Agilent 1200 Series
Binary Pump

User Manual

Agilent Technologies

Notices

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CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Contents

1 Introduction

Introduction to the Binary Pump

The binary pump comprises two identical pumps integrated into one housing. It provides gradient generation byhigh-pressure mixing. Degassing is not included but a vacuum degasser is available as a separate product for applications that require best flow stability especially at low flow rates or maximum detector sensitivity. This is most likely required to run small internal diameter columns (2 mm and 1 mm i.d.) which require low flow rates. A solvent selection valve (optional) will allow to select a binary mixture (isocratic and gradient) from four independent solvent bottles. An active seal wash (optional) is available when the pump is used with concentrated buffer solutions.

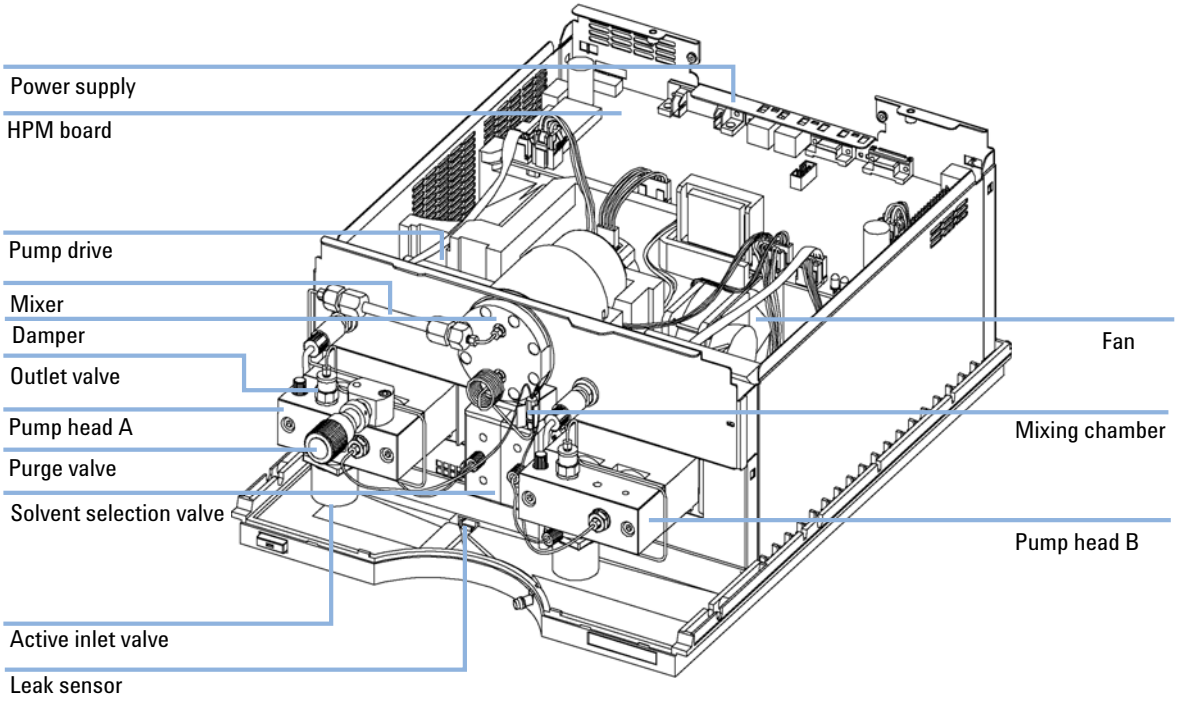

Figure 1 Overview of the Binary Pump

Overview of the Binary Pump

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

Each channel comprises a pump assembly including pump drive, pump head, active inlet valve which has a replaceable cartridge, and outlet valve. Both channels are connected in a low-volume mixing chamber which is connected by a capillary coil to a damping unit and a mixer. A purge valve including a PTFE frit is fitted at the pump outlet for convenient priming of the pumping system.

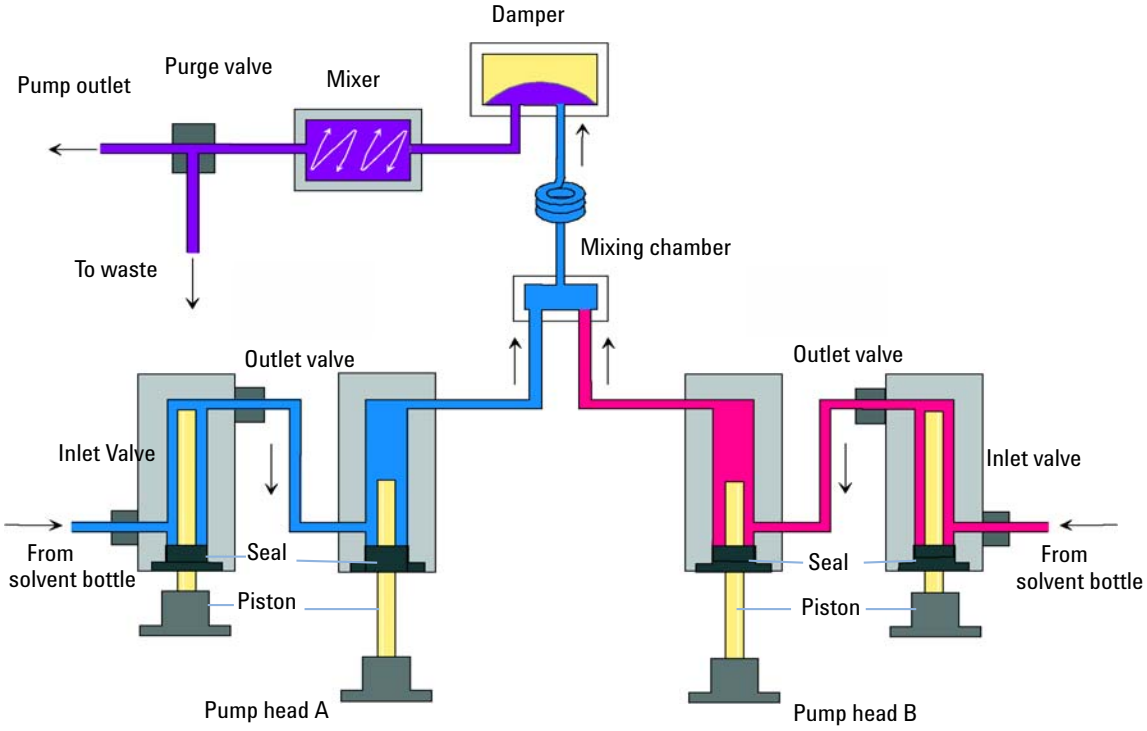

Figure 2 The Hydraulic Path

A seal wash (optional) is available when the pump is used with buffer solutions.

How Does the Binary Pump Work?

The liquid runs from the solvent reservoir through an active inlet valve. Each side of the binary pump comprises two substantially identical pump units. Both pump units comprise a ball-screw drive and a pump head with two sapphire pistons for reciprocating movement.

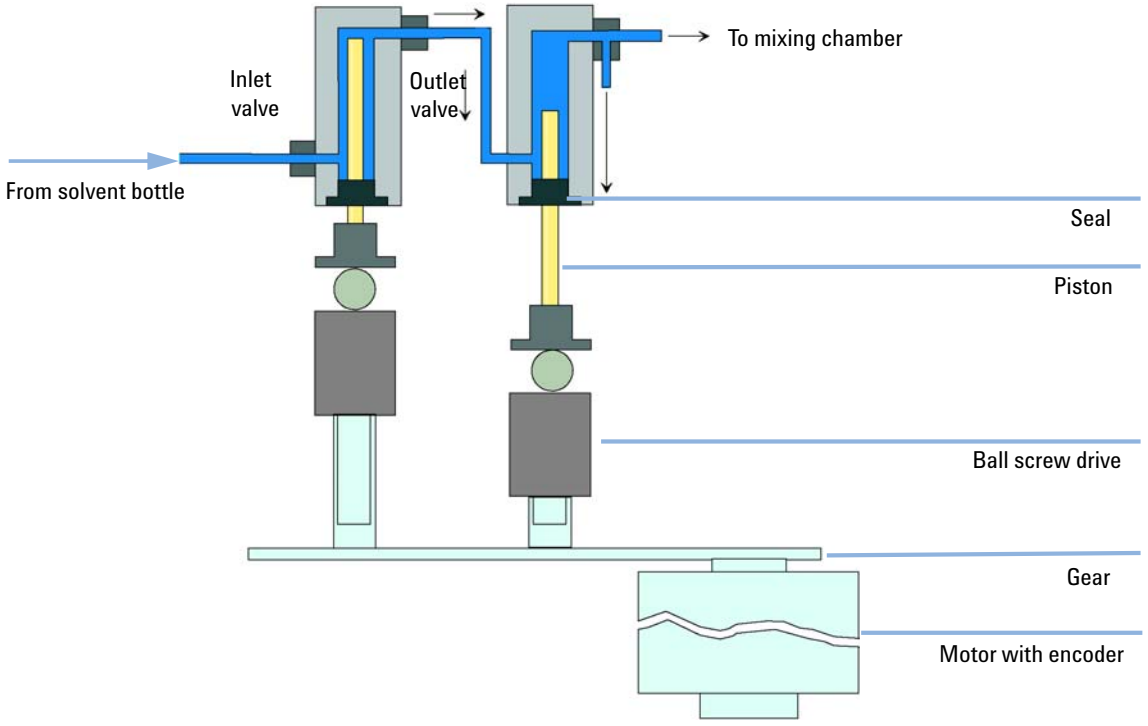

Figure 3 Principle of Pump Unit

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 piston to move at double the speed of the second piston. The solvent enters the pump heads close to the bottom limit and leaves it at its top. The outer diameter of the piston is smaller than the inner diameter of the pump-head chamber allowing the solvent to fill the gap in between. The first piston has a stroke volume in the range of 20 µl to 100 µl depending on the flow rate. The microprocessor controls all flow rates

in a range of 1 µl/min to 5 ml/min. The inlet of the first pumping unit is connected to the active inlet valve which is processor-controlled opened or closed allowing solvent to be drawn into the first pump unit.

The outlet of the pump unit is connected directly to the second pump unit. The outlet of the second pump unit is connected via a small mixing chamber, a coil and the damping unit to the purge valve assembly. The outlet of the purge valve assembly is then connected to the following chromatographic system.

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

The active inlet valve is opened and the down moving piston draws solvent into the first pump head. At the same time the second piston is moving upwards delivering into the system. After a controller-defined stroke length (depending on the flow rate) the drive motors are stopped and the active inlet valve is closed. The motor direction is reversed and moves the first piston up until it reaches the stored upper limit and at the same time moving the second piston downwards.

Then the sequence starts again moving the pistons up and down between the two limits. During the upward movement of the first piston the solvent in the pump head is pressed through the outlet ball valve into the second pumping unit. The second piston draws in half of the volume displaced by the first piston and the remaining half volume is directly delivered into the system. During the drawing stroke of the first piston, the second piston delivers the drawn volume into the system.

Table 1 Pump Details

Delay volume	From mixing point to pump outlet, dependent on back pressure (180–480 µl without mixer 600–900 µl with mixer)
Materials in contact with mobile phase	
Pump head	SST, gold, sapphire, ceramic
Active Inlet Valve	SST, sapphire, ruby, ceramic, PTFE
Outlet Valve	SST, gold, sapphire, ruby, tantalum

Table 1 Pump Details

Adapter	SST, gold
Purge Valve	SST, gold, PTFE, ceramic
Damping Unit	Gold, SST

For pump specifications, see "Site Requirements" on page 18.

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 piston. The pressure in the piston 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 piston.

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 module 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.

Early Maintenance Feedback (EMF)

The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-settable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

For details on EMF counters and how to use them, see Agilent Lab Advisor.

Instrument Layout

The industrial design of the module incorporates several innovative features. It uses Agilent's E-PAC concept for the packaging of electronics and mechanical assemblies. This concept is based upon the use of expanded polypropylene (EPP) layers foam plastic spacers in which the mechanical and electronic boards components of the module are placed. This pack is then housed in a metal inner cabinet which is enclosed by a plastic external cabinet. The advantages of this packaging technology are:

- virtual elimination of fixing screws, bolts or ties, reducing the number of components and increasing the speed of assembly/disassembly,
- the plastic layers have air channels molded into them so that cooling air can be guided exactly to the required locations,
- the plastic layers help cushion the electronic and mechanical parts from physical shock, and
- the metal inner cabinet shields the internal electronics from electromagnetic interference and also helps to reduce or eliminate radio frequency emissions from the instrument itself.

Electrical Connections

- The GPIB connector is used to connect the module with a computer. The address and control switch module next to the GPIB connector determines the GPIB address of your module. The switches are preset to a default address and is recognized once after power is switched ON.
- The CAN bus is a serial bus with high speed data transfer. The two connectors for the CAN bus are used for internal Agilent 1200 Series module data transfer and synchronization.
- One analog output provides signals for integrators or data handling systems.
- The interface board slot is used for external contacts and BCD bottle number output or LAN connections.
- The REMOTE connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features such as start, stop, common shut down, prepare, and so on.
- With the appropriate software, the RS-232C connector may be used to control the module from a computer through a RS-232C connection. This connector is activated and can be configured with the configuration switch. See your software documentation for further information.
- The power input socket accepts a line voltage of 100 – 240 volts AC ± 10% with a line frequency of 50 or 60 Hz. Maximum power consumption is 220 VA. There is no voltage selector on your module because the power supply has wide-ranging capability. There are no externally accessible fuses, because automatic electronic fuses are implemented in the power supply. The security lever at the power input socket prevents the module cover from being taken off when line power is still connected.

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

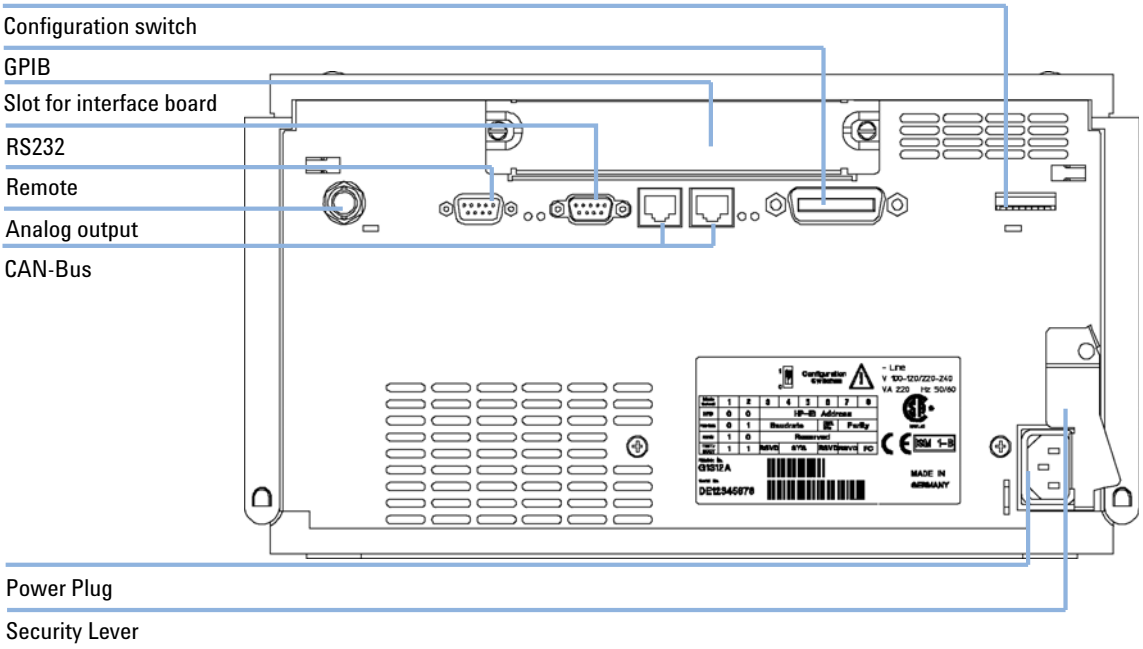

Figure 4 Rear View of Binary Pump - Electrical Connections and Label

2
Site Requirements and Specifications

Site Requirements

A suitable environment is important to ensure optimum performance of the instrument.

Power Consideration

The module power supply has wideranging capability (see Table 2 on page 22). It accepts any line voltage in the range described in the above mentioned table. Consequently there is no voltage selector in the rear of the module. There are also no externally accessible fuses, because automatic electronic fuses are implemented in the power supply.

WARNING

Incorrect line voltage at the instrument

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

➔ Connect your instrument to the specified line voltage.

WARNING

Module is partially energized when switched off, as long as the power cord is plugged in.

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

➔ 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.

CAUTION

Unaccessable power plug.

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

➔ Make sure the power connector of the instrument can be easily reached and unplugged.

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

Power Cords

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

WARNING

Electric Shock

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

➔ 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

The use of 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.

CAUTION

Unaccessable power plug.

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

➔ Make sure the power connector of the instrument can be easily reached and unplugged.

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

Bench Space

The module dimensions and weight (see Table 2 on page 22) allow to place the module on almost any laboratory bench. It needs an additional 2.5 cm (1.0 inches) of space on either side and approximately 8 cm (3.1 inches) in the rear for the circulation of air and electric connections.

