2707 Autosampler

Overview and Maintenance Guide

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Waters

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Safety considerations

Some reagents and samples used with Waters instruments and devices can pose chemical, biological, or radiological hazards (or any combination thereof). You must know the potentially hazardous effects of all substances you work with. Always follow Good Laboratory Practice, and consult your organization's standard operating procedures.

Safety hazard symbol notice

Documentation needs to be consulted in all cases where the symbol is used, to find out the nature of the potential hazard and any actions that have to be taken.

Considerations specific to the 2707 Autosampler

Power cord replacement hazard

Warning: To avoid electric shock, use the SVT-type power cord in the United States and HAR-type (or better) in Europe. The main power cord must be replaced only with one of adequate rating. For information regarding what cord to use in other countries, contact your local Waters distributor.

High voltage hazard

Warning: To avoid electric shock, do not remove the protective panels from the 2707 Autosampler. The components they cover are not user-serviceable.

Spill hazard

Warning: To avoid spills, do not remove the drip tray. All drip trays must remain in place during the instrument's operation and maintenance.

Bottle placement prohibition

Warning: To avoid injury from electrical shock or fire, and damage to the equipment, do not place vessels containing liquid atop the workstation or ancillary equipment or otherwise expose those units to dripping or splashing liquids.

Prohibited: Do not place vessels containing liquid—such as solvent bottles—atop the workstation or ancillary equipment or otherwise expose those units to dripping or splashing liquids.

FCC radiation emissions notice

Changes or modifications not expressly approved by the party responsible for compliance, could void the users authority to operate the equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Electrical power safety notice

Do not position the instrument so that it is difficult to disconnect the power cord.

Equipment misuse notice

If equipment is used in a manner not specified by its manufacturer, protections against personal injury inherent in the equipment's design can be rendered ineffective.

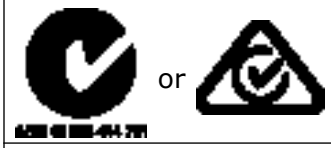
Safety advisories

Consult Appendix A for a comprehensive list of warning advisories and notices.

Operating this instrument

When operating this instrument, follow standard quality-control (QC) procedures and the guidelines presented in this section.

Applicable symbols

Symbol	Definition
	Manufacturer
	Date of manufacture
	Authorized representative of the European Community
	Confirms that a manufactured product complies with all applicable European Community directives
	Australia EMC compliant
	Confirms that a manufactured product complies with all applicable United States and Canadian safety requirements
	Consult instructions for use
	Supply ratings

Symbol	Definition
	Electrical and electronic equipment with this symbol may contain hazardous substances and should not be disposed of as general waste. For compliance with the Waste Electrical and Electronic Equipment Directive (WEEE) 2012/19/EU, contact Waters Corporation for the correct disposal and recycling instructions.
	Serial number
	Part number catalog number

Audience and purpose

This guide is intended for use by individuals who install, operate, and maintain the 2707 Autosampler. It provides an overview of the autosampler's operation, preparation, and maintenance.

Intended use of the 2707 Autosampler

Waters designed the 2707 Autosampler as a sample handler with a reliable, precise fluid path for use in varied methods and applications. The optional sample cooling module accommodates a wide range of samples. The 2707 Autosampler is not intended for use in diagnostic applications.

Calibrating

To calibrate LC systems, follow acceptable calibration methods using at least five standards to generate a standard curve. The concentration range for standards must include the entire range of QC samples, typical specimens, and atypical specimens.

Quality control

Routinely run three QC samples that represent subnormal, normal, and above-normal levels of a compound. If sample trays are the same or very similar, vary the location of the QC samples in the trays. Ensure that QC sample results fall within an acceptable range, and evaluate precision from day to day and run to run. Data collected when QC samples are out of range might not be valid. Do not report these data until you are certain that the instrument performs satisfactorily.

See also: The *Using Empower SystemsQT Qualification Tool for Waters Modular Systems* white paper.

EMC considerations

Canada spectrum management emissions notice

This class A digital product apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001.

ISM Classification: ISM Group 1 Class B

This classification has been assigned in accordance with IEC CISPR 11 Industrial Scientific and Medical (ISM) instruments requirements.

Group 1 products apply to intentionally generated and/or used conductively coupled radio-frequency energy that is necessary for the internal functioning of the equipment.

Class B products are suitable for use in both commercial and residential locations and can be directly connected to a low voltage, power-supply network.

EC authorized representative

EC REP

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Table of Contents

General Information iii

Copyright notice iii

Trademarks iii

Customer comments iii

Contacting Waters iv

Safety considerations iv

Safety hazard symbol notice iv

Considerations specific to the 2707 Autosampler v

FCC radiation emissions notice v

Electrical power safety notice v

Equipment misuse notice vi

Safety advisories vi

Operating this instrument vi

Applicable symbols vi

Audience and purpose vii

Intended use of the 2707 Autosampler vii

Calibrating vii

Quality control vii

EMC considerations viii

Canada spectrum management emissions notice viii

ISM Classification: ISM Group 1 Class B viii

EC authorized representative viii

1 2707 Autosampler overview 13

1.1 Components of the autosampler 13

1.2 Options for the autosampler 14

1.2.1 Sample cooling 15

1.2.2 Preparative-mode kit 15

1.2.3 Biocompatibility kit 15

1.2.4 Air needles 16

1.2.5 Well plates and vial trays 16

1.2.6 Injection modes 17

1.2.7 Pressure-assisted sample aspiration 17

1.2.8 Wash solvent, syringe, buffer tubing, and loop 18

1.3 Injection sequences in analytical mode 19
1.3.1 Partial-loop using needle-overfill injection sequence (analytical mode) ... 19
1.3.2 Full-loop using needle-overfill injection sequence (analytical mode) 21
1.3.3 Partial-loop injection sequence (analytical mode) 23
1.4 Injection sequence in preparative mode 26

2 Preparing the 2707 Autosampler 29

2.1 Preparing for installation 29
2.2 Setting up the autosampler 30
2.3 Plumbing the autosampler 30
2.3.1 Supplying the wash solvent and syringe rinse 34
2.4 Making Ethernet connections 35
2.5 Controlling I/O connections 35
2.5.1 Defining TTL inputs 35
2.5.2 Defining contact closure outputs 35
2.6 Connecting to the electricity source 36
2.7 Starting up the autosampler 37
2.8 Installing the preparative kit 38
2.8.1 Configuring the autosampler for prep mode 39
2.8.2 Selecting the plate type 39
2.8.3 Configuring custom 12-vial plates 40
2.9 Installing the biocompatibility kit 41

3 Maintenance Procedures 43

3.1 Maintenance schedule 43
3.2 Spare parts 43
3.3 Troubleshooting with Connections INSIGHT 43
3.4 Safety and handling 44
3.4.1 Preventing contamination 45
3.4.2 Preparing solvents for mobile phases 45
3.5 Installing a sample loop 45
3.6 Replacing the sample needle 46
3.7 Maintaining air needles 48
3.7.1 Examining the standard air needle 48

3.7.2 Pairing air needles with plates or vials 49
3.7.3 Example 51
3.7.4 Replacing air needles 51
3.7.5 Adjusting the needle position 52
3.8 Replacing a syringe 53
3.8.1 Replacing syringe plungers and plunger tips 54
3.8.2 Replacing the syringe dispenser valve 55
3.9 Removing or replacing the injection valve rotor seal 57
3.10 Cleaning the autosampler 58
3.11 Replacing fuses 58

A Safety Advisories 61

A.1 Warning symbols 61
A.1.1 Specific warnings 62
A.2 Notices 63
A.3 Bottles Prohibited symbol 64
A.4 Required protection 64
A.5 Warnings that apply to all Waters instruments and devices 64
A.6 Warnings that address the replacing of fuses 67
A.7 Electrical and handling symbols 69
A.7.1 Electrical symbols 69
A.7.2 Handling symbols 70

B Specifications 73

B.1 Physical specifications 73
B.2 Analytical mode specifications 76
B.3 Prep mode specifications 77

1 2707 Autosampler overview

The Waters 2707 Autosampler is a high-throughput device that injects samples from well plates or vial holders. Sample cooling is available as a factory-installed option.

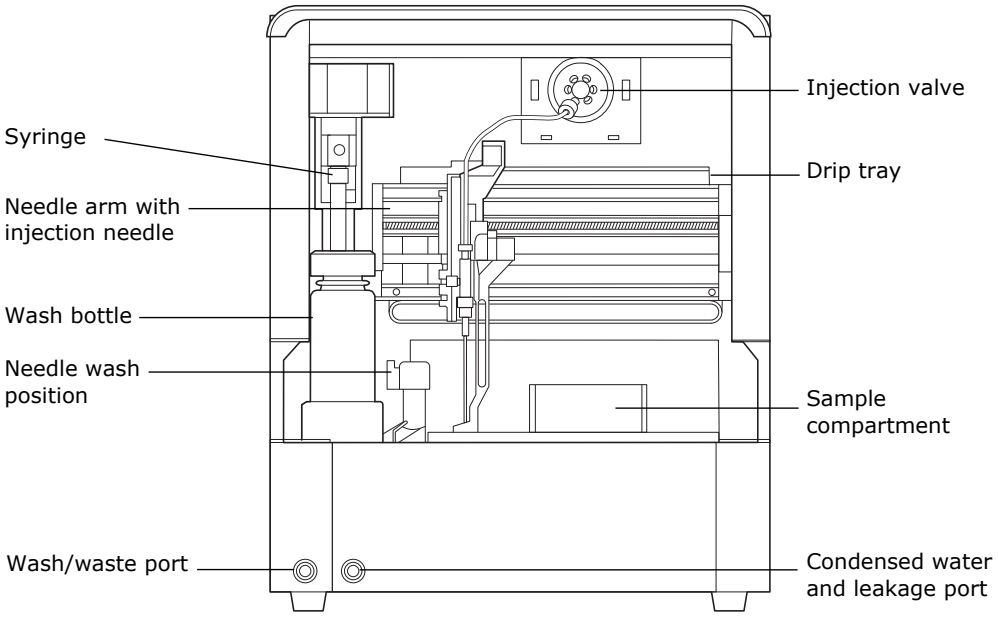
The autosampler performs injections at analytical scales. With the optional preparative-mode kit, the autosampler can perform injections at preparative scales.

