Agilent InfinityLab LC Series

Multisamplers

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.

In This Guide

This manual covers the following InfinityLab LC Series Multisamplers:

- Agilent 1290 Infinity II Multisampler (G7167B)
- Agilent 1260 Infinity II Multisampler (G7167A), and
- Agilent 1260 Infinity II Bio-inert Multisampler (G5668A)

1 Introduction

This chapter gives an introduction to the Multisampler.

2 Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

3 Using the Module

This chapter explains the essential operational parameters of the module.

4 Preparing the Module

This chapter explains the operational parameters of the module.

5 Optimizing Performance

This chapter gives hints on how to optimize the performance or use additional devices.

6 Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

7 Error Information

This chapter describes the meaning of error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

Contents

1
Introduction

This chapter gives an introduction to the Multisampler.

Product Description (G7167B)

The Agilent 1290 Infinity II Multisampler can handle both vials and microtiter plates with ease and efficiency up to 1300 bar system pressure, optimized on chromatographic performance.

In fact, this compact module has the capacity to house up to 6144 samples, all inside the Agilent stack footprint and the robotics to smoothly inject each into the chromatograph in turn.

With the multi-wash capability, you can reduce carryover to less than 9 parts per million.

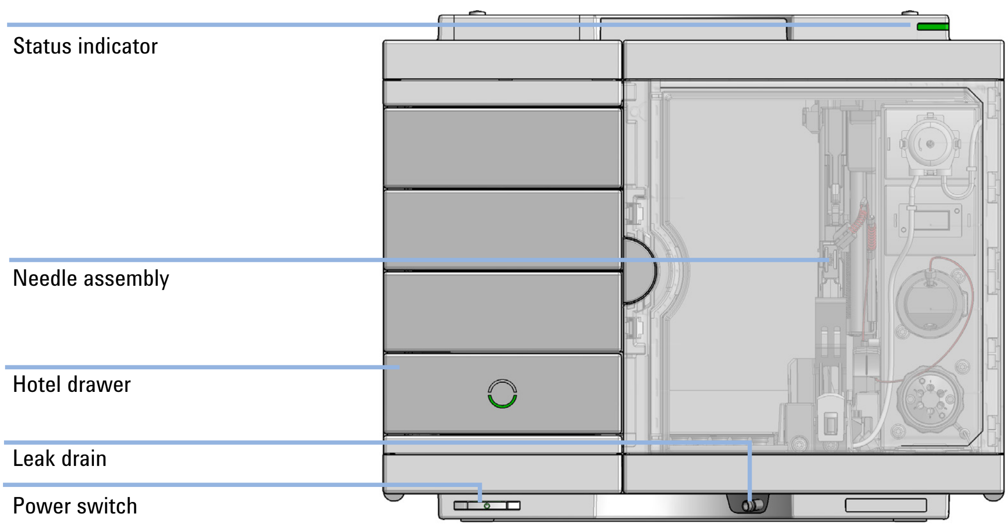


Figure 1 Overview of the Multisampler

Features (G7167B)

- *Unmatched flexibility* – You choose how you want to introduce samples for injection, whether you prefer vials, microtiter plates, or any combination of formats. Sample drawers are available in three heights, and you can mix shallow drawers with deeper ones to accommodate different sample sizes.
- *High capacity* – Using shallow well-plate drawers, the 1290 Infinity II Multisampler takes a maximum load of 16 microtiter plates and up to 6144 samples—the most of any single system.
- *Seamless automation* – Internal robotics move microtiter plates and other sample containers from the sample hotel to the central workspace for sample processing steps and injections.
- *Dual-needle injection* – By running samples alternately through one or the other injection path, you can reduce cycle times to mere seconds, virtually eliminating conventional wait times—whether for large volume loadings or flushing procedures.
- *Scalable injection volumes* – The Agilent unique dual-needle setup also enhances flexibility by providing two differently optimized injectors in a single instrument. You can, for example, optimize one path for large volume injections and the other for low delay volumes.
- *Ultralow carryover* – The 1290 Infinity II Multisampler is designed for low carryover, but you can take clean to a whole new level with our multi-wash capability, cleaning all relevant injection parts between runs. This sophisticated, integrated feature flushes the injection needle outside with three solvents, and uses seat backflush procedures to reduce carryover to less than 9 ppm.
- *Integrated sample cooler or thermostat* – available as option or upgrade, providing cooling capacity down to 4 °C (with cooler), or cooling and heating (with thermostat) in the range from 4 °C - 40 °C.
- *Instant information* – Lights on each drawer tell you all you need to know about loading status, current activity, and accessibility.

Product Description (G7167A)

The Agilent 1260 Infinity II Multisampler can handle both vials and microtiter plates with ease and efficiency up to 800 bar system pressure, optimized on high flexibility.

This compact module can house up to 6144 samples, all inside the Agilent stack footprint and the robotics to inject each into the chromatograph in turn.

With the multi-wash capability, you can reduce carryover to less than 9 parts per million.

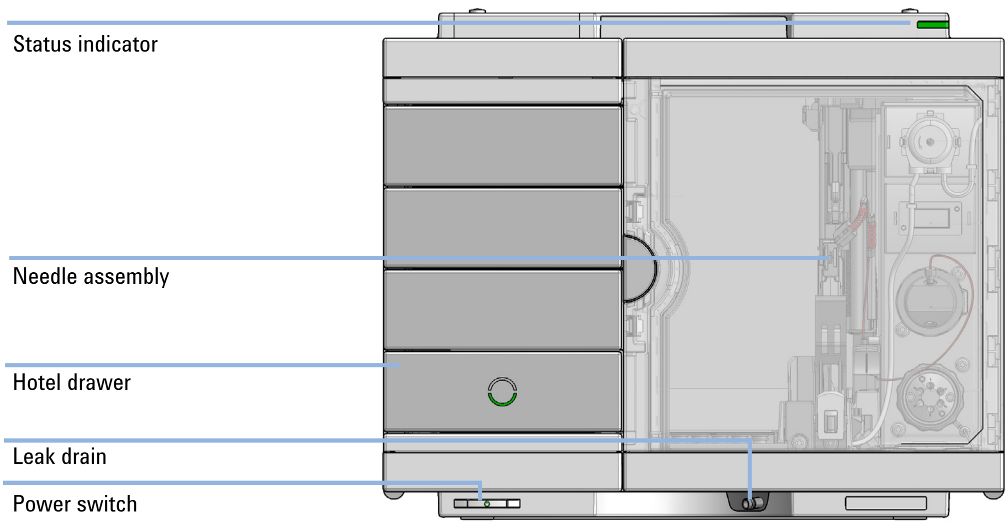


Figure 2 Overview of the Multisampler

Features (G7167A)

- *Unmatched flexibility* – You can choose how you want to introduce samples for injection, whether you prefer vials, microtiter plates, or any combination of formats. Sample drawers are available in three heights, and you can mix shallow drawers with deeper ones to accommodate different sample sizes.
- *High capacity* – Using shallow well-plate drawers, the 1260 Infinity II Multisampler takes a maximum load of 16 microtiter plates and up to 6144 samples—the most of any single system.
- *Seamless automation* – Internal robotics move microtiter plates and other sample containers from the sample hotel to the central workspace for sample processing steps and injections.
- *Dual-needle injection* – By running samples alternately through one or the other injection path, you can reduce cycle times to mere seconds, virtually eliminating conventional wait times—whether for large volume loadings or flushing procedures.
- *Scalable injection volumes* – The Agilent dual-needle setup enhances flexibility by providing two differently optimized injectors in a single instrument. You can, for example, optimize one path for large volume injections and the other for low delay volumes.
- *Ultralow carryover* – The 1260 Infinity II Multisampler has a low carryover, and a multi-wash capability, cleaning all relevant injection parts between runs. This integrated feature flushes the injection needle outside with three solvents, and uses seat backflush procedures to reduce carryover to less than 9 ppm.
- *Efficient temperature control* – For temperature-sensitive samples, add Agilent's compressor-based cooling system. It maintains temperature control on all vials and plates inserted into the 1260 Infinity II Multisampler.
- *Instant information* – Lights on each drawer tell you about loading status, current activity, and accessibility.

Product Description (G5668A)

Agilent 1260 Infinity II Bio-Inert Multisampler features a 100 % metal-free sample flow path and is therefore the ideal injector for all biorelated applications, including analysis of mAbs, proteins in general and oligonucleotides. The ceramic needle, PEEK needle seat, and stainless steel-clad PEEK capillaries ensure highest injection accuracy and precision and are rated for a maximum system pressure of 600 bar allowing the use of highest performance columns. With multiwash capability, you can reduce carryover to less than 9 ppm. This design offers highest flexibility by handling both vials and microtiter plates and can house up to 6144 samples. For temperature-sensitive samples, simply add Agilent's highly efficient compressor-based cooling system. It allows you to maintain perfect temperature control on all vials and plates inserted.

Figure 3 Overview of the Bio-inert Multisampler

Features (G5668A)

- *Reliable analysis of biological samples* – the metal-free sample flow path at 600 bar means that none of your precious sample touches metal surfaces.
- *Maintain perfect temperature control* - for temperature-sensitive samples, simply add Agilent’s new highly efficient compressor-based cooling system. It allows you to efficiently control the temperature of all vials and plates inserted into the 1260 Infinity II Multisampler.
- *Ultralow carryover* - the 1260 Infinity II Multisampler is designed for low carryover. But you can take clean to a whole new level with our multiwash capability, cleansing all relevant injection parts between runs. This sophisticated, integrated feature flushes the injection needle outside with three solvents, and uses seat backflush procedures to reduce carryover to less than 9 ppm.
- *Unmatched flexibility* - you choose how you want to introduce samples for injection, whether you prefer vials, microtiter plates, or any combination of formats. Sample drawers are available in three heights, and you can mix shallow drawers with deeper ones to accommodate different sample sizes
- *High capacity* - using shallow well-plate drawers, the 1260 Infinity II Multisampler takes a maximum load of 16 microtiter plates and up to 6144 samples. The most of any single system.
- *Seamless automation* - internal robotics move microtiter plates and other sample containers from the sample hotel to the central workspace for sample processing steps and injections.

Overview of the Module

The Multisampler transport mechanism uses a Cartesian robot. The X-Y drive together with the Z drive optimize the grabbing and positioning for the sample trays and the needle handling inside of the Multisampler. The sample coupler moves the sample container from the sample hotel which stores all the samples and place it on the central workspace. Then the needle coupler of the Z drive takes over and grabs the needle assembly from the needle station and performs the analytical procedures inside of the Multisampler. Due the uncoupled needle design, the robot can do other liquid handling jobs during the analysis.

The multisampler employs an active vial/plate pusher mechanism to hold down the vial or the plate while the needle is drawn back from the sample vessel (a must in the case a septum is used). This active vial/plate pusher employs a sensor to detect the presence of a plate and to ensure accurate movement regardless of plate used. All axes of the transport mechanism are driven by very fast BLCD motors. Optical encoders ensure the correct operation of the movement.

The standard configuration of the Multisampler uses either a 40 µL or a 100 µL metering device. With this instrument setup, it is possible to inject a maximum volume of 20 µL or 100 µL. For higher injection volumes, additional hardware modifications are required. For minimum internal carry-over, the entire injection flowpath is always flushed by the mobile phase.

In addition, you have two different possibilities to reduce the carry-over. First the external needle wash. In the Standard configuration, the needle flush station is equipped with a peristaltic pump to wash the outside of the needle. This reduces already low carry-over for very sensitive analysis. The bottle containing the mobile phase for the wash procedure will be located in the solvent bottle cabinet. Produced waste during this operation is channeled safely away through a waste drain. In the Multi-Wash configuration, the external needle wash will be done by a micro piezo pump combined with a solvent selection valve, where you can select between three different solvents. If this is not sufficient to reduce the carry over, there is an additional and perfect way to achieve the lowest carry over in the Multi-Wash configuration by using the integrated flush pump. This high-pressure pump can also select between three different solvents and is capable of reducing the carry over to a minimum by using the seat backflushing. The flush pump outlet capillary is connected to port 4 of the Multisampler's injection valve, which normally holds the waste line. If the Multisampler is in bypass mode, the flush pump connects to the needle seat and can flush backwards through the needle seat into the waste line attached to the needle seat outlet port.

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

The Cooling Control of the vial/plate temperature in the Multisampler is achieved using an additional Agilent Sample Cooler or Sample Thermostat module. The chiller unit is a micro compressor-based refrigerator. A fan draws air from the central workstation above the sample container of the Multisampler. It is then blown through the fins of the cooling module, where it is cooled according to the temperature setting. The cooled air enters the Sampler Hotel through a recess underneath the special designed base plate. The air is then distributed evenly through the Sample Hotel ensuring effective temperature control, regardless of how many sample containers are in the drawer. In cooling mode, condensation is generated on the cooled side of the Sample Cooler or Sample Thermostat. This condensed water is safely guided into a waste bottle for condensed water that is located underneath the working bench.

Standard Single Needle Setup

The movements of the Multisampler components during the sampling sequence are monitored continuously by the Multisampler processor. The processor defines specific time windows and mechanical ranges for each movement. If a specific step of the sampling sequence is not completed successfully, an error message is generated. Solvent is bypassed from the Multisampler by the injection valve during the sampling sequence. After the required sample container was automatically loaded from the sample hotel and placed on the central workspace. The Needle assembly moves via robot to the desired sample position and is lowered into the sample liquid in the sample to allow the metering device to draw up the desired volume by moving its plunger back a certain distance. The needle assembly is then raised again and moved to the needle park station onto the seat to close the sample loop. Sample is applied to the column when the injection valve returns to the mainpass position at the end of the sampling sequence.

The standard sampling sequence occurs in the following order:

1 The robot loads the required sample container on the central workspace
2 The injection valve switches to the bypass position.
3 The plunger of the metering device moves to the initialization position.
4 The robot couples into the needle assembly from the needle parkstation.
5 The robot unlocks the needle assembly and moves up.
6 The coupled needle assembly/robot moves to the desired sample vial (or well plate) position on the central workstation.
7 The needle lowers into the sample vial (or well plate).
8 The metering device draws the preset sample volume.
9 The needle lifts out of the sample vial (or well plate).
10 The coupled needle assembly/robot is then moved to the park station onto the seat to close the sample loop.
11 The needle assembly is locked into the park station and moves down.
12 The injection cycle is completed when the injection valve switches to the mainpass position.

13 The robot moves the sample container back into the sample hotel if the sampling sequence is done. If needle wash is required it will be done between step 9 and 10.

NOTE

For the needle seat backflush the Multisampler must be in bypass mode.

If an additional needle seat backflush is required this step must also be done between step 5 and 9.

Injection Sequences

Injection Sequence for single needle

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

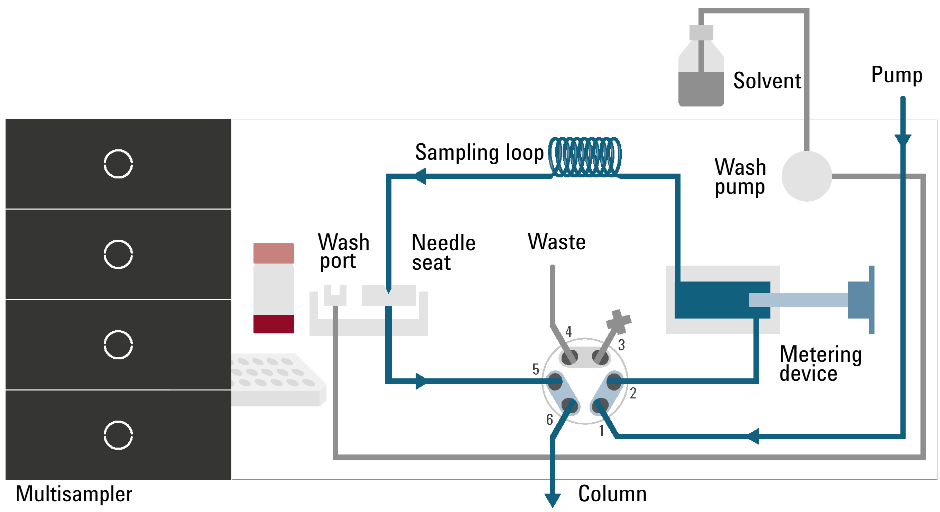


Figure 4 Valve in mainpass, flow through

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

The standard injection starts with draw sample from vial/wellplate from the central workstation. In order to do this the needle assembly moves via robot to the desired sample position and is lowered into the sample liquid in the sample to allow the metering device to draw up the desired volume by moving its plunger back a certain distance. The needle assembly is then raised again and moved to the needle park station onto the seat to close the sample loop. In case of an injector program several steps are interspersed at this point.

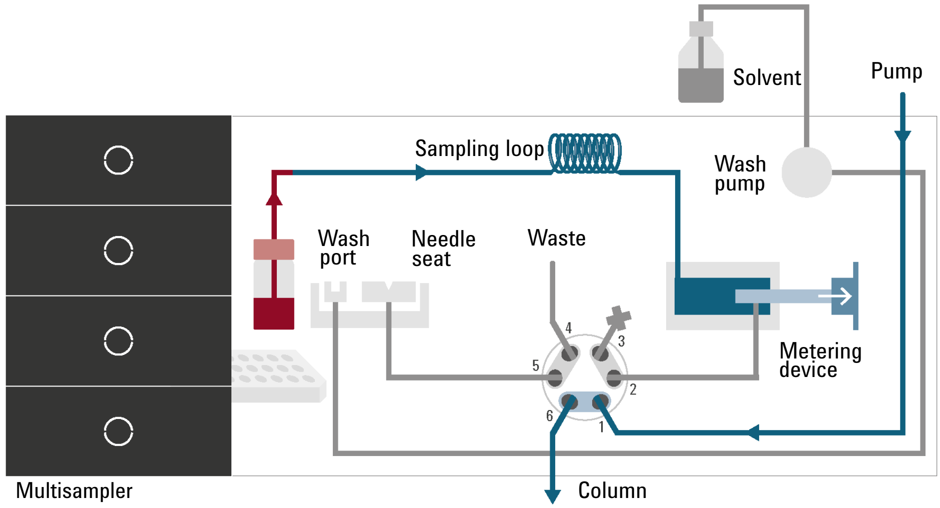


Figure 5 Valve in bypass, drawing sample

Flush the Needle

Before injection and to reduce the carry-over for very sensitive analysis, the outside of the needle can be washed in a flush port located behind the injector port. As soon as the needle is on the flush port a wash pump delivers some solvent during a defined time to clean the outside of the needle. At the end of this process the needle assembly returns to the needle port.

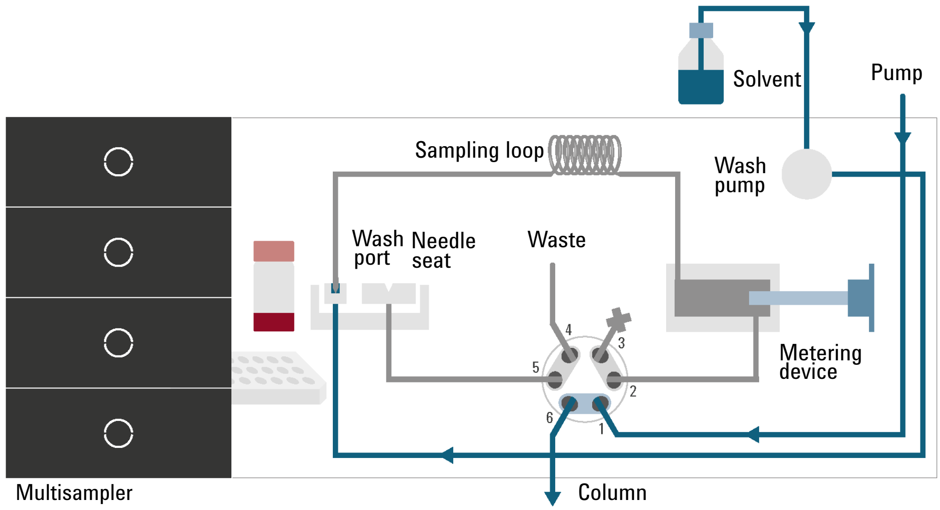


Figure 6 Valve in bypass, washing needle

Inject-and-Run

The final step is the inject- and run-step. The six-port valve is switched to the mainpass position, and directs the flow back through the sample loop, which now contains a certain amount of sample. The solvent flow transports the sample onto the column, and separation begins. This is the beginning of a run within an analysis. In this stage, all major performance-influencing hardware is flushed internally by the solvent flow. For standard applications no additional flushing procedure is required.

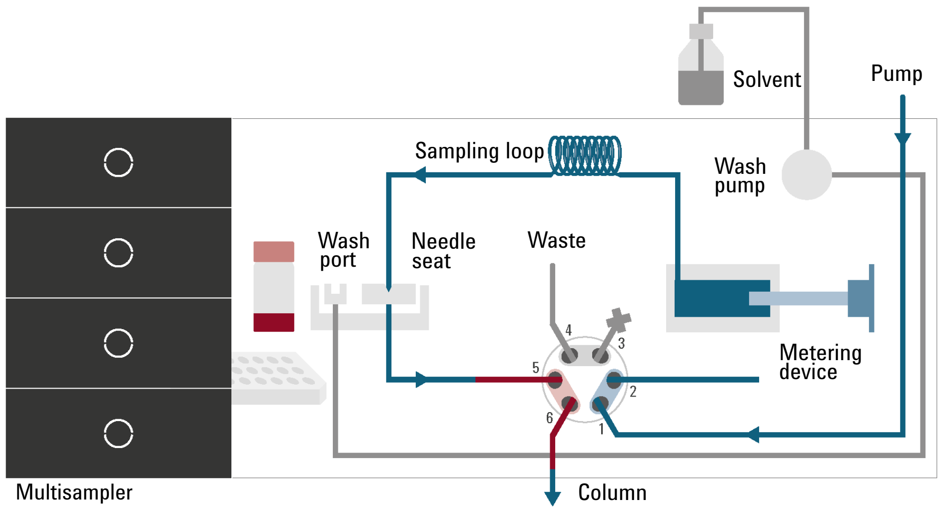


Figure 7 Valve in mainpass, sample injected

Needle seat back flush

After the injection to reduce the carry- over for very sensitive analysis, the needle seat can be flushed by an integrated flush pump with up to 3 different solvents which may have different properties and solvent strengths. As soon as injection valve is in bypass mode the flush pump delivers some solvent during a defined time to clean the needle seat. The back flushing solvent will be guided into the waste line attached on the needle wash port. At the end of this process the injection valve switches back into the mainpass position ready for the next injection. The last rinsing step should always include the mobile phase as solvent to get the initial conditions again.

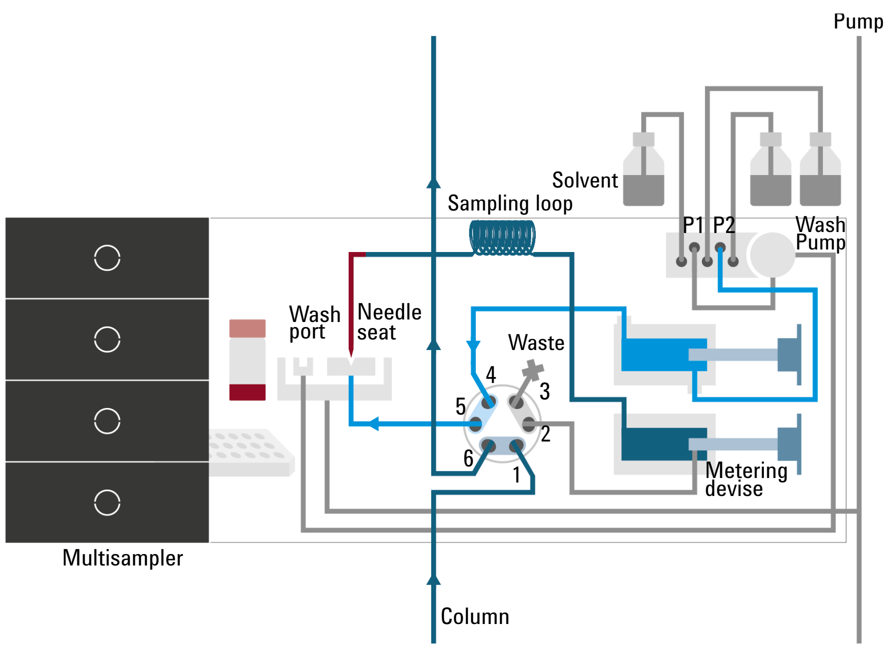


Figure 8 Valve in bypass, needle backflush (Multiwash)

Injection Sequence for dual needle (alternating mode)

Flushing the system

The Start of the pump or changes in solvent composition trigger the purge routine of the multisampler. The purge routine flushes the hydraulic setup of the multisampler with fresh mobile phase (for example metering device, sample loops, and needles). This ensures cleanness of the flowpath.

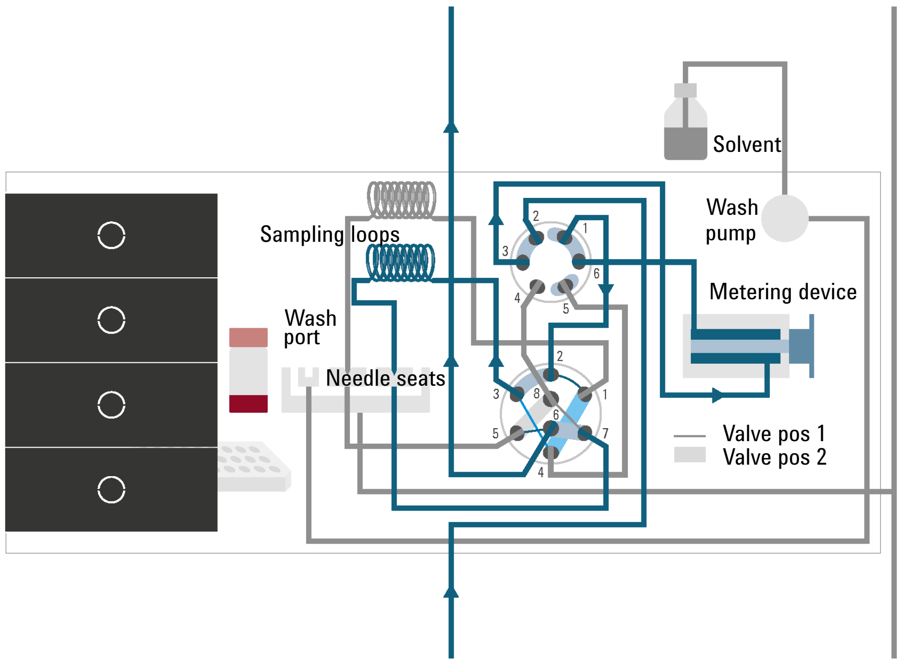


Figure 9 Valve in mainpass (right), metering device purged, and alternate dual needle injection prepared

NOTE For pumps with a manual purge valve, it is mandatory to start the purge routine before a run or sequence. This will guarantee that the complete flow path of the dual needle setup is flushed with fresh mobile phase.

The robot moves the wellplates or vial trays from the sample hotel to the central workspace. The injection valve unit switches to the mainpass (left) position. Then the sampling process starts. Solvent from the pump enters the peripheral valve at port 2, and flows through port 1 directly to the injection valve. The solvent enters the injection valve at port 2, flows via port 1 through the sample loop (left), the needle (left), the needle seat (left), port 5 and port 6 to the column.

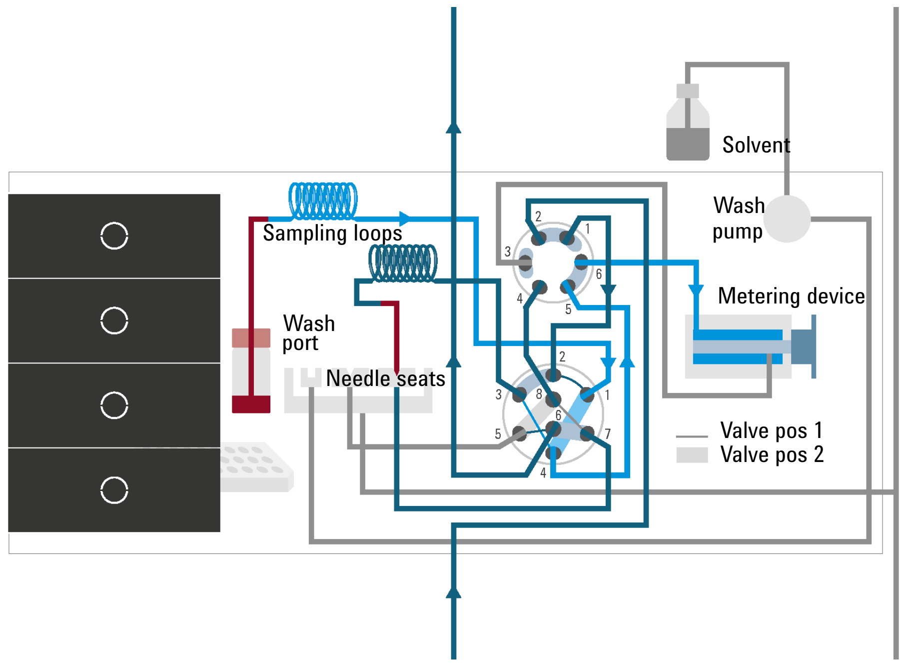


Figure 10 Valve in mainpass (right), drawing sample with left needle

Drawing sample (right)

Then the needle assembly (right) moves to the desired sample position and immerses into the sample. The plunger of the metering device moves back and draws up the desired volume. Then the needle assembly (right) raises and moves to the needle park station on the needle seat (right). This closes the sample loop (right).

Flush the Needle (if selected)

To reduce carry-over, the outside of the left or the right needle can be washed in the flush port that is located behind the needle park station. As soon as the needle is on the flush port, a wash pump flushes the outside of the needle for a defined time (defined for example in the method). After this process the needle assembly returns to the appropriate needle park station. This closes the sample loop (right).

Alternating Dual needle Inject and Run (Right needle)

The eight port valve switches to the mainpass (right) position. Now Port 2 and 3 and Port 7 and 6 of the injection valve are connected. This directs the flow through the sample loop (right) and the solvent transports the sample to the column. Separation and analysis starts. In the meantime, the flow path (right) is flushed internally by the solvent.

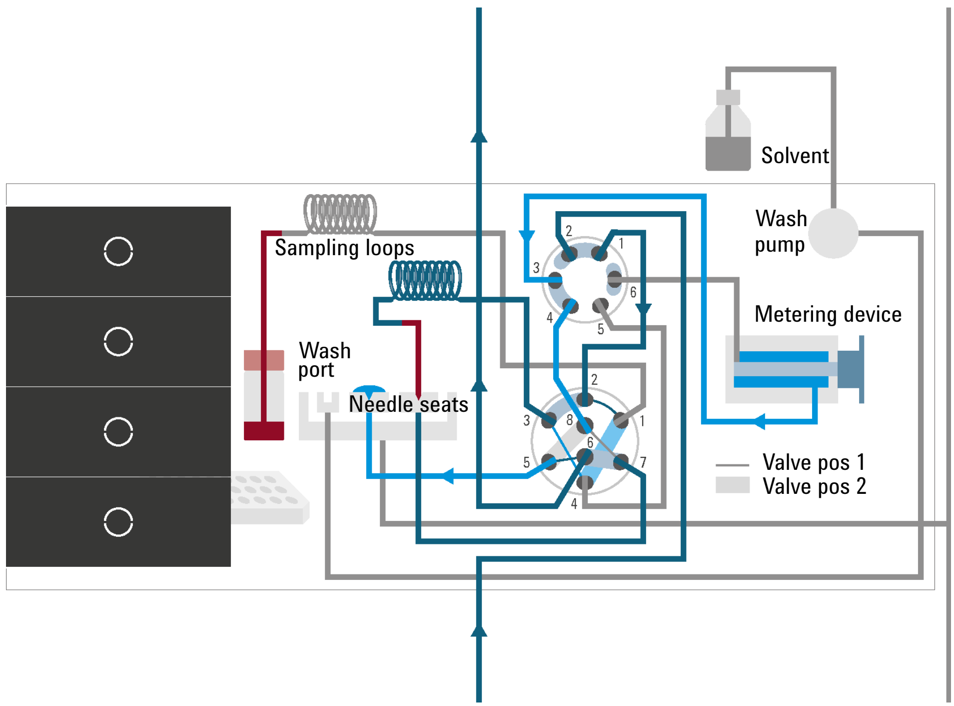


Figure 11 Valve in mainpass (right), metering home (multi-load position of the peripheral valve)

Prepare Inject and Run of the alternating dual needle (left needle)

The sample container is in the central sample work space. The robot detaches the needle assembly (left) from the needle port. The metering device drives to the home position. Then the needle assembly (left) is moved to the desired sample position and immerses into the sample. The plunger of the metering device moves back and draws up the desired volume. Then the needle assembly (left) raises and moves to the needle park station on the needle seat (left). This closes the sample loop (left).

The left needle can be flushed as the right needle, see description above.

The eight port valve switches to the mainpass (left) position. Now Port 2 and 1 and Port 5 and 6 of the injection valve are connected. This directs the flow through the sample loop (left) and the solvent transports the sample to the column. Separation and analysis starts. In the meantime, the flow path (left) is flushed internally by the solvent.

The alternating flush and injection cycles minimize injection cycle times and ensure maximal cleanness of the hardware.

Multi-load with Dual needle (left needle)

In the multi-load mode, the peripheral valve switches in different positions while the plunger of the metering device moves back and forward. At the same time, the needle remains in the sample vial or well. That way the multi-load technique allows to draw multiple times and inject large sample volumes. This multi-load technique is completely different from the multi-draw technique that is used in other autosamplers.

Injection Sequence for dual needle (bypass mode)

This corresponds to the injection sequence for single needles, see "Injection Sequence for single needle" on page 23. Only one flow path is used on a regular basis, and a defined bypass capillary replaces either the left or the right dual needle sample loop. This bypass capillary shortcuts one path to allow faster reconditioning.

System Overview

Leak and Waste Handling

The Agilent InfinityLab LC Series has been designed for safe leak and waste handling. It is important that all security concepts are understood and instructions are carefully followed.

The solvent cabinet is designed to store a maximum volume of 8 L solvent. The maximum volume for an individual bottle stored in the solvent cabinet should not exceed 2 L. For details, see the usage guideline for the Agilent Infinity II Solvent Cabinets (a printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available on the Internet).

All leak plane outlets are situated in a consistent position so that all Infinity and Infinity II modules can be stacked on top of each other. Waste tubes are guided through a channel on the right hand side of the instrument, keeping the front access clear from tubes.

The leak plane provides leak management by catching all internal liquid leaks, guiding them to the leak sensor for leak detection, and passing them on to the next module below, if the leak sensor fails. The leak sensor in the leak plane stops the running system as soon as the leak detection level is reached.

Solvent and condensate is guided through the waste channel into the waste container:

- from the detector's flow cell outlet
- from the Multisampler needle wash port
- from the Sample Cooler or Sample Thermostat (condensate)
- from the Seal Wash Sensor (if applicable)
- from the pump's Purge Valve or Multipurpose Valve

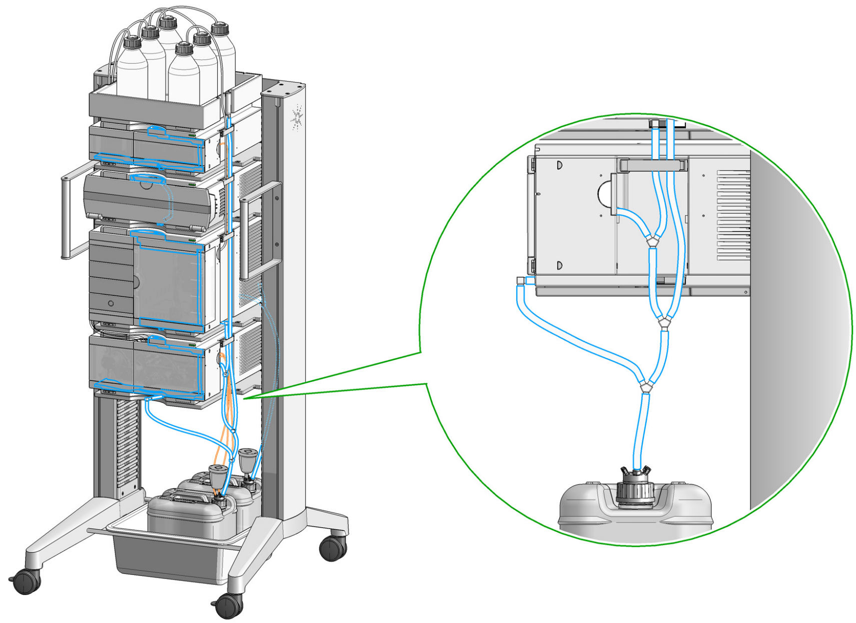


Figure 12 Infinity II Leak Waste Concept (Flex Bench installation)

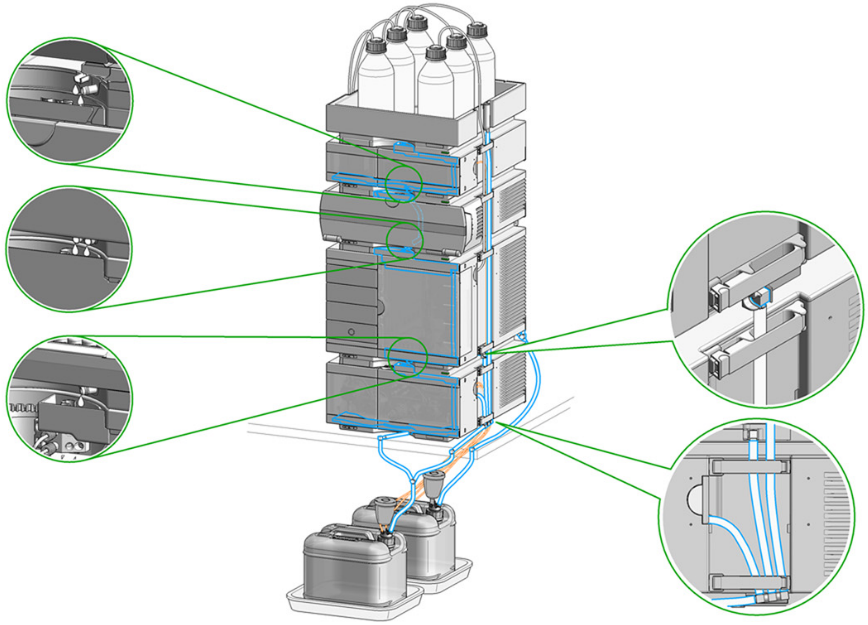


Figure 13 Infinity II Single Stack Leak Waste Concept (bench installation)

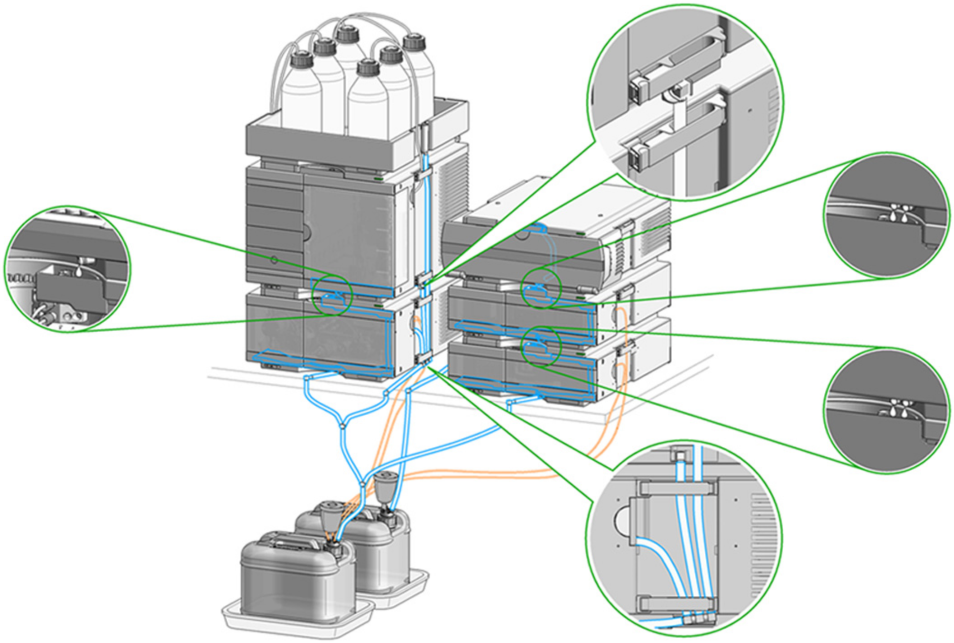


Figure 14 Infinity II Two Stack Leak Waste Concept (bench installation)

The waste tube connected to the leak pan outlet on each of the bottom instruments guides the solvent to a suitable waste container.

Leak Sensor

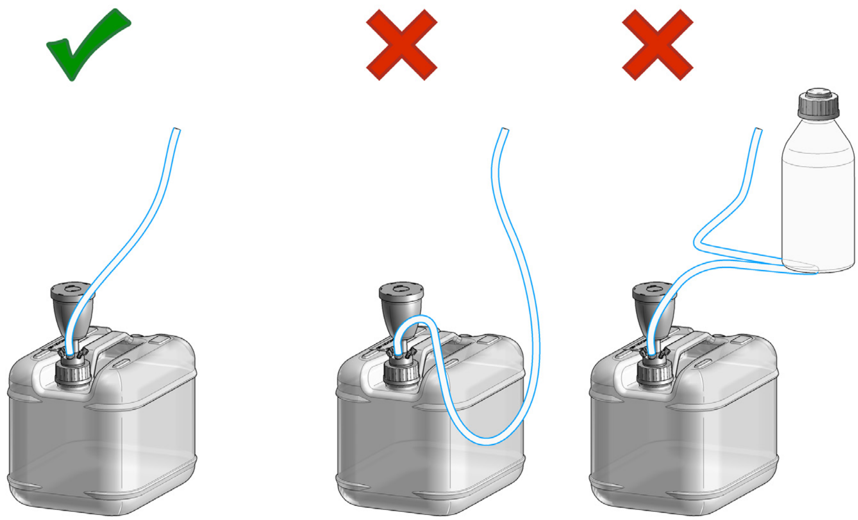
CAUTION

Solvent incompatibility

The solvent DMF (dimethyl formamide) leads to corrosion of the leak sensor. The material of the leak sensor, PVDF (polyvinylidene fluoride), is incompatible with DMF.

→ Do not use DMF.

Waste Guidance



NOTE The waste drainage must go straight into the waste containers. The waste flow must not be restricted at bends or joints.

Waste Concept

1 Agilent recommends using the 6 L waste can with 1 Stay Safe cap GL45 with 4 ports (5043-1221) for optimal and safe waste disposal. If you decide to use your own waste solution, make sure that the tubes don't immerse in the liquid.

Leak and Waste Handling in a Mixed Configuration

Leak and Waste Handling in a Mixed Configuration

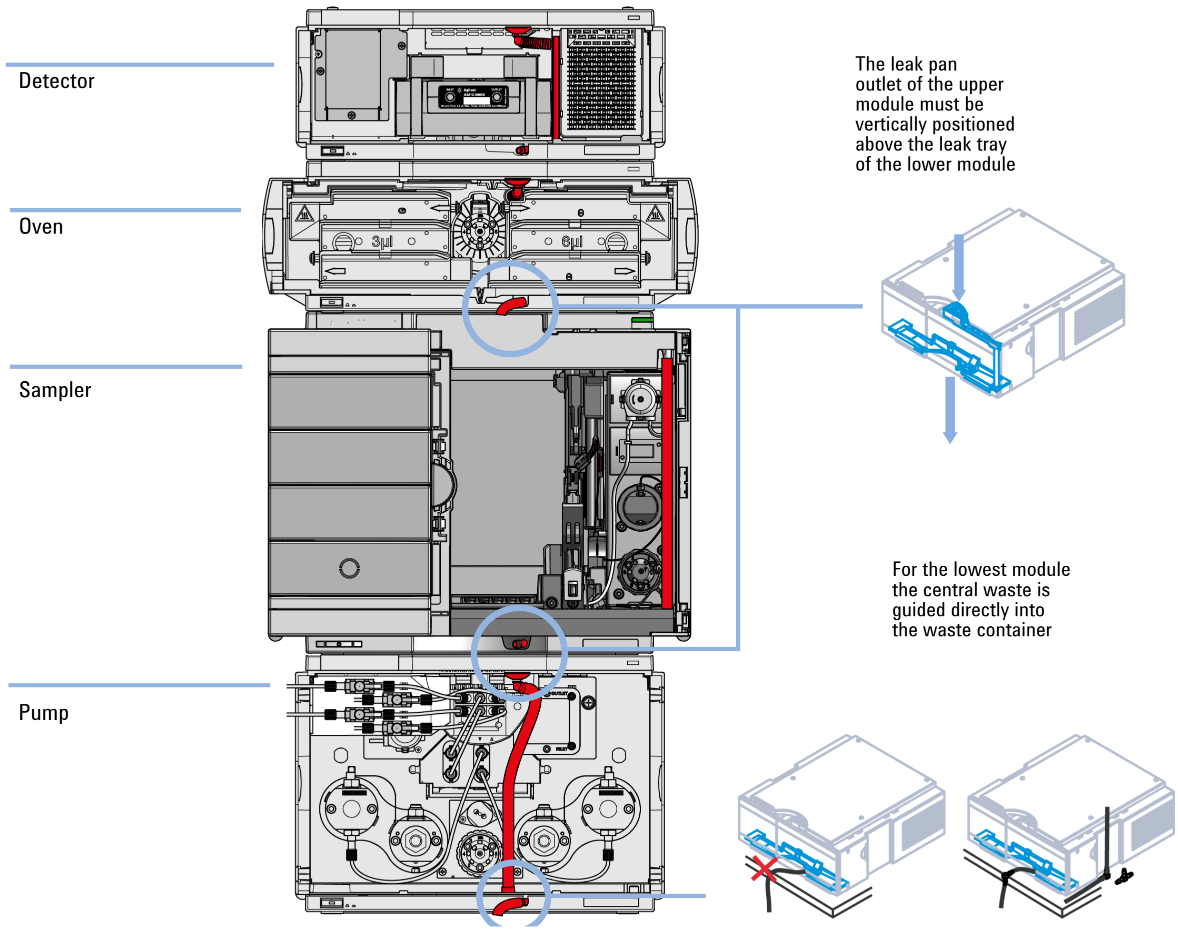


Figure 15 Leak and waste handling with multisampler in a mixed configuration as an example

NOTE Flush solvent from the washport of the multisampler is guided out to the right of the instrument.

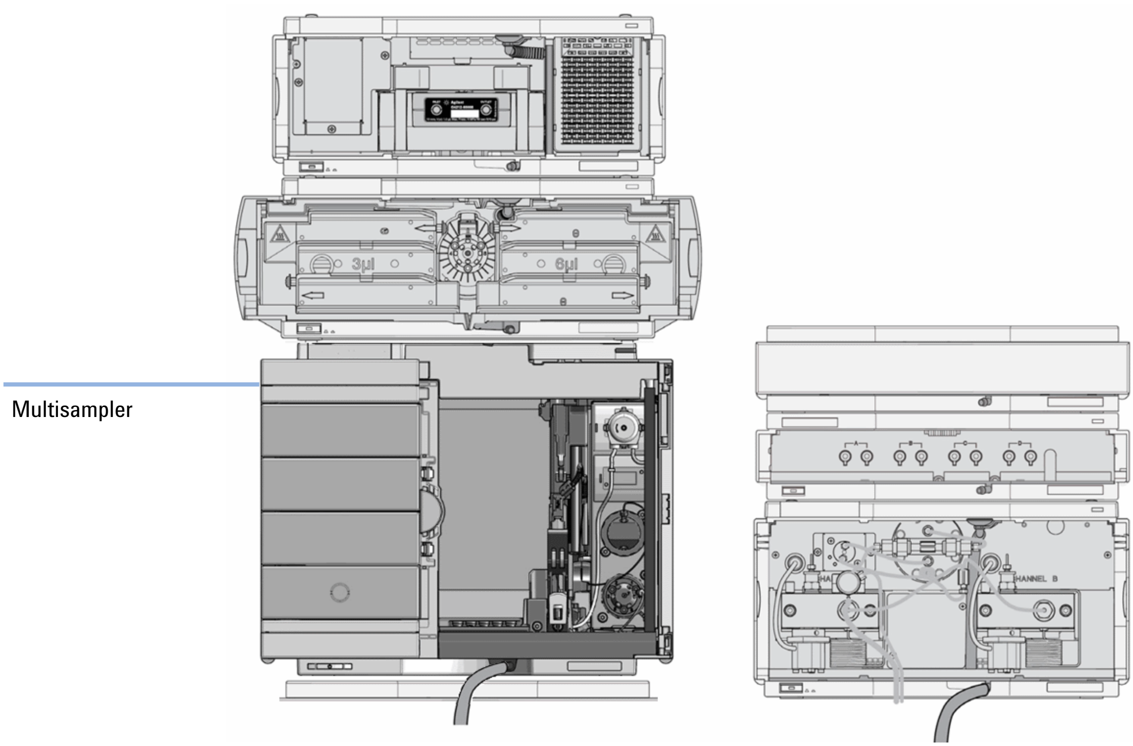


Figure 16 Leak and waste handling with multisampler in a mixed configuration as an example (two stack configuration)

NOTE Do not place the multisampler directly on the bench if a sample cooler or sample thermostat is installed.

2
Site Requirements and Specifications

This chapter provides information on environmental requirements, physical and performance specifications.

Site Requirements

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

Power Considerations

The module power supply has wide ranging capability. It accepts any line voltage in the range described in Table 1 on page 46. 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

Hazard of electrical shock 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 only.

WARNING

The 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. electrical shock, when the cover is opened and the module is connected to power.

→ Always unplug the power cable before opening the cover.

→ Do not connect the power cable to the instrument while the covers are removed.

WARNING

Inaccessible 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

Country-specific power cords are available for the module. The female end of all power cords is identical. It plugs into the power-input socket at the rear. The male end of each power cord is different and designed to match the wall socket of a particular country or region.

Agilent makes sure that your instrument is shipped with the power cord that is suitable for your particular country or region.

WARNING

Absence of ground connection

The absence of ground connection can lead to electric shock or short circuit.

→ Never operate your instrumentation from a power outlet that has no ground connection.

WARNING

Unintended use of supplied power cords

Using power cords for unintended purposes can lead to personal injury or damage of electronic equipment.

→ Never use a power cord other than the one that Agilent shipped with this instrument.

→ Never use the power cords that Agilent Technologies supplies with this instrument for any other equipment.

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

WARNING

Power cords

Solvents may damage electrical cables.

→ Prevent electrical cables from getting in contact with solvents.

→ Exchange electrical cables after contact with solvents.

Room Size and Ventilation

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the sample thermostat and laboratory.

➔ Keep open fire or sources of ignition away from the device.

➔ Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the sample thermostat).

➔ Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.

➔ Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the sample thermostat.

Bench Space

The module dimensions and weight (see Table 1 on page 46) allow you to place the module on almost any desk or 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 air circulation and electric connections.

If the bench shall carry a complete HPLC system, make sure that the bench is designed to bear the weight of all modules.

The module should be operated in a horizontal position, especially if a sample cooler or sample thermostat is installed. Use a bubble level to check the leveling of the sampler.

NOTE

Agilent recommends that you install the HPLC instrument in the InfinityLab Flex Bench rack. This option helps to save bench space as all modules can be placed into one single stack. It also allows to easily relocate the instrument to another laboratory.

WARNING

Heavy weight

The module is heavy.

→ Carry the module at least with 2 people.

→ Avoid back strain or injury by following all precautions for lifting heavy objects.

→ Ensure that the load is as close to your body as possible.

→ Ensure that you can cope with the weight of your load.

Condensation

CAUTION

Condensation within the module

Condensation can 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

Physical Specifications Agilent 1290 Infinity II Multisampler (G7167B)

Table 1 Physical Specifications

Type	Specification	Comments
Weight	22 kg (48.5 lbs)	w/o Thermostat
Dimensions (height × width × depth)	320 x 396 x 468 mm (12.6 x 15.6 x 18.4 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	180 VA, 180 W	
Ambient operating temperature	4 - 40 °C (39 - 104 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)[1]	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15092 ft)	For storing the module
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Boiling point ≥56 °C Auto-ignition temperature ≥200 °C	

1 If a sample cooler or thermostat is included the upper value for humidity can be reduced. Please check your lab conditions to stay beyond dew point values for non–condensing operation.

Physical Specifications Agilent 1260 Infinity II Multisampler (G7167A)

Table 2 Physical Specifications

Type	Specification	Comments
Weight	22 kg (48.5 lbs)	w/o Thermostat
Dimensions (height × width × depth)	320 x 396 x 468 mm (12.6 x 15.6 x 18.4 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	180 VA, 180 W	
Ambient operating temperature	4 - 40 °C (39 - 104 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)[1]	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15092 ft)	For storing the module
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Boiling point ≥56 °C Auto-ignition temperature ≥200 °C	

1 If a sample cooler or thermostat is included the upper value for humidity can be reduced. Please check your lab conditions to stay beyond dew point values for non–condensing operation.

Physical Specifications Agilent 1260 Infinity II Bio-inert Multisampler (G5668A)

Table 3 Physical Specifications

Type	Specification	Comments
Weight	22 kg (48.5 lbs)	w/o Thermostat
Dimensions (height × width × depth)	320 x 396 x 468 mm (12.6 x 15.6 x 18.4 inches)	
Line voltage	100 – 240 V~, ± 10 %	Wide-ranging capability
Line frequency	50 or 60 Hz, ± 5 %	
Power consumption	180 VA, 180 W	
Ambient operating temperature	4 - 40 °C (39 - 104 °F)	
Ambient non-operating temperature	-40 – 70 °C (-40 – 158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)[1]	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15092 ft)	For storing the module
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11
Permitted solvents	Boiling point ≥56 °C Auto-ignition temperature ≥200 °C	

1 If a sample cooler or thermostat is included the upper value for humidity can be reduced. Please check your lab conditions to stay beyond dew point values for non–condensing operation.

Performance Specifications

Performance Specifications (G7167B)

Table 4 Performance Specifications Agilent 1290 Infinity II Multisampler (G7167B)

Type	Specification	Comment
Injection range for *Single-needle* instruments	Default: 0.1 – 20 µL in 0.1 µL increments; optional: 40 µL or 100 µL (using 100 µL analytical head)	Up to 1300 bar using 40 µL (default) or optional 100 µL analytical head
	0.1 – 500 µL or 900 µL in 0.1 µL increments (using 900 µL analytical head)	Pressure range up to 400 bar due to 900 µL analytical head
	0.1 – 120 µL in 0.1 µL increments with 1290 Infinity large volume injection kit (hardware modification required) G4216-68711 0.1 – 500 µL or 1500 µL in 0.1 µL increments with 100 µL upgrade kit (hardware modification required) G7167-68711	Pressure range up to 1300 bar Multi-draw modus (Injection into needle-seat capillary)
Injection range for *Dual-needle* instruments	Default: 0.1 – 20 µL in 0.1 µL increments; optional: 40 µL or 100 µL	Up to 1300 bar using 100 µL analytical head
	Up to 500 µL in 0.1 µL increments depending on installed loop size	Up to 1300 bar using 100 µL analytical head + Multi-load
Injection precision for *Single-needle* instruments	<0.15 % RSD or SD <10 nL, whatever is greater	Measured caffeine
Injection precision for *Dual-needle* instruments	<0.2 % RSD or SD <10 nL, whatever is greater	Measured caffeine
Injection linearity	0.9999 in the range of 0.1 – 100 µL	Measured caffeine
Pressure range	Up to 1300 bar	Max pressure for basic instrument
Sample viscosity range	0.2 – 5 cp	

Table 4 Performance Specifications Agilent 1290 Infinity II Multisampler (G7167B)

Type	Specification	Comment
Sample capacity	1H Drawer up to 8 drawers and 16 positions Shallow well plates (MTP)	Max. 6144/1536 samples (384MTP/96)
	2H Drawer up to 4 drawers and 8 positions MTP, deep well plates, vials, Eppendorf	3072 samples, 432 vials (2 mL)
	3H Drawer up to 2 drawers and 4 positions MTP, deep well plates, vials up to 6 mL, Eppendorf	1536 samples, 60 vials (6 mL), 384 vials (1 mL), 216 vials (2 mL)
Injection cycle time	<10 s using following standard conditions: Default draw speed: 100 µL/min Default eject speed: 400 µL/min Injection volume: 1 µL	Time between 2 injections is not mechanically limited, time delay depends on communication speed of software, OS or network connections
Carry Over	<0.003 % (30 ppm) Multisampler Standard and Dual Needle <0.0009 % (9 ppm) Multisampler Multiwash	
Multiwash	Outer needle wash and seat backflush for carryover reduction with up to 3 different solvents	
Instrument Control	LC & CE Drivers A.02.10 or above Instrument Control Framework (ICF) A.02.03 or above Instant Pilot (G4208A) with firmware B.02.19 or above Lab Advisor B.02.06 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC and CE Drivers
Communications	Controller-area network (CAN), Local Area Network (LAN) ERI: ready, start, stop and shut-down signals	
Maintenance and safety-related features	Extensive diagnostics, error detection and display with Agilent Lab Advisor software Leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors.	
Housing	All materials recyclable.	

Performance Specifications (G7167A)

Table 5 Performance Specifications Agilent 1260 Infinity II Multisampler (G7167A)

Type	Specification	Comment
Injection range for *Single-needle* instruments	Default: 0.1 – 90 µL in 0.1 µL increments optional: 20 µL or 40 µL (using optional 40 µL analytical head)	Up to 800 bar using the 100 µL (default) or optional 40 µL analytical head
	0.1 – 500 µL or 900 µL in 0.1 µL increments (using 900 µL analytical head)	Pressure range up to 400 bar due to 900 µL analytical head
	0.1 – 120 µL in 0.1 µL increments with 1290 Infinity II large volume injection kit (hardware modification required) G4216-68711 0.1 – 500 µL or 1500 µL in 0.1 µL increments with 100 µL upgrade kit (hardware modification required) G7167-68711	Pressure range up to 800 bar Multi-draw modus (Injection into needle-seat capillary)
Injection range for *Dual-needle* instruments	Default: 0.1 – 100 µL in 0.1 µL increments; optional: 20 µL or 40 µL (using 100 µL analytical head)	Up to 800 bar using 100 µL analytical head
	Up to 900 µL in 0.1 µL increments depending on installed loop size	Up to 800 bar using 100 µL analytical head
Injection precision for *single-needle* instruments	<0.15 % RSD or SD <10 nL, whatever is greater	Measured caffeine
Injection precision for *dual-needle* instruments	<0.2 % RSD or SD <10 nL, whatever is greater	Measured caffeine
Injection linearity	0.9999 in the range of 0.1 – 100 µL	Measured caffeine
Pressure range	Up to 800 bar	Max pressure for basic instrument Feature is available for instruments manufactured in Sep 2017 or later. Requires LC and CE Drivers A.02.17 or later.
Sample viscosity range	0.2 – 5 cp	

Table 5 Performance Specifications Agilent 1260 Infinity II Multisampler (G7167A)

Type	Specification	Comment
Sample capacity	*1H Drawer* up to 8 drawers and 16 positions Shallow well plates (MTP)	Max. 6144/1536 samples (384MTP/96)
	2H Drawer up to 4 drawers and 8 positions MTP, deep well plates, vials, Eppendorf	3072 samples, 432 vials (2 mL)
	3H Drawer up to 2 drawers and 4 positions MTP, deep well plates, vials up to 6 mL, Eppendorf	1536 samples, 60 vials (6 mL), 384 vials (1 mL), 216 vials (2 mL)
Injection cycle time	<10 s using following standard conditions: Default draw speed: 100 µL/min Default eject speed: 400 µL/min Injection volume: 1 µL	Time between 2 injections is not mechanically limited, time delay depends on communication speed of software, OS or network connections
Carry Over	<0.003 % (30 ppm) Multisampler Standard and Dual Needle <0.0009 % (9 ppm) Multisampler Multiwash	
Multiwash	Outer needle wash and seat backflush for carryover reduction with up to 3 different solvents	
Instrument Control	LC and CE Drivers A.02.10 or above Instrument Control Framework (ICF) A.02.03 or above Instant Pilot (G4208A) with firmware B.02.19 or above Lab Advisor B.02.06 or above	For details about supported software versions refer to the compatibility matrix of your version of the LC and CE Drivers
Communications	Controller-area network (CAN), Local Area Network (LAN) ERI: ready, start, stop and shut-down signals	
Maintenance and safety-related features	Extensive diagnostics, error detection and display with Agilent Lab Advisor software Leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas	
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors.	
Housing	All materials recyclable.	