If the bench should carry a complete Agilent 1200 Series system, make sure that the bench is designed to carry the weight of all the modules.

NOTE

The module should be operated in a horizontal position!

Environment

Your pump will work within the specifications at ambient temperature and relative humidity described in Table 2 on page 22.

NOTE The pump is designed to operate in a typical electromagnetic environment (EN61326-1) where RF transmitters, such as mobile phones, should not be used in close proximity.

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 slowly to room temperature to avoid condensation.

Physical Specifications

Table 2 Physical Specifications

Type	Specification	Comments
Weight	15.5 kg (34 lbs)	
Dimensions (width × depth × height)	180 x 345 x 435 mm (7 x 13.5 x 17 inches)	
Line voltage	100 – 240 VAC, ± 10%	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5%	
Power consumption	220 VA, 74 W / 253 BTU	Maximum
Ambient operating temperature	4–55 °C (41–131 °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 module
Safety standards: IEC, CSA, UL	Installation Category II, Pollution Degree 2	For indoor use only. Research Use Only. Not for use in Diagnostic Procedures.

Performance Specifications

Table 3 Performance Specification Agilent 1200 Series Binary Pump

Type	Specification
Hydraulic system	Two dual piston in series pumps with proprietary servo-controlled variable stroke drive, floating piston design and active inlet valve
Setable flow range	Setpoints 0.001 – 5 ml/min, in 0.001 ml/min increments
Flow range	0.1 – 5.0 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
Pressure	Operating range 0 400 bar (0 – 5880 psi) up to 5 ml/min
Pressure pulsation	< 2 % amplitude (typically < 1 %), at 1 ml/min isopropanol, at all pressures > 1 MPa
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	High-pressure binary mixing, delay volume 180 – 480 µl without mixer, 600 – 900 µl with mixer, dependent on back pressure
Composition range	1 – 99 % or 5 µl/min per channel, whatever is greater
Composition precision	£ 0.5% absolute
Composition accuracy	± 0.15% RSD, at 1 ml/min
Control and data evaluation	Agilent ChemStation for LC
Analog output	For pressure monitoring, 2 mV/bar, one output
Communications	Controller-area network (CAN), GPIB, RS-232C, APG Remote: ready, start, stop and shut-down signals, LAN optional

Table 3 Performance Specification Agilent 1200 Series Binary Pump

Safety and maintenance	Extensive diagnostics, error detection and display (through handheld controllers G4208A, G1323B and Agilent ChemStation), leak detection, safe leak handling, leak output signal for shutdown of pumping system. Low voltages in major maintenance areas.
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage in terms of seal wear and volume of pumped mobile phase with user-settable limits and feedback messages. Electronic records of maintenance and errors.
Housing	All materials recyclable.

NOTE For use with flow rates below 500 µl/min a vacuum degasser is required.

3
Installing the Pump

Unpacking the Binary Pump

Damaged Packaging

Upon receipt of your module, inspect the shipping containers for any signs of damage. If the containers or cushioning material are damaged, save them until the contents have been checked for completeness and the instrument has been mechanically and electrically checked. If the shipping container or cushioning material is damaged, notify the carrier and save the shipping material for the carrier's inspection.

Delivery Checklist

Delivery Checklist

Ensure all parts and materials have been delivered with the binary pump. The delivery checklist is shown in Table 4 on page 27. In order to identify parts, you may refer to "Parts and Materials" on page 110. Please report missing or damaged parts to your local Agilent Technologies sales and service office.

Table 4 Binary Pump Checklist

Description	Quantity
Binary pump	1
Solvent cabinet	1 (5062-8591)
Solvent bottle	2 or 4[1] (9301-1450 amber bottle, 9301-1420 transparent bottle)
Bottle head assembly	2 or 4* (G1311-60003)
Waste tube, purge valve	1 (5042-2461, reorder number, 5 m)
Power cable	1
CAN cable, 1 m	1
Remote cable	As ordered
Signal cable	As ordered
Service Manual	1
Accessory kit (see Table 5 on page 28)	1

[1] if the binary pump is equipped with a solvent selection valve

Accessory Kit Contents G1311-68705

Table 5 Accessory Kit Contents G1311-68705

Description	Part Number
Capillary, pump to injection device, length 900 mm, ID 0.17 mm	**G1329-87300**
Seal insert tool	**01018-23702**
Wrench; 1/4 – 5/16 inch	**8710-0510**
Wrench; 14 mm	**8710-1924**
Hex key 4 mm	**8710-2392**
Corrugated Waste Tube (1.2 m)	no PN
Corrugated Waste tube (reorder number, 5 m)	**5062-2463**
Velocity regulator (reorder number, pack of 3)	**5062-2486**
PTFE Frit	**01018-22707**

Optimizing the Stack Configuration

If your binary pump is part of a complete Agilent 1200 Series system, you can ensure optimum performance by using the configuration of the system stack in the following configuration. This configuration optimizes the system flow path, ensuring minimum delay volume.

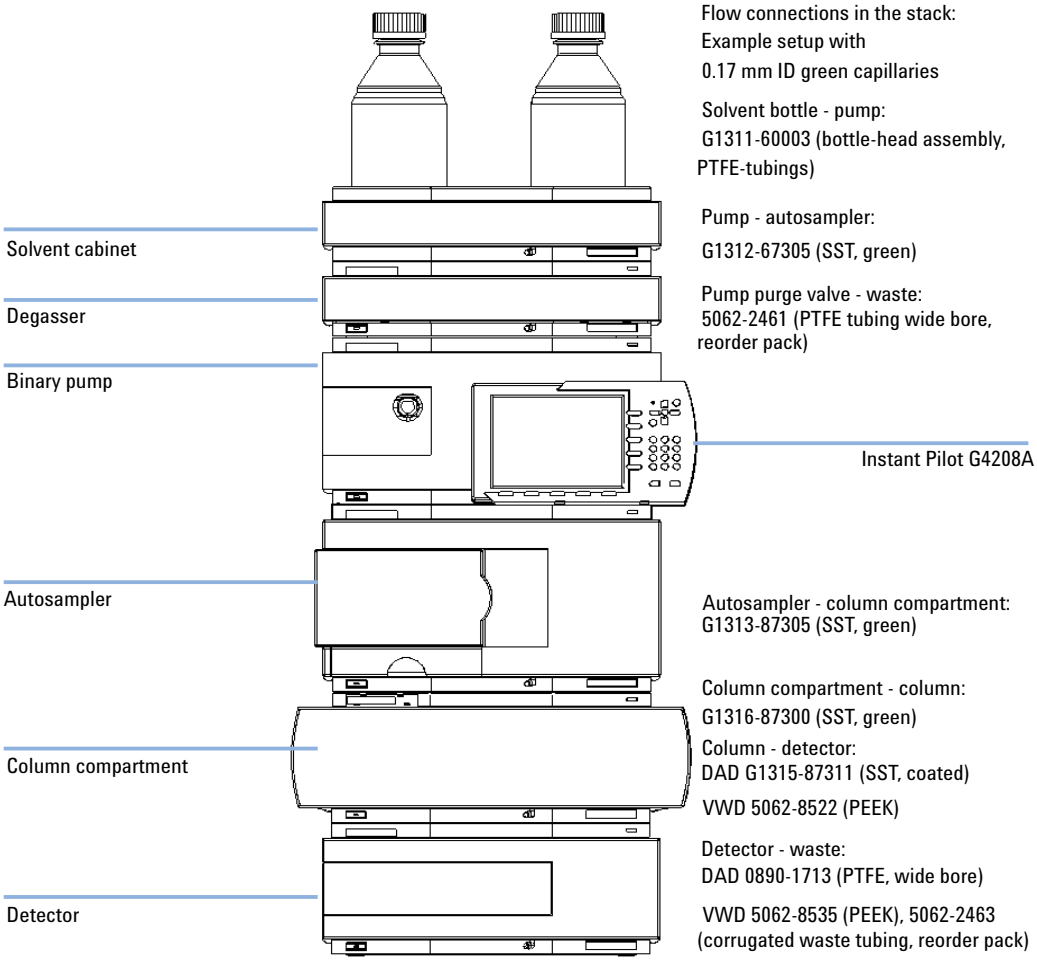

Figure 5 Recommended Stack Configuration (Front View)

NOTE For a detailed view of the flow connections refer to the section “Flow connections” in the product information of the individual modules.

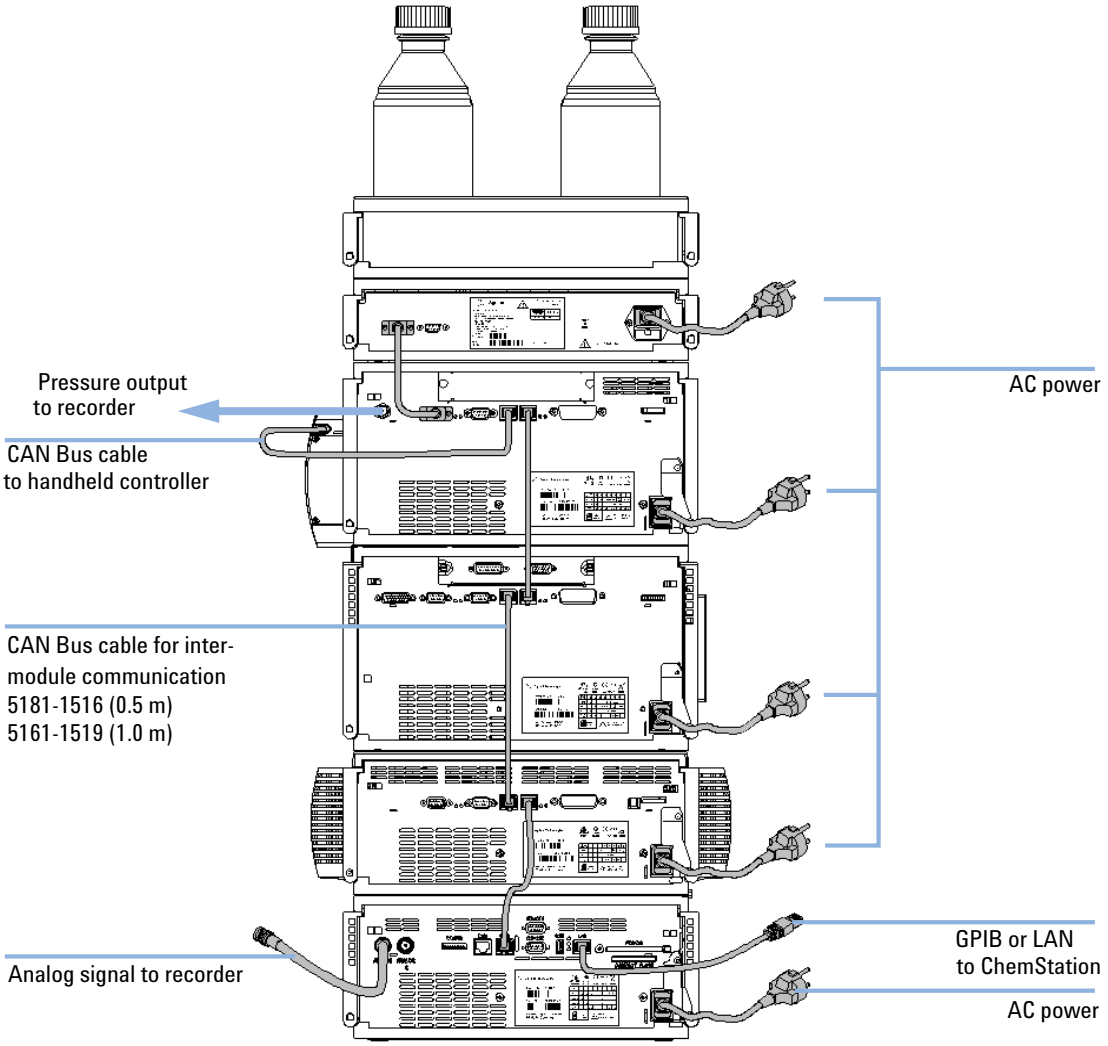

Figure 6 Recommended Stack Configuration (Rear View)

Pressure output to recorder	see Cable Overview in the Service Manual.
Analog signal to recorder	see Cable Overview in the Service Manual.
GPIB or LAN to ChemStation	see Cable Overview in the Service Manual.

NOTE If a single stack configuration becomes too high, e.g. if an additional module like a G1327A ALS Thermostat is added or if your LC system is too high, a two stack configuration may be a better setup. Separate the stack between pump and autosampler and place the stack containing the pump on the right side of the stack containing the autosampler.

Installing the Binary Pump

Parts required

#	Part number	Description
1		Pump
1		Power cord, for other cables see text below and Cable Overview in the Service Manual.
1	G4208A	Control Software (ChemStation, EZChrom, OL, etc.)
1	G1323B	and/or a handheld controller (Instant Pilot or Control Module)

Preparations

- Locate bench space.
- Provide power connections.
- Unpack the pump.

WARNING

Module is partially energized when switched off, as long as the power cord is plugged in.

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

CAUTION

"Defective on arrival" problems

If there are signs of damage, please do not attempt to install the module. Inspection by Agilent is required to evaluate if the instrument is in good condition or damaged.

➔ Notify your Agilent sales and service office about the damage.

➔ An Agilent service representative will inspect the instrument at your site and initiate appropriate actions.

1 Place the module on the bench in a horizontal position.

2 Ensure the power switches on the front of the modules are OFF (switches stand out).

3 At the rear of the binary pump move the security lever to its maximum right position.

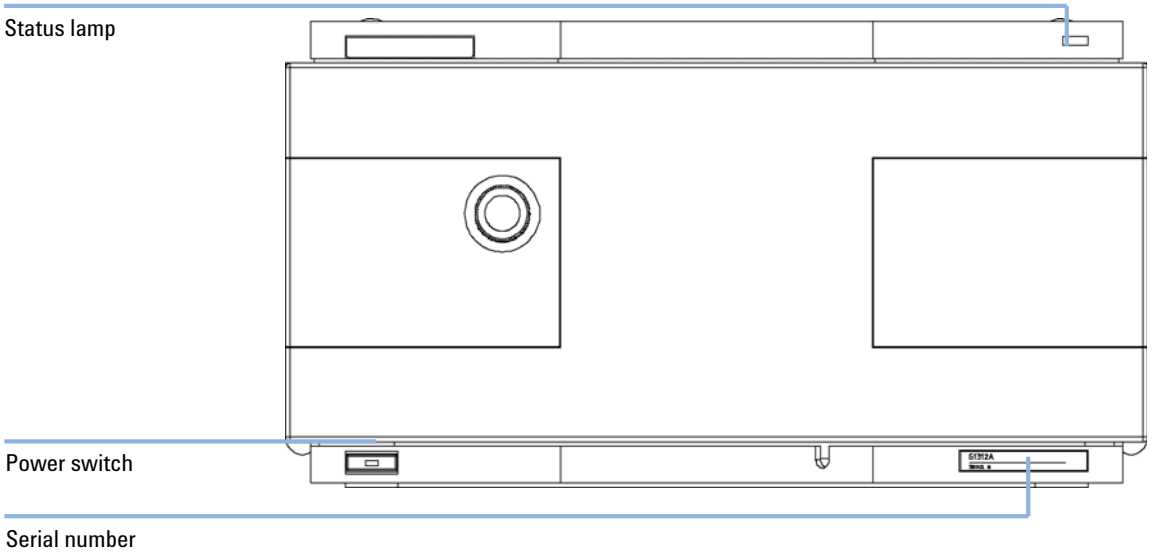

Figure 7 Front of Binary Pump

4 Connect the power cable to the power connector at the rear of the module. The security lever will prevent that the cover is opened while the power cord is connected to the module.

5 Connect the required interface cables to the rear of the binary pump, see "Connecting Modules and Control Software" on page 36.

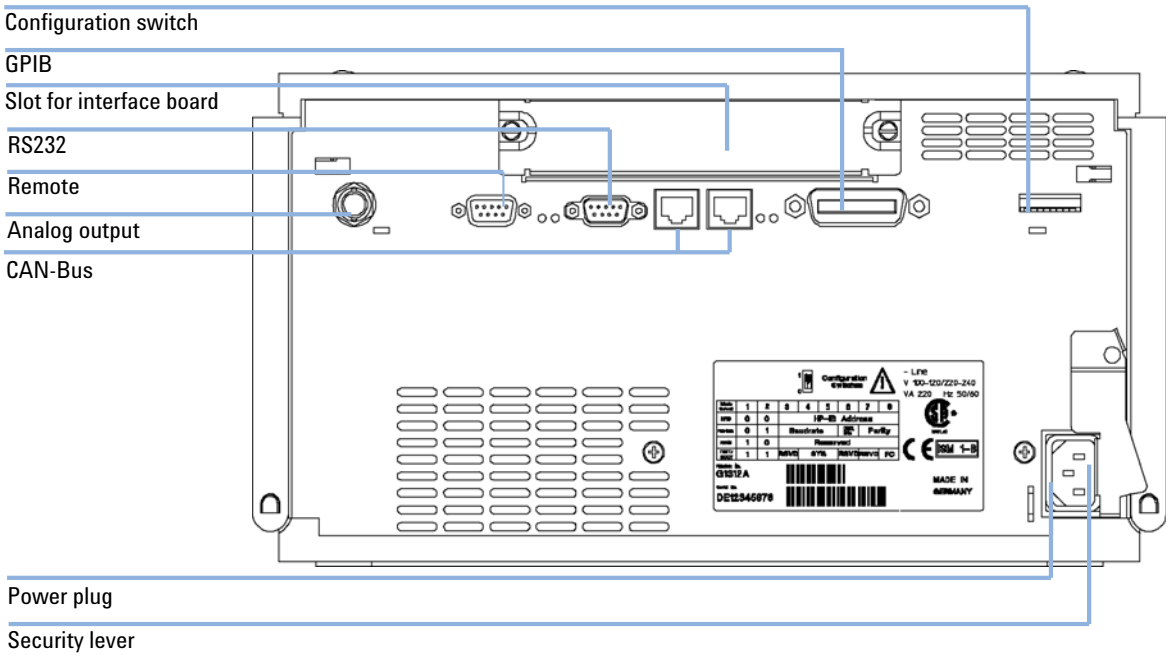

Figure 8 Rear of Binary Pump

6 Connect the capillary, solvent tubes and waste tubings (see "Flow Connections of the Binary Pump with Solvent Selection Valve" on page 39 or "Flow Connections of the Binary Pump without Solvent Selection Valve" on page 42).