1.1 Components of the autosampler

The autosampler can perform in analytical mode (standard) or preparative mode (with installation of the optional preparative-mode kit). The autosampler has the following capabilities:

- Interchangeable, fixed-volume sample loops
- Variable-volume partial-loop injection
- Pressure-assisted sample aspiration injection

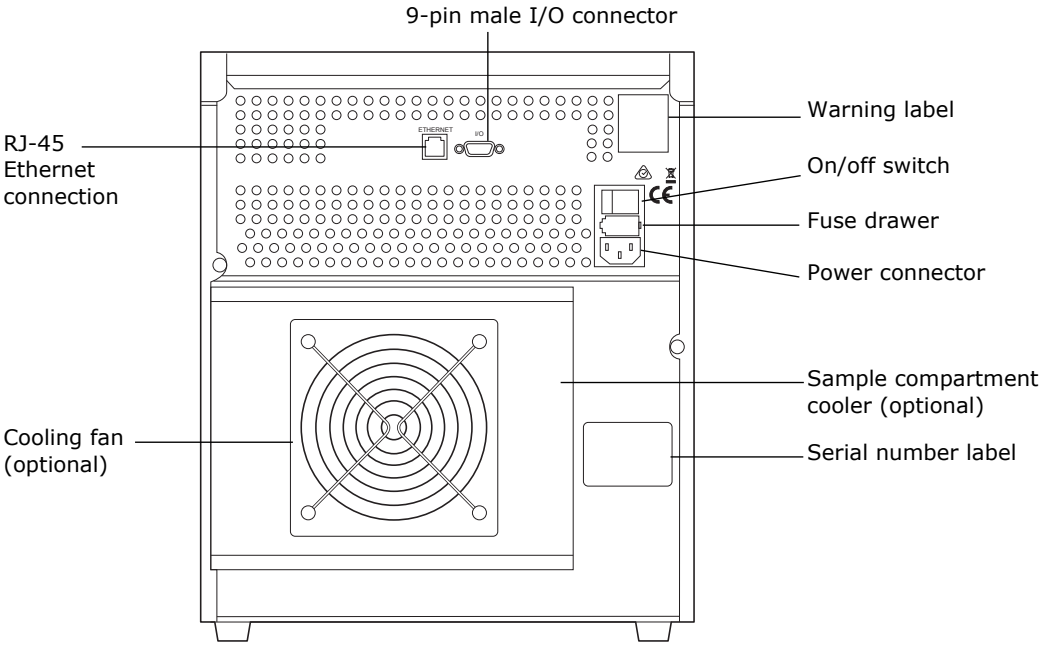
The autosampler includes a syringe, needle, and injection valve that are housed inside a sample compartment. The autosampler also comprises the following components:



The autosampler accepts standard well plates and vial trays. The sample compartment can house two well plates or vial trays in almost any combination.

Exception: The sample compartment cannot accommodate the combination of a 384-well, short plate on the left side and a 96-well, tall plate on the right side.

Figure 1–1: Autosampler's rear panel:



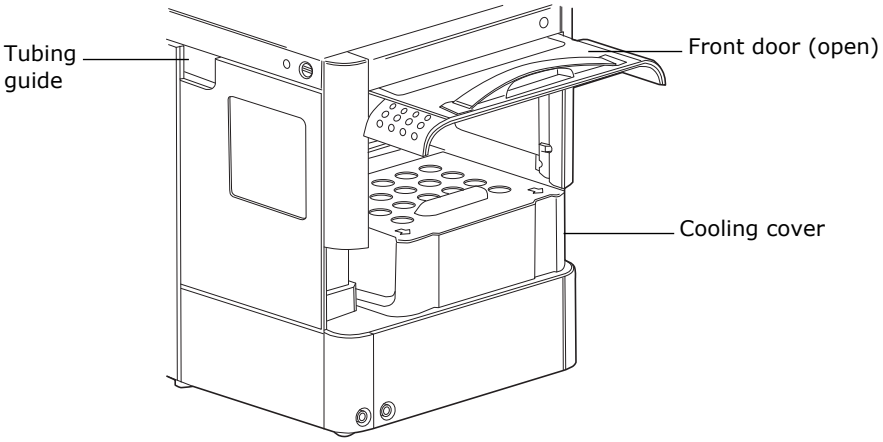
1.2 Options for the autosampler

The autosampler has several options that are available to help you optimize results from your samples:

- Sample cooling
- Preparative-mode kit
- Biocompatibility kit
- Air needles
- Well plates and vial trays
- Sample loops

1.2.1 Sample cooling

With the factory-installed sample cooling option, the autosampler can maintain the samples from 4 °C to 22 °C. A removable cooling cover and a cooling fan at the rear help to maintain the temperature in the sample compartment.



1.2.2 Preparative-mode kit

The preparative-mode kit is suitable for large-volume sampling. You can install the kit by replacing analytical-scale components with their prep-scale counterparts.

The kit includes these components:

- 2,500-µL syringe
- 2,000-µL buffer tubing
- Preparative valve
- 10-mL and 5-mL sample loops
- Large sample-volume (LSV), 60-µL needle
- 12-vial sample tray for 10-mL vials
- 0.030-in pump inlet tube
- 50-mm air needle (yellow handle)

See also: "Injection sequence in preparative mode".

1.2.3 Biocompatibility kit

You can install the biocompatibility kit to make the standard sample flow path and valve biocompatible.

The kit includes a Silcosteel® inert sample needle, PEEK® biocompatible valve, and Valco® 100-µL PEEK sample loop and fittings.

See also: "Installing the biocompatibility kit".

1.2.4 Air needles

Air needles pressurize sample vials during aspiration to prevent bubbles. There are six types of air needles available for use in the autosampler. The 62-mm default air needle suits most well plates and vial trays.

See also: "Replacing the sample needle".

1.2.5 Well plates and vial trays

The instrument accommodates two well plates or vial trays at a time. You can use the following well plates and vial trays in analytical mode and preparative mode:

- 96-well, tall and deep microtiter plates (1-mL or 2-mL wells)
- 96-well, short microtiter plates (300-µL or 350-µL wells)
- 384-well, short or tall microtiter plates (100-µL or 250-µL wells)
- 48-position, 2-mL vial trays (Waters ACQUITY format)
- 12-position, 10-mL vial trays (preparative mode only; Waters ACQUITY format)

Exception: The sample compartment cannot accommodate the combination of a 384-well, short plate on the left side and a 96-well, tall plate on the right side.

Tip: Data-system references to trays 1 and 2 correspond to the left and right trays, respectively, in the autosampler.

American National Standards Institute (ANSI)-compliant plates are recommended, but the needle and tray mechanism adjusts to accommodate non-ANSI-compliant plates.

Notice:

- To avoid needle breakage, do not use hard plastic storage cap mats or vial septa. The instrument's needle is of narrow diameter (0.031") and cannot penetrate firm materials.
- To avoid contamination from the adhesive, do not use adhesive-backed microtiter film.

You can use the following materials as covers:

Table 1–1: Acceptable covers for sample containers:

Sample container	Covers
Vials	Caps with PTFE or preslit PTFE/silicone septa
Low-volume inserts	PTFE/silicone caps or cap mats
Well plates	Polypropylene or PTFE/silicone cap mats; heat-sealed microtiter plate film

1.2.6 Injection modes

The autosampler offers four injection modes:

- Analytical injections:
  - Partial-loop using needle-overfill mode.
  - Full-loop using needle-overfill mode.
  - Partial-loop mode.
- Preparative injections: Partial-loop using needle-overfill mode.

Table 1–2: Autosampler's injection modes:

Injection	Mode	Description
Partial-loop using needle-overfill	Analytical or preparative	Maximum flexibility. Analytical and preparative modes have different injection sequences.
Full-loop using needle-overfill	Analytical	Maximum injection volume precision
Partial-loop	Analytical	Zero sample loss

See also: Videos demonstrate the autosampler's injection modes. On www.waters.com, click Services and Support > How To Videos > Autosampler > Instrument: Autosampler 2707.

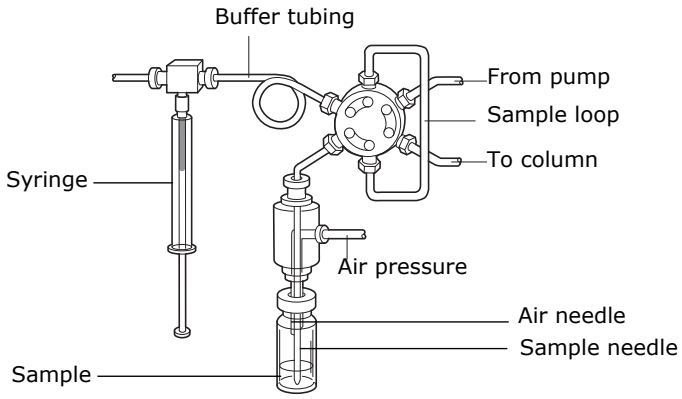
1.2.7 Pressure-assisted sample aspiration

The instrument method can enable loop injection with pressure-assisted sample aspiration. This option pairs an on-board compressor with intelligent valve switching and highly accurate syringe control, resulting in these benefits:

- Helps aspirate viscous samples.
- Reduces the risk of bubbles in the sample line.
- Prevents unwanted sample movement in the needle.

The syringe aspirates the sample from a vial into the sample loop. Buffer tubing between the syringe and the injection valve prevents syringe contamination.

Figure 1–2: Pressurizing the vial:



1.2.8 Wash solvent, syringe, buffer tubing, and loop

During a wash cycle, wash solvent flows from the pump through the injection valve. The syringe pushes the wash solvent through the buffer tubing and out to waste.

Wash solvent serves two purposes:

- Removes sample from the buffer tubing and sample needle.
- Rinses the buffer tubing and sample needle.

Analytical injections require a 500-µL analytical syringe and 1,000-µL buffer tubing. The default sample loop is 100 µL, and you can use all loop sizes ranging from 5 µL to 5,000 µL. The default needle is 15 µL, and you can use a 60-µL needle.

Preparative injections require a 60-µL needle, 2,500-µL preparative syringe, and 2,000-µL buffer tubing. The default sample loop is 10,000 µL, and you can use all loop sizes ranging from 5 µL to 10,000 µL.

Tip: You can install a different sample loop on the injection valve, provided you select the proper combination of syringe and tubing.

The injection volume ranges depend on the sizes of the syringe, needle, and loop.

Table 1–3: Examples of injection volume ranges:

Type	Syringe's injection volume range	Maximum injection volume
Partial-loop using needle-overfill injections (analytical), using a 100-µL loop	0 to 50 µL	Half the loop volume
Full-loop injections (analytical), using a 100-µL loop	100 µL	Equal to the loop volume
Partial-loop injections (analytical), using a 50-µL loop and 15-µL needle	0 to 2.5 µL	(Loop volume – [3 × needle volume])/2
Partial-loop using needle-overfill injections (preparative mode), using a 10,000-µL loop	0 to 10,000 µL	Equal to the loop volume

1.3 Injection sequences in analytical mode

The autosampler has three injection sequences in analytical mode:

- "Partial-loop using needle-overfill injection sequence (analytical mode)"
- "Full-loop using needle-overfill injection sequence (analytical mode)"
- "Partial-loop injection sequence (analytical mode)"

1.3.1 Partial-loop using needle-overfill injection sequence (analytical mode)

In the standard configuration (analytical scale), partial-loop using needle-overfill injections yield maximum accuracy and reproducibility better than 0.5% RSD for injection volumes greater than 10 µL. The minimum flush volume of 30 µL is recommended.

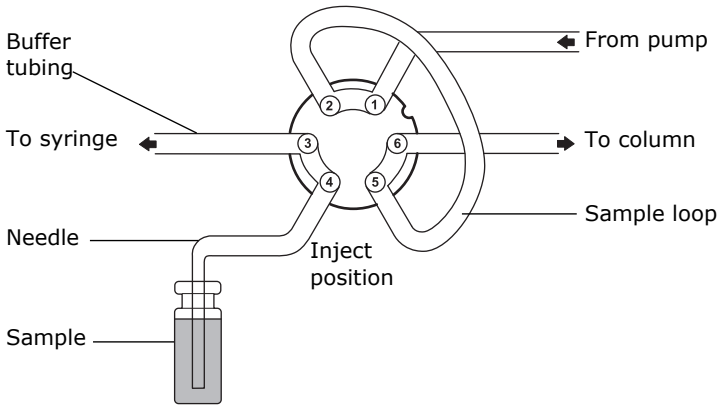
1.3.1.1 Air segments with injections (optional)

An air segment that is at the front of the flush volume, but not injected, can minimize sample dilution caused by dispersion during aspiration.