Performance Specifications G5668A

Table 6 Performance Specifications 1260 Infinity II Bio-inert Multisampler (G5668A)

Type	Specification	Comment
Injection range	Default: 0.1 – 100 µL in 0.1 µL increments	Up to 600 bar using 100 µL
	Default: 0.1 – 250 µL or 1000 µL in 0.1 µL increments with Multidraw upgrade kit (Bio-inert) (G5667-68711)	Pressure range up to 400 bar Multi-draw mode (Injection into needle-seat capillary)
Precision	<0.15 % RSD or SD <10 nL, whatever is greater	Measured caffeine
Pressure range	Up to 600 bar	Max pressure for basic instrument
Sample viscosity range	0.2 – 5 cp	
Sample capacity	1H Drawer up to 8 drawers and 16 positions Shallow well plates (MTP)	Max. 6144/1536 samples (384MTP/96)
	2H Drawer up to 4 drawers and 8 positions MTP, deep well plates, vials, Eppendorf	3072 samples, 432 vials (2 mL)
	3H Drawer up to 2 drawers and 4 positions MTP, deep well plates, vials up to 6 mL, Eppendorf	1536 samples, 60 vials (6 mL), 384 vials (1 mL), 216 vials (2 mL)
Injection cycle time	<10 s using following standard conditions: Default draw speed: 100 µL/min	Using standard Single-needle setup
	Default eject speed: 400 µL/min Injection volume: 1 µL	Time between 2 injections is not mechanically limited, time delay depends on communication speed of software, OS or network connections

Table 6 Performance Specifications 1260 Infinity II Bio-inert Multisampler (G5668A)

<table>
<tr><th>Type</th><th>Specification</th><th>Comment</th></tr>
<tr><td>Carry Over</td><td><0.003 % (30 ppm) Multisampler Standard
<0.0009 % (9 ppm) Multisampler Multiwash</td><td>Using the following conditions:
• Column: Agilent Pursuit XRs 3 C18, 2.0 x 50 mm
• Mobile phase:
  • A: 0.1 % TFA in water
  • B: 0.1 % TFA in Acetonitrile
• Isocratic : % B=40 %
• Flow rate: 0.5 mL/min
• Temperature: ambient
• Wavelength: 257 nm
• Sample: 1200 ng/µL Chlorhexidine (dissolved with mobile phase A), 1 µL injected and measured on G4212A DAD
• Wash solution: H_2O with 0.1 % TFA (3 s)</td></tr>
<tr><td>Multiwash</td><td>Outer needle wash and seat backflush for carryover reduction with up to 3 different solvents</td><td></td></tr>
<tr><td rowspan="2">Materials in flow path</td><td>Titanium, gold, PTFE, PEEK, ceramic</td><td>Upstream of sample-introduction</td></tr>
<tr><td>PEEK, ceramic</td><td>Downstream of sample-introduction</td></tr>
<tr><td>Instrument Control</td><td>Lab Advisor B.02.08 or above
LC and CE Drivers A.02.14 or above</td><td>For details about supported software versions refer to the compatibility matrix of your version of the LC and CE Drivers</td></tr>
<tr><td>Local Control</td><td>Agilent Instant Pilot (G4208A)</td><td>B.02.20 or above</td></tr>
<tr><td>Communications</td><td>Controller-area network (CAN), Local Area Network (LAN), USB
ERI: ready, start, stop and shut-down signals</td><td></td></tr>
<tr><td>Safety and maintenance</td><td>Extensive support for troubleshooting and maintenance is provided by the Instant Pilot, Agilent Lab Advisor, and the Chromatography Data System.
Safety-related features are leak detection, safe leak handling, leak output signal for shutdown of pumping system, and low voltages in major maintenance areas.</td><td></td></tr>
</table>

Table 6 Performance Specifications 1260 Infinity II Bio-inert Multisampler (G5668A)

Type	Specification	Comment
GLP features	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors.	
Housing	All materials recyclable.	
Metering device	Metering device in high pressure flow path	

Physical Specifications of the Sample Cooler

Cooling unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.

Table 7 Physical Specification of the Sample Cooler

Type	Specification	Comments
Weight	< 6 kg	
Dimensions (height × width × depth)	205 mm x 340 mm x 370 mm	
Refrigerant gas	HFC-134a (0.042 kg)	Ozone depletion potential (ODP) = 0
Supply voltage	24 VDC (nominal)	
Current	10 A max.	
Ambient operating temperature	4 – 40 ° C (39.2 – 104 ° F)	
Ambient non-operating temperature	-40 – 70 ° C (-20 – 158 ° F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15091 ft)	
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only.
ISM Classification	ISM Group 1 Class B	According to CISPR 11

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

→ The breakdown of the sample cooler or sample thermostat unit must be carried out by specialist refrigeration company.

→ All media must be disposed of in accordance with national and local regulations.

→ Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance or check www.agilent.com for more info.

Table 8 Performance Specifications Agilent 1290 Sample Cooler

Type	Specifications
Operating principle	High performance, low-energy consumption micro-compressor based cooler with ozone-friendly HFC-134a coolant (42 g), user-upgradable.
Temperature range	from 4 °C to 5 °C below ambient
Temperature settable	from 4 – 40 °C in 1 ° increments
Temperature accuracy (<25 °C, <50 % r.H.)	2 °C to 6 °C at a setpoint of 4 °C

Specifications of the Sample Thermostat

The sample thermostat is designed as a combination of a heater and vapor-compression refrigeration system. It uses non-Freon refrigerant (isobutane). This material is harmless to the environment and does not affect the ozone layer and global warming but it is combustable. Please adhere to the warnings listed in the manual.

Table 9 Physical Specifications of the Sample Thermostat

Type	Specification	Comment
Weight	<6 kg	
Dimensions (height x width x depth)	205 mm x 340 mm x 370 mm	
Refrigerant gas	R600a (0.030 kg)	Ozone depletion potential (ODP) =0 Global warming potential (GWP) =3
Supply voltage	24VDC (nominal)	
Current	10 A max.	
Ambient operating temperature	-4 – 40 °C (39.2 – 104 °F)	
Ambient non-operating temperature	-40 – 70 °C (-20 – 158 °F)	
Humidity	< 95 % r.h. at 40 °C (104 °F)	Non-condensing
Operating altitude	Up to 3000 m (9842 ft)	
Non-operating altitude	Up to 4600 m (15091 ft)	
Safety standards: IEC, EN, CSA, UL	Installation category II, Pollution degree 2	For indoor use only
ISM Classification	ISM Group 1 Class B	According to CISPR 11

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

→ The breakdown of the sample cooler or sample thermostat unit must be carried out by specialist refrigeration company.

→ All media must be disposed of in accordance with national and local regulations.

→ Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance or check www.agilent.com for more info.

Table 10 Performance Specifications for the Sample Thermostat

Type	Specifications
Operating principle	High performance, low-energy consumption micro-compressor based cooler with natural R600a coolant (Butane 30 g), user-upgradable
Temperature range	from 4 – 40 °C
Temperature settable	from 4 – 40 °C in 1 °C increments
Temperature accuracy (<25 °C, <50 % r.H.)	2 – 6 °C at a setpoint of 4 °C

NOTE

Minimum firmware revision for the sample thermostat is D.07.22.

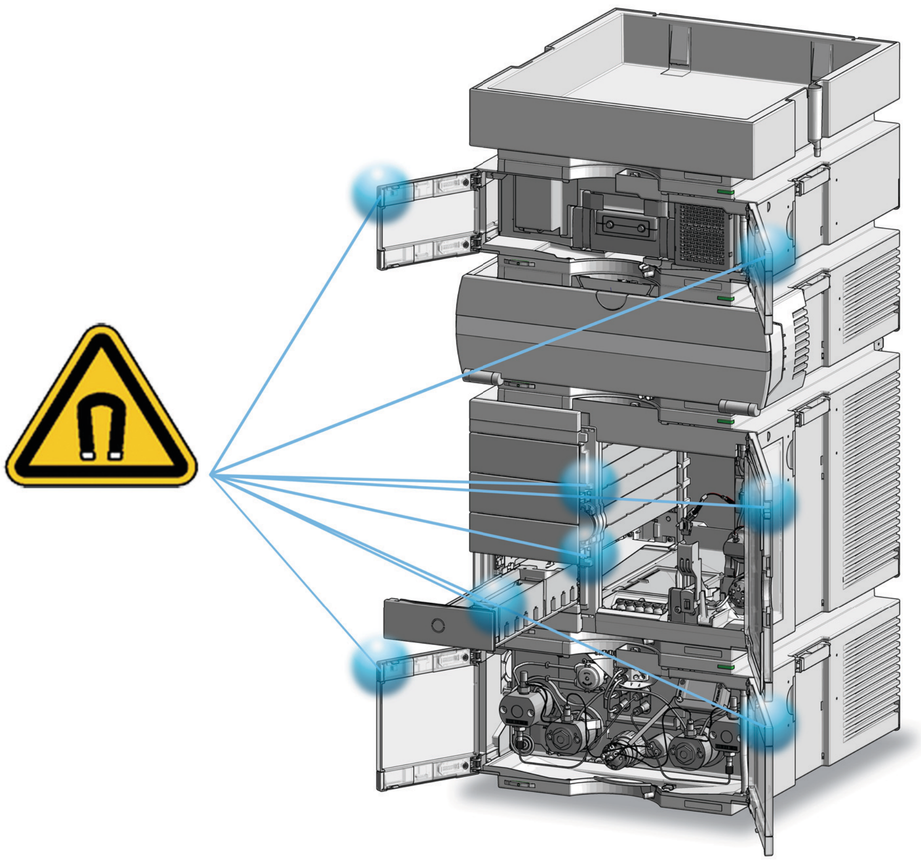
Minimum LC driver revision for the sample thermostat is A.02.14.

3
Using the Module

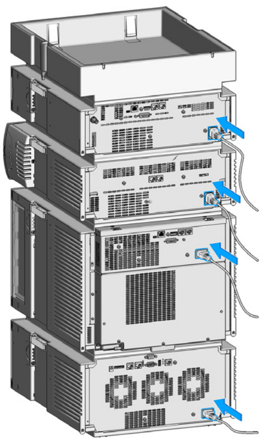
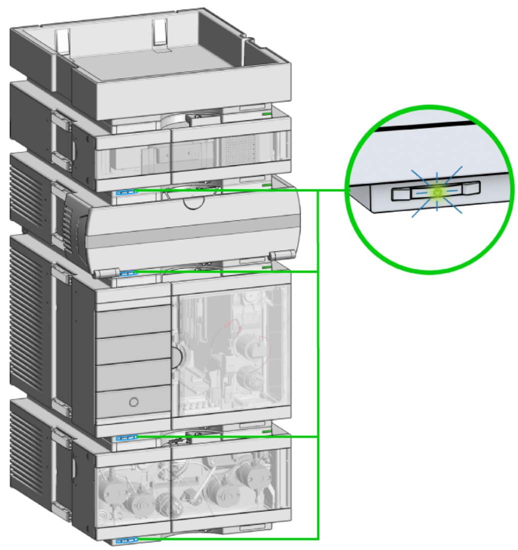
This chapter explains the essential operational parameters of the module.

Magnets

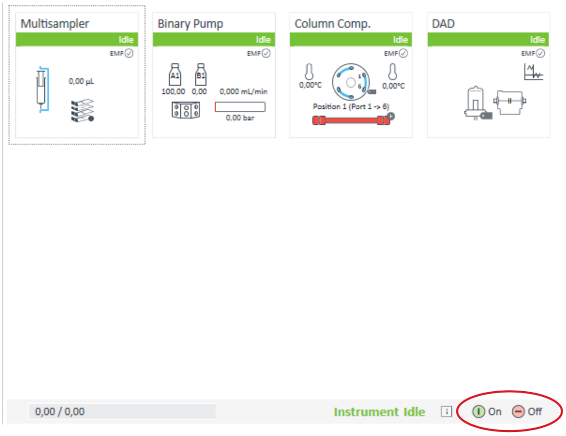
1 This stack exemplarily shows the magnets' positions in the modules.



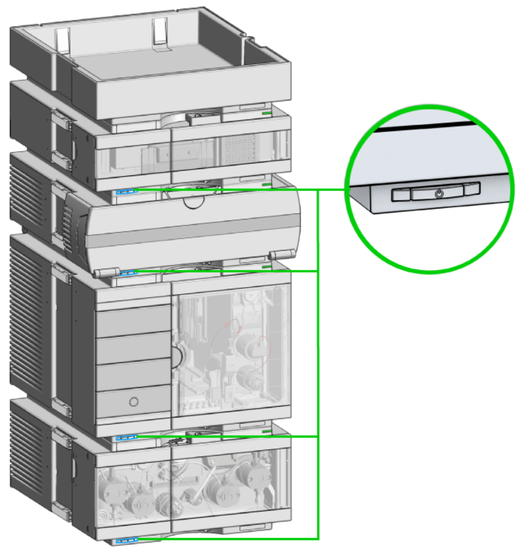
Turn on/off

1	2
	 Power switch: On

3 Turn instrument **On/Off** with the control software.

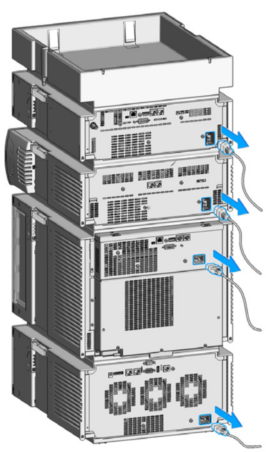


4



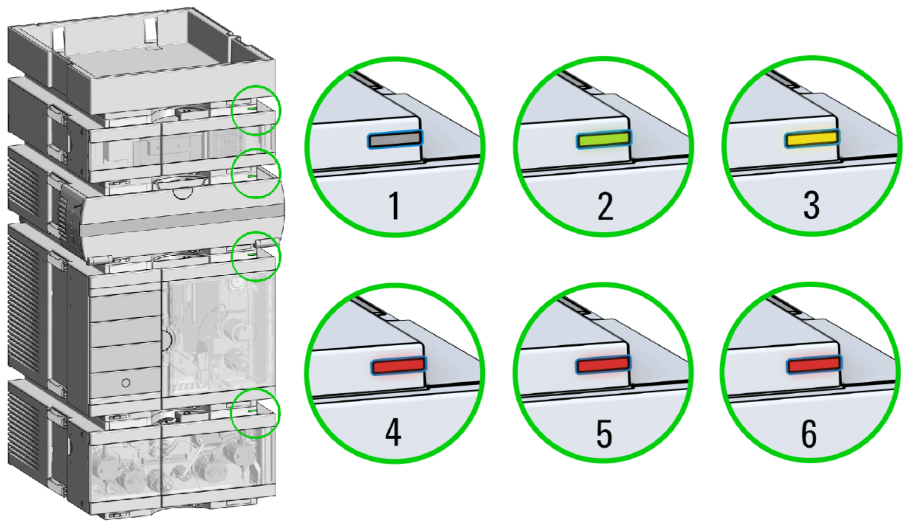
Power switch: Off

5



Status indicators

1 The module status indicator indicates one of six possible module conditions:



Status indicators

1. Idle

2. Run mode

3. Not-ready. Waiting for a specific pre-run condition to be reached or completed.

4. Error mode - interrupts the analysis and requires attention (for example a leak or defective internal components).

5. Resident mode (blinking) - for example during update of main firmware.

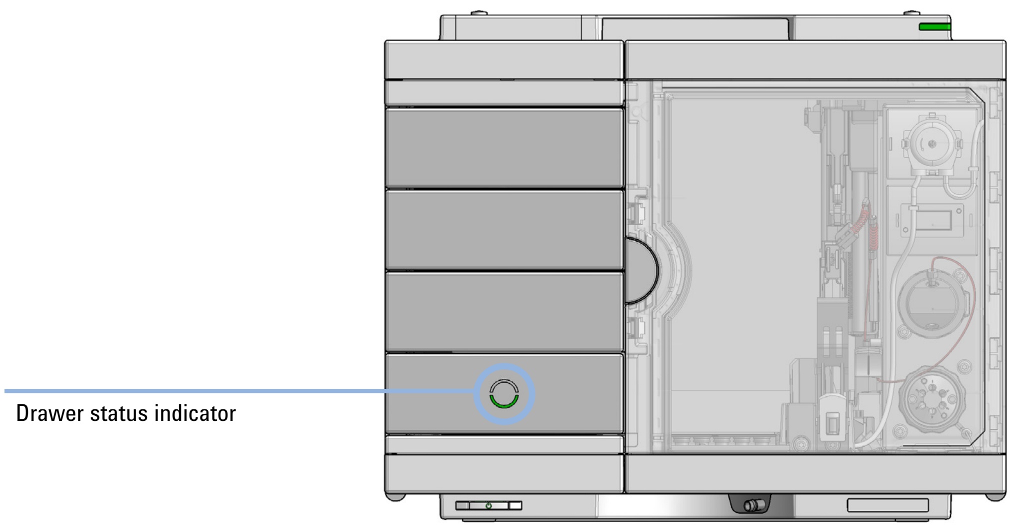
6. Bootloader mode (fast blinking). Try to re-boot the module or try a cold-start. Then try a firmware update.

Drawer Status Indicator

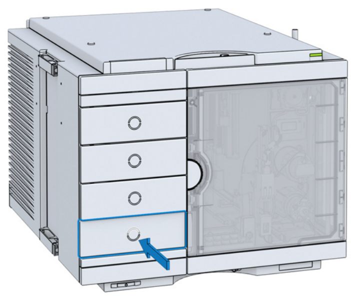
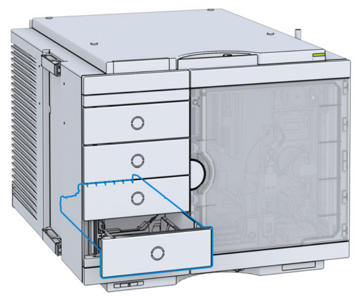
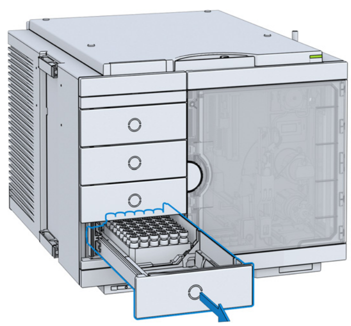
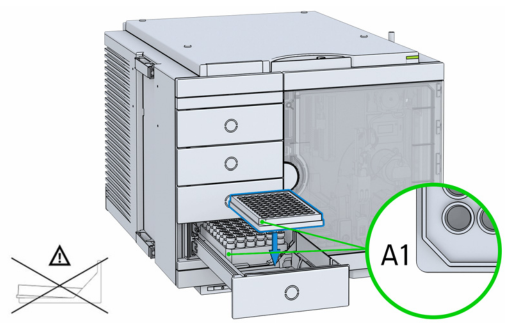
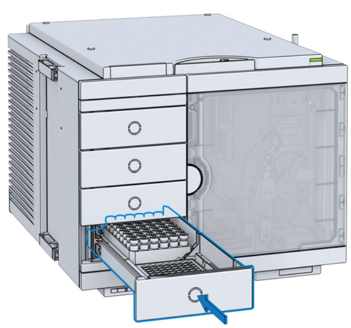
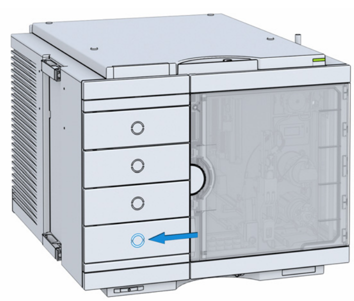
The module status indicator indicates one of three possible module conditions:

- When the status indicator is *OFF* no sample containers are loaded.
- When the upper, lower or both semi circle status indicators are *ON*, indicates the rear or front position of the drawer or both positions are loaded with a sample containers.
- When semi circle indicators are *blinking* the robot interacts with a drawer.

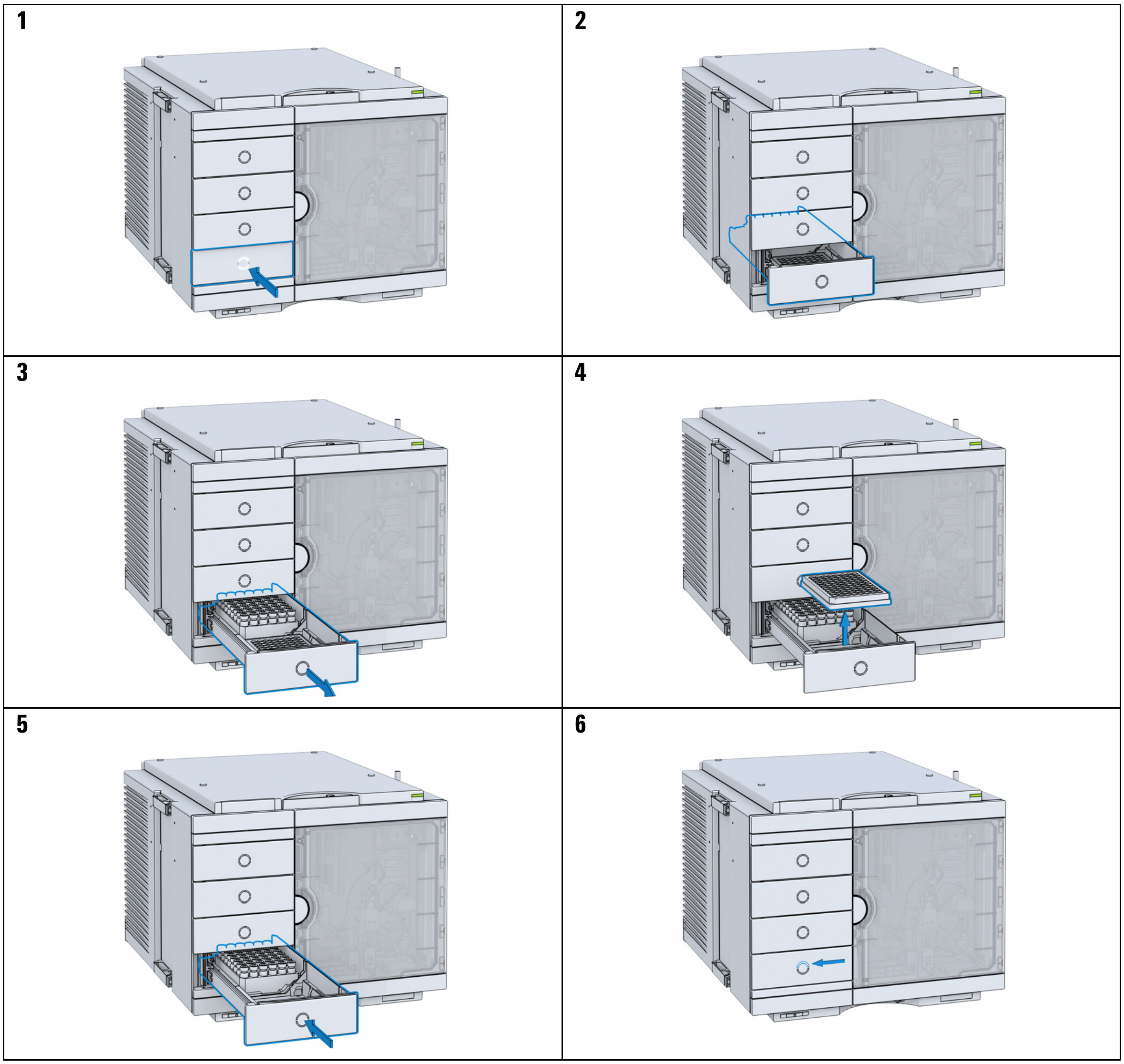
NOTE During blinking of the drawer status indicator. Do not try to open the drawer at this point.



Insert vial trays/wellplates

1 	**2** 
3 	**4** Ensure correct seat and orientation of vial trays/wellplates 
5 	**6** 
7 Configure vial trays/wellplates	

Remove vial trays/wellplates



Installing the Sample Cooler or Thermostat

Damaged Packaging

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

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.

Install the Sample Cooler or Thermostat

Parts required	#	p/n	Description
	1		Multisampler
	1	G7167-60005	Sample cooler
OR	1	G7167-60101	InfinityLab Sample Thermostat
	1		Power cord
	1	G7167-90171	Installation of the Infinity II Cooler/Thermostat Condensate Drainage Tubing Kit

Preparations Sampler is installed in the stack.

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the sample thermostat and laboratory.

- → Keep open fire or sources of ignition away from the device.
- → Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the sample thermostat).
- → Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.
- → Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the sample thermostat.

WARNING

Flammable refrigerant used

- → When handling, installing and operating the Sample Thermostat, care should be taken to avoid damage to the refrigerant tubing or any part of the Sample Thermostat.

CAUTION

Condensate inside the sample cooler or thermostat

Damage to the electronics of the module

- → After installation of the sample cooler or thermostat, wait at least 30 min before switching on the module.
- → Make sure there is no condensate inside the module.

WARNING

In the event of a damage

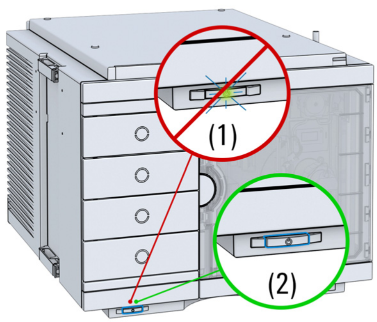
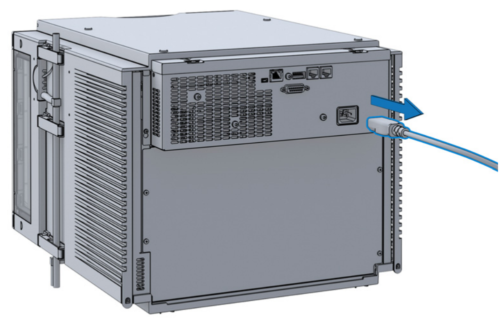
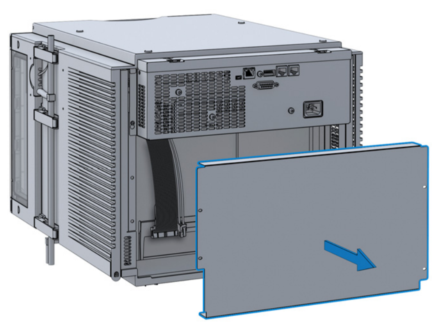
- → Keep open fire or sources of ignition away from the device.
- → Ventilate the room for several minutes.
- → Do not use the Sample Thermostat any more.

NOTE Do not open the Sample Thermostat. There are no serviceable parts inside.

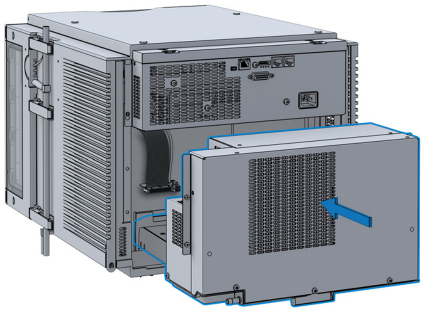
NOTE If the sample cooler or thermostat is disconnected from the power supply, you should wait for at least five minutes before replugging and switching on the compressor again.

NOTE Even under average humidity conditions, a significant amount of condensed water gathers every day. A suitable container must be provided and emptied regularly in order to avoid overflow.

NOTE For best cooling performance the 2H drawer must be installed in the lowest position.

1 Ensure that the power switch on the front of the module is OFF (switch stands out).  	**2** Ensure that the power cable is removed from the instrument. 
3 Open the 4 screws on the rear of the module. 	**4** Remove the sample cooler/thermostat mainframe cover. 

5 Slide in the sample cooler or thermostat the halfway.



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.

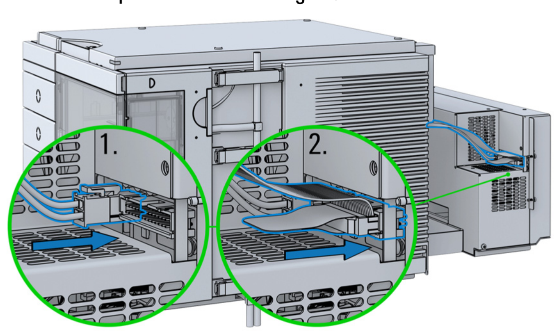
- **Make sure that it is always possible to access the power plug.**
- **Do not use the sample cooler or thermostat if it is not operating correctly or has been damaged. Disconnect it from the power supply and call your local service center.**
- **Remove the power cable from the module before opening the cover.**
- **Do not connect the power cable to the module while the covers are removed.**
- **If the sample cooler or thermostat is disconnected from the power supply, you should wait for at least five minutes before switching on the compressor.**

CAUTION

Damaged electronics

- **To avoid damages of the electronics of the module make sure the power cords are unplugged before disconnecting or reconnecting the sampler to the sample cooler/thermostat cables.**

6 Connect power cable and signal/data cable.



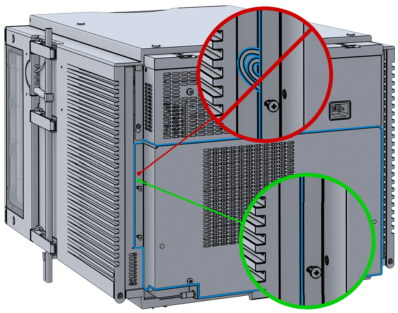
CAUTION

Damage to the cables

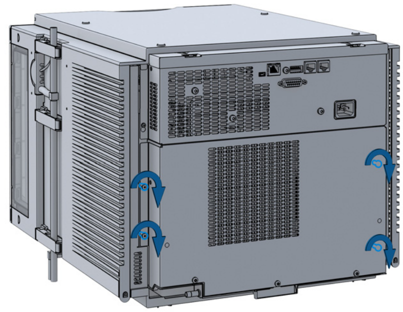
→ **Do not bend or pinch the cables.**

→ **Fit in the sample cooler or thermostat perfectly.**

7 Slide in the whole unit.



8 Tighten the four screws which hold the sample cooler or thermostat unit in place.

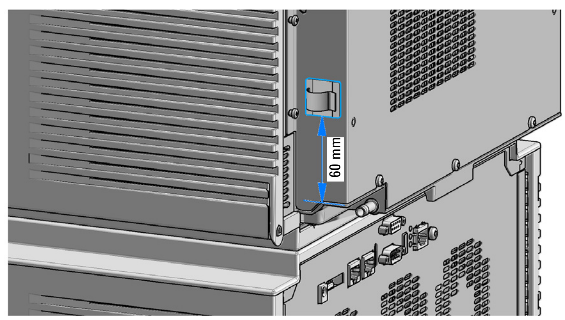


9 Use a bubble level to check the leveling of the sampler.

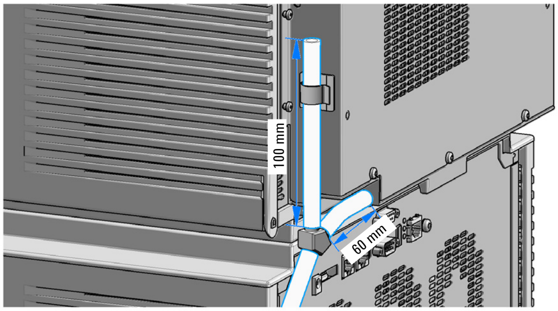
NOTE

The module should be operated in a proper horizontal position.

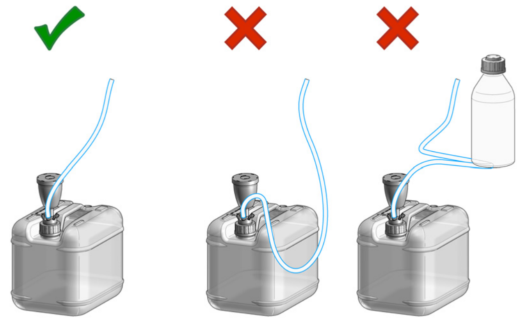
10



11



12



NOTE

Check leak waste handling for further info.

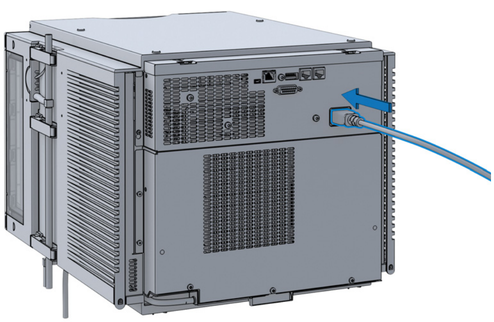
CAUTION

Damage to the sample cooler or thermostat

→ **Wait at least 30 min before switching on the module.**

→ **This allows the refrigerant and system lubrication to reach equilibrium.**

13 Connect the power cable to the power connector at the rear of the module.



14 Configure the Sample Cooler or Thermostat in the CDS.

Transporting the Sampler with a Sample Cooler or Sample Thermostat Installed

NOTE

There are magnets in the front area of the multisampler, see “Magnets” on page 62.

NOTE

When moving the sampler around the laboratory, make sure that any condensed water inside the thermostat is removed.

- Remove the drainage and place a beaker underneath the drain outlet of the sample cooler or sample thermostat. Then carefully tilt the module to the back so that the water inside the thermostat can safely flow into the leak funnel. If condensate removal is done improperly, you can harm the electronic of the module.
- Otherwise no special precautions are needed for the modules.

WARNING

Heavy weight

The module is heavy.

→ Carry the module at least with 2 people.

→ Avoid back strain or injury by following all precautions for lifting heavy objects.

→ Ensure that the load is as close to your body as possible.

→ Ensure that you can cope with the weight of your load.

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the sample thermostat and laboratory.

→ Keep open fire or sources of ignition away from the device.

→ Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the sample thermostat).

→ Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.

→ Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the sample thermostat.

NOTE

Transporting the sampler with a sample cooler or sample thermostat installed is only allowed for short distances. For longer distances, you must separate the units and send them independently.

CAUTION

Mechanical damage of the module

If the transport assembly is not parked and not protected by the transport foam, the module could be damaged due to excessive shock of the shipping container during transport.

→ Always park the transport assembly before shipment.

→ Protect the instrument by Transport-Protection (G4267-40033).

→ Store the installation foam in a save place, to use it for later transport of the module.

If the sampler with a sample cooler or sample thermostat needs to be shipped to another location via carrier, ensure:

- The two modules are shipped in separate boxes.
- The Sample handler of the multisampler is parked, see **Park Robot** in Agilent Lab Advisor online help for more information.
- The sample containers (vial trays) are removed from the sample hotel.
- Install the transport protection.
- The condensed water inside of the sample cooler or sample thermostat is removed.

Solvent Information

Observe the following recommendations on the use of solvents.

- Follow recommendations for avoiding the growth of algae, see pump manuals.
- Small particles can permanently block capillaries and valves. Therefore, always filter solvents through 0.22 µm filters.
- Avoid or minimize the use of solvents that may corrode parts in the flow path. Consider specifications for the pH range given for different materials like flow cells, valve materials etc. and recommendations in subsequent sections.

Recommended Wash Solvents

- water
- ethanol
- methanol
- water/acid (especially for basic compounds)
- water/base (especially for acidic compounds)
- water/acetonitrile

NOTE For different wash solvents as mentioned above, verify that the wash solvent is suitable for the silicone wash tubing.

Materials in Flow Path

Following materials are used in the flow path of this module:

Table 11 Materials in flow path (G7110B, G7111A, G7111B)

Part	Materials
Degasser chamber	TFE/PDD Copolymer, PFA (internal tubings), PEEK (inlets), FEP (tubings), ETFE (fittings)
MCGV	SST, PTFE
Passive inlet valve	SST, gold, sapphire, ruby, ceramic, PTFE
Active inlet valve	SST, gold, sapphire, ruby, ceramic, PTFE
Outlet valve	SST, gold, ruby, ZrO_2-based ceramic, tantalum
Adapter	SST, gold
Pump head (body)	SST
Pistons	Sapphire
Piston seals/wash seals	PTFE, SST (reversed phase) or UHMW-PE, SST (normal phase)
Pressure sensor	SST
Purge valve	SST, gold, PTFE, ceramic
Damping unit	SST, gold
Capillaries/fittings	SST
Tubings	PTFE

Table 12 Materials in flow path (G5654A)

Part	Materials
Degasser chamber	TFE/PDD Copolymer, PFA (internal tubings), PEEK (inlets), FEP (tubings), ETFE (fittings)
MCGV	Platinum-iridium, titanium, PTFE
Active inlet valve	Platinum-iridium, titanium, gold, sapphire, ruby, ceramic, PTFE
Outlet valve	Titanium, gold, ruby, ZrO_2-based ceramic, tantalum
Adapter	Titanium, gold
Pump head (body)	Titanium
Pistons	Sapphire
Piston seals/wash seals	PTFE, gold
Pressure sensor	Titanium
Purge valve	Titanium, gold, PTFE, ceramic
Damping unit	Titanium, gold
Capillaries/fittings	Titanium
Tubings	PTFE

Bio-inert Materials

For the Bio-inert LC system, Agilent Technologies uses highest quality materials in the flow path (also referred to as wetted parts), which are widely accepted by life science scientists, as they are known for optimum inertness to biological samples and ensure best compatibility with common samples and solvents over a wide pH range. Explicitly, the complete flow path is free of stainless steel and free of other alloys containing metals such as iron, nickel, cobalt, chromium, molybdenum or copper, which can interfere with biological samples. The flow downstream of the sample introduction contains no metals whatsoever.

Table 13 Used Bio-inert materials

Module	Materials
Agilent 1260 Infinity II Bio-inert Pump (G5654A)	Titanium, gold, platinum-iridium, ceramic, ruby, PTFE, PEEK
Agilent 1260 Infinity II Bio-inert Multisampler (G5668A)	Upstream of sample introduction: • Titanium, gold, PTFE, PEEK, ceramic Downstream of sample introduction: • PEEK, ceramic
Agilent 1260 Infinity II Bio-inert Manual Injector (G5628A)	PEEK, ceramic
Agilent 1260 Infinity II Bio-inert Analytical Fraction Collector (G5664B)	PEEK, ceramic, PTFE
Bio-inert Flow Cells:	
Standard flow cell bio-inert, 10 mm, 13 µL, 120 bar (12 MPa) for MWD/DAD, includes Capillary Kit Flow Cells BIO (p/n G5615-68755) (G5615-60022) (*for Agilent 1260 Infinity II Diode Array Detectors DAD G7115A*)	PEEK, ceramic, sapphire, PTFE
Bio-inert flow cell, 8 µL, 20 bar (pH 1–12) includes Capillary Kit Flow Cells BIO (p/n G5615-68755) (G5615-60005) (*for Agilent 1260 Infinity II Fluorescence Detector FLD G7121A/B*)	PEEK, fused silica, PTFE
Bio-inert Heat Exchangers, Valves and Capillaries:	
Quick-Connect Heat Exchanger Bio-inert (G7116-60009) (*for Agilent 1260 Infinity II Multicolumn Thermostat G7116A*)	PEEK (steel-cladded)
Bio-inert Valve heads (G4235A, G5631A, G5632A, G5639A)	PEEK, ceramic (Al_2O_3 based)
Bio-inert Connection capillaries	Upstream of sample introduction: • Titanium Downstream of sample introduction: • Agilent uses stainless-steel-cladded PEEK capillaries, which keep the flow path free of steel and provide pressure stability to more than 600 bar.

NOTE To ensure optimum bio-compatibility of your Agilent 1260 Infinity II Bio-inert LC system, do not include non-inert standard modules or parts to the flow path. Do not use any parts that are not labeled as Agilent "Bio-inert". For solvent compatibility of these materials, see "Material Information" on page 82.

Material Information

Materials in the flow path are carefully selected based on Agilent's experiences in developing highest quality instruments for HPLC analysis over several decades. These materials exhibit excellent robustness under typical HPLC conditions. For any special condition, please consult the material information section or contact Agilent.

Disclaimer

Subsequent data was collected from external resources and is meant as a reference. Agilent cannot guarantee the correctness and completeness of such information. Data is based on compatibility libraries, which are not specific for estimating the long-term life time under specific but highly variable conditions of UHPLC systems, solvents, solvent mixtures and samples. Information can also not be generalized due to catalytic effects of impurities like metal ions, complexing agents, oxygen etc. Apart from pure chemical corrosion, other effects like electro corrosion, electrostatic charging (especially for non-conductive organic solvents), swelling of polymer parts etc. need to be considered. Most data available refers to room temperature (typically 20 – 25 °C, 68 – 77 °F). If corrosion is possible, it usually accelerates at higher temperatures. If in doubt, please consult technical literature on chemical compatibility of materials.

PEEK

PEEK (Polyether-Ether Ketones) combines excellent properties regarding biocompatibility, chemical resistance, mechanical and thermal stability. PEEK is therefore the material of choice for UHPLC and biochemical instrumentation.

It is stable in the specified pH range (for the Bio-inert LC system: pH 1 – 13, see bio-inert module manuals for details), and inert to many common solvents.

There is still a number of known incompatibilities with chemicals such as chloroform, methylene chloride, THF, DMSO, strong acids (nitric acid > 10 %, sulphuric acid > 10 %, sulfonic acids, trichloroacetic acid), halogenes or aequous halogene solutions, phenol and derivatives (cresols, salicylic acid etc.).

When used above room temperature, PEEK is sensitive to bases and various organic solvents, which can cause it to swell. Under such conditions normal

PEEK capillaries are very sensitive to high pressure. Therefore Agilent uses stainless-steel cladded PEEK capillaries in bio-inert systems. The use of stainless steel cladded PEEK capillaries keeps the flow path free of steel and ensures pressure stability to at least 600 bar. If in doubt, consult the available literature about the chemical compatibility of PEEK.

Polyimide

Agilent uses semi-crystalline polyimide for rotor seals in valves and needle seats in autosamplers. One supplier of polyimide is DuPont, which brands polyimide as Vespel, which is also used by Agilent.

Polyimide is stable in a pH range between 1 and 10 and in most organic solvents. It is incompatible with concentrated mineral acids (e.g. sulphuric acid), glacial acetic acid, DMSO and THF. It is also degraded by nucleophilic substances like ammonia (e.g. ammonium salts in basic conditions) or acetates.

Polyethylene (PE)

Agilent uses UHMW (ultra-high molecular weight)-PE/PTFE blends for yellow piston and wash seals, which are used in 1290 Infinity pumps, 1290 Infinity II pumps, the G7104C and for normal phase applications in 1260 Infinity pumps.

Polyethylene has a good stability for most common inorganic solvents including acids and bases in a pH range of 1 to 12.5. It is compatible to many organic solvents used in chromatographic systems like methanol, acetonitrile and isopropanol. It has limited stability with aliphatic, aromatic and halogenated hydrocarbons, THF, phenol and derivatives, concentrated acids and bases. For normal phase applications, the maximum pressure should be limited to 200 bar.

Tantalum (Ta)

Tantalum is inert to most common HPLC solvents and almost all acids except fluoric acid and acids with free sulfur trioxide. It can be corroded by strong bases (e.g. hydroxide solutions > 10 %, diethylamine). It is not recommended for the use with fluoric acid and fluorides.

Stainless Steel (ST)

Stainless steel is inert against many common solvents. It is stable in the presence of acids and bases in a pH range of 1 to 12.5. It can be corroded by acids below pH 2.3. It can also corrode in following solvents:

- Solutions of alkali halides, their respective acids (for example, lithium iodide, potassium chloride, and so on) and aqueous solutions of halogens.
- High concentrations of inorganic acids like nitric acid, sulfuric acid and organic solvents 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:

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

  This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol.
- Chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropylether). Such ethers should be filtered through dry aluminium oxide which adsorbs the peroxides.
- Solutions of organic acids (acetic acid, formic acid, and so on) in organic solvents. For example, a 1 % solution of acetic acid in methanol will attack steel.
- Solutions containing strong complexing agents (for example, EDTA, ethylene diamine tetra-acetic acid).
- Mixtures of carbon tetrachloride with 2-propanol or THF.

Titanium (Ti)

Titanium is highly resistant to oxidizing acids (for example, nitric, perchloric and hypochlorous acid) over a wide range of concentrations and temperatures. This is due to a thin oxide layer on the surface, which is stabilized by oxidizing compounds. Non-oxidizing acids (for example, hydrochloric, sulfuric and phosphoric acid) can cause slight corrosion, which increases with acid concentration and temperature. For example, the corrosion rate with 3 % HCl (about pH 0.1) at room temperature is about 13 µm/year. At room temperature, titanium is resistant to concentrations of about 5 % sulfuric acid (about pH 0.3). Addition of nitric acid to hydrochloric or sulfuric acids significantly reduces corrosion rates. Titanium is sensitive to acidic metal chlorides like $FeCl_3$ or $CuCl_2$. Titanium is subject to corrosion in anhydrous methanol, which can be avoided by adding a small amount of water (about 3 %). Slight corrosion is possible with ammonia > 10 %.

Diamond-Like Carbon (DLC)

Diamond-Like Carbon is inert to almost all common acids, bases and solvents. There are no documented incompatibilities for HPLC applications.

Fused silica and Quartz (SiO_2)

Fused silica is used in Max Light Cartridges. Quartz is used for classical flow cell windows. It is inert against all common solvents and acids except hydrofluoric acid and acidic solvents containing fluorides. It is corroded by strong bases and should not be used above pH 12 at room temperature. The corrosion of flow cell windows can negatively affect measurement results. For a pH greater than 12, the use of flow cells with sapphire windows is recommended.

Gold

Gold is inert to all common HPLC solvents, acids and bases within the specified pH range. It can be corroded by complexing cyanides and concentrated acids like aqua regia.

Zirconium Oxide (ZrO_2)

Zirconium Oxide is inert to almost all common acids, bases and solvents. There are no documented incompatibilities for HPLC applications.

Platinum/Iridium

Platinum/Iridium is inert to almost all common acids, bases and solvents. There are no documented incompatibilities for HPLC applications.

Fluorinated polymers (PTFE, PFA, FEP, FFKM, PVDF)

Fluorinated polymers like PTFE (polytetrafluorethylene), PFA (perfluoroalkoxy) and FEP (fluorinated ethylene propylene) are inert to almost all common acids, bases, and solvents. FFKM is perfluorinated rubber, which is also resistant to most chemicals. As an elastomer, it may swell in some organic solvents like halogenated hydrocarbons.

TFE/PDD copolymer tubings, which are used in all Agilent degassers except G1322A, are not compatible with fluorinated solvents like Freon, Fluorinert, or Vertrel. They have limited life time in the presence of Hexafluoroisopropanol (HFIP). To ensure the longest possible life with HFIP, it is best to dedicate a particular chamber to this solvent, not to switch solvents, and not to let dry out the chamber. For optimizing the life of the pressure sensor, do not leave HFIP in the chamber when the unit is off.

The tubing of the leak sensor is made of PVDF (polyvinylidene fluoride), which is incompatible to the solvent DMF (dimethyl formamide).

Sapphire, Ruby and Al_2O_3-based ceramics

Sapphire, ruby and ceramics based on aluminum oxide Al_2O_3 are inert to almost all common acids, bases and solvents. There are no documented incompatibilities for HPLC applications.

Reset the Multisampler in Case of an Error

When In some cases the multisampler has to be reset by the user in order for the system to resume working in normal operation mode.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

➔ Open the safety lock of the needle assembly *only* on the sample handler and for this particular procedure.

➔ Be careful working at the z-robot.

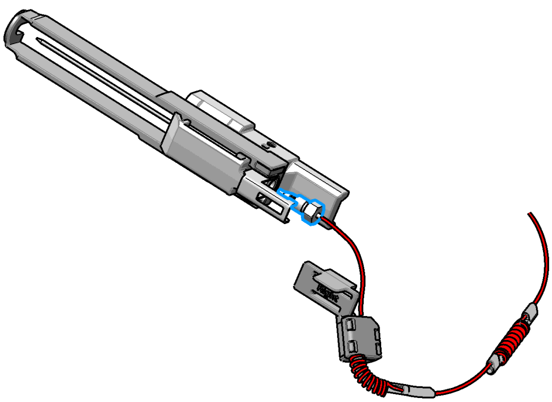
➔ Wear safety gloves when removing the needle assembly.

Resetting the Multisampler

1 Check the condition of the needle assembly and the sample loop. Replace them if necessary, see “Remove the Needle Assembly” on page 215 and “Remove the Sample Loop-Flex” on page 261

NOTE

Take care that the needle is installed properly. The plastic adapter must be installed correctly and the sample loop should not be kinked.



WARNING

Risk of injury by uncovered needle

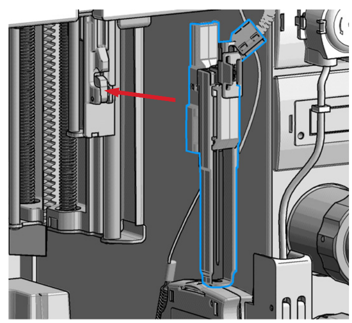
An uncovered needle is a risk of harm to the operator.

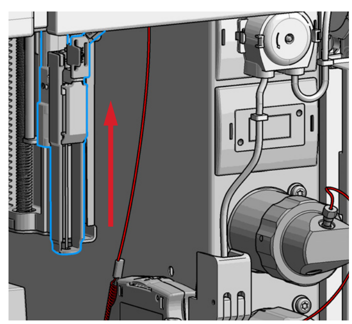
- → **Open the safety lock of the needle assembly *only* on the sample handler and for this particular procedure.**
- → **Be careful working at the z-robot.**
- → **Wear safety gloves when removing the needle assembly.**

2 Unlock the needle.

NOTE

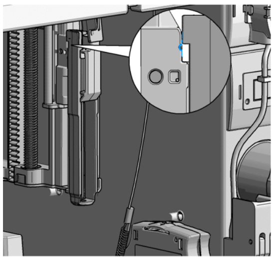
This procedure is completely different than the standard PM replacement of the needle assembly in Lab Advisor. The safety lock of the needle assembly has to be released by carefully sliding the pusher upwards.



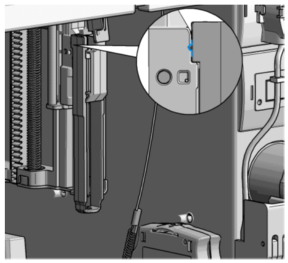


3 Verify that the needle assembly is unlocked after installation.

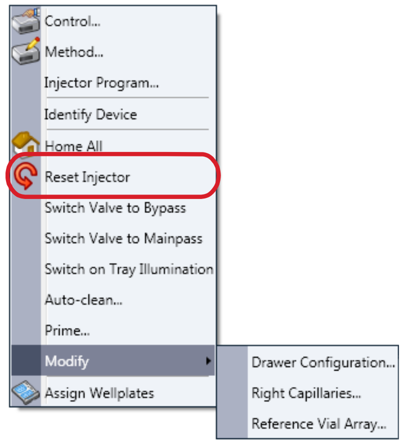
Needle unlocked



Needle locked



4 Reset the multisampler (using the instrument control) or turn the instrument Off/On again to start the initialization.



Next Steps:

5 Close the front door.

6 Wait until the initialization of the multisampler is completed.

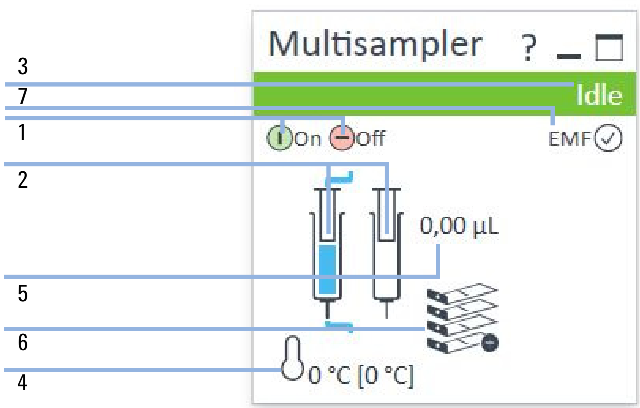
7 If the error persists, contact your local service representive.

Using the Sample Cooler or Thermostat in an Infinity II Autosampler

The following section describes exemplarily how to use the sample cooler or sample thermostat in the multisampler. The principle is the same for other sampler types.

After successfully loading the Agilent CDS, the module should appear as an active item in the graphical user interface (GUI).

Within the autosampler GUI, there are active areas. If the mouse cursor is moved across the icons the cursor will change, see the following figure.



1	ALS: turn on and off
2	ALS configuration
3	ALS Status
4	Sample Cooler/Sample Thermostat Status (on/off)
5	Injection Volume
6	Drawer Configuration
7	EMF Status

ALS configuration is displayed when moving with the mouse cursor over the syringe. The information provides ALS related information like

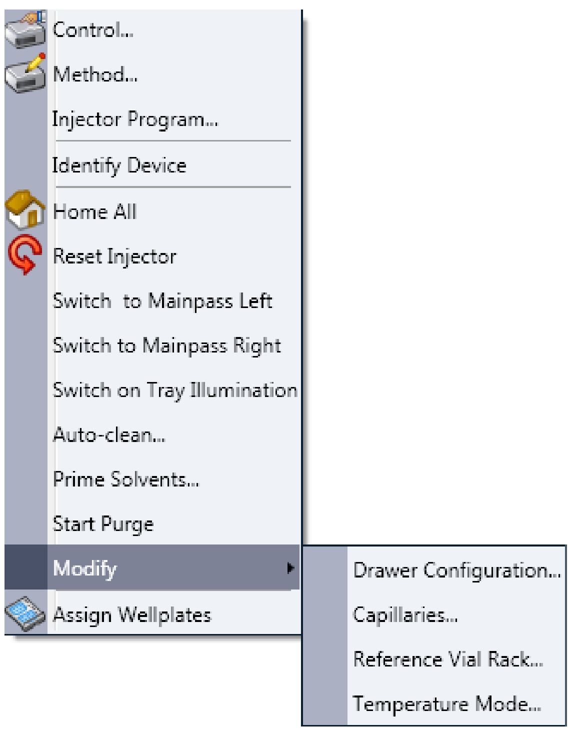
- Part number
- ALS setup

and other details.

NOTE Depending on the autosampler temperature set point and the environment the autosampler temperature can deviate by up to 3 degrees. If the system is not in the range of ± 2 °C you will see a yellow bar over the temperature values.

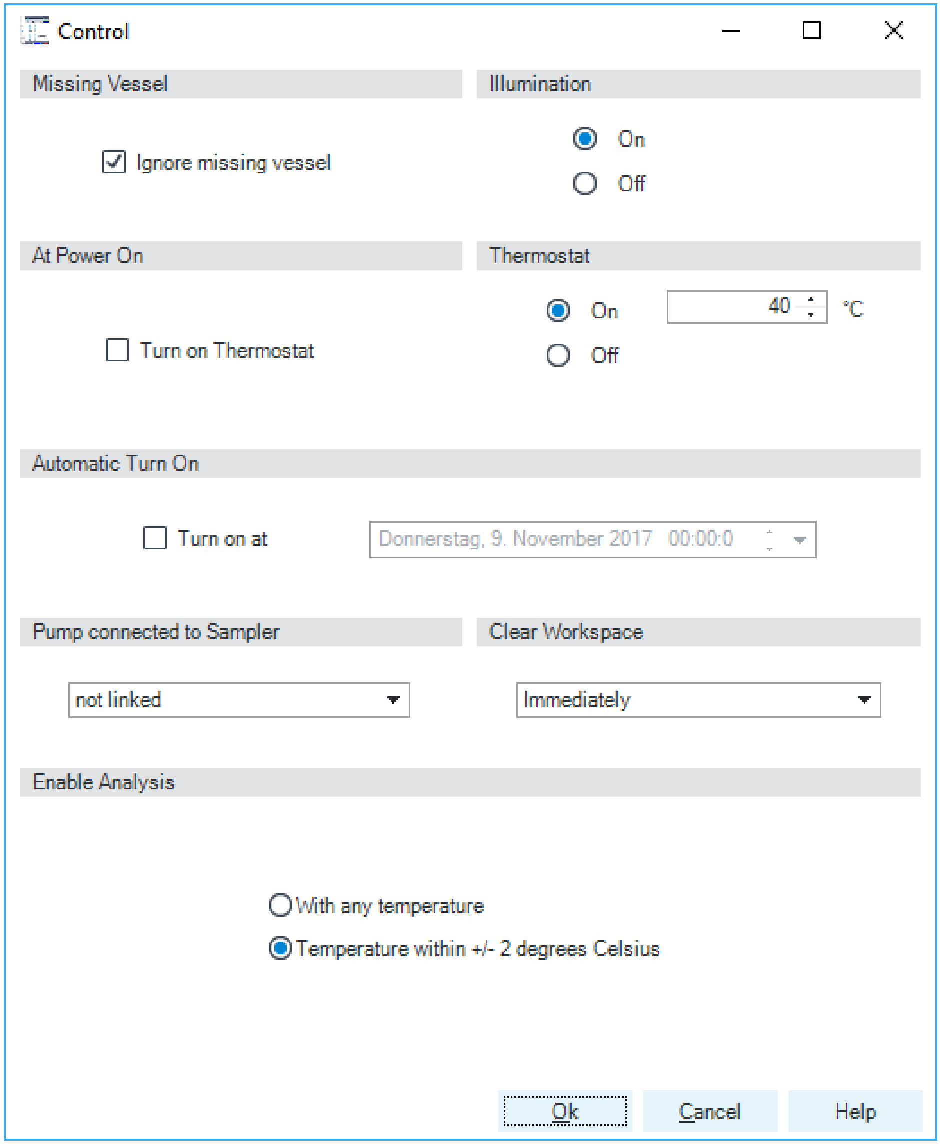
Control Interface

A right-click into the active area will open a menu to show the Control Interface.



Control

The **Thermostat** section of the **Control** dialog box is available when you have a sample cooler or sample thermostat installed. It allows you to switch the cooler or thermostat on and off manually.



Select **On** to switch on the cooler/thermostat. Specify the required temperature in the adjacent field. Note that the specified temperature must be at least 5 °C below ambient for proper temperature control.

Select **Off** to switch off the cooler/thermostat.

Temperature Mode

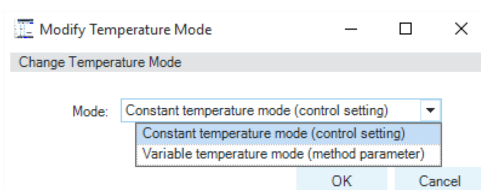
Temperature control for autosampler thermostats.

Since driver A.02.04, users could decide whether the *temperature of the thermostats* should be a *control setting or a method parameter*. With the introduction of Multisamplers, it has been decided that the thermostat should not be a method parameter for the following reasons:

- Changing the temperature from method to method changes the ALS temperature for ALL samples, not only for the one in the current method.
- The sample temperature can not be directly controlled, only the temperature of the air stream from the thermostat. If the air stream has the correct temperature during method execution, it may have been stored at higher temperatures with previous methods.

As a result, we are now introducing two modes which can be configured in the dashboard:

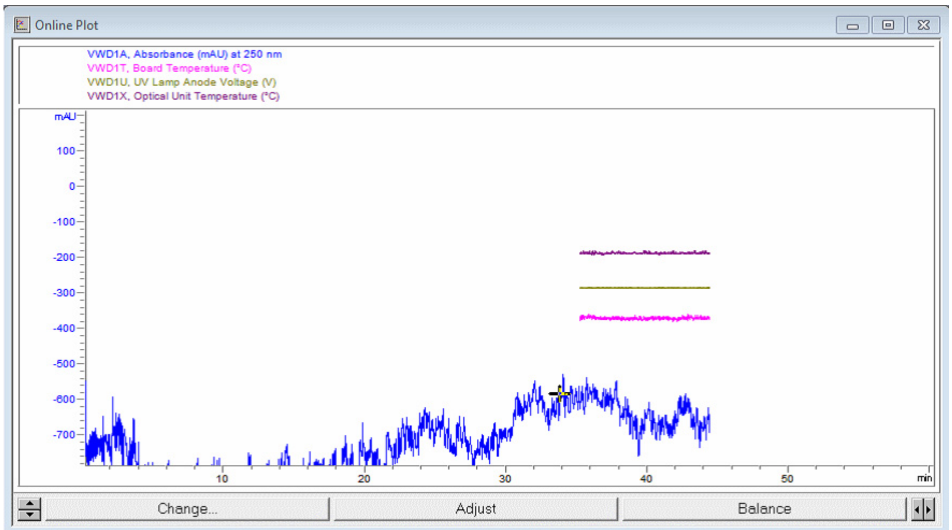
- *Constant temperature mode*: this mode uses the control setting for keeping samples at a fixed temperature. This is the default and recommended for most customers.
- *Variable temperature mode*: this mode allows changing the temperature as a method parameter. This mode may be used for degradation experiments (this solution is not officially recommended by Agilent) or as a workaround for reporting. Reporting of control parameters will become available with the CDS and ICF.



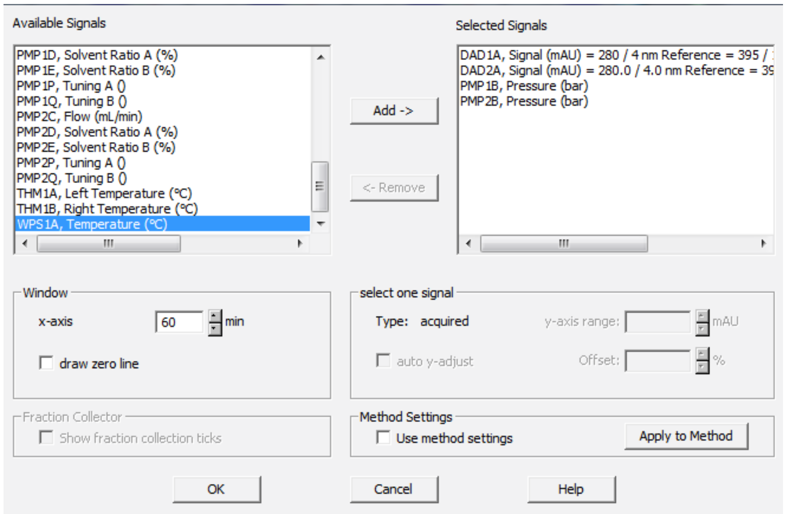
Online Signal Monitor

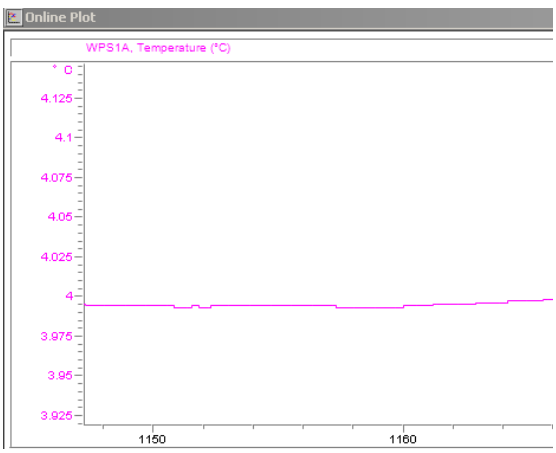
The online signal monitor for the chiller is also available and allows you to monitor the WPS1A temperature signals.