7 Press power switch to turn on the module.

NOTE The power switch stays pressed in and a green indicator lamp in the power switch is on when the module is turned on. When the line power switch stands out and the green light is off, the module is turned off.

8 Purge the binary pump (see "Priming and Purging the System" on page 45).

NOTE The pump was shipped with default configuration settings. To change these settings, see Setting the 8-bit Configuration Switch in the Service Manual..

Connecting Modules and Control Software

WARNING

Use of unsupplied cables

Using cables not 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.

Connecting Agilent 1200 Series modules

1. Place the individual modules in a stack configuration as shown in Figure 5 on page 29.
2. Ensure the power switches on the front of the modules are OFF (switches stand out).
3. Plug a CAN cable into the CAN connector at the rear of the respective module (except vacuum degasser).
4. Connect the CAN cable to the CAN connector of the next module, see Figure 6 on page 30.
5. Press in the power switches to turn on the modules.

Connecting an Agilent 1200 Series Vacuum Degasser

1 Place the vacuum degasser in the stack of modules as shown in Figure 5 on page 29.
2 Ensure the power switch on the front of the vacuum degasser is OFF (switch stands out).
3 Plug an APG cable into the APG remote connector at the rear of the module.
4 Connect the APG cable to the APG remote connector of the pump, see Figure 6 on page 30.
5 Press in the power switches to turn on the vacuum degasser.

NOTE The AUX output allows the user to monitor the vacuum level in the degasser chamber.

Connecting control software and/or control modules

1 Ensure the power switches on the front of the modules in the stack are OFF (switches stand out).

2 Plug a GPIB cable into the GPIB connector at one of the modules, preferably at the detector (MUST for the DAD).

3 Connect the GPIB cable to the Agilent control software in use.

4 Plug a CAN cable into the CAN connector of the control module.

NOTE Do not connect the Agilent control software or the control module with the vacuum degasser.

5 Connect the CAN cable to the CAN connector of one of the modules.

6 Press in the power switches to turn on the modules.

NOTE The Agilent control software (e.g. ChemStation, EZChrom, OL, etc.) can be also be connected to the system through a LAN cable, which requires the installation of a LAN-board. For more information about connecting the control module or Agilent control software refer to the respective user manual. For connecting the Agilent 1200 Series equipment to non-Agilent 1200 Series equipment, see "Introduction to the Binary Pump" on page 6.

Flow Connections of the Binary Pump with Solvent Selection Valve

Parts required	**#**	**Part number**	**Description**
			Other modules
		G1311-68705	Parts from accessory kit (see Accessory Kit Contents in the Service Manual.)
	2		wrenches 1/4 - 5/16 inch for capillary connections

Preparations Pump is installed in the LC system

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.

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1 Remove the front cover by pressing the snap fasteners on both sides.

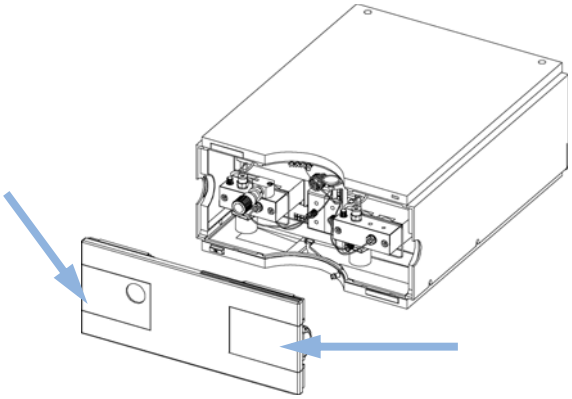


Figure 9 Removing the Front Cover

2 Place the solvent cabinet on top of the binary pump.

3 Place the bottles into the solvent cabinet and place a bottle head assembly into each bottle.

4 Connect the solvent tubes from the bottle head assemblies to the inlet connectors A1, A2, B1 and B2 of the solvent selection valve and label the tubes accordingly. Fix the tubes in the clips of solvent cabinet and binary pump.

5 Using a piece of sanding paper, connect the waste tubing to the purge valve and place it into your waste system.

6 If the binary pump is not part of a Agilent 1200 Series System stack or placed on the bottom of a stack, connect the corrugated waste tube to the waste outlet of the pump leak handling system.

7 Connect the outlet capillary (binary pump to injection device) to the outlet of the purge valve.

8 Purge your system before first use (see "Priming and Purging the System" on page 45).

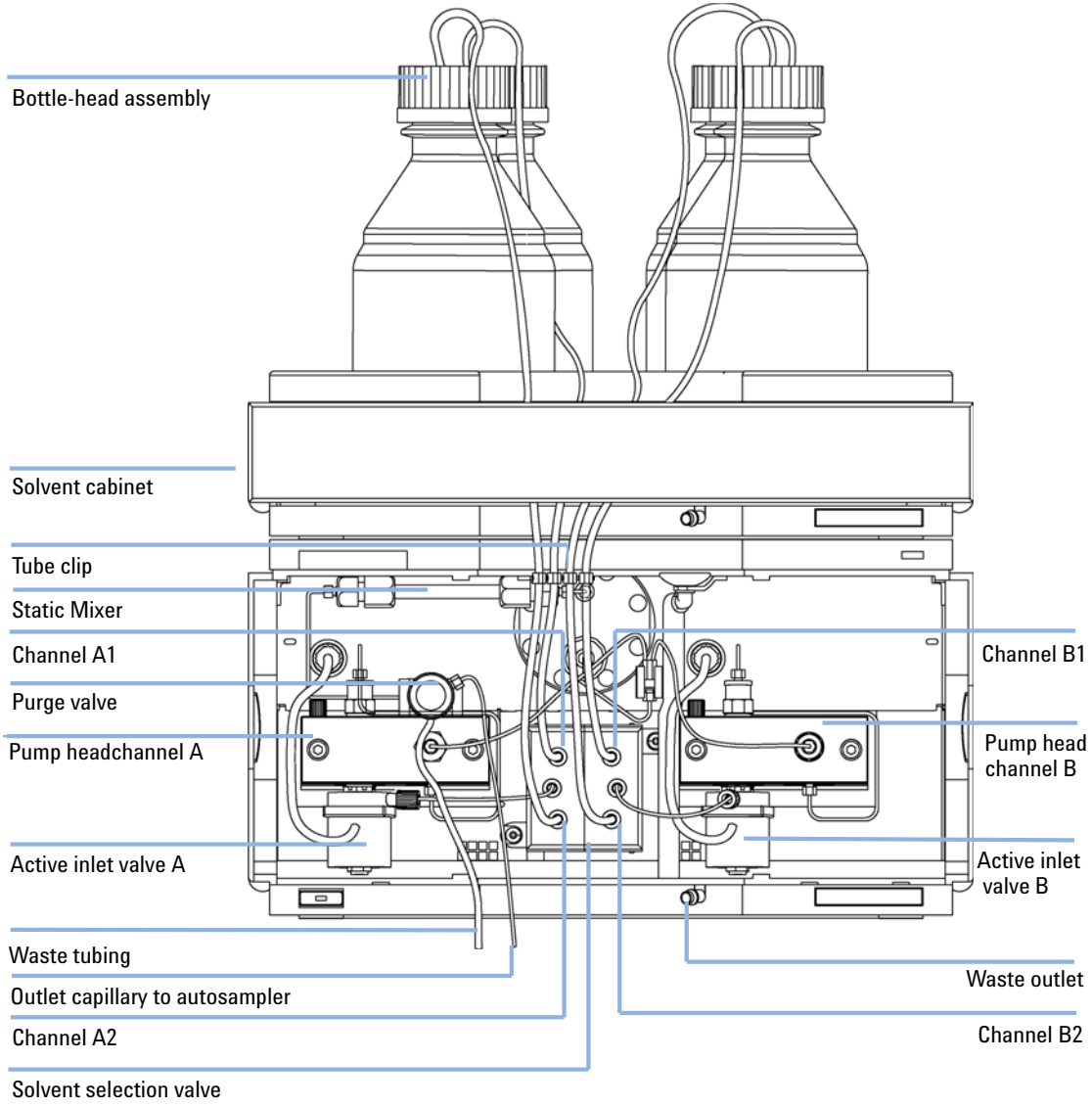


Figure 10 Binary Pump with Solvent Selection Valve

Flow Connections of the Binary Pump without Solvent Selection Valve

Parts required

#	Part number	Description
		Other modules
	G1311-68705	Parts from accessory kit (see Accessory Kit Contents in the Service Manual.)
2		wrenches 1/4 - 5/16 inch for capillary connections

Preparations Pump is installed in the LC system

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.

1 Remove the front cover by pressing the snap fasteners on both sides.

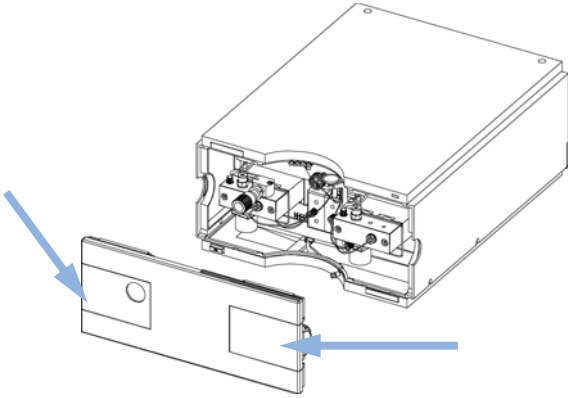


Figure 11 Removing the Front Cover

2 Place the solvent cabinet on top of the binary pump.

3 Place the bottles into the solvent cabinet and place a bottle head assembly into each bottle.

4 Connect the solvent tubes from the bottle head assemblies to the inlet adapters of the active inlet valves. Fix the tubes in the clips of solvent cabinet and binary pump.

5 Using a piece of sanding paper, connect the waste tubing to the purge valve and place it into your waste system.

6 If the binary pump is not part of a Agilent 1200 Series System stack or placed on the bottom of a stack, connect the corrugated waste tube to the waste outlet of the pump leak handling system.

7 Connect the outlet capillary (binary pump to injection device) to the outlet of the purge valve.

8 Purge your system before first use (see "Priming and Purging the System" on page 45).

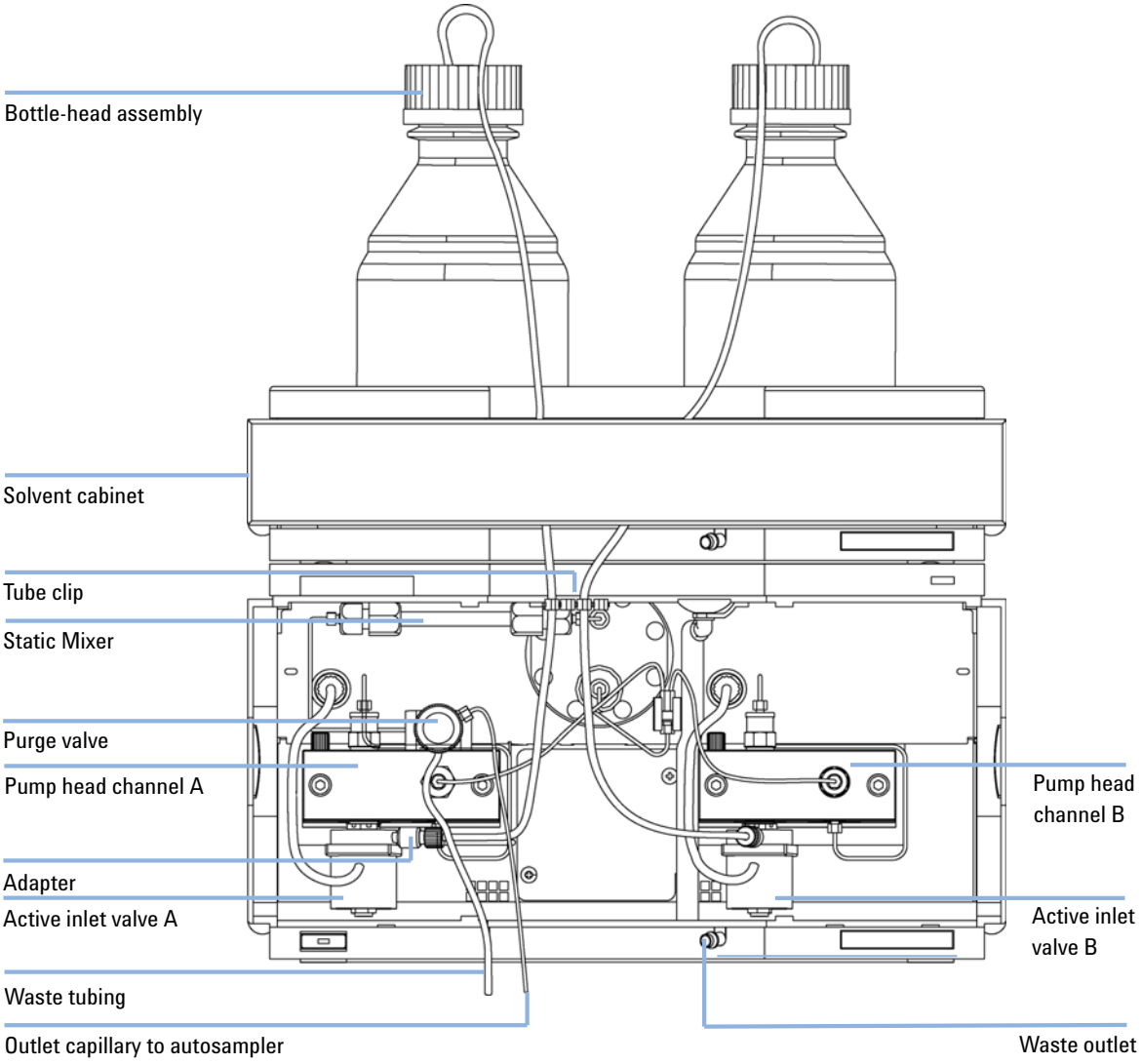


Figure 12 Flow Connection of Binary Pump Without Solvent Selection Valve

Priming and Purging the System

If a degasser is installed, it can be primed either by drawing solvent through the degasser with a syringe or by pumping with the pump.

Priming the vacuum degasser or system with a syringe is recommended, when:

- vacuum degasser or system is used for the first time, or vacuum tubes are empty, or
- changing to solvents that are immiscible with the solvent currently in the tubes.

Priming the system by using the pump at high flow rate (3–5 ml/min) is recommended, when:

- pumping system was turned off for a length of time (for example, overnight) and if volatile solvent mixtures are used, or
- solvents have been changed.

Priming with a Syringe

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.

Before using a new degasser or new tubings for the first time:

1 Prime all tubings with at least 30 ml of iso-propanol no matter whether the channels will be used with organic mobile phase or with water.

NOTE

If you are changing to a solvent that is immiscible with the solvent currently in the tubing continue as follows:

2 Replace the current solvent with adequate organic solvent (see Table 6 on page 48), if current solvent is organic or with water, if current solvent is an inorganic buffer or contains salt.

3 Disconnect solvent tube from your pump.

4 Connect syringe adapter to solvent tube.

5 Push syringe adapter onto syringe.

6 Slowly pull the syringe plunger to draw at least 30 ml of solvent through degasser and tubing.

7 Replace the priming solvent with the new solvent of your choice.

8 Pull syringe plunger to draw at least 30 ml of solvent through degasser and tubing.

9 Disconnect syringe adapter from solvent tube.

10 Connect solvent tube to your pump.

11 Repeat step 3 on page 46 through step 10 on page 46 for the other channel(s) of the binary pump.

NOTE When priming the vacuum degasser with a syringe the solvent is drawn through the degasser tubes very quickly. The solvent at the degasser outlet will therefore not be fully degassed. Pump for approximately 10 minutes with your selected flow rate before starting any application. This will allow the vacuum degasser to properly degas the solvent in the degasser tubes.