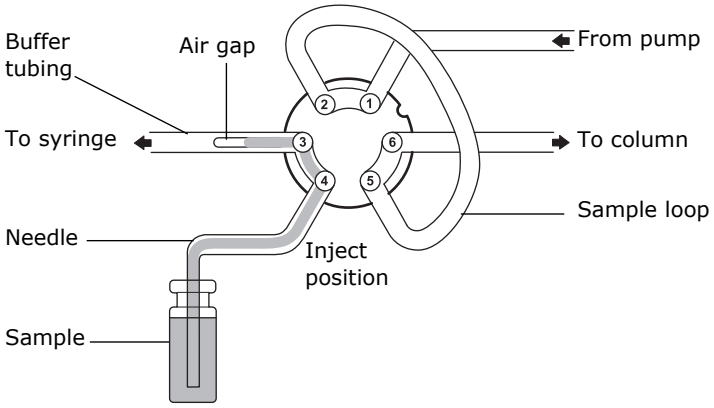
With a standard needle, recommended flush volumes are 30 µL for injections that incorporate air segments, and 35 µL for injections that do not incorporate air segments. Highly viscous samples can require larger flush volumes and reduced syringe speeds.

Partial-loop using needle-overfill injection sequence:

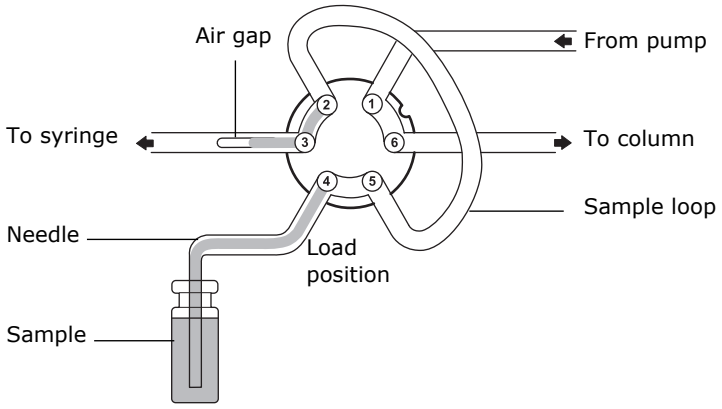
1. The injection valve moves to the Inject position, and the sample needle and air needle enter the vial or well. When the instrument method enables sample pressurization, the air needle applies headspace pressure, to prevent air or vapor bubbles from forming during sample aspiration.



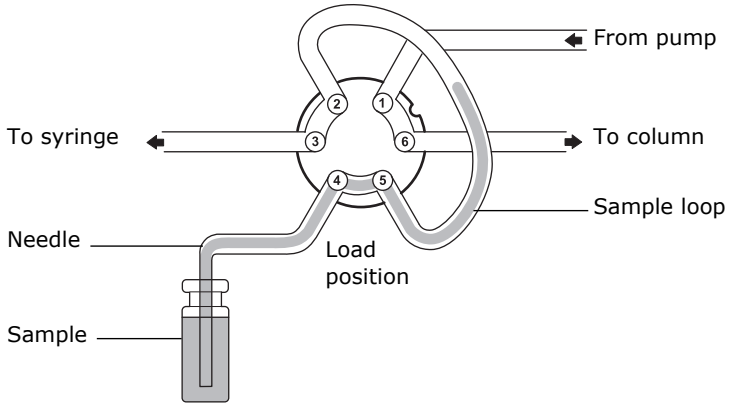
2. The syringe dispenser aspirates the flush volume (30 µL default) from the sample vial, to fill the sample line with sample and remove wash solvent.



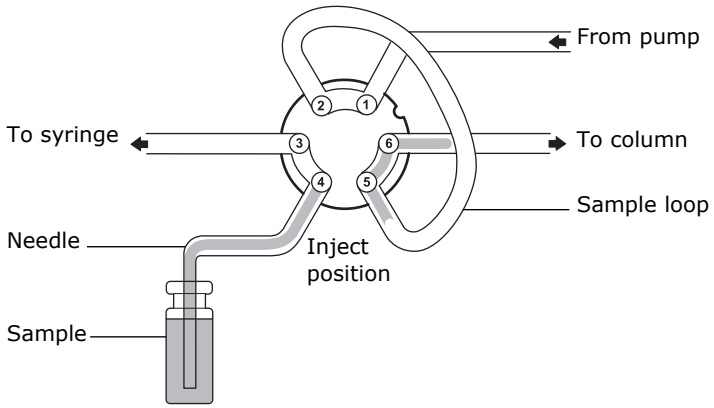
3. The injection valve switches to the Load position, placing a plug of sample at the beginning of the sample loop.



4. The programmed injection volume aspirates into the sample loop.



5. The injection valve switches to the Inject position, and the sample loop becomes part of the flow path for the mobile phase. Sample enters the column, and analysis starts.



6. After each injection, a wash routine of programmable volume occurs.

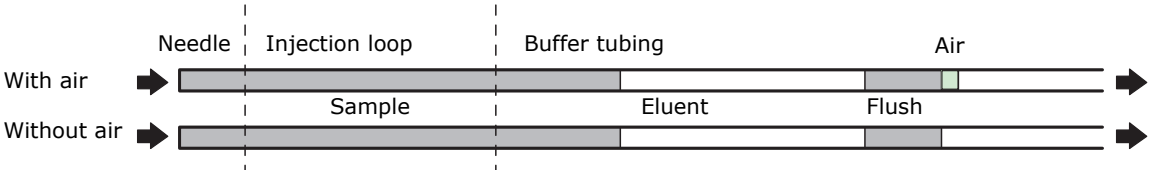
1.3.2 Full-loop using needle-overfill injection sequence (analytical mode)

In the standard configuration, full-loop injections yield maximum possible reproducibility of less than 0.3% RSD, but not necessarily maximum accuracy, because loop volume is typically specified with an accuracy of plus or minus 10%. Typical sample usage is 330 µL (3 × loop overfill + 30 µL flush volume for the needle). The minimum flush volume of 30 µL is recommended. You can program smaller flush volumes, but they decrease performance.

1.3.2.1 Air segments with injections (optional)

A 5-µL air segment that is at the front of the flush volume, but not injected, can minimize sample dilution caused by dispersion during aspiration.

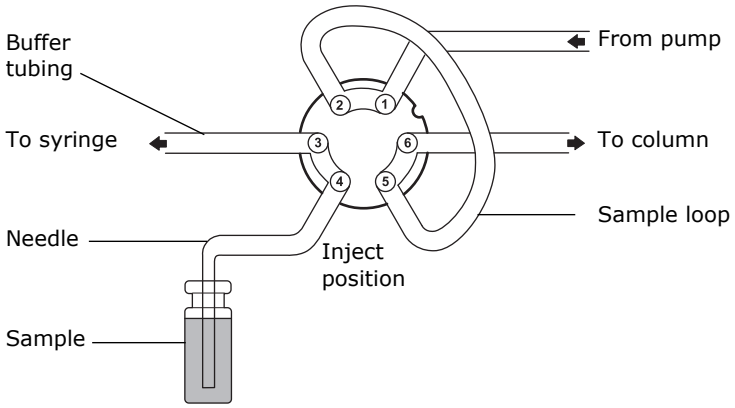
With a standard needle, recommended flush volumes are 30 µL for injections that incorporate air segments, and 35 µL for injections that do not incorporate air segments. Highly viscous samples can require larger flush volumes and reduced syringe speeds.



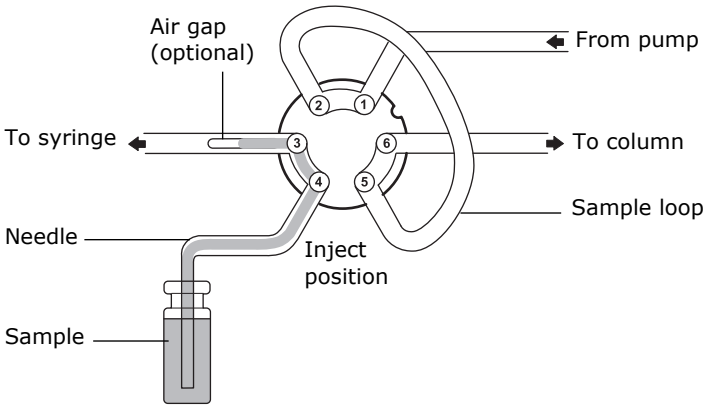
Full-loop using needle-overfill injection sequence:

1. The injection valve moves to the Inject position, and the sample needle and air needle enter the well or vial. When the instrument method enables sample

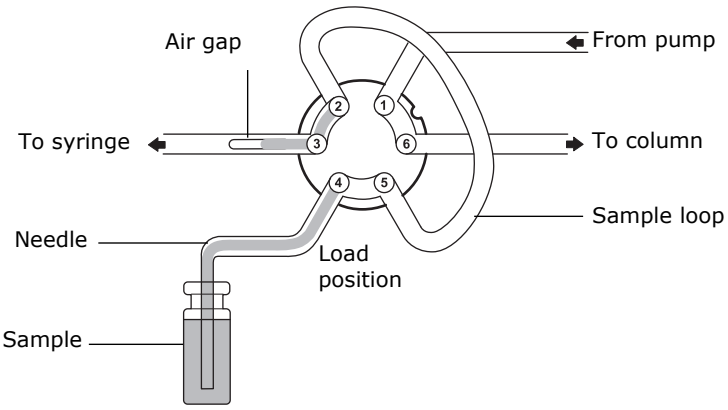
pressurization, the air needle applies headspace pressure to prevent air or vapor bubbles from forming during sample aspiration.



2. The syringe dispenser aspirates the flush volume (30 µL default) from the sample well or vial, to fill the sample line with sample and remove wash solvent.

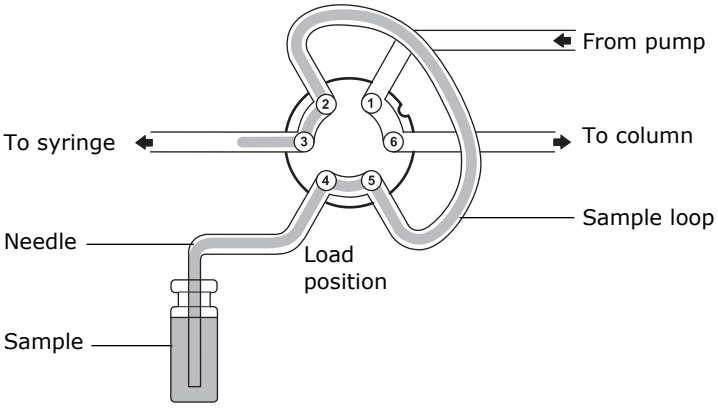


3. The injection valve switches to the Load position, placing a sample plug at the sample loop inlet.

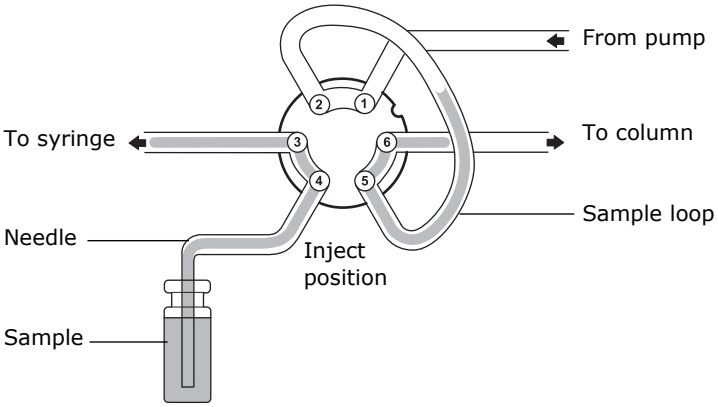


4. The sample loop fills quantitatively by transporting multiple loop volumes through the loop.

Loop size	Volume
≤ 100 µL	3 × loop size
100 to 500 µL	2 × loop size
> 500 µL	1.5 × loop size



5. The injection valve switches to the Inject position, and the sample loop becomes part of the flow path for the mobile phase. Sample enters the column, and analysis starts.