The Online Plot Window should look like this:



If the change button is pressed you can select the Chiller signal WPS1A in the online plot.


Available Signals
PMP1D, Solvent Ratio A (%)
PMP1E, Solvent Ratio B (%)
PMP1P, Tuning A ()
PMP1Q, Tuning B ()
PMP2C, Flow (mL/min)
PMP2D, Solvent Ratio A (%)
PMP2E, Solvent Ratio B (%)
PMP2P, Tuning A ()
PMP2Q, Tuning B ()
THM1A, Left Temperature (°C)
THM1B, Right Temperature (°C)
WPS1A, Temperature (°C)
Add ->
<- Remove
Selected Signals
DAD1A, Signal (mAU) = 280 / 4 nm Reference = 395 /
DAD2A, Signal (mAU) = 280.0 / 4.0 nm Reference = 39
PMP1B, Pressure (bar)
PMP2B, Pressure (bar)
Window
x-axis
60
min
draw zero line
select one signal
Type: acquired
y-axis range:
mAU
auto y-adjust
Offset:
%
Fraction Collector
Show fraction collection ticks
Method Settings
Use method settings
Apply to Method
OK
Cancel
Help


Online Plot
WPS1A, Temperature (°C)
° C
4.125
4.1
4.075
4.05
4.025
4
3.975
3.95
3.925
1150
1160

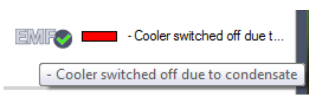
Operation Information

Initial start-up: When the sample cooler or sample thermostat starts back up after being shut down for a while (installation, moving, etc.), moisture can build up inside. This is normal and should disappear after about 24 hours or once the chiller has stabilized at a specific temperature.

Frequent opening of door/drawers: If the doors are opened frequently, warm and/or humid air enters the workspace of the autosampler. Try to limit opening the door/drawers in extremely hot or humid weather

Temperature rise: Due to the warm air temperatures generated during heating from a cold to a warm chiller set point, it is possible to see moisture forming on the shelves and the vials. This moisture is caused by the warm air coming into contact with the colder temperatures in the workspace or the sample hotel. This will disappear after the unit comes out of the heating cycle and goes back into normal operation.

Shut down of the sample cooler or sample thermostat at low temperatures will build up some condensate inside the autosampler.



Important Information

- If the temperature is too warm or too cold in the chiller, check the air vents first to make sure they are not blocked.
- If frost and ice build up inside the sample cooler or sample thermostat, defrost the chiller. This is best done overnight. After defrosting, first check the drainages of the sample cooler or sample thermostat to make sure they are not blocked.

NOTE Do not use mechanical devices or other means to accelerate the defrosting process.

- Waiting for the autosampler to cool down can take 30 min - 45 min or more. This slow ramping behavior is necessary to avoid icing inside the chiller.
- If you turn the sample cooler or sample thermostat off:
  - **a** Remove all sample containers or vials from the autosampler.
  - **b** Let the autosampler temperature stabilize to ambient temperature (open the door far enough for air to get in).
  - **c** Clean the drawers of the sample hotel or the cold reservoir (underneath the drawers) in the sampler, wipe them down, and dry them well.
- Drawer Alarm: The Drawer Alarm feature sounds an alarm when the sample hotel drawer stays open for 2 min and the cooling is turned on. The alarm will repeat constantly until the drawers are closed. The feature will reactivate when the drawers stay open again for 2 min.

NOTE If the alarm sound is audible while the drawers are closed, most likely the front door is open while the robot is moving or a wrong drawer configuration has been detected.

NOTE Adjusting the sample cooler set points from a colder to a warmer set point will result in some condensation.

NOTE Adjusting the sample thermostat set points from a colder to a warmer set point will take longer to avoid some condensation.

Agilent Local Control Modules

Agilent InfinityLab LC Companion G7108AA

The Agilent InfinityLab LC Companion gives you complete control, system monitoring, signal plotting and diagnostic capabilities for a wide range of LC system modules.

The instrument control solution is available as full package including all hardware and accessories, but can also be used on your own mobile devices like tablets, mobile phones and other electronic equipment.

Combining the conveniences of the Agilent Instant Pilot features with state of the art mobile technology, the Agilent InfinityLab LC Companion gives you maximum flexibility and ease of use to control and monitor your LC system modules.

Features:

- Complete local control and monitoring of Agilent Infinity II Prime LC Modules
- Excellent usability and ease of use through a user interface specifically tailored for mobile devices - simple, intuitive touch-enabled and visual controllable.
- High flexibility through a modern “Bring your own device” approach. Connection between LC module and mobile device either wireless via WLAN or wired over USB cable (with full package).
- Convenient, ergonomic operation either handheld or attached to a module at the stack with newly developed, secure tablet holder (included in the full package).
- Preconfigured tablet with all required software already installed (included in the full package).
- Centerpiece of the solution is a USB dongle that activates the complete intelligence of the InfinityLab LC Companion on the instrument stack.

The InfinityLab LC Companion provides:

- fast and direct control in front of the instrument
- a clear overview of the system status

- control functionalities
- access to method parameters and sequences
- a logbook showing events from the modules
- diagnose tests

Agilent 1200 Infinity Series Instant Pilot G4208A

The Agilent 1200 Infinity Series Instant Pilot controller gives you complete control, system monitoring, signal plotting and diagnostic capabilities for a virtually unlimited number of LC system modules. It is connected to the LC system with a CAN cable for power supply and communication.

Features:

- Complete local control and monitoring of an Agilent 1200 Series, 1260 Infinity and 1290 Infinity system or a single module from a single point. However, not for Agilent 1220 Compact LC.
- Mixed system configurations supported, e.g. 1200 Series, 1200 Series SL- and 1100 Series.
- Excellent readability and usability by large colored display with background light, high resolution and contrast.
- Convenient, ergonomic operation either handheld or at the stack with newly developed, secure attachment.
- Handheld or attached to a module in a stack to facilitate operator preferences.

The 1200 Infinity Series Instant Pilot provides:

- Easy automation – recalibration intervals and multi-method sequences satisfy the most stringent automation routines.
- Transfer and archiving of methods, sequences and logbooks via standard USB memory sticks.
- Factory installed software – flat dialog structure, user configurable interface, enhanced sequence engine, for example with wait for baseline stabilization, diagnosis with passed/failed.
- GLP – System logbook and module log-books record errors, unusual events and maintenance activities for GLP traceability.

4
Preparing the Module

This chapter explains the operational parameters of the module.

Leak and Waste Handling

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- → When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.
- → Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).
- → Avoid high vapor concentrations. Always keep the temperature in the sample compartment at least 25 K below the boiling point of the solvent used.
- → Do not operate the instrument in an explosive atmosphere.
- → Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).
- → Reduce the volume of substances to the minimum required for the analysis.
- → Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.
- → Ground the waste container.
- → Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.
- → To achieve maximal safety, regularly check the tubing for correct installation.

NOTE

For details, see the usage guideline for the solvent cabinet. A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available in the Agilent Information Center or via the Internet.

For details on correct installation, see separate installation documentation.

Preparing the Multisampler

For best performance of the multisampler

- When using the multisampler in a system with a vacuum degassing unit, shortly degas your samples before using them in the multisampler.
- Filter samples before use in an InfinityLab LC Series system. Use High pressure filter kit (5067-4638) for inline filtering.
- When using buffer solutions, flush the system with water before switching it off.
- Check the multisampler plungers for scratches, grooves and dents when changing the piston seal. Damaged plungers cause micro leaks and will decrease the lifetime of the seal.
- Solvent Information - Observe recommendations on the use of solvents, see "Solvent Information" on page 77.
- Priming and Purging the System - When the solvents have been exchanged or the system has been turned off for a certain time (for example, overnight) oxygen will re-diffuse into the solvent channel. Therefore priming and purging of the system is required before starting an application.

Table 14 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

Table 14 Choice of Priming Solvents for Different Purposes

Activity	Solvent	Comments
To clean the system when using buffers	Bidistilled water	Best solvent to re-dissolve buffer crystals
After a solvent change	Bidistilled water	Best solvent to re-dissolve buffer crystals

Recommended Mats and Vials

Table 15 Recommended plates and closing mat

Description (Part Number)	Rows	Columns	Plate height	Volume (µL)	Package
384Agilent (5042-1388)	16	24	14.4	80	30
384Corning (No Agilent PN)	16	24	14.4	80	
384Nunc (No Agilent PN)	16	24	14.4	80	
96 well plate 0.5 ml, PP (pack of 10) (5042-1386) 96 well plate 0.5 ml, PP (pack of 120) (5042-1385)	8	12	14.3	500	10 120
96Agilent conical (5042-8502)	8	12	17.3	150	25
96CappedAgilent (5065-4402)	8	12	47.1	300	1
96Corning (No Agilent PN)	8	12	14.3	300	
96CorningV (No Agilent PN)	8	12	14.3	300	
96DeepAgilent31mm (5042-6454)	8	12	31.5	1000	50
96DeepNunc31mm (No Agilent PN)	8	12	31,5	1000	
96DeepRitter41mm (No Agilent PN)	8	12	41.2	800	
96Greiner (No Agilent PN)	8	12	14.3	300	
96GreinerV (No Agilent PN)	8	12	14.3	250	
96Nunc (No Agilent PN)	8	12	14.3	400	
Closing mat for all 96 Agilent plates (5042-1389)	8	12			50

Recommended Vial Plates

p/n	Description
G2255-68700	Vial plate for 54 x 2 mL vials (6/pk)
5022-6539	Vial plate for 15 x 6 mL vials (1/pk)
5022-6538	Vial plate for 27 Eppendorf tubes (1/pk)
5023-2471	Vial plate 40 x 2 mL vials

NOTE

Agilent Technologies recommends to use preslit septa.

NOTE

Bottom sensing is a feature to detect the depth of vials or plates via the software.

If the bottom sensing feature is used, the bottom of the plates and vials must resist the needle. Make sure that the material supports this feature.

NOTE

For the Needle height position, an offset of 0 equates to 2 mm above the wellplate bottom.

Configure Well Plate Types

If the plate you are using is not found on the "Recommended Mats and Vials" on page 105 you may configure a custom plate. Measure the exact dimensions of the plate as marked below and enter the values in the plate configuration table of the ChemStation.

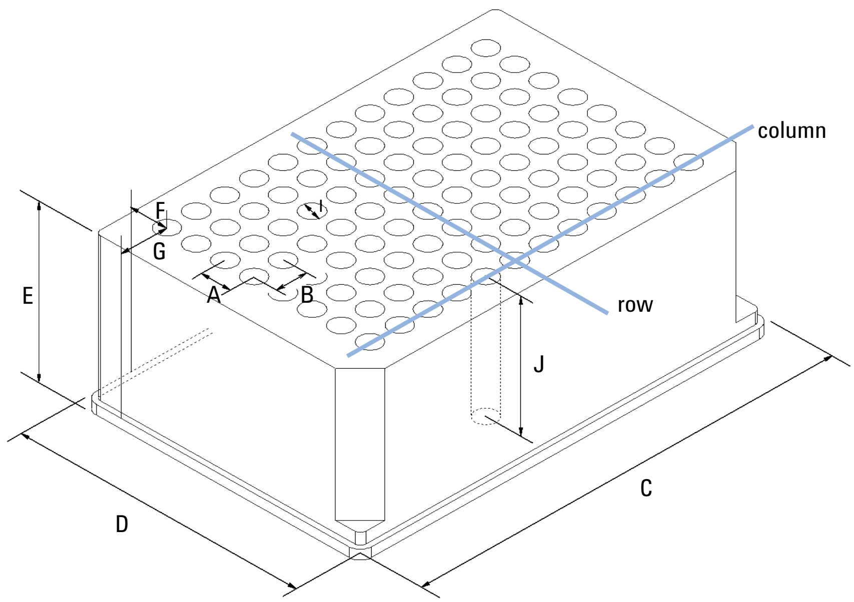


Figure 17 Well Plate Dimensions (straight)

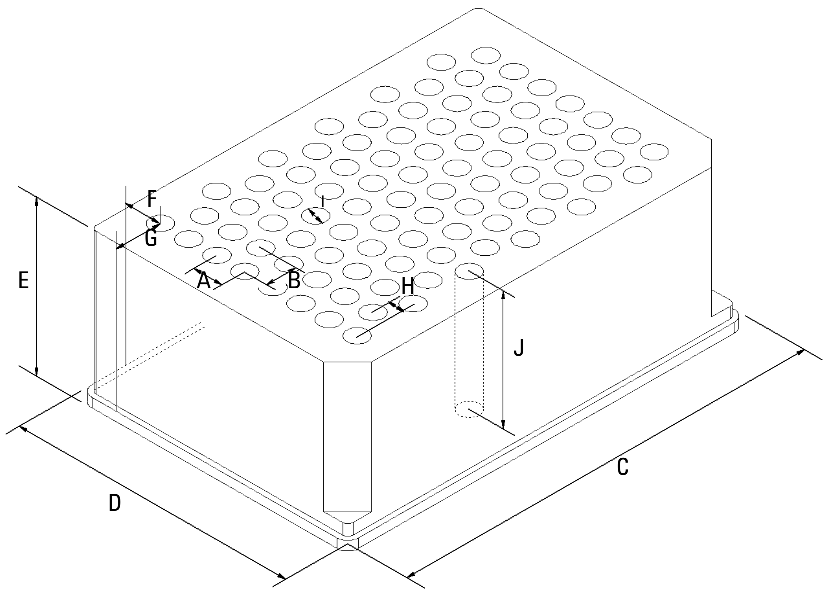


Figure 18 Well Plate Dimensions (staggered)

Table 16 Well Plate Dimensions

Location	Description	Definition	Limits
	Rows	Number of rows on the plate	up to 16
	Columns	Number of columns on the plate	up to 24
	Volume	Volume (in µl) of a sample vessel	
A	Row distance	Distance (in mm) between the center of two rows	
B	Column distance	Distance (in mm) between the center of two columns	
C	Plate length	X size (in mm) at the bottom of the plate	127.75+/- 0.25 mm (SBS Standard)

Table 16 Well Plate Dimensions

Location	Description	Definition	Limits
D	Plate width	Y size (in mm) at the bottom of the plate	85.50+/-0.25 mm (SBS Standard)
E	Plate height	Size (in mm) from the bottom to the top of the plate	up to 47 mm
F	Row offset	Distance (in mm) from the back edge (bottom) to the center of the first hole (A1)	
G	Column offset	Distance (in mm) from the left edge (bottom) to the center of the first hole (A1)	
H	Column shift	Offset (in mm) to Y when the rows are not straight but staggered	
I	Well diameter	Diameter (in mm) of the well	at least 4 mm
J	Well depth	Distance (in mm) from the top of the plate to the bottom of the well	up to 45 mm

NOTE The distances need to be measured with high precision. It is recommended to use calipers.

Capillary Color Coding Guide

Type

Key	Description
Capillary	Connection capillaries
Loop	Loop capillaries
Seat	Autosampler needle seats
Tube	Tubing
Heat exchanger	Heat exchanger

Material

Key	Description
ST	Stainless steel
Ti	Titanium
PK	PEEK
FS/PK	PEEK-coated fused silica*
PK/ST	Stainless steel-coated PEEK**
PTFE	PTFE
FS	Fused silica

*Fused silica in contact with solvent
**PEEK in contact with solvent

Fitting Left/Fitting Right

Key	Description
W	Swagelok + 0.8 mm Port id
S	Swagelok + 1.6 mm Port id
M	Metric M4 + 0.8 mm Port id
E	Metric M3 + 1.6 mm Port id
U	Swagelok union
L	Long
X	Extra long
H	Long head
G	Small head SW 4 mm
N	Small head SW 5 mm
F	Fingertight
V	1200 bar
B	Bio
P	PEEK

The **type** gives some indication on the primary function, like a loop or a connection capillary.
The **material** indicates which raw material is used.
The **fitting** left/right indicate which fitting is used on both ends of the capillary.

At-a-glance color-coding keys

The color of your capillary will help you quickly identify the capillary id – see the chart to the right for reference.

Color-coding key for Agilent capillary tubing

Internal Diameter in mm	Color code
0.015	Orange
0.025	Yellow
0.05	Beige
0.075	Black
0.1	Purple
0.12	Red
0.17	Green
0.20/0.25	Blue
0.3	Grey
0.50	Bone White

Tip: As you move to smaller-volume, high efficiency columns, you'll want to use narrow id tubing, as opposed to the wider id tubing used for conventional HPLC instruments.

Figure 19 Syntax for capillary description

Installing Capillaries

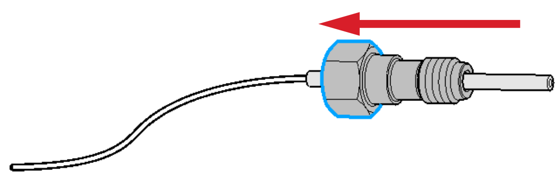
For correct installation of capillary connections of the sampler it's important to choose the correct fittings, see "Capillary Color Coding Guide" on page 110.

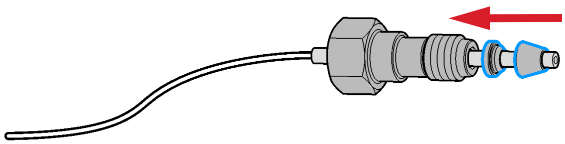
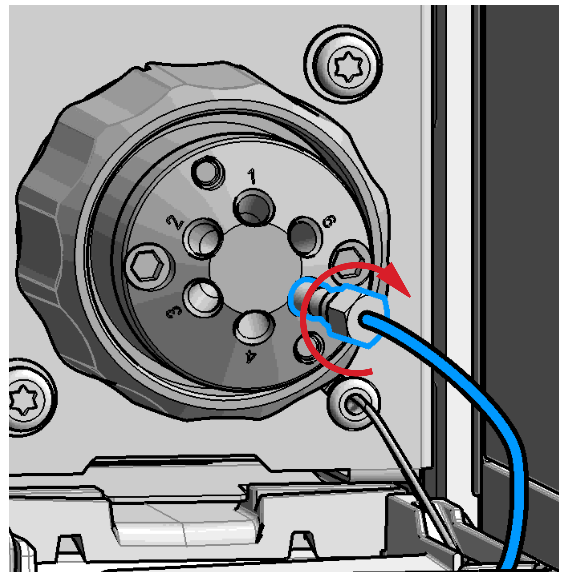
Parts required	p/n	Description
	5067-4650	Capillary ST 0.12 mm x 150 mm SL/SX
	5067-4651	Capillary ST 0.12 mm x 280 mm SL/SX
	5067-4720	Capillary ST 0.17 mm x 150 mm SL/SX
	5067-4722	Capillary ST 0.17 mm x 280 mm SL/SX
	5065-4454	Fitting screw long 10/pk Quantity depends on configuration of the module (number of connections to the multisampler).

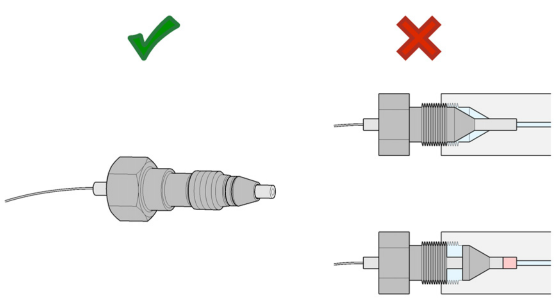
The capillaries mentioned above are examples only.

1 Select a nut that is long enough for the fitting you'll be using.

2 Slide the nut over the end of the tubing or capillary.



<table>
<tr>
<td>3 Carefully slide the ferrule components on after the nut and then finger-tighten the assembly while ensuring that the tubing is completely seated in the bottom of the end fitting.
</td>
<td>4 Use a column or injection valve to gently tighten the fitting which forces the ferrule to seat onto the tubing or capillary.


NOTE
Don't overtighten. Overtightening will shorten the lifetime of the fitting.</td>
</tr>
<tr>
<td>5 Loosen the nut and verify that the ferrule is correctly positioned on the tubing or capillary.
</td>
<td></td>
</tr>
</table>

NOTE

The first time that the swagelock fitting is used on a column or an injection valve, the position of the ferrule is permanently set. If changing from a column or an injection valve to another, the fitting may leak or decrease the quality of the separation by contributing to band broadening.

Flow Connections to the Washport (Standard)

Preparations	Module is installed in the system. Use an appropriate solvent based on the sample and mobile phase chemistries. The composition of the wash solvent should be the most solubilizing compatible solvent (your strongest diluent). Selecting the wash solvent is part of the method development. A mixture of 50 % up to 100 % organic solvent in distilled water is a good choice for many applications.

NOTE The silicone waste drainage is suitable for the most common wash solvents. For critical wash solvents, it may be necessary to replace the silicone tube with a PTFE tube (Tubing Flex (1.5 m) (5042-9974))

1 Place a needle wash solvent reservoir into the solvent cabinet.
2 Connect the Needle Wash Bottle Head Assembly to the solvent reservoir and close the bottle.
3 Guide the tube of the Needle Wash Bottle Head Assembly through the cover opening and connect it to the peristaltic pump.
4 Route the drainage of the washport outlet to the waste container.
5 Prime or auto clean the wash solvent tubings.
6 Check setting up the autosampler with OpenLAB Chemstation.

Flow Connections to the Multisampler (Standard)

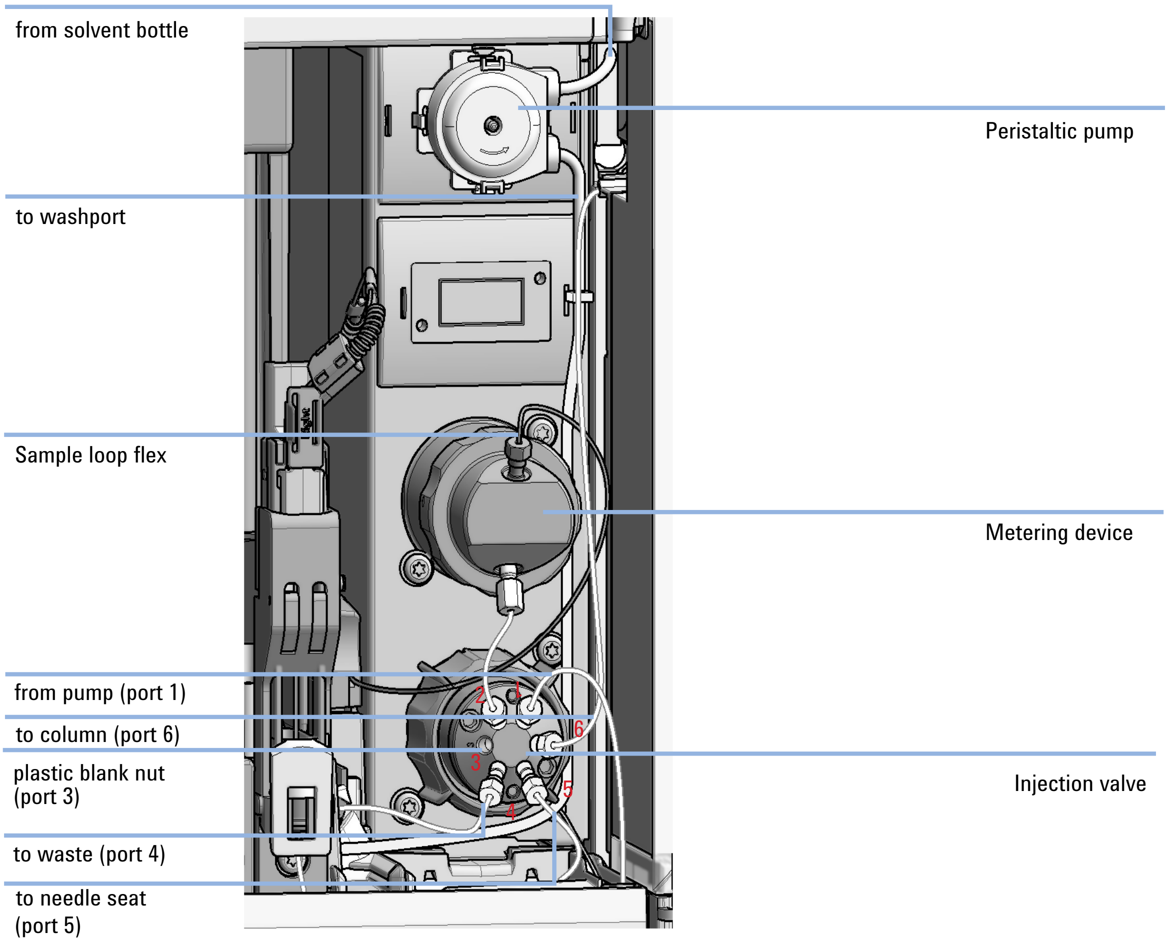


Figure 20 Capillary connections (Standard)

Flow Connections to the Washport (Dual-Needle)

Preparations	Module is installed in the system. Use an appropriate solvent based on the sample and mobile phase chemistries. The composition of the wash solvent should be the most solubilizing compatible solvent (your strongest diluent). Selecting the wash solvent is part of the method development. A mixture of 50 % up to 100 % organic solvent in distilled water is a good choice for many applications.

NOTE

The silicone waste drainage is suitable for the most common wash solvents. For critical wash solvents, it may be necessary to replace the silicone tube with a PTFE tube (Tubing Flex (1.5 m) (5042-9974))

1 Place a needle wash solvent reservoir into the solvent cabinet.
2 Connect the Needle Wash Bottle Head Assembly to the solvent reservoir and close the bottle.
3 Guide the tube of the Needle Wash Bottle Head Assembly through the cover opening and connect it to the peristaltic pump.
4 Route the drainage of the washport outlet to the waste container.
5 Prime or auto clean the wash solvent tubings.
6 Check setting up the autosampler with OpenLAB Chemstation.

Flow Connections to the Multisampler (Dual-Needle)

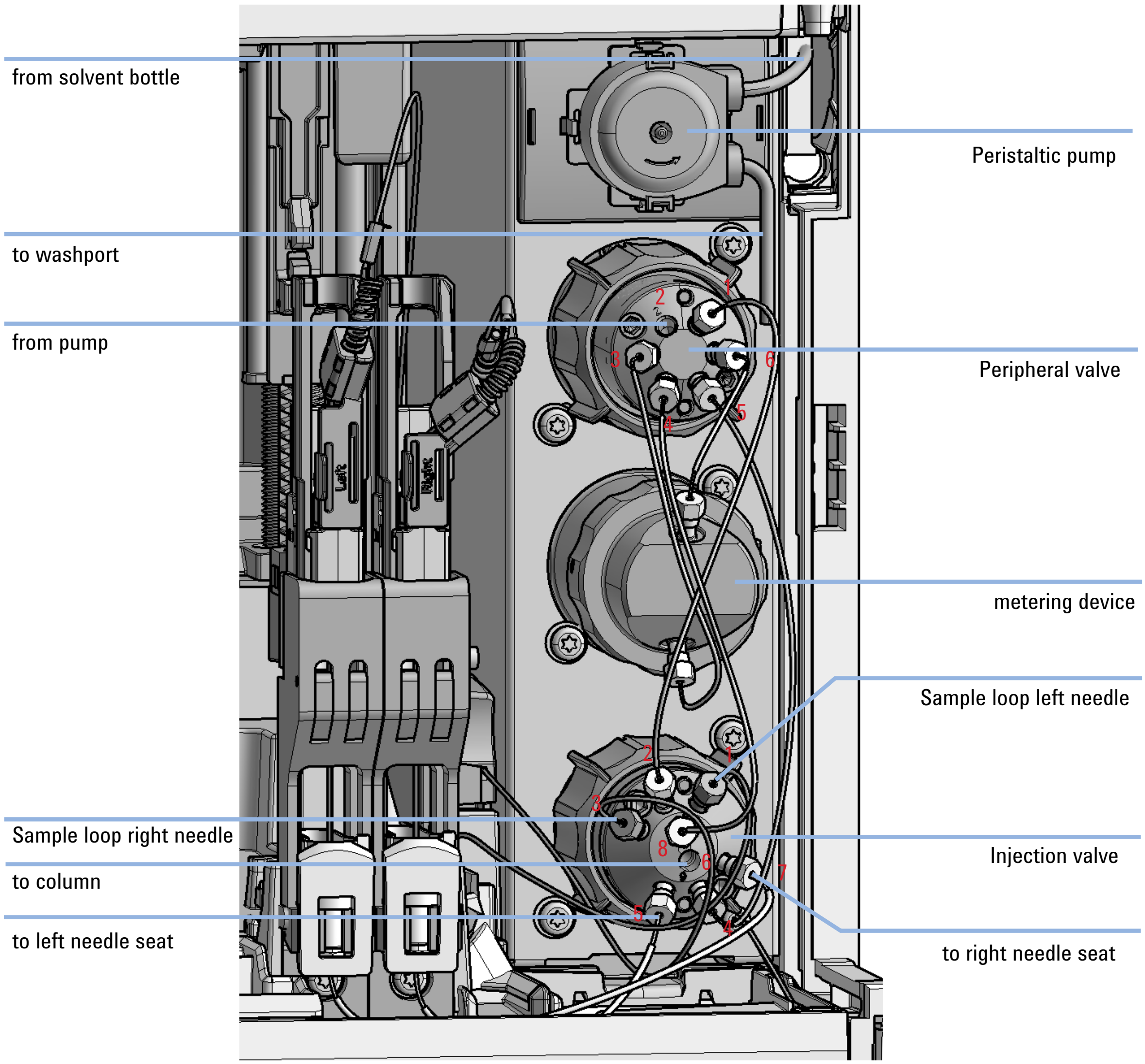


Figure 21 Capillary connections (Dual-Needle)

Installing the Bypass Capillary (Dual Needle)

When When the dual-needle configuration has to be used in single-path mode. The bypass capillary allows the configuration of a minimized injection path to reduce flush times. In this case, the needle where the bypass is installed is no longer available for injection.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

p/n	Description
5500-1238	Capillary ST 0.12 mm x 105 mm SL/SL

Preparations Finish any pending acquisition job and return any plate on the workspace back to the hotel. Remove the Sample Loop-Flex that will be replaced by the bypass capillary. Store the unused sample loop in a safe place.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

→ Do not open the safety lock of the needle assembly

→ Be careful working at the z-robot.

→ Wear safety goggles, when removing the needle assembly.

CAUTION

Mismatching sample loop configuration

Damage to the system

→ Make sure, that the sample loop configuration matches to the hardware installed.

NOTE

If you have changed the bypass capillary, verify that the correct sample loop and bypass capillary is configured in the CDS (see "Setting up the Autosampler with Agilent OpenLab CDS ChemStation Edition" on page 123).

NOTE For details on the setup of the dual-needle system, see “Modify Capillaries” on page 136.

1 Install the bypass capillary to the left or right flow path.

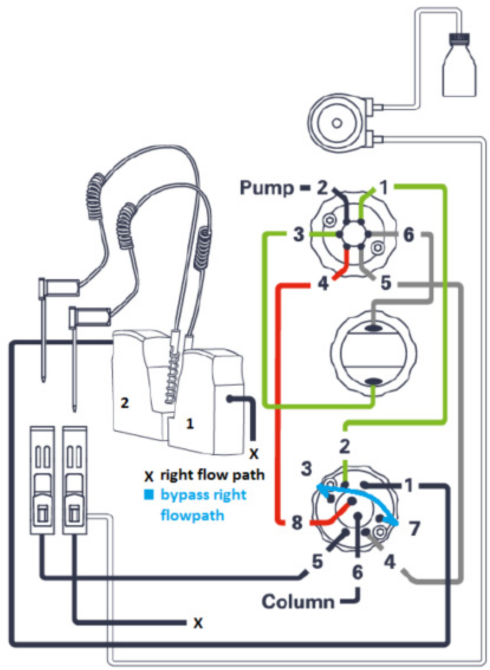
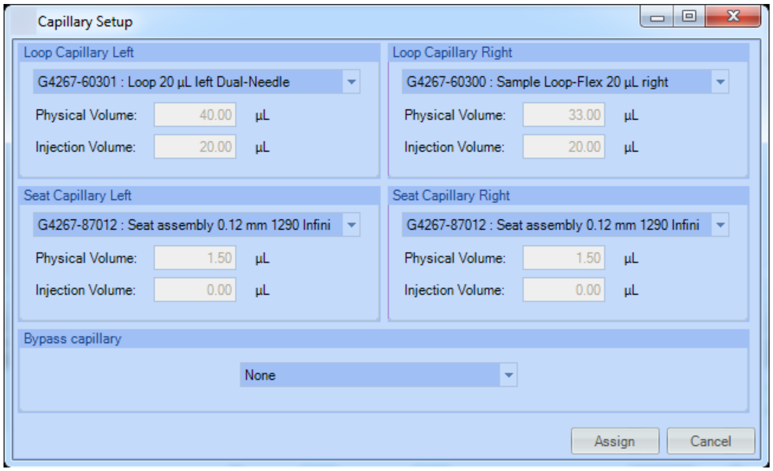


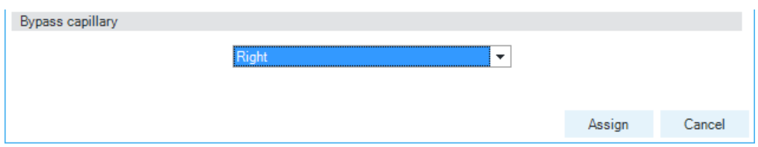
Figure 22 The right bypass capillary is installed

NOTE Either connect the bypass capillary from port 1 to port 5 in the left flow path or connect the bypass capillary from port 3 to port 7 for the right flow path.

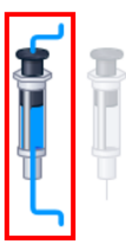
2 To set up the bypass capillary in the CDS, right-click into the active area, then select **Modify > Capillaries** from the context menu.



3 Select **Right** or **Left** from the **Bypass capillary** dropdown menu, depending on which flow path you want to bypass.



In the active area, you will see that one syringe icon is greyed out, indicating that only one flow path is active. Click **Assign**.



Flow Connections to the Washport (Multiwash)

Preparations

Module is installed in the system.

Use an appropriate solvent based on the sample and mobile phase chemistries.

The composition of the wash solvent should be the most solubilizing compatible solvent (your strongest diluent). Selecting the wash solvent is part of the method development.

A mixture of 50 % up to 100 % organic solvent in distilled water is a good choice for many applications.

NOTE The silicone waste drainage is suitable for the most common wash solvents. For critical wash solvents, it may be necessary to replace the silicone tube with a PTFE tube (Tubing Flex (1.5 m) (5042-9974))

1 Place solvent reservoirs for needle wash and needle seat flushing into the solvent cabinet.
2 Connect the Wash Bottle Head Assemblies to the solvent reservoirs and close the bottles.
3 Guide the tubes of the Wash Bottle Head Assemblies through the cover opening and connect it to the ports S1, S2, and S3 of the solvent selection valve.
4 Route the drainage of the washport outlet to the waste container.
5 Prime or auto clean the wash solvent tubings.
6 Check setting up the autosampler with OpenLAB Chemstation.

Flow Connections to the Multisampler (Multiwash)

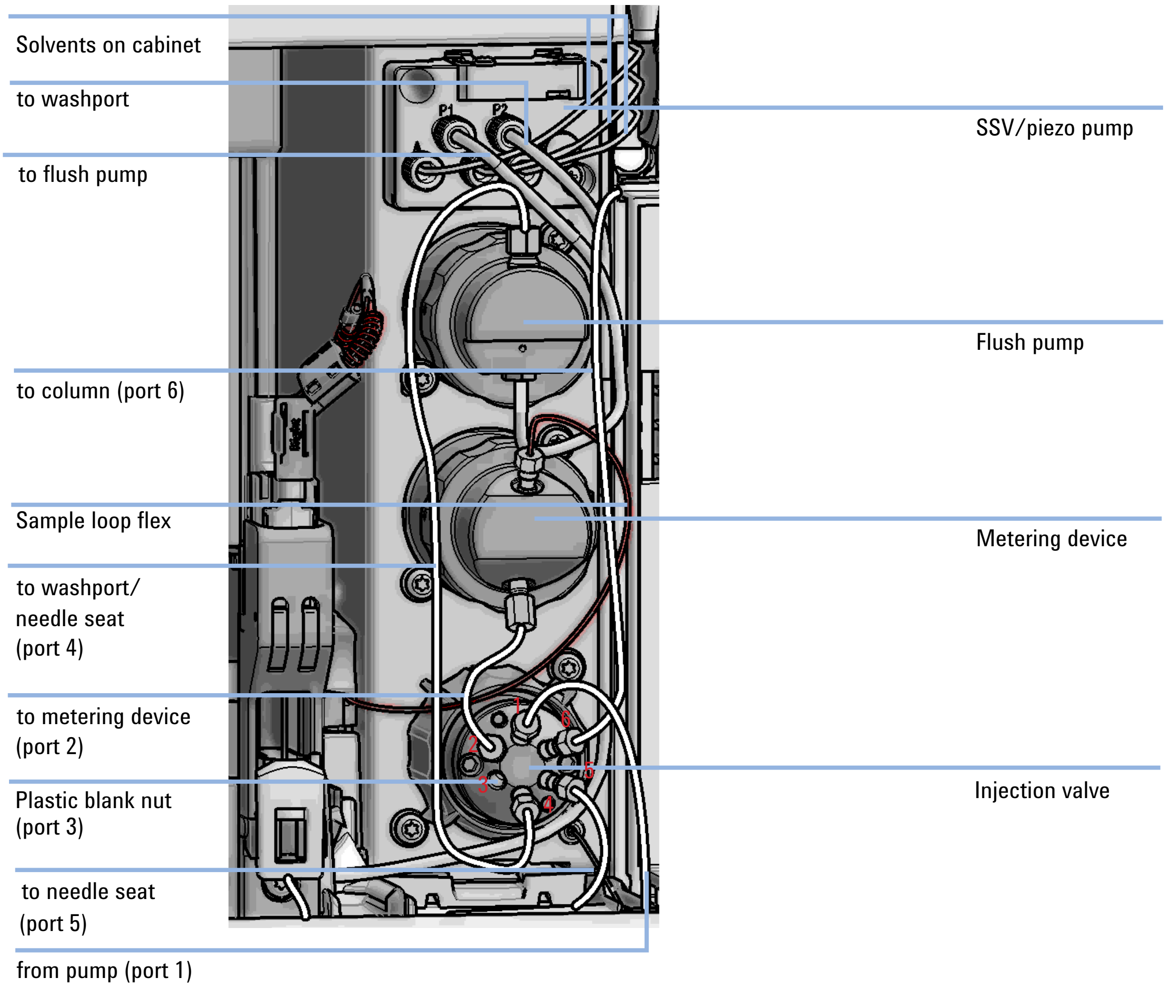


Figure 23 Capillary connections (Multiwash)

Setting up the Autosampler with Agilent OpenLab CDS ChemStation Edition

The setup of the Multisampler is shown with the Agilent OpenLab CDS ChemStation Edition C.01.06. Depending on the controller (e.g. Local Controller, OpenLab CDS EZChrom Edition, Masshunter) the screens look different.

NOTE This section describes the autosampler settings only. For information on Agilent OpenLab CDS ChemStation Edition or other InfinityLab LC Series modules refer to the corresponding documentation.

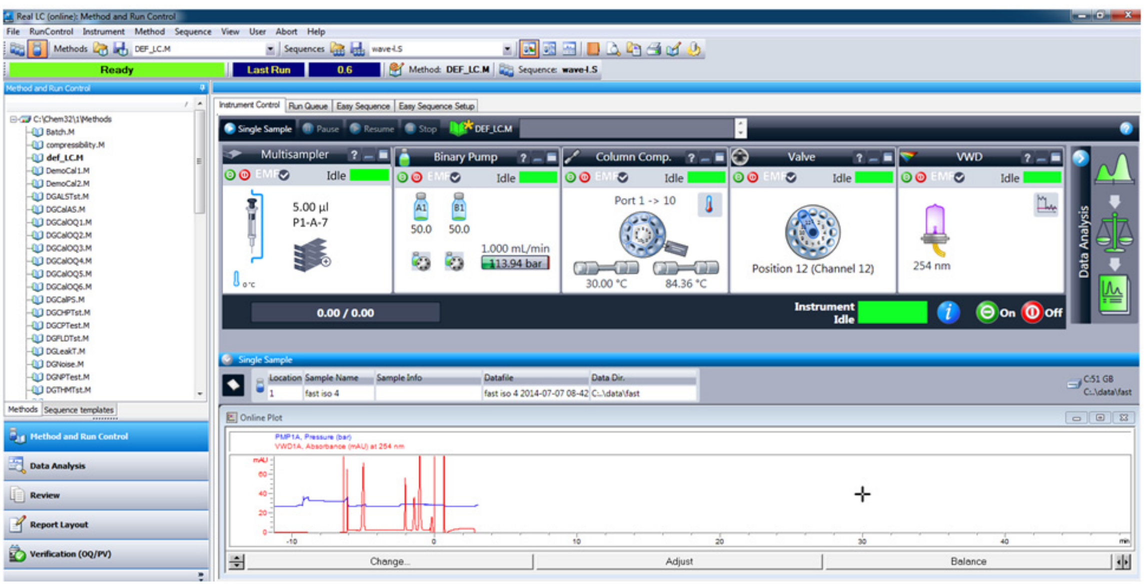
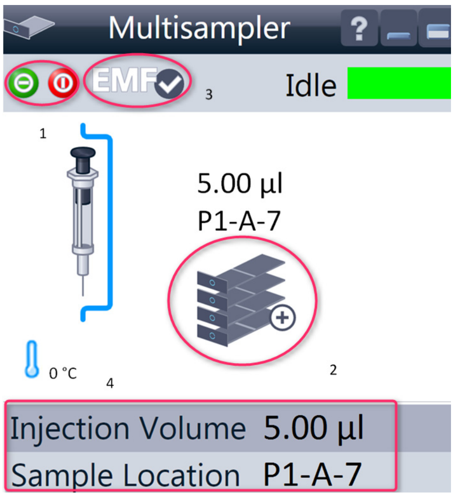


Figure 24 ChemStation Method and Run Control

After successful load of the OpenLab CDS ChemStation Edition, you should see the module as an active item in the graphical user interface (GUI).

Table 17 The Autosampler User Interface

	Within the Multisampler user interface, there are active areas. If you move the mouse cursor across the icons (tray, EMF button), the cursor will change and you may click on the icon to **1** Turn on/off the autosampler **2** Configure the sample hotel **3** Get the status of the **EMF** (Early Maintenance Feature) **4** Sample Cooler/Thermostat Temperatur Current instrument information on: • **Injection volume** • **Sample location**

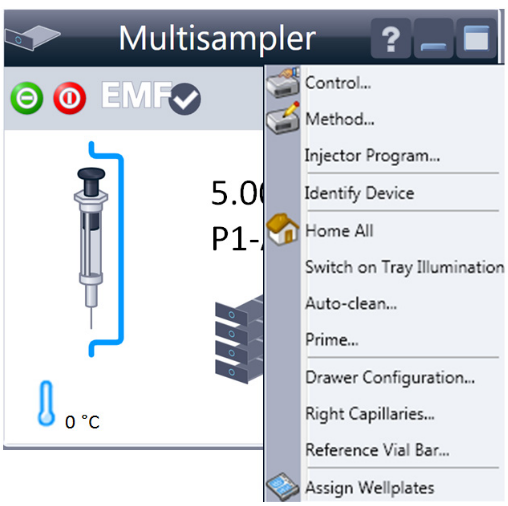
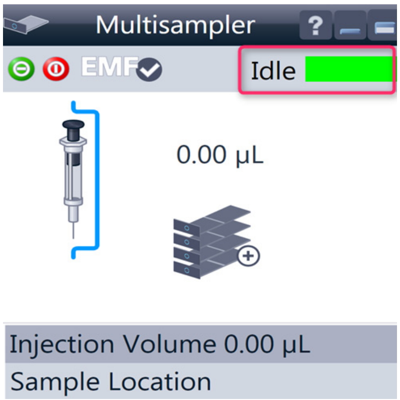
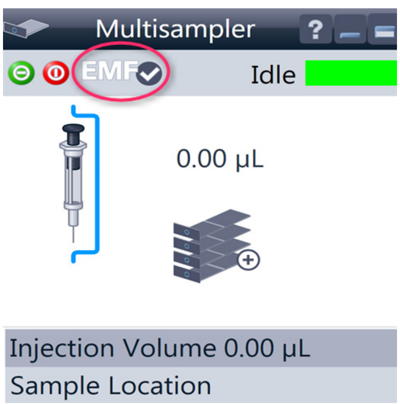
	A right-click into the Active Area will open a menu to
	• Show the **Control** User Interface (special module settings)
	• Show the **Method** User interface (same as via menu **Instrument > Set up Instrument Method > Setup G7167B**)
	• **Injector Program**
	When you activate a pretreatment/injector program, it replaces the standard injection cycle.
	• **Identify Device**
	• **Home All**
	• **Switch on Tray Illumination**
	• **Auto Clean**
	• **Prime**
	• **Modify**
	  ◦ **Drawer Configuration**
	  Changing the load capacity of the Sample Hotel
	  ◦ **Capillaries**
	  Changing Sample Loop, Needle Seat, and bypass capillary configuration
	  ◦ **Reference Vial Rack**
	• **Assign Wellplates**
	Wellplate Configuration (same as click on the Tray icon)

Table 17 The Autosampler User Interface

	**Module Status** shows Run / Ready / Error state and "Not Ready text" or "Error text" • **Error** (Red) • **Not ready** (yellow) • **Ready** (green) • **Pre run**, **Post run** (purple) • **Run** (blue) • **Idle** (green) • **Offline** (dark gray) • **Standby** (light gray)
	EMF Status shows Run / Ready / Error state and "Not Ready text" or "Error text" • Offline (gray) • Ok No Maintenance required (green) • EMF warning. Maintenance might be required (yellow) • EMF warning. Maintenance required (red)

NOTE The multisampler configuration is done in the module dashboard context menu, not in the instrument configuration.

Control Settings

The control settings are available via right click on the active area of the grafical user interface, see "Setting up the Autosampler with Agilent OpenLab CDS ChemStation Edition" on page 123.

Table 18 Control settings

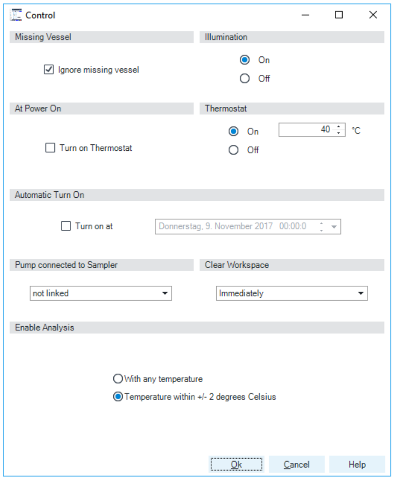


Figure 25 Control settings

The Sampler control parameters are in the following sections:

- **Missing Vial**
  Mark the **Ignore missing vial** check box to specify that, if a vial is missing, the injector ignores it and continues with a 6-second dummy run. The message "Missing vial <x>" is logged, and the system continues with the next injection.
- **Illumination**
  Toggles the illumination of the sample area, On or Off.
- **At Power On**
  The section is available when a cooler or thermostat is installed and configured. Mark the **Turn on Thermostat** check box to specify that the cooler/thermostat is switched on automatically when the instrument is switched on.
- **Thermostat**
  The section is available when a cooler or thermostat is installed and configured and the Constant temperature mode is selected.
  Select **On** to switch on the cooler/thermostat. Specify the required temperature in the adjacent field. The specified temperature must be at least 5 °C below ambient for proper temperature control.
  Select **Off** to switch off the cooler/thermostat.
- **Automatic Turn On**
  You can set a date and time at which the cooler/thermostat switches on automatically.
- **Pump connected to Sampler**
  Use this section to specify the pump that is used with the Vialsampler. If more than one pump is configured, display the drop-down list and select the appropriate pump from the list.
- **Clear Workspace**
  Immediately Returns the sample container on the workspace to its position in the sample hotel immediately after the injection has been completed. This allows you to quickly retrieve the sample container for further processing.
  At End of Analysis Returns the sample container on the workspace to its position in the sample hotel after the current run or sequence/worklist has been completed. This is the default setting.
  Never Leaves the sample container on the workspace until a different sample container is required to replace it.
- **Enable Analysis**
  This section is available when you have a thermostated autosampler with a thermostat element connected and enabled only when the **Thermostat controlled by method** check box in the **Options** section of the **Configuration** dialog box is cleared. It indicates the temperature conditions under which an analysis will be made. Select the **With Any Temperature** option to specify that the analysis can be started irrespective of the temperature of the sample. Select the **Temperature within +/- 1°C** option to specify that the analysis can be started only when the temperature of the sample is within 1 °C of the specified value.

NOTE

The Enable Analysis section is disabled when Not controlled is selected in the Temperature section.

NOTE For additional help and support, highlight the desired area and press the **F1** key. A help screen will open with additional information and documentation about the topic.

Method Parameter Settings

These settings are available via **Menu > Instrument > Set up Instrument Method Multisampler** or via right click on the Active area.

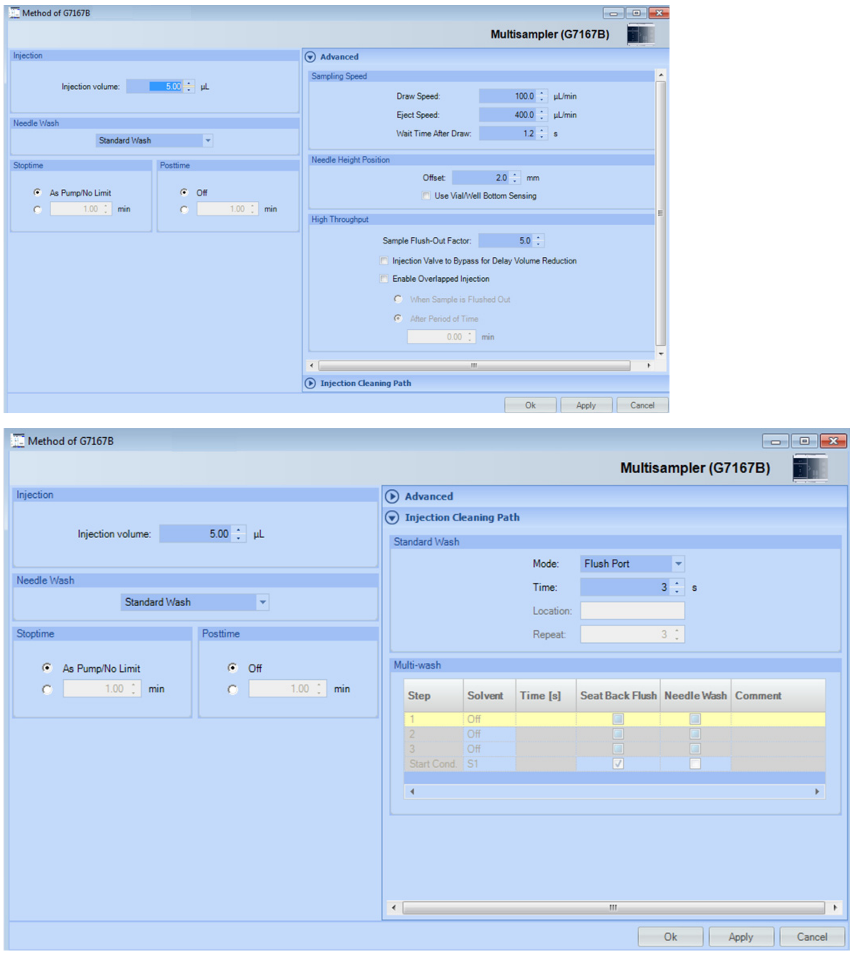
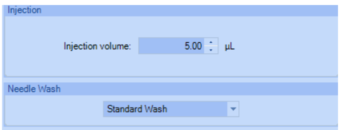


Figure 26 Method parameter settings

NOTE Usually default draw offset = 0 equates to 2 mm above the wellplate bottom.

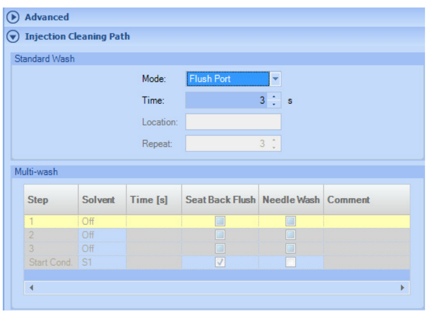
NOTE For additional help and support. Highlight the desired cell and press the **F1** key. A help screen will open with additional information and documentation about the topic.



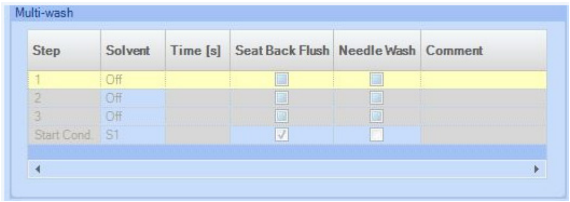
Injection Mode/ Needle Wash

The settable **Injection volume** is depending on what kind of configuration is installed. Default configuration 0.1 – 20 µL.

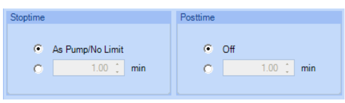
It is possible to select between using the **Standard Wash** or **Standard Wash off**. Using needle wash is one option to obtain minimum carry-over.



The Injection cleaning section allows you to select between the **Standard Wash** option and the **Multi-wash** option. With the **Standard Wash** (default configuration) you can choose between two modes the Flush port or Wash Vial. If the **Multi-Wash** option is installed (additional hardware is required) you can use **Needle Wash** and **Seat Back Flush** together to obtain the lowest carry-over.



Multi-wash (Multisampler Injection Cleaning)
The Multi-wash table allows you to specify up to four steps that will be used to clean the system.
The Start Cond. step is not always executed. Therefore it is recommend to check the box to ensure that, at the end of the cleaning procedure, the flow path of the sampler is filled with the starting solvent conditions for the next sample.
For each cleaning step, Click the Solvent down arrow and select the solvent to use (S1, S2, S3) or switch the step Off.
Specify a duration (in seconds) in the Time [s] field.
Mark the check boxes for **Seat Back Flush** and/or **Needle Wash** to include these actions. If both are selected, they are carried out simultaneously; if neither is selected, the step is ignored (equivalent to selecting **Off**). Add a comment in the **Comment** column, if necessary.



Stoptime/Posttime
A Multisampler **Stoptime** can be set. For equilibration of the Multisampler a **Posttime** can be set.

NOTE

It takes approximatly 30 s to fully exchange one solvent for another in the flushport. To flush and exchange the solvent in the needle seat it takes 18 s.

Additionally it is strong recommended to use Auto-Clean function to flush the module regularly with all installed solvents.

Module Configuration View for Single Needle

The settings are available via menu **Instrument > Instrument Configuration > Multisampler Configuration**.

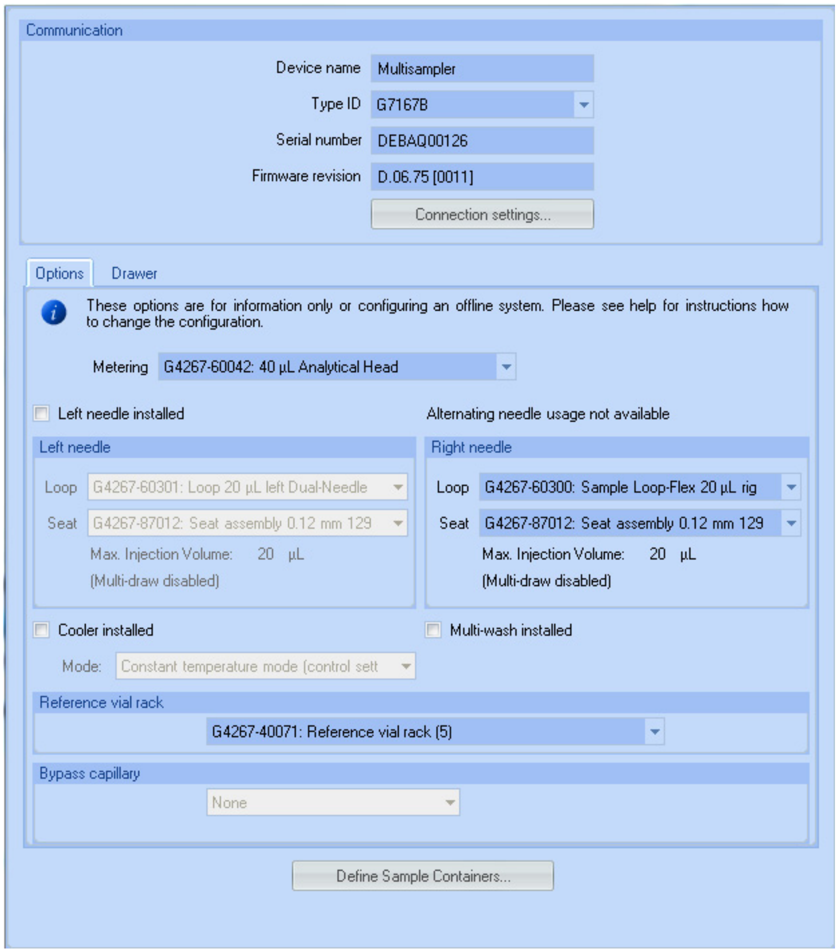
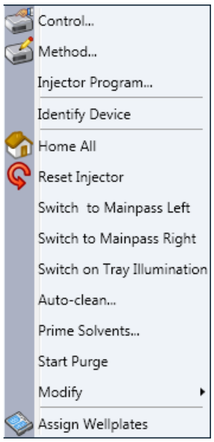


Figure 27 Configuration view (single needle)

- **Device name**: based on the module.
- **Type ID**: based on the module (product number). Some modules may allow changing the type based on hardware/firmware. This results in a change of features and functions.
- **Serial number**: based on the module.
- **Firmware revision**: based on the module.
- **Options**: lists installed options.

NOTE Changes in the sampler configuration can only be done in the online view of the CDS system, see Table 17 on page 124.

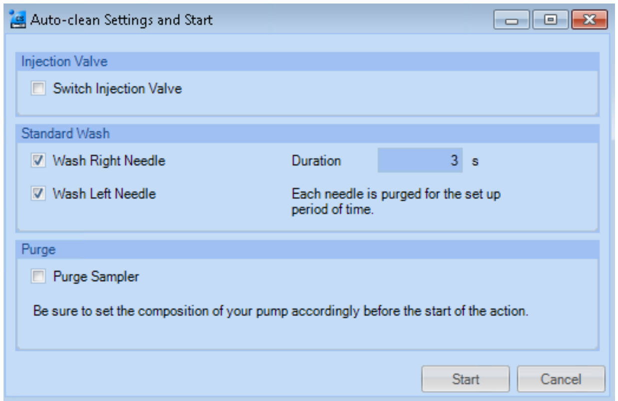
Setting up the Dual Needle System with Agilent OpenLAB CDS ChemStation Edition



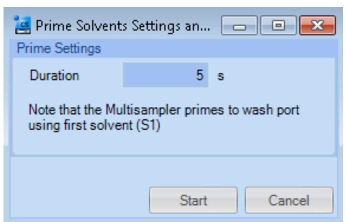
A right-click into the Active Area will open a menu to

- Show the **Control** User Interface (special module settings)
- Show the **Method** User interface (same as via menu **Instrument > Set up Instrument Method > Setup G7167B**)
- **Injector Program**

  When you activate a pretreatment/injector program, it replaces the standard injection cycle.
- **Identify Device**
- **Home All**
- **Reset Injector**
- **Switch to Mainpass Left** (needle loop left is connected to the pump device)
- **Switch to Mainpass Right** (needle loop right is connected to the pump device)
- **Switch on Tray Illumination**
- **Auto-clean**



- **Prime Solvents**



- **Start Purge**:

  Manual start of the purge routine, duration defined by hydraulic setup.

  See “Purge” on page 135 for further information on purge.
- **Modify**
  - **Drawer Configuration**: Changing the load capacity of the Sample Hotel
  - **Capillaries Setup**: for the sample loops, needle seat, and bypass capillaries for dual needle option
  - **Reference Vial Bar**
- **Assign Wellplates**

  Wellplate Configuration (same as click on the Tray icon)

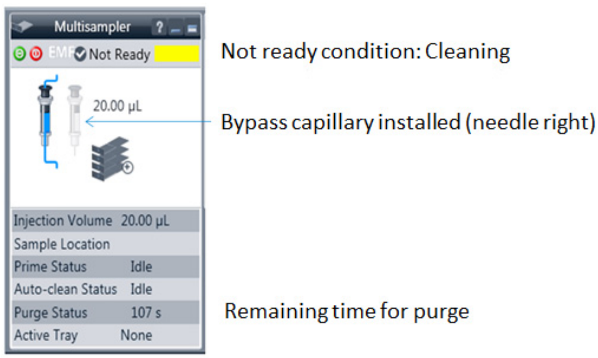
Purge

Typical time for purge:

- 1290 Binary pump, 2x 20 µL setup, flow rate: 0.5 mL/min ~ 125 s
- 1290 Binary pump, 2x 20 µL setup, flow rate: 1.0 mL/min ~ 85 s

Other configurations (especially large volume setups) will last longer.

In order to get information about remaining purge time, expand the window in the user interface:



NOTE The start of the pump or changes in solvent composition trigger the purge routine of the multisampler. The purge routine flushes the hydraulic setup of the multisampler with fresh mobile phase (for example metering device, sample loops, and needles). This ensures cleanness of the flowpath.