NOTE The pump should never be used for priming empty tubings (never let the pump run dry). Use the syringe to draw enough solvent for completely filling the tubings to the pump inlet before continueing to prime with the pump.

Priming with the Pump

When the pumping system has been turned off for a certain time (for example, overnight) oxygen will rediffuse into the solvent channel between the vacuum degasser and the pump. Solvents containing volatile ingredients will slightly lose these, if left in the degasser without flow for a prolonged period of time. Therefore priming of the vacuum degasser and the pumping system is required before starting an application.

1. Open the purge valve of your pump (by turning it counterclockwise) and set flow rate to 3-5 ml/min.
2. Flush the vacuum degasser and all tubes with at least 30 ml of solvent.
3. Set flow to required value of your application and close the purge valve.
4. Pump for approximately 10 minutes before starting your application.
5. Repeat step 1 on page 48 through step 4 on page 48 for the other channel(s) of the binary pump.
6. Close the purge valve and set the required composition and flow rate for your application.

Table 6 Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
After an installation	Isopropanol	Best solvent to flush air out of the system
When switching between reverse phase and normal phase (both times)	Isopropanol	Best solvent to flush air out of the system
After an installation	Ethanol or Methanol	Alternative to Isopropanol (second choice) if no Isopropanol is available
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer cristals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer cristals
After the installation of normal phase seals (P/N 0905-1420)	Hexane + 5% Isopropanol	Good wetting properties

4
Using the Binary Pump

Hints for Successful Use of the Binary Pump

- Place solvent cabinet with the solvent bottles always on top (or at a higher level) of the binary pump.
- When using the binary pump without vacuum degasser, shortly degass your solvents (for example, apply vacuum for 15 – 30 s in an appropriate vessel) before using them in the binary pump. If possible apply solvent conditions that will decrease the gas solubility over time (for example, warming up the solvents).
- For highest precision and reproducibility use a vacuum degasser.
- When using the binary pump with vacuum degasser – before operating the binary pump flush the degasser with at least two degasser tubing volumes (30 ml), especially when the pumping system was turned off for a certain length of time (for example, overnight) and volatile solvent mixtures are used in the channels (see "Priming and Purging the System" on page 45).
- Prevent blocking of solvent inlet filters (never use the pump without solvent inlet filter). Growth of algae should be avoided (see "Prevent Blocking of Solvent Filters" on page 53).
- 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 binary pump at low flow rates (below 0.2 ml/min) check all 1/16-inch fittings for any signs of leaks.
- Whenever possible use a minimum flow rate of 5 µl/min per solvent channel to avoid crossflow of solvent into the unused pump channel.
- Whenever exchanging the pump seals the purge valve frit and the outlet ball valve sieve should be exchanged, too.
- When using buffer solutions, flush the system with water before switching it off. The seal wash option should be used when buffer solutions of 0.1 molar or higher will be used for long time periods.
- Check the pump plungers for scratches when changing the piston seals. Scratched plungers will lead to micro leaks and will decrease the lifetime of the seal.

- After changing the plunger seals apply the seal wear-in procedure (see "Exchanging the Pump Seals" on page 94).
- Place the aqueous solvent on channel A and the organic solvent on channel B. The default compressibility settings are set accordingly.

Solvent Information

Always filter solvents through 0.4 µm filters, small particles can permanently block the capillaries and valves. 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 sulfuric and nitric 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:

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

  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.
- Mixtures of carbon tetrachloride with 2-propanol or THF dissolve stainless steel.

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 module. 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 module.

- 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.

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 1200 Series HPLC

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 1200 Series where helium is not used for degassing (most algae need oxygen and light for growth).

The presence of algae in the Agilent 1200 Series 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. Please refer to the section “Exchanging the Purge Valve Frit or the Purge Valve” on page 88 in this manual.

- 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.

5
Optimizing Performance

When to Use a Vacuum Degasser

The pump does not necessarily require degassing. But for the following conditions the vacuum degasser is recommended:

- if your detector is used with maximum sensitivity in the low UV wavelength range,
- if your application requires highest injection precision, or
- if your application requires highest retention-time reproducibility (mandatory at flow rates below 0.5 ml/min).

Operational Hints for the Vacuum Degasser

If you are using the vacuum degasser for the first time, if the vacuum degasser was switched off for any length of time (for example, overnight), or if the vacuum degasser lines are empty, you should prime the vacuum degasser before running an analysis.

The vacuum degasser can be primed either by drawing solvent through the degasser with a syringe or by pumping with the pump.

Priming the degasser with a syringe is recommended, when:

- vacuum degasser is used for the first time, or vacuum tubes are empty, or
- changing to solvents that are immiscible with the solvent currently in the vacuum tubes.

Priming the vacuum degasser by using the pump at high flow rate (3 – 5 ml/min) is recommended, when:

- pump was turned off for a length of time (for example, during night) and volatile solvent mixtures are used, or
- solvents have been changed.

For more information see the *User Manual* for the Agilent 1200 Series vacuum degasser.

When to use the Seal Wash Option

Highly-concentrated buffer solutions will reduce the lifetime of the seals and plungers in your pump. The seal wash option allows to maintain the seal lifetime by flushing the back side of the seal with a wash solvent.

The seal wash option is strongly recommended when buffer concentrations of 0.1 Molar or higher will be used for long time periods in the pump.

The seal wash option can be ordered by quoting part number 01018-68722 (kit contains all parts needed for one pump head). The active seal wash option kit can be ordered by quoting part number G1311-68711.

The seal wash option comprises a support ring, secondary seal, gasket and seal keeper for both plunger sides. A wash bottle filled with water /isopropanol (90/10) should be placed above the pump in the solvent cabinet and gravity will maintain a flow through the pump head removing all possible buffer crystals from the back of the pump seal. For the active seal wash a peristaltic pump is pumping the solvent through the pump head.

NOTE

Running dry is the worst case for a seal and drastically reduces its lifetime. The seal will build up sticky layers on the surface of the plunger. These sticky layers will also reduce the lifetime of the primary seal. Therefore the tubes of the wash option should always be filled with solvent to prolong the lifetime of the wash seal. Always use a mixture of bidistilled water (90 %) and isopropanol (10 %) as wash solvent. This mixture prevents bacteria growth in the wash bottle and reduces the surface tension of the water.

For information on the installation of the active seal wash option refer to “Installing the Active Seal Wash Option” on page 98

When to Use Alternative Seals

The standard seal for the pump can be used for most applications. However applications that use normal phase solvents (for example, hexane) are not suited for the standard seal and require a different seal when used for a longer time in the pump.

For applications that use normal phase solvents (for example, hexane) we recommend the use of the polyethylene seals, part number 0905-1420 (pack of 2). These seals have less abrasion compared to the standard seals.

NOTE

Polyethylene seals have a limited pressure range 0–200 bar. When used above 200 bar their lifetime will be significantly reduced. **DO NOT** apply the seal wear-in procedure performed with new standard seals at 400 bar.

When to Remove the Static Mixer

The binary pump is equipped with a static mixer. The total delay volume of the pump is 600 – 900 µl. The mixer has a volume of 420 µl.

The static mixer and both connecting capillaries can be replaced by a small capillary (G1312-67301) under the following conditions:

- the delay volume of the pump should be reduced to a minimum for fastest gradient response, and
- the detector is used at medium or low sensitivity.

NOTE Removing the mixer will result in an increase of the composition ripple and higher detector noise.

How to Optimize the Compressibility Compensation Setting

The compressibility compensation default settings are 50×10^{-6} /bar (best for most aqueous solutions) for pump head A and 115×10^{-6} /bar (to suit organic solvents) for pump head B. The settings represent average values for aqueous solvents (A side) and organic solvents (B side). Therefore it is always recommended to use the aqueous solvent on the A side of the pump and the organic solvent on the B side. Under normal conditions the default settings reduce the pressure pulsation to values (below 1 % of system pressure) that will be sufficient for most applications. If the compressibility values for the solvents used differ from the default settings, it is recommended to change the compressibility values accordingly. Compressibility settings can be optimized by using the values for various solvents described in Table 7 on page 63. If the solvent in use is not listed in the compressibility table, when using premixed solvents and if the default settings are not sufficient for your application the following procedure can be used to optimize the compressibility settings:

1. Start channel A of the binary 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 (see Pressure Test in the Service Manual).
3. Your pump must be connected to a control software (e.g. ChemStation, EZChrom, OL, etc.) or handheld controller with which the pressure and %-ripple can be monitored, otherwhise connect a signal cable between the pressure output of the isocratic pump and a recording device (for example, 339X integrator) and set parameters, e.g.

   Zero 50 %

   Att 2^3

   Chart Speed 10 cm/min
4. Start the recording device with the plot mode.
5. Starting with a compressibility setting of 10×10^{-6} /bar increase the value in steps of 10. Re-zero the integrator as required. The compressibility compensation setting that generates the smallest pressure ripple is the optimum value for your solvent composition.

Table 7 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

6 Repeat step 1 on page 62 through step 5 on page 62 for the B channel of your binary pump.

6
Troubleshooting and Diagnostics

Agilent Lab Advisor Software

The Agilent Lab Advisor Software is a standalone product that can be used with or without data system. Agilent Lab Advisor helps to manage the lab for high quality chromatographic results and can monitor in real time a single Agilent LC or all the Agilent GCs and LCs configured on the lab intranet.

Agilent Lab Advisor provides diagnostic capabilities for all Agilent 1200 Series HPLC modules. This includes tests and calibrations procedures as well as the different injector steps to perform all the maintenance routines.

Agilent Lab Advisor also allows users to monitor the status of their LC instruments. The Early Maintenance Feedback (EMF) feature helps to carry out preventive maintenance. In addition, users can generate a status report for each individual LC instrument. The tests and diagnostic features as provided by the Agilent Lab Advisor Software may differ from the descriptions in this manual. For details refer to the Agilent Lab Advisor help files.

This manual provides lists with the names of Error Messages, Not Ready messages, and other common issues.

Overview of the Pump's Indicators and Test Functions

Status Indicators

The pump is provided with two status indicators which indicate the operational state (prerun, run, and error states) of the pump. The status indicators provide a quick visual check of the operation of the pump (see "Status Indicators" on page 68).

Error Messages

In the event of an electronic, mechanical or hydraulic failure, the instrument generates an error message in the user interface. For details on error messages and error handling, please refer to the Agilent Lab Monitor & Diagnostic Software.

Pressure Test

The pressure test is a quick test designed to determine the pressure tightness of the system. After exchanging flow path components (e.g. pump seals or injection seal), use this test to verify the system is pressure tight up to 400 bar (see Service Manual).

Leak Test

The leak test is a diagnostic test designed to determine the pressure tightness of the pump. When a problem with the pump is suspected, use this test to help troubleshoot the pump and its pumping performance. The following sections describe these functions in detail (see Service Manual).

Status Indicators

Two status indicators are located on the front of the binary pump. The lower left one indicates the power supply status, the upper right one indicates the instrument status.

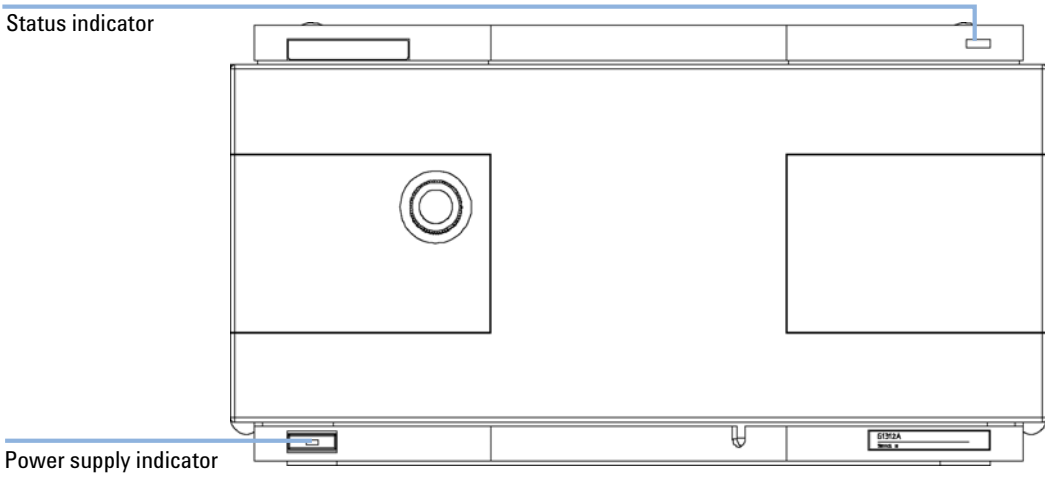


Figure 13 Location of Status Indicators

Power Supply Indicator

The power supply indicator is integrated into the main power switch. When the indicator is illuminated (*green*) the power is ON.

When the indicator is off, the module is turned OFF. Otherwhise check power connections, availability of power or check functioning of the power supply.

Instrument Status Indicator

The instrument status indicator indicates one of four possible instrument conditions:

- When the status indicator is *OFF* (and power switch light is ON), the module is in a*prerun* condition, and is ready to begin an analysis.
- A *green* status indicator, indicates the module is performing an analysis (*run* mode).
- A *yellow* indicator indicates a *not-ready* condition. The module is in a not-ready state when it is waiting for a specific condition to be reached or completed (for example, immediately after changing a setpoint), or while a self-test procedure is running.
- An *error* condition is indicated when the status indicator is *red*. An error condition indicates the module has detected an internal problem which affects correct operation of the module. Usually, an error condition requires attention (for example, leak, defective internal components). An error condition always interrupts the analysis.
- A *flashing yellow* status indicator indicates that the module is in its resident mode. Call your local service provider for assistance upon observing this error condition.
- A *flashing red* status indicator indicates a severe error during the *startup* procedure of the module. Call your local service provider for assistance upon observing this error condition.

User Interfaces

Depending on the User Interface, the available test vary. Some descriptions are only available in the Service Manual.

Table 8 Test Functions available vs. User Interface

Test	ChemStation	Instant Pilot G4208A	Control Module G1323B	Agilent LC Diagnostic Software
Pressure Test	Yes	No	Yes	
Leak Test	Yes	No	Yes	

7 Maintenance

Introduction to Maintenance and Repair

Simple Repairs

The module is designed for easy repair. The most frequent repairs such as plunger seal change and purge valve frit change can be done from the front of the module with the module in place in the system stack.

These repairs are described in "Simple Repairs" on page 80

Exchanging Internal Parts

Some repairs may require exchange of defective internal parts. Exchange of these parts requires removing the module from the stack, removing the covers, and disassembling the module. The security lever at the power input socket prevents that the module cover is taken off when line power is still connected.

Warnings and Cautions

WARNING

Module is partially energized when switched off, as long as the power cord is plugged in.

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

WARNING

Sharp metal edges

Sharp-edged parts of the equipment may cause injuries.

➔ 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 are static sensitive and should be handled with care so as not to damage them. Touching electronic boards and components can cause electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ Be sure to hold the board by the edges and do not touch the electrical components. Always use an ESD protection (for example, an ESD wrist strap) when handling electronic boards and components.

Using the ESD Strap

Electronic boards are sensitive to electronic discharge (ESD). In order to prevent damage, always use an ESD strap when handling electronic boards and components.

1 Unwrap the first two folds of the band and wrap the exposed adhesive side firmly around your wrist.

2 Unroll the rest of the band and peel the liner from the copper foil at the opposite end.

3 Attach the copper foil to a convenient and exposed electrical ground.

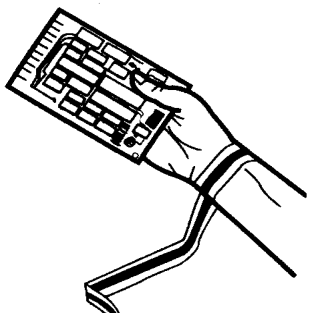


Figure 14 Using the ESD Strap

Cleaning the module

The module case should be kept clean. Cleaning should be done with a soft cloth slightly dampened with water or a solution of water and mild detergent. Do not use an excessively damp cloth as liquid may drip into the module.

WARNING

Liquid dripping into the electronic compartment of your module.

Liquid in the module electronics can cause shock hazard and damage the module.

➔ Do not use an exessively damp cloth during cleaning.

➔ Drain all solvent lines before opening any fittings.

Early Maintenance Feedback (EMF)

Maintenance requires the exchange of components in the flow path which are subject to mechanical wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the instrument and the analytical conditions, and not on a predefined time interval. The early maintenance feedback (EMF) feature monitors the usage of specific components in the instrument, and provides feedback when the user-settable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

The 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 pump provides the following EMF counters:

- liquimeter pump A,
- seal wear pump A,
- liquimeter pump B,
- seal wear pump B.

Liquimeters

The liquimeters display the total volume of solvent pumped by the left and right pump heads since the last reset of the counters. Both liquimeters 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.

Using the EMF Counters

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.

Setting the EMF Limits

The setting of the EMF limits must be optimized over one or two maintenance cycles. Initially, no EMF limit should be set. When performance indicates maintenance is necessary, take note of the values displayed by pump liquimeter and seal wear counters. Enter these values (or values slightly less than the displayed values) as EMF limits, and then reset the EMF counters to zero. The next time the EMF counters exceed the new EMF limits, the EMF flag will be displayed, providing a reminder that maintenance needs to be scheduled.