6. After each injection, a wash routine of programmable volume occurs.

1.3.3 Partial-loop injection sequence (analytical mode)

Partial-loop injections yield no sample loss and, like partial-loop needle-overfill injections, maximum accuracy. However, their reproducibility specification is slightly lower. In the standard configuration (analytical scale), peak area RSD is less than 1% for injection volumes greater than 10 µL.

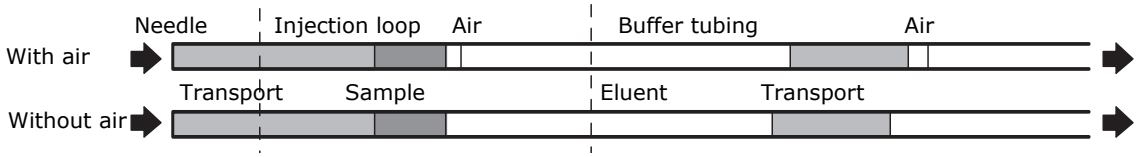
Recommendation: Because wash solvent injects with the sample in partial-loop mode, consider the effect on the chromatography. In general, for reversed-phase chromatography, match the wash solvent mixture to the initial gradient conditions.

1.3.3.1 Air segments with injections (optional)

When an air segment is programmed, it appears at the front of the first plug of transport liquid and at the front of every sample plug.

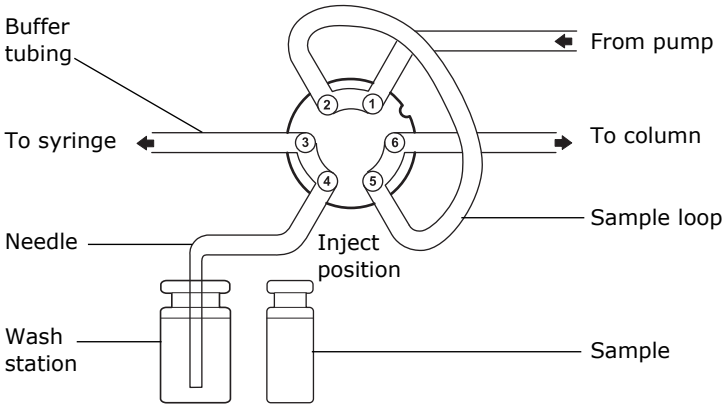
The following conditions apply to this injection mode:

- The air segment at the front of the sample plug injects into the system.
- No headspace pressure can be applied on vials or wells, to avoid sample errors arising from air expansion during exchange from the sample vial or well to the transport position.

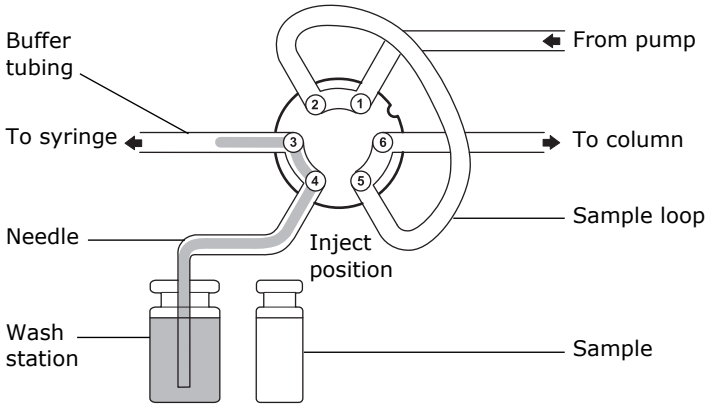


Partial-loop injection sequence:

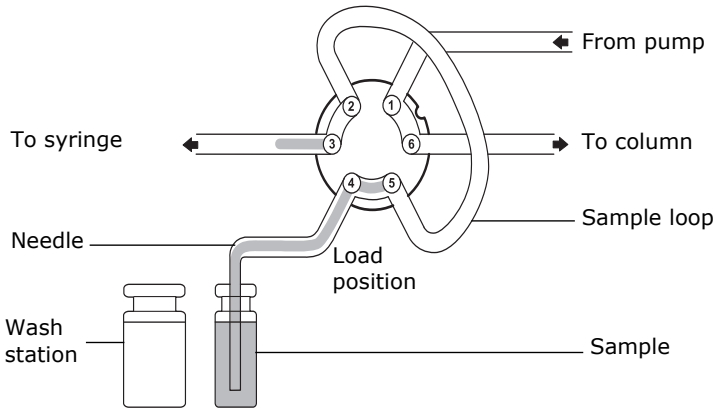
1. The injection valve moves to the Inject position, and the sample needle moves to the Transport position.



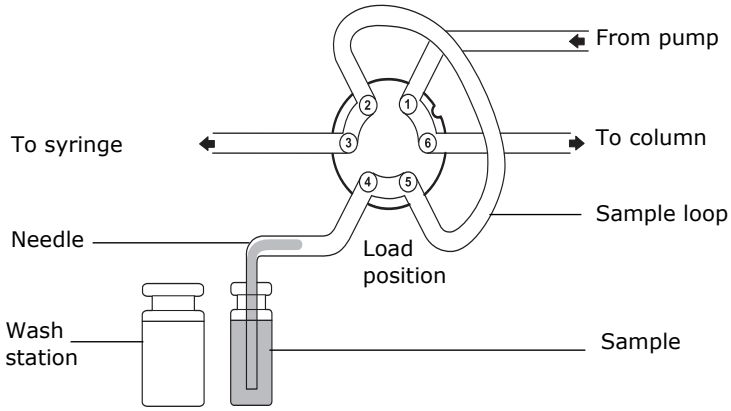
2. The syringe dispenser aspirates a plug of wash solvent from the wash station, filling the sample line with transport liquid.



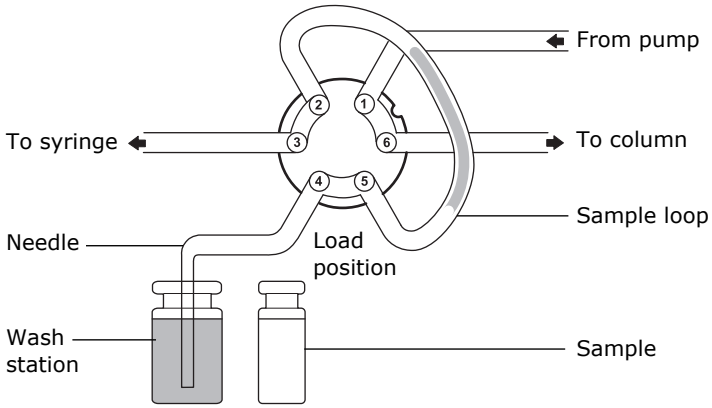
3. The needle moves from the wash station to the sample vial. The injection valve switches to the Load position.



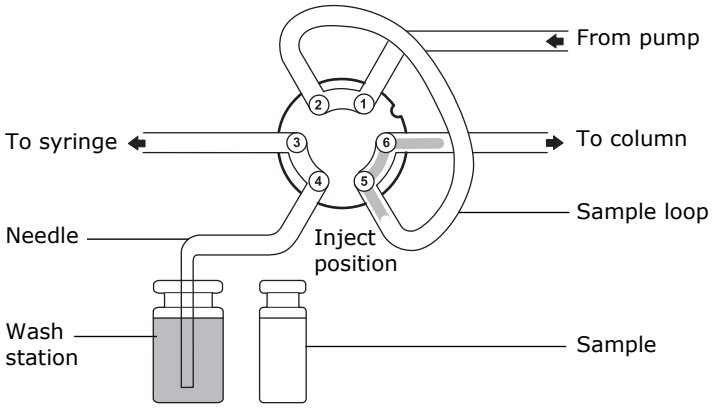
4. The programmed injection volume of sample aspirates from the sample vial.



5. The sample needle moves back to the wash station, and a second plug of wash solvent aspirates. The sample enters the loop.



6. The injection valve switches to the Inject position, and the sample loop becomes part of the flow path for the mobile phase. Sample enters the column, and analysis starts.

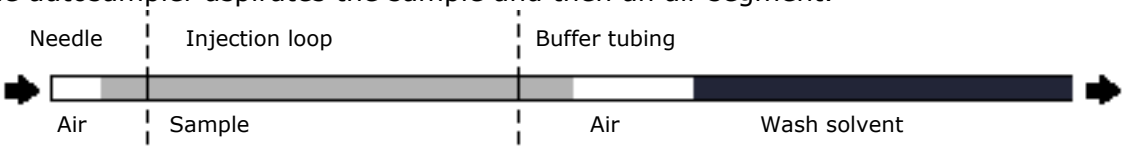


7. After each injection, a wash routine of programmable volume occurs.

1.4 Injection sequence in preparative mode

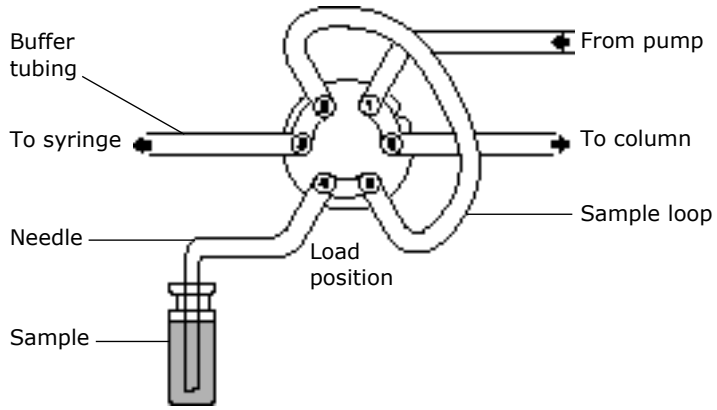
The autosampler has one injection sequence in preparative mode: partial-loop using needle-overfill injections.

The autosampler aspirates the sample and then an air segment.