NOTE For pumps with a manual purge valve, it is mandatory to start the purge routine before a run or sequence. This will guarantee that the complete flow path of the dual needle setup is flushed with fresh mobile phase.

NOTE The only way to speed up the purge routine is to increase flow rate. Best practices is to write a purge method in the sequence table. The purge method includes a column switching valve that switches at high flow rate into the waste position.

Modify Capillaries

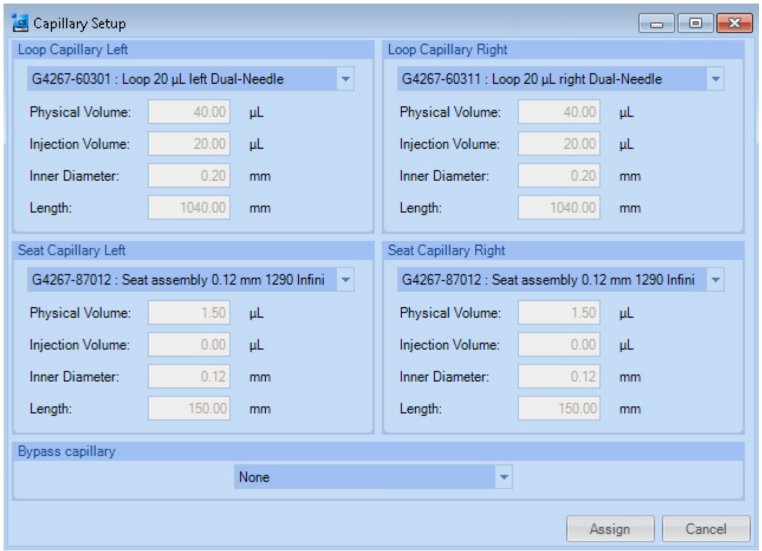


Figure 28 **Capillary Setup** for the Multisampler

NOTE To avoid damage of the system, the configuration of the dual-needle system must match to the installed hardware, especially the sample loops.

NOTE Only the listed capillary PN 5500-1238 can be used as bypass capillary (either left or right).

Instrument Configuration View for Dual Needle

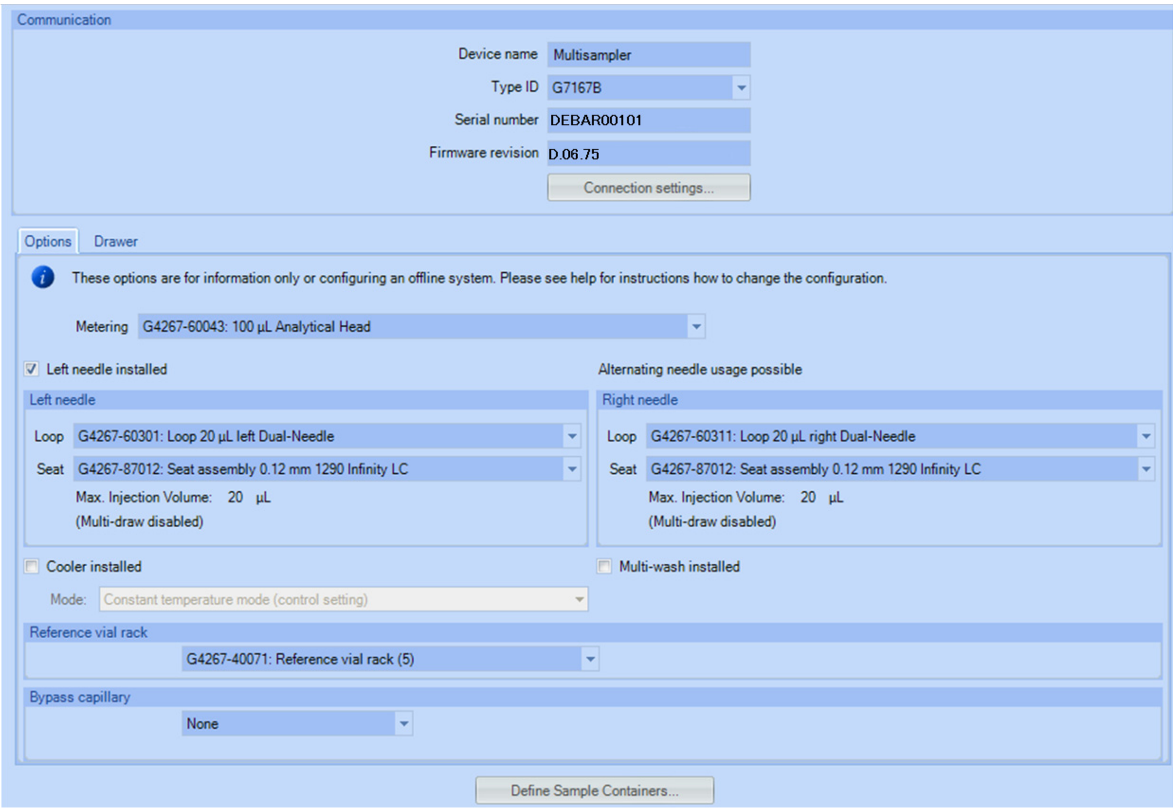


Figure 29 Configuration view for alternating dual needle with two 20 µL Sample Loops

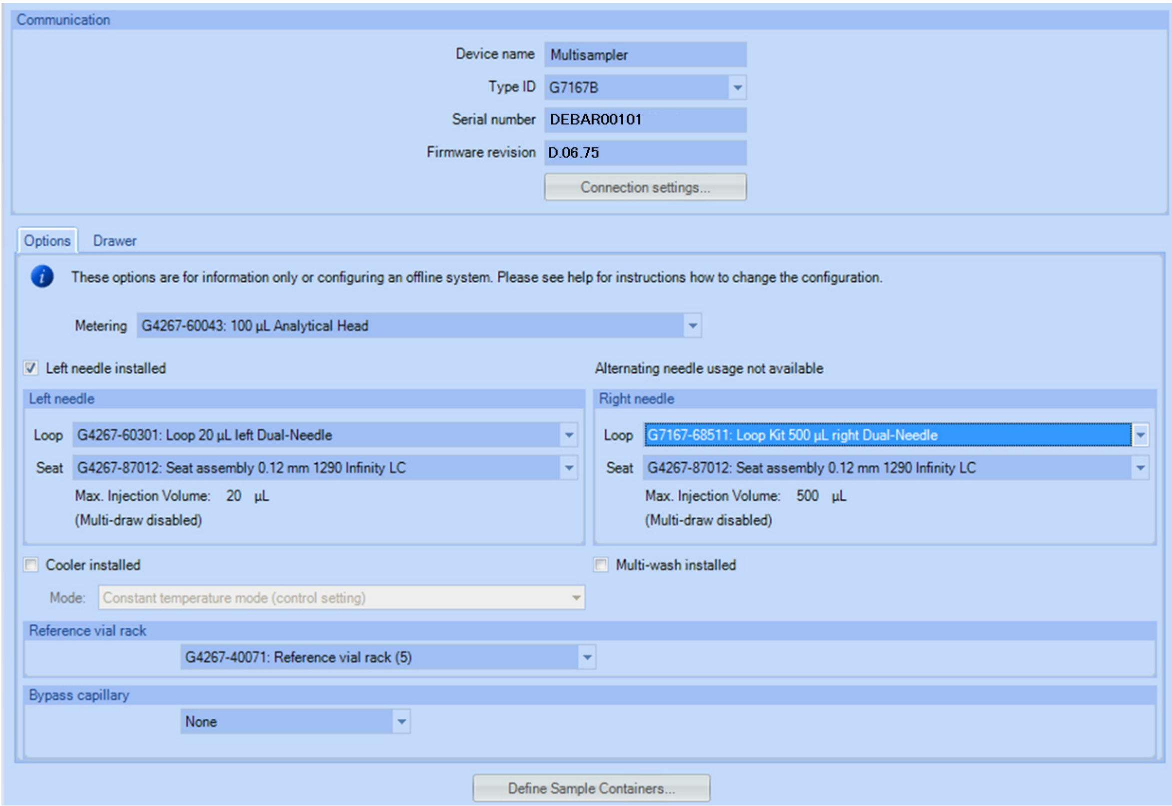


Figure 30 Configuration view for dual needle with non-identical flow paths (e.g a 20 µL and a 500 µL Sample Loop)

NOTE In this view it is not possible to change the online configuration of the sample loops or the seat capillaries.

Shows the currently installed devices and status.

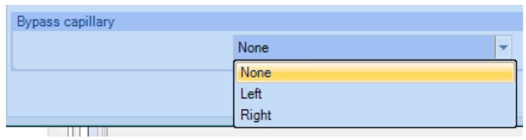
Table 19 Instrument configuration view for dual needle

Communication	• **Device name**: Multisampler • **Type ID**: G7167A/B • **Serial number**: DEBAR00101 • **Firmware revision**: D.06.75 • **Connection settings**: LAN connection or hostname
Options	**Metering**: G4267-60043 100 µL Analytical Head **NOTE** For dual needle only the 100 µL metering device is available. For single needle you can use 40 µL, 100 µL or 900 µL metering devices
Left Needle installed	This check box is marked to indicate that your system is equipped with a dual-needle option. When the check box is marked, the Left Needle section is enabled. **NOTE** If the Left Needle parameters are equivalent to the Right Needle parameters, then Alternating Needle Usage is possible, which increases sampling efficiency. **NOTE** If dual-needle option is installed, the system will use multi-load instead of multi-draw for larger sample volumes. For multi-wash and an installed dual-needle option, multi-draw is not available.
Left Needle	This section is enabled only when the Left Needle installed check box is marked.
Loop	Shows the currently installed loop capillary. **NOTE** It is mandatory that the configuration of the dual needle system, especially sample loops, match to the installed hardware to avoid damage to the system.
Seat	Shows the currently installed seat capillary.
Right Needle	This section is always enabled.

Table 19 Instrument configuration view for dual needle

Loop	Shows the currently installed loop capillary. **NOTE** For the dual needle setup, only the correct dual needle sample loops must be configured and used, for instance Sample Loop 20 µL right Dual needle (G4267-60311). These sample loops are manufactured especially for dual-needle systems.
Seat	Shows the currently installed seat capillary. The needle seat capillary volume is used for the Automatic Delay Volume Reduction option and ISET.
Thermostat installed	This check box is marked to show that a sample cooler or sample thermostat is installed.
Mode	Select **Constant temperature mode** to set the temperature using the **Thermostat** section of the Multisampler Control parameters. Use this mode to store samples at a constant temperature across multiple runs. This is the default mode, which is recommended in most cases. Select **Variable temperature mode** to set the temperature using the **Thermostat** section of the Advanced Method Setup parameters. In this mode, the temperature can be varied from run to run.
Multi-wash installed	This check box is marked to show that the multi-wash option is installed, and the Multi-wash option in the Needle Wash section of the Method parameters is available (*Not available for dual-needle*).
Reference vial rack	Click the down-arrow and select the reference vial rack that is installed in your multisampler from the drop-down list.

Table 19 Instrument configuration view for dual needle

Bypass capillary	Click the down arrow and select where the bypass capillary is installed (if any). When installed, the bypass capillary allows the configuration of a minimized injection path to reduce flush times and allows the dual-needle configuration to be used in single-path mode. In this case, the needle where the bypass is installed is no longer available for injection.  **NOTE** Bypass capillary either installed left or right: only the listed capillary (p/n 5500-1238) can be used as bypass capillary.
Define Sample Containers	Displays the **Define and edit Wellplates configuration** dialog box, which contains a list of standard preconfigured wellplates plus any custom wellplates that have been added.

NOTE

For the dual needle setup, only the correct hardware must be configured and used, for instance the Capillary ST 0.12 mm x 105 mm SL/SL (5500-1238) or Sample Loop 20 µL right Dual needle (G4267-60311).

Method Setup

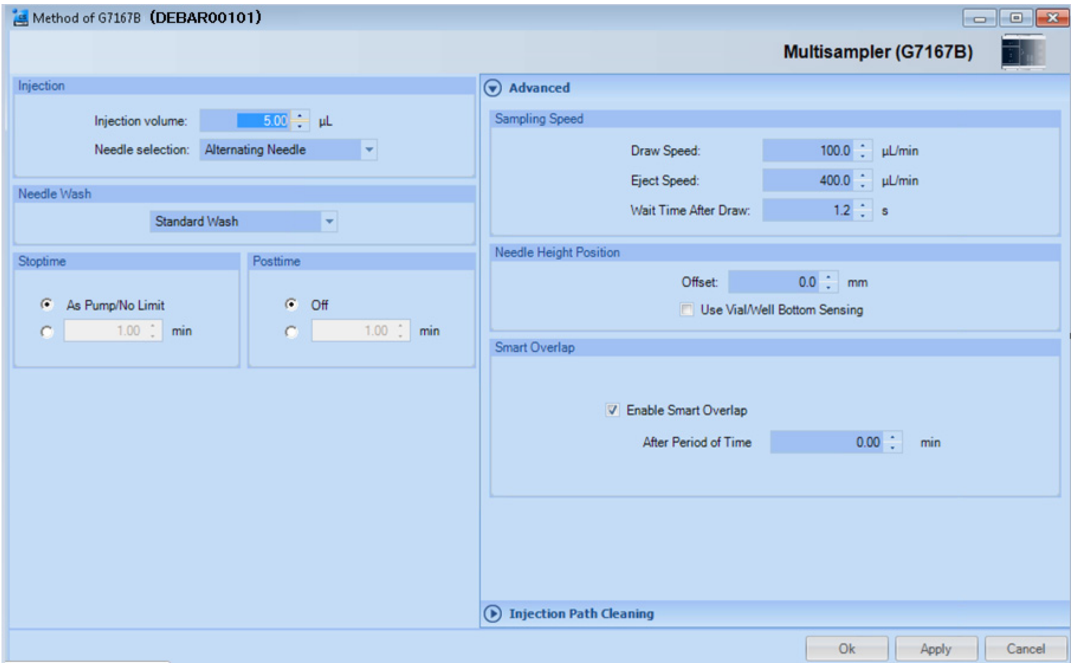


Figure 31 Method setup screen for Dual Needle option

Table 20 Method setup parameters (DN)

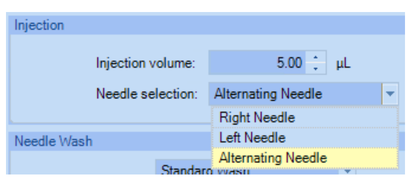
Injection	The Injection section allows you to specify the **Injection volume** and to select the needle
Needle selection	 • **Alternating Needle**: Needles will be toggled (only possible if the both flowpaths of are configured identically) • **Right Needle**: only the right needle will be used • **Left Needle**: only the left needle will be used

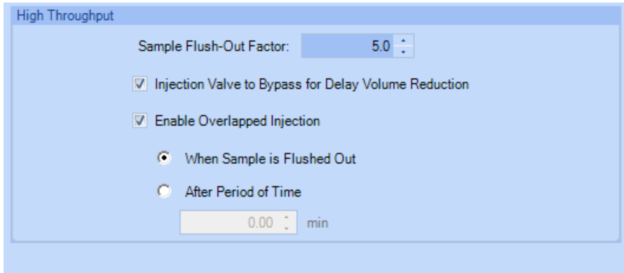
Table 20 Method setup parameters (DN)

Needle Wash	The needle is washed in accordance with the parameters set up in the **Standard Wash** section of the Injection Path Cleaning section of the Method.
Stoptime	The **Stoptime** enables you to set the time that the analysis stops. Limits: 0.01 to 99999 min or **As Pump/No Limit**.
Posttime	You can set the **Posttime** so that your Multisampler remains in a post-run state during the **Posttime** to delay the start of the next analysis. A **Posttime** period can be used to allow your column to equilibrate after changes in solvent composition (for example after gradient elution). Limits: 0.01 to 99999 min or Off (0.0 min).
Sampling Speed	• **Draw Speed**: determines the rate at which the plunger draws sample from the vial. Set the speed to an appropriate value for your sample. For viscous samples, use a slow **Draw Speed**. • **Eject Speed**: determines the rate at which the plunger ejects sample from the metering device. If you are injecting large volumes of sample, setting a high **Eject Speed** will shorten the time needed for an injection cycle. For viscous samples, use a slow **Eject Speed**. • **Wait Time After Draw**: this time ensures that the temporary vacuum, which originates from the drawing of liquid from the sample vial, dissipates. The needle first stays on the seat for the specified time, then after drawing sample from the vial remains there for the specified time.

Table 20 Method setup parameters (DN)

Needle Height Position	• **Offset**: this is a vertical offset that enables you to position the needle a specific distance (in mm) away from its standard position. The **Offset** function is useful when analyzing very small sample volumes, or when only a specific part of the sample is required, for example, the top layer. Usually default draw offset = 0 equates to 2 mm above the wellplate bottom. • **Use Vial/Well Bottom Sensing**: this feature allows the needle to detect non-uniform well bottoms, and adjusts the depth of the needle position to 2 mm (default value) above the detected bottom of the vial or well. You can use **Vial/Well Bottom Sensing** in combination with the **Offset** to customize the draw position of the needle.To turn on **Vial/Well Bottom Sensing**, mark the check box. The default setting is cleared. You may want to turn off **Vial/Well Bottom Sensing** to increase speed of injection, or to avoid the needle touching the bottom of the well if a sample precipitate could clog it.
Smart Overlap	• **Enable Smart Overlap**: Overlapped injection provides faster throughput of samples by allowing the preparation of the next injection while the current injection is in the mainpass. This section is available only for a dual-needle Multisampler with identical left and right flow paths (Seat capillary and Loop capillary), and **Alternating Needle** selected in the **Injection** section of the method setup. • **After Period of Time**: specifies the time (in minutes) that the Multisampler waits after injection of a sample before taking up and injecting the next sample. **NOTE** It is important to calculate the time close to the start point of the next run to avoid waiting time with filled sample loop.

High Throughput

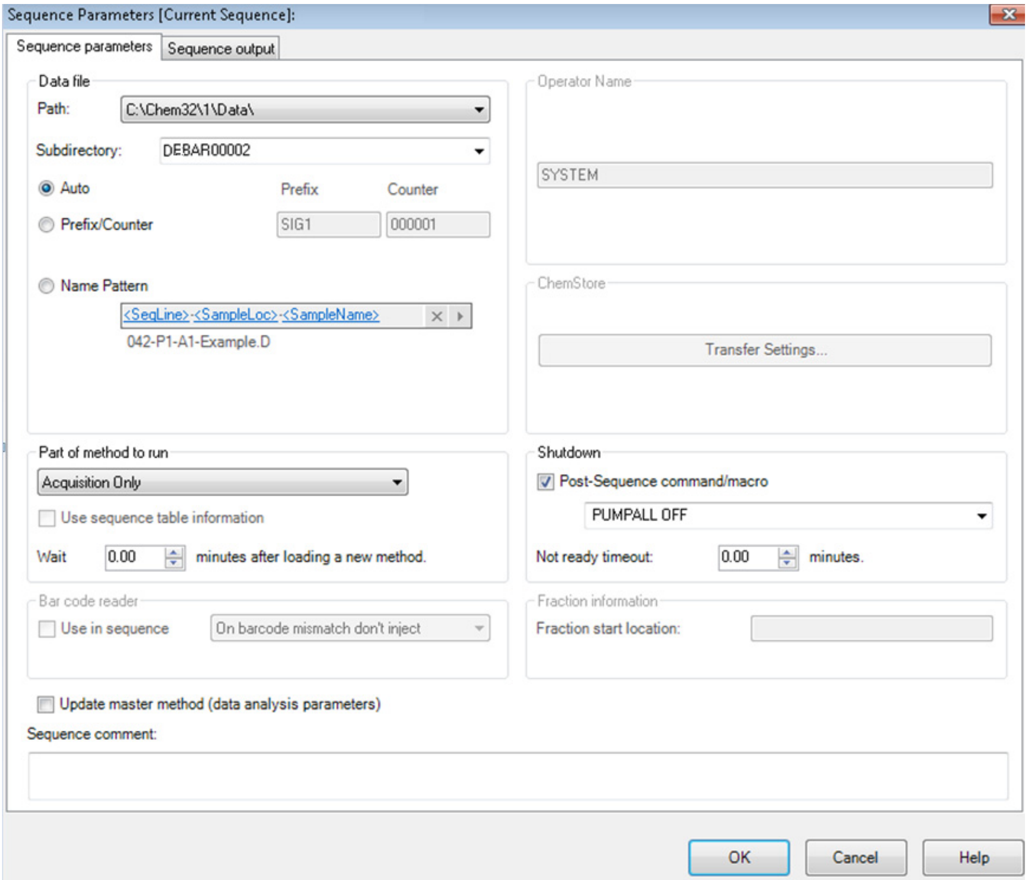


NOTE This section is available only for a dual-needle Multisampler with different seat-capillary and loop-capillary volumes, and either **Right Needle** or **Left Needle** selected in the **Injection** section of the method setup.

Table 21 High throughput

Sample Flush-Out Factor	The **Sample Flush-Out Factor** ensures that the sample is thoroughly flushed out of the sample loop and needle after switching into the mainpass. The factor is part of the flush-out volume formula, which is calculated by the Multisampler firmware. The volume is calculated as: factor x (injection volume + seat capillary volume + valve volume). The **Sample Flush-Out Factor** is preset to 5.0 at the factory. The preset **Sample Flush-Out Factor** is correct for most methods. However, for unusually viscous samples, you should increase the **Sample Flush-Out Factor** to obtain the desired degree of flushing in order to prevent sample carry-over.
Injection Valve to Bypass for Delay Volume Reduction	This parameter is used to switch the flow from the injector from mainpass to bypass after injection has taken place. This reduces the delay volume for low volume techniques. You can specify the point during the analyses when the valve switches to bypass. This is done by setting the **Sample Flush-out Factor**.
Enable Overlapped Injection	Overlapped injection provides faster throughput of samples by allowing the preparation of the next sample during analysis of the injected sample.

Sequence Parameters



Not ready timeout: the time in minutes has to be longer than the purge routine lasts - otherwise the run will be aborted before start.

5
Optimizing Performance

This chapter gives hints on how to optimize the performance or use additional devices.

Delay Volume and Extra-Column Volume

The *delay volume* is defined as the system volume between the point of mixing in the pump and the top of the column.

The *extra-column volume* is defined as the volume between the injection point and the detection point, excluding the volume in the column.

Delay Volume

In gradient separations, this volume causes a delay between the mixture changing in the pump and that change reaching the column. The delay depends on the flow rate and the delay volume of the system. In effect, this means that in every HPLC system there is an additional isocratic segment in the gradient profile at the start of every run. Usually the gradient profile is reported in terms of the mixture settings at the pump and the delay volume is not quoted even though this will have an effect on the chromatography. This effect becomes more significant at low flow rates and small column volumes and can have a large impact on the transferability of gradient methods. It is important, therefore, for fast gradient separations to have small delay volumes, especially with narrow bore columns (e.g., 2.1 mm i.d.) as often used with mass spectrometric detection.

How to Configure the Optimum Delay Volume

For very fast gradients over 0.5 min the delay volume of the system can be easily reduced without changing the physical configuration of the system. The change is achieved by changing the behavior of the multisampler. The delay volume of the autosampler is due to the flow path from the injection valve through the metering device, needle, needle seat and connecting capillaries back to the injection valve (see Table 22 on page 150). For a 1290/1260 Infinity II Multisampler the delay volume equates approximatley to 78 µL (G7167B) or 265 µL (G7167A). To make an injection the valve switches from mainpass to bypass so that the metering device can draw the sample into the needle capillary. The injection is made when the valve switches back to mainpass and the sample is flushed onto the column. The valve remains in this position during analysis so that the autosampler is continually flushed and hence the gradient has to flow through this delay volume to reach the column. This can be eliminated by switching the injection valve from mainpass to bypass after the injection has been made and the injected sample has been flushed onto the column. In practice this can be done a few seconds after injection and is activated by selecting the **Automatic Delay Volume Reduction** (ADVR) function in the autosampler setup menu. The Flush-out Factor (typically 5 times injection volume) ensures that enough time is allowed to flush the sample out of the injector before switching to bypass. For instance a 1 µL injection under standard conditions effectively reduces the system delay volume by approximatly 50 µL or 240 µL, depending on the installed Multisampler.

Table 22 Schematic of injection steps in the Multisampler (Single needle)

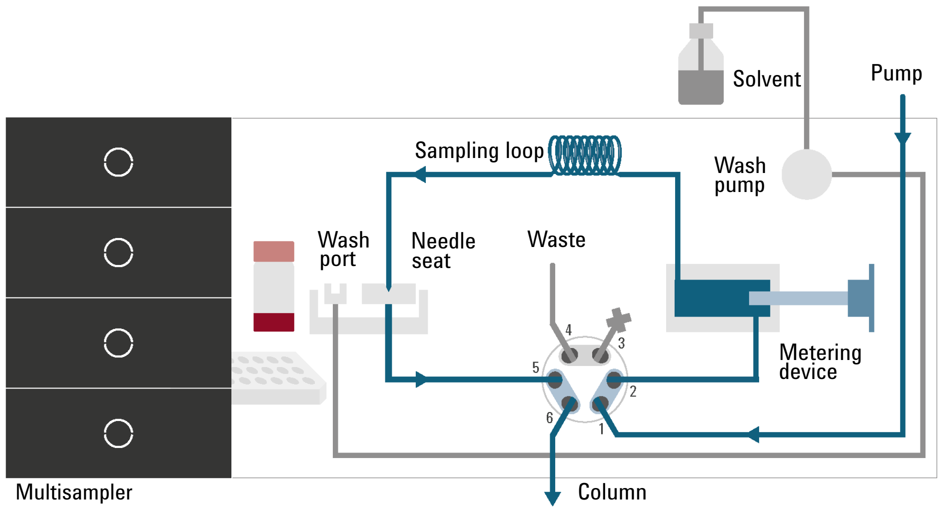


Figure 32 Valve in mainpass, flow through

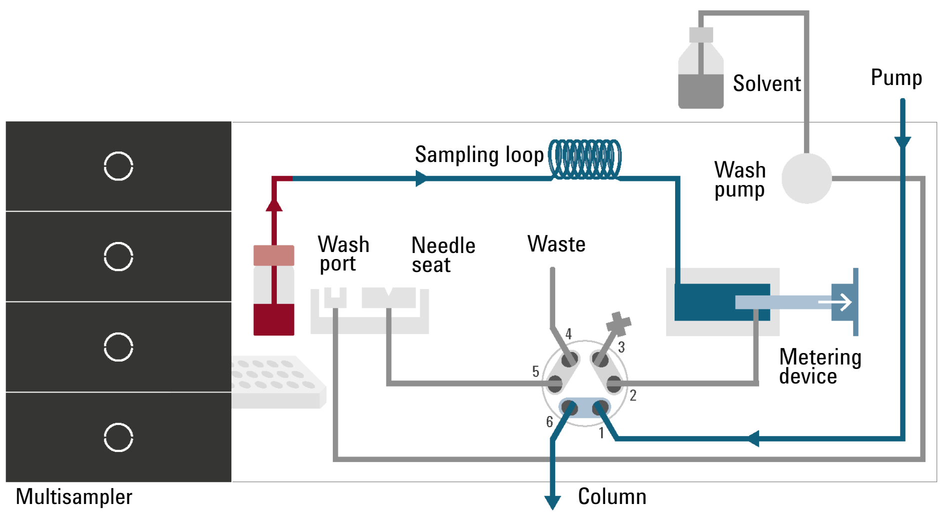


Figure 33 Valve in bypass, drawing sample

Table 22 Schematic of injection steps in the Multisampler (Single needle)

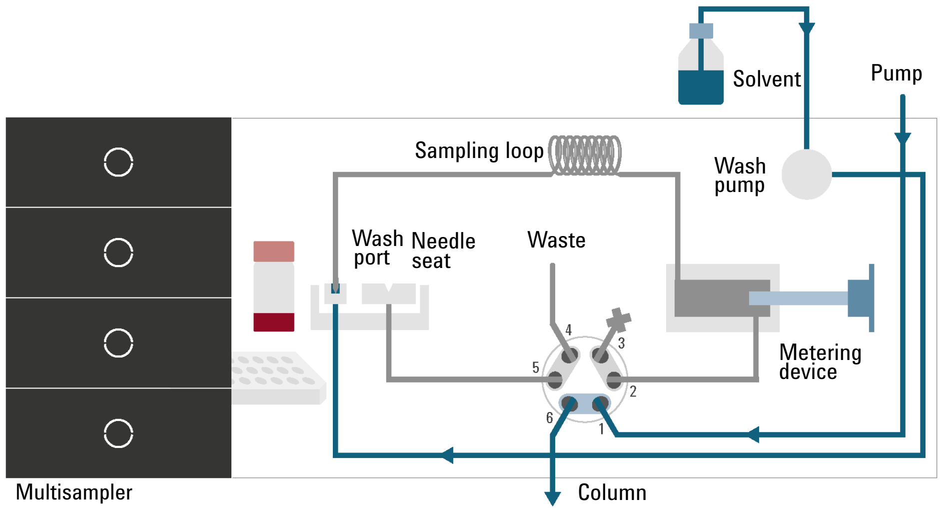


Figure 34 Valve in bypass, washing needle

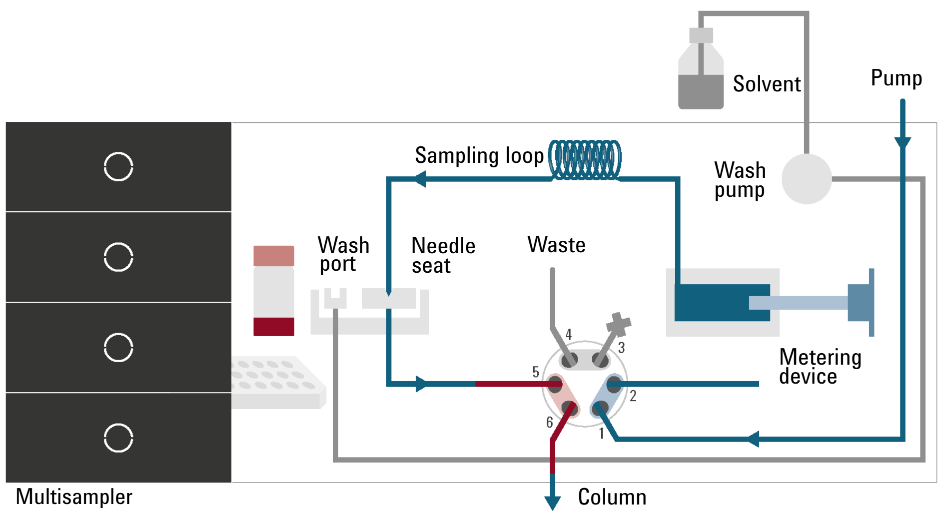


Figure 35 Valve in mainpass, sample injected

Table 22 Schematic of injection steps in the Multisampler (Single needle)

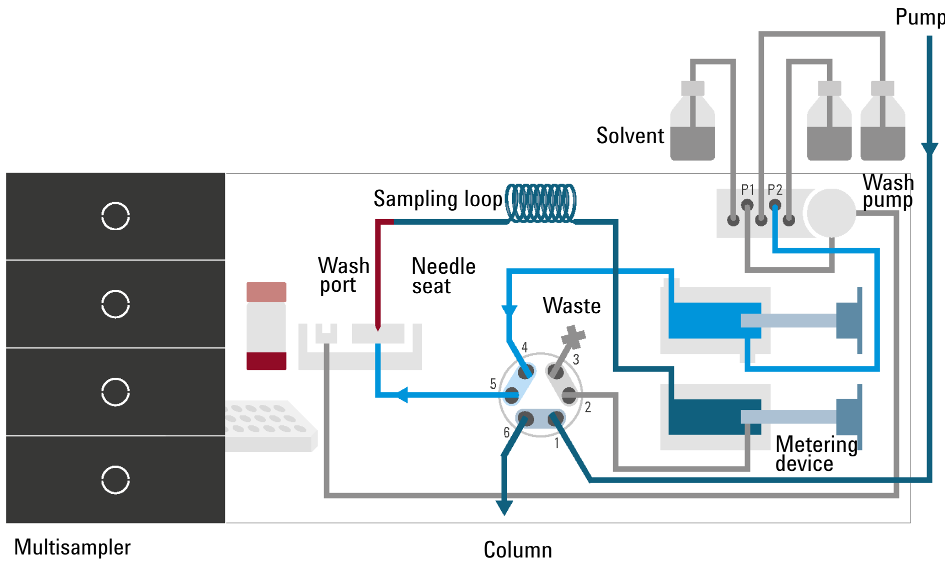


Figure 36 Valve in bypass, needle backflush (Multiwash)

When using ADVR it should be noted that the gradient has already started at the pump at the instant of injection. The question should be asked whether the gradient has already reached the autosampler, in which case a small step in the gradient will result. This happens when the delay volume is less than the flush-out volume and is not necessarily a problem but may be a factor to be considered in a method transfer. With a flush-out factor of 5 and an injection volume of 10 µl, the autosampler will allow 50 µl to pass through before switching to bypass which, with a delay volume of 50 µl, means the gradient just reached the injection valve. Smaller injection volumes will have no effect but for larger injection volumes this will introduce a small step in the gradient. The flow rate in use will also have an impact on the decision to use ADVR or not. At 0.2 ml/min the delay time saved is 21 seconds while at 1.0 ml/min it is 4 seconds.

The ADVR function is unlikely to be suitable for applications involving compounds which are known to cause carry-over problems. The best solution to reduce the delay volume is to install the 40 µL Analytical Head and the 20 µL Loop. To get the best results it is also recommended to order the Low dispersion heat exchanger and the micro flow cell for UV. This will reduce the the delay volume by 60 µL or 250 µL.

How to Achieve Higher Injection Volumes

The standard configuration of the Multisampler can inject a maximum volume of 20 µL with the standard loop capillary. To increase the injection volume the Multidraw upgrade kit (G4216-68711) can be installed. With this kit you can add a maximum of 80 µL to the injection volume of your injector. The total volume for the standard Multisampler is then 100 µL or 120 µL depending on the loop size with 40 µL analytical head installed.

For higher injection volume you can choose between further options. This requires additional hardware modifications. One way to increase the injection volume is to change the analytical head volume. There are a 100 µL and 900 µL analytical heads available. Additional you can install the Multidraw kit (G7167-68711). With the kit you can add a maximum of 400 µL or 1400 µL to the injection volume of your injector. The total volume is then 500 µL or 1500 µL for the Multisampler with a 100 µL analytical head setup. Note the delay volume of your Multisampler is extended when using the extended seat capillaries fromthe multi-draw kit. When calculating the delay volume of the Multisampler you have to double the volume of the extended capillaries. The system delay volume due to the Multisampler will increase accordingly.

Whenever a method is scaled down from a larger column to a smaller column it is important that the method translation makes an allowance for reducing the injection volume in proportion to the volume of the column to maintain the performance of the method. This is to keep the volume of the injection at the same percentage volume with respect to the column. This is particular important if the injection solvent is stronger (more eluotropic) than the starting mobile phase and any increase will affect the separation particularly for early running peaks (low retention factor). In some cases it is the cause of peak distortion and the general rule is to keep the injection solvent the same or weaker than the starting gradient composition. This has a bearing on whether, or by how much, the injection volume can be increased and the user should check for signs of increased dispersion (wider or more skewed peaks and reduced peak resolution) in trying to increase the injection size. If an injection is made in a weak solvent then the volume can probably be increased further because the effect will be to concentrate the analyte on the head of the column at the start of the gradient. Conversely if the injection is in a stronger solvent than the starting mobile phase then increased injection volume will spread the band of analyte down the column ahead of the gradient resulting in peak dispersion and loss of resolution.

Perhaps the main consideration in determining injection volume is the diameter of the column as this will have a big impact on peak dispersion. Peak heights can be higher on a narrow column than with a larger injection on a wider column because there is less peak dispersion. With 2.1 mm i.d. columns typical injection volumes might range up to 5 to 10 µL but it is very dependent on the chemistry of the analyte and mobile phase as discussed above. In a gradient separation injection volumes of about 5 % of the column volume might be achieved whilst maintaining good resolution and peak dispersion. One way to achieve larger injections is to use a trapping column selected by a switching valve to capture and concentrate the injection before switching it, i.e. injecting it, onto an analytical column, see Figure 37 on page 154. The valve can be conveniently located in the Multicolumn Thermostat.

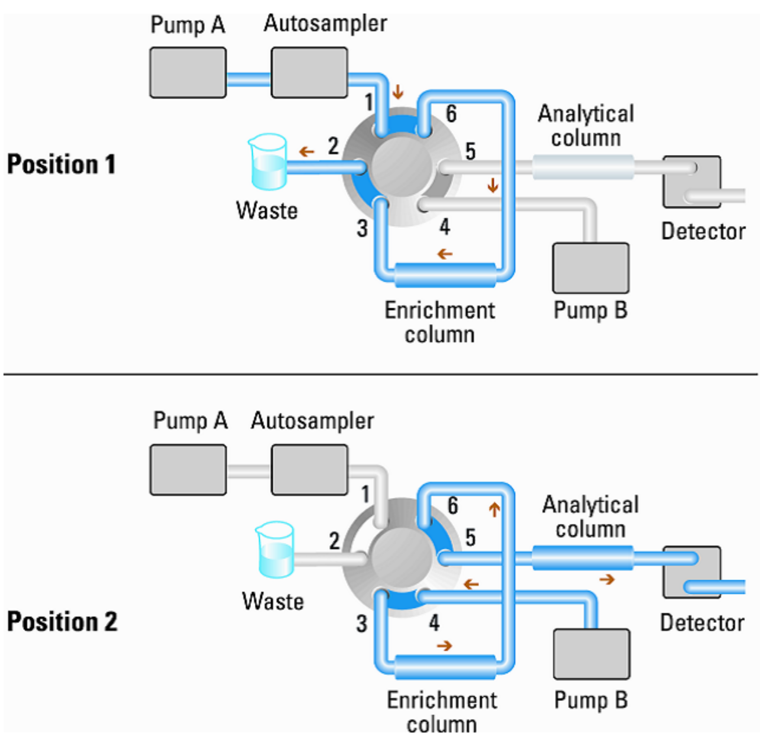


Figure 37 Sample enrichment

How to Achieve High Throughput

The injection can be optimized for speed remembering that drawing the sample too fast can reduce the reproducibility. Marginal gains are to be made here as the sample volumes used tend towards the smaller end of the range in any case. A significant portion of the injection time is the time taken with the needle movements to and from the vial and into the flush port. These manipulations can be performed while the previous separation is running. This is known as *overlapped injection* and it can be easily turned on from the Multisampler setup screen in the control software. The Multisampler can be told to switch the flow through the Multisampler to bypass after the injection has been made and then after, for example, 3 minutes into a 4 minutes run to start the process of aspirating the next sample and preparing for injection. This can typically save 0.5 to 1 minute per injection.

How to Achieve Higher Resolution

Increased resolution in a separation will improve the qualitative and quantitative data analysis, allow more peaks to be separated or offer further scope for speeding up the separation. This section explains how resolution can be increased by examining the following points:

- Optimize selectivity
- Smaller particle-size packing
- Longer Columns
- Shallower gradients, faster flow

Resolution between two peaks is described by the resolution equation:

$$Rs = \frac{1}{4}\sqrt{N}\,\frac{(\alpha - 1)}{\alpha}\,\frac{(k_2 + 1)}{k_2}$$

where

- R_S=resolution,
- N=plate count (measure of column efficiency),
- α=selectivity (between two peaks),
- k_2=retention factor of second peak (formerly called capacity factor).

The term that has the most significant effect on resolution is the selectivity, α, and practically varying this term involves changing the type of stationary phase (C18, C8, phenyl, nitrile etc.), the mobile phase and temperature to maximize the selectivity differences between the solutes to be separated. This is a substantial piece of work which is best done with an automated method development system which allows a wide range of conditions on different columns and mobile phases to be assessed in an ordered scouting protocol. This section considers how to get higher resolution with any chosen stationary and mobile phases. If an automated method development system was used in the decision on phases it is likely that short columns were used for fast analysis in each step of the scouting.

The resolution equation shows that the next most significant term is the plate count or efficiency, N, and this can be optimized in a number of ways. N is inversely proportional to the particle size and directly proportional to the length of a column and so smaller particle size and a longer column will give a higher plate number. The pressure rises with the inverse square of the particle size and proportionally with the length of the column. This is the reason that the 1290 Infinity II LC system was designed to go to 1300 bar so that it can run sub-two-micron particles and column length can be increased to 100 mm or 150 mm. There are even examples of 100 mm and 150 mm columns linked to give 250 mm length. Resolution increases with the square root of N so doubling the length of the column will increase resolution by a factor of 1.4. What is achievable depends on the viscosity of the mobile phase as this relates directly to the pressure. Methanol mixtures will generate more back pressure than acetonitrile mixtures. Acetonitrile is often preferred because peak shapes are better and narrower in addition to the lower viscosity but methanol generally yields better selectivity (certainly for small molecules less than about 500 Da). The viscosity can be reduced by increasing the temperature but it should be remembered that this can change the selectivity of the separation. Experiment will show if this leads to increase or decrease in selectivity. As flow and pressure are increased it should be remembered that frictional heating inside the column will increase and that can lead to slightly increased dispersion and possibly a small selectivity change both of which could be seen as a reduction in resolution. The latter case might be offset by reducing the temperature of the thermostat by a few degrees and again experiment will reveal the answer.

The van Deemter curve shows that the optimum flow rate through an STM column is higher than for larger particles and is fairly flat as the flow rate increases. Typical, close to optimum, flow rates for STM columns are: 2 ml/min for 4.6 mm i.d.; and 0.4 ml/min for 2.1 mm i.d. columns.

In isocratic separations, increasing the retention factor, k, results in better resolution because the solute is retained longer. In gradient separations the retention is described by k^* in the following equation:

$$k^* = \frac{t_G}{\Delta\%B} \cdot \frac{F}{V_m} \cdot \frac{100}{S}$$

where:

- k^* = mean k value,
- t_G = time length of gradient (or segment of gradient) (min),
- F = flow (ml/min),
- V_m = column delay volume,
- Δ%B = change in fraction of solvent B during the gradient,
- S = constant (ca. 4-5 for small molecules).

This shows that k and hence resolution can be increased by having a shallower gradient (2 to 5 %/min change is a guideline), higher flow rate and a smaller volume column. This equation also shows how to speed up an existing gradient – if the flow is doubled but the gradient time is halved, k^* remains constant and the separation looks the same but happens in half the time. Recently published research has shown how a shorter STM column (at temperatures above 40 °C) can generate higher peak capacity than a longer STM column by virtue of running it faster. (Refer to *Petersson et al., J.Sep.Sci, 31, 2346-2357, 2008, Maximizing peak capacity and separation speed in liquid chromatography*).

How to Achieve Higher Sensitivity

The sensitivity of a separation method is linked to the choice of stationary and mobile phases as good separation with narrow peaks and a stable baseline with minimal noise are desirable. The choice of instrument configuration will have an effect and a major impact is the setup of the detector. This section considers how sensitivity is affected by:

- Pump mixer volume
- Narrower columns
- Detector flow cell
- Detector parameters

In addition, the discussion on detector parameters also mentions the related topics of selectivity and linearity.

Columns

Sensitivity is specified as a signal-to-noise ratio (S/N) and hence the need to maximize peak height and minimize baseline noise. Any reduction in peak dispersion will help to maintain peak height and so extra-column volume should be minimized by use of short, narrow internal diameter, connection capillaries and correctly installed fittings. Using smaller inner diameter columns should result in higher peak height and is therefore ideal for applications with limited sample amounts. If the same sample amount can be injected on a smaller i.d. column, then the dilution due to column diameter will be less and the sensitivity will increase. For example, decreasing the column i.d. from 4.6 mm to 2.1 mm results in a theoretical gain in peak height of 4.7 times due to the decreased dilution in the column. For a mass spectrometer detector, the lower flow rates of narrow columns can result in higher ionization efficiencies and therefore higher sensitivity.

How to Achieve Lowest Carry Over

Carryover is measured when residual peaks from a previous active-containing injection appear in a subsequent blank solvent injection. There will be carry over between active injections which may lead to erroneous results. The level of carryover is reported as the area of the peak in the blank solution expressed as a percentage of the area in the previous active injection. The Multisampler is optimized for lowest carryover by careful design of the flow path and use of materials in which sample adsorption is minimized. A carryover figure of 0.001 % should be achievable even when a triple quadrupole mass spectrometer is the detector. Operating settings of the Multisampler allow the user to set appropriate parameters to minimize carryover in any application involving compounds liable to stick in the system. The following functions of the Multisampler can be used to minimize carryover:

- Internal needle wash
- External needle wash
- Needle seat backflush
- Injection valve cleaning

The flow path, including the inside of the needle, is continuously flushed in normal operation, providing good elimination of carryover for most situations. Automated delay volume reduction (ADVR) will reduce the delay volume but will also reduce the flushing of the Standard Multisampler and should not be used with analytes where carryover might be a problem.

The outside of the needle can be washed using a wash vial in a specific location or the needle can be washed using the flush port. If a wash vial in a tray location specified by the user is chosen then this vial should have no septum and should contain a solvent suitable for washing the sample from the needle. The septum is not used to avoid wiping contamination off the needle on the downstream only to re-apply it on the upstroke. The needle can be dipped into the vial multiple times. This will be effective in removing a small degree of carryover but for more effective washing of the outside of the needle use the flushport.

The flush port is located above and behind the needle seat and in the standard hardware configurationa peristaltic pump delivers the wash solvent. It has a volume of 0.68 mL and the peristaltic pump delivers 5 mL/min, which means the flush port volume is completely refilled with fresh solvent in 7 s.

If the flush port is selected, the user can set how long the outside of the needle is to be washed with fresh solvent. This can last two or three seconds in routine situations where carryover is less of a problem and 10 – 20 s for more complete washing.

It is recommended that washing the outside of the needle in the flush port should be standard procedure to avoid contaminating the needle seat. If the needle seat becomes contaminated it will have to be back-flushed. In the standard setup it must be done by manually changing the flow connections to clean it.

In this standard configuration the task can be done automated by using the Flexible Cube module. If you have installed the Multisampler with Multi-Wash option the flushport will be primed with a micro piezo pump. This pump can choose between 3 different wash solvents.

The flush port and its solvent delivery pump and tubing should be regularly flushed to ensure the lowest carryover. For example, before using the system each day, prime the flush pump for three minutes with appropriate solvent.

When other measures have failed to eliminate carryover it might be that analyte is sticking inside the injector valve. With auto clean feature in the CDS system the injector valve can be set to make additional switching movements to clean out the flow path in the valve if problems occur here with carryover. If the problem compounds need a high percentage of organic phase for elution, it is recommended to switch the injection valve at the high percentage of organic phase after the last peak has eluted. It is also recommended to switch the injection valve again after the initial conditions for the mobile phase have stabilized. This ensures that the bypass groove in the rotor seal of the valve contains the gradient start conditions, which is especially important for flow rates below 0.5 mL/min. For samples where the outside of the needle cannot be cleaned sufficiently with water or alcohol from the flush pump use wash vials with an appropriate solvent. With an injector program several wash vials can be used for cleaning.

The optimum carry-over performance of the Multisampler is achieved after a run-in period of new instruments or after the exchange of consumable parts (like needle, needle seat and valve parts). During injections in this period, surfaces of these parts adjust to each other. After this period, we recommend back-flushing the needle seat in order to get the sealing areas between needle and needle seat clean. Regular Preventive Maintenance service is recommended as the carry-over performance of the Autosampler depends on the integrity of these consumable parts.

6
Troubleshooting and Diagnostics

This chapter gives an overview about the troubleshooting and diagnostic features and the different user interfaces.

User Interfaces

- Depending on the user interface, the available tests and the screens/reports may vary.
- Preferred tool should be Agilent Lab Advisor Software, see "Agilent Lab Advisor Software" on page 165.
- The Agilent OpenLAB ChemStation C.01.03 and above do not include any maintenance/test functions.
- Screenshots used within these procedures are based on the Agilent Lab Advisor Software.

Agilent Lab Advisor Software

The Agilent Lab Advisor Software is a standalone product that can be used with or without a chromatographic data system. Agilent Lab Advisor helps to manage the lab for high-quality chromatographic results by providing a detailed system overview of all connected analytical instruments with instrument status, Early Maintenance Feedback counters (EMF), instrument configuration information, and diagnostic tests. By the push of a button, a detailed diagnostic report can be generated. Upon request, the user can send this report to Agilent for a significantly improved troubleshooting and repair process.

The Agilent Lab Advisor software is available in two versions:

- Lab Advisor Basic
- Lab Advisor Advanced

Lab Advisor Basic is included with every Agilent 1200 Infinity Series and Agilent InfinityLab LC Series instrument.

The Lab Advisor Advanced features can be unlocked by purchasing a license key, and include real-time monitoring of instrument actuals, all various instrument signals, and state machines. In addition, all diagnostic test results, calibration results, and acquired signal data can be uploaded to a shared network folder. The Review Client included in Lab Advisor Advanced allows to load and examine the uploaded data no matter on which instrument it was generated. This makes Data Sharing an ideal tool for internal support groups and users who want to track the instrument history of their analytical systems.

The optional Agilent Maintenance Wizard Add-on provides an easy-to-use, step-by-step multimedia guide for performing preventive maintenance on Agilent 1200 Infinity and Agilent InfinityLab LC Series instrument.

The tests and diagnostic features that are provided by the Agilent Lab Advisor software may differ from the descriptions in this manual. For details, refer to the Agilent Lab Advisor software help files.

7 Error Information

This chapter describes the meaning of error messages, and provides information on probable causes and suggested actions how to recover from error conditions.

What Are Error Messages

Error messages are displayed in the user interface when an electronic, mechanical, or hydraulic (flow path) failure occurs which requires attention before the analysis can be continued (for example, repair, or exchange of consumables is necessary). In the event of such a failure, the red status indicator at the front of the module is switched on, and an entry is written into the module logbook.

If an error occurs outside a method run, other modules will not be informed about this error. If it occurs within a method run, all connected modules will get a notification, all LEDs get red and the run will be stopped. Depending on the module type, this stop is implemented differently. For example, for a pump the flow will be stopped for safety reasons. For a detector, the lamp will stay on in order to avoid equilibration time. Depending on the error type, the next run can only be started, if the error has been resolved, for example liquid from a leak has been dried. Errors for presumably single time events can be recovered by switching on the system in the user interface.

Special handling is done in case of a leak. As a leak is a potential safety issue and may have occurred at a different module from where it has been observed, a leak always causes a shutdown of all modules, even outside a method run.

In all cases, error propagation is done via the CAN bus or via an APG/ERI remote cable (see documentation for the APG/ERI interface).

General Error Messages

General error messages are generic to all Agilent series HPLC modules and may show up on other modules as well.

Timeout

Error ID: 0062

The timeout threshold was exceeded.

Probable cause	Suggested actions
1 The analysis was completed successfully, and the timeout function switched off the module as requested.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.
2 A not-ready condition was present during a sequence or multiple-injection run for a period longer than the timeout threshold.	Check the logbook for the occurrence and source of a not-ready condition. Restart the analysis where required.

Shutdown

Error ID: 0063

An external instrument has generated a shutdown signal on the remote line.

The module continually monitors the remote input connectors for status signals. A LOW signal input on pin 4 of the remote connector generates the error message.

Probable cause	Suggested actions
1 Leak detected in another module with a CAN connection to the system.	Fix the leak in the external instrument before restarting the module.
2 Leak detected in an external instrument with a remote connection to the system.	Fix the leak in the external instrument before restarting the module.
3 Shut-down in an external instrument with a remote connection to the system.	Check external instruments for a shut-down condition.
4 The degasser failed to generate sufficient vacuum for solvent degassing.	Check the vacuum degasser for an error condition. Refer to the *Service Manual* for the degasser or the pump that has the degasser built-in.

Remote Timeout

Error ID: 0070

A not-ready condition is still present on the remote input. When an analysis is started, the system expects all not-ready conditions (for example, a not-ready condition during detector balance) to switch to run conditions within one minute of starting the analysis. If a not-ready condition is still present on the remote line after one minute the error message is generated.

Probable cause	Suggested actions
1 Not-ready condition in one of the instruments connected to the remote line.	Ensure the instrument showing the not-ready condition is installed correctly, and is set up correctly for analysis.
2 Defective remote cable.	Exchange the remote cable.
3 Defective components in the instrument showing the not-ready condition.	Check the instrument for defects (refer to the instrument’s documentation).

Lost CAN Partner

Error ID: 0071

During an analysis, the internal synchronization or communication between one or more of the modules in the system has failed.

The system processors continually monitor the system configuration. If one or more of the modules is no longer recognized as being connected to the system, the error message is generated.

Probable cause	Suggested actions
1 CAN cable disconnected.	• Ensure all the CAN cables are connected correctly. • Ensure all CAN cables are installed correctly.
2 Defective CAN cable.	Exchange the CAN cable.
3 Defective main board in another module.	Switch off the system. Restart the system, and determine which module or modules are not recognized by the system.

Leak Sensor Short

Error ID: 0082

The leak sensor in the module has failed (short circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak sensor current to change within defined limits. If the current increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Defective leak sensor.	Please contact your Agilent service representative.
2 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.
3 Power switch assembly defective	Please contact your Agilent service representative.

Leak Sensor Open

Error ID: 0083

The leak sensor in the module has failed (open circuit).

The current through the leak sensor is dependent on temperature. A leak is detected when solvent cools the leak sensor, causing the leak-sensor current to change within defined limits. If the current falls outside the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Leak sensor not connected to the Power Switch board.	Please contact your Agilent service representative.
2 Defective leak sensor.	Please contact your Agilent service representative.
3 Leak sensor incorrectly routed, being pinched by a metal component.	Please contact your Agilent service representative.
4 Power switch assembly defective	Please contact your Agilent service representative.

Compensation Sensor Open

Error ID: 0081

The ambient-compensation sensor (NTC) on the power switch board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the power switch board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor increases above the upper limit, the error message is generated.

Probable cause	Suggested actions
1 Loose connection between the power switch board and the main board	Please contact your Agilent service representative.
2 Defective power switch assembly	Please contact your Agilent service representative.

Compensation Sensor Short

Error ID: 0080

The ambient-compensation sensor (NTC) on the power switch board in the module has failed (open circuit).

The resistance across the temperature compensation sensor (NTC) on the power switch board is dependent on ambient temperature. The change in resistance is used by the leak circuit to compensate for ambient temperature changes. If the resistance across the sensor falls below the lower limit, the error message is generated.

Probable cause	Suggested actions
1 Defective power switch assembly	Please contact your Agilent service representative.
2 Loose connection between the power switch board and the main board	Please contact your Agilent service representative.

Fan Failed

Error ID: 0068

The fan in the autosampler module or in the sample cooler or sample thermostat has failed.

The hall sensor on the fan shaft is used by the main board to monitor the fan speed. If the fan speed falls below a certain limit for a certain length of time, the error message is generated.

This limit is given by 2 revolutions/second for longer than 5 seconds.

Depending on the module, assemblies (e.g. the lamp in the detector) are turned off to assure that the module does not overheat inside.

Probable cause	Suggested actions
1 Fan cable disconnected.	Please contact your Agilent service representative.
2 Defective fan.	Please contact your Agilent service representative.
3 Defective sample cooler or sample thermostat fan	Replace the sample cooler or sample thermostat.
4 Defective main board.	Please contact your Agilent service representative.

Leak

Error ID: 0064

A leak was detected in the module.

The signals from the two temperature sensors (leak sensor and board-mounted temperature-compensation sensor) are used by the leak algorithm to determine whether a leak is present. When a leak occurs, the leak sensor is cooled by the solvent. This changes the resistance of the leak sensor which is sensed by the leak-sensor circuit on the main board.

Probable cause	Suggested actions
1 Loose fittings.	Ensure all fittings are tight.
2 Broken capillary.	Exchange defective capillaries.
3 Leaking rotor seal or needle seat.	Exchange the rotor seal or seat capillary.
4 Defective metering seal.	• Exchange the metering seal. • *Make sure the leak sensor is thoroughly dry before restarting the autosampler.*
5 Leaking peristaltic pump	Exchange the peristaltic pump.

Sampler Error Messages

NOTE Please verify the first errors in the list. The last error message could be a subsequent error.

Draw command aborted

Error ID: 25478

The robot (sample handler) failed to move correctly during injection sequence.

Probable cause	Suggested actions
1 Missing vessel	Check if the sample vial is installed in the correct position, or edit the method or sequence accordingly.
2 Needle command failed	Check the status of the needle assembly. Perform an autoreferencing.

Missing vessel

Error ID: 25471

No vial was found in the position defined in the method or sequence. When the needle carrier moves to a vial and the needle lowers into the vial, the position of the needle is monitored by an encoder behind the vial pusher. If no vial is present, the encoder detects an error and the message “missing vial” is generated.

Probable cause	Suggested actions
1 No vial in the position defined in the method	• Install the sample vial in the correct position. • Edit the method or sequence accordingly.
2 Defective needle assembly	Exchange the needle assembly.
3 Defective sample handler	Please contact your Agilent service representative.

Initialization failed

Error ID: 25120

The autosampler failed to complete initialization correctly. The autosampler initialization procedure moves the robot to its reference positions in a predefined routine. During initialization, the processor monitors the position sensors and motor encoders to check for correct movement. During initialization the system also checks the status of the sample hotel and the hydraulic box. If one or more of the movements or the status information of the subparts is not read out successfully, the error message is generated.

Probable cause	Suggested actions
1 Front door not installed correctly.	• Check if the front door is installed correctly. • Check if the magnet is in place in the front door.
2 Sample handler not aligned correctly.	Do an autoreferencing.
3 Mechanical obstruction	Ensure unobstructed movement of the sample handler. Please contact your Agilent service representative.
4 Defective sample handler motors.	Please contact your Agilent service representative.
5 Loose connection between hydraulic box and adapter board	Please contact your Agilent service representative.
6 Defective sample hotel electronic	Please contact your Agilent service representative.
7 Defective specific main board or fusion board	Please contact your Agilent service representative.

Injection valve initialization failed

Error ID: 25123

The autosampler failed to complete initialization correctly. The autosampler initialization procedure can recognize and move the injection valve to its reference positions in a predefined routine. During initialization, the processor monitors the position sensor, tag sensors, and actuator motor to check for correct movement. If one or more of the movements or the status information of the subparts is not read out successfully, the error message is generated.

Probable cause	Suggested actions
1 Injection valve not installed correctly.	Check if the injection valve is installed correctly.
2 TAG and TAG reader not aligned correctly.	Check if the TAG or the TAG Reader are aligned correctly.
3 Electrical connection or components are defective.	Please contact your Agilent service representative.

Sampler alignment procedure command failed

Error ID: 25034

The autosampler failed to complete the alignment correctly. The autosampler initialization procedure can recognize and move the injection valve to its reference positions in a predefined routine. During initialization, the processor monitors the position sensor, tag sensors, and actuator motor to check for correct movement. If one or more of the movements or the status information of the subparts is not read out successfully, the error message is generated.

	Probable cause	Suggested actions
1	Sample handler not aligned correctly.	Switch off the instrument and do an autoreferencing.
2	Mechanical obstruction of the sample handler.	Ensure unobstructed movement.
3	Defective sample handler motors.	Please contact your Agilent service representative.

Sampler transport initialization failed

Error ID: 25121

The autosampler failed to complete initialization correctly. The autosampler initialization procedure moves the robot to its reference positions in a predefined routine. During initialization, the processor monitors the position sensors and motor encoders to check for correct movement. During initialization, the processor monitors the position sensor, tag sensors, and actuator motor to check for correct movement. If one or more of the movements or the status information of the subparts is not read out successfully, the error message is generated.

Probable cause	Suggested actions
1 Sample handler not aligned correctly.	Switch off the instrument and do an autoreferencing.
2 Mechanical obstruction of the sample handler.	Ensure unobstructed movement
3 Defective sample handler motors.	Please contact your Agilent service representative.

Front door error

Error ID: 25051,25049 and 25048

The autosampler failed to complete initialization correctly. The autosampler initialization procedure can recognize that the front door is closed. During initialization, the processor monitors the door sensor and generates this error message.

Probable cause	Suggested actions
1 Front door is not closed properly.	Check if the front door is closed or if the magnet is missing.

Alignment procedure: needle command failed

Error ID: 25095

The autosampler failed to complete initialization or injection sequence correctly. The autosampler initialization procedure or injection sequence cannot move and position the needle assembly correctly in the needle park station. During the parking or movements of the needle assembly, the status information of the subparts is not read out successfully and the error message is generated.

Probable cause	Suggested actions
1 The sample loop capillary was squeezed in the needle parkstation.	• Check if the sample loop is installed correctly. • Do an autoreferencing afterwards (needle assembly must be installed in the needle parkstation during this procedure).
2 The needle assembly was not installed correctly in the needle parkstation.	• Check if the needle assembly is installed correctly. • Install the needle assembly on the sample handler. • Do a reset of the sample handler. • Do an autoreferencing (the needle assembly must be installed in the needle parkstation during this procedure). • If this will not help: Please contact your Agilent service representative.

Needle hit the vessel bottom

Error ID: 25226

The autosampler failed to complete injection sequence correctly. The autosampler can move and draw sample from the draw position and generates the error message.

Probable cause	Suggested actions
1 Sample container is not installed correctly in the pallet.	Check if the sample container is installed correctly.
2 Sample container definition in the CDS is not correctly.	• Check if the correct sample container is selected in the CDS. • Verify if the dimension of the sample container match the database of your CDS.
3 Sample handler not aligned correctly.	• Check if the sample handler can move freely. • Do an auto referencing (needle assembly must be installed in the needle parkstation during this procedure). • If this will not help: Please contact your Agilent service representative.