Overview of Maintenance and Repair

Figure 15 on page 78 shows the main assemblies of the binary pump. The pump heads and its parts do require normal maintenance (for example, seal exchange) and can be accessed from the front (simple repairs). Replacing internal parts will require to remove the module from its stack and to open the top cover.

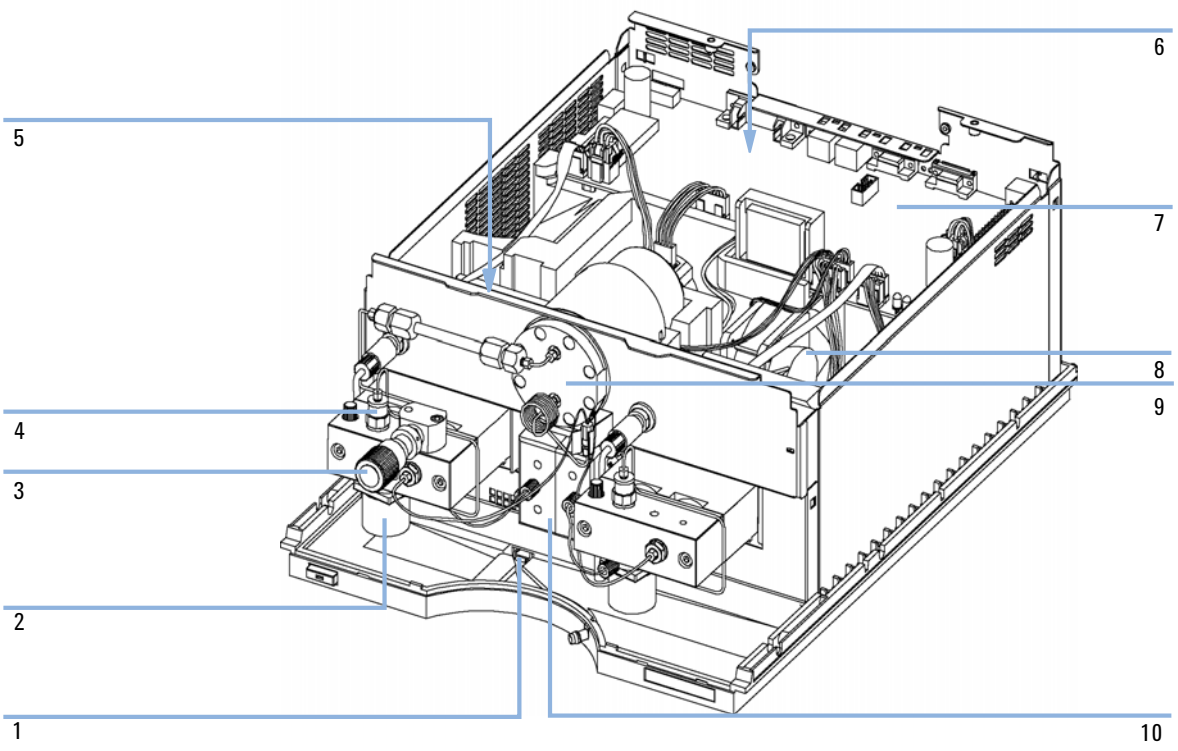


Figure 15 Overview of Repair Procedures

1	Leak sensor, see Exchanging the Leak Sensor in the Service Manual
2	Active inlet valve, see "Exchanging the Active Inlet Valve" on page 82

3	Purge valve, see "Exchanging the Purge Valve Frit or the Purge Valve" on page 88
4	Outlet ball valve, see "Exchanging the Outlet Ball Valve Sieve or the Complete Valve" on page 86
5	Pump drive, see Exchanging a Pump Drive in the Service Manual
6	Power supply, see Exchanging the Power Supply in the Service Manual
7	HPM board, see Exchanging the High Pressure Pump Main Board in the Service Manual
8	Fan, see Exchanging the Fan in the Service Manual
9	Damper, see Exchanging the Damper in the Service Manual
10	Solvent selection valve, see "Exchanging the Solvent Selection Valve" on page 90

Simple Repairs

The procedures described in this section can be done with the binary pump in place in the system stack.

Table 9 Simple Repair Procedures

Procedure	Typical Condition	Notes
"Checking and Cleaning the Solvent Filter" on page 81	If solvent filter is blocked	Gradient performance problems, intermittent pressure fluctuations
"Exchanging the Active Inlet Valve" on page 82	If internally leaking	Pressure ripple unstable, run leak test for verification
"Exchanging the Outlet Ball Valve Sieve or the Complete Valve" on page 86	If internally leaking	Pressure ripple unstable, run leak test for verification
"Exchanging the Purge Valve Frit or the Purge Valve" on page 88	If internally leaking	Solvent dripping out of waste outlet when valve closed
"Exchanging the Purge Valve Frit or the Purge Valve" on page 88	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 valve open) indicates blockage
"Exchanging the Solvent Selection Valve" on page 90	If internally leaking	Error messages "Valve failed" or "Valve Fuse" are generated
"Exchanging the Pump Seals" on page 94	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 Plungers" on page 97	If scratched	Seal life time shorter than normally expected — check plungers while changing the seals
"Exchanging the Wash Seals" on page 102	When seals show indication of leaks	Leaks at lower pump head side, loss of wash solvent
"Exchanging the Optional Interface Board" on page 106	If defective	Error condition, indicated by red status indicator

Checking and Cleaning the Solvent Filter

When If solvent filter is blocked

Parts required

#	Description
	Concentrated nitric acid (35%)
	Bidistilled water
1	Beaker

Preparations Remove solvent inlet tube from the adapter at the AIV

CAUTION

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

Damage of the module.

➔ Always filter solvents.

➔ Never use the module 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.

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.

Cleaning the Solvent Filter

1. Remove the blocked solvent filter from the bottle-head assembly and place it in a beaker with concentrated nitric acid (35%) 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 Active Inlet Valve

When If internally leaking (backflow)

Tools required Wrench 14 mm

Parts required

#	Part number	Description
1	G1312-60025	Active inlet valve body
1	5062-8562	Valve cartridge (400 bar)

Preparations Switch off binary pump at power switch

1. Remove the front cover.
2. Unplug the active inlet valve cable from the connector.
3. Disconnect the solvent inlet tube at the inlet valve (beware of leaking solvents).

NOTE BPs without the solvent selection valve (SSV) have an adapter installed between the solvent line and the active inlet valve (AIV). Disconnect the solvent tubes at the adapter and remove the adapter from the AIV.

4. Using a 14 mm wrench loosen the active inlet valve and remove the valve from pump head.
5. Insert the valve into the pump head. Using the 14 mm wrench turn the nut until it is hand tight.
6. Position the valve so that the solvent inlet tube connection points towards the front.

7 Using the 14 mm wrench tighten the nut by turning the valve in its final position (not more than a quarter turn). Do not overtighten the valve.

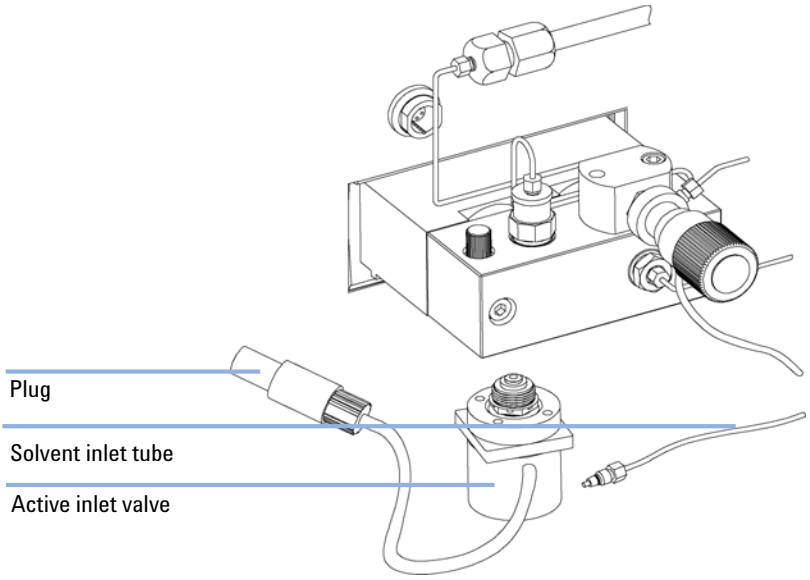


Figure 16 Exchanging the Active Inlet Valve

8 Reconnect the Active Inlet Valve cable to the connector at the Z-panel and the inlet tube to the valve.

9 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 Active Inlet Valve Cartridge

When If internally leaking (backflow)

Tools required Wrench 14 mm

Parts required

#	Part number	Description
1	G1312-60025	Active inlet valve body
1	5062-8562	Valve cartridge (400 bar)

Preparations Switch off pump at the main power switch and unplug the power cable

1 Remove the front cover.
2 Unplug the active inlet valve cable from the connector.
3 Disconnect the solvent inlet tube at the inlet valve (beware of leaking solvents).

NOTE BPs without the solvent selection valve (SSV) have an adapter installed between the solvent line and the active inlet valve (AIV). Disconnect the solvent tubes at the adapter and remove the adapter from the AIV.

4 Using a 14 mm wrench loosen the active inlet valve and remove the valve from pump head.
5 Using a pair of tweezers remove the valve cartridge from the actuator assembly.
6 Clean the area in the actuator assembly. Flush the cartridge area thouroughly.
7 Insert a new valve cartridge into the actuator assembly (make sure the valve cartridge is fully inserted into the actuator assembly).
8 Insert the valve into the pump head. Using the 14 mm wrench turn the nut until it is hand tight.
9 Position the valve so that the solvent inlet tube connection points towards the front.
10 Using the 14 mm wrench tighten the nut by turning the valve in its final position (do not overtighten the valve).

11 Reconnect the Active Inlet Valve cable to the connector at the Z-panel and the inlet tube to the valve.

12 Reinstall the front cover.

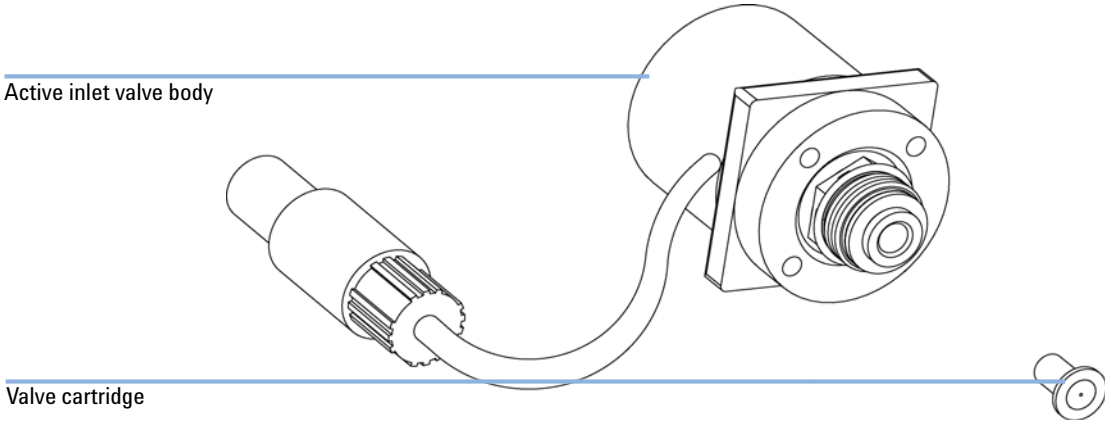


Figure 17 Active Inlet Valve Parts

NOTE After an exchange of the valve cartridge 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 Sieve or the Complete Valve

When

Sieve — whenever the pump seals will be exchanged

Valve — if internally leaking

Tools required

Wrench 1/4 inch

Wrench 14 mm

Parts required

#	Part number	Description
1	G1312-60008	Outlet ball valve
1	5063-6505	Sieve (pack of 10)

Preparations

Switch off pump at the main power switch and unplug the power cable

NOTE

Before exchanging the outlet ball valve you can try to clean it in a sonic bath. Remove the gold seal and the sieve. Place the valve in upright position (onto the plastic cap) in a small beaker with alcohol. Place in a sonic bath for 5 to 10 minutes. Insert a new sieve and replace the gold seal.

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. Remove the plastic cap with the gold seal.
4. Using a pair of tweezers remove the sieve.

NOTE

Check the gold seal. It should be exchanged when strongly deformed. Place the valve in an upright position, insert the sieve into the recess and replace the gold seal with the cap. Make sure that the sieve cannot move and is away from the seal area of the gold seal.

5 Place a new sieve into the recess of the outlet ball valve and replace the cap with the gold seal.

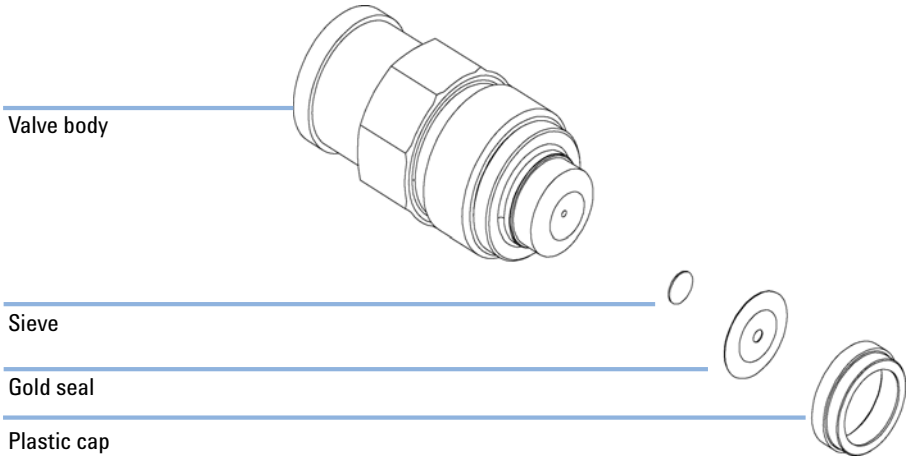


Figure 18 Outlet Ball Valve Parts

6 Reinstall the outlet ball valve and tighten the valve.

7 Reconnect the valve capillary.

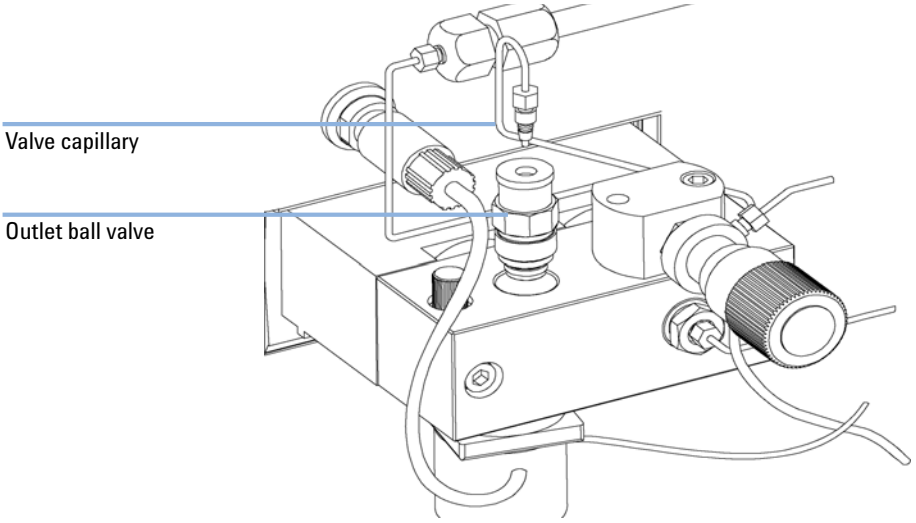


Figure 19 Exchanging the Outlet Ball Valve

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	G1311-60009	Purge valve

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 from the purge valve holder.
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.

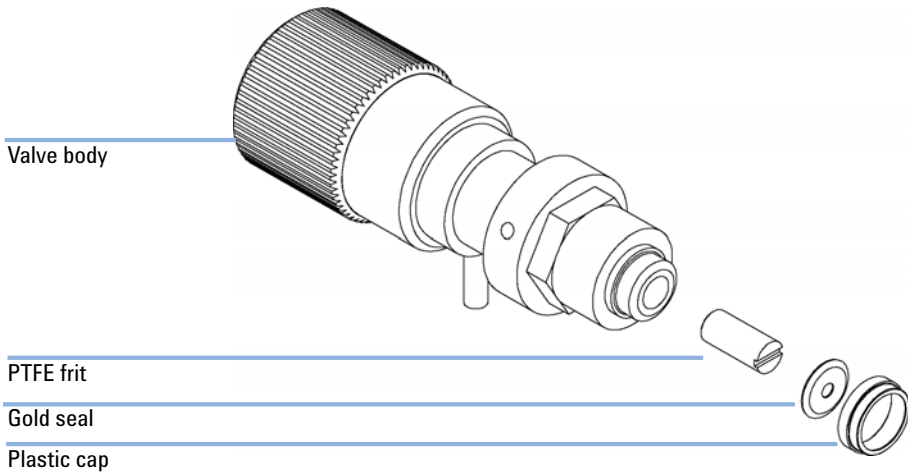


Figure 20 Purge Valve Parts

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

7 Replace 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 purge valve holder and locate the pump outlet and the waste outlet as shown below.