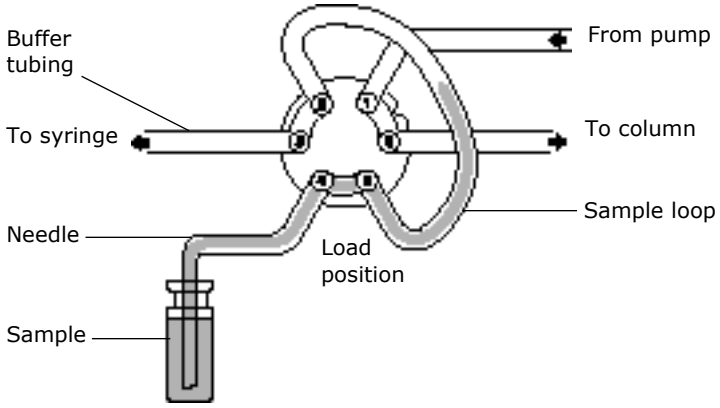


Injection sequence:

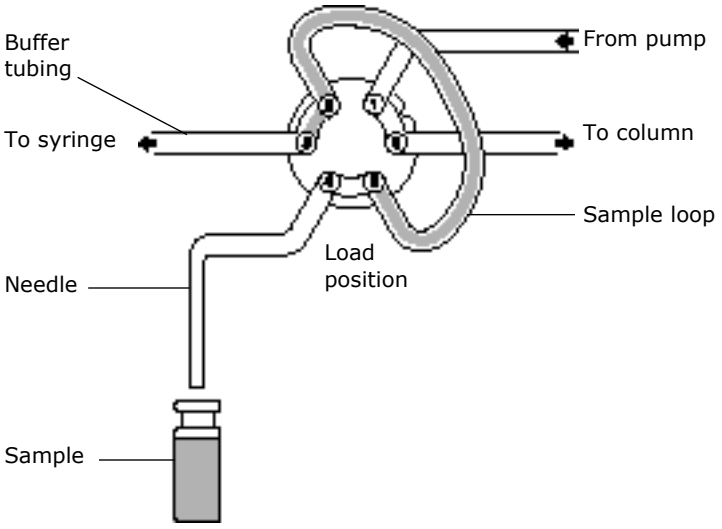
1. The injection valve moves to the Load position, and the sample needle enters the vial or well. When the instrument method enables sample pressurization, the air needle applies headspace pressure to prevent air or vapor bubbles from forming during sample aspiration.



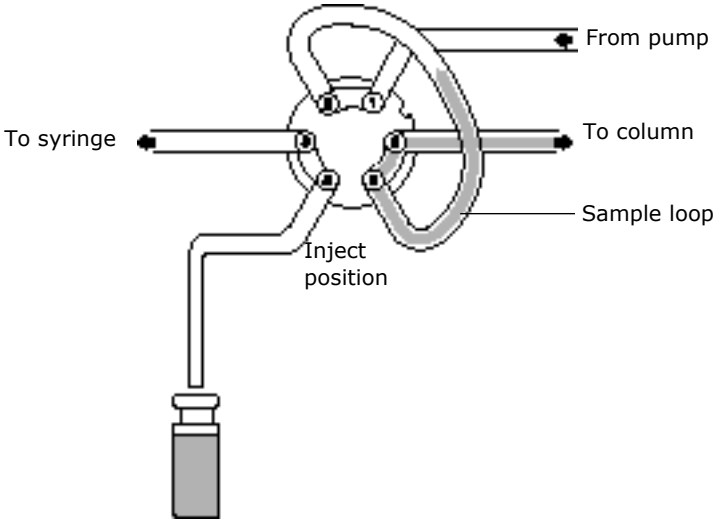
2. The syringe dispenser aspirates the programmed injection volume of sample from the sample vial into the sample loop.



3. The needle rises out of the vial, and the syringe aspirates 60 µL of air, pulling the remaining sample into the loop.



4. The injection valve switches to inject position, making the sample loop part of the mobile phase flow path. Sample flows to the column, and analysis starts.



2 Preparing the 2707 Autosampler

You can install the 2707 Autosampler. You can also install the optional preparative kit and the optional biocompatibility kit.

2.1 Preparing for installation

Requirement: To install the autosampler, you must know, in general, how to set up and operate laboratory instruments and computer-controlled devices, as well as how to handle solvents properly.

Tip: Before installing the autosampler, ensure that:

- It is not situated under a heating or cooling vent.
- All required components are present.
- No shipping containers or unpacked items are damaged.

If you discover any damage or discrepancy when inspecting carton contents, immediately contact the shipping agent and your local Waters representative.

If you are in the USA or Canada, report damage and discrepancies to Waters Technical Service (800-252-4752). From other areas, contact your local Waters subsidiary or Waters corporate headquarters in Milford, MA, USA, or visit http://www.waters.com.

For complete information on reporting shipping damages and submitting claims, see *Waters Licenses, Warranties, and Support Services*.

2.2 Setting up the autosampler

Notice: Extreme environmental conditions can impede instrument performance, so choose an indoor operating location that lacks direct heat or sunlight exposure, as well as excessive dust and shocks.

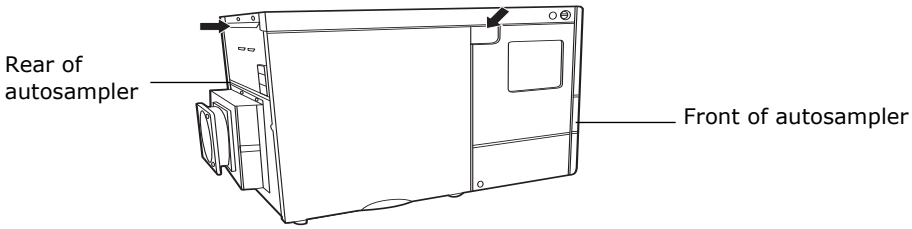
Notice: Blocked ventilation holes can affect the autosampler's performance and cooling capabilities, so make sure the ventilation holes at the back of the device are unobstructed.

Notice: When objects are placed to only one side of the device, allow 5 cm from the autosampler. When objects are placed on both sides, allow 10 cm.

To set up the autosampler:

1. Using both hands as shown in the accompanying figure, lift the autosampler from its packaging.

Figure 2–1: Lifting the autosampler:



2. With both hands under the autosampler, lift it to its operating location, keeping it upright.
3. Place the autosampler in its operating position.

   Requirement: Arrange the power cord such that its access to the power source is unobstructed.
4. Allow the autosampler to equilibrate to ambient temperature for at least 1 hour.

2.3 Plumbing the autosampler

You plumb the autosampler by connecting the solvent lines from the pump and column to the injection valve, installing tubing, and filling the wash bottle.

Warning: To avoid injury, ensure the front cover is intact and the door is closed during normal operation.

Warning: To avoid puncture wounds, keep hands or loose clothing clear of the needle assembly mechanism while it is moving.

Notice: To avoid damage to the components in the flow path, ensure solvents are compatible with each other. To avoid blockages, which can severely damage the autosampler, do not use crystalline or buffer solutions as wash solvents.

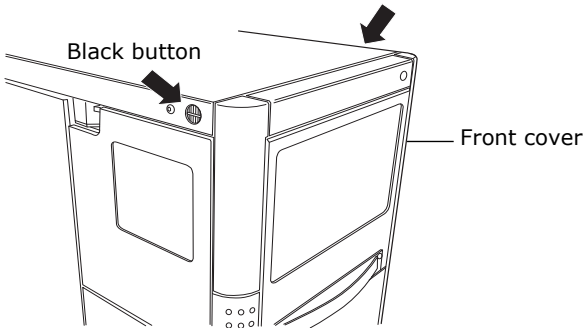
Tips:

- To access components more easily during installation or maintenance, you can remove the autosampler's cover.
- The plate and needle drive mechanisms are designed to move more slowly when the autosampler's front cover is removed or the door is open.

To plumb the autosampler:

1. Simultaneously press the two black buttons on either side of the top of the autosampler.

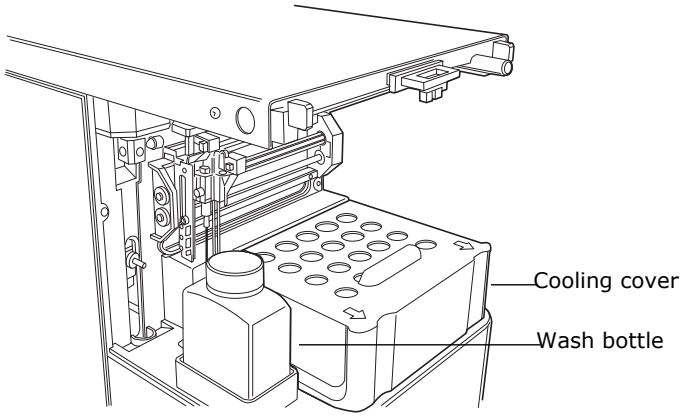
Figure 2–2: Removing the front cover:



2. Gently pull the front cover toward you and set it aside.
3. If installed, slide the cooling cover outward by pulling it gently toward you.

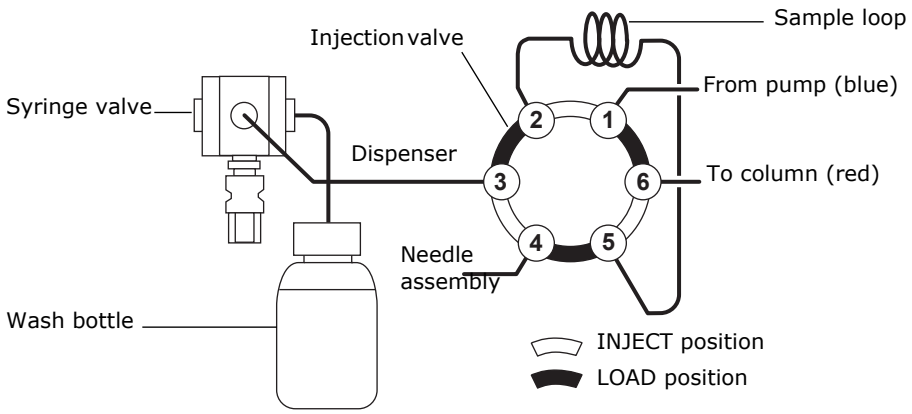
   Tip: When the autosampler has the cooling option, a cooling cover overlays the well plates.

Figure 2–3: Removing the cooling cover:



4. Connect the pump tubing (blue) to port 1 of the injection valve.

Figure 2–4: Connecting the tubing:



5. Connect the column tubing (red) to port 6 of the injection valve.

   Tip: For Waters connections, the startup kit includes stainless steel and PEEK plastic fittings. Some tubing is attached to the injection valve at the factory.

Table 2–1: Autosampler tubing:

Tubing color	Description
Clear	Plastic tubing for wash solvent.
Blue	High-pressure steel tubing, 0.03-inch (0.75-mm) ID; connects the autosampler to the pump.
Red	High-pressure steel tubing, 0.009-inch (0.25-mm) ID; connects the autosampler to the column.
Drain	Two 0.25-inch clear lines; attach to the drip trays on the autosampler's bottom. The left-hand tubing drains wash, waste, solvent, and sample spills. The right-hand tubing drains water from the cooler as well as sample spills and mobile phase leaks.

6. To prevent wash solvent tubing from obstructing the needle unit's horizontal movement, route the solvent wash tubing through the tubing guide in the left-hand side of the drip tray.