Robot drive current too high

Error ID: 25409

The autosampler failed to complete initialization correctly. The autosampler initialization procedure can not move the motors inside of the sample handler to their reference positions in a predefined routine. During initialization, the processor monitors the position sensor and encoders to check for correct movement. If one or more of the movements or the status information of the subparts is not read out successfully, the error message is generated.

Probable cause	Suggested actions
1 Sample handler is blocked.	• Check if the sample handler can move freely. • Switch off the instrument. • Do an auto referencing (needle assembly must be installed in the needle parkstation during this procedure).
2 Defective sample handler motors.	Please contact your Agilent service representative.

Robot drive hardware overcurrent

Error ID: 25411

The autosampler failed to complete initialization correctly. The autosampler electronic has detected a increasing of the internal limits and has generated the error message.

Probable cause	Suggested actions
1 Bad electronic connections	Please contact your Agilent service representative.
2 Defective mainboard/fusion board	Please contact your Agilent service representative.

Sample Cooler Error Messages

Cooler Voltage Failure

Error ID: 30722

The sample cooler board has detected a voltage failure.

Probable cause	Suggested actions
1 Blown fuses, defective cable	• Check the power cable from the ALS to the sample cooler. • Please contact your Agilent service representative.
2 Voltage issue in the sample cooler	Please contact your Agilent service representative.

Cooler PCB Error State

Error ID: 30724, 30275

The sample cooler PCB board seems to be defective.

Probable cause	Suggested actions
1 Blown fuses, defective cable	• Check the power cable from the ALS to the sample cooler. • Please contact your Agilent service representative.
2 Defective PCB boards	Replace the sample cooler.

Cooler temperature below or above target temperatur.

Error ID: 30705, 30706

The sample cooler temperature is above or below the target temperature.

Probable cause	Suggested actions
1 Condensate inside of the chiller	Check if the drainage is ok.
2 Defective cable	Check the signal cable from the ALS to the sample cooler.
3 Defective temperature sensor	Replace the sample cooler.

Cooler Overpressure Failure

Error ID: 30712

The sample cooler pressure sensor has detected an overpressure.

Probable cause	Suggested actions
1 Overpressure in the chiller	Switch off the instrument and wait for 15 min. Restart the instrument and check the signals in Lab Advisor.
2 Defective compressor	Replace the sample cooler.

Cooler Condensate Error

Error ID: 30702, 30709, 30710

The sample cooler has detected condensate inside of the leak pane.

Probable cause	Suggested actions
1 Blocked drainage	Switch off the instrument and remove the condensate tubings. Place a beaker underneath the waste outlet. Check the waste container. There should be no kinked and sealed tubing.
2 Defective condensate sensor	Switch the sample cooler off/on and check if after 8 min the error shows up again.
3 Defective leak sensor	Replace the sample cooler.

8
Test Functions and Calibration

This chapter describes the built in test functions.

Introduction

All tests are described based on the Agilent Lab Advisor Software B.02.06 or above. Other user interfaces may not provide any test or just a few. For details on the use of the interface refer to the interface documentation.

Table 23 Interfaces and available test functions

Interface	Comment	Available Function
Agilent Lab Advisor	All tests are available Adding of pressure to chromatographic signals possible	• System Pressure test • Maintenance • Drawer Detection/Auto Referencing • Sample Cooler Function Test • Sample Thermostat Function Test
Agilent ChemStation	No tests available Adding of pressure to chromatographic signals possible	• Drawer Detection/Auto Referencing • Temperature mainboard • Pressure/Pressure ripple

For details on the use of the interface refer to the interface documentation.

System Pressure Test

The test determines the leak rate of the system between pump outlet valves and a blank nut. The blank nut can be positioned at different locations in the system before the flow cell, to determine and verify the leak rate of individual modules and components. The test allows for setting the pressure at which the test is performed. The leak rate of high pressure parts is not always a linear function and therefore it is recommended to perform the test at a pressure that corresponds to the normal operating pressure of the system.

When

- In case of a suspected leak
- To verify successful execution of maintenance

Parts required

p/n	Description
5067-6127	Blank Nut SL For 1290 Infinity II Multisampler you have to use the Blank Nut SL which only fits for the special port size of the VICI valve. This Blank Nut is backward compatible and can be used for the 1260 Infinity II Multisampler as well.

1 Run the System pressure test with the Agilent Lab Advisor (for further information see Online-Help of user interface).

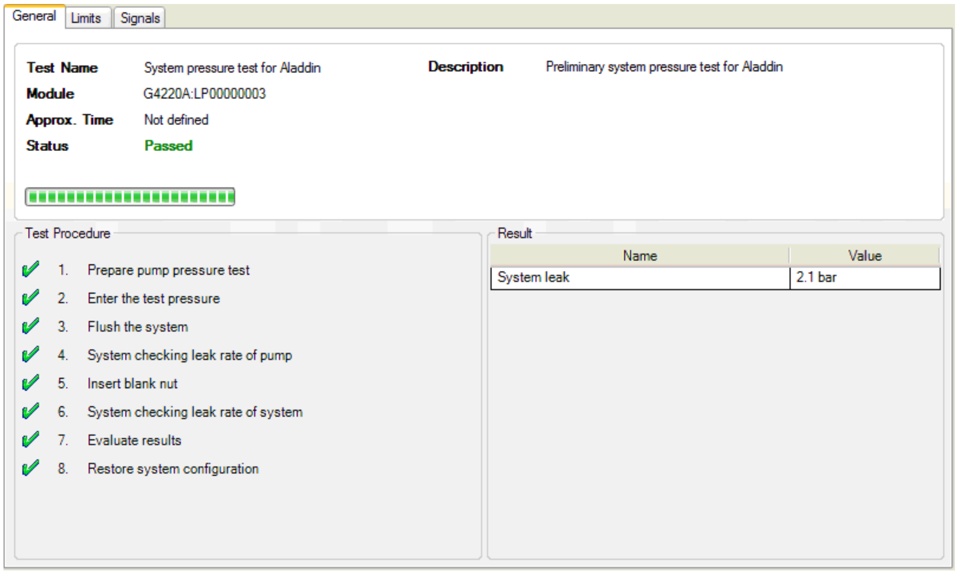


Figure 38 System Pressure Test – Result

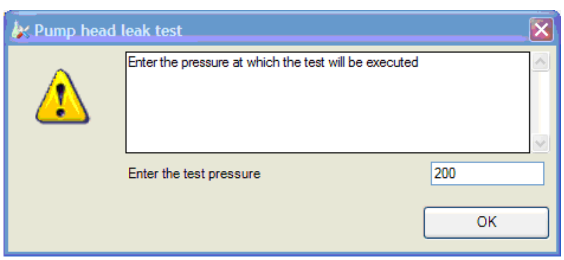


Figure 39 System Pressure Test – Dynamic pressure input

System Pressure Test Evaluation

`Test Failed`

Probable cause	Suggested actions
1 Damaged blank nut (poorly shaped from over tightening)	Before investigating any other possible sources of failure make sure that the blank nut you are using is in a good condition and properly tightened.
2 Pump leakages	Perform the Pump Head Leak test.
3 Loose or leaky fittings	Tighten the fittings or replace capillaries.
4 Autosampler leakages	Perform the Autosampler Leak test.
5 Themostatted Column Compartment valve leakages	Replace the TCC valve rotor seal.

NOTE Notice the difference between *error* in the test and a *failed* result! An *error* is caused by an abnormal termination during the operation of the test, whereas a *failed* result indicates that the test result were not within the specified limits.

Auto Referencing

The multisampler auto referencing uses predefined positions on the base plate and the sample hotel to calibrate the positioning of the needle parkstation and the sample hotel. The auto referencing is required to compensate deviations in positioning the needle assembly and the sample tray. The auto referencing is required after disassembling the system or when you exchange the sample handler, the sample hotel, the needle parkstation, the needle assembly or one of the main boards. This function is implemented in the drawer detection and in the needle exchange routine.

When After disassembling the module or an exchange of the needle assembly.

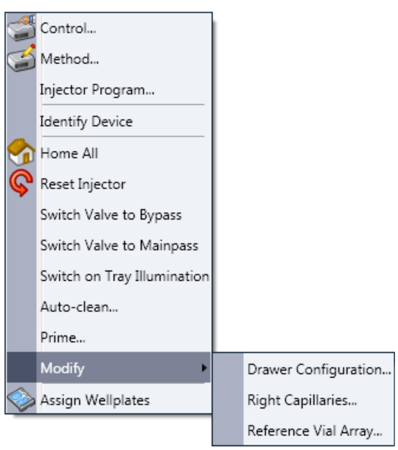
Preparations

- Workspace of the multisampler is empty
- All drawers are closed properly

1 Open the CDS of the instrument.

A right-click into the Active Area of the Multisampler will open a menu to modify

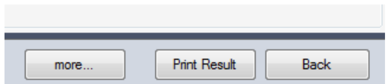
- drawer configuration
- capillaries
- Reference Vial Bar



2 Use drawer configuration and follow the software instructions.

   Auto referencing is done.

3 Click the **Back** button to leave the **Service & Diagnosis** menu.



NOTE For auto referencing, you can alternatively use the Local Controller.

NOTE For auto referencing, the needle assembly has to be installed in the needle parkstation.

Maintenance Positions

Some maintenance procedures require the needle assembly, the sample loop flex, the metering device and the needle seat to be moved to specific positions to enable easy access to components. The maintenance functions move these assemblies into the appropriate maintenance position. In the Agilent Lab Advisor Software the maintenance positions can be selected in the **Service & Diagnostics** view.

When Performing maintenance on the module

1 Run the Maintenance Positions in the **Service & Diagnostics** View in the Agilent Lab Advisor (for further information see Online-Help of user interface).

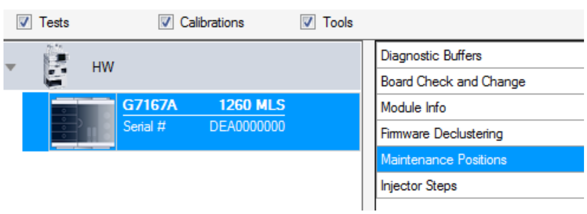


Figure 40 Maintenance Positions

Change Needle Assembly

The Sample handler is positioning the needle assembly so that there is easy access for changing needle assembly or needle seat. The position is far to the left of the needle parkstation, and the current to the motors are off, so that the Z-drive of the robot can be moved while servicing the module.

NOTE For safety reason you have to lock the needle assembly before you detach the needle from the robot. Refer to "Remove the Needle Assembly" on page 215 and "Install the Needle Assembly" on page 220.

NOTE During normal operation the needle assembly has to be unlocked.

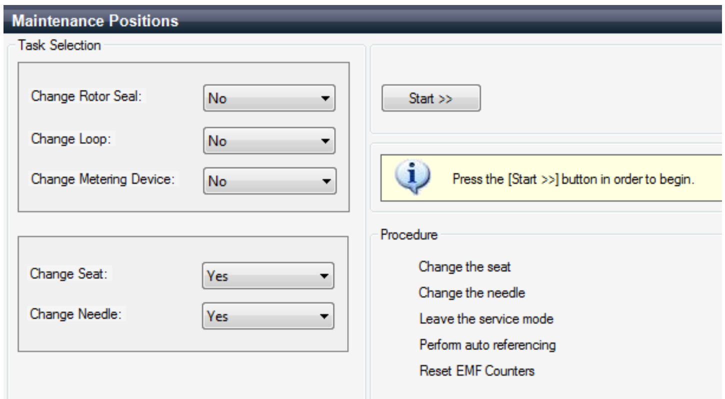


Figure 41 Change Needle Asssembly

Change Sample Loop Capillary

The **Change Loop** command positions the Z-drive of the robotarm far to the left of the needle parkstation to enable easy exchange of the sample loop cartridge.

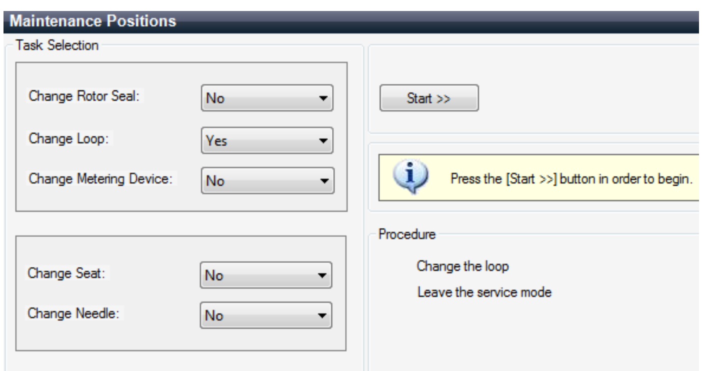


Figure 42 Change Sample Loop Capillary

Arm Position

The home position of the multisampler ensures a better access to the workspace. When transporting the module it is highly recommended to use the **Instrument Control > Park Position** command, in order to place the Sample Handler in a position for safe transport.

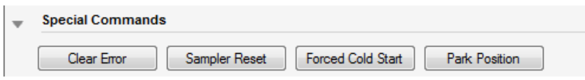


Figure 43 Park Position Button

NOTE If the transport assembly is not parked and not protected by the transport foam, the module could be damaged due to excessive shock of the shipping container during transport.

Change Metering Device

When removing the metering device is necessary (by exchanging the metering seal for instance), the metering drive needs to be moved to a position at the far back, in order to prevent seal and/or piston damage.

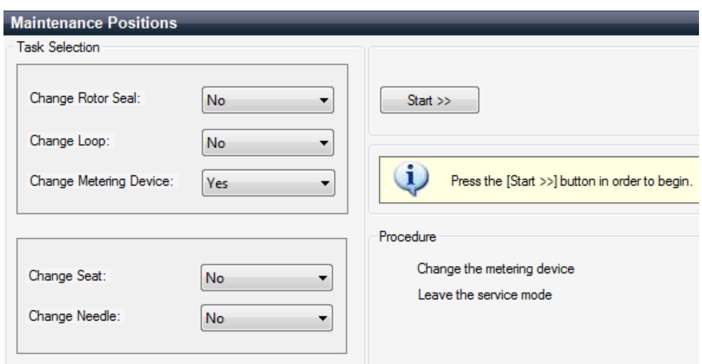
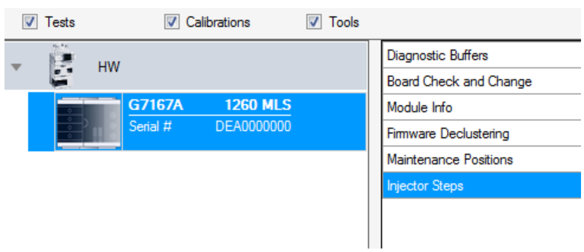


Figure 44 Change Metering Device

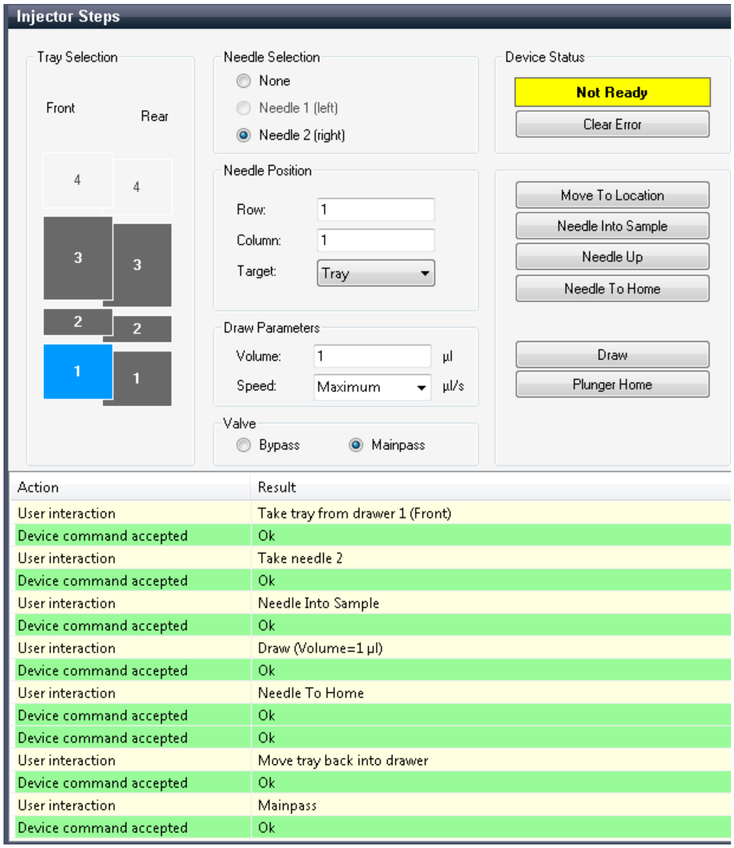
Injector Steps

Each movement of the sampling sequence can be done under manual control. This is useful during troubleshooting, where close observation of each of the sampling steps is required to confirm a specific failure mode or verify successful completion of a repair. Each injector step command actually consists of a series of individual commands that move the multisampler components to predefined positions, enabling the specific step to be done.

1 Run the **Injector Steps** in the **Service & Diagnostics** View in the Agilent Lab Advisor (for further information see Online-Help of user interface).



2 Select the individual step command like needle selection and needle position (for further information see Online-Help of user interface).



NOTE

Follow a logical order to use the injector steps function.

Sample Cooler Function Test

The Sample Cooler Function Test can be used as a simple verification that the sample cooler is functioning.

After the test has been started, it begins to acquire data from the cooler's PT1000 temperature sensor. As soon as the temperature has equilibrated (that is, the temperature does not change by more than 0.5 °Cover a 10 s period) the cooler is turned on and measurement is started.

For the test to succeed, three temperature checkpoints must be reached within a specified time.

Sample Thermostat Function Test

The Sample Thermostat Function Test can be used as a simple verification that the sample thermostat is functioning. After the test has been started, it begins to acquire data from the thermostat's temperature sensor. As soon as the temperature has equilibrated (that is, the temperature does not change by more than 0.5 °C over a 10 s period) the cooler is turned on and measurement is started. After the first measurement is done the system will heat up to verify the heating performance. For the test to succeed, several temperature checkpoints must be reached within a specified time.

NOTE

The Sample Thermostat Function Test is available in Lab Advisor Version B.02.11.

9 Maintenance

This chapter describes the maintenance of the Multisampler

Introduction to Maintenance

Figure 45 on page 206 shows the main user accessible assemblies of the multisampler. These parts can be accessed from the front (simple repairs) and don't require to remove the multisampler from the system stack.

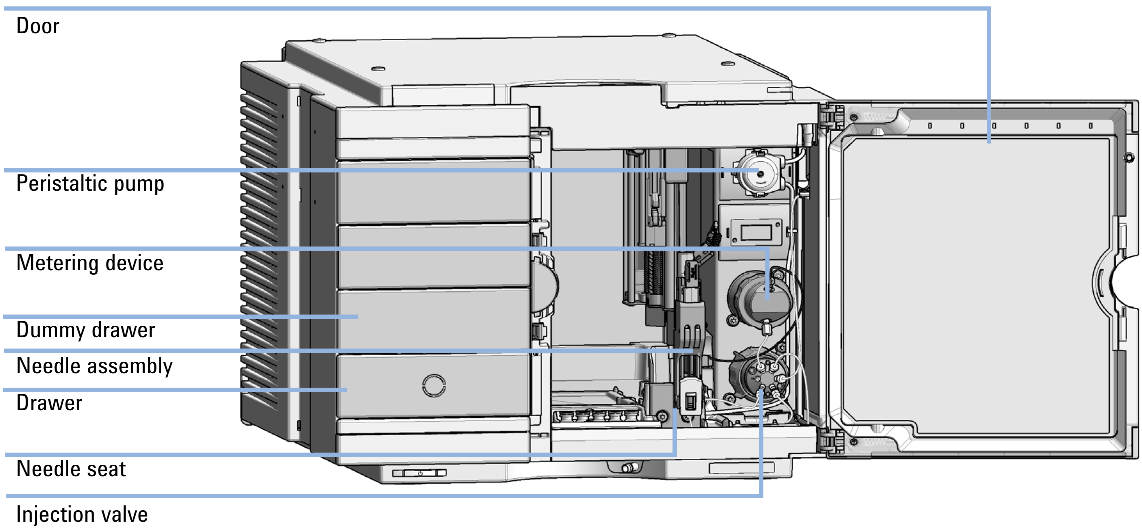


Figure 45 Main user accessible assemblies (standard)

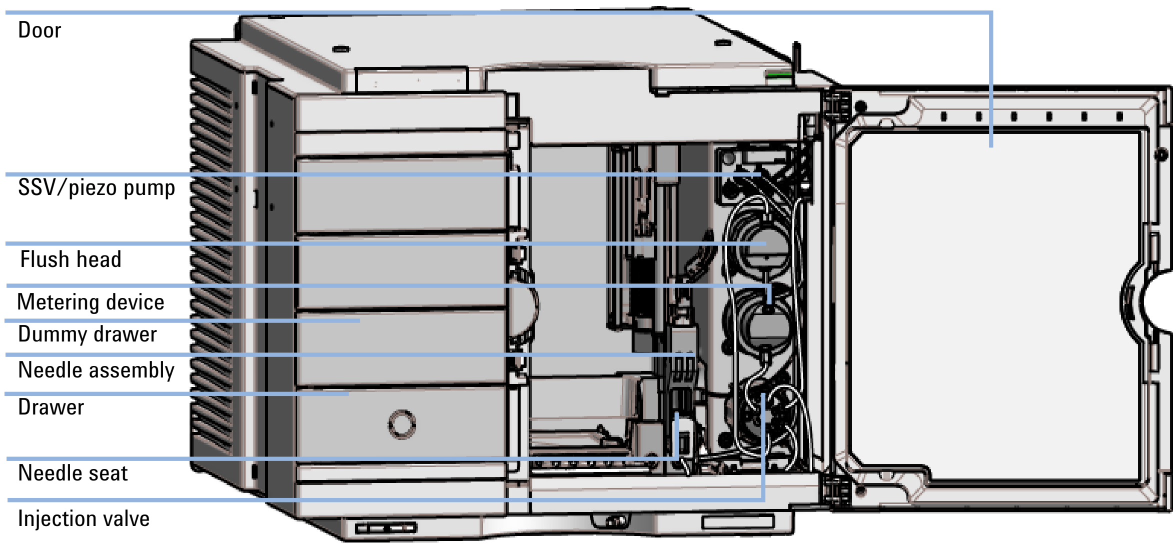


Figure 46 Main user accessible assemblies (multiwash)

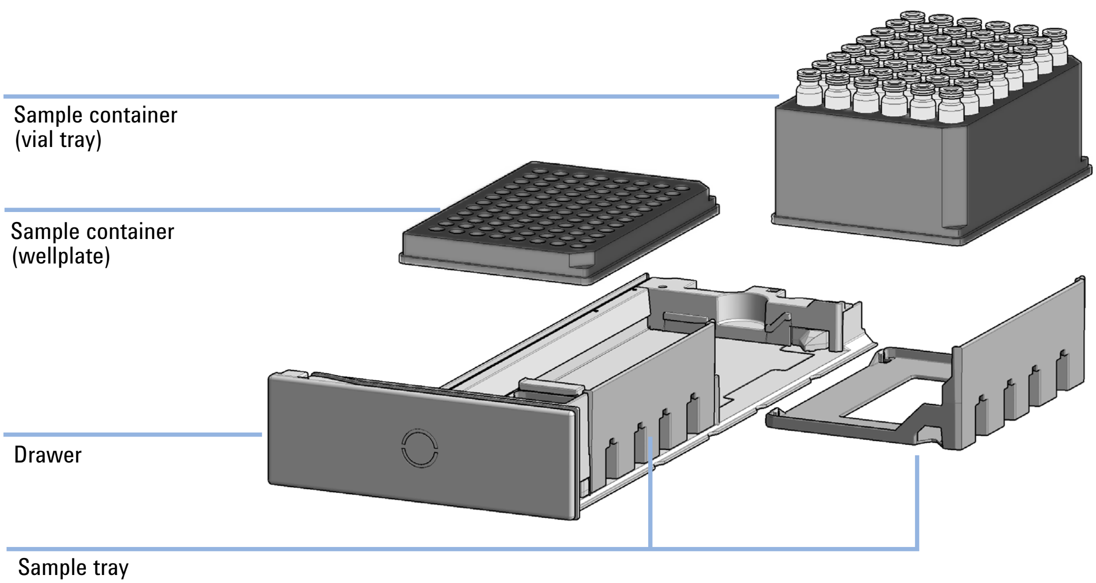


Figure 47 Overview of drawer, sample tray and sample container

Warnings and Cautions

WARNING

Personal injury or damage to the product

Agilent is not responsible for any damages caused, in whole or in part, by improper use of the products, unauthorized alterations, adjustments or modifications to the products, failure to comply with procedures in Agilent product user guides, or use of the products in violation of applicable laws, rules or regulations.

→ Use your Agilent products only in the manner described in the Agilent product user guides.

WARNING

Electrical shock

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

→ Do not remove the cover of the module.

→ Only certified persons are authorized to carry out repairs inside the module.

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

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

→ When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.

→ The volume of substances should be reduced to the minimum required for the analysis.

→ Do not operate the instrument in an explosive atmosphere.

CAUTION

Safety standards for external equipment

→ If you connect external equipment to the instrument, make sure that you only use accessory units tested and approved according to the safety standards appropriate for the type of external equipment.

CAUTION

Sample degradation and contamination of the instrument

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

→ For bio-inert applications, always use dedicated bio-inert parts, which can be identified by the bio-inert symbol or other markers described in this manual.

→ Do not mix bio-inert and non-inert modules or parts in a bio-inert system.

Overview of Maintenance

It is necessary to perform periodic inspection of this instrument to ensure its safe use. It is possible to have these periodic inspections performed by Agilent service representatives on a contractual basis. For information regarding the maintenance inspection contract, contact your Agilent representative.

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

Table 24 Overview of maintenance

Procedure	Typical interval (minimum)	Notes
Change needle/needle seat	60000 needle into seat movements	
Change peristaltic pump cartridge	3000 min on time	
Change rotor seal	30000 injections	

Clean the Module

To keep the module case clean, use a soft cloth slightly dampened with water, or a solution of water and mild detergent.

WARNING

Liquid dripping into the electronic compartment of your module can cause shock hazard and damage the module

→ Do not use an excessively damp cloth during cleaning.

→ Drain all solvent lines before opening any connections in the flow path.

Removal and Installation of the Front Door

When	If the front door is defective or the hinge are damaged.		
Tools required	**Description**		
	Flat screwdriver		
Parts required	**#**	**p/n**	**Description**
	1	5067-5415	Door Assy
OR	1	G7167-68718	Light Protection Kit
Preparations	Finish any pending acquisition job and return any plate on the workspace back to the hotel.		

NOTE

For detailed information on position of the magnets, refer to “Magnets” on page 62

CAUTION

Magnetic fields

Magnets produce a far-reaching, strong magnetic field.

You can damage for example televisions, laptops, computer harddisks, credit cards, magnetic cards may be damaged as well.

→ Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.

WARNING

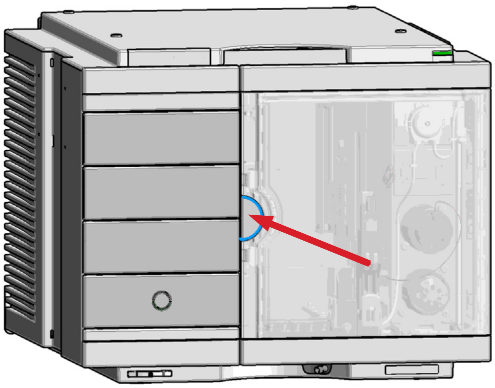
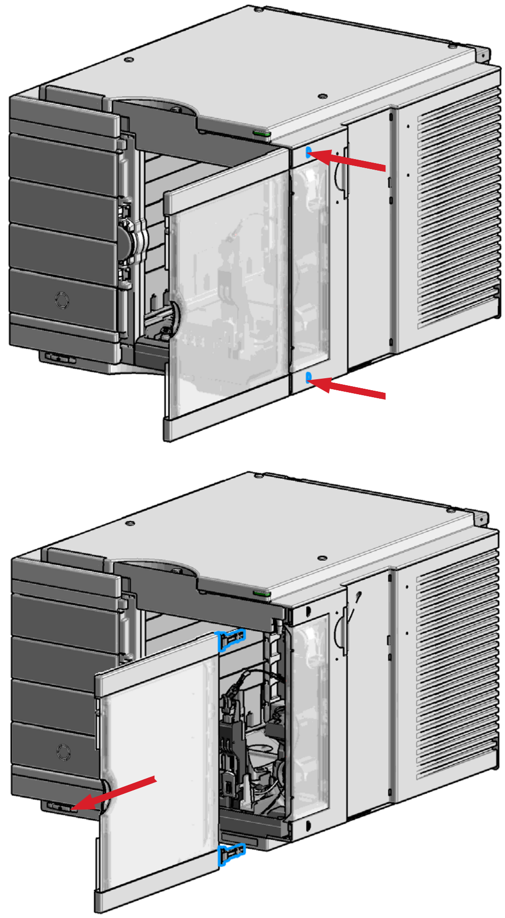
Heart pacemakers

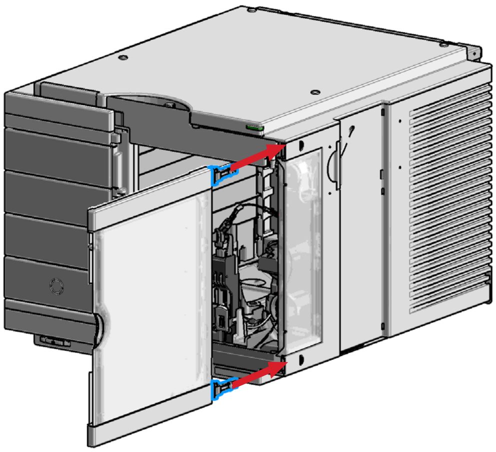
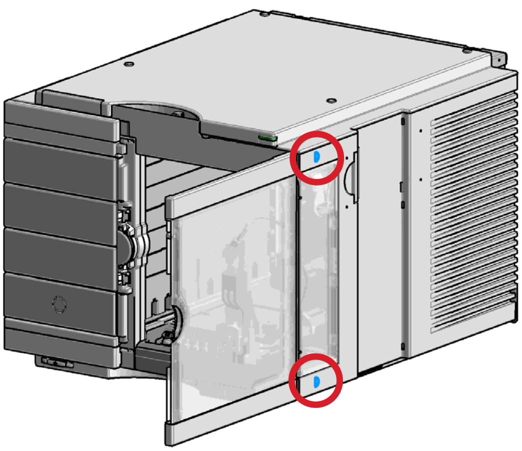
Magnets could affect the functioning of pacemakers and implanted heart defibrillators.

A pacemaker could switch into test mode and cause illness.

A heart defibrillator may stop working.

→ Bearers of heart pacemakers or implanted defibrillators must stay off at least 55 mm from the magnets.

1 Open the front door. 	**2** Press the release buttons and pull the front door out. 

<table>
<tr>
<td>3 For the Installation of the front door. Insert the hinges into their guides and move the door in until the release buttons click into their final position.

</td>
<td></td>
</tr>
</table>

Remove the Needle Assembly

BIO INERT

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

When When the limit in the needle into seat counter in the EMF is exceeded or when needle shows indications of damage, blockage or leaks.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

	#	p/n	Description
	1	G4267-87201	Needle Assembly
OR	1	G4267-87210	Needle Assembly (slotted) for high injection volumes
	1	G5668-87200	Needle Bio-Sampler (for G5668A)

Preparations In order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

→ Do not open the safety lock of the needle assembly

→ Be careful working at the z-robot.

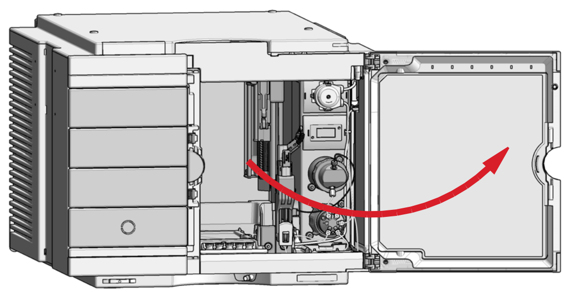
→ Wear safety goggles, when removing the needle assembly.

WARNING **Toxic, flammable and hazardous solvents, samples and reagents**

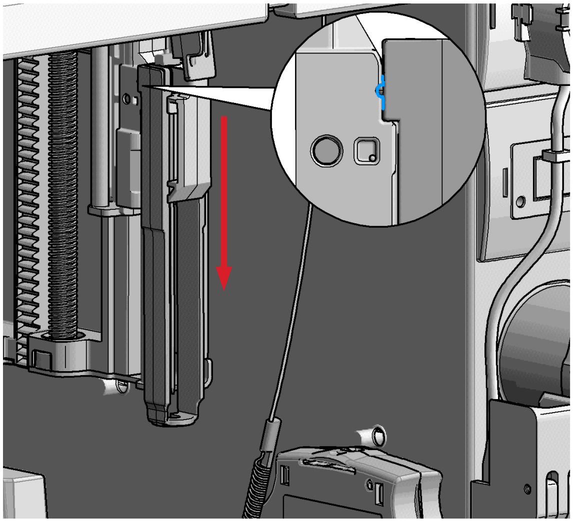
The handling of solvents, samples and reagents can hold health and safety risks.

→ When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.

NOTE It is recommended to always exchange the needle assembly and the needle seat at the same time to prevent premature leakage.

1 In the Local Controller start the maintenance mode and select **Change needle/seat** function. OR In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen (**Tools**) **Maintenance Positions > Change Needle/Loop**, click **Start** and wait until the needle assembly is in maintenance position.	**2** Open the front door. 

3 Lock the needle in the safety position.



NOTE

During normal operation of the Multisampler the needle assembly has to be unlocked.

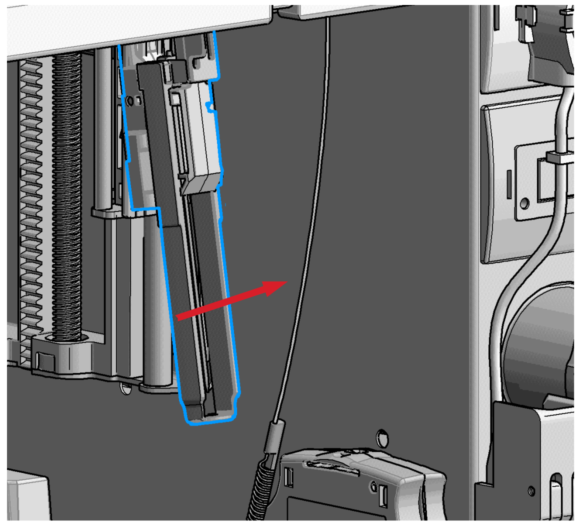
WARNING

Sharp needle

Uncovered needles may cause injuries

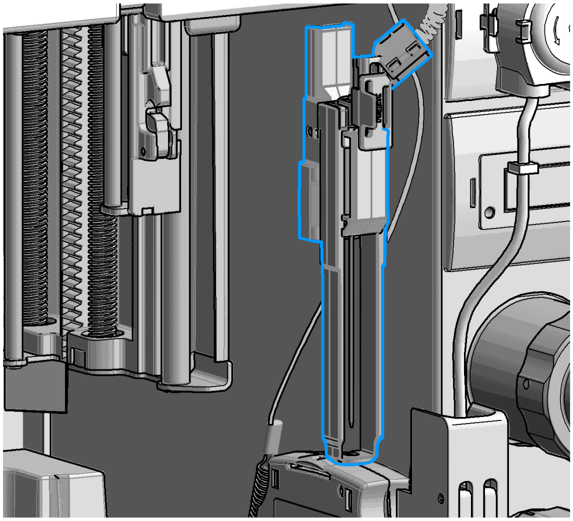
→ **Make sure the needle is in the safety lock position.**

4 Remove the needle assembly by slightly pulling the needle cartridge.



5

Z-Robot (Z-arm coupler) without the needle assembly.



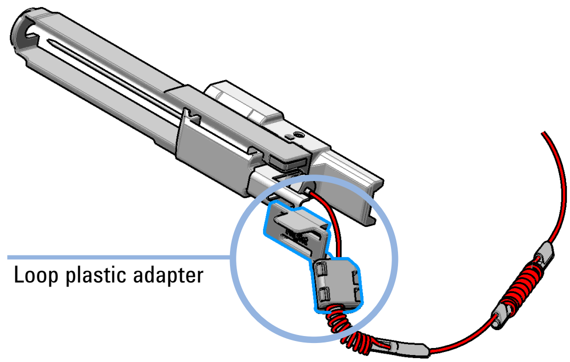
CAUTION

Damage of the loop

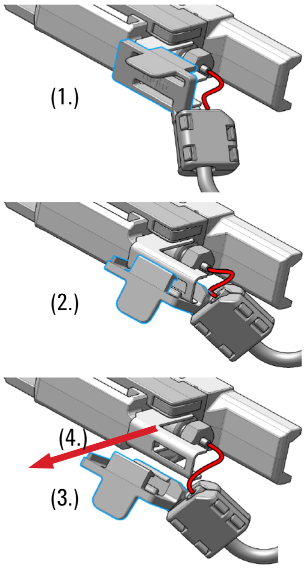
The loop shape may be damaged if the loop is stretched or bent too far.

- **Avoid to change the loop shape.**
- **Do not pull or bend the loop too far.**

6 The needle assembly is still connected to the loop capillary.



7 Remove the loop plastic adapter.



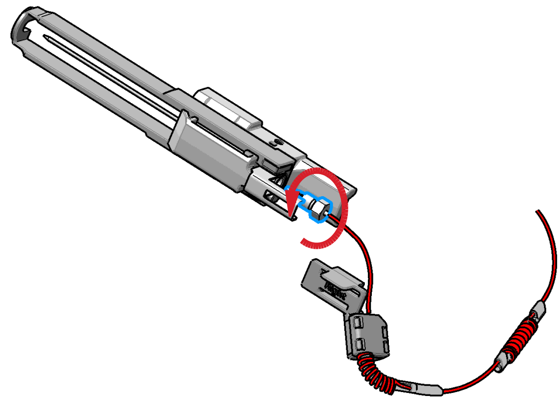
NOTE

Do not open the rear plastic clamp.

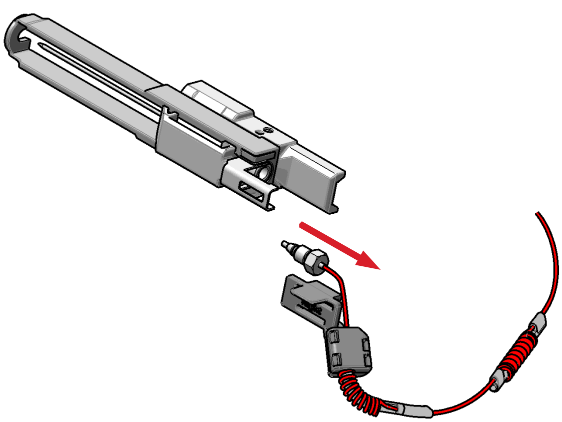
NOTE

If the plastic adapter is damaged the sample loop has to be replaced.

8 Use a 1/4 inch wrench to loosen the fitting of the loop capillary.



9 Remove the needle assembly.



Install the Needle Assembly

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

When

When the limit in the needle into seat counter in the EMF is exceeded or when needle shows indications of damage, blockage or leaks.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

	#	p/n	Description
	1	G4267-87201	Needle Assembly
OR	1	G4267-87210	Needle Assembly (slotted) for high injection volumes
	1	G5668-87200	Needle Bio-Sampler (for G5668A)

Preparations

In order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

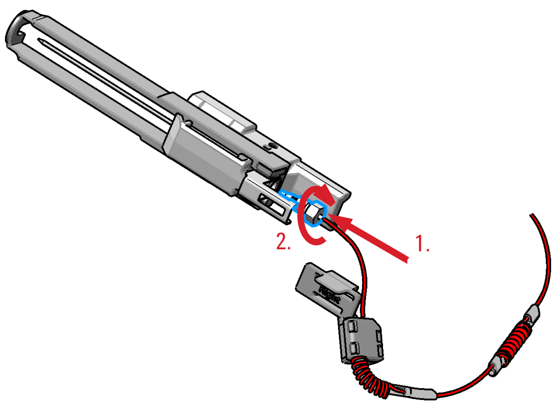
→ Do not open the safety lock of the needle assembly

→ Be careful working at the z-robot.

→ Wear safety goggles, when removing the needle assembly.

NOTE It is recommended to always exchange the needle assembly and the needle seat at the same time to prevent premature leakage.

1 Install the loop capillary on top of the needle cartridge (1.) and tighten the fitting hand tight (2.).



NOTE If the sample loop is changed, we recommend changing the needle as well.

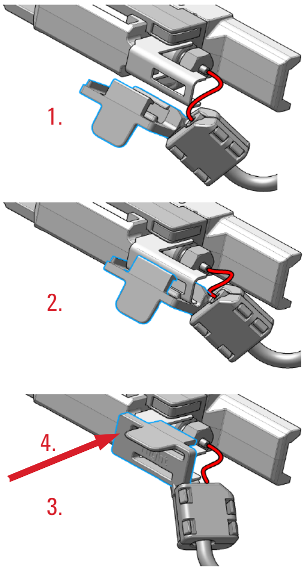
CAUTION

Blockages inside of the needle assembly union

→ **Do not overtighten the fitting. A quarter turn should be sufficient.**

2 Use a 1/4 inch wrench to tighten the fitting of the loop capillary.

3 Install loop plastic adapter.



NOTE

Verify the sample loop info on the plastic adapter. A left or a right sample loop must be installed in the correct slot of the needle parkstation. For single needle, the default position is on the right.

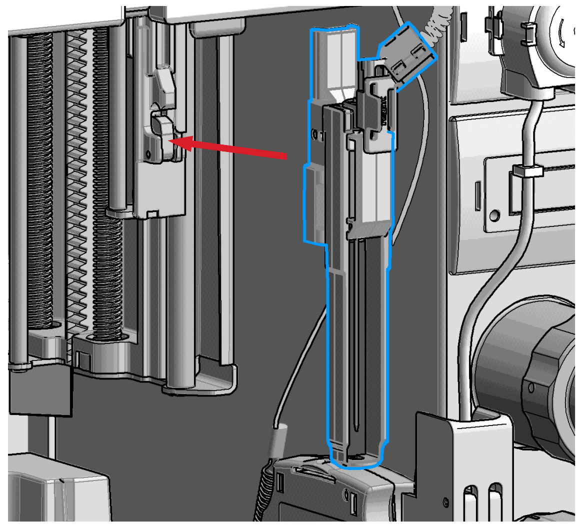
NOTE

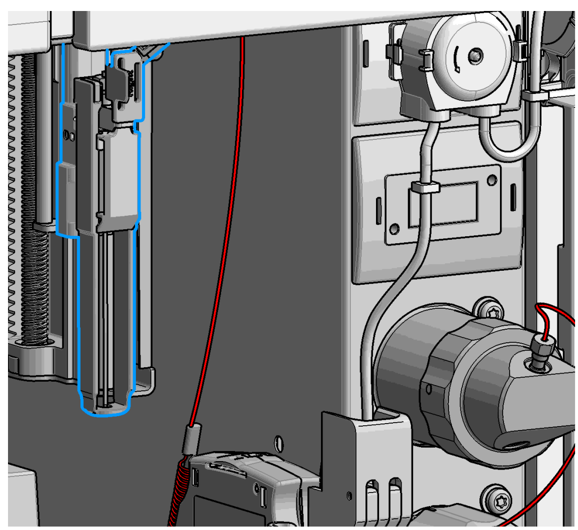
If the plastic adapter is damaged the sample loop has to be replaced.

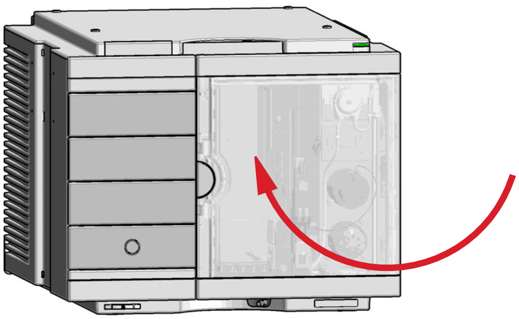
4 Pinch and reinsert the needle assembly and the connected loop capillary into the z-arm coupler.

NOTE

Check the tension of the loop capillary. This must be forced and guided to the hydraulic box to prevent it from being caught by the Z-drive.





<table>
<tr>
<td>
5 Close the front door.

</td>
<td>
Next Steps:
6 In the Local Controller close Change needle /seat.
OR
In the Agilent Lab Advisor software Change needle/loop > End, click End and wait until the needle assembly is in the needle park station.
7 Perform a pressure test.
</td>
</tr>
</table>

Exchange the Needle Seat

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

When When seat is visibly damaged, blocked or leaks.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch
	Flat head screwdriver

Parts required

	#	p/n	Description
	1	G4267-87012	High Pressure Needle Seat, 0.12 mm (PEEK)
OR	1	G4267-87020	High Pressure Seat Assembly 0.075 mm (PEEK)
OR	1	G5668-87017	Bio Seat ID 0.17 (for G5668A)

Preparations In order to avoid leaks, stop the pump running and remove the tubings from the solvent bottles. If available close the shutoff valves.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

→ Do not open the safety lock of the needle assembly

→ Be careful working at the z-robot.

→ Wear safety goggles, when removing the needle assembly.

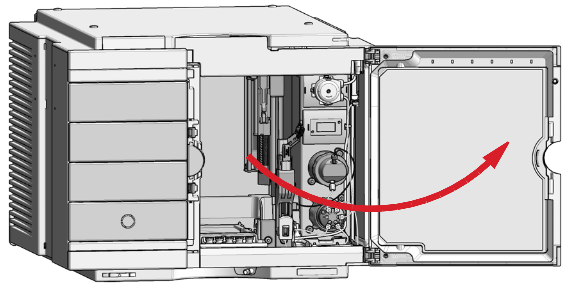
NOTE Refer the Agilent 1290 Infinity II Ultra Low Dispersion Kit Technical Note (p/n 01200-90105) for further details.

1 In the Local Controller start the maintenance mode and select **Change needle/seat** function.

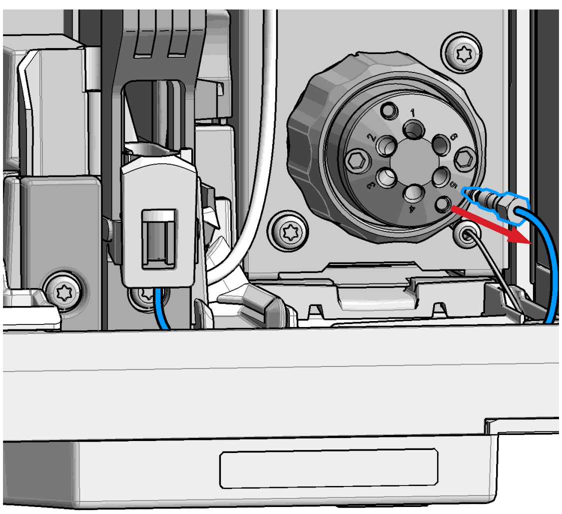
OR

In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen **Maintenance Positions > Change Needle**, click **Start** and wait until the needle assembly is in maintenance position.

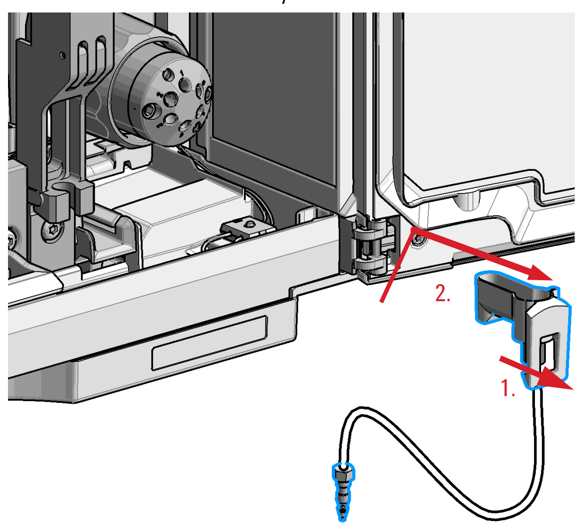
2 Open the front door.



3 Disconnect the seat capillary from the Injection valve.



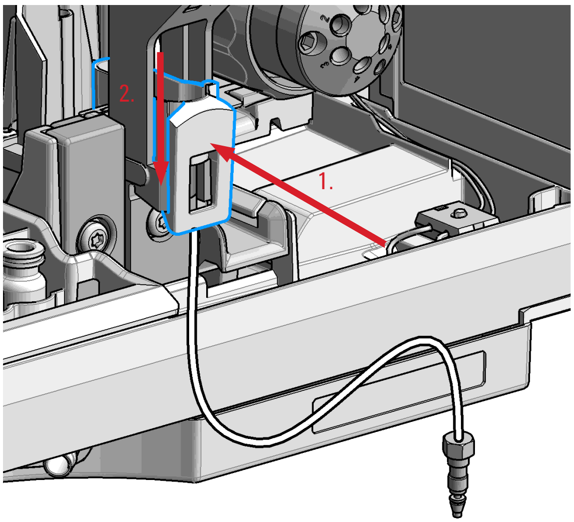
4 Slightly pull (1.) the front clip which holds the needle seat in position. Then carefully lift up (2.) the complete leak tube needle assembly from the holder.



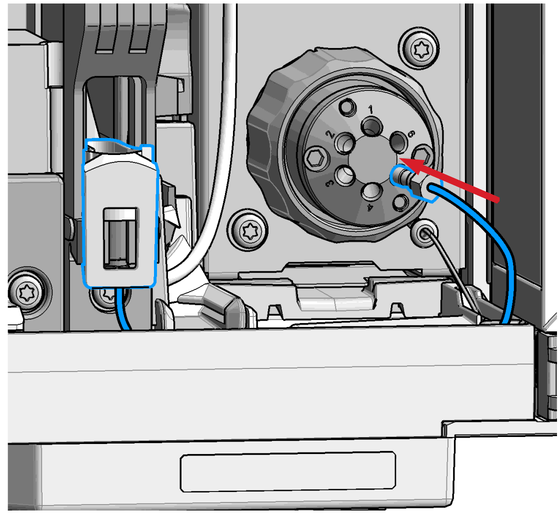
5 Insert the new Needle seat (1.). Press it firmly in position (2.).

NOTE

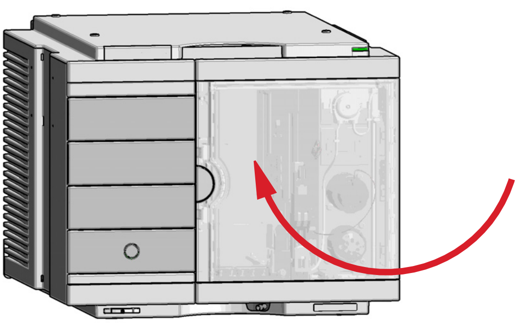
Verify that the needle seat clip is locked in the needle park station.



6 Reconnect the seat capillary to the injection valve.



7 Close the front door.



Next Steps:

8 In the Local Controller close **Change needle /seat**.

OR

In the Agilent Lab Advisor software **Change needle** click **End** and wait until the needle assembly is in the needle park position.

9 Perform a pressure test.

Replace the Rotor Seal

BIO INERT

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

When When poor injection volume reproducibility or when injection valve is leaking.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch
8710-2394	Hex key 9/64 inch 15 cm long T-handle
	Cleaning tissue and appropriate solvent like isopropanol or methanol

Parts required

#	p/n	Description
1	5068-0198	Rotor Seal 1300 bar (PEEK) for 1290 Infinity II Injection Valve
1	5068-0209	Rotor Seal (PEEK)
1	5068-0229	Rotor Seal (PEEK) for 3Pos/6Port Peripheral Valve Dual Needle
1	5068-0232	Rotor Seal (PEEK) for 2Pos/8Port Injection Valve Dual Needle
1	0100-1851	Stator face, ceramic for the bio-inert injection valve
1	5068-0099	Rotor Seal (PEEK) for the bio-inert injection valve

CAUTION

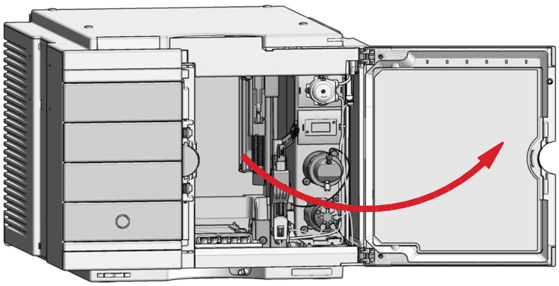
Reduced life time of the injection valve

Component cleanliness is crucial for the life time of the injection valve.

→ Replace the rotor seal in a clean environment.

NOTE Please bear in mind that depending on which valve you have installed the images may slightly differ from the actual item.

1 Open the front door.

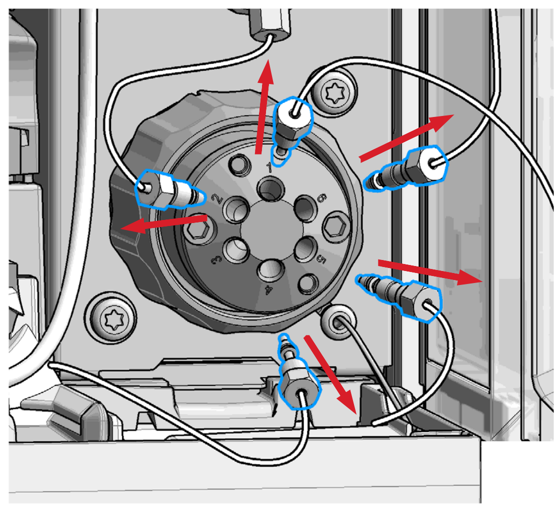


2 Remove all capillaries from the injection valve with a 1/4 inch wrench.

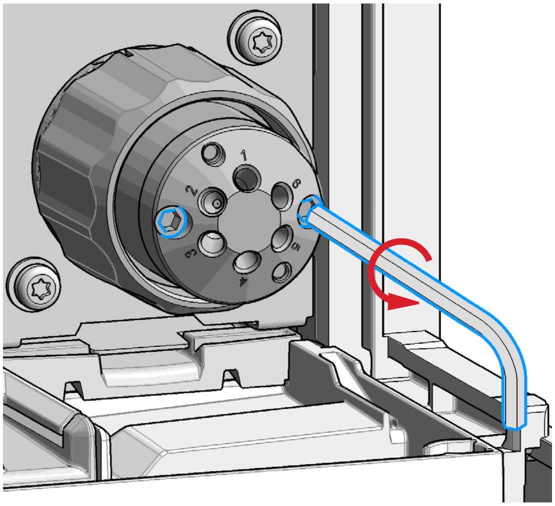
NOTE

Remember the correct plumbing.

Check the drawing on the side cover of the hydraulic box for correct plumbing.



3 Use a 9/64 inch hex driver to unscrew the two socket screws which hold the stator head in place.



CAUTION

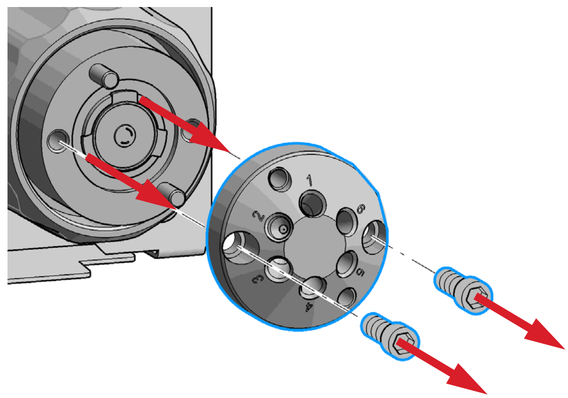
Damage to the stator head

The polished sealing surface of the stator head contains six ports that access handling can easily damage.

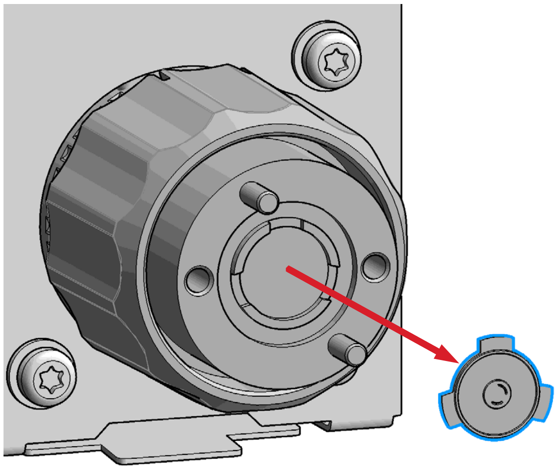
→ **Avoid touching the polished surface of the stator head.**

→ **Never place the polished surface on a hard surface.**

4 Carefully remove the stator head. To ensure that the sealing surface of the stator head is not damaged, place it on its outer face.



5 Remove the rotor seal.



NOTE

Remove the rotor seal with a small tool, gently pry the rotor seal away from the drive.

Examine the rotor sealing surface for scratches and nicks.

- If scratches are visible the rotor seal must be replaced.
- If no scratches are visible clean all the parts with an appropriate solvent, taking care that no surfaces get scratched.

CAUTION

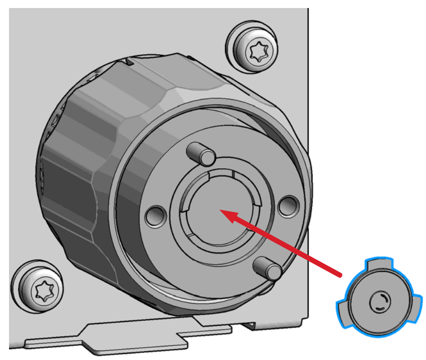
Damage to the rotor seal and cross-port leaks

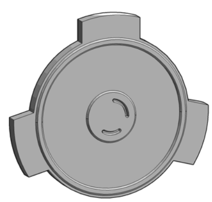
→ **Before you replace the rotor seal, clean the stator.**

→ **Inspect the stator head and swab it with the appropriate solvent. If more stringent cleaning is required, use a sonicator. Inspect the remaining valve components for contamination. Clean them as necessary.**

→ **If the stator head is scratched, replace the valve.**

6 Install new rotor seal.





NOTE

Make sure that the rotor sealing surface with its engraved flow passages is facing out. The pattern is asymmetrical to prevent improper placement.

NOTE

The Bio-inert injection valve additionally has a stator face installed.

<table>
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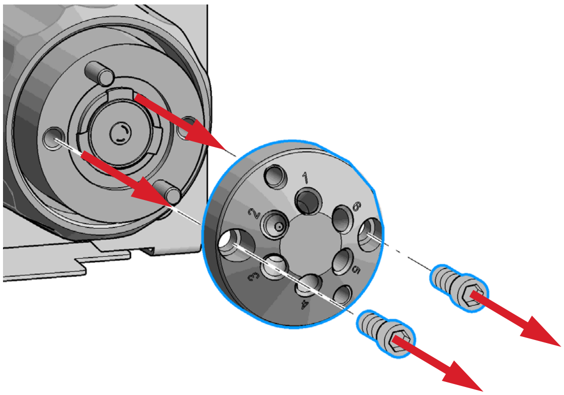
7 Reinstall the stator head. The index pins on the drive and the stator head must engage in the corresponding holes. Insert the two socket head screws.



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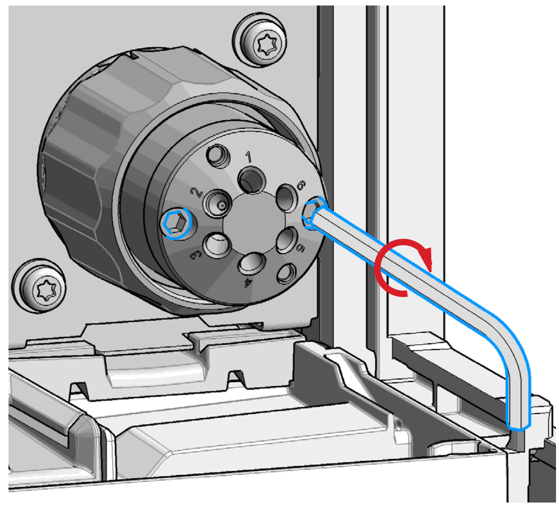
<td>

8 Using a 9/64 in. L-Hex wrench, tighten each screw gently until you feel resistance (approximately fingertight). Tighten each screw by 1/8 turn, and then tighten each screw again, until the stator is secured to the driver.



NOTE

Do not over-tighten the screws. The screws hold the assembly together and do not affect the sealing force. The sealing force is automatically set as the screws close the stator head against the valve body.

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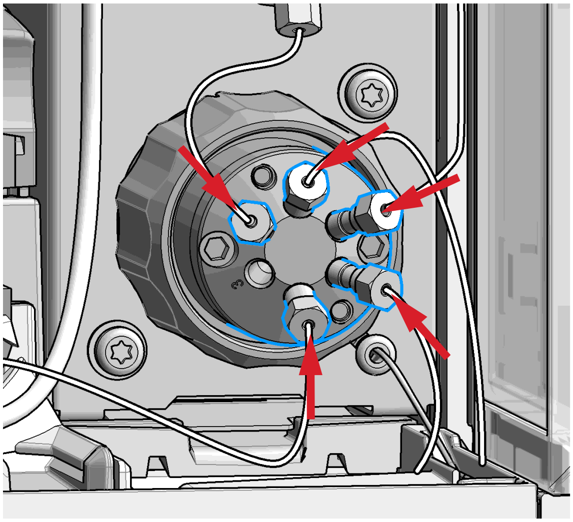
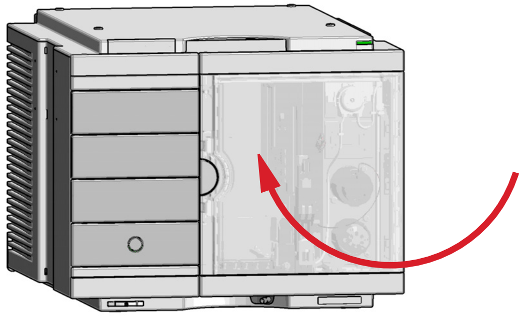
9 Reconnect all capillaries to the proper injection valve ports with a 1/4 inch wrench 	**10** Close the front door. 
11 Perform a pressure test.	

