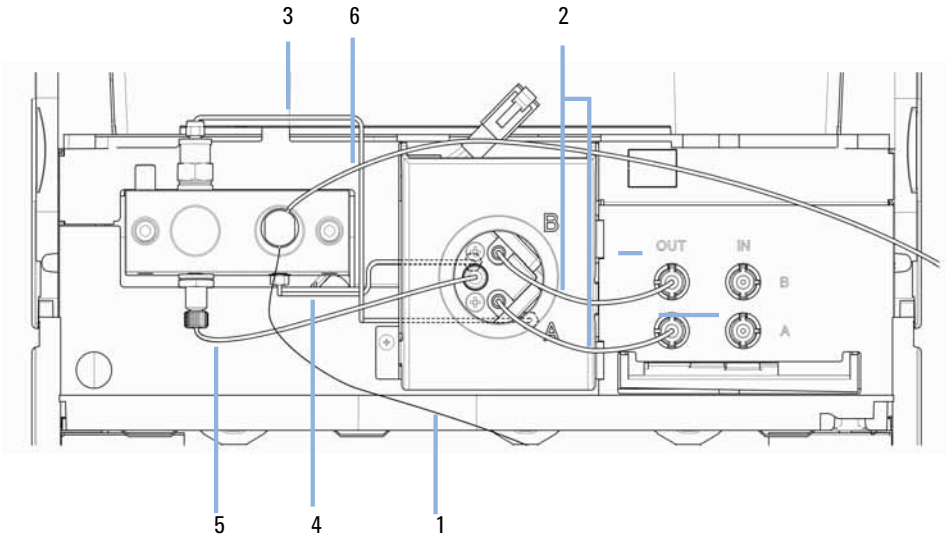

Figure 42 Hydraulic Flow Path of the Pump

Injection System

Sampling Unit Assembly

Table 42 Autosampler Sampling Unit Assembly

Item	Description	Part Number
	Sampling unit assembly (The assy comes without injection valve and analytical head)	**G4280-60008**
1	Sampling unit connector board (SUD)	**G1313-66503**
2	Belt gear for metering unit and needle arm	**1500-0697**
3	Stepper motor for metering unit and needle arm	**5062-8590**
4	Loop capillary (100 µl)	**01078-87302**
5	Analytical head assembly (100 µl)	**01078-60003**
6	Inj. valve - anal. head cap (160 mm 0.25 mm)	**G1313-87301**
7	Safety cover	**G1329-44115**
8	Injection valve assembly	**0101-0921**
9	Waste tube injection valve assy (120 mm)	**G1313-87300**
11	Needle-seat assy (0.17 mm i.d 2.3 µl)	**G1313-87101**
12	Seat adapter	**G1313-43204**
13	Safety flap	**G1313-44106**
14	Flex board	**G1313-68715**
15	Needle assembly for G1313-87101 or G1313-87103 needle-seat	**G1313-87201**
	Clamp kit (includes needle clamp and 2 x clamp screw)	**G1313-68713**