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

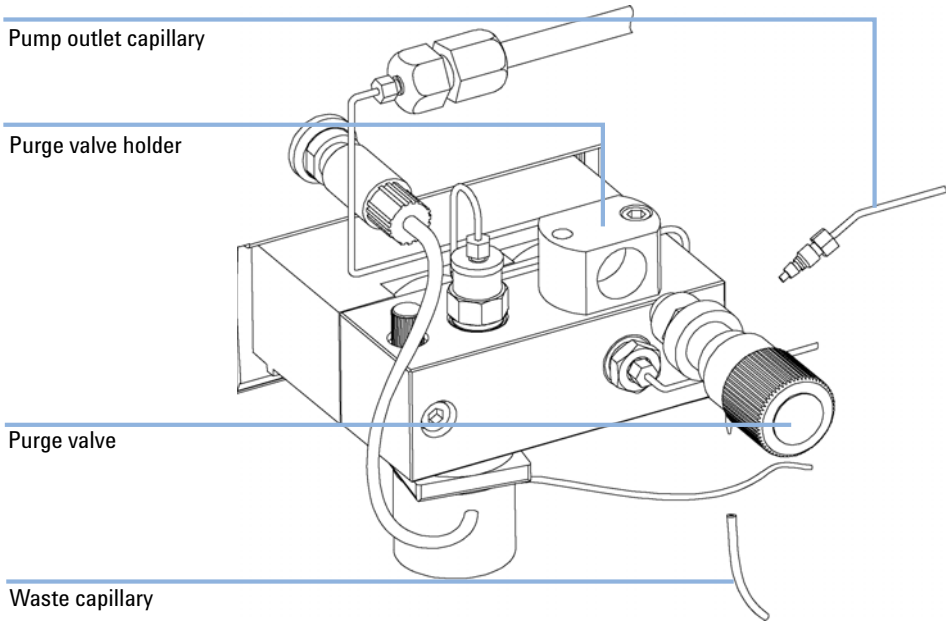


Figure 21 Exchanging the Purge Valve Frit

Exchanging the Solvent Selection Valve

When If leaking internally (croossflow between the ports), or if one of the channels is blocked

Tools required Screwdriver Pozidriv #1

Parts required

#	Part number	Description
1	G1312-60000	Solvent selection valve (PN gives half of a complete solvent selection block)

1. Disconnect the solvent tubes. Place solvent tubes into the solvent cabinet to prevent leaks due to hydrostatic flow. Disconnect the active inlet valve connection tubes from the solvent selection valves.
2. Using a Pozidriv screwdriver #1 loosen the holding screws of the valves.
3. Pull the valve module out of its connector.
4. Hold the two plastic bodies of the valves and pull the two solvent selection valves apart.
5. Exchange the defective solvent selection valve. Press the exchanged valve (new half) together with the properly working old half.
6. Connect the valve module to its electrical connectors and fix the assembly with the two holding screws.

7 Reinstall solvent tubes and the active inlet valve connection tubes

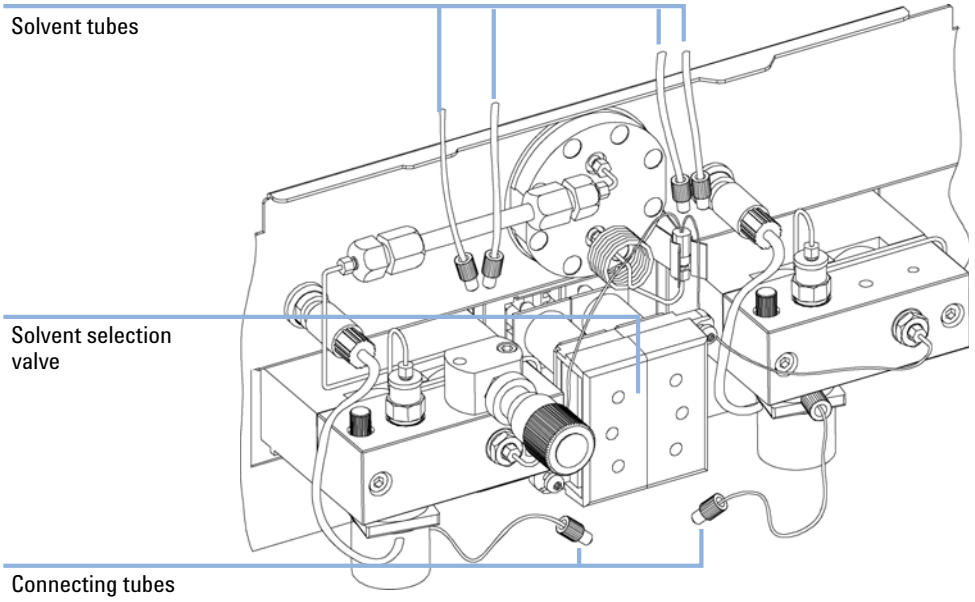


Figure 22 Exchanging the solvent selection valve

Removing the Pump Head Assembly

When
Exchanging pump seals
Exchanging plungers
Exchanging seals of the seal wash option

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

Preparations
Switch off pump at the main power switch and unplug the power cable

CAUTION
Damage of the pump drive

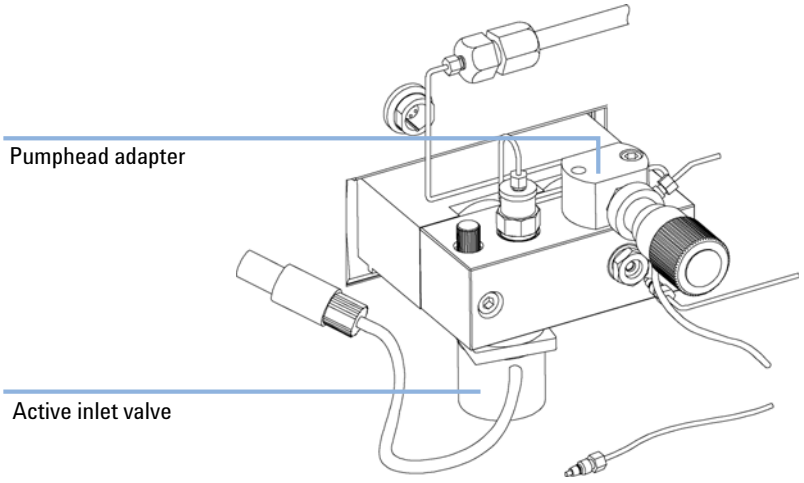
Starting the pump when the pump head is removed may damage the pump drive.

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

NOTE
Both pump head assemblies use the same internal components. In addition, pump head A is fitted with the purge valve and mixing junction. The following procedure describes the removal and disassembly of pump head A (left one). For pump head B (right one) proceed in the same way and skip steps that deal with the purge valve

1 Remove the front cover.

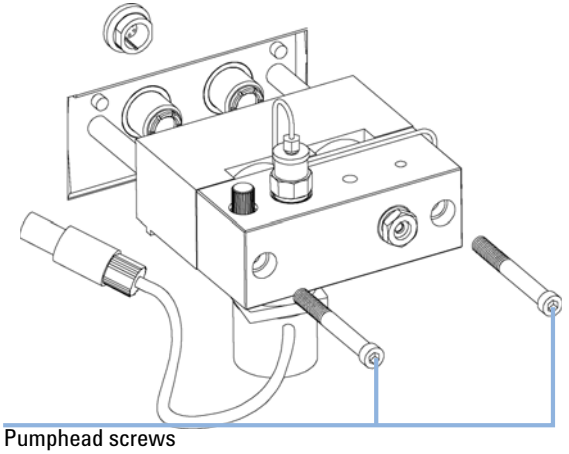
2 Disconnect the capillary at the pumphead adapter and the tube at the active inlet valve. Beware of leaking solvents



3 Using a 3-mm hexagonal key loosen the purge valve holder and lift it up.

4 Disconnect the Active Inlet Valve cable.

5 Using a 4-mm hexagonal key stepwise loosen and remove the two pump head screws.



6 Remove the pump head from the pump drive.

Exchanging the Pump Seals

When Seals leaking, if indicated by the results of the pump test (check both pump heads individually!)

Tools required
- 3-mm hexagonal key
- 4-mm hexagonal key
- 1/4 inch wrench

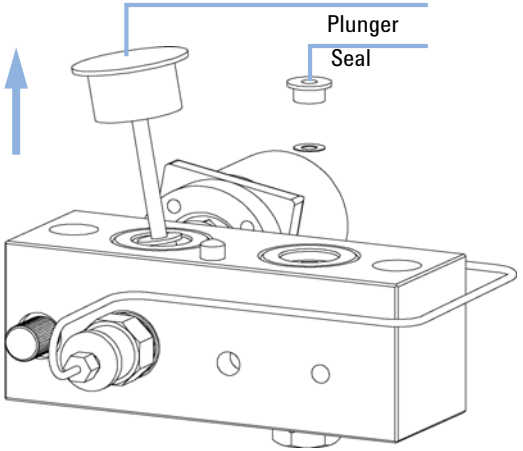
Parts required

#	Part number	Description
2	5063-6589 (standard) or 0905-1420 (for normal phase application)	Seals (pack of 2)
1	5022-2159	*For the seal wear-in procedure:* Restriction capillary

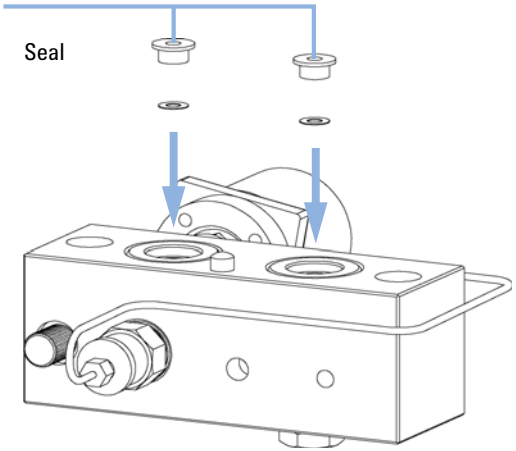
Preparations
- Switch off binary pump at power switch
- Remove the front cover to have access to the pump mechanics
- "Removing the Pump Head Assembly" on page 92

1 Disassemble the Pumphead assembly.

2 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.



3 Insert seals into the pump head and press firmly in position.



4 Reassemble the pump head assembly (see "Reinstalling the Pump Head Assembly" on page 104).

NOTE Reset the seal wear counter and liquimeter as described in the User Interface documentation.

Seal Wear-in Procedure

NOTE This procedure is required for standard seals only (5063-6589), but it will definitely damage the normal phase application seals (0905-1420).

1 Place a bottle with 100 ml of isopropanol in the solvent cabinet and place the tubing (including bottle head assembly) of the pump head that is supposed to be worn-in into the bottle.

2 Screw the adapter (0100-1847) to the AIV and connect the inlet tube from the bottle head directly to it.

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. The pressure can be monitored at your analog output signal, with the handheld controller, Chemstation or any other controlling device connected to your pump.

6 Turn OFF the pump, slowly open the purge valve to release the pressure from the system, disconnect the restriction capillary and reconnect the outlet capillary at the purge valve and the connecting tube from solvent selection valve (if installed) to the AIV.

7 Rinse your system with the solvent used for your next application.

Exchanging the Plungers

When When scratched

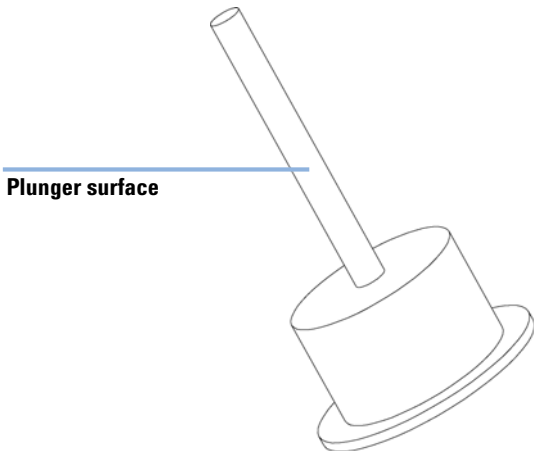
Tools required hexagonal key3-mm
4-mm hexagonal key

Parts required

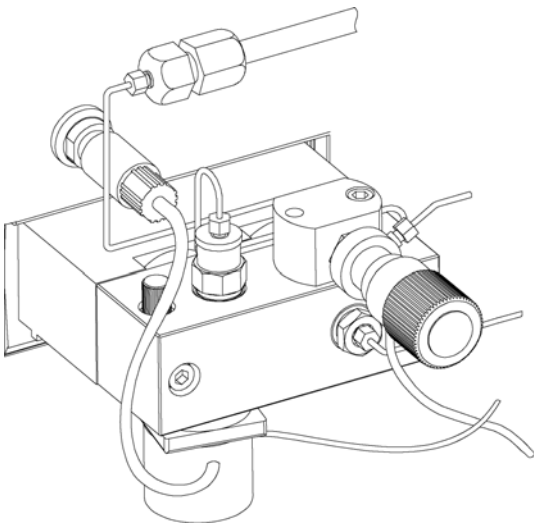
#	Part number	Description
1	5063-6586	Plunger

Preparations
- Switch off binary pump at power switch
- Remove the front cover to have access to the pump mechanics
- "Removing the Pump Head Assembly" on page 92

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



2 Reassemble the pump head assembly (see "Reinstalling the Pump Head Assembly" on page 104).



Installing the Active Seal Wash Option

When When installing seal wash option

Tools required
- 4-mm hexagonal key
- Screwdriver Pozidrive #1

Parts required

#	Part number	Description
1	G1311-68711	Active Seal Wash Option kit (Isocratic or Quaternary pump)
1	G1312-68711	Active Seal Wash Option kit (Binary pump)

Preparations
- Switch off the pump at the main power switch
- Remove the front cover
- Remove the top cover and foam

1 By using a screwdriver remove the metal plug in the z-panel.

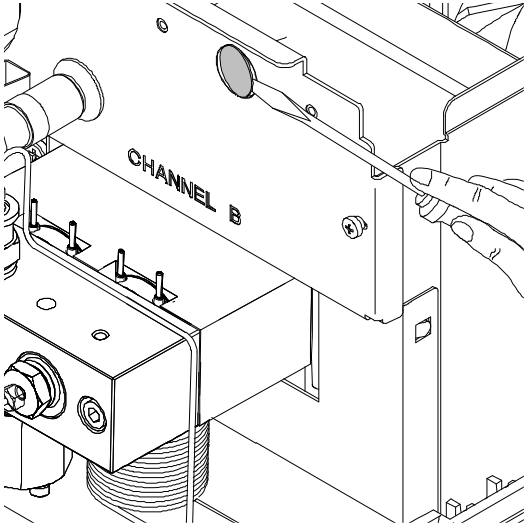


Figure 23 Removing the metal plug from the z-panel

2 Insert the socket, delivered with the Seal Wash pump assembly, into the hole on the z-panel.

3 Guide the wire of the active seal wash assembly through the hole and screw it onto the z-panel.

4 Guide the wire over the fan and plug the connector onto the mainboard connector P7.

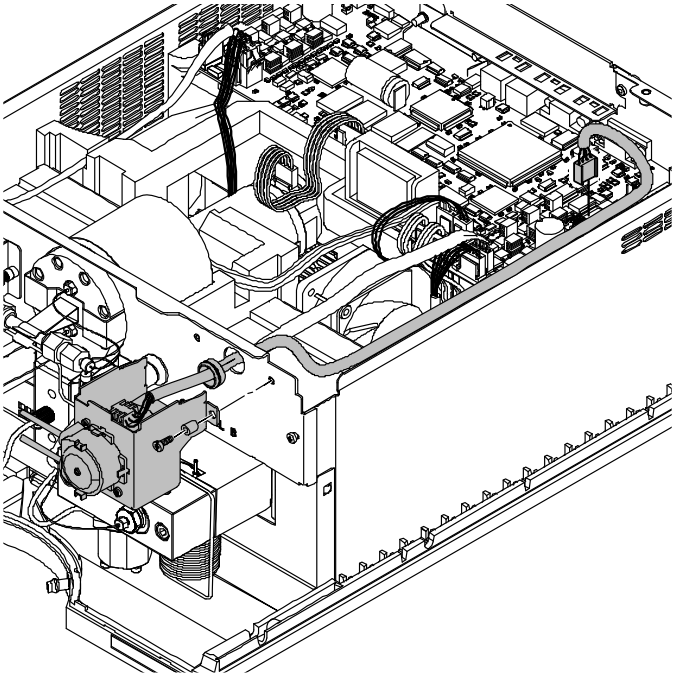


Figure 24 Wire connected to the mainboard.