Replace the Injection Valve

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

When Add new injection valve or replace defective injection valve.

Tools required

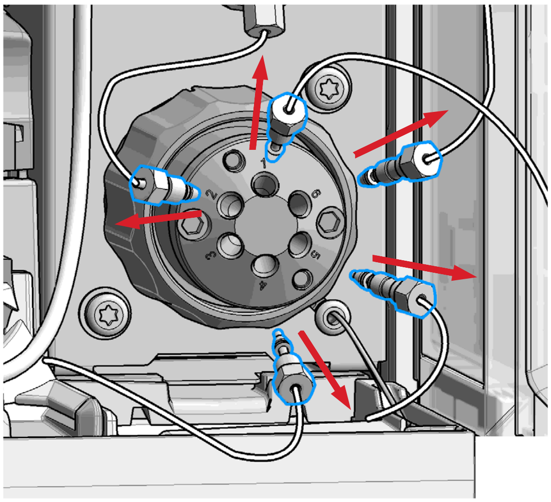
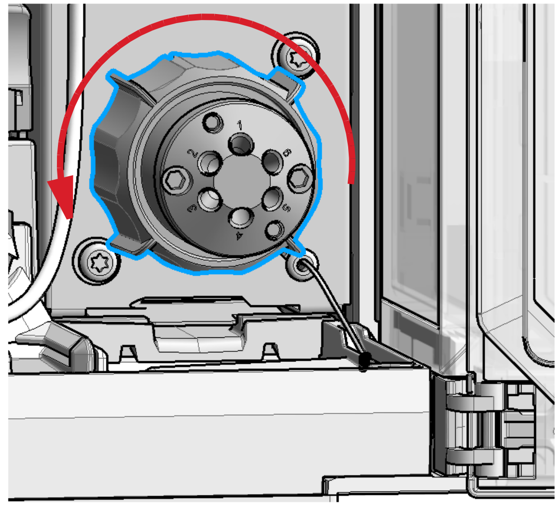
Description
Wrench 9/64

Parts required

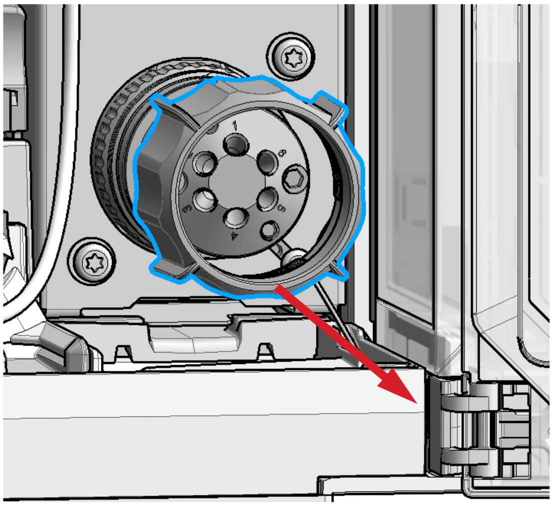
#	p/n	Description
1	5067-4232	2pos/6port Injection Valve (VICI) 1300 bar 1300 bar (G7167B)
1	5067-6698	2ps-6pt RC Injection Valve 800 bar (G7167A)
1	5067-4260	2pos/8port Injection Valve Dual Needle 1300 bar
1	5067-4263	2pos/6port Injection Valve Bio-inert 600 bar for bio inert solution

Preparations Switch off the power of the Multisampler

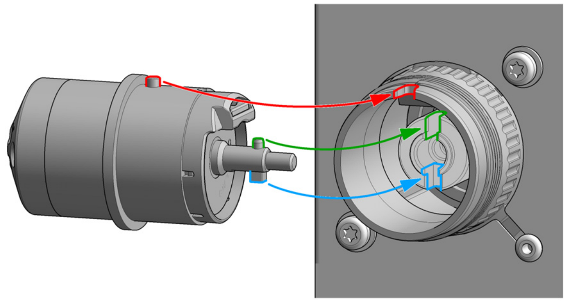
NOTE Please bear in mind that depending on which valve you have installed the images may slightly differ from the actual item.

1 Disconnect the capillaries. 	**2** Turn the spanner nut counter clockwise until the injection valve head detaches from the hydraulic box (Do not use wrenches on the spanner nut). 

3 Remove the spanner nut from the injection valve head.

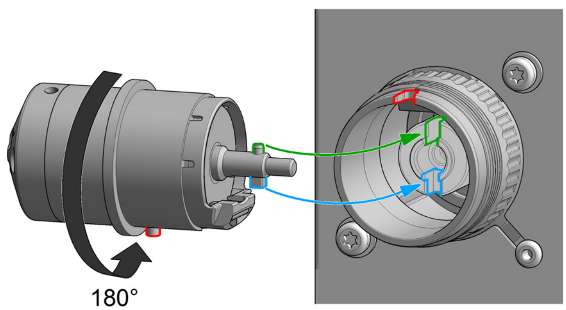


4 Take the replacment injection valve head and insert it into the open actuator slot of the hydraulic box. Rotate until the unions at the base of the replacement injection valve head and the valve actuator engage



OR

If the outside pin does not fit into the outside groove, you have to turn the valve head until you feel that the two pins snap into the grooves. Now you should feel additional resistance from the valve drive while continue turning the valve head until the pin fits into the groove.



NOTE

Check the orientation of the rear side.

Verify the correct position of the Valve TAG.

<table>
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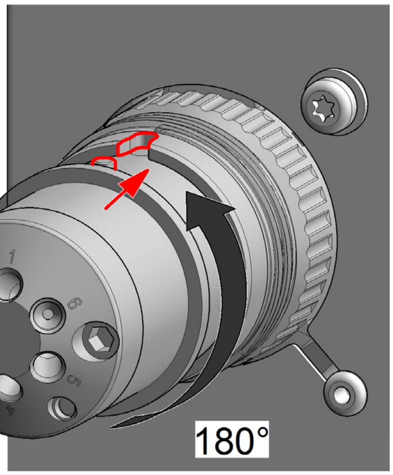
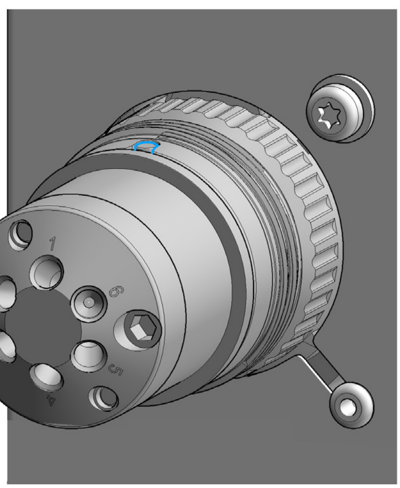
<td>

5 Continue to rotate until the clocking pin in the injection valve head align with the notch in the housing and press the replacement injection valve head into the actuator.





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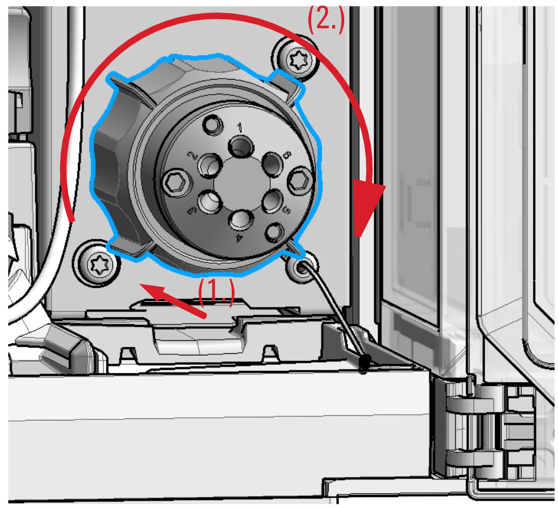
<td>

6 Replace the spanner nut (1.) and tighten clockwise (2.) (Hand tighten only, do not use wrenches on the spanner nut).



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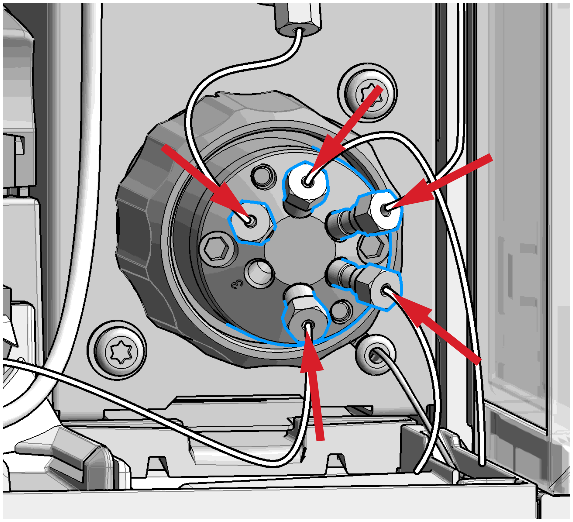
7 Reconnect the capillaries 	

Replace Analytical Heads/Metering Device

BIO INERT

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

Tools required	p/n	Description
	8710-0510	Wrench open 1/4 — 5/16 inch

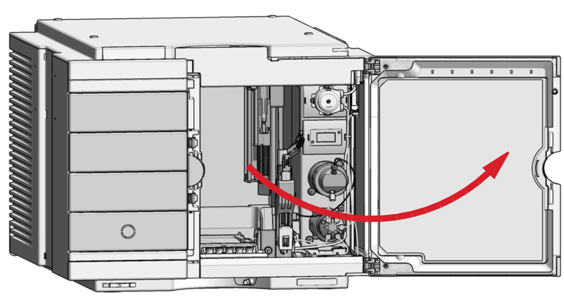
Parts required	#	p/n	Description
	1	G4267-60042	Analytical Head, 40 µL
OR	1	G4267-60043	Analytical Head, 100 µL
OR	1	G4267-60046	Analytical head, 900 µL, 400 bar
OR	1	G4267-60049	Flush head, 500 µL
OR	1	G5668-60043	Bio Analytical Head 100 µL for bio inert solution
OR	1	G5668-60049	Flush Head Bio 500 µL for bio inert solution

1 In the Local Controller start the maintenance mode and select **Change Metering Device** function.

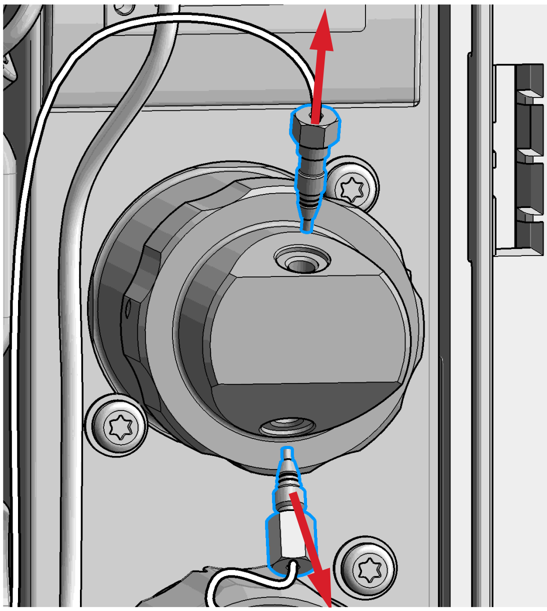
OR

In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen **(Tools)** > **Maintenance Positions** > **Change Metering Device**, click **Start** and wait until the metering device is in maintenance position.

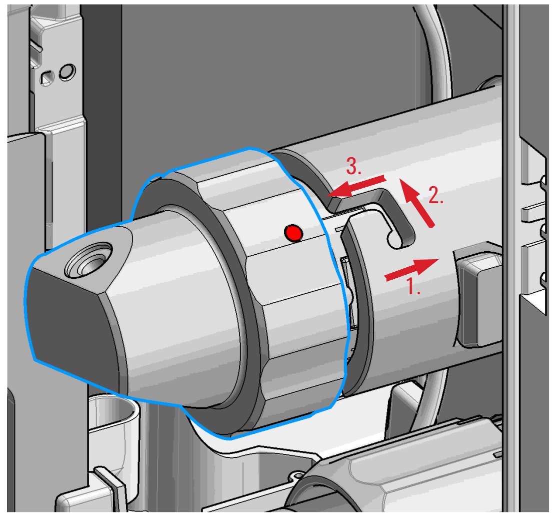
2 Open the front door.

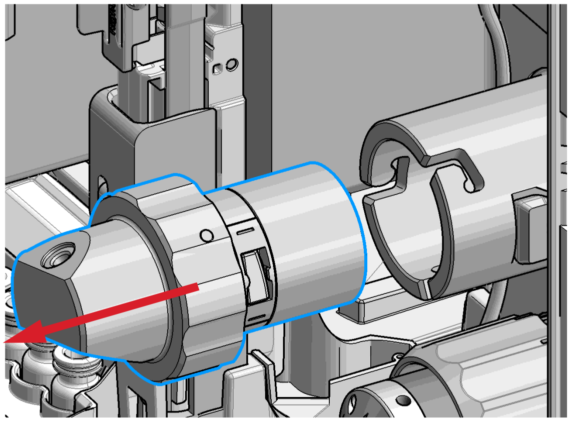
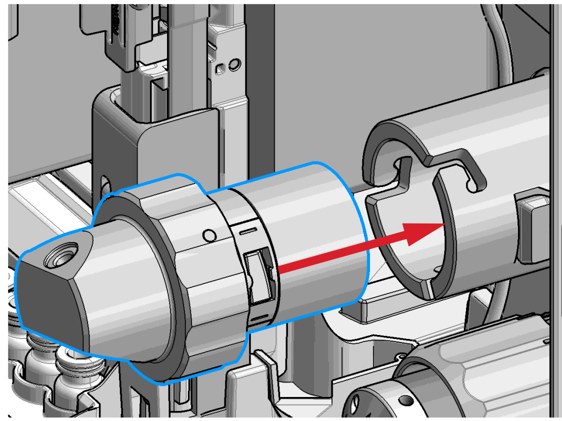


3 Disconnect all capillaries from the metering device.

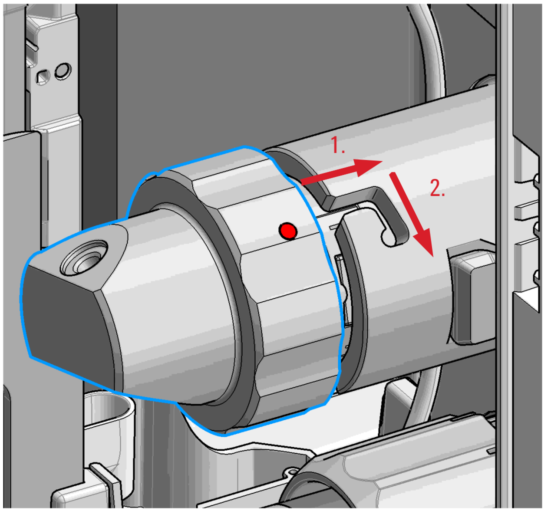


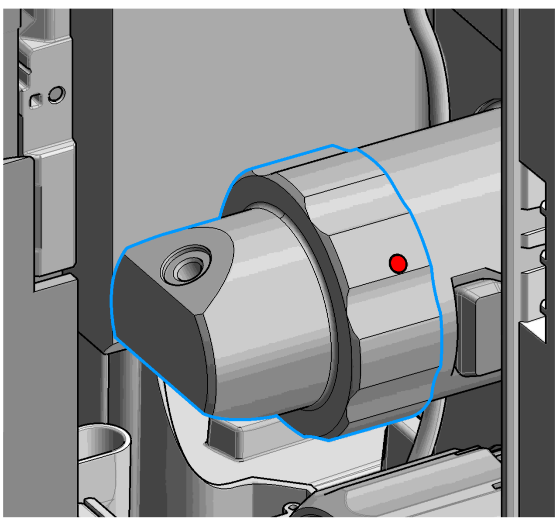
4 To release the bayonet lock, push (1.) and rotate (2.) the analytical head a quarter left. Then you can pull and detach the analytical head assembly from the actuator (3.).



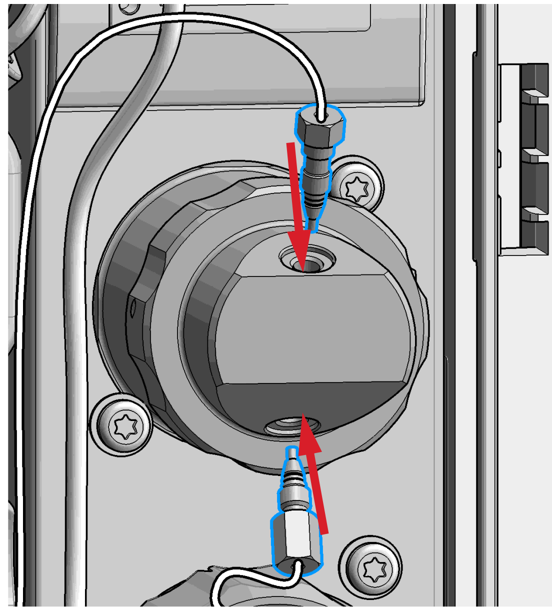
5 Remove the metering device. 	**6** Reinstall the complete analytical head with the actuator housing  **NOTE** For proper installation, check the correct position of the tag.

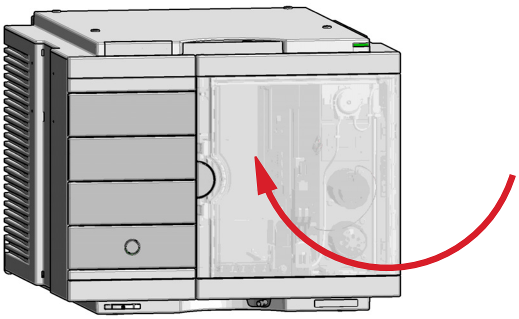
7 Fix the analytical head by pushing (1.) and rotating (2.) via twist and lock bayonet mechanism.





8 Reconnect the capillaries.



9 Close the front door. 	**Next Steps:** **10** In the Local Controller exit the maintenance mode and select **Change metering device** function. OR In Agilent Lab Advisor software system screen exit **Service & Diagnostics (Tools) > Maintenance Positions > Change Metering Device** click **End** and wait until the metering device is in **Home** position. **11** Perform a pressure test.

Remove the Metering Seal

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

When When poor injection volume reproducibility or when metering device / analytical head is leaking.

Tools required	**p/n**	**Description**
	8710-0510	Wrench open 1/4 — 5/16 inch
	8710-2392	4 mm Hex key
	01018-23702	Insert tool
OR	G4226-43800	Seal insert tool for 100 µL or 40 µL

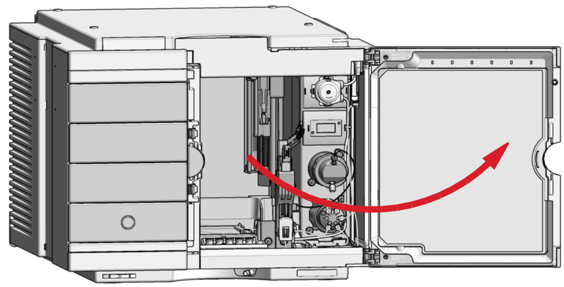
Parts required	**#**	**p/n**	**Description**
	1	0905-1717	Metering seal 40 µL for 40 µL analytical head
	1	0905-1719	PE Seal for 100 µL analytical head
	1	5067-5620	Piston ceramic 40 µL If previous piston is scratched
	1	5067-5678	Piston ceramic 100 µL If previous piston is scratched
OR	1	G5611-21503	Piston Seal PTFE (Bio-inert) for bio inert solution

1. In the Local Controller start the maintenance mode and select **Change metering device** function.

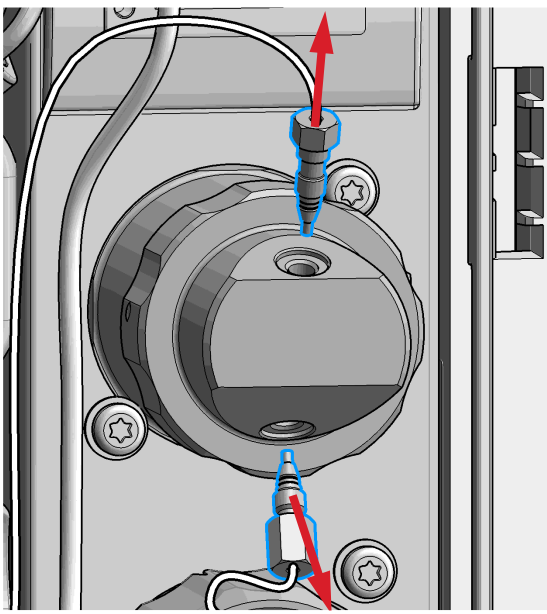
   OR

   In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen **(Tools)** > **Maintenance Positions** > **Change Metering Device**, click start and wait until the metering device is in maintenance position.

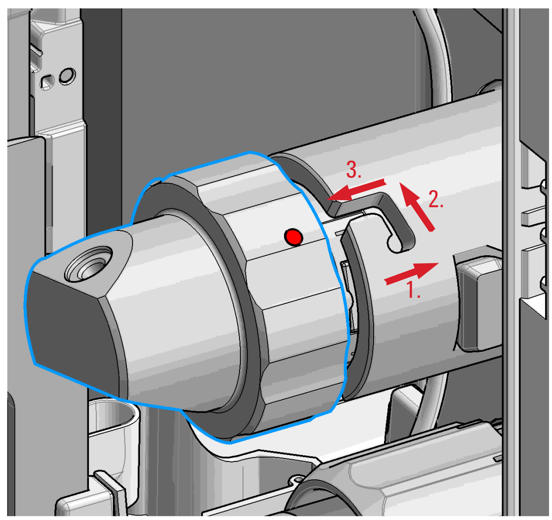
2. Open the front door.

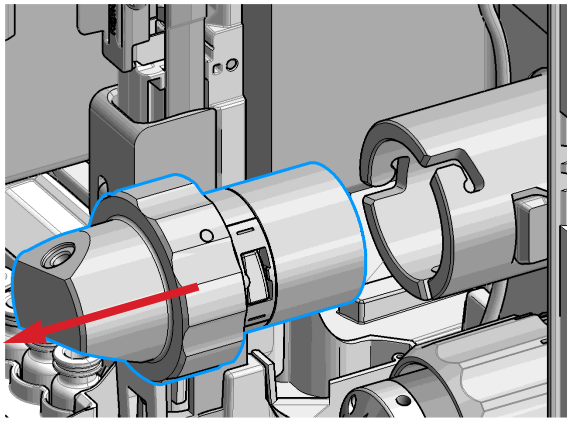
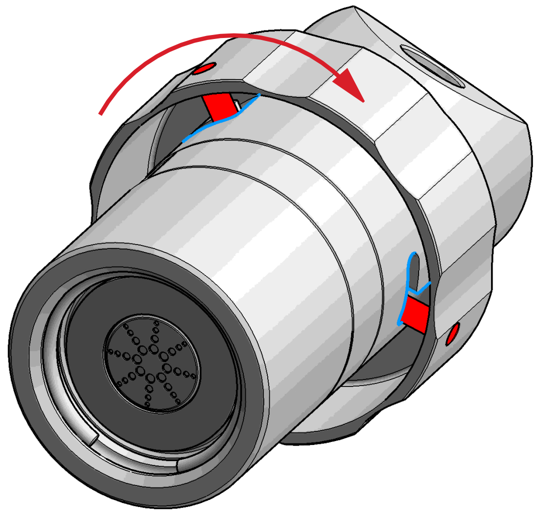
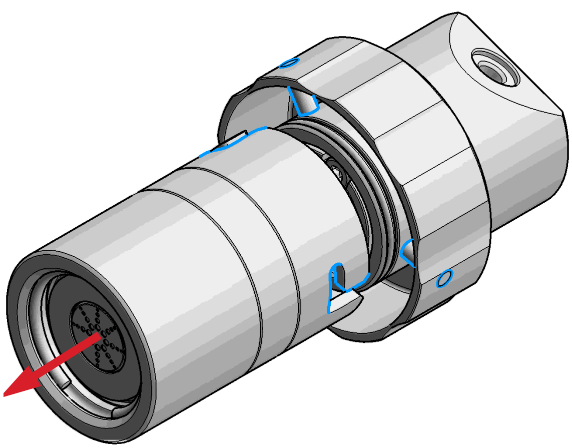
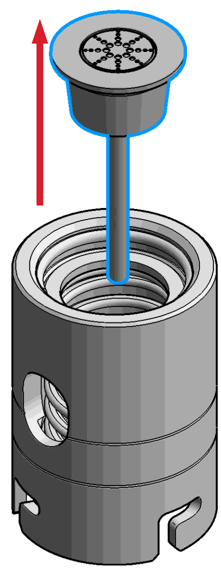


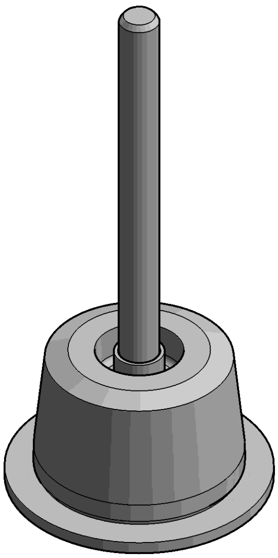
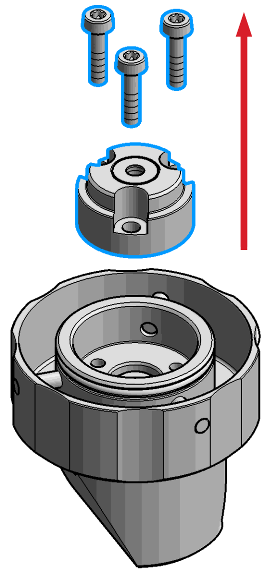
3. Disconnect all capillaries from the metering device.

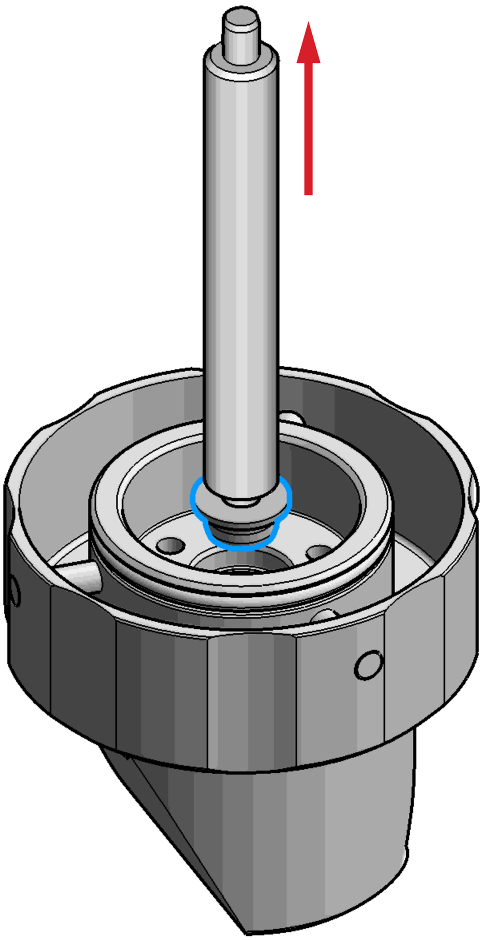


4. To release the bayonet lock, push (1.) and rotate (2.) the analytical head a quarter left. Then you can pull and detach the analytical head assembly from the actuator (3.).



5 Remove the metering device. 	**6** Take the metering device. Push against the rear side of the metering device and rotate a quarter left to release the bayonet lock. 
7 Now you can separate the analytical head and head body. 	**8** Remove the piston out of the head body. 

9 Inspect the piston for cleanliness and scratches.	10 Take the analytical head and remove the three screws on the rear side, which holds the support ring in place. Check the support ring for any damages.
 • If dirty: Clean the piston with an appropriate solvent. • If scratched: Replace the piston by a new one.	

11 Carefully remove the metering seal using the steel side of the insert tool. Clean the chamber with an appropriate solvent and ensure that all particulate matter is removed. 	

Install the Metering Seal

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

When After removing the metering seal.

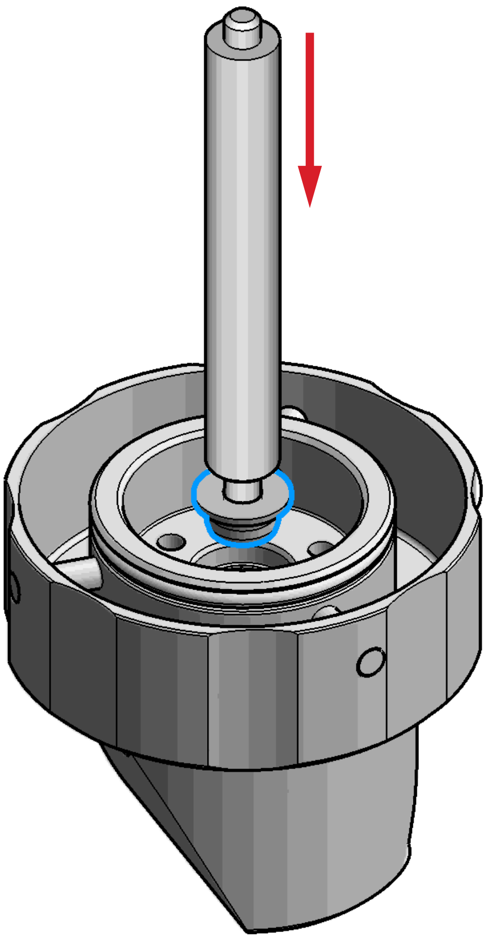
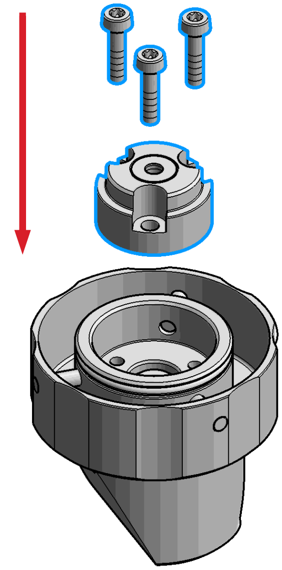
Tools required

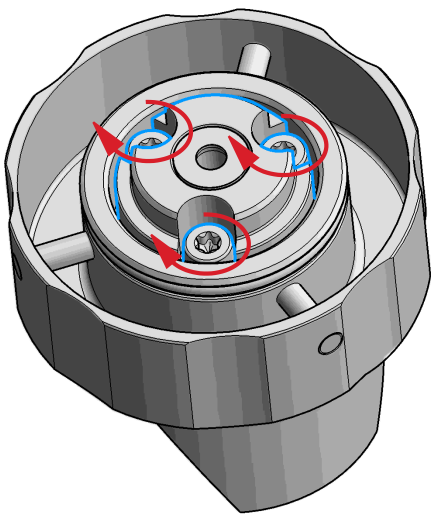
	p/n	Description
	8710-0510	Wrench open 1/4 — 5/16 inch
	8710-2392	4 mm Hex key
	01018-23702	Insert tool
OR	G4226-43800	Seal insert tool for 100 µL or 40 µL
		Cleaning tissue and appropriate solvent like isopropanol or methanol

Parts required

	#	p/n	Description
	1	0905-1717	Metering seal 40 µL for 40 µL analytical head
	1	0905-1719	PE Seal for 100 µL analytical head
	1	5067-5620	Piston ceramic 40 µL If previous piston is scratched
	1	5067-5678	Piston ceramic 100 µL If previous piston is scratched
OR	1	G5611-21503	Piston Seal PTFE (Bio-inert) for bio inert solution

Preparations Removing the metering seal, see "Remove the Metering Seal" on page 243

1 Install the new metering seal using the plastic side of the insert tool. Press it firmly into position. Avoid any offset angle as it might deform the seal. 	**2** Reassemble the support ring. 

<table>
<tr>
<td>
3 Make sure to comply to the following order of actions:
a Tighten the three screws fingerthight, then
b Tighten the screws a little at a time to keep the support ring surface parallel (important!) to the surface of the analytical head.

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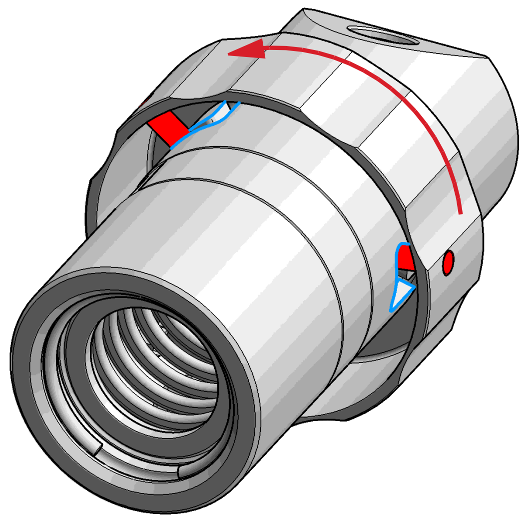
<td>
4 Use the twist and lock bayonet mechanims to reassemble the analytical head assembly. Push the two parts together to couple the head body with the analytical head. Once the pin reaches the bottom of the slot, one or both parts are rotated so that the pin slides along the horizontal arm of the L until it reaches the serif. The spring then pushes the male connector up into the serif to keep the pin locked into place.

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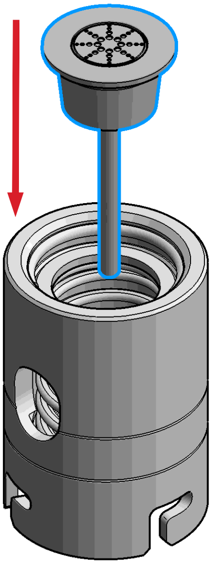
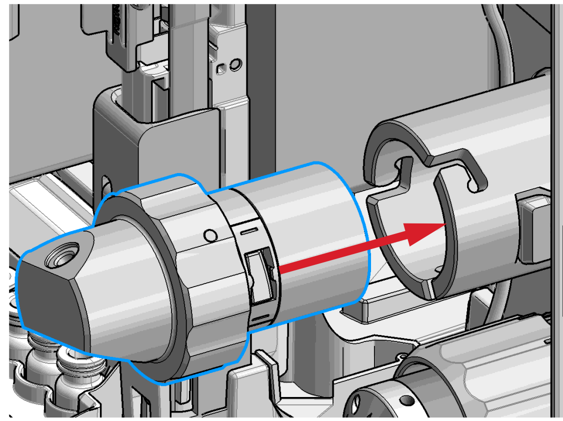
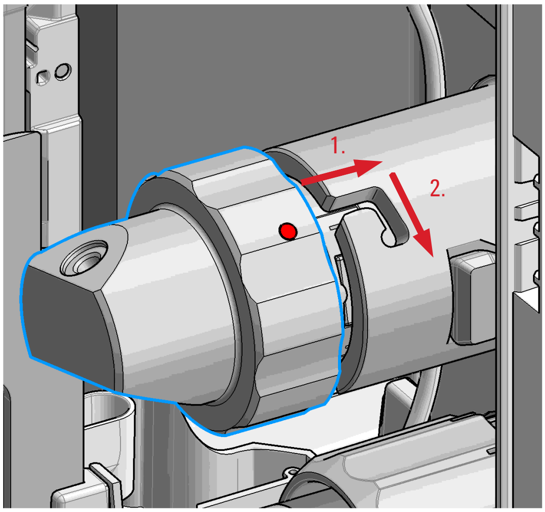
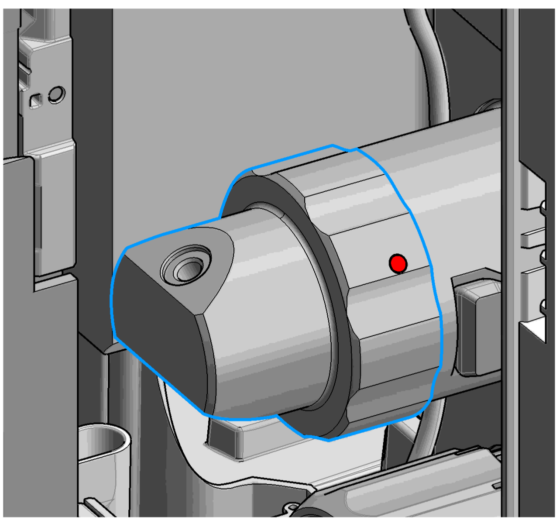
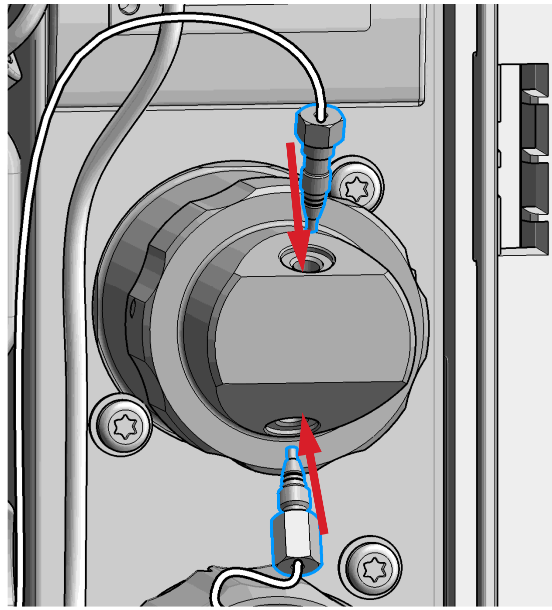
5 Press the piston carefully into the housing of the head body and the seal. 	**6** Reinstall the complete analytical head with the actuator housing  **NOTE** For proper installation, check the correct position of the tag.

7 Fix the analytical head by pushing (1.) and rotating (2.) via twist and lock bayonet mechanism.





8 Reconnect the capillaries.



<table>
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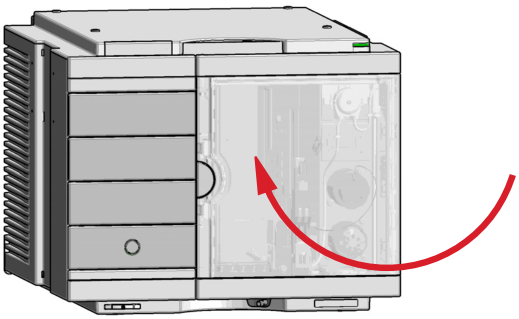
<td>

9 Close the front door.



</td>
<td>

Next Steps:

10 In the Local Controller exit the maintenance mode and select **Change metering device** function.

OR

In Agilent Lab Advisor software system screen exit **Service & Diagnostics (Tools) > Maintenance Positions > Change Metering Device** click **End** and wait until the metering device is in **Home** position.

11 Perform a pressure test.

</td>
</tr>
</table>

Replace the Peristaltic Pump Cartridge

When	Tubing blocked or broken		
Parts required	**#**	**p/n**	**Description**
	1	5065-4445	Peristaltic pump with Pharmed tubing (default)
OR	1	5042-8507	Peristaltic pump cartridge, silicone tubing
OR	1	5042-9952	Peristaltic pump with Chemsure tubing
Preparations	Remove the inlet filter of the solvent bottle which guides the solvent to the peristaltic pump to avoid syphoning effects.		

WARNING

When opening capillary or tube fittings solvents may leak out.

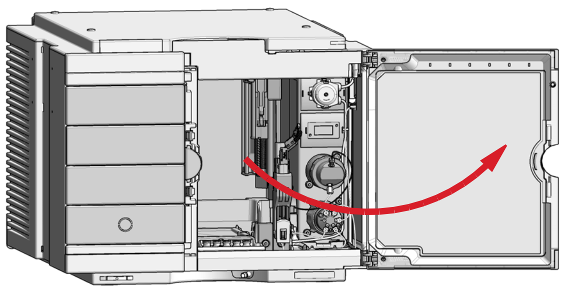
The handling of toxic and hazardous solvents and reagents can hold health risks.

→ 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.

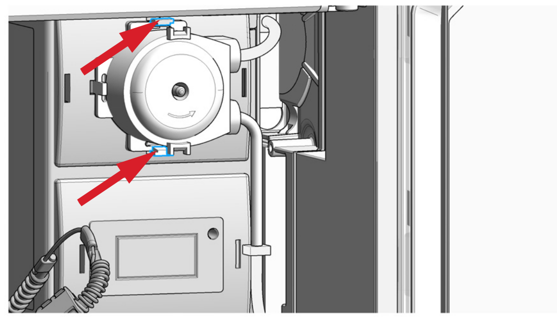
NOTE

The peristaltic pump cartridge is a replaceable unit. The tubing inside the pump is not replaceable.

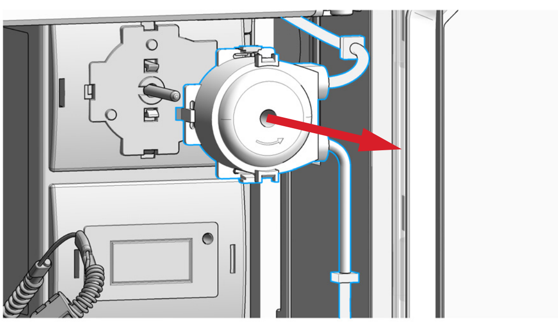
1 Open the front door.



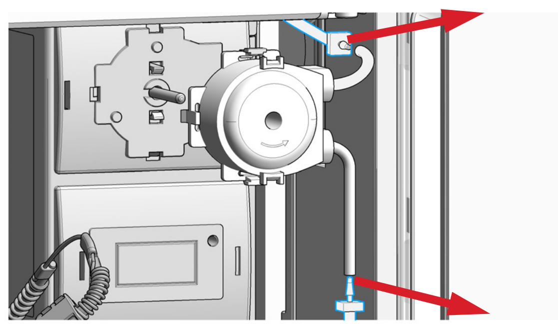
2 Press the two clips on the front of the peristaltic pump cartridge.



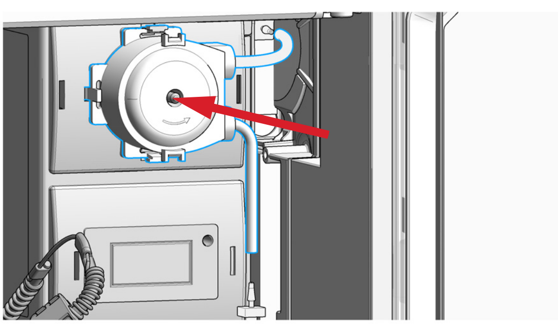
3 Pull the cartridge forward off the motor shaft.



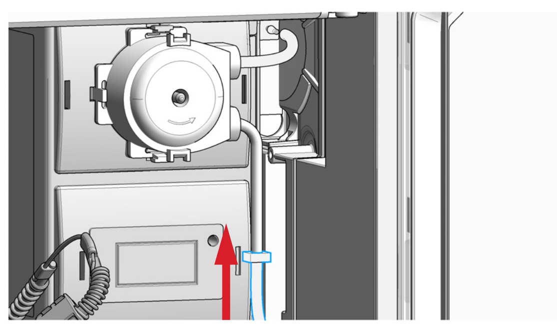
4 Disconnect the tubing coupler leading to the wash port and the tubing coupler coming from the solvent bottle.

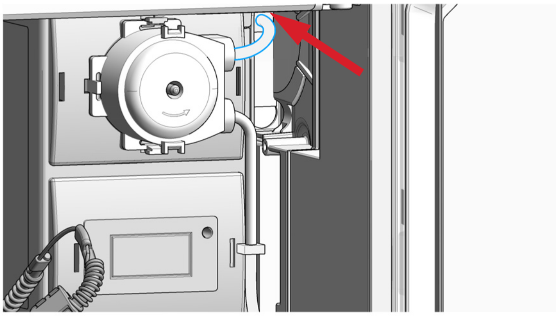
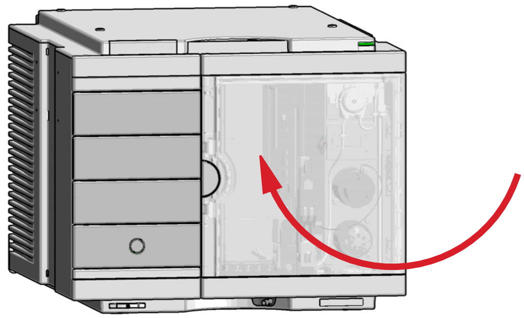


5 Push the new cartridge onto the motor shaft until the clips click into place.



6 Connect the wash port tubing to the upper tubing of the new cartridge (use sand paper to get a good grip on the tubing).



7 Connect the inlet filter of the solvent bottle again. Use the syringe to draw enough solvent for completely filling of the peristaltic pump tubing before continuing to prime the peristaltic pump. 	**8** Close the front door. 

Replace the Flushhead Seal

BIO INERT

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

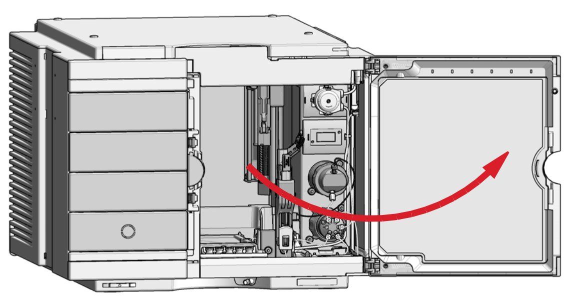
When	Flush head is leaking	
Tools required	**p/n**	**Description**
	8710-0510	Wrench open 1/4 — 5/16 inch
	8710-2392	Hex key 4 mm15 cm long T-handle
Parts required	**p/n**	**Description**
	5067-5918	Seal 500 µL
	G5668-60494	Seal 500 µL Bio for bio inert solution
Preparations	• Cleaning tissue • Appropriate solvent like isopropanol or methanol	

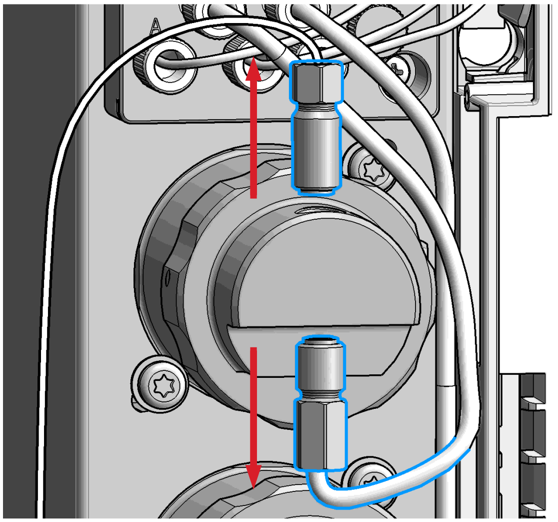
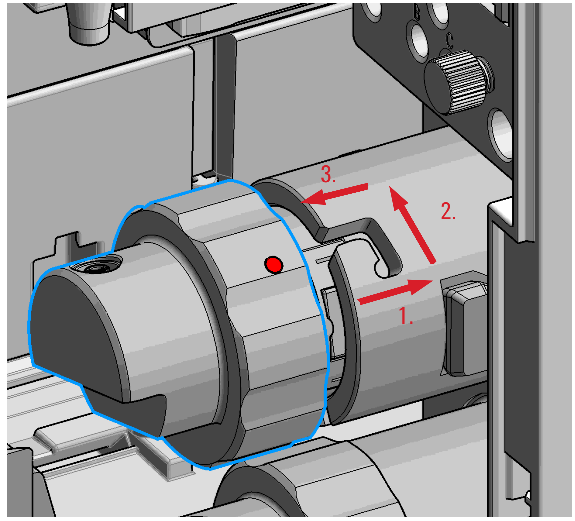
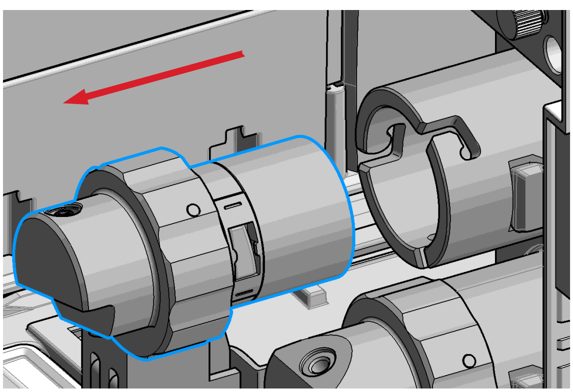
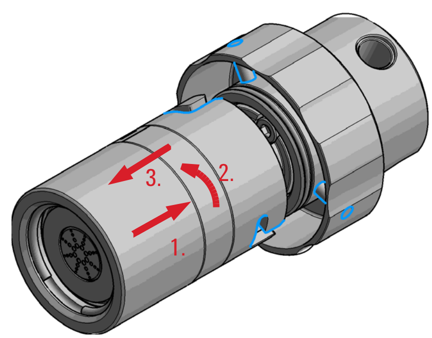
1 In the Local Controller start the maintenance mode and select **Change metering device** function.

OR

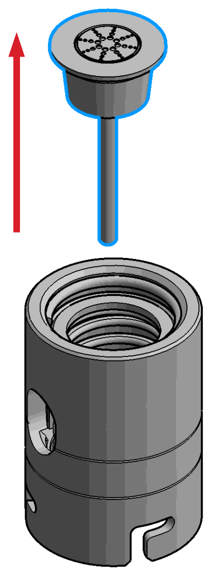
In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen **(Tools) > Maintenance Positions > Change Metering Device**, click start and wait until the metering device is in maintenance position.

2 Open the front door.

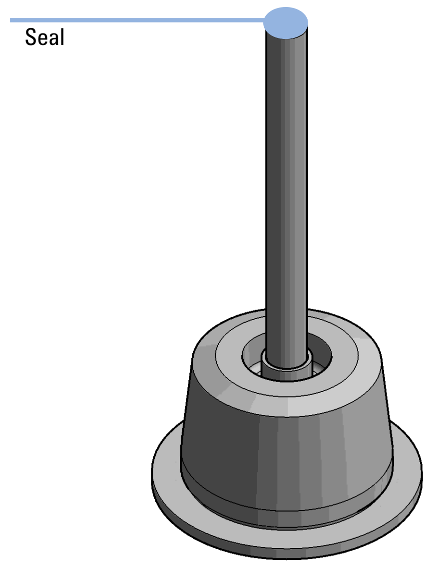


3 Remove capillaries and valves from the flush head. 	**4** Press and turn the Flush Head a quarter left (bayonet fitting) and detach the metering device from the actuator. 
5 Pull the flush head away from the hydraulic box 	**6** Press against the rear side of flush head and turn a quarter left (bayonet fitting) and separate the flush head, head body and the piston.  **NOTE** Be careful not to break the piston.

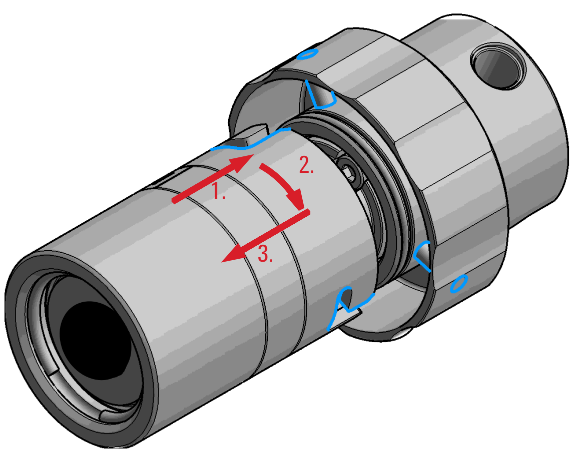
7 Remove the piston from the head body.



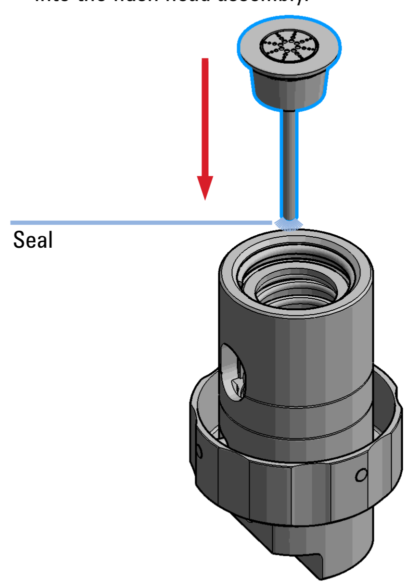
8 Carefully remove the metering seal from the tip of the piston.



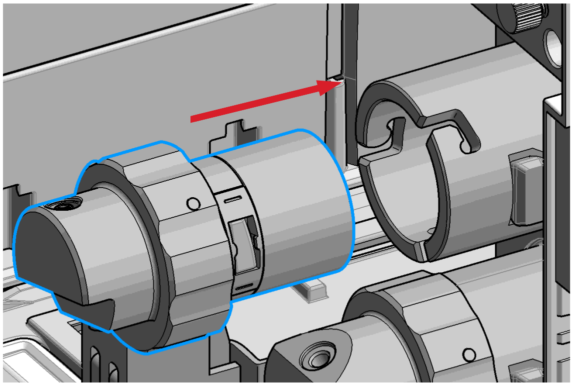
9 Reassemble the flush head and the head body (without piston).



10 Carefully insert the piston with the new metering seal into the flush head assembly.



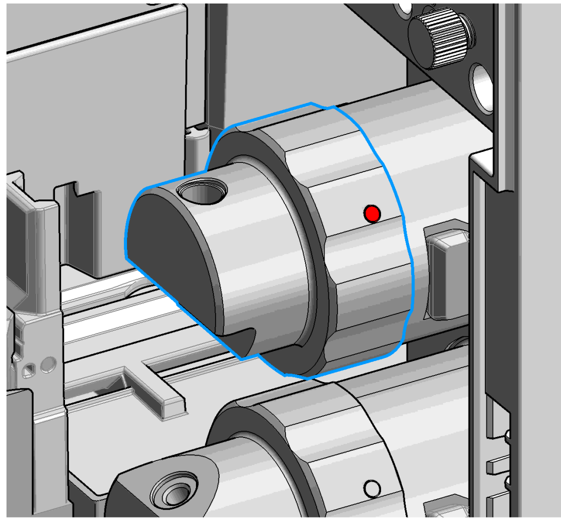
11 Reinstall the flush head to the actuator housing.



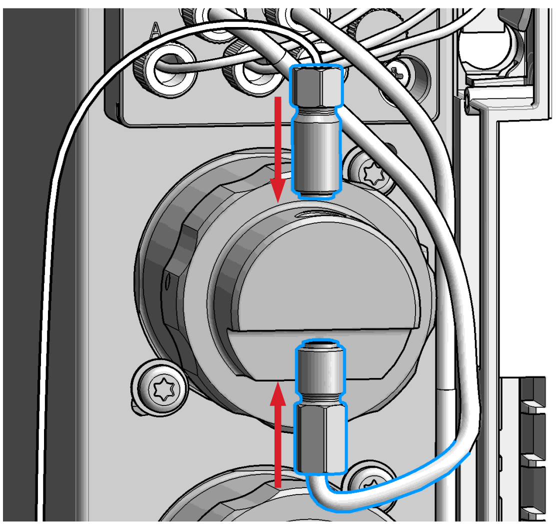
NOTE

For proper installation, check the correct position of the tag.

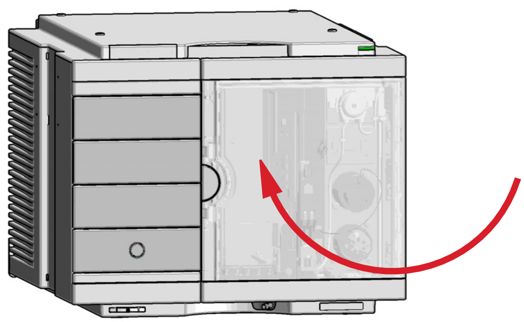
12 Fix the flush head.



13 Connect the capillaries.



14 Close the front door.



Remove the Sample Loop-Flex

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

When If the sample loop flex is defective or damaged.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

p/n	Description
G4267-60300	Sample Loop Flex 20 µL, right (red coded)
G4267-60400	Sample Loop Flex 40 µL, right (green coded)
G4267-60500	Sample Loop Flex 100 µL, right (blue coded)
G7167-68500	Sample Loop Cartridge 500 µL right
G7167-68900	Sample Loop Cartridge 900 µL right
G5668-60500	Bio-inert Sample Loop 100 µL (for G5668A)

Further sample loops for the Dual Needle option are available, see “Sample Loops and Capillaries (Dual Needle)” on page 307.

Preparations Finish any pending acquisition job and return any plate on the workspace back to the hotel.

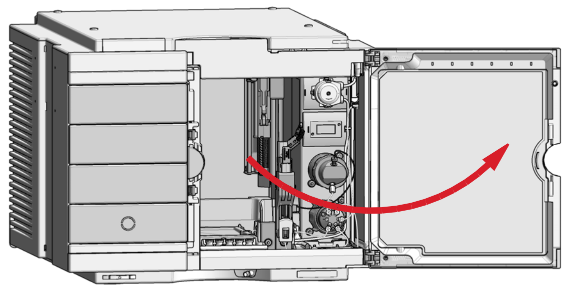
WARNING **Risk of injury by uncovered needle**

An uncovered needle is a risk of harm to the operator.

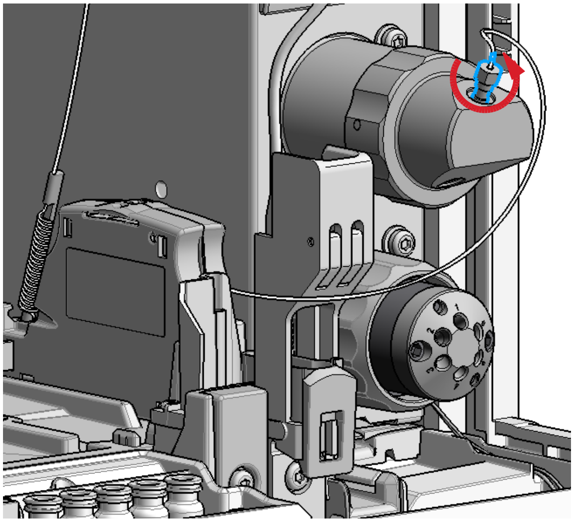
→ Do not open the safety lock of the needle assembly

→ Be careful working at the z-robot.

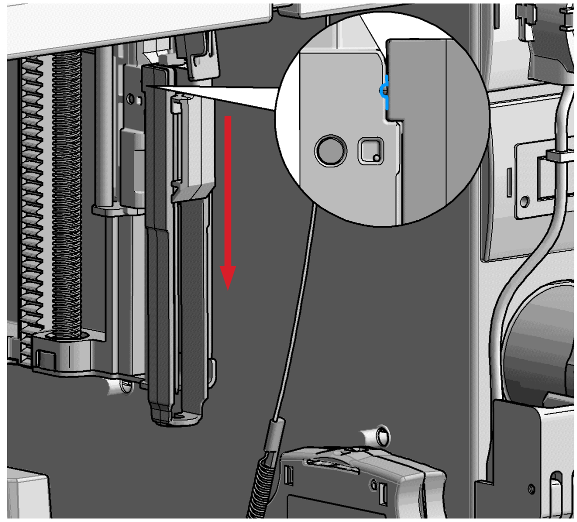
→ Wear safety goggles, when removing the needle assembly.

1 In the Local Controller start the maintenance mode and select **Change needle/seat** function. OR In the Agilent Lab Advisor software select **Service & Diagnostics** in the system screen (**Tools**) **Maintenance Positions > Change Needle/Loop**, click **Start** and wait until the needle assembly is in maintenance position.	**2** Open the front door. 

3 The needle assembly is still connected to the loop capillary. Use a 1/4 inch wrench to loosen the fitting of the loop capillary connected to the analytical head.



4 Lock the needle in the safety position.



NOTE

During normal operation of the Multisampler the needle assembly has to be unlocked.

CAUTION

Damage of the loop
The loop shape may be damaged if the loop is stretched or bent too far.