Figure 2–5: Wash solvent tubing guide:

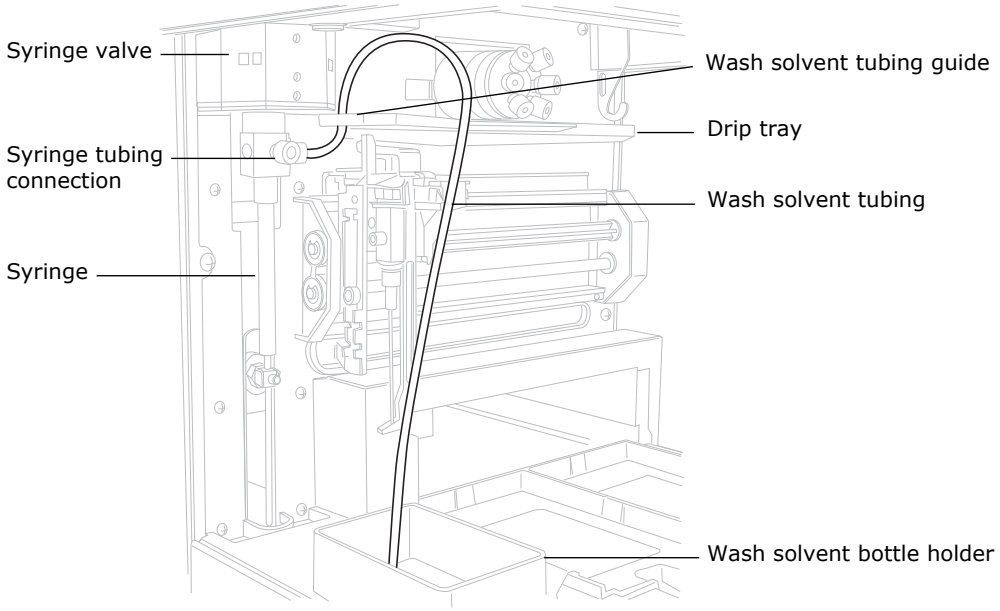
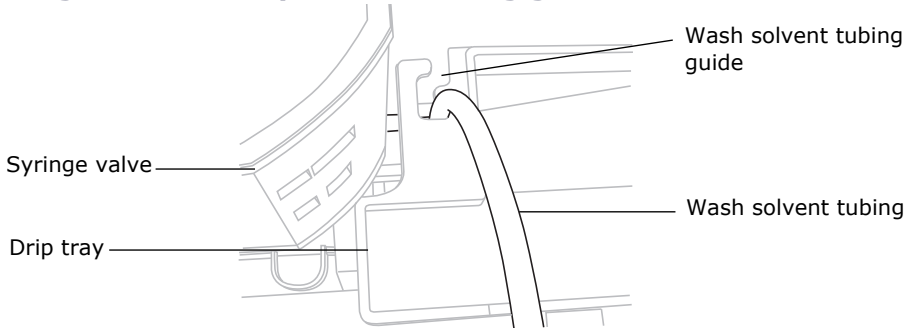


Figure 2–6: Top view of tubing guide:



7. Connect the pump inlet line (blue) from port 1 of the inject valve to the pump.

   Tip: Route the tubing through one of the square cutouts on either side of the instrument.

8. Connect the red line to port 6 of the injector valve.
9. Route the red line through one of the square cutouts on either side of the autosampler, and then connect it to the column.

   Tip: When a Waters 1500 series pump and column heater are used, both the red and blue lines are likely to exit the autosampler through the left-hand cutout.

10. Connect the tee end of each drain tubing to the right-hand and left-hand drain hose connectors.

    Tip: Point the center tee port upward.

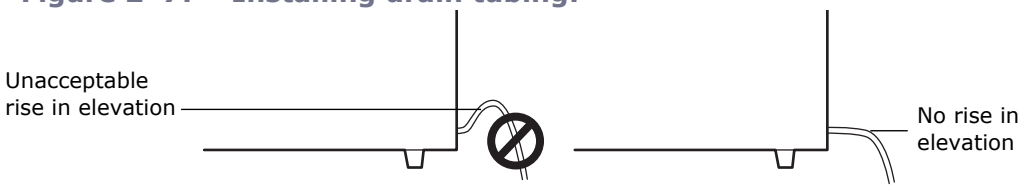
Notice: To avoid hindering waste drainage, route the waste tubing downward, toward the waste container, with no rise in elevation.

11. Place the other ends of the drain tubings in a waste container on the floor.

    Tips:

    - General waste tubing removes all liquid dispensed to the wash position, as well as uninjected sample liquid and condensate from the cooler.
    - To keep the flow path clear, ensure that the drain and waste tubes are untwisted, with no rise in elevation.

Figure 2–7: Installing drain tubing:



2.3.1 Supplying the wash solvent and syringe rinse

Recommendations:

- Use only water or organic wash solvents, preferably distilled water and methanol (80%/20%).
- To improve the wash solvent degassing, use a Waters inline degasser.

Notice: To avoid blockages, which can severely damage the autosampler, do not use crystalline or buffer solutions as wash solvents.

To fill the wash solvent tubing:

1. Fill a clean wash solvent bottle with wash solvent, and degas it.

   Tip: The approved wash solvent bottle is made of glass.

2. Place the bottle in the wash solvent bottle holder.
3. Place the end of the wash solvent tubing in the filled wash solvent bottle.

   Recommendations:

   - To achieve the necessary length, replace the wash solvent line with tubing from the Waters inline degasser. Attach the tubing to the front of the syringe valve, and route it out one of the square cutouts on the autosampler's side.
   - To avoid flow problems, use tubing with low gas permeability and an internal diameter sufficient to minimize flow impedance, such as the tubing supplied with the Waters inline degasser.

2.4 Making Ethernet connections

Recommendations:

- Use only the shielded Ethernet cables in the startup kit.
- For workstations with only one Ethernet instrument, connect an Ethernet cable to the PC's network interface card (NIC).
- Older, nonautosensing NICs require shielded cross-over cables, which are not supplied in the startup kit.

To make Ethernet connections:

1. Connect one end of one Ethernet cable to the network switch, and then connect the other end to the Ethernet card on the computer.
2. Connect one end of one Ethernet cable to the autosampler's rear panel, and then connect the other end to the network switch.

2.5 Controlling I/O connections

The autosampler has one I/O connector, which supports TTL inputs (active low) and contact closure outputs.

Notice: Connect this autosampler only to other devices that meet relevant safety standards.

2.5.1 Defining TTL inputs

TTL inputs allow other devices to control the autosampler. The following table describes the options for the autosampler's two TTL inputs, which you define via the instrument method (click Instrument Method Editor > W2707 > Events > Inputs).

Table 2–2: TTL input signals:

Signal	Description
Hold Inject (default)	When this input is active before the start of an analysis, the autosampler performs all programmed pre-injection sample handling (sample loop), but waits to inject the sample until the input becomes inactive. If the input becomes active during an analysis, it has no effect until the next analysis starts.
Stop Inject	Aborts the run immediately.

2.5.2 Defining contact closure outputs

Requirement: Route an Inject Start I/O cable to any non-Ethernet or non-Waters device that requires an injection trigger signal. Waters IEEE detectors, such as the 2487 UV/Vis and 2996 PDA, require this I/O cable connection.

Tip: Most Waters devices start remotely through the Ethernet and require no Inject Start I/O connections.

The Inject Start switch generates an injection marker output when the injection valve switches from the Load to Inject position. Status duration of the injection marker is 1.0 second.

Table 2–3: I/O connector—Contact closure output and TTL inputs:

Pin number	Description	Cable color
1	Inject Start	White
2	Inject Start	Green
3	Input 1	Red
4	Input 2	Black
5	Not used	None
6	Not used	Gray
7	Not used	None
8	Ground	Orange
9	Ground	Brown

2.6 Connecting to the electricity source

The autosampler requires a grounded electricity source. The ground connection in the electrical outlet must be common and connected near the system.

Warning: To avoid electrical shock, confirm that the line voltage conforms to that required by the device, and insert power cords in correct voltage sources.

Requirement: Arrange the autosampler's power cord such that its access to the power source is unobstructed.

Recommendation: Use a line conditioner or an uninterruptible power supply (UPS) for optimum long-term input voltage stability.

To connect to the electricity source:

1. Confirm that fuses and the voltage range on the rear of the autosampler match the target power outlet.
2. Connect the female end of the power cord to the receptacle on the rear panel of the autosampler.
3. Connect the male end of the power cord to a suitable wall outlet.

2.7 Starting up the autosampler

Warning: To avoid puncture wounds, keep hands or loose clothing clear of the needle assembly mechanism while it is moving.

To start up the autosampler:

1. On the rear panel, power-on the instrument.
2. Wait until the power LED on the console is green, indicating startup diagnostics are complete.
3. From the 2707 Autosampler control panel in the data-application software, click (Launch Instrument Console).
4. On the 2707 Console, click Control > Wash/prime needle, to fill the tubes with wash solvent.

   Alternative: On the 2707 Control panel, right-click and select Wash/prime needle.

   Tips:

   - To remove all air from the syringe and achieve maximal operation, perform an extra wash.
   - If bubbles form in the syringe on the intake stroke of the wash cycle, the wash solvent can be insufficiently degassed or, in the case of an external degasser, the inlet tubing diameter can be too small.
5. On the system console, set the mobile phase pump to deliver 1 mL/min of 100% methanol or acetonitrile for 10 minutes.
6. Inspect the autosampler's syringe, valve, tubing and fittings for leaks.

   Recommendations:

   - Allow the system to stabilize for 5 minutes.
   - If air bubbles appear in the syringe, or injection precision is poor, ensure that the fittings on the syringe valve, needle assembly, and ports 3 and 4 of the injector valve are finger tight. Do not overtighten these fittings with a tool.
7. On the 2707 Console, click Control > Wash/prime needle, to fill the flow path with wash solvent.

   Tips:

   - To remove all air from the syringe and achieve maximal operation, perform an extra wash.
   - If bubbles form in the syringe on the intake stroke of the wash cycle, ensure that the wash solvent is sufficiently degassed or, in the case of an external degasser, the inlet tubing diameter is sufficiently large.
8. On the 2707 Console, click Control > Move tray forward.
9. Install two well plates or vial trays in the autosampler tray.

   Requirement: Place the plates so that well A1 of each plate is at the front, left corner.

Figure 2–8: Placing the plates in the autosampler:

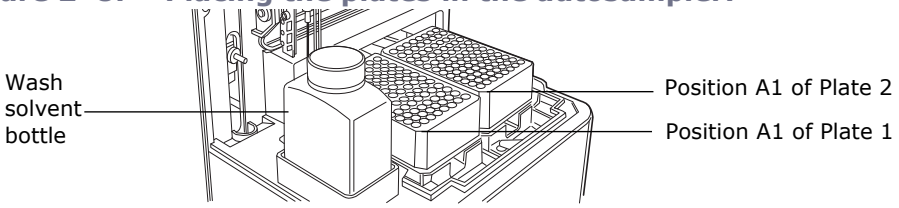


Figure 2–9: Well plates and vial holders for the autosampler:

Description	Volume per well or vial
96-well, tall and deep collection (microtiter) plates	1-mL or 2-mL wells
96-well, short collection plates	350-µL wells
384-well, short or tall collection plates	100-µL or 250-µL wells
48-position vial holder trays	2-mL vials
12-position vial holder trays (Waters format) **Restriction:** Use 10-mL vials in prep mode only.	10-mL vials

10. Slide the optional cooler cover on the plates.
11. Install the front cover, and close the door.

2.8 Installing the preparative kit

Installing the optional preparative kit involves removing the analytical (standard) components and installing the components from the preparative kit.