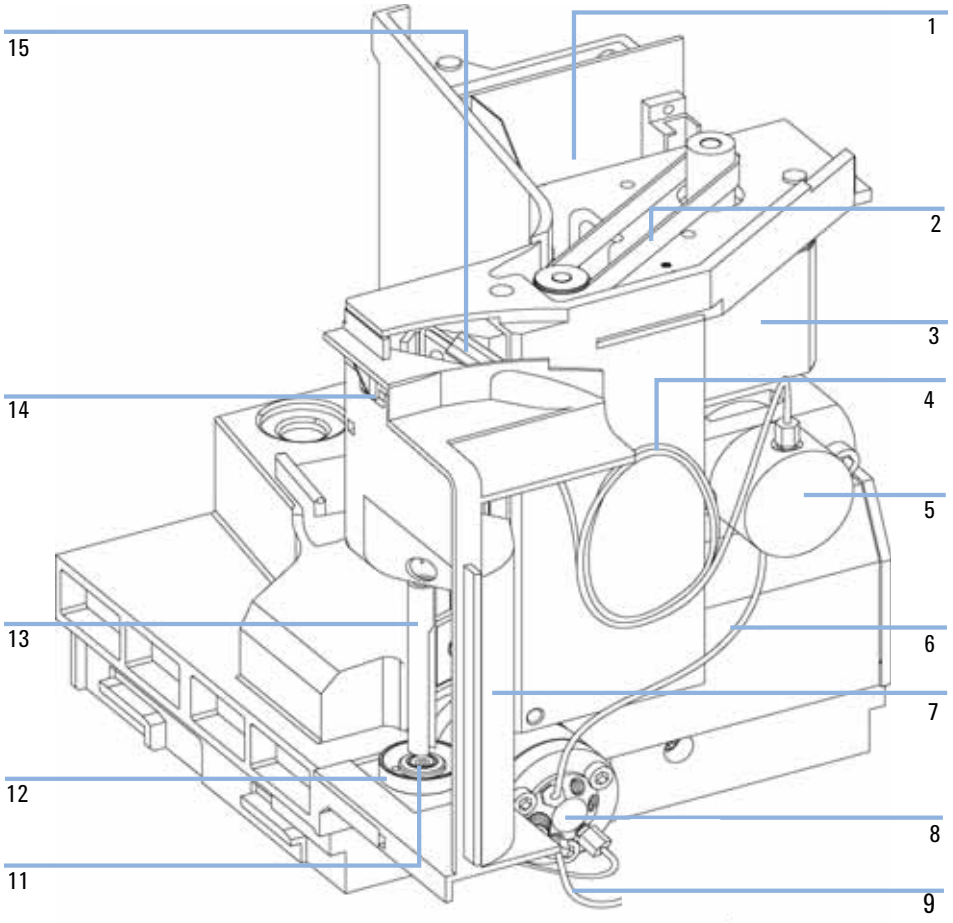

Figure 43 Autosampler Sampling Unit Assembly

Injection-Valve Assembly

Table 43 Injection-Valve Assembly

Item	Description	Part Number
1	Injection-valve assembly, includes items1 – 6	**0101-0921**
2	Isolation seal	**0100-1852**

Table 43 Injection-Valve Assembly

Item	Description	Part Number
3	Rotor seal (Vespel)	**0100-1853**
3	Rotor seal (Tefzel)	**0100-1849**
4	Stator face	**0100-1851**
5	Stator head	**0100-1850**
6	Stator screws	**1535-4857**

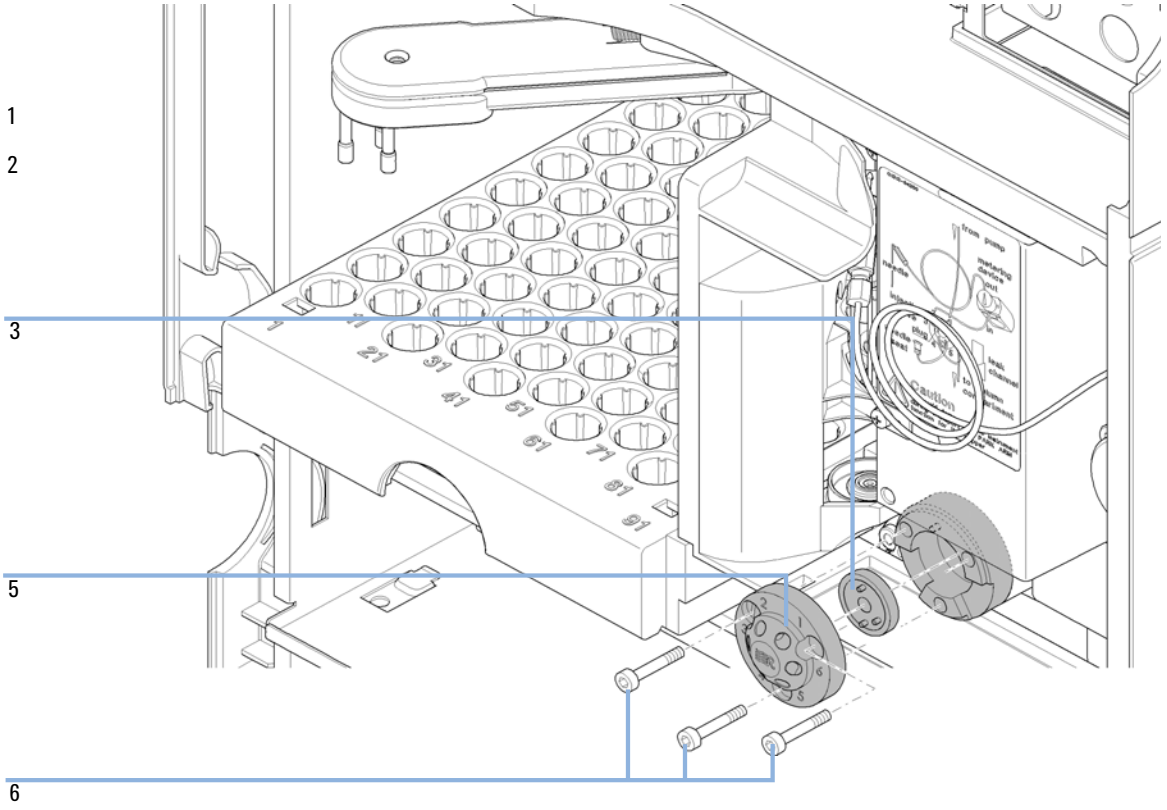

Figure 44 Injection-Valve Assembly

Column Oven

Column Oven Assy **part number: G4280-60040**

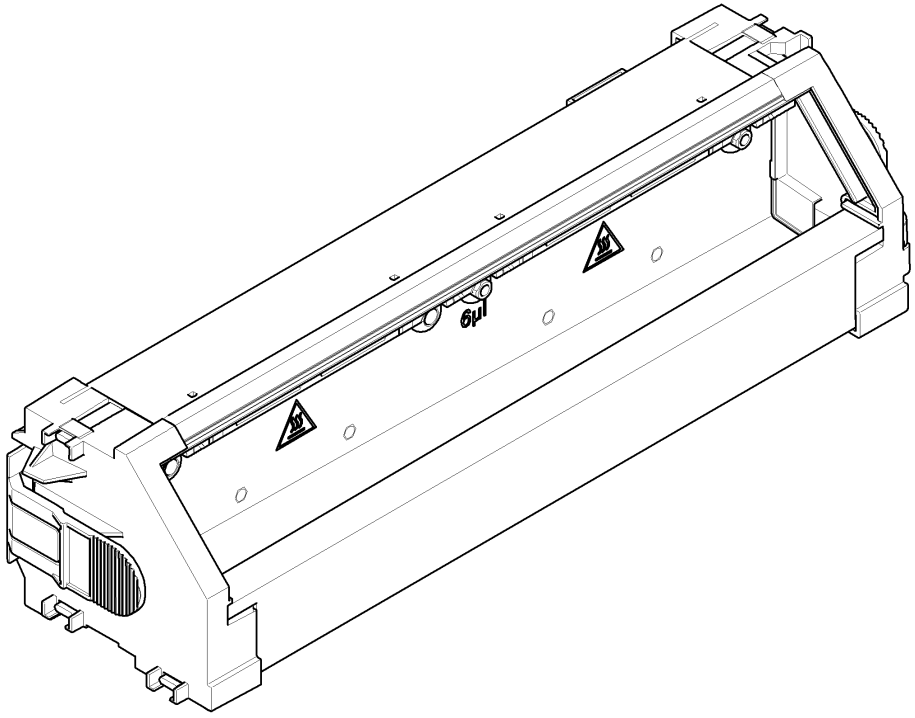

Figure 45 Column Oven Assy

Detector

Optical Unit and Fan Assembly

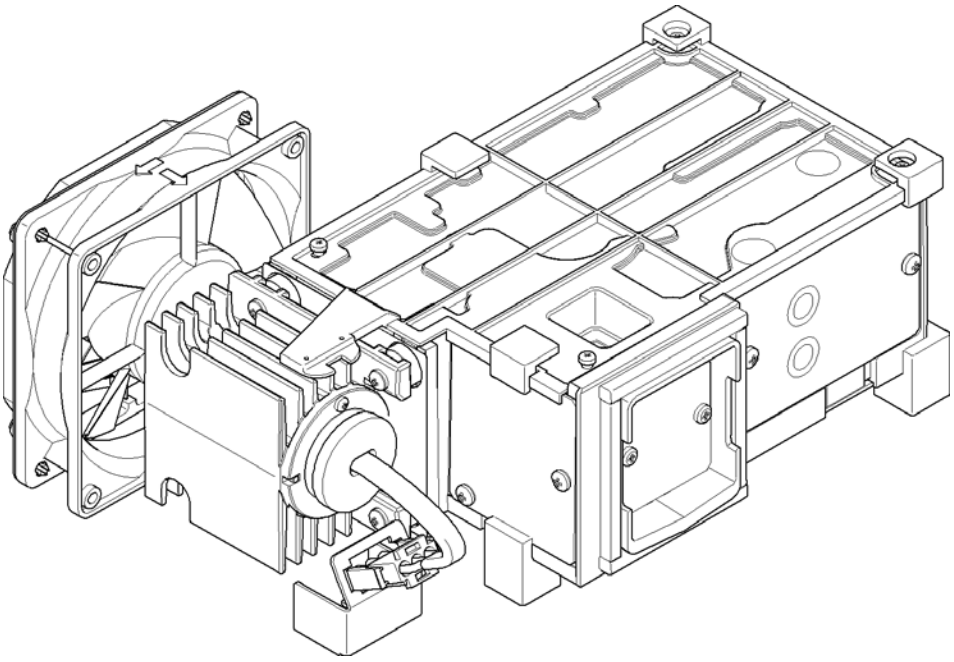

Figure 46 Optical Unit

NOTE

Repairs in the optical unit require special knowledge.

6 Appendix

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This chapter provides additional information on safety, legal and web.

General Safety Information

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

General

This is a Safety Class I instrument (provided with terminal for protective earthing) and has been manufactured and tested according to international safety standards.

Operation

Before applying power, comply with the installation section. Additionally the following must be observed.

Do not remove instrument covers when operating. Before the instrument is switched on, all protective earth terminals, extension cords, auto-transformers, and devices connected to it must be connected to a protective earth via a ground socket. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury. Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any intended operation.

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

CAUTION

Ensure the proper usage of the equipment

The protection provided by the equipment may be impaired.

➔ The operator of this instrument is advised to use the equipment in a manner as specified in this manual.

Some adjustments described in the manual, are made with power supplied to the instrument, and protective covers removed. Energy available at many points may, if contacted, result in personal injury.

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible. When inevitable, this should be carried out by a skilled person who is aware of the hazard involved. Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present. Do not replace components with power cable connected.

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

Do not install substitute parts or make any unauthorized modification to the instrument.

Capacitors inside the instrument may still be charged, even though the instrument has been disconnected from its source of supply. Dangerous voltages, capable of causing serious personal injury, are present in this instrument. Use extreme caution when handling, testing and adjusting.

When working with solvents please observe appropriate safety procedures (e.g. goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet by the solvent vendor, especially when toxic or hazardous solvents are used.

Safety Symbols

Table 44 Safety Symbols

Symbol	Description
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	Indicates eye damage may result from directly viewing the light produced by the deuterium lamp used in this product.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.

WARNING

A WARNING

alerts you to situations that could cause physical injury or death.

➔ Do not proceed beyond a warning until you have fully understood and met the indicated conditions.

CAUTION

A CAUTION

alerts you to situations that could cause loss of data, or damage of equipment.

➔ Do not proceed beyond a caution until you have fully understood and met the indicated conditions.

Solvent Information

Observe the following recommendations on the use of solvents.

Flow Cell

Avoid the use of alkaline solutions (pH > 9.5) which can attack quartz and thus impair the optical properties of the flow cell.

Prevent any crystallization of buffer solutions. This will lead into a blokkage/damage of the flow cell.

If the flow cell is transported while temperatures are below 5 degree C, it must be assured that the cell is filled with alcohol.

Aqueous solvents in the flow cell can built up algae. Therefore do not leave aqueous solvents sitting in the flow cell. Add small % of organic solvents (e.g. Acetonitrile or Methanol ~5%).

Solvents

Brown glass ware can avoid growth of algae.

Always filter solvents, small particles can permanently block the capillaries. Avoid the use of the following steel-corrosive solvents:

- Solutions of alkali halides and their respective acids (for example, lithium iodide, potassium chloride, and so on).
- High concentrations of inorganic acids like nitric acid, sulfuric acid especially at higher temperatures (replace, if your chromatography method allows, by phosphoric acid or phosphate buffer which are less corrosive against stainless steel).
- Halogenated solvents or mixtures which form radicals and/or acids, for example:

  $2CHCl_3 + O_2 \rightarrow 2COCl_2 + 2HCl$

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.

- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether) such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1-% solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Radio Interference

Cables supplied by Agilent Technoligies are screened to provide opitimized protection against radio interference. All cables are in compliance with safety or EMC regulations.

Test and Measurement

If test and measurement equipment is operated with unscreened cables, or used for measurements on open set-ups, the user has to assure that under operating conditions the radio interference limits are still met within the premises.

UV-Radiation

Emissions of ultraviolet radiation (200-315 nm) from this product is limited such that radiant exposure incident upon the unprotected skin or eye of operator or service personnel is limited to the following TLVs (Threshold Limit Values) according to the American Conference of Governmental Industrial Hygienists:

Table 45 UV-Radiation Limits

Exposure/day	Effective Irradiance
8 hours	0.1 µW/cm^2
10 minutes	5.0 µW/cm^2

Typically the radiation values are much smaller than these limits:

Table 46 UV-Radiation Typical Values

Position	Effective Irradiance
Lamp installed, 50-cm distance	average 0.016 µW/cm^2
Lamp installed, 50-cm distance	maximum 0.14 µW/cm^2

Sound Emission

Manufacturer's Declaration

This statement is provided to comply with the requirements of the German Sound Emission Directive of 18 January 1991.

This product has a sound pressure emission (at the operator position) < 70 dB.

- Sound Pressure L_p < 70 dB (A)
- At Operator Position
- Normal Operation
- According to ISO 7779:1988/EN 27779/1991 (Type Test)

Declaration of Conformity for HOX2 Filter

Declaration of Conformity

We herewith inform you that the

Holmium Oxide Glass Filter (Type Hoya HY-1)
(Part No. 79880-22711)

meets the following specification of absorbance maxima positions:

Product Number	Series	Measured Wavelength *	Wavelength Accuracy	Optical Bandwidth
79883A	1090	361.0 nm 418.9 nm 453.7 nm 536.7 nm	+/- 1 nm	2 nm
79854A	1050			
G1306A	1050			
G1315A	1100			
G1315B/C	1100 / 1200			
G1600				
79853C	1050	360.8nm 418.5nm 536.4nm	+/- 2 nm	6 nm
G1314A/B/C	1100 / 1200	360.8nm 418.5nm 536.4nm	+/- 1 nm	6 nm

*) The variation in Measured Wavelength depends on the different Optical Bandwidth.

Agilent Technologies guarantees the traceability of the specified absorbance maxima to a National Institute of Standards & Technology (NIST) Holmium Oxide Solution Standard with a lot-to-lot tolerance of ± 0.3 nm.

The wavelength calibration filter built into the Agilent Technologies UV-VIS detectors is made of this material and meets these specifications. It is, therefore, suitable for wavelength calibration of these detectors within the specified wavelength accuracy of the respective detector over its wavelength range.

January 13, 2006
(Date)

(Engineering Manager)

(Quality Manager)

P/N 89550-90501	Revision: E Effective by: Jan 13, 2006	Agilent Technologies

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC)

Abstract

The Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC), adopted by EU Commission on 13 February 2003, is introducing producer responsibility on all Electric and Electronic appliances from 13 August 2005.

NOTE

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category:

With reference to the equipment types in the WEEE Directive Annex I, this product is classed as a “Monitoring and Control instrumentation” product.

Do not dispose off in domestic household waste!

To return unwanted products, contact your local Agilent office, or see www.agilent.com for more information.

Agilent Technologies on Internet

For the latest information on products and services visit our worldwide web site on the Internet at:

http://www.agilent.com

Select Products/Chemical Analysis

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In this Book

This manual contains information about the Agilent 1120 Series Compact LC.

The manual describes the following:

- General Information about the Agilent 1120 Compact LC System
- Installing the Agilent 1120 Compact LC
- Introduction and Optimizing Performance
- Preventive Maintenance and Repair
- Parts for Maintenance and Repair
- Appendix

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