→ **Avoid to change the loop shape.**

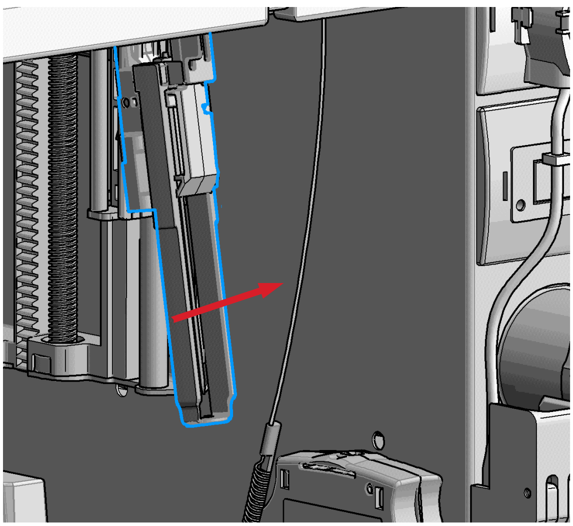
→ **Do not pull or bend the loop too far.**

WARNING

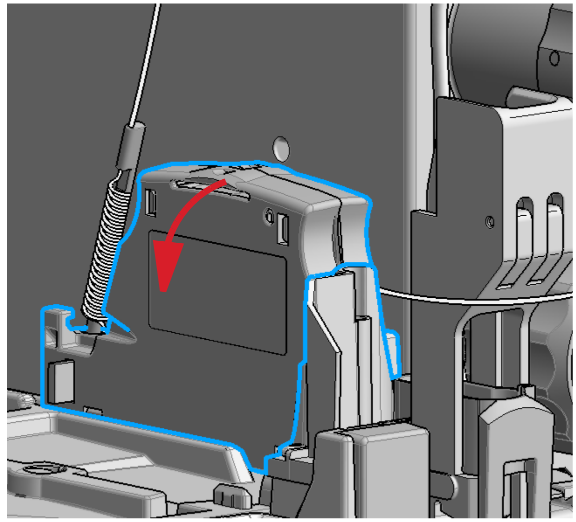
Sharp needle
Uncovered needles may cause injuries

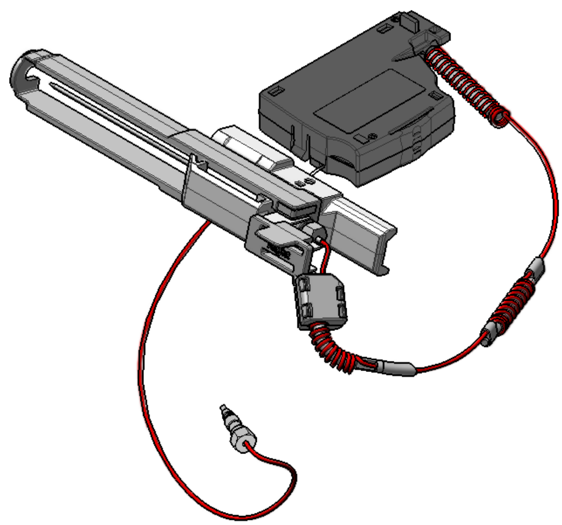
→ **Make sure the needle is in the safety lock position.**

5 Remove the needle assembly by slightly pulling the needle cartridge.

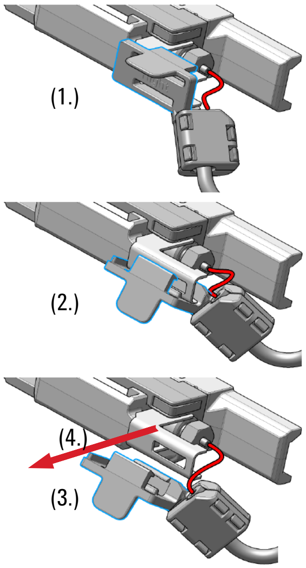


6 Remove the cartridge out of its proper position. By gently tilting and pulling it out of the work space of the multisampler.





7 Remove the loop plastic adapter.



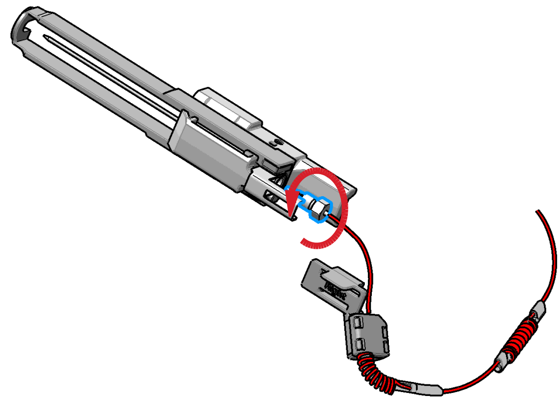
NOTE

Do not open the rear plastic clamp.

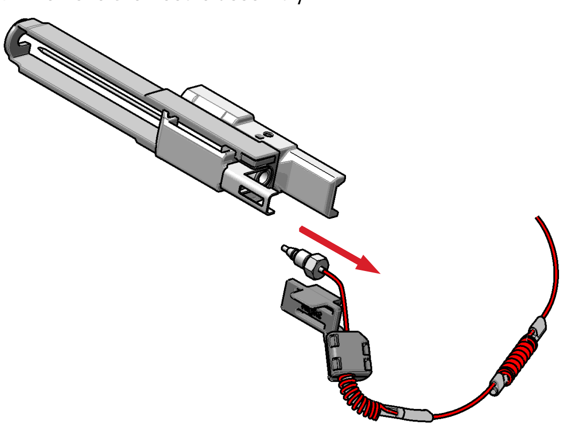
NOTE

If the plastic adapter is damaged the sample loop has to be replaced.

8 Use a 1/4 inch wrench to loosen the fitting of the loop capillary.



9 Remove the needle assembly.



Installing the Sample Loop-Flex

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

When If the sample loop flex is defective or damaged.

Tools required

p/n	Description
8710-0510	Wrench open 1/4 — 5/16 inch

Parts required

p/n	Description
G4267-60300	Sample Loop Flex 20 µL, right (red coded)
G4267-60400	Sample Loop Flex 40 µL, right (green coded)
G4267-60500	Sample Loop Flex 100 µL, right (blue coded)
G7167-68500	Sample Loop Cartridge 500 µL right
G7167-68900	Sample Loop Cartridge 900 µL right
G5668-60500	Bio-inert Sample Loop 100 µL (for G5668A)

Further sample loops for the Dual Needle option are available, see “Sample Loops and Capillaries (Dual Needle)” on page 307.

Preparations Finish any pending acquisition job and return any plate on the workspace back to the hotel.

WARNING

Risk of injury by uncovered needle

An uncovered needle is a risk of harm to the operator.

→ Do not open the safety lock of the needle assembly

→ Be careful working at the z-robot.

→ Wear safety goggles, when removing the needle assembly.

CAUTION

Mismatching sample loop configuration

Damage to the system

→ Make sure, that the sample loop configuration matches to the hardware installed.

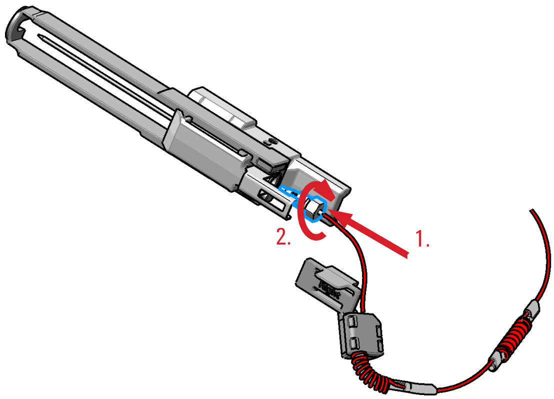
NOTE

If you have changed the sample loop, verify that the correct sample loop is configured in the CDS (see "Setting up the Autosampler with Agilent OpenLab CDS ChemStation Edition" on page 123).

NOTE

For details on the setup of the dual-needle system, see "Modify Capillaries" on page 136.

1 Install the loop capillary on top of the needle cartridge (1.) and tighten the fitting hand tight (2.).



NOTE

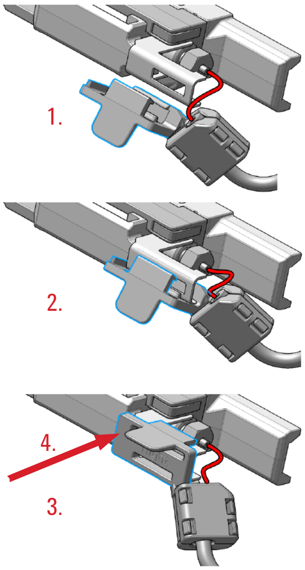
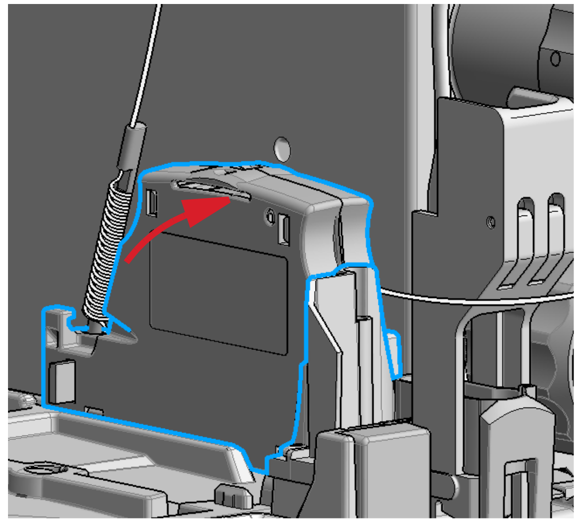
If the sample loop is changed, we recommend changing the needle as well.

CAUTION

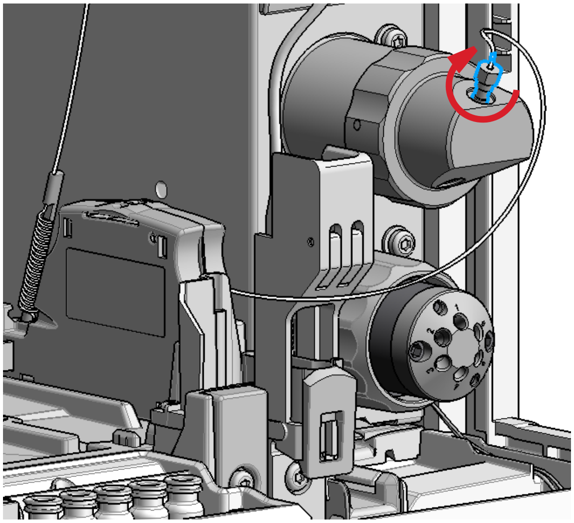
Blockages inside of the needle assembly union

→ **Do not overtighten the fitting. A quarter turn should be sufficient.**

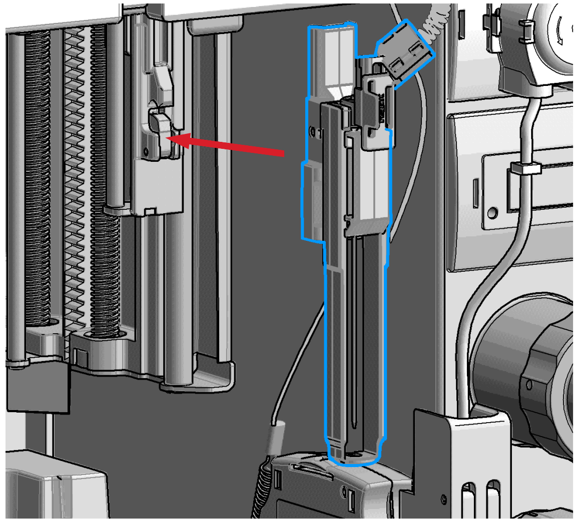
2 Then use a 1/4 inch wrench to tighten the fitting of the loop capillary.

3 Install loop plastic adapter.  **NOTE** Verify the sample loop info on the plastic adapter. A left or a right sample loop must be installed in the correct slot of the needle parkstation. For single needle, the default position is on the right. **NOTE** If the plastic adapter is damaged the sample loop has to be replaced.	**4** Click the sample loop cartridge in the designated location and keep the right orientation. 

5 Install the shorter capillary of the sample loop cartridge to the analytical head.



6 Pinch and reinsert the needle assembly and the connected sample loop capillary into the z- arm coupler.

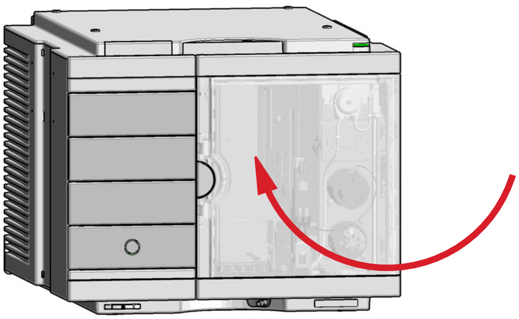


NOTE

Check the tension of the loop capillary. This must be forced and guided to the hydraulic box to prevent it from being caught by the Z-drive.

<table>
<tr>
<td>

7 Close the front door.



</td>
<td>

Next Steps:

8 In the Local Controller close **Change needle /seat**.

OR

In Agilent Lab Advisor software **Change needle/loop**. Click **NEXT** and wait until the needle is in the needle park station.

Click **Back** to leave the Maintenance window.

NOTE

If you need an autoreferencing step included you must choose the change needle procedure

NOTE

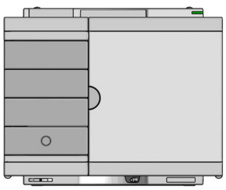
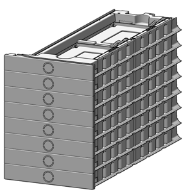
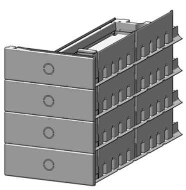
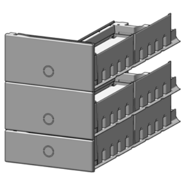
If you have changed the sample loop, verify that the correct sample loop is configured in the CDS (see “Setting up the Autosampler with Agilent OpenLab CDS ChemStation Edition” on page 123).

</td>
</tr>
</table>

Replace the Dummy Drawer

Optional Configurations

Table 25 Overview on optional configurations (examples for uniform types)

		1H	2H	3H	Dummy-Drawer
	**Delivery Status**	-	G7167-60020 1x	-	G4267-60024 3x
	**Up to 8 single height drawers** 16 positions Shallow wellplates and MTP Max Sample capacity 1536 / 6144 samples (96 Shallow Wellplates / 384 MTP)	G7167-60021 8x	-	-	-
	**Up to 4 Dual Height drawers** 8 positions Vials (2 mL), deep well plates, MTP, Eppendorf Max Sample capacity 432 / 3072 samples (2 mL Vials/ 384 MTP)	-	G7167-60020 4x	-	-
	**Up to 2 Drawers Triple Height** 4 positions (2H or 2*1H option left over) Vials (6 ml), deep well plates, MTP, Eppendorf Max Sample capacity 60 / 216/ 1536 samples (6 mL Vials/ 2 mL Vials/ 384 MTP)	-	G7167-60020 1x	G7167-60022 2x	-

NOTE

Mixed configurations are possible (for example 1x3H- with 1x2H- and 3x1H-drawer).

All positions in the Sample Hotel must be filled either with dummies or drawers. The drawers must be installed from bottom to top.

Installing and Replacing of Drawers (Upgrade Drawer Kit)

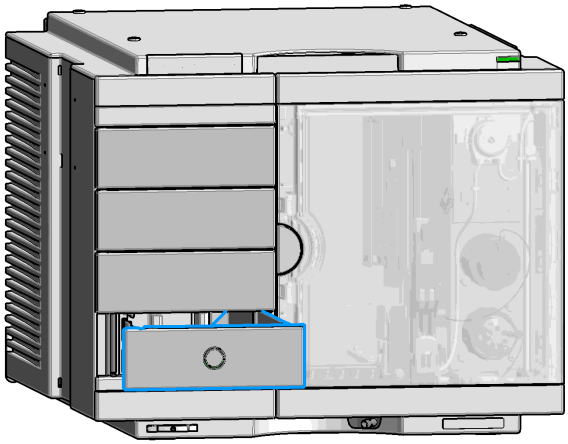
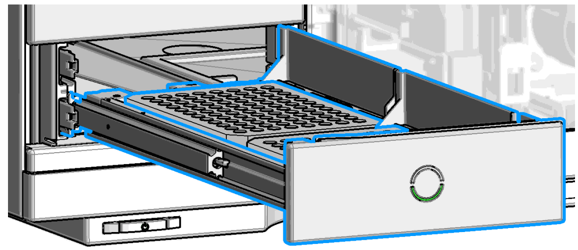
Tools required	Description
	Screwdriver

Parts required	p/n	Description
	G7167-60020	Drawer 2H
	G7167-60021	Drawer 1H
	G7167-60022	Drawer 3H

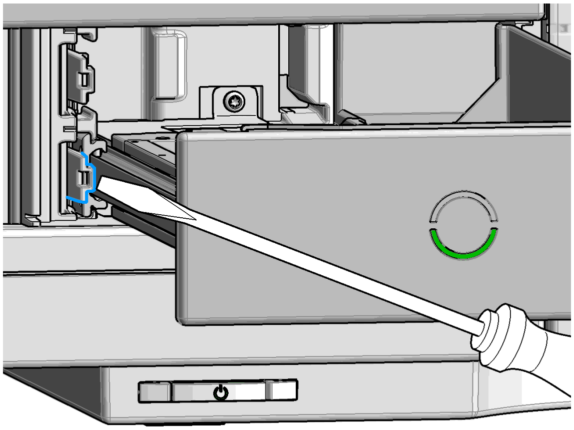
NOTE Before you start the new drawer installation you have to remove the lower drawer (2H drawer = default configuration) from the Sample Hotel.

NOTE For best cooling performance the 2H drawer must be installed in the lowest position.

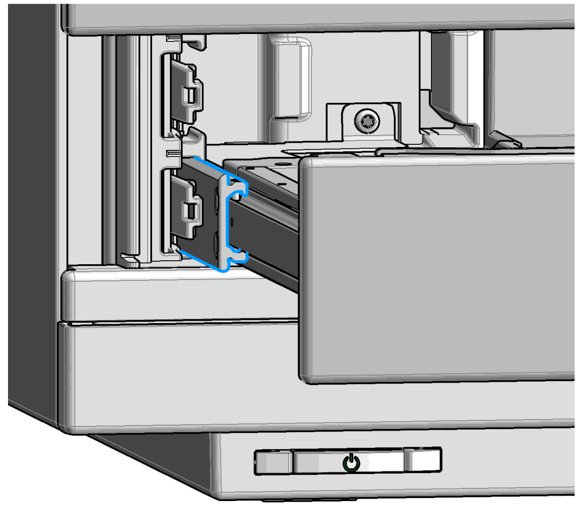
NOTE More detailed video information is available on the Agilent Information CD.

1 Open the drawer. 	**2** Pull the drawer completely out. 

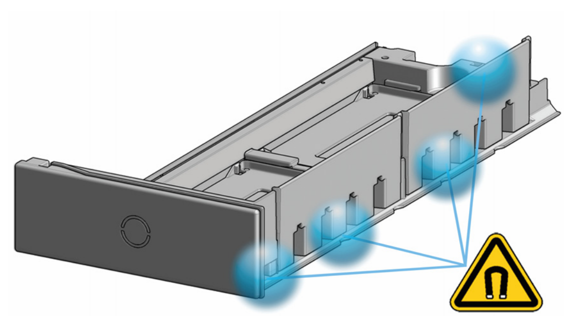
3 Unlatch the drawer: Use a screwdriver to press the clamping lever lightly to the left.

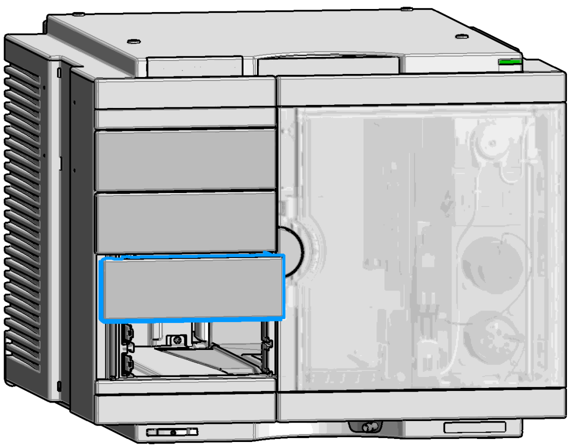
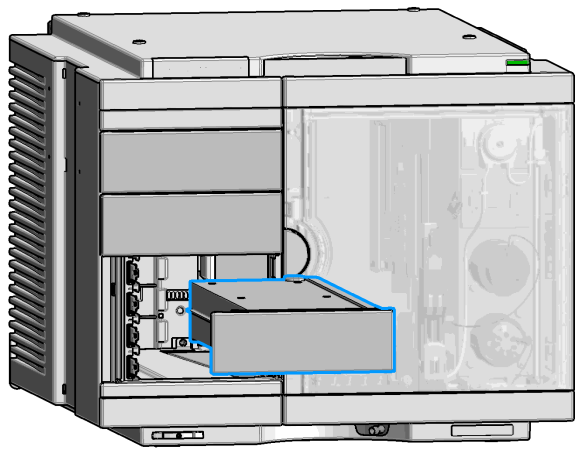


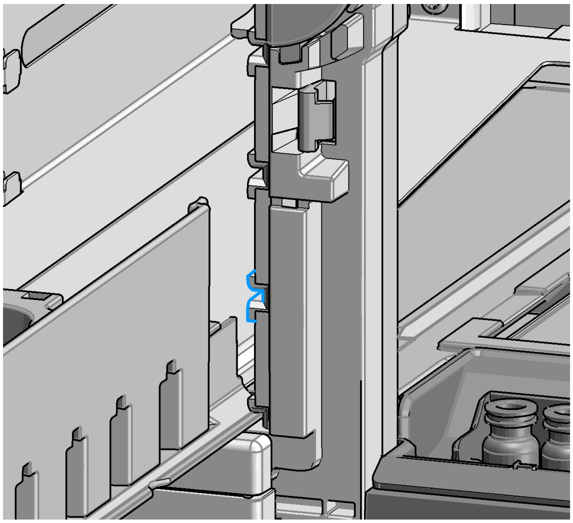
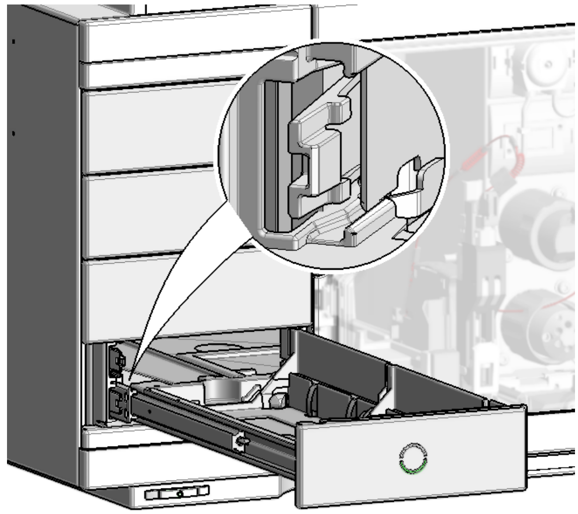
4 Remove the drawer from the rail guide.



The drawer is now out of the hotel.



<table>
<tr>
<td>5 Grab in the recession below the dummy drawer front panel (1.) and lift the left side (2.).
</td>
<td>6 Remove the dummy drawer.
NOTE
At this stage remove all other dummies that will be replaced by hotel drawers.
</td>
</tr>
</table>

7 Place the new drawer horizontally into the sample hotel. Check that the drawer matches the middle bracket of the sample hotel. 	**8** Push until the complete drawer locks in place. **NOTE** Take care that the clamping lever locks.  **NOTE** Always fill sample hotel completely (no empty drawer slots). Otherwise the drawers can't be configured in the software.
9 Configure the hotel drawers in the controller software (see the Online Help of the software for details).	

Configuration of the Hotel Drawers

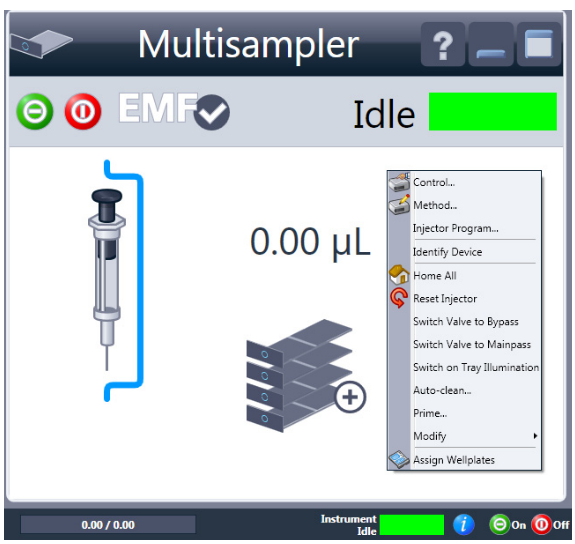
The configuration of your drawers is necessary to detect the new drawer configuration for your CDS system. When a wrong configuration is detected there will be a mismatch in your CDS system and your are not able to use the new drawers. The new drawer configuration is active and stored after you have done the Drawer Configuration.

Configure the Hotel Drawers in the Control Software

Software required	OpenLAB (A.02.01 or above) LC driver (A.02.10 or above
Preparations	• Stop the acquisition run. • Remove the sample containers (trays and well plates) from workspace. • Complete the drawer installation. • Remove the sample containers (trays and well plates) from the drawers. • Verify that all sample trays (palettes) are installed in their drawers. • All open drawers and dummies have to be closed and installed properly.

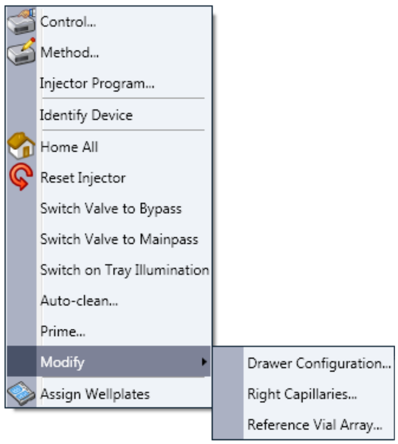
1 Start OpenLAB CDS ChemStation Edition.

2 Right-click on the **Multisampler** GUI.



3 Select **Modify > Drawer Configuration** in the GUI screen.

NOTE For correct detection, it is necessary to remove all sample containers (for example 54 vial tray or well plates).



4 Follow the Setup or Change configuration screen.

5 System is ready after the robot has done Auto Referencing (see "Auto Referencing" on page 196).

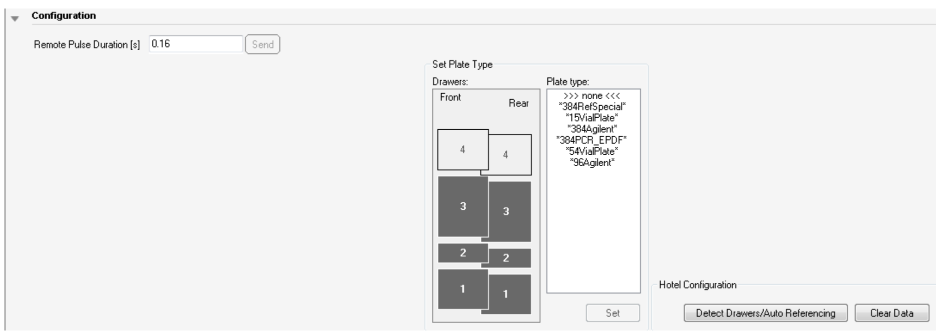
Configure the Hotel Drawers in Lab Advisor

Software required Lab Advisor (B.02.05 or above)

Preparations

- Stop the acquisition run.
- Remove the sample containers (trays and well plates) from workspace.
- Complete the drawer installation.
- Remove the sample containers (trays and well plates) from the drawers.
- Verify that all sample trays (palettes) are installed in their drawers.
- All open drawers and dummies have to be closed and installed properly.

1 Start the Lab Advisor Software.
2 Connect the instrument and select **Instrument Control** in the system screen.
3 Switch In the **Configuration** menu of the Multisampler. Select **Detect Drawers** in the **Hotel Configuration**.



4 Follow the Detect Hotel Configuration screen to detect the physically available drawers.

NOTE For correct detection, it is necessary to remove all sample containers (for example 54 vial tray or well plates).

5 System is ready after the robot has done Auto Referencing (see "Auto Referencing" on page 196).

Remove the Sample Cooler or Thermostat

When	If the cooler/thermostat is damaged or defective
Tools required	**Description** Screwdriver, Pozidriv #1 PT3
Preparations	• Drain off all condensate before dismounting the sample cooler/thermostat. • Make sure that there is no condensate left.

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the sample thermostat and laboratory.

→ Keep open fire or sources of ignition away from the device.

→ Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the sample thermostat).

→ Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.

→ Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the sample thermostat.

WARNING

Heavy weight

The module is heavy.

→ Carry the module at least with 2 people.

→ Avoid back strain or injury by following all precautions for lifting heavy objects.

→ Ensure that the load is as close to your body as possible.

→ Ensure that you can cope with the weight of your load.

CAUTION

Routing of the condensation tubing

Proper routing of the condensation tubing is critical for correct condensate drainage.

→ Do not place the sampler directly on the bench.

CAUTION

Condensate inside the cooler or thermostat

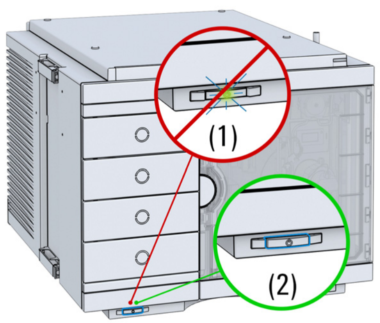
Damage to the electronics

→ Unplug the power cords.

→ Drain off all condensate before dismounting the sample cooler or thermostat.

→ Make sure that there is no condensate left.

1



Power switch

(1) On

(2) Off

2 Remove the power cable from the module.

3 Open the 4 screws on the rear of the module.

Next Steps:

4 Slide the sample cooler/thermostat the half way out.

5 Remove power and the signal cable.

6 Slide the cooler/thermostat completely out.

7 Place the sample cooler/thermostat on the bench.

NOTE

If the sampler with a sample cooler or sample thermostat needs to be shipped to another location via carrier, ensure:

- The two modules are shipped in separate boxes.
- The Sample handler of the multisampler is parked properly, see *Park Robot* in *Agilent Lab Advisor* online help for more information.
- The sample containers (vial trays) are removed from the sample hotel.
- The condensed water inside of the sample cooler or sample thermostat is removed.

Install the Sample Cooler or Sample Thermostat

When If the cooler/thermostat is damaged or defective.

Tools required

Description
Screwdriver, Pozidriv #1 PT3

Parts required

	#	p/n	Description
	1	G7167-60005	Sample cooler
OR	1	G7167-60101	InfinityLab Sample Thermostat

WARNING

Flammable refrigerant

Formation of flammable gas-air mixtures inside the sample thermostat and laboratory.

→ Keep open fire or sources of ignition away from the device.
→ Ensure a room size of 4 m^3 (1 m^3 for every 8 g of R600a refrigerant inside of the sample thermostat).
→ Ensure adequate ventilation: typical air exchange of 25 m^3/h per m^2 of laboratory floor area.
→ Keep all ventilation openings in the enclosure clear of obstructions. Do not block the openings on the circumference of the sample thermostat.

CAUTION

Routing of the condensation tubing

Proper routing of the condensation tubing is critical for correct condensate drainage.

→ Do not place the sampler directly on the bench.

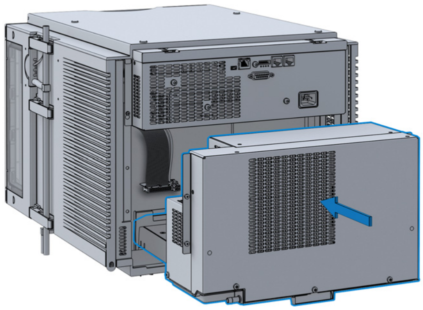
CAUTION

Condensate inside the cooler or thermostat

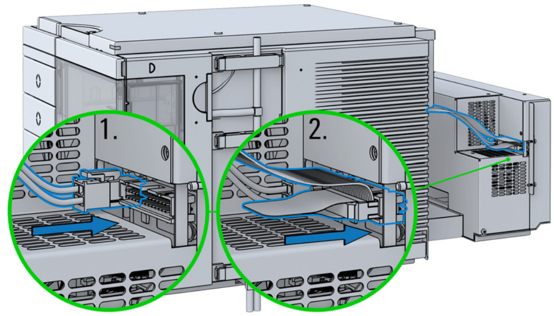
Damage to the electronics

→ Unplug the power cords.
→ Drain off all condensate before dismounting the sample cooler or thermostat.
→ Make sure that there is no condensate left.

1 Slide in halfway



2



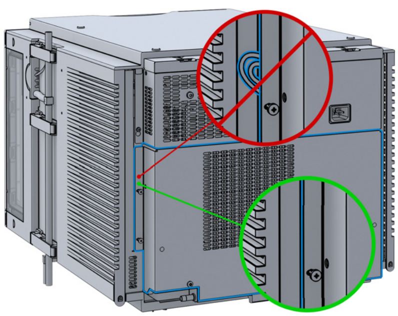
CAUTION

Damage to the cables

→ **Do not bend or pinch the cables.**

→ **Fit in the sample cooler or thermostat perfectly.**

3 Slide in the whole unit.



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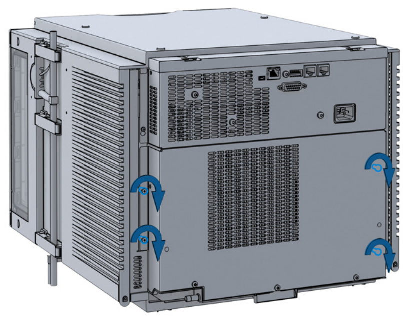
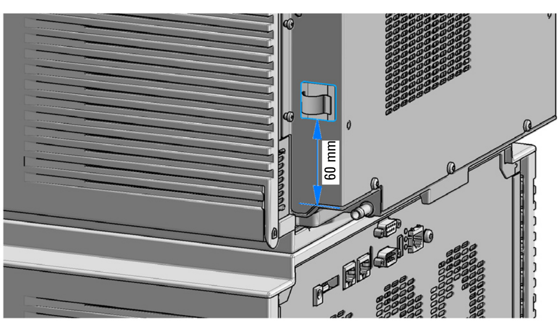


5



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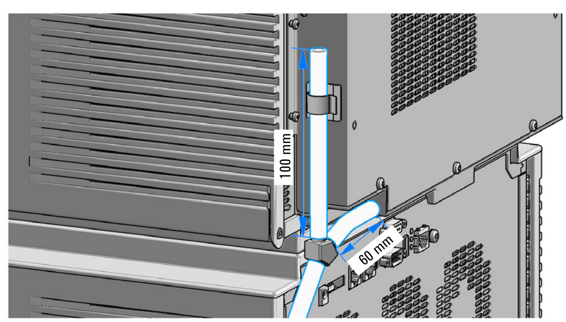

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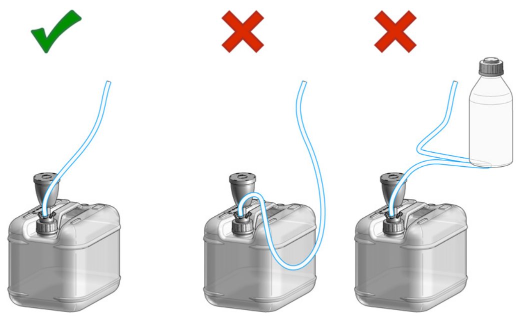


NOTE

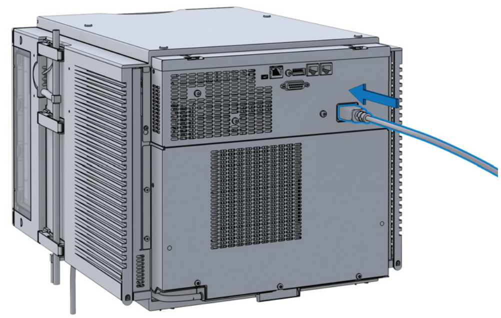
Check leak waste handling for further info.

CAUTION

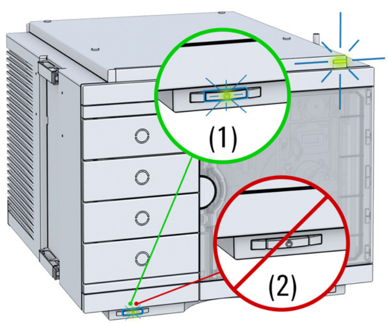
Damage to the sample cooler

→ **Wait at least 30 min before switching on the compressor of the sample cooler.**

8



9



Power switch

(1) On

(2) Off

Replace the Module 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 party control software requires a special version.

Tools required

Description
Agilent Lab Advisor software

Parts required

#	Description
1	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 carry out the following steps:

1. Download the required module firmware, the latest FW Update Tool and the documentation from the Agilent web.
   http://www.agilent.com/en-us/firmwareDownload?whid=69761
2. For loading the firmware into the module follow the instructions in the documentation.

Module Specific Information

There is no specific information for this module.

10
Parts for Maintenance and Upgrade or Options

This chapter provides information on parts material required for the module.

Standard Parts

Standard Parts

p/n	Description
G4267-87201	Needle Assembly
G4267-87210	Needle Assembly (slotted) for high injection volumes
G4267-87012	High Pressure Needle Seat, 0.12 mm (PEEK)
5068-0198	Rotor Seal 1300 bar (PEEK) for 1290 Infinity II Injection Valve (Single Needle)
5068-0209	Rotor Seal (PEEK) for 1260 Infinity II Injection Valve (Single Needle)
5068-0232	Rotor Seal (PEEK) for Dual needle Injection Valve
5068-0229	Rotor Seal (PEEK) for Dual needle Peripheral Valve
G4267-60300	Sample Loop Flex 20 µL, right (red coded)
G4267-60400	Sample Loop Flex 40 µL, right (green coded)
G4267-60500	Sample Loop Flex 100 µL, right (blue coded)
G7167-68500	Sample Loop Cartridge 500 µL right
G7167-68900	Sample Loop Cartridge 900 µL right
G7167-60300	Extension Sample Loop-Flex 500 – 900 µL Right Single Needle
G4267-40033	Transport-Protection

Standard Parts Bio-Inert

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

p/n	Description
G5668-87200	Needle Bio-Sampler (G5668A)
5068-0099	Rotor Seal (PEEK) (G5668A)
G5668-87017	Bio Seat ID 0.17 (G5668A)
G5668-60500	Bio-inert Sample Loop 100 µL

Hotel Drawer

Item	p/n	Description
1	G7167-60021	Drawer 1H (including 2*G4267-60206 Sample Tray (Palette))[1]
2	G7167-60020	Drawer 2H (including 2*G4267-60205 Sample Tray (Palette))[1]
3	G7167-60022	Drawer 3H (including 2*G4267-60205 Sample Tray (Palette))[1]
	G4267-60024	Dummy Drawer (not shown)

1 Note: This partnumber should only be used for repairs. For increasing the capacity in the Sample Hotel please order a pair of drawers via ELSA http://wadnts02.germany.agilent.com/csc/tools/web_elsa/elsa.htm.

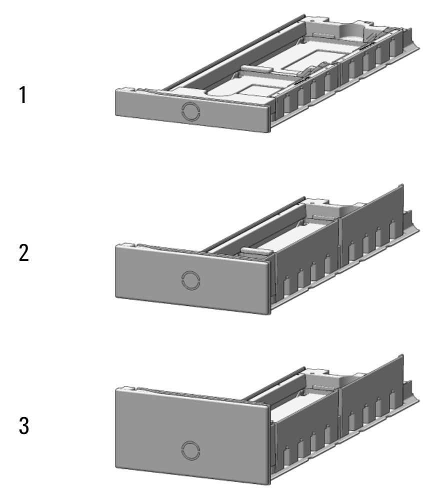


Figure 48 Hotel drawer

Analytical Head Assembly 40 µL

Item	p/n	Description
	G4267-60042	Analytical Head, 40 µL
1	G4267-60423	Head Assembly, 40 µL
2	0905-1717	Metering seal 40 µL
	G4267-60422	Seal Support Assembly, 40 µL
4	0515-4384	Screw
5	G4267-60432	Spring Adapter Assembly
6	5067-5620	Piston ceramic 40 µL
	5043-1000	O-Ring (not shown)
	5500-1159	Capillary ST 0.17 mmx100 mm SX/S-2.3 Capillary from the metering device to the injection valve (not shown)

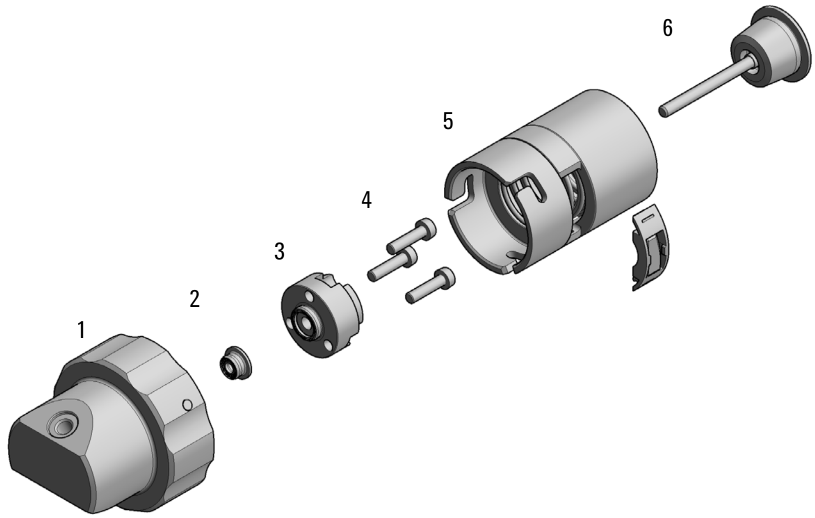


Figure 49 Analytical head assembly, 40 µL

Analytical Head Assembly 100 µL

Item	p/n	Description
	G4267-60043	Analytical Head, 100 µL for G7167A, G7167B
1	G4267-60433	Head Assembly, 100 µL
2	0905-1719	PE Seal
	G4267-60434	Seal Support Assembly, 100 µL
4	0515-1052	Screw 2.5 mm hex
5	G4267-60432	Spring Adapter Assembly
6	5067-5678	Piston ceramic 100 µL
	5043-1000	O-Ring (not shown)
	5500-1159	Capillary ST 0.17 mmx100 mm SX/S-2.3 Capillary from the metering device to the injection valve (not shown)

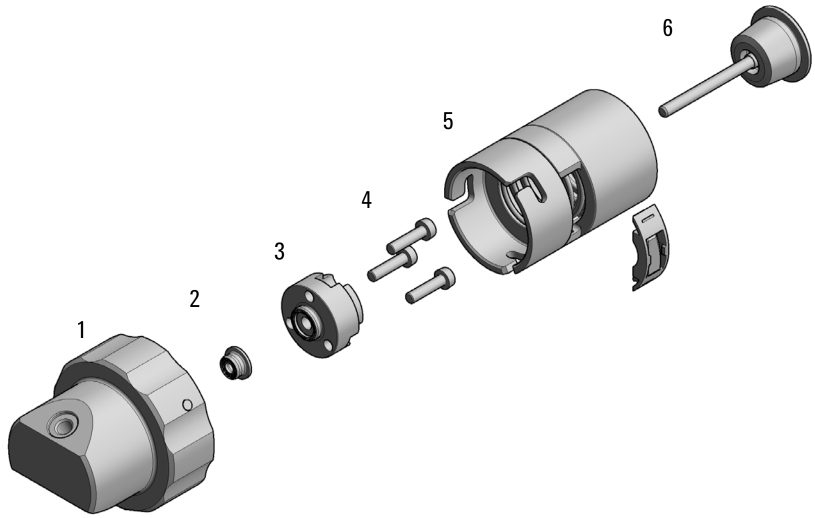


Figure 50 Analytical head assembly, 100 µL

Bio Analytical Head Assembly (100 µL) (1200 bar)

BIO INERT

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

Item	p/n	Description
	G5668-60043	Bio Analytical Head 100 µL for G5668A
	G5668-60433	BIO Analytical Head 100 µL
	G5611-21503	Piston Seal PTFE (Bio-inert)
	G4267-60434	Seal Support Assembly, 100 µL
4	0515-1052	Screw 2.5 mm hex
5	G4267-60432	Spring Adapter Assembly
6	5067-5678	Piston ceramic 100 µL

Capillary from the metering device to the injection valve (not shown)

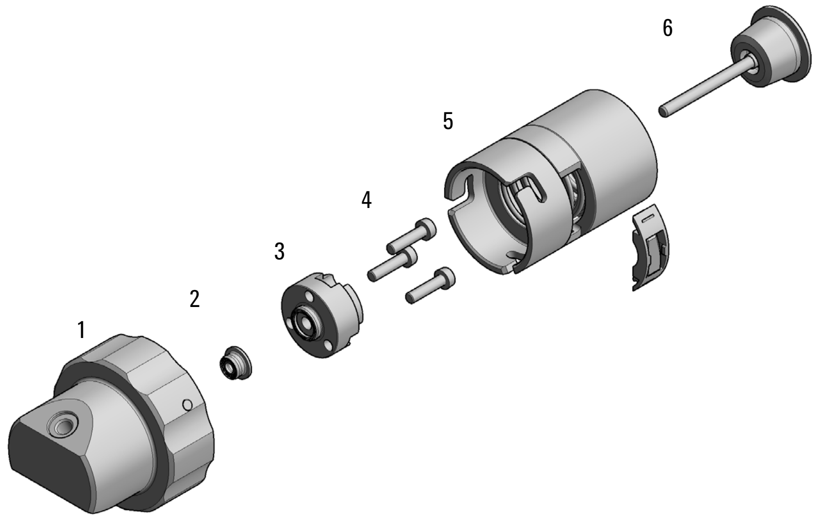
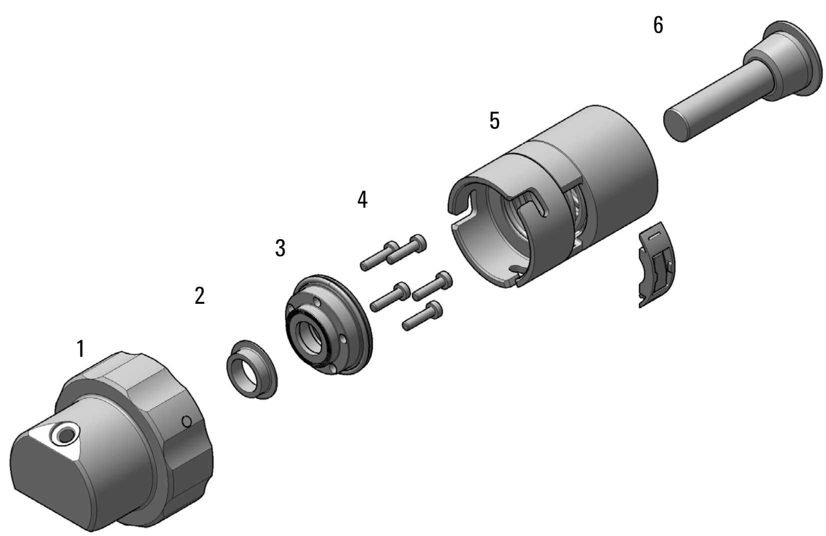


Figure 51 Analytical head assembly, 100 µL

Analytical Head Assembly 900 µL

Item	p/n	Description
	G4267-60046	Analytical head, 900 µL, 400 bar
1	G4267-60461	Head Assembly, 900 µL
2	0905-1294	Metering seal, 900 µL
3	G4267-60463	Seal Support Assembly, 900 µL
4	SCREW-SKT	SCREW-SKT HD CAP M2.5 X 0.45 10MM LG (not available)
5	G4267-60432	Spring Adapter Assembly
6	G4267-60462	Piston Assembly, 900 µL
	5043-1000	O-Ring (not shown)
	5500-1159	Capillary ST 0.17 mmx100 mm SX/S-2.3 Capillary from the metering device to the injection valve (not shown)



Flush Head Assembly 500 µL

Item	p/n	Description
	G4267-60049	Flush head, 500 µL
1	G4267-60491	Flush Head Assembly, 500 µL
2	5023-2473	Sealing Plate 500 µL
3	G4267-60482	Cylinder Assembly, 500 µL
4	5067-5918	Seal 500 µL
5	0515-5167	Screw
6	1410-1881	Bearing-Sleeve 8 mm-ID 10 mm-OD 10 mm-LG PI
7	G4267-60432	Spring Adapter Assembly
8	5067-5919	Piston Assembly 500 µL
9	G4267-60451	Pump Valve IN
10	G4267-60452	Pump Valve Out
	5043-1000	O-Ring (not shown)
	5500-1167	Capillary ST 0.17 mm x 250 mm SL-SL Capillary from the flush head to the injection valve (not shown)

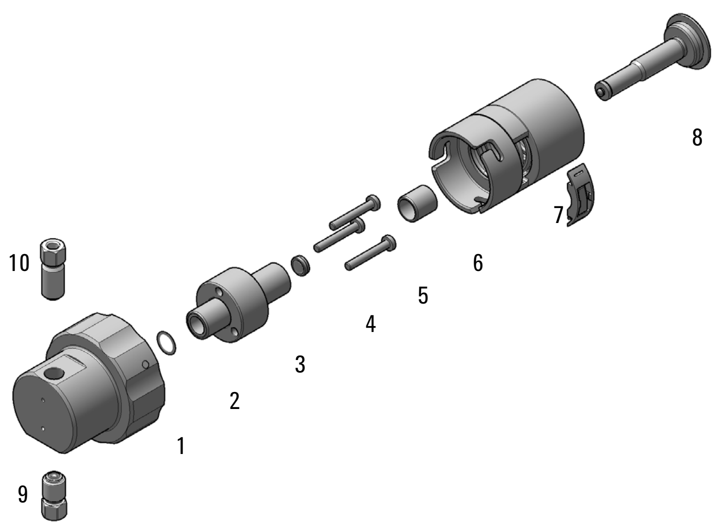


Figure 52 Flush head assembly, 500 µL

Bio Flush Head Assembly 500 µl

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

Item	p/n	Description
	G5668-60049	Flush Head Bio 500 µL
1	G5668-60491	Flush Head Bio Assembly, 500 µL
2	5023-2473	Sealing Plate 500 µL
3	G4267-60482	Cylinder Assembly, 500 µL
4	G5668-60494	Seal 500 µL Bio
5	0515-5167	Screw
6	1410-1881	Bearing-Sleeve 8 mm-ID 10 mm-OD 10 mm-LG PI
7	G4267-60432	Spring Adapter Assembly
8	5067-5919	Piston Assembly 500 µL
9	G5668-60492	Pump Valve IN
10	G5668-60493	Pump Valve Out

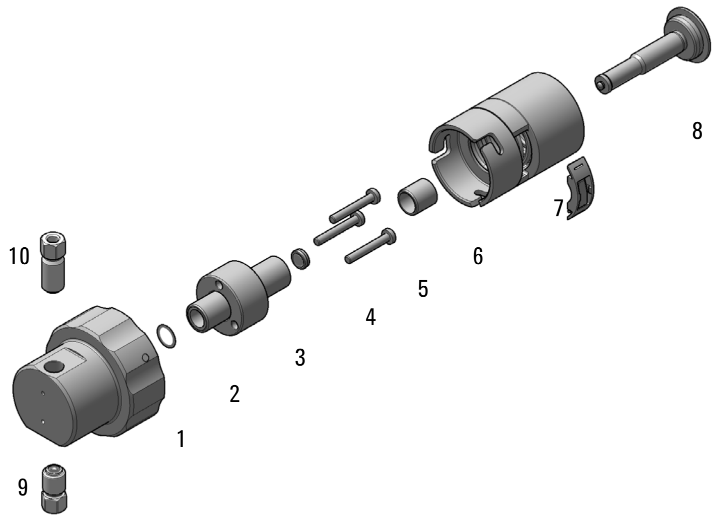


Figure 53 Flush head assembly, 500 µL

2ps 6pt Injection Valve VICI

Item	p/n	Description
	5067-4232	2pos/6port Injection Valve (VICI) 1300 bar 1300 bar (G7167B)
1	5068-0210	Stator screws
2	5068-0197	Stator head
3	5068-0198	Rotor Seal 1300 bar (PEEK)
	5500-1159	Capillary ST 0.17x100 SX/S-2.3 Metering Device to Injection Valve
	5067-4650	Capillary ST 0.12 mm x 150 mm SL/SX Pump to sampler
	5500-1157	Capillary ST, 0.12 mm x 500 mm SL/S Sampler to column compartment
	5067-6127	Blank Nut SL

NOTE For the VICI Valve SL/SX fittings are mandatory.

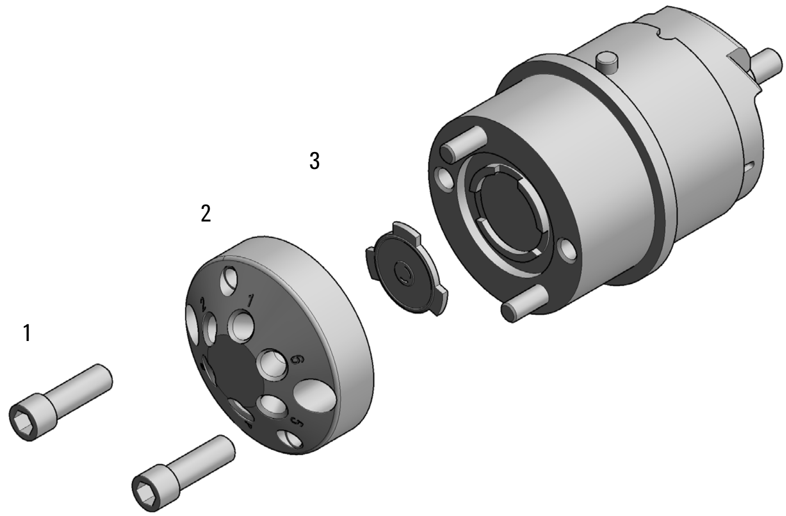


Figure 54 Injection valve assembly (VICI)

2ps 6pt Injection Valve IDEX

Item	p/n	Description
	5067-6698	2ps-6pt RC Injection Valve
1	1535-4857	Stator screws
2	5068-0208	Stator head
3	5068-0120	Stator ring
4	5068-0209	Rotor Seal (PEEK)
5	1535-4045	Bearing ring

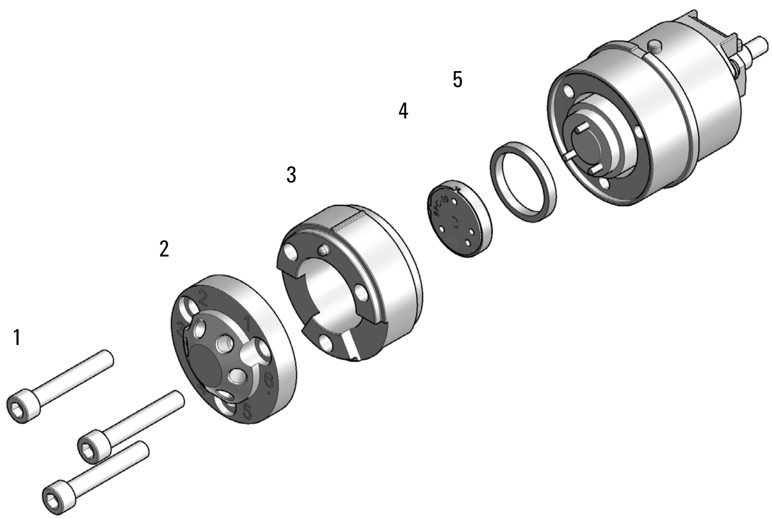


Figure 55 Injection valve assembly (IDEX)

2ps 6pt Injection Valve Bio-inert IDEX

BIO INERT

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

p/n	Description
5067-4263	2pos/6port Injection Valve Bio-inert 600 bar (G5668A)
1535-4857	Stator screws
5068-0060	Bio-inert stator head
0100-1851	Stator face, ceramic
5068-0120	Stator ring
5068-0099	Rotor Seal (PEEK)
1535-4045	Bearing ring

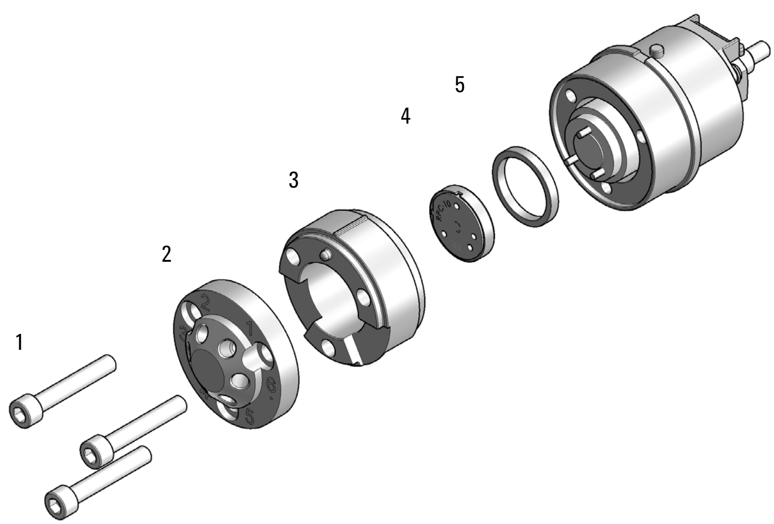


Figure 56 Injection valve assembly (IDEX)

Injection Valve with Actuator

Item	p/n	Description
1	5067-4232	2pos/6port Injection Valve (VICI) 1300 bar (G7167B)
OR	5067-6698	2ps-6pt RC Injection Valve
2	5043-0291	Lock Nut
3	5188-8030	Tag Reader
4	5067-4162	Direct-Actuator-50 Assembly

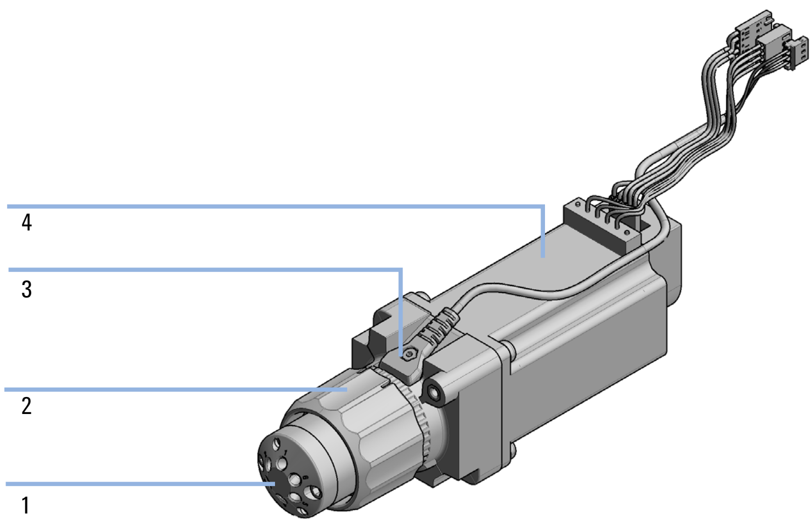


Figure 57 Injection valve with actuator

Sample Loops and Capillaries (Dual Needle)

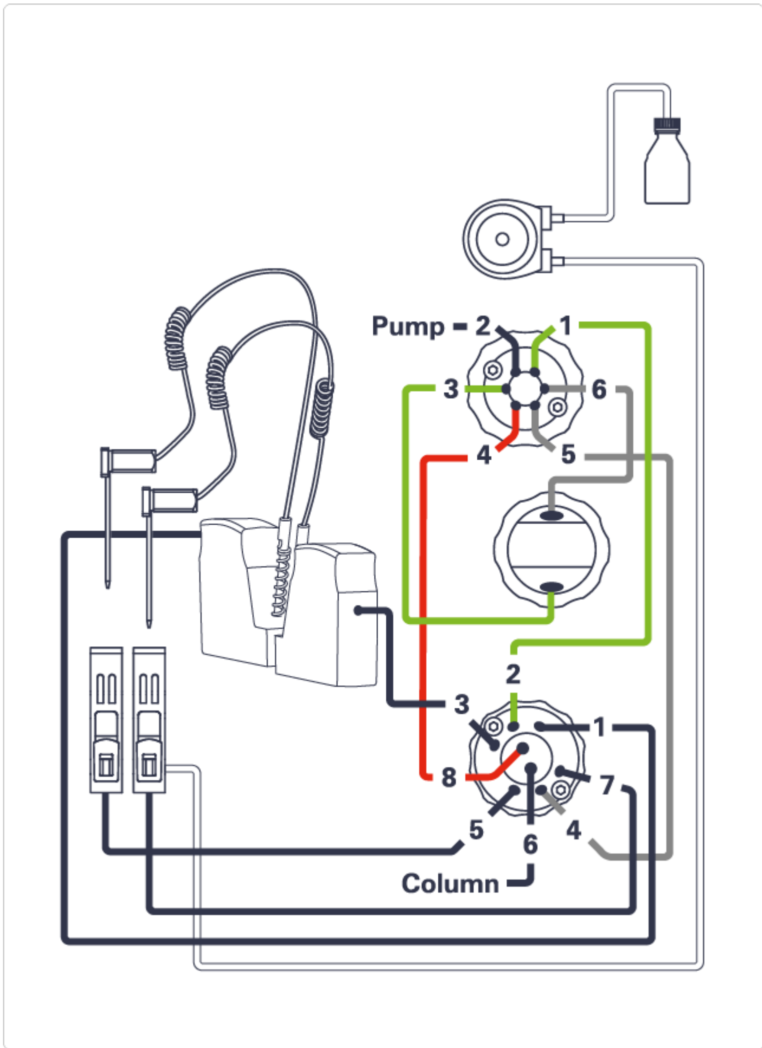


Figure 58 Capillary connections (Dual Needle Option)

NOTE Important for precision and avoiding of retention time shifts: only these sample loops must be used for the dual needle option.

NOTE It is mandatory that the configuration of the dual needle system, especially sample loops, must match to the installed hardware to avoid damage to the system.