Table 2–4: Installing the preparative components:

Component	Analytical volume (µL)	Preparative volume (µL)	Procedure
Sample loop	100	10,000 or 5,000	See "Installing a sample loop".
Syringe	500	2,500	See "Replacing a syringe".
Buffer tubing	1,000	2,000	Connect tubing from port 3 of injector valve to syringe valve.
Sample needle assembly	15	60	See "Replacing the sample needle".

Tip: You can install different sample loops on the injection valve, provided you select the proper combination of syringe and tubing.

Guidelines:

- Prep mode requires the 2,500-µL sample syringe.
- Use the 10,000-µL sample loop for the prep mode only. A 5,000-µL loop is also available in the kit.

See also: A video demonstrates installing and configuring the optional prep kit and biocompatibility kit. On www.waters.com, click Services and Support > How To Videos > Autosamplers > Instrument: Autosampler 2707 > Installing the Prep and Biocompatibility Kit.

2.8.1 Configuring the autosampler for prep mode

You must specify the volumes of the prep-kit components on the 2707 console.

To configure the autosampler for prep mode:

1. From the system console, select the 2707 Autosampler.
2. Click Configure > Volumes.
3. Select the Use Prep Mode check box.
4. In the Loop field, specify the sample loop that is installed in the autosampler.

   Tips:

   - The Prep kit contains two sample loops: 10,000 µL and 5,000 µL.You can use any sample loop in preparative analyses. Use a sample loop that closely matches the desired preparative injection volume. Ensure you select the proper combination of loop, syringe, and tubing.
   - The Needle field specifies 60 µL.
   - The Sample syringe field specifies 2,500 µL.
5. Click OK to save the changes.

2.8.2 Selecting the plate type

In prep mode, you can use the following plate types in the autosampler:

Table 2–5: Well plates or vial trays:

Plate type	Description of sample container
12 Vials	10-mL vials (default) in a stainless steel, 12-vial tray in Waters ACQUITY format. **Requirement:** You must configure the 12-vial trays in the Empower software. **Restriction:** Use 10-mL vials in prep mode only.
48 Vials	2-mL vials in a 48-vial tray in Waters ACQUITY format.
384 Low	100-µL wells in 384-well, short collection plates.
96 High	1-mL or 2-mL wells, depending on well shape, in 96-well, medium or tall collection plates.
96 Low	300-µL or 350-µL wells in 96-well, short collection plates.

Exception: The sample compartment cannot accommodate the combination of a 384-well, short plate on the left and a 96-well, tall plate on the right.

2.8.3 Configuring custom 12-vial plates

The 2707 prep kit contains two plates that can hold 12, 10-mL vials each. This plate type is not part of the standard list that is available in Empower software. You must configure the plate as a custom plate using the Empower plate configuration editor. When you do so, the plate type is automatically saved, and the plate is available in the Adjust needle position dialog box.

To configure the plate type for the 12-vial, 10-mL vial tray:

1. From the Empower Run Samples window, select New > Plate Type.
2. In the New Plate Type dialog box, specify the following settings:

Table 2–6: Plate tab settings for 12-vial, 10-mL vial tray:

Name	Setting
Plate Type Name	2707 Prep 12 × 10mL Vials **Tip:** Specify the name exactly as written.
Format	XY
Plate Dimensions - mm:	
X	128.00
Y	86.00
Height	43.90
Well Dimensions - mm:	
Top Left Well Location, X	23.39
Top Left Well Location, Y	15.75
Well Size, Diameter	22.00
Well Size, Depth	30.00

Table 2–7: Rows and Columns tab settings for 12-vial, 10-mL vial tray:

Name	Setting
Row and Column Dimensions - mm:	
Rows, Number	3
Rows, Spacing	27.00
Columns, Number	4
Columns, Spacing	27.00
Row and Column Offsets - mm:	
Row Offset	None
Column Offset	None

3. Click OK.

4. On the 2707 Autosampler control panel, click (Launch Instrument Console).
5. Select the 2707 Autosampler, and then click Maintain > Adjust needle position.
6. In the Sample Position area, select "12 Vials" for the plate types, and then click Close.

2.9 Installing the biocompatibility kit

To install the optional biocompatibility kit, remove and replace the following accessories:

- Injection valve with sample loop (PEEK instead of stainless steel)
- Needle assembly (silica-coated stainless steel version instead of stainless steel)
- Inlet (pump) and outlet (column) tubing with plastic fittings (not included in the startup kit)

Notice: To avoid damaging the manifold, avoid using metal fittings in the biocompatible injector valve.

See also: A video demonstrates installing and configuring the optional prep kit and biocompatibility kit. On www.waters.com, click Services and Support > How To Videos > Autosampler > Instrument: Autosampler 2707 > Installing the Prep and Biocompatibility Kit.

3 Maintenance Procedures

This chapter provides the maintenance guidelines and procedures necessary to maintain the autosampler's performance.

Keep to a maintenance schedule, and perform maintenance as required and described in this chapter.

3.1 Maintenance schedule

The following table lists periodic maintenance schedules that ensure optimum performance. The maintenance frequencies apply to autosamplers that normally receive moderate use.

Table 3–1: Maintenance schedule:

Procedure	Frequency	For information
Clean the autosampler case.	As required.	See page 58.
Install a sample loop.	As required.	See page 45.
Replace the sample needle.	As required.	See page 46.
Maintain the air needle.	As required.	See page 48.
Replace the syringe.	Annually or as required.	See page 53.
Remove or replace the injection valve rotor seal.	Annually or as required.	See page 57.
Replace fuses.	As required.	See page 58.

3.2 Spare parts

To ensure that your system operates as designed, use only Waters Quality Parts®. Visit www.waters.com/wqp for information about Waters Quality Parts, including how to order them.

3.3 Troubleshooting with Connections INSIGHT

Connections INSIGHT® is an "intelligent" device management (IDM) Web service that enables Waters to provide proactive service and support for the ACQUITY UPLC® system. To use Connections INSIGHT, you must install its service agent software on

your Empower or MassLynx® workstation. In a client/server system, you must also install the service agent, on the computer from which you control the system. The service agent software automatically and securely captures and sends information about the support needs of your system directly to Waters.

If you encounter a performance issue when using the Instrument Console, you can manually submit a Connections Insight request to Waters customer support. Alternatively, you can use Remote Desktop, a real-time collaboration option that controls the two-way connection with the ACQUITY UPLC system by enabling the Connections INSIGHT iAssist service level.

Consult these sources for more information about Connections INSIGHT and Connections INSIGHT iAssist:

- http://www.waters.com
- *Connections INSIGHT Installation Guide* (part number 715001399)
- *Connections INSIGHT User's Guide* (part number 715001400)
- Your sales representative
- Your local Waters subsidiary
- Waters Customer Support

To submit a Connections Insight request:

1. Select Troubleshoot > Submit Connections Insight request.
2. In the Connections Insight Request dialog box, enter your name, telephone number, e-mail address, and a description of the problem.
3. Click Submit, and allow approximately 5 minutes to save the service profile.

   Result: A .zip file containing your Connections Insight profile is forwarded to Waters customer support for review.

   Tip: Saving a service profile or plot file from the Instrument Console can require as much as 150 MB of file space.

3.4 Safety and handling

Bear in mind the following safety considerations when performing maintenance procedures:

Warning: The device components can be contaminated with biologically hazardous materials. Always wear chemical-resistant, powder-free gloves while handling the components.

Warning: To prevent injury, always observe Good Laboratory Practice when handling solvents, changing tubing, or operating the device. Know the physical and chemical properties of the solvents used (see the Material Safety Data Sheets for the solvents in use).

Warning: To avoid electric shock,

- do not remove the device's panels. There are no user-serviceable items inside the device.
- ensure that the device is in Standby mode before commencing any maintenance.

See Appendix A for safety advisory information.

3.4.1 Preventing contamination

For information on preventing contamination, refer to Controlling Contamination in LC/MS Systems (part number 715001307), found on http://www.waters.com. Click Services and Support, and then search in the Support Library.

3.4.2 Preparing solvents for mobile phases

These are the most common solvents used to prepare mobile phases for reversed-phase LC-MS:

- Water
- Methanol
- Acetonitrile
- Formic acid (<0.1%)
- Acetic acid (<0.1%)
- Trifluoroacetic acid (<0.1%)
- Ammonium acetate (<10 mM)
- Ammonium formate (<10 mM)

3.5 Installing a sample loop

The autosampler is fitted with a 100-µL sample loop as standard equipment in the analytical mode. You can install a different sample loop on the injection valve, provided you select the proper combination of syringe and tubing.

Table 3–2: Sample loops for analytical and preparative modes:

Loop volume (µL)	Analytical mode	Prep mode
5	Yes	Yes
10	Yes	Yes
20	Yes	Yes
50	Yes	Yes
100	Yes (default)	Yes
500	Yes	Yes
2,000	Yes	Yes

Table 3–2: Sample loops for analytical and preparative modes: (continued)

Loop volume (µL)	Analytical mode	Prep mode
5,000	Yes	Yes
10,000	No	Yes (default)

Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- Sample loop

To install a sample loop:

1. Connect the loop's fittings to port 2 and port 5 of the injection valve.
2. On the 2707 Console, click Configure > Volumes.
3. Select the appropriate loop volume.
4. Click OK.

Calculate maximum injection volumes using the following equations:

Table 3–3: Maximum injection volumes:

Injection mode	Maximum injection volume
Partial-loop using needle-overfill	Analytical mode: Half the loop volume Preparative mode: Equal to the loop volume
Full-loop using needle-overfill	Equal to the loop volume
Partial-loop	(Loop volume – [3 × needle volume])/2

3.6 Replacing the sample needle

The sample needle aspirates sample from the trays and prepares for injection onto the column. The air needle minimizes the bubbles that can form when aspirating viscous fluids. The autosampler is fitted with a 15-µL sample needle as standard equipment.

Requirement: You must install a 60-µL sample needle as part of the preparative option.

Warning: To avoid puncture wounds, keep hands or loose clothing clear of the needle assembly mechanism while it is moving.

See also: A video demonstrates installing and configuring the optional prep kit and biocompatibility kit. On www.waters.com, click Services and Support > How To Videos > Autosampler > Instrument: Autosampler 2707.

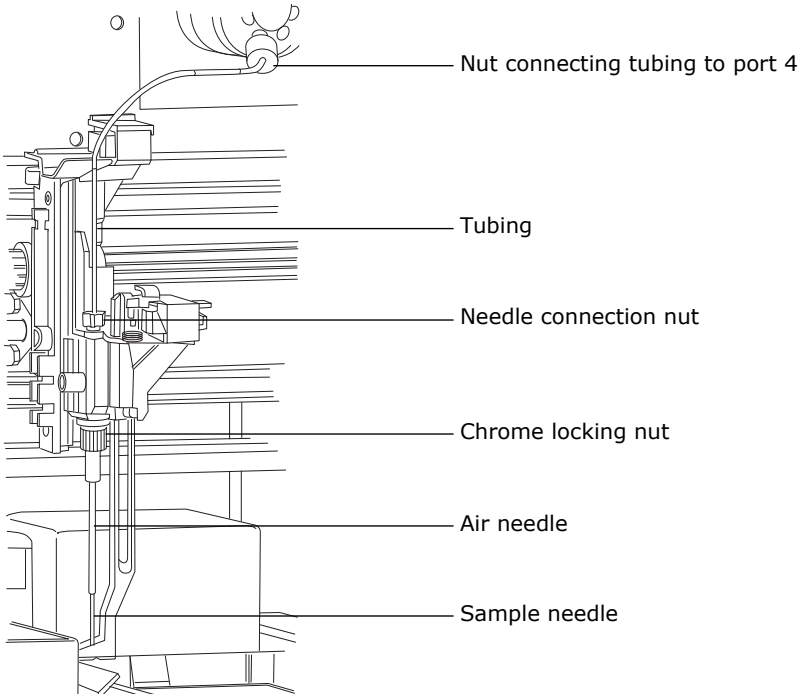
Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- Sample needle

To replace the sample needle:

1. Remove the front cover.
2. From the 2707 Console, click Maintain > Replace > Needle.
   Result: The needle moves to the exchange position.
3. Follow the instructions in the Replace Needle warning box, and then click OK.
4. Loosen the needle connection nut.