5 Replace the foam and top cover.

6 Disconnect all capillaries and tubes from the pump head and disconnect the active inlet valve cable.

7 Using a 4-mm hexagonal key stepwise loosen and remove the two pump head screws and remove the pump head from the pump drive

8 Place the pump head, on the backside of the plungerhousing, 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.

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

10 Install the support ring assembly from the active seal wash option kit into the plunger housing.

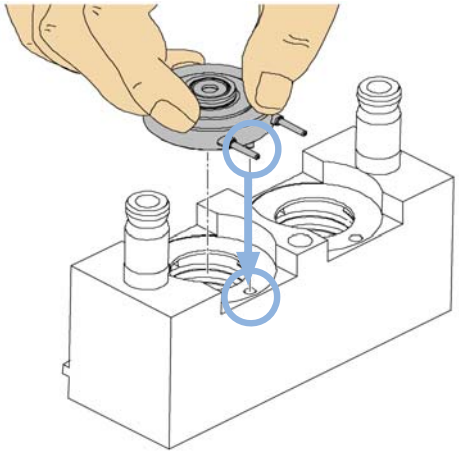


Figure 25 Inserting the active seal wash support rings.

11 Place the support rings on the plunger housing (plungers not installed) and snap the pump head and plunger housing together.

12 Insert the plungers and carefully press them into the seal.

13 Tighten the lock screw.

14 Slide the pump head assembly onto the metering drive. Apply a small amount of pump head grease (part number 79846-65501) to the pumphead screws and the balls of the spindle drive. Tighten the pumphead screws stepwise with increasing torque

15 Reconnect all capillaries, tubes and the active inlet valve cable to its connector.

16 Route the wash inlet tube into a bottle filled with a mixture of distilled water and isopropanol (90/10) and place the bottle above the pump in the solvent cabinet.

17 Route the outlet of the wash tube into a waste container.

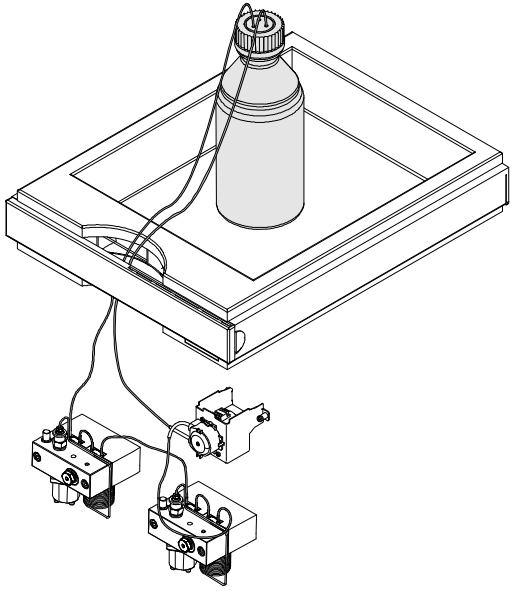


Figure 26 Pumphead after completed installation.

Exchanging the Wash Seals

When If leaking

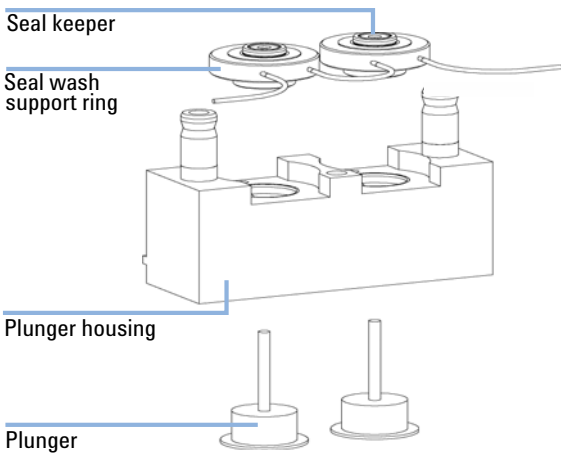
Tools required
- hexagonal key3-mm
- 4-mm hexagonal key
- Insert tool
- Small flat-head screwdriver

Parts required

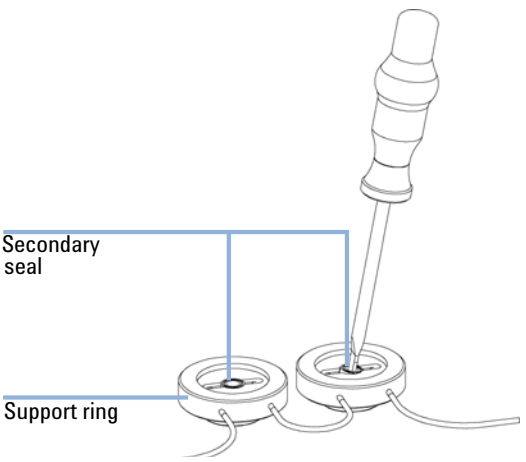
#	Part number	Description
1	0905-1175	Wash seal
6	5062-2484	Gasket, seal wash (pack of 6)

Preparations
- Switch off binary pump at power switch
- Remove the front cover to have access to the pump mechanics "Removing the Pump Head Assembly" on page 92

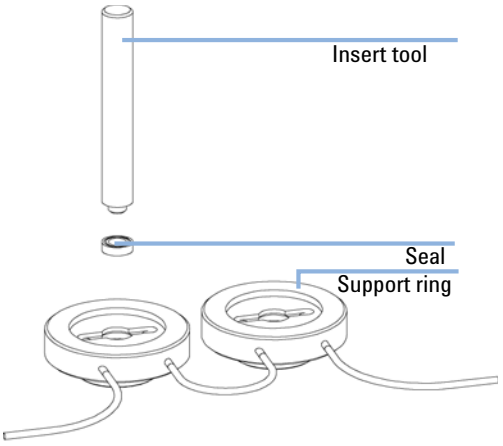
1 Remove the seal keeper and the seal wash support rings from the plunger housing. Remove the seal keeper from the support ring assembly.



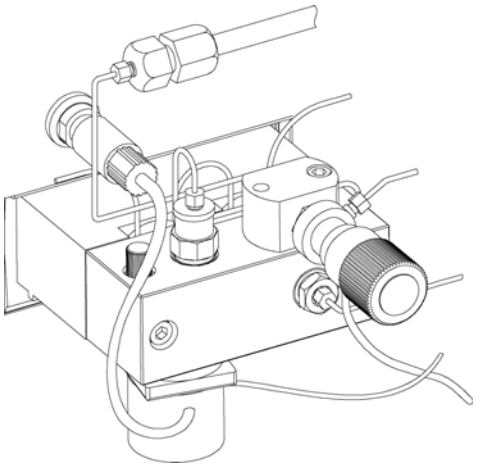
2 Using the blade of a flat head screwdriver remove seal wash gasket and the secondary seal from the support ring.



3 Using the insert tool press the seal (spring pointing upwards) into the recess of the support ring. Place a seal wash gasket in the recess of the support ring and replace the seal keeper.



4 Reassemble the pump head assembly (see "Reinstalling the Pump Head Assembly" on page 104).



Reinstalling the Pump Head Assembly

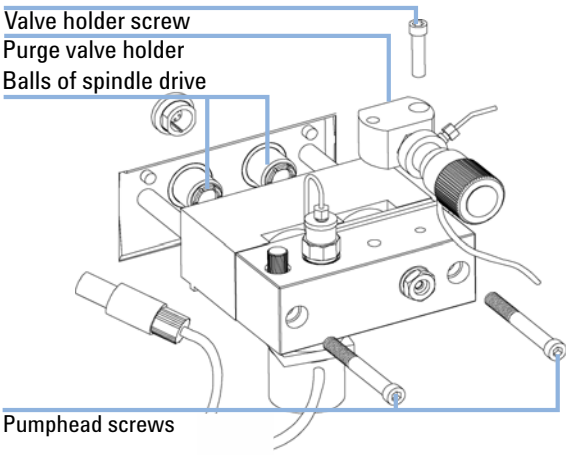
When When reassembling the pump

Tools required
- 3-mm hexagonal key
- 4-mm hexagonal key

Parts required

#	Description
79841-65501	PTFE lubricant

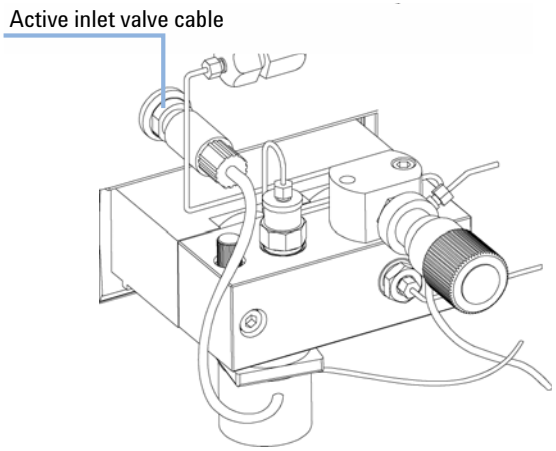
1 Slide the pump head assembly onto the pump drive.



2 Using a 4 mm hexagonal key tighten the pumphead screws stepwise with increasing torque.

3 Using a 3 mm hexagonal key fix the purge valve holder to the pump head.

4 Reconnect the capillaries, tubing and the active inlet valve cable to the connector.



Exchanging the Optional Interface Board

When Board defective

Parts required

#	Description
1	BCD (Interface) board, see BCD / External Contact Board in the Service Manual

CAUTION Electronic boards are static sensitive and should be handled with care so as not to damage them. Touching electronic boards and components can cause electrostatic discharge (ESD).

ESD can damage electronic boards and components.

➔ Be sure to hold the board by the edges and do not touch the electrical components. Always use an ESD protection (for example, an ESD wrist strap) when handling electronic boards and components.

1. Switch OFF the module at the main power switch. Unplug the module from main power.
2. Disconnect cables from the interface board connectors.
3. Loosen the screws. Slide out the interface board from the module.
4. Install the new interface board. Secure screws.
5. Reconnect the cables to the board connector.

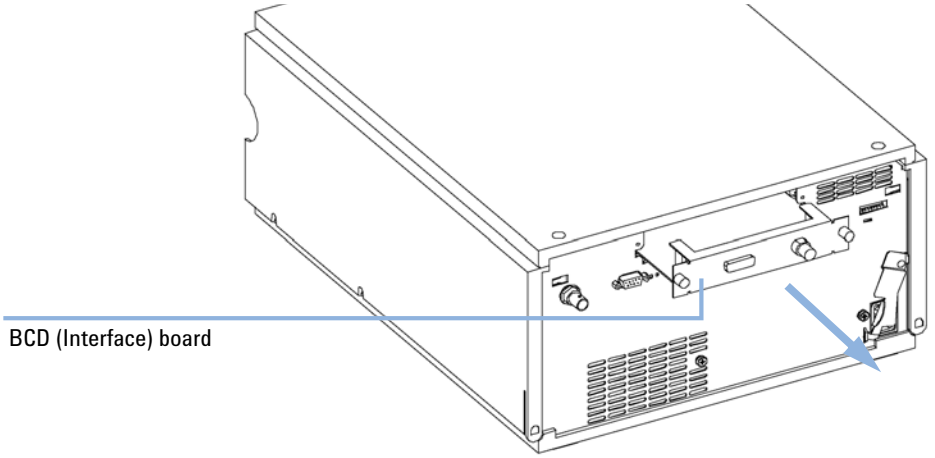


Figure 27 Exchanging the Interface Board

Replacing the Module's Firmware

When

The installation of newer firmware might be necessary
- if a newer version solves problems of older versions or
- to keep all systems on the same (validated) revision.

The installation of older firmware might be necessary
- to keep all systems on the same (validated) revision or
- if a new module with newer firmware is added to a system or
- if third part control software requires a special version.

Tools required

- LAN/RS-232 Firmware Update Tool or
- Agilent Lab Monitor & Diagnostic Software (LMD)
- Instant Pilot G4208A (only if supported by module)
- Control Module G1323B (only if supported by module)

Parts required

Description
Firmware, tools and documentation from Agilent web site

Preparations

Read update documentation provided with the Firmware Update Tool.

To upgrade/downgrade the module's firmware the following steps have to be performed:

1 Download the required module firmware, the latest LAN/RS-232 FW Update Tool and the documentation from the Agilent web.
   - http://www.chem.agilent.com/scripts/cag_firmware.asp.

2 Load the firmware into the module as described in the documentation.

NOTE The G1312B Binary-SL requires firmware revision A.06.02 or above (main and resident).

NOTE Due to a different hardware platform, there is no way to convert a G1314D VWD and the G1314E VWD SL Plus to a G1314A/B VWD or G1314C VWD SL.

8
Parts and Materials for Maintenance

Parts and Materials

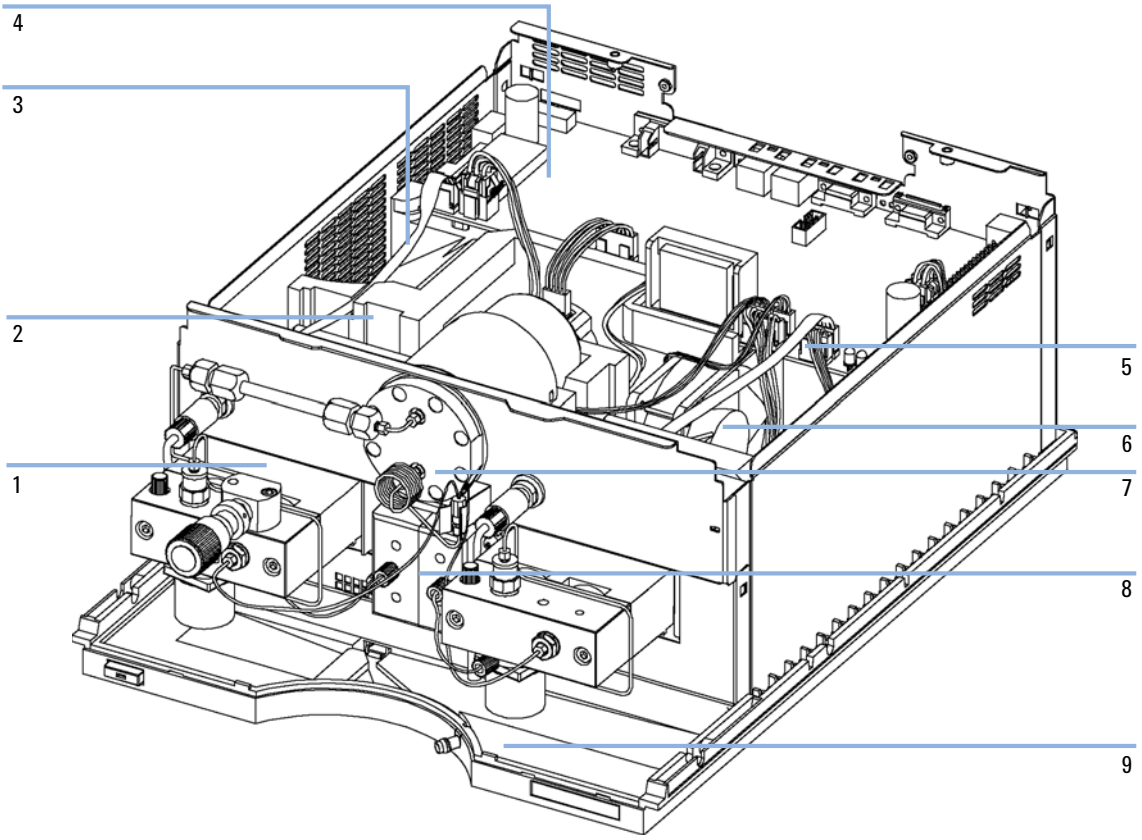


Figure 28 Overview of Main Assemblies (Front View)

Table 10 Repair Parts — Pump Housing and Main Assemblies (Front View)

Item	Description	Part Number
1	Pump head, see "Pump-Head Assembly" on page 114	**G1311-60004**
2	Pump drive assembly Exchange assembly — pump drive	**G1311-60001** **G1311-69001**
3	Cable assembly — AIV to main board	**G1311-61601**
4	High-pressure pump main board (HPM) Exchange assembly — HPM board	**G1312-66520** **G1312-69520**
5	Cable assembly — solvent selection valve	**G1312-61602**
6	Fan assembly	**3160-1017**
7	Damping unit	**79835-60005**
8	Solvent selection valve (half of a complete valve Screw, solvent selection valve	**G1312-60000** **5022-2112**
9	Leak pan - pump	**5042-8590**

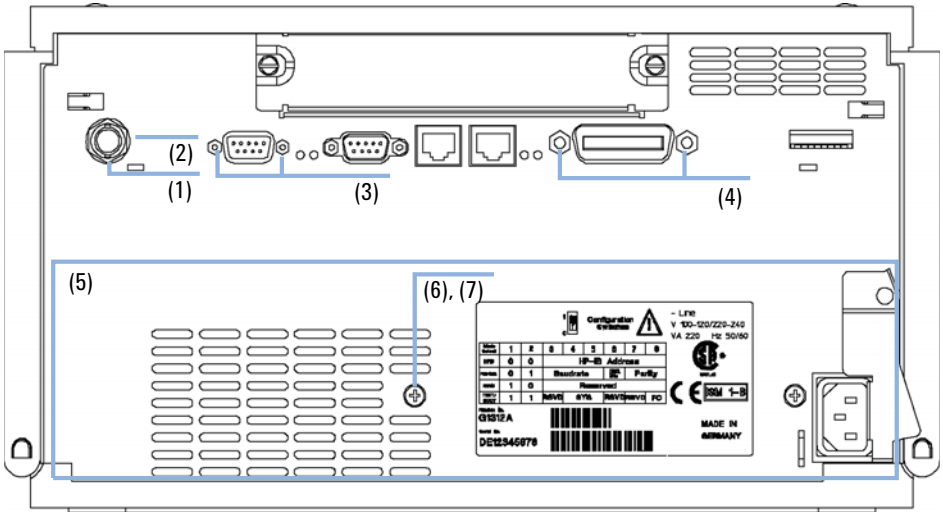


Figure 29 Overview of Main Assemblies (Rear View)