Dual needle Sample Loops right

p/n	Description
G4267-60311	Sample Loop 20 µL right Dual needle
G4267-60411	Sample Loop 40 µL right Dual needle
G4267-60511	Sample Loop 100 µL right Dual needle
G7167-68511	Sample Loop 500 µL right Dual needle
G7167-68911	Sample Loop 900 µL right Dual needle
G7167-60300	Extension Sample Loop-Flex 500 – 900 µL Right Single Needle
G7167-60311	Extension Sample Loop-Flex 500 – 900 µL Right Dual Needle

Dual needle Sample Loops left

p/n	Description
G4267-60301	Sample loop 20 µL left Dual needle
G4267-60401	Sample loop 40 µL left Dual needle
G4267-60501	Sample loop 100 µL left Dual needle
G7167-68501	Sample Loop 500 µL left Dual needle
G7167-68901	Sample Loop 900 µL left Dual needle
G7167-60301	Extension Sample Loop-Flex 500 – 900 µL Left Dual Needle

Capillaries for the Dual Needle Option

p/n	Description
5500-1225	Capillary ST 0.12 mm x 180 mm SL-SL Port 4 Peripheral Valve/Port 8 Injection Valve
5500-1226	Capillary ST 0.17 mm x 180 mm SL-SL Port 2 Injection Valve/ Port 1 Peripheral Valve
5500-1227	Capillary ST 0.17 mm x 150 mm SL-SL Port 3 Peripheral Valve/Metering Device bottom
5500-1228	Capillary ST 0.3 mm x 80 mm SL-SL Metering Device Top/Port 6 Peripheral Valve
5500-1229	Capillary ST 0.3 mm x 180 mm SL-SL Port 4 Injection Valve/Port 5 Peripheral Valve
5500-1238	Capillary ST 0.12 mm x 105 mm SL/SL

3Pos/6Port Peripheral Valve Dual Needle

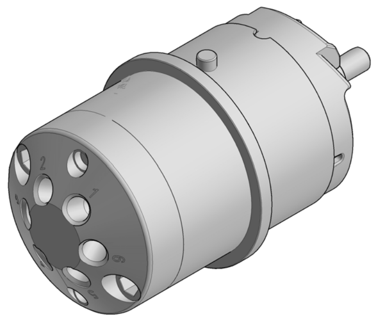


Figure 59 Peripheral valve (dual needle)

p/n	Description
5067-4256	3pos/6port Peripheral Valve DN 1300 bar
5068-0229	Rotor Seal (PEEK)
5068-0197	Stator head

2Pos/8Port Injection Valve Dual Needle

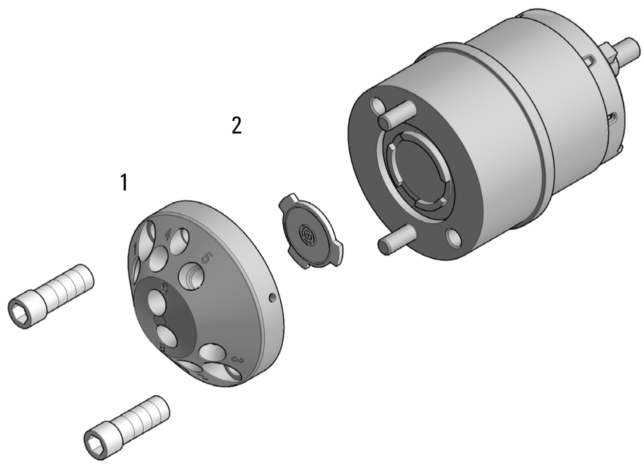


Figure 60 Injection valve (dual needle)

Item	p/n	Description
	5067-4260	2pos/8port Injection Valve Dual Needle 1300 bar
1	5068-0231	Stator
2	5068-0232	Rotor Seal (PEEK)

Needle Port Assembly

Item	p/n	Description
1	G4267-60044	Needle Port Assembly Station
2	G4267-40045	Needle port Adapter

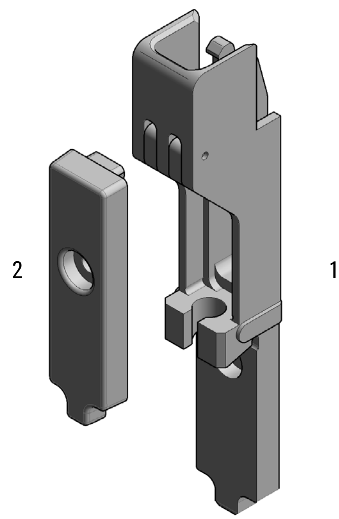


Figure 61 Needle port assembly

Door Assy

Item	#	p/n	Description
	1	5067-5415	Door Assy
1	1	5021-1879	Permanent Magnet
2	1		Pressure Spring (not available)
3	2	5067-5412	Hinge Universal
	1	G7167-68718	Light Protection Kit (not shown)

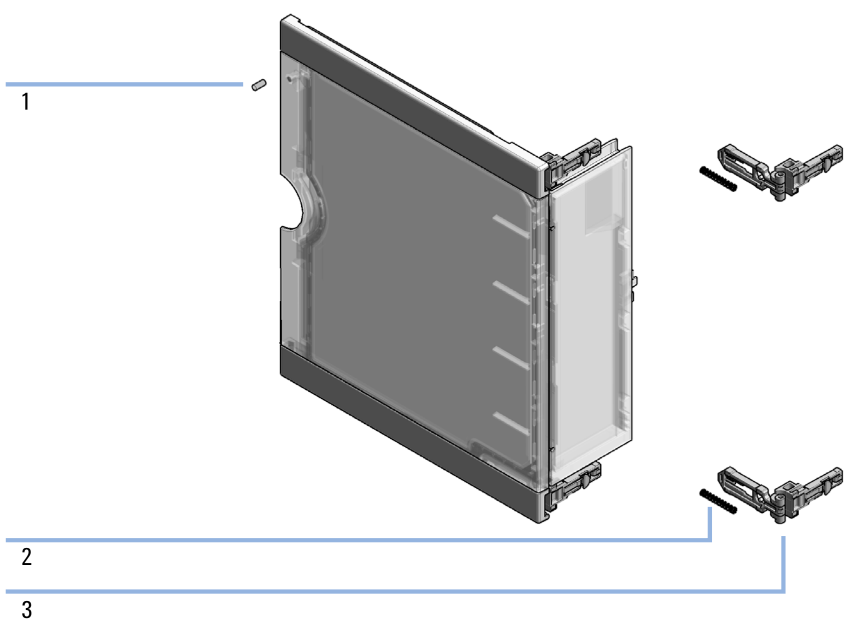


Figure 62 Door assy

Accessory Kit

Item	p/n	Description
	G4267-68705	Accessory Kit
	G7167-68715	Accessory Kit
1	G4220-60007	Bottle Head Assembly (not included in the accessory kit)
2	5063-6527	Tubing assembly, i.d. 6 mm, o.d. 9 mm, 1.2 m (to waste)
3	5500-1157	Capillary ST, 0.12 mm x 500 mm SL/S (1290 module)
OR	5500-1246	Capillary ST 0.17 mm x 500 mm SI/SI (1260 module)
4	5043-1013	Tubing Clip
5	5181-1519	CAN cable, Agilent module to module, 1 m
	5067-5967	Tubing Clip Tube Connector

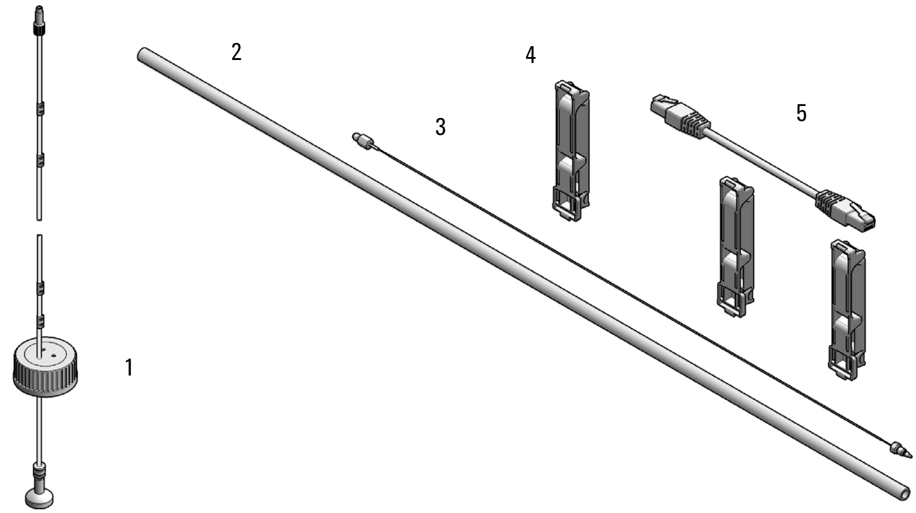


Figure 63 Accessory kit (standard)

Tools

Item	p/n	Description
1	0100-1710	Mounting Tool for Tubing Connections
2	5023-2533	Mounting tool

Tubing Connector Leak Kit (5067-6137)

p/n	Description
5067-6137	Tubing Connector Leak Kit

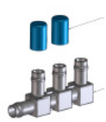
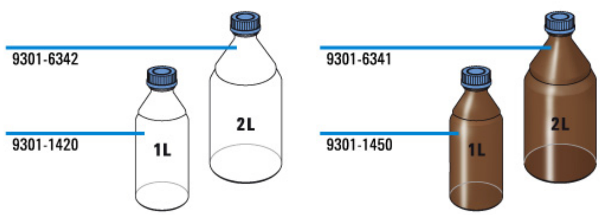


Figure 64 Tubing connector Leak Kit

Bottles

p/n	Description
9301-1420	Solvent bottle, transparent
9301-1421	Solvent Reservoir 1 L with cap
9301-6342	Solvent bottle, clear 2 L
9301-6341	Solvent bottle, amber 2 L



Tubing Kit Sampler Standard

Item	p/n	Description
	G4267-60061	Tubing-Kit-Sampler-Standard contains:
1	5042-9974	Tubing Flex (1.5 m)
2	5500-1155	Tube Connector, 90 degree, ID 6.4
3	0890-1760	Tubing Flexible 1 ea / 1 meter
4	5042-6422	Tubing connector, 1 mm o.d.
5	0100-1708	Nut 1/8 PPS
6	0100-1700	FERRULE-AY-18IN
7	0100-1846	UNION-TEFZEL
	5067-5967	Tubing Clip Tube Connector

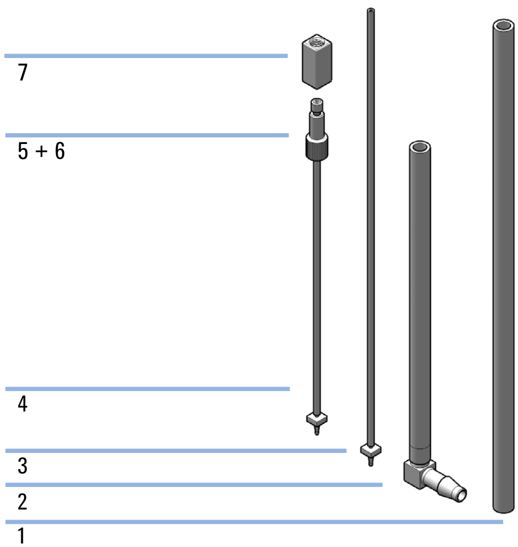


Figure 65 Tubing kit sampler standard

Tubing Kit Sampler Multi-Wash

Item	p/n	Description
	G4267-60081	Tubing-Kit-Sampler-Multi-Wash Contains:
1		Flex-Tubing
2		Flex-Tubing with tube connector 90 °
3		FEP Tubing OD 0.0625 with Ferrule/Nut for washport
4		FEP Tubing OD 0.0625 with Ferrule/Nut for flushpump

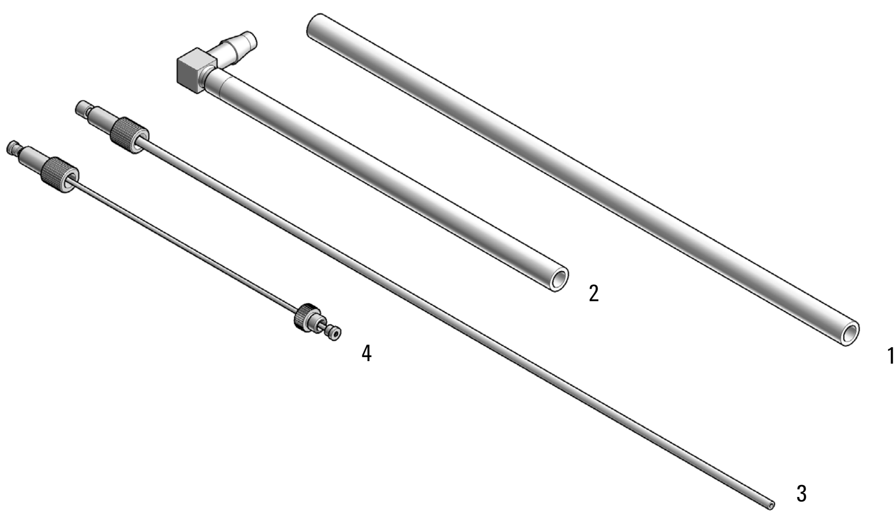


Figure 66 Tubing kit sampler multi-wash

Multi Draw Kit

NOTE At the moment, multidraw is only possible with the Standard Multisampler.

Item	p/n	Description
	G7167-68711	Multidraw kit Contains:
1	0100-0900	Union
2	G7167-87307	Seat capillary, 500 µL, 0.5 mm id
3	G7167-87308	Seat capillary, 1500 µL, 0.9 mm id
	G7167-68500	Sample Loop Cartridge 500 µL right [1]
	G7167-68900	Sample Loop Cartridge 900 µL right [1]
	G7167-60300	Extension Sample Loop-Flex 500 – 900 µL Right Single Needle

[1] Upgrade kit only usable with 900 µL analytical head for Single Needle

NOTE Sample Loop Cartridges are not part of the multidraw kit.

NOTE If you want to use this upgrade kit in a single needle system, you have to install a 900 µL analytical head for single needle as well.

Bio-Inert Multi-Draw Kit

Multidraw upgrade kit (Bio-inert) (G5667-68711) contains:

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

p/n	Description
5067-4741	ZDV union (Bio-inert)
0101-1234	Sample loop 2 mL
0101-1236	Sample loop 500 µL

Upgrade Kits

p/n	Description
G4757A	Multi-wash upgrade kit
G4758A	G71767A Dual-needle upgrade kit
G4759A	G71767B Dual-needle upgrade kit

NOTE

For instructions on how to install the Upgrade Kits, please refer to the respective Installation Notes:

- Agilent Infinity II Series Multi-wash Upgrade Kit Installation Note (G7167-90210)
- Dual-Needle Infinity II Upgrade Kit Installation Note (G7167-90220)

Leak System Parts

Item	p/n	Description
	G4267-68708	Drain management contains:
1	G4267-40013	Leak Plane
2		Ref Vial Holder (not orderable as one part)
3		Wash Port Assembly (not orderable as one part)
	G4267-60060	Blind seat not shown

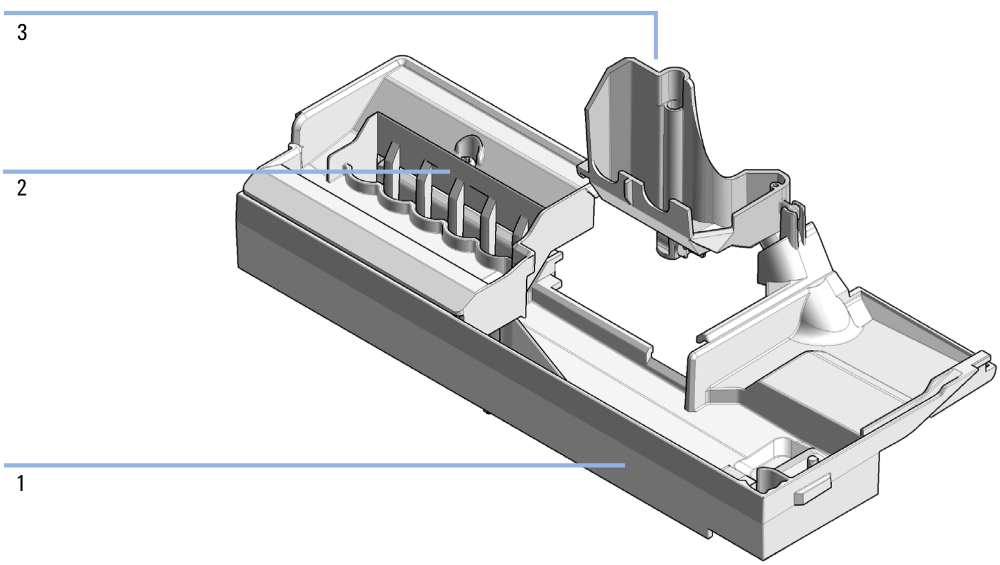


Figure 67 Drain management kit

Sample Cooler

The Sample Cooler Upgrade (G4760A) contains:

Item	p/n	Description
1	G7167-60005	Sample cooler
	G4267-81015	Cable Power Sample Cooler not shown
	G4267-81014	Cable-Ribbon Sample Cooler not shown
	2110-1519	Fuse 3.50 A125 V not shown
	5067-6208	Condensate Drainage Kit not shown

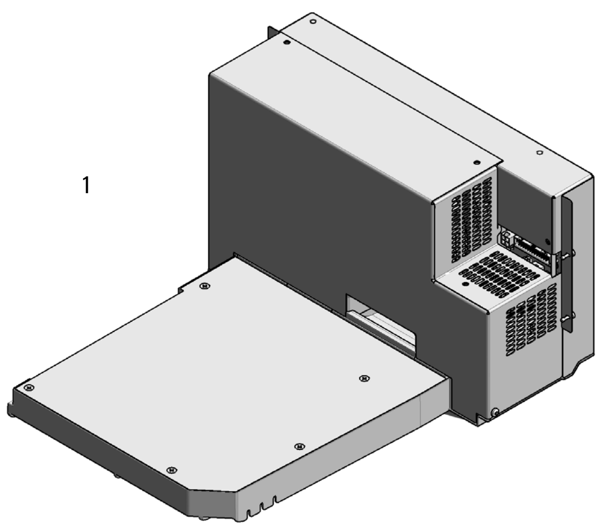


Figure 68 Sample cooler

Sample Thermostat

The Sample Thermostat Upgrade (G4761A) contains:

p/n	Description
G7167-60101	InfinityLab Sample Thermostat
G4267-81015	Cable Power Sample Cooler
G4267-81014	Cable-Ribbon Sample Cooler
2110-1519	Fuse 3.50 A125 V
5067-6208	Condensate Drainage Kit

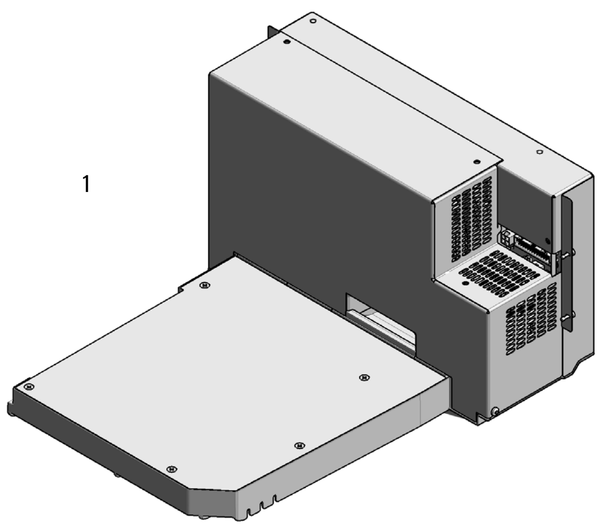


Figure 69 Sample cooler

NOTE The Sample Thermostat contains flammable refrigerant R600a please check further details for installation.

11
Identifying Cables

This chapter provides information on cables used with the modules.

Cable Overview

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

Analog cables

p/n	Description
35900-60750	Agilent 35900A A/D converter
01046-60105	Analog cable (BNC to general purpose, spade lugs)

Remote cables

p/n	Description
5188-8029	ERI to general purpose
5188-8044	Remote Cable ERI – ERI
5188-8045	Remote Cable APG – ERI
5188-8059	ERI-Extension-Cable 1.2 m
5061-3378	Remote Cable to 35900 A/D converter
01046-60201	Agilent module to general purpose
5188-8057	Fraction Collection ERI remote Y-cable

CAN cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

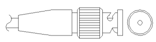
RS-232 cables (not for FUSION board)

p/n	Description
RS232-61601	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

USB cables

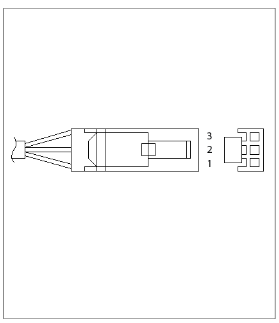
p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

Analog Cables

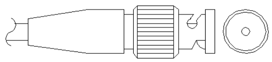


One end of these cables provides a BNC connector to be connected to Agilent modules. The other end depends on the instrument to which connection is being made.

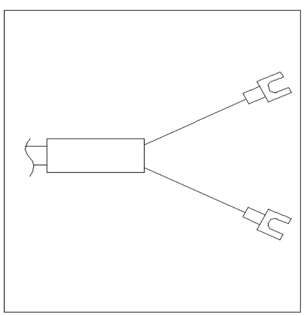
Agilent Module to 35900 A/D converters

p/n 35900-60750	35900	Pin Agilent module	Signal Name
	1		Not connected
	2	Shield	Analog -
	3	Center	Analog +

Agilent Module to BNC Connector

p/n 8120-1840	Pin BNC	Pin Agilent module	Signal Name
	Shield	Shield	Analog -
	Center	Center	Analog +

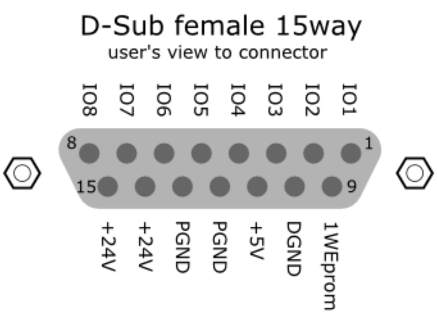
Agilent Module to General Purpose

p/n 01046-60105	Pin	Pin Agilent module	Signal Name
	1		Not connected
	2	Black	Analog -
	3	Red	Analog +

Remote Cables

ERI (Enhanced Remote Interface)

- 5188-8029 ERI to general purpose (D-Sub 15 pin male - open end)
- 5188-8044 ERI to ERI (D_Sub 15 pin male - male)
- 5188-8059 ERI-Extension-Cable 1.2 m (D-Sub15 pin male / female)



p/n 5188-8029	pin	Color code	Enhanced Remote	Classic Remote	Active (TTL)
	1	white	IO1	START REQUEST	Low
	2	brown	IO2	STOP	Low
	3	green	IO3	READY	High
	4	yellow	IO4	POWER ON	High
	5	grey	IO5	NOT USED	
	6	pink	IO6	SHUT DOWN	Low
	7	blue	IO7	START	Low
	8	red	IO8	PREPARE	Low
	9	black	1wire DATA		
	10	violet	DGND		
	11	grey-pink	+5V ERI out		
	12	red-blue	PGND		
	13	white-green	PGND		
	14	brown-green	+24V ERI out		
	15	white-yellow	+24V ERI out		
	NC	yellow-brown			

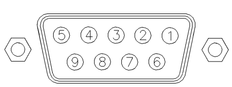
- 5188-8045 ERI to APG (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG))

p/n 5188-8045	Pin (ERI)	Signal	Pin (APG)	Active (TTL)
	10	GND	1	
	1	Start Request	9	Low
	2	Stop	8	Low
	3	Ready	7	High
	5	Power on	6	High
	4	Future	5	
	6	Shut Down	4	Low
	7	Start	3	Low
	8	Prepare	2	Low
	Ground	Cable Shielding	NC	

- 5188-8057 ERI to APG and RJ45 (Connector D_Subminiature 15 pin (ERI), Connector D_Subminiature 9 pin (APG), Connector plug Cat5e (RJ45))

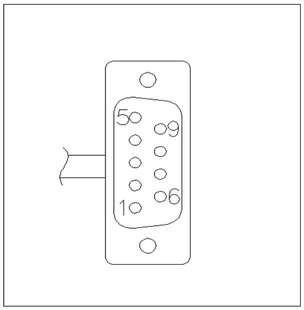
Table 26 5188-8057 ERI to APG and RJ45

p/n 5188-8057	Pin (ERI)	Signal	Pin (APG)	Active (TTL)	Pin (RJ45)
					
	10	GND	1		5
	1	Start Request	9	High	
	2	Stop	8	High	
	3	Ready	7	High	
	4	Fraction Trigger	5	High	4
	5	Power on	6	High	
	6	Shut Down	4	High	
	7	Start	3	High	
	8	Prepare	2	High	
	Ground	Cable Shielding	NC		

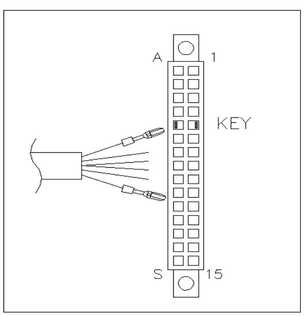


One end of these cables provides a Agilent Technologies APG (Analytical Products Group) remote connector to be connected to Agilent modules. The other end depends on the instrument to be connected to.

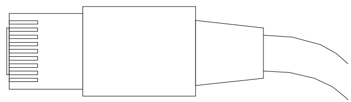
Agilent Module to Agilent 35900 A/D Converters

p/n 5061-3378	Pin 35900 A/D	Pin Agilent module	Signal Name	Active (TTL)
	1 - White	1 - White	Digital ground	
	2 - Brown	2 - Brown	Prepare run	Low
	3 - Gray	3 - Gray	Start	Low
	4 - Blue	4 - Blue	Shut down	Low
	5 - Pink	5 - Pink	Not connected	
	6 - Yellow	6 - Yellow	Power on	High
	7 - Red	7 - Red	Ready	High
	8 - Green	8 - Green	Stop	Low
	9 - Black	9 - Black	Start request	Low

Agilent Module to General Purpose

p/n 01046-60201	Wire Color	Pin Agilent module	Signal Name	Active (TTL)
	White	1	Digital ground	
	Brown	2	Prepare run	Low
	Gray	3	Start	Low
	Blue	4	Shut down	Low
	Pink	5	Not connected	
	Yellow	6	Power on	High
	Red	7	Ready	High
	Green	8	Stop	Low
	Black	9	Start request	Low

CAN/LAN Cables



Both ends of this cable provide a modular plug to be connected to Agilent modules CAN or LAN connectors.

CAN Cables

p/n	Description
5181-1516	CAN cable, Agilent module to module, 0.5 m
5181-1519	CAN cable, Agilent module to module, 1 m

LAN Cables

p/n	Description
5023-0203	Cross-over network cable, shielded, 3 m (for point to point connection)
5023-0202	Twisted pair network cable, shielded, 7 m (for point to point connection)

Agilent Module to PC

p/n	Description
RS232-61601	RS-232 cable, 2.5 m Instrument to PC, 9-to-9 pin (female). This cable has special pin-out, and is not compatible with connecting printers and plotters. It's also called "Null Modem Cable" with full handshaking where the wiring is made between pins 1-1, 2-3, 3-2, 4-6, 5-5, 6-4, 7-8, 8-7, 9-9.
5181-1561	RS-232 cable, 8 m

USB

To connect a USB Flash Drive use a USB OTG cable with Mini-B plug and A socket.

p/n	Description
5188-8050	USB A M-USB Mini B 3 m (PC-Module)
5188-8049	USB A F-USB Mini B M OTG (Module to Flash Drive)

12 Hardware Information

This chapter describes the module in more detail on hardware and electronics.

Firmware Description

The firmware of the instrument consists of two independent sections:

- a non-instrument specific section, called *resident system*
- an instrument specific section, called *main system*

Resident System

This resident section of the firmware is identical for all Agilent 1100/1200/1220/1260/1290 series modules. Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- memory management
- ability to update the firmware of the 'main system'

Main System

Its properties are:

- the complete communication capabilities (CAN, LAN, USB and RS- 232)
- memory management
- ability to update the firmware of the 'resident system'

In addition the main system comprises the instrument functions that are divided into common functions like

- run synchronization through APG/ERI remote,
- error handling,
- diagnostic functions,
- or module specific functions like
  - internal events such as lamp control, filter movements,
  - raw data collection and conversion to absorbance.

Firmware Updates

Firmware updates can be done with the Agilent Lab Advisor software with files on the hard disk (latest version should be used).

Required tools, firmware and documentation are available from the Agilent web: http://www.agilent.com/en-us/firmwareDownload?whid=69761

The file naming conventions are:

PPPP_RVVV_XXX.dlb, where

- PPPP is the product number, for example, 1315B for the G1315B DAD,
- R the firmware revision, for example, A for G1315B or B for the G1315C DAD,
- VVV is the revision number, for example 650 is revision 6.50,
- XXX is the build number of the firmware.

For instructions on firmware updates refer to section *Replacing Firmware* in chapter *"Maintenance"* or use the documentation provided with the *Firmware Update Tools*.

NOTE

Update of main system can be done in the resident system only. Update of the resident system can be done in the main system only.

Main and resident firmware must be from the same set.

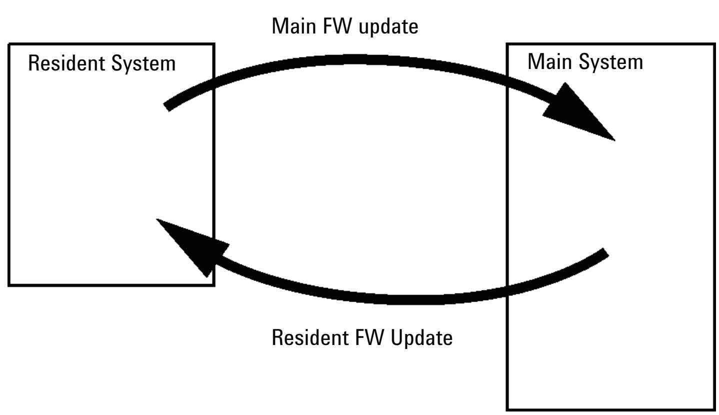


Figure 70 Firmware Update Mechanism

NOTE

Some modules are limited in downgrading due to their main board version or their initial firmware revision. For example, a G1315C DAD SL cannot be downgraded below firmware revision B.01.02 or to a A.xx.xx.

Some modules can be re-branded (e.g. G1314C to G1314B) to allow operation in specific control software environments. In this case the feature set of the target type are use and the feature set of the original are lost. After re-branding (e.g. from G1314B to G1314C), the original feature set is available again.

All these specific informations are described in the documentation provided with the firmware update tools.

The firmware update tools, firmware and documentation are available from the Agilent web.

- http://www.agilent.com/en-us/firmwareDownload?whid=69761

Electrical Connections

- The CAN bus is a serial bus with high-speed data transfer. The two connectors for the CAN bus are used for internal module data transfer and synchronization.
- The ERI/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 shutdown, prepare, and so on.
- With the appropriate software, the LAN connector may be used to control the module from a computer through a LAN connection. This connector is activated and can be configured with the configuration switch.
- With the appropriate software, the USB connector may be used to control the module from a computer through a USB connection.
- The power input socket accepts a line voltage of 100 – 240 VAC ± 10 % with a line frequency of 50 or 60 Hz. Maximum power consumption varies by module. 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.

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

Rear view of the module

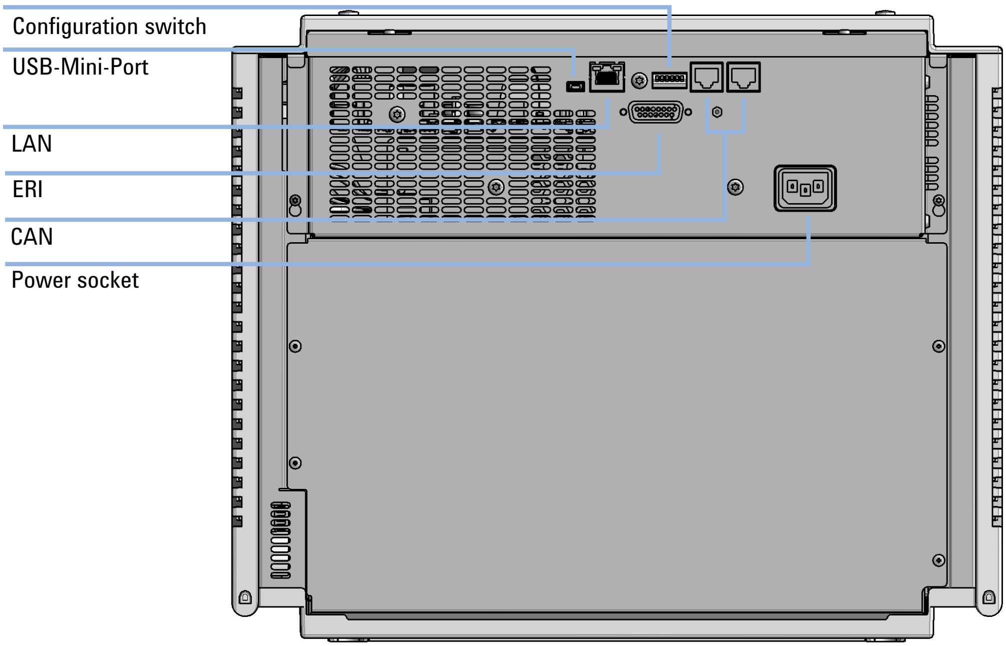


Figure 71 Rear view of multisampler - electrical connections and label

Information on Instrument Serial Number

Serial Number Information 1200 Series and 1290 Infinity

The serial number information on the instrument labels provide the following information:

CCYWWSSSSS	Format
CC	country of manufacturing • DE = Germany • JP = Japan • CN = China
YWW	year and week of last major manufacturing change, e.g. 820 could be week 20 of 1998 or 2008
SSSSS	real serial number

Serial Number Information 1260/1290 Infinity

The serial number information on the instrument labels provide the following information:

CCXZZ00000	Format
CC	Country of manufacturing • DE = Germany • JP = Japan • CN = China
X	Alphabetic character A-Z (used by manufacturing)
ZZ	Alpha-numeric code 0-9, A-Z, where each combination unambiguously denotes a module (there can be more than one code for the same module)
00000	Serial number

Interfaces

The Agilent InfinityLab LC Series modules provide the following interfaces:

Table 27 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
Pumps							
G7104A/C	2	No	Yes	Yes	1	A	
G7110B	2	Yes	Yes	No	No	E	
G7111A/B, G5654A	2	Yes	Yes	No	No	E	
G7112B	2	Yes	Yes	No	No	E	
G7120A	2	No	Yes	Yes	1	A	
G7161A/B	2	Yes	Yes	No	No	E	
Samplers							
G7129A/B/C	2	Yes	Yes	No	No	E	
G7167B/C, G5667A	2	Yes	Yes	No	No	E	
G7157A	2	Yes	Yes	No	No	E	
Detectors							
G7114A/B	2	Yes	Yes	No	1	E	
G7115A	2	Yes	Yes	No	1	E	
G7117A/B/C	2	Yes	Yes	No	1	E	
G7121A/B	2	Yes	Yes	No	1	E	
G7162A/B	2	Yes	Yes	No	1	E	
G7165A	2	Yes	Yes	No	1	E	
Fraction Collectors							
G7159B	2	Yes	Yes	No	No	E	

Table 27 Agilent InfinityLab LC Series Interfaces

Module	CAN	USB	LAN (on-board)	RS-232	Analog	APG (A) / ERI (E)	Special
G7166A	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card
G1364E/F, G5664B	2	Yes	Yes	No	No	E	THERMOSTAT for G1330B
Others							
G7116A/B	2	No	No	No	No	No	Requires a HOST module via CAN
G7122A	No	No	No	Yes	No	A	
G7170B	2	No	No	No	No	No	Requires a host module with on-board LAN with minimum FW B.06.40 or C.06.40, or with additional G1369C LAN Card

NOTE The detector (DAD/MWD/FLD/VWD/RID) is the preferred access point for control via LAN. The inter-module communication is done via CAN.

- CAN connectors as interface to other modules
- LAN connector as interface to the control software
- RS-232C as interface to a computer
- USB (Universal Series Bus) as interface to a computer
- REMOTE connector as interface to other Agilent products
- Analog output connector(s) for signal output

Overview Interfaces

CAN

The CAN is inter-module communication interface. It is a 2-wire serial bus system supporting high speed data communication and real-time requirement.

LAN

The modules have either an interface slot for an LAN card (e.g. Agilent G1369B/C LAN Interface) or they have an on-board LAN interface (e.g. detectors G1315C/D DAD and G1365C/D MWD). This interface allows the control of the module/system via a PC with the appropriate control software. Some modules have neither on-board LAN nor an interface slot for a LAN card (e.g. G1170A Valve Drive or G4227A Flex Cube). These are hosted modules and require a Host module with firmware B.06.40 or later or with additional G1369C LAN Card.

NOTE If an Agilent detector (DAD/MWD/FLD/VWD/RID) is in the system, the LAN should be connected to the DAD/MWD/FLD/VWD/RID (due to higher data load). If no Agilent detector is part of the system, the LAN interface should be installed in the pump or autosampler.

USB

The USB interface replaces the RS-232 Serial interface in new FUSION generation modules. For details on USB refer to "USB (Universal Serial Bus)" on page 353.

Analog Signal Output

The analog signal output can be distributed to a recording device. For details refer to the description of the module's main board.

Remote (ERI)

The ERI (Enhanced Remote Interface) connector may be used in combination with other analytical instruments from Agilent Technologies if you want to use features as common shut down, prepare, and so on.

It allows easy connection between single instruments or systems to ensure coordinated analysis with simple coupling requirements.

The subminiature D connector is used. The module provides one remote connector which is inputs/outputs (wired- or technique).

To provide maximum safety within a distributed analysis system, one line is dedicated to **SHUT DOWN** the system's critical parts in case any module detects a serious problem. To detect whether all participating modules are switched on or properly powered, one line is defined to summarize the **POWER ON** state of all connected modules. Control of analysis is maintained by signal readiness **READY** for next analysis, followed by **START** of run and optional **STOP** of run triggered on the respective lines. In addition **PREPARE** and **START REQUEST** may be issued. The signal levels are defined as:

- standard TTL levels (0 V is logic true, + 5.0 V is false),
- fan-out is 10,
- input load is 2.2 kOhm against + 5.0 V, and
- output are open collector type, inputs/outputs (wired- or technique).

NOTE All common TTL circuits operate with a 5 V power supply. A TTL signal is defined as "low" or L when between 0 V and 0.8 V and "high" or H when between 2.0 V and 5.0 V (with respect to the ground terminal).

Table 28 ERI signal distribution

Pin	Signal	Description
1	START REQUEST	(L) Request to start injection cycle (for example, by start key on any module). Receiver is the autosampler.
2	STOP	(L) Request to reach system ready state as soon as possible (for example, stop run, abort or finish and stop injection). Receiver is any module performing run-time controlled activities.
3	READY	(H) System is ready for next analysis. Receiver is any sequence controller.
4	POWER ON	(H) All modules connected to system are switched on. Receiver is any module relying on operation of others.
5		Not used
6	SHUT DOWN	(L) System has serious problem (for example, leak: stops pump). Receiver is any module capable to reduce safety risk.

Table 28 ERI signal distribution

Pin	Signal	Description
7	START	(L) Request to start run / timetable. Receiver is any module performing run-time controlled activities.
8	PREPARE	(L) Request to prepare for analysis (for example, calibration, detector lamp on). Receiver is any module performing pre-analysis activities.

Special Interfaces

There is no special interface for this module.

ERI (Enhanced Remote Interface)

ERI replaces the AGP Remote Interface that is used in the HP 1090/1040/1050/1100 HPLC systems and Agilent 1100/1200/1200 Infinity HPLC modules. All new InfinityLab LC Series products using the FUSION core electronics use ERI. This interface is already used in the Agilent Universal Interface Box 2 (UIB2)

ERI Description

The ERI interface contains eight individual programmable input/output pins. In addition, it provides 24 V power and 5 V power and a serial data line to detect and recognize further add-ons that could be connected to this interface. This way the interface can support various additional devices like sensors, triggers (in and out) and small controllers, etc.

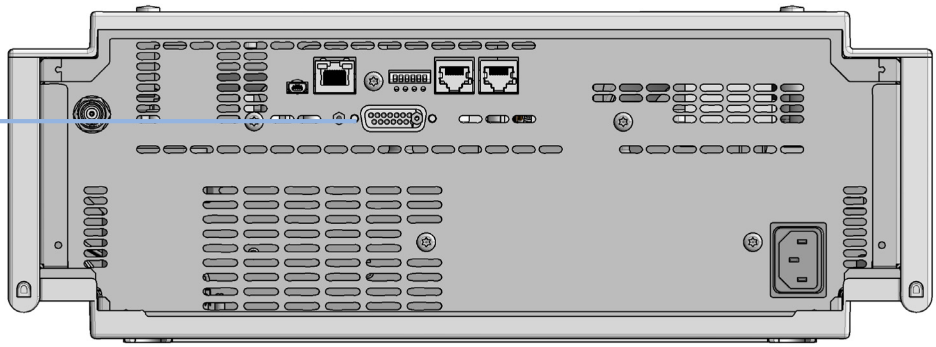
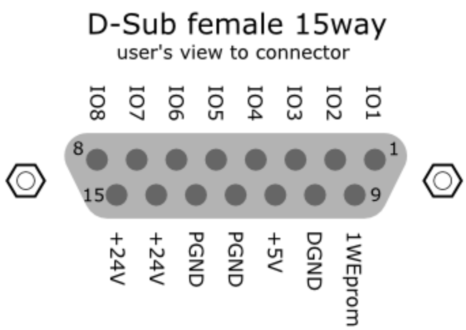


Figure 72 Location of the ERI interface (example shows a G7114A/B VWD)

	Pin	Enhanced Remote
	1	IO 1 (START REQUEST)
	2	IO 2 (STOP)
	3	IO 3 (READY)
	4	IO 4 (POWER ON)
	5	IO 5 (NOT USED)
	6	IO 6 (SHUT DOWN)
	7	IO 7 (START)
	8	IO 8 (PREPARE)
	9	1 wire DATA
	10	DGND
	11	+5 V ERI out
	12	PGND
	13	PGND
	14	+24 V ERI out
	15	+24 V ERI out

IO (Input/Output) Lines

- Eight generic bi-directional channels (input or output).
- Same as the APG Remote.
- Devices like valves, relays, ADCs, DACs, controllers can be supported/controlled.

1-Wire Data (Future Use)

This serial line can be used to read out an EPROM or write into an EPROM of a connected ERI-device. The firmware can detect the connected type of device automatically and update information in the device (if required).

5V Distribution (Future Use)

- Available directly after turn on oft the hosting module (assures that certain base functionality of the device can be detected by firmware).
- For digital circuits or similar.
- Provided 500 mA maximum.
- Short-circuit proof with automatic switch off (by firmware).

24V Distribution (Future Use)

- Available by firmware command (defined turn on/off).
- For devices that need higher power
  - Class 0: 0.5 A maximum (12 W)
  - Class 1: 1.0 A maximum (24 W)
  - Class 2: 2.0 A maximum (48 W)
- Class depends on hosting module’s internal power overhead.
- If a connected device requires more power the firmware detects this (overcurrent detection) and provides the information to the user interface.
- Fuse used for safety protection (on board).
- Short circuit will be detected through hardware.

USB (Universal Serial Bus)

USB (Universal Serial Bus) - replaces RS232, supports:

- a PC with control software (for example Agilent Lab Advisor)
- USB Flash Disk

Setting the 6-bit Configuration Switch

The 6-bit configuration switch is located at the rear of the module with FUSION electronics. Switch settings provide configuration parameters for LAN and instrument specific initialization procedures.

All modules with FUSION electronics:

- Default is ALL switches DOWN (best settings).
  - Default IP address for LAN 192.168.254.11
- For specific LAN modes switches 4-5 must be set as required.
- For boot resident/cold start modes switches 1+2 or 6 must be UP.

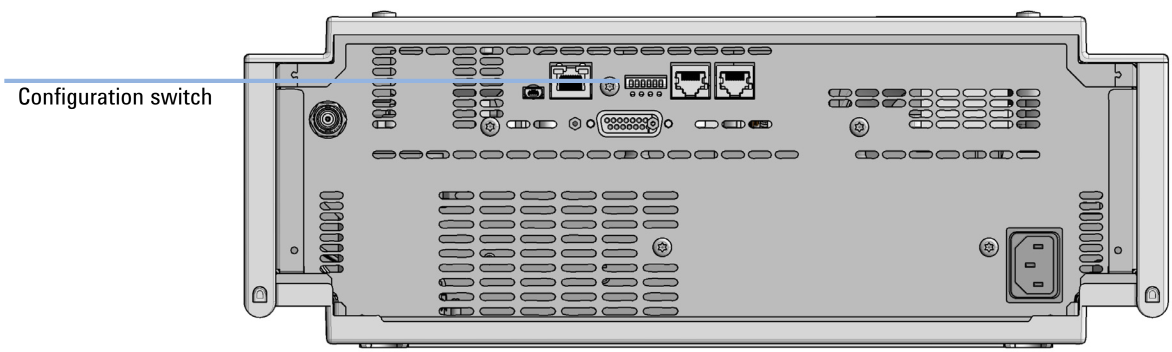


Figure 73 Location of Configuration switch (example shows a G7114A/B VWD)

Table 29 6-bit Configuration Switch

	Mode	Function/Setting				
	Switch 1	**Switch 2**	**Switch 3**	**Switch 4**	**Switch 5**	**Switch 6**
COM[1]	**0**	n.a.[2]	n.a.	LAN Init Mode		n.a.
Use Default IP Address[3]		0	0	0	0	0
Use Stored IP Address		0	0	0	1	0
Use DHCP to request IP Address[4]		0	0	1	0	0
Test	**1**	**System**	**n.a.**	**n.a.**	**n.a.**	**ColdStart**
Boot Main System / Keep Data		0	0	0	0	0
Boot Resident System / Keep Data		1	0	0	0	0
Boot Main System / Revert to Default Data		0	0	0	0	1
Boot Resident System / Revert to Default Data		1	0	0	0	1

1 When selecting mode COM, settings are stored to non-volatile memory. When selecting mode TEST, COM settings are taken from non-volatile memory.

2 not assigned - Always keep these switches on position ‘0’ (off)

3 Default IP Address is 192.168.254.11

4 Host Name will be the MAC address.

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 of 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.

Early Maintenance Feedback

Maintenance requires the exchange of components which are subject to wear or stress. Ideally, the frequency at which components are exchanged should be based on the intensity of usage of the module 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-selectable limits have been exceeded. The visual feedback in the user interface provides an indication that maintenance procedures should be scheduled.

EMF Counters

EMF counters increment with use and can be assigned a maximum limit which provides visual feedback in the user interface when the limit is exceeded. Some counters can be reset to zero after the required maintenance procedure.

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 useful maintenance cycle is dependent on the requirements for use. 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 the default **EMF** limits should be set. When instrument performance indicates maintenance is necessary, take note of the values displayed by the **EMF 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.

13
LAN Configuration

This chapter provides information on connecting the detector to the Agilent ChemStation PC.

Setting up the module in a LAN environment

It is not recommended to connect a system via an autosampler. The detector is producing the most data in the stack, followed by the pump, and it is therefore highly recommended to use either of these modules for the LAN connection.

14
Appendix

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

General Safety Information

General Safety Information

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

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.

Safety Standards

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

General

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

WARNING

Wrong voltage range, frequency or cabling

Personal injury or damage to the instrument

- → Verify that the voltage range and frequency of your power distribution matches to the power specification of the individual instrument.
- → Never use cables other than the ones supplied by Agilent Technologies to ensure proper functionality and compliance with safety or EMC regulations.
- → Make all connections to the unit before applying power.

NOTE

Note the instrument's external markings described under "Symbols" on page 366.

Ground the Instrument

WARNING

Missing electrical ground

Electrical shock

- → If your product is provided with a grounding type power plug, the instrument chassis and cover must be connected to an electrical ground to minimize shock hazard.
- → The ground pin must be firmly connected to an electrical ground (safety ground) terminal at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an Explosive Atmosphere

WARNING

Presence of flammable gases or fumes

Explosion hazard

→ Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the Instrument Cover

WARNING

Instrument covers removed

Electrical shock

→ Do Not Remove the Instrument Cover

→ Only Agilent authorized personnel are allowed to remove instrument covers. Always disconnect the power cables and any external circuits before removing the instrument cover.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Agilent Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

WARNING

Damage to the module

Personal injury (for example electrical shock, intoxication)

→ Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

Solvents

WARNING

Toxic, flammable and hazardous solvents, samples and reagents

The handling of solvents, samples and reagents can hold health and safety risks.

- → When working with these substances observe appropriate safety procedures (for example by wearing goggles, safety gloves and protective clothing) as described in the material handling and safety data sheet supplied by the vendor, and follow good laboratory practice.
- → Do not use solvents with an auto-ignition temperature below 200 °C (392 °F). Do not use solvents with a boiling point below 56 °C (133 °F).
- → Avoid high vapor concentrations. Always keep the temperature in the sample compartment at least 25 K below the boiling point of the solvent used.
- → Do not operate the instrument in an explosive atmosphere.
- → Do not use solvents of ignition Class IIC according IEC 60079-20-1 (for example, carbon disulfide).
- → Reduce the volume of substances to the minimum required for the analysis.
- → Never exceed the maximum permissible volume of solvents (8 L) in the solvent cabinet. Do not use bottles that exceed the maximum permissible volume as specified in the usage guideline for solvent cabinet.
- → Ground the waste container.
- → Regularly check the filling level of the waste container. The residual free volume in the waste container must be large enough to collect the waste liquid.
- → To achieve maximal safety, regularly check the tubing for correct installation.

NOTE

For details, see the usage guideline for the solvent cabinet. A printed copy of the guideline has been shipped with the solvent cabinet, electronic copies are available in the Agilent Information Center or via the Internet.

Symbols

Table 30 Symbols

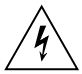
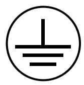
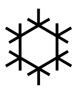
	The apparatus is marked with this symbol when the user should refer to the instruction manual in order to protect risk of harm to the operator and to protect the apparatus against damage.
	Indicates dangerous voltages.
	Indicates a protected ground terminal.
	The apparatus is marked with this symbol when hot surfaces are available and the user should not touch it when heated up.
	Sample Cooler unit is designed as vapor-compression refrigeration system. Contains fluorinated greenhouse gas (refrigerant) according to the Kyoto protocol. For specifications of refrigerant, charge capacity, carbon dioxide equivalent (CDE), and global warming potential (GWP) see instrument label.
	Flammable Material For Sample Thermostat which uses flammable refrigerant consult Agilent Information Center / User Manual before attempting to install or service this equipment. All safety precautions must be followed.
	Confirms that a manufactured product complies with all applicable European Community directives. The European Declaration of Conformity is available at: http://regulations.corporate.agilent.com/DoC/search.htm
	Manufacturing date.
	Power symbol indicates On/Off. The apparatus is not completely disconnected from the mains supply when the power switch is in the Off position

Table 30 Symbols

	Pacemaker Magnets could affect the functioning of pacemakers and implanted heart defibrillators. A pacemaker could switch into test mode and cause illness. A heart defibrillator may stop working. If you wear these devices keep at least 55 mm distance to magnets. Warn others who wear these devices from getting too close to magnets.
	Magnetic field Magnets produce a far-reaching, strong magnetic field. They could damage TVs and laptops, computer hard drives, credit and ATM cards, data storage media, mechanical watches, hearing aids and speakers. Keep magnets at least 25 mm away from devices and objects that could be damaged by strong magnetic fields.
	Indicates a pinching or crushing hazard
	Indicates a piercing or cutting hazard.

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.

Waste Electrical and Electronic Equipment Directive

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 of in domestic household waste

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

Refrigerant

The refrigerant HFC-134a is used only in the Agilent Infinity II Sample Cooler.

Table 31 Physical properties of refrigerant HFC-134a

Molecular weight	102
Critical temperature	101.1 °C
Critical pressure	40.6 bar
Boiling point	-26.5 °C

Table 32 Physical properties of refrigerant R600a (isobutane)

Molecular weight	58.12
Critical temperature	134.98 °C
Critical pressure	36.6 bar
Boiling point	-11.7 °C

WARNING

Refrigerant

Refrigerant HFC-134a is known as a safe refrigerant, however accidents can occur if it is handled incorrectly. For this reason, the following instructions must be observed:

- → Avoid contact with liquid refrigerant HFC-134a. At atmospheric pressure HFC-134a evaporates at approximately -26 °C and causes frost bite.
- → After skin contact, rinse the affected area with water.
- → After eye contact, rinse the eye(s) with plenty of water for at least 15 minutes and consult a doctor.
- → HFC-134a must not be allowed to escape in enclosed areas. Although HFC-134a is not toxic, there is a danger of suffocation as gaseous refrigerant is heavier than air.
- → Please observe the following first aid instructions. After inhalation, move the affected person to fresh air, keep him warm and allow him to rest. If necessary, he should be supplied with oxygen. If he has stopped breathing or is breathing erratically, he should be given artificial respiration. In the case of cardiac arrest, carry out heart massage. Send for a doctor immediately.
- → Moreover, it must be noted that HFC-134a must always be extracted from the system and collected. It must never be discharged into the atmosphere on environmental grounds (greenhouse effect).

CAUTION

General hazards and improper disposal

Improper disposal of the media and components used pollutes the environment.

- → The breakdown of the sample cooler or sample thermostat unit must be carried out by specialist refrigeration company.
- → All media must be disposed of in accordance with national and local regulations.
- → Please contact your local Agilent Service Center in regard to safe environmental disposal of the appliance or check www.agilent.com for more info.

CAUTION

Risk of fire or explosion

- Dispose of properly in accordance with federal or local regulations. Flammable Refrigerant Used.
- Do not dispose of in domestic household waste.
- To return unwanted products, contact your local Agilent office, or see http://www.agilent.com for more information.

Radio Interference

Never use cables other than the ones supplied by Agilent 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.

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)

Solvent Information

Observe the following recommendations on the use of solvents.

- Brown glass ware can avoid growth of algae.
- 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 acid and nitric acid, especially at higher temperatures (if your chromatography method allows, replace by phosphoric acid or phosphate buffer which are less corrosive against stainless steel),
  - halogenated solvents or mixtures which form radicals and/or acids, for example:

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

    This reaction, in which stainless steel probably acts as a catalyst, occurs quickly with dried chloroform if the drying process removes the stabilizing alcohol,
  - chromatographic grade ethers, which can contain peroxides (for example, THF, dioxane, di-isopropyl ether) should be filtered through dry aluminium oxide which adsorbs the peroxides,
  - solvents containing strong complexing agents (e.g. EDTA),
  - mixtures of carbon tetrachloride with 2-propanol or THF.
- Avoid the use of dimethyl formamide (DMF). Polyvinylidene fluoride (PVDF), which is used in leak sensors, is not resistant to DMF.

Installation of Stainless Steel Cladded PEEK Capillaries

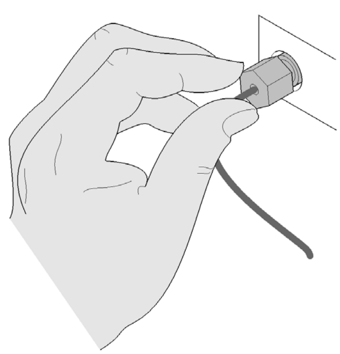
NOTE This installation procedure applies for capillaries and corresponding fittings used in modules delivered before January 2013.

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

The installation consists of two steps. In the first step, the fitting is installed finger-tight without using tools. Finger-tight means that the fitting will grip and hold the capillary. This brings the fitting to the appropriate start position (marked as 0 ° below) for the second step.

First Step: Finger-tight Fitting

1 Tighten the fitting using your fingers.



Second Step: Installation to Connector

In the second step ("Second Step: Installation to Hard Connectors" on page 376 or "Second Step: Installation to Soft Connectors" on page 377), a wrench is used to rotate the fitting relative to the finger-tight position by a defined angle. For each of the cases mentioned above, there is a recommended range in which the fitting is tight.

Staying below this range could create a leak, either a visible one or a micro-leak, potentially biasing measurement results. Exceeding the recommended range could damage the capillary.

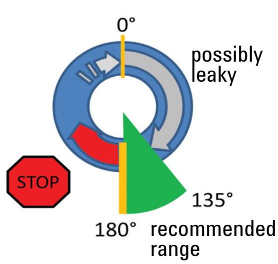
Alternatively, a torque wrench may be used. The target torque for all connections is about 0.7 Nm. When using a torque wrench, read instructions for that tool carefully, as wrong handling may easily miss the correct torque.

Second Step: Installation to Hard Connectors

Use this procedure for hard connectors made from metal (titanium) or ceramics. In the system, these are connections to and from the analytical head of the autosampler (connections to injection valve and needle), and to a metal column.

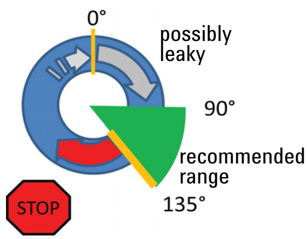
First installation of a capillary to a hard connector

1 When tightening a fitting for the first time, start from the finger-tight position (which is not necessarily a vertical wrench position) and rotate the wrench by 135 – 180 °. Staying below 135 ° (grey arrow) will be insufficiently tight, more than 180 ° (red arrow) could damage the capillary.



Second and subsequent installations of a capillary to a hard connector

1 When tightening the fitting for the second and subsequent times, again start from the finger-tight position (which is not necessarily a vertical wrench position) and rotate the wrench by 90 – 135 °. Staying below 90 ° (grey arrow) could be insufficiently tight, more than 135 ° (red arrow) could damage the capillary.



Second Step: Installation to Soft Connectors

Use this procedure for soft connectors, which are typically made from PEEK. These are the following connections:

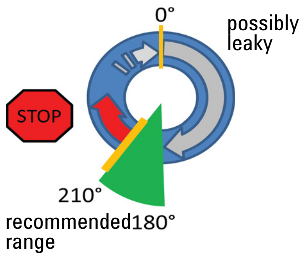
- to and from all bio-inert valves (injection valve in the autosampler and valves in the thermostatted column compartment and 1290 Infinity Valve Drive),
- bio-inert ZDV unions (detector flow cells, multi-draw upgrade kit, capillary to capillary connections, for example, for heat exchangers),
- to the autosampler needle and
- to PEEK columns (like many bio-inert columns).

For the installation of bio-inert ZDV unions, refert to the Technical Note *"Installation of stainless steel cladded PEEK capillaries" (p/n G5611-90120)*.

First installation of a capillary to a soft connector

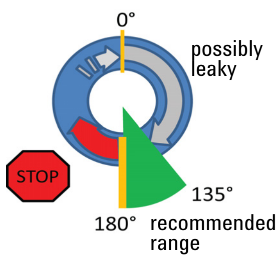
1 When tightening a fitting for the first time, start from the finger-tight position (which does not necessarily need to be a vertical wrench position) and rotate the wrench by 180 – 210 °. Staying below 180 ° (grey arrow) will

not be sufficiently tight, more than 210 ° (red arrow) could damage the capillary.



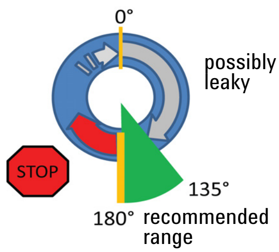
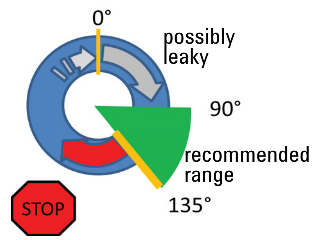
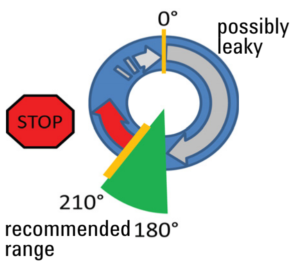
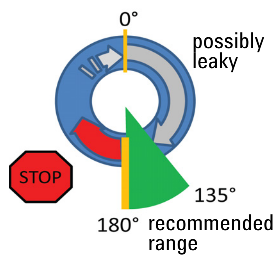
Second and subsequent installations of a capillary to a soft connector

1 When tightening the fitting for the second and subsequent times, again start from the finger-tight position (which is not necessarily a vertical wrench position) and rotate the wrench by 135 – 180 °. Staying below 135 ° (grey arrow) could be insufficiently tight enough, more than 180 ° (red arrow) could damage the capillary.



Summary for Second Step

Table 33 Summary for second step

<table>
<tr><th>2nd Step</th><th>First installation</th><th>Subsequent installations</th></tr>
<tr><td>Hard connectors</td><td>
</td><td>
</td></tr>
<tr><td>Soft connectors</td><td>
</td><td>
</td></tr>
</table>

Removing Capillaries

CAUTION

Potential damage of capillaries

➔ Do not remove fittings from used capillaries.

To keep the flow path free of stainless steel, the front end of the capillary is made of PEEK. Under high pressure, or when in contact with some solvents, PEEK can expand to the shape of the connector where the capillary is installed. If the capillary is removed, this may become visible as a small step. In such cases, do not try to pull the fitting from the capillary, as this can destroy the front part of the capillary. Instead, carefully pull it to the rear. During installation of the capillary, the fitting will end up in the correct position.

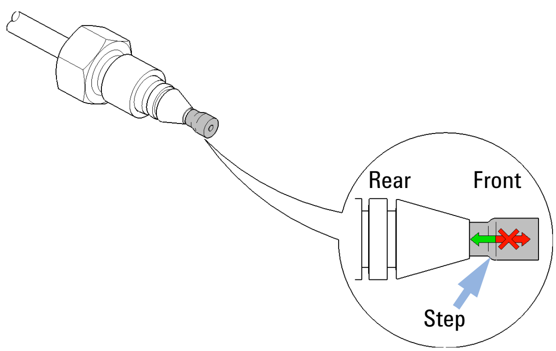


Figure 74 Capillary fitting

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http://www.agilent.com

Index

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In This Book

This manual contains technical reference information about the Agilent 1290 Infinity II Multisampler (G7167B), the Agilent 1260 Infinity II Multisampler (G7167A) and the Agilent 1260 Infinity II Bio-inert Multisampler (G5668A).

The manual describes the following:

- Introduction,
- Site requirements and specifications,
- Using the module,
- Preparing the module,
- Optimizing performance,
- Troubleshooting and diagnostics,
- Error information,
- Test functions,
- Maintenance,
- Parts,
- Hardware information,
- LAN configuration,
- Safety and related information.

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