Figure 3–1: Replacing the sample needle:



5. Loosen the nut that connects the tubing to port 4 of the injection valve.
6. Pull the sample needle out of its fitting by the tubing.
7. Install a new sample needle assembly.
   Recommendation: Ensure that the air seal encircles the needle.
8. Using the needle connection nut, tighten the needle assembly.
9. Connect the other end of the needle connection tubing to port 4 of the injection valve.
   Recommendation: To avoid blocking the tubing, finger tighten only.
10. In the Replace Needle dialog box, click Reset.
    Result: The sample needle returns to the home position.
11. On the 2707 Console, click Control > Wash/prime needle.

3.6.1 Adjusting the vertical position of the needle

You can adjust the vertical position of the needle in the 2707 instrument method.

Tip: When you want to finetune the *x*-*y* injection position, calibrate the needle axes.

See also: "Adjust the needle position" in the 2707 Autosampler Help.

Notice: To prevent the needle from touching the bottoms of vials when using trays with 12 or 48 vials, make sure the needle height setting is greater than 2 mm.

To adjust the vertical position of the needle:

1. In the General tab of the 2707 Autosampler instrument method editor, select the Advanced button.
2. In the Advanced Settings dialog box, specify the Needle Placement above the bottom of the vial or well, and then click OK.

   Default: 6.0 mm.
3. Save the method.

3.7 Maintaining air needles

Six air needles of varying length accommodate different plate heights. An air needle is available for every well and vial plate. The needles vary in 6-mm intervals; the needle holder allows for an extra 6-mm variation in needle height.

Ideally, the end of the air needle pierces the vial cap or septum during sample aspiration, but it does not extend far enough to contact the liquid sample.

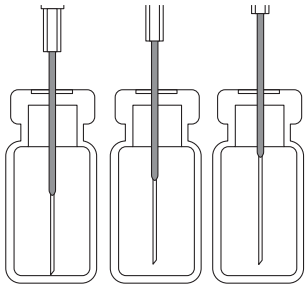
Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- Air needle

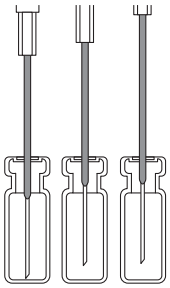
3.7.1 Examining the standard air needle

The standard air needle, which is 62 mm long, works well in most cases and accommodates a wide range of high and low plates. The accompanying figure shows the needle's puncturing depths.

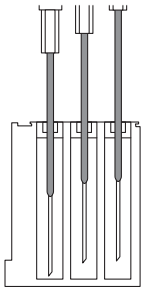
Figure 3–2: Air needle puncturing depths:



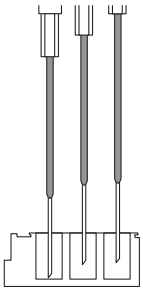
10-mL vial, 56-mm air needle



2 mL vial, 62-mm air needle (standard)



Greiner deep well plate (M53000) with capmat, 56-mm air needle



Greiner low well plate (air pressurization not recommended)

The air needle lowers deeply into 10-mL vials. When the vials are less than 60% full, the pressurize vial feature is available. The same is true of deep wells.

Tip: When deviating from standard settings, use an optional air needle type.

Recommendation: Do not use the pressurize vial feature for low-well plates. With this feature, the sample needle punctures the seal to prevent a vacuum in the sample container. However, the function of the air needle in such a case is insignificant.

3.7.2 Pairing air needles with plates or vials

When choosing an air needle, calculate the protrusion length of the sample needle—the distance between the point of the sample needle and the point of the air needle.

Figure 3–3: Air needle dimensions:

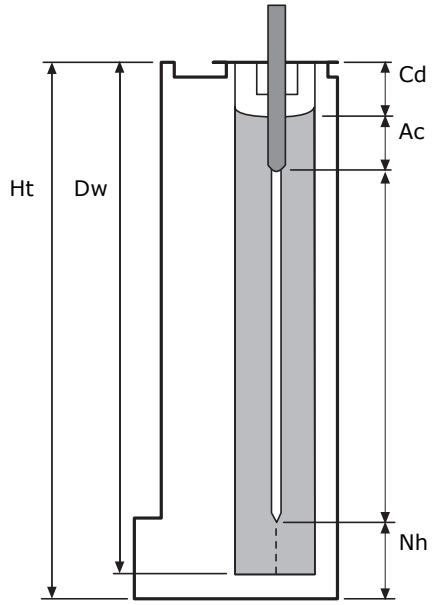


Table 3–4: Key:

Abbreviation	Description
Ht	Height of the microtiter plate, in mm
Dw	Well depth, in mm
Cd	Thickness of capmat or seal, in mm
Nh	Set needle height, in mm
Ac	Distance of the air needle point through the capmat or seal in mm, minimum 2 mm

Calculate the protrusion length of the sample needle—the distance between the point of the sample needle and the point of the air needle:

- Ht – Dw must be between 2 and 6 mm.
- The protrusion length is Ht – Cd – Nh – Ac.
- On the basis of protrusion length, choose the most suitable air needle.

Table 3–5: Protrusion length and air needle:

Protrusion length range (mm)	Air needle type	Description
34 to 40	50 mm, yellow	For preparative mode
28 to 34	56 mm, red	For 10-mL vial or Greiner deep well plate (M53000) with capmat (both shown in the figure, "Air needle puncturing depths:")
22 to 28	62 mm, natural (clear or white)	Standard needle; for most vials (2-mL vials shown in figure, "Air needle puncturing depths:")
16 to 22	68 mm, blue	

Table 3–5: Protrusion length and air needle: (continued)

Protrusion length range (mm)	Air needle type	Description
10 to 16	74 mm, green	
4 to 10	80 mm, black	

3.7.3 Example

For a Greiner deep well with Micronic capmat M53000, the autosampler operates using a standard needle height.

- Ht = 41.4 mm
- Dw = 37.8 mm
- Cd = 3.8 mm
- Nh = 6.0 mm (standard)
- Ac = 2.0 mm (minimum)

The following is true:

- 41.4 - 37.8 = 3.6 *(which is between 2 and 6 mm)*
- Protrusion length = 41.4 - 3.8 - 6.0 - 2.0 = 29.6
- A 56-mm (red) air needle is needed.

3.7.4 Replacing air needles

To replace the air needle:

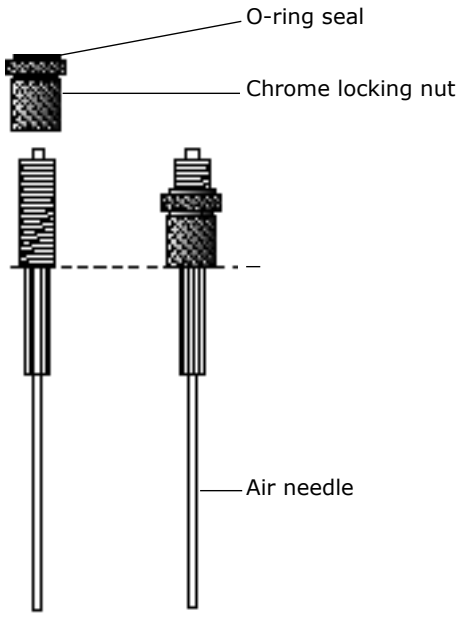
1. From the 2707 Console, click Maintain > Replace > Needle.

   Result: The needle moves to the exchange position.
2. Follow the instructions in the Replace Needle warning box, and then click OK.
3. Loosen the needle connection nut (see the figure, "Replacing the sample needle:").
4. Loosen the nut that connects the tubing to port 4 of the injection valve.
5. Grasp the sample needle's tubing, and pull the sample needle out of its fitting.
6. Unscrew the air needle's chrome locking nut.
7. Pull the air needle downward and out of its fitting.
8. Remove the chrome locking nut from the old air needle, and install the locking nut on the new air needle.

   Tips:

   - Ensure that the O-ring seal is in the locking nut.
   - Ensure that the bottom thread of the air needle is level with the lower part of the locking nut.

Figure 3–4: Installing the chrome locking nut:



9. Install the air needle into the needle assembly.

   Requirement: Ensure that the air seal encircles the needle.

10. Install the sample needle, and then tighten the needle connection nut onto the needle assembly.
11. In the Replace Needle window, click Reset.

    Result: The needles return to the home position.

12. Finger-tighten the other end of the sample needle connection tubing to port 4 of the injection valve.

    Recommendation: To avoid blocking the tubing, finger tighten only.

13. On the 2707 Console, click Control > Wash/prime needle.

3.7.5 Adjusting the needle position

If the needle's position is not optimal, adjust the needle position. The needle height adjustment is set in the 2707 instrument method.

See also: "Adjust the needle position" in the 2707 Autosampler Help.

In the General tab of the 2707 Autosampler instrument method editor, select the Advanced button. In the Advanced Settings dialog box, specify the Needle Placement (in mm) above the bottom of the vial or well.

Default: 6.0 mm.

Notice: To prevent the needle from touching the bottoms of vials when using trays with 12 or 48 vials, make sure the needle height setting is greater than 2 mm.

3.8 Replacing a syringe

The autosampler is fitted with a 500-µL syringe as standard equipment. The preparative option requires a 2,500-µL syringe.

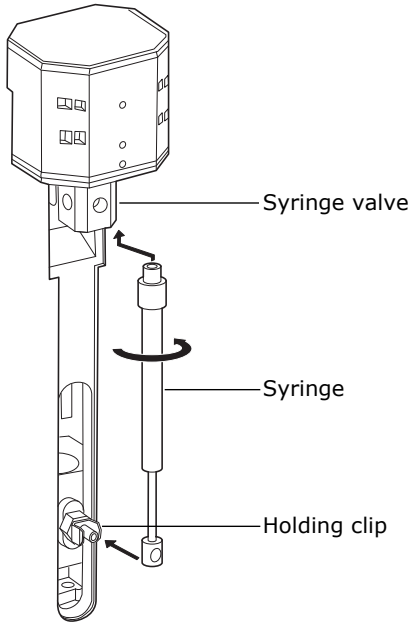
Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- Syringe including a new Teflon syringe gasket
- Isopropanol

To replace a syringe:

1. From the 2707 Console, click Maintain > Replace > Syringe.
   Result: The syringe plunger lowers.
2. Unscrew the syringe from syringe valve.
   Requirement: Keep the connector in the valve intact.

Figure 3–5: Replacing the syringe:



3. Disconnect the plunger from the syringe drive by sliding it straight backward, out of the holding clip.
4. Remove the Teflon syringe gasket from the valve's syringe fitting port.
5. Fill the new syringe with degassed wash solvent.
   Recommendations