Table 11 Repair rear panel and connectors

Item	Description	Part Number
1	Nut M14 — analog output	**2940-0256**
2	Washer — analog output	**2190-0699**
3	Standoff — remote connector	**1251-7788**
4	Standoff — GPIB connector	**0380-0643**
5	Power supply (behind rear panel)	**0950-2528**
6	Screw, M4, 7 mm lg — power supply	**0515-0910**
7	Washer — power supply	**2190-0409**

Pump-Head Assembly

Table 12 Pump-Head Assembly

Item	Description	Part Number
	Complete assembly, included items marked with (*)	**G1311-60004**
1*	Sapphire plunger	**5063-6586**
2*	Plunger housing (including springs)	**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	Capillary outlet valve to piston 2	**G1312-67300**
6*	Pump chamber housing	**G1311-25200**
7	Active inlet valve body Replacement cartridge for active inlet valve (400 bar)	**G1312-60025** **5062-8562**
8*	Screw M4 — purge valve holder	**0515-0175**
9	Purge valve holder	**G1312-23200**
10	Outlet ball valve	**G1312-60012**
11*	Screw lock	**5042-1303**
12	Apdater	**G1312-23201**
13	Purge valve assembly	**G1311-60009**
14*	Screw M5, 60 mm lg	**0515-2118**

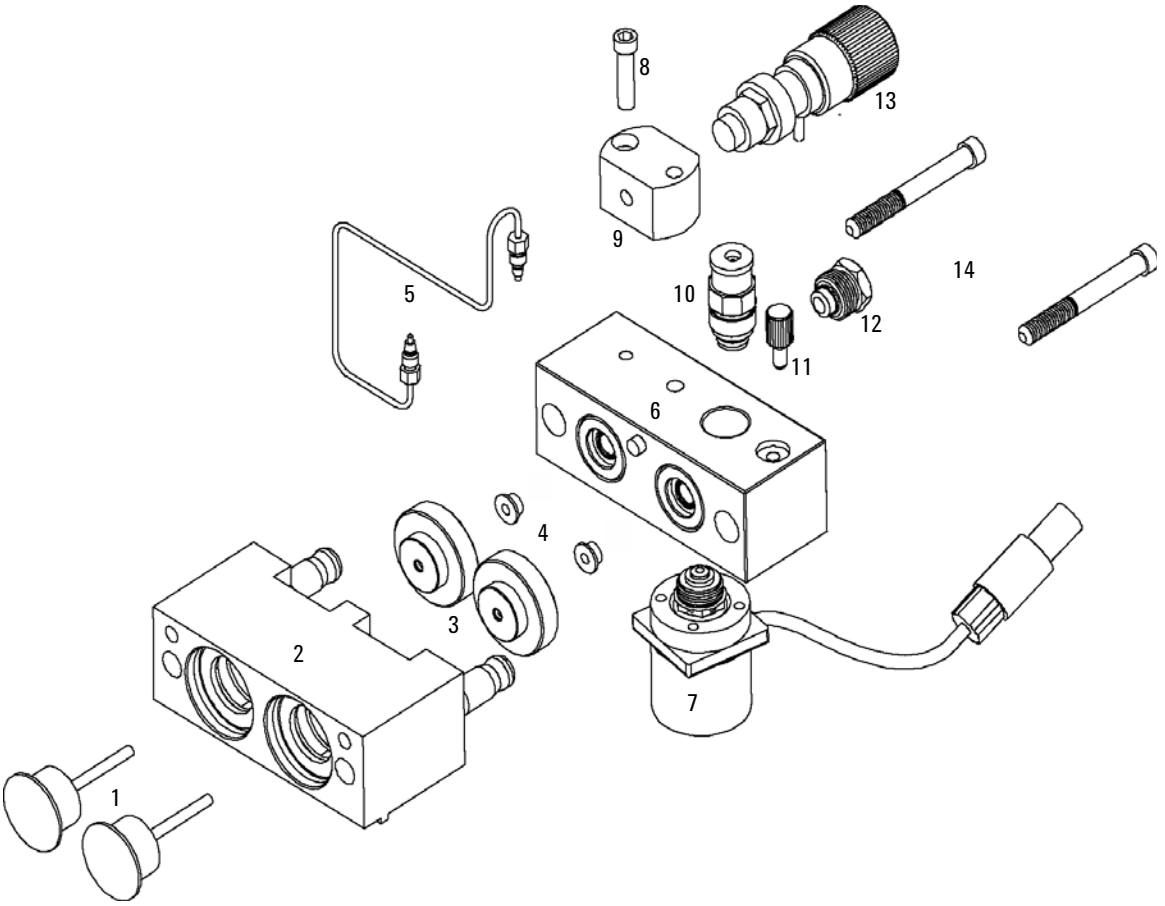


Figure 30 Pump-Head Assembly

Pump-Head Assembly with Seal Wash

Table 13 Pump-Head Assembly with Seal Wash

Item	Description	Part Number
	Complete assembly, included items marked with (*)	**G1311-60005**
1*	Sapphire plunger	**5063-6586**
2*	Plunger housing (including springs)	**G1311-60002**
3*	Support ring, seal wash	**5062-2465**
4	Secondary seal	**0905-1175**
5	Wash tube (1.0 m)	**0890-1764**
6	Gasket, seal wash (pack of 6)	**5062-2484**
7	Seal keeper (pack of 2)	**5001-3743**
8*	Seal (pack of 2) or Seal (pack of 2), for normal phase applications (optional)	**5063-6589** **0905-1420**
9	Capillary outlet valve to piston 2	**G1312-67300**
10*	Pump chamber housing	**G1311-25200**
11	Active inlet valve body Replacement cartridge for active inlet valve (400 bar)	**G1312-60025** **5062-8562**
12*	Screw, purge-valve holder	**0515-0175**
13	Purge-valve holder	**G1312-23200**
14	Outlet ball valve	**G1312-60012**
15*	Screw lock	**5042-1303**
16	Apdater	**G1312-23201**
17	Purge-valve assembly	**G1311-60009**
18	Screw M5 60 mm lg	**0515-2118**
19*	Seal wash pump assembly	**5065-9953**

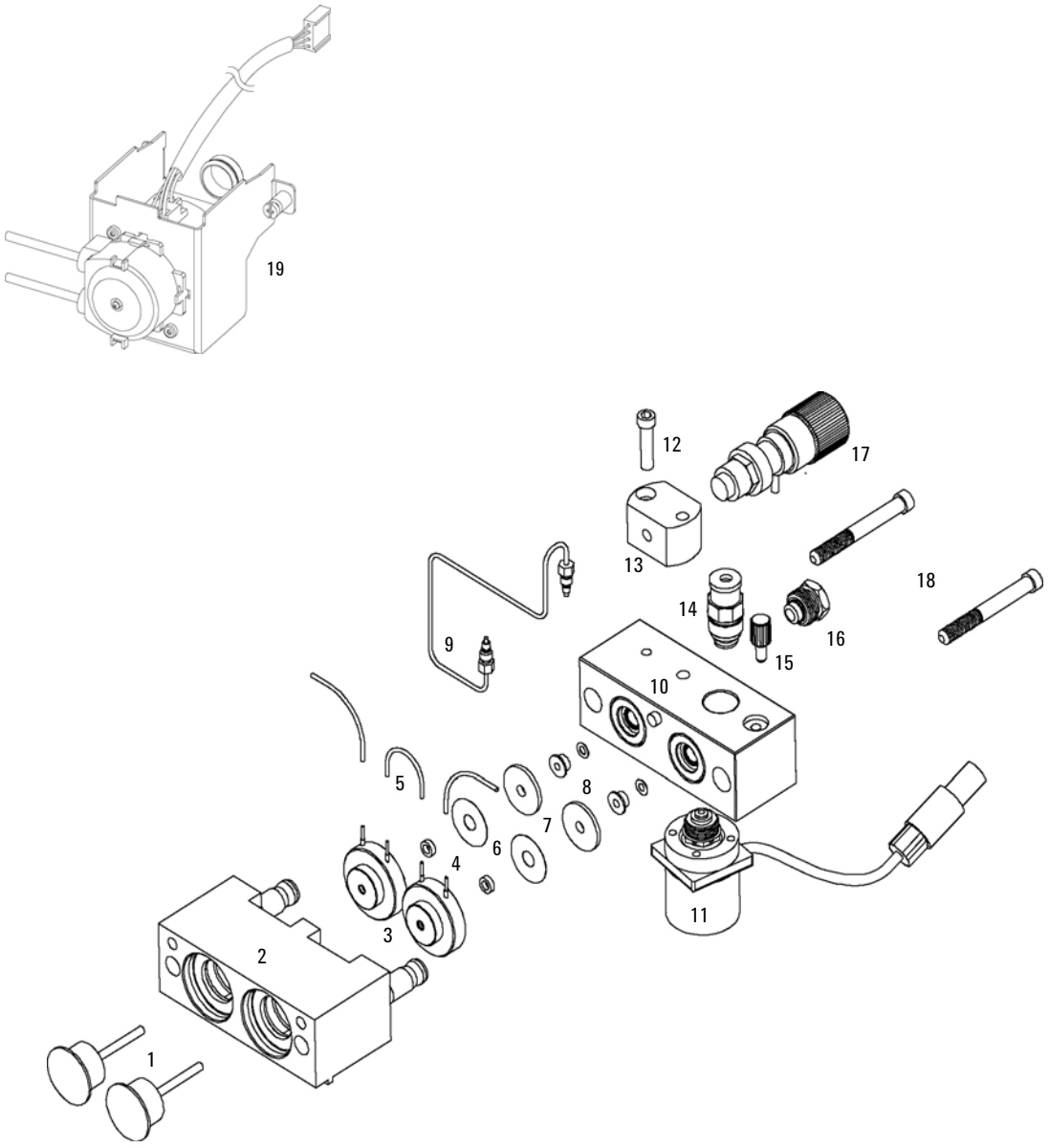


Figure 31 Pump Head Assembly with Seal Wash Option

Outlet Ball Valve Assembly

Table 14 Outlet Ball Valve Assembly

Item	Description	Part Number
	Outlet ball valve — complete assembly	**G1312-60012**
1	Socket cap	**G1312-21208**
2	Housing screw	**01018-22410**
3	Outlet valve cartridge	No part number
4	Sieve (pack of 10)	**5063-6505**
5	Gold seal, outlet	**5001-3707**
6	Cap (pack of 4, reoder number)	**5062-2485**

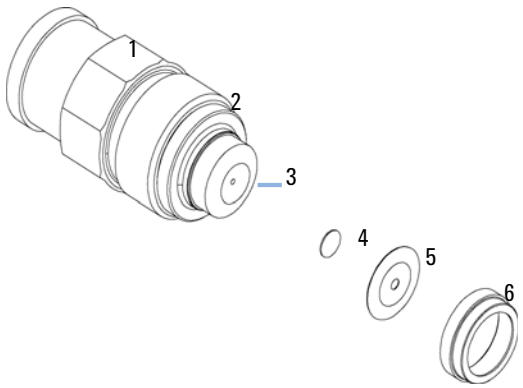


Figure 32 Outlet Ball Valve

Purge Valve Assembly

Table 15 Purge-Valve Assembly

Item	Description	Part Number
	Purge valve — complete assembly	**G1311-60009**
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**

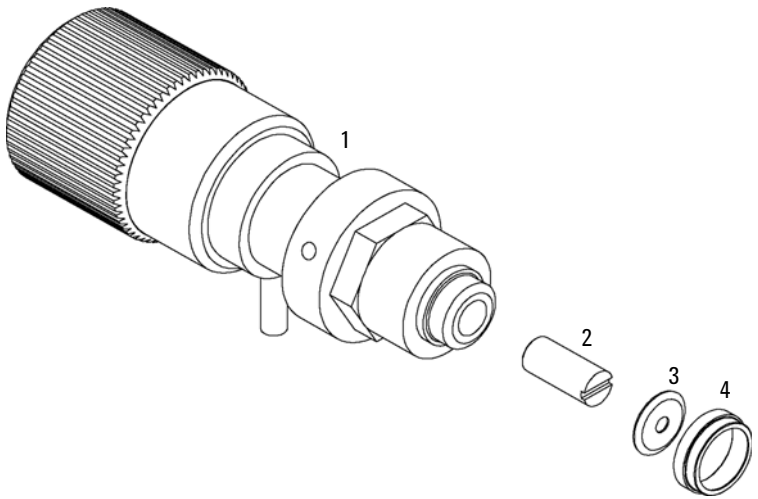


Figure 33 Purge-Valve Assembly

Active Inlet Valve Assembly

Table 16 Active Inlet Valve Assembly

Item	Description	Part Number
1	Active inlet valve body — No cartridge included	**G1312-60025**
2	Valve cartridge (400 bar)	**5062-8562**

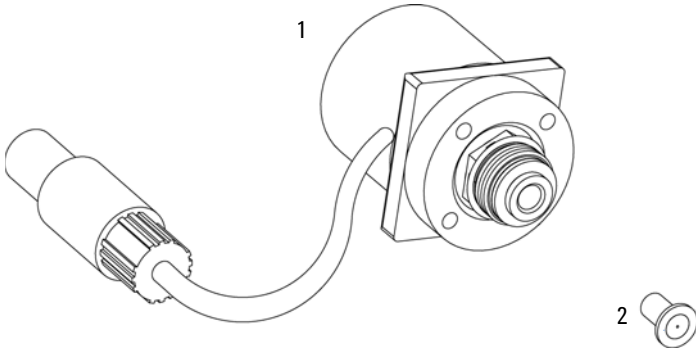


Figure 34 Active Inlet Valve Assembly

Accessory Kit G1311-68705

Table 17 Tools and Accessories

Description	Part Number
Wrench 14 mm	**8710-1924**
Seal insert tool	**01018-23702**
PTFE Frit (pack of 5)	**01018-22707**
Corrugated waste tube (1.2 m)	no PN
Corrugated waste tube (reorder number), 5 m	**5062-2463**
Velocity regulator (reorder number, pack of 3)	**5062-2486**
Hex key 4 mm	**8710-2392**
Wrench 1/4 – 5/16 inch	**8710-0510**
Capillary, pump to injection device, length 900 mm, ID 0.17 mm	**G1329-87300**

Seal Wash Option G1312-68711

Table 18 Active Seal Wash Option kit for Binary pump

Description	Part Number
Seal wash pump assembly (includes pump casette and pump motor)	**5065-9953**
Pump casette (Silicone)	**5042-8507**
Support ring, seal wash (4 EA for Binary pump)	**5062-2465**
Secondary seal (pre-installed in support rings)	**0905-1175**
Gasket, wash seal (4 EA for binary pump) (for re-order pack of 6)	**5062-2484**
Seal keeper (4 EA for binary pump)	**5001-3743**
Silicone rubber tubing 1mm I.D. (3 m)	**0890-1764**
Seal (2 packs of 2 for binary pump)	**5063-6589**
Seals insert tool	**01018-2370**

9 Appendix

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.

WARNING

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.

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.

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 whenever possible. When inevitable, this has to 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 19 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.

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 starting with 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.

NOTE

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.

Lithium Batteries Information

WARNING

Lithium batteries may not be disposed-off into the domestic waste. Transportation of discharged Lithium batteries through carriers regulated by IATA/ICAO, ADR, RID, IMDG is not allowed.

Danger of explosion if battery is incorrectly replaced.

➔ Discharged Lithium batteries shall be disposed off locally according to national waste disposal regulations for batteries.

➔ Replace only with the same or equivalent type recommended by the equipment manufacturer.

WARNING

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering.

Udskiftning må kun ske med batteri af samme fabrikat og type.

➔ Lever det brugte batteri tilbage til leverandøren.

WARNING

Lithiumbatteri - Eksplosionsfare.

Ved udskiftning benyttes kun batteri som anbefalt av apparatfabrikanten.

➔ Brukt batteri returneres appararleverandoren.

NOTE

Bij dit apparaat zijn batterijen geleverd. Wanneer deze leeg zijn, moet u ze niet weggooien maar inleveren als KCA.

Radio Interference

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

Test and Measurement

If test and measurement equipment is operated with equipment unscreened cables and/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.

Radio interference at unscreened cables

If test and measurement equipment is operated with equipment unscreened cables and/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.

Sound Emission

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

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

http://www.agilent.com

Select “**Products & Services**” - “**Life Sciences & Chemical Analysis Solutions**”

It will provide also the latest firmware of the Agilent 1200 Series modules for download.

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In This Book

This manual contains technical reference information about the Agilent 1200 Series Binary Pump. The manual describes the following:

- introduction,
- requirements,
- installation,
- configuring the pump,
- using the pump,
- optimizing performance,
- troubleshooting and diagnostics,
- maintenance
- parts and materials,
- identifying cables
- safety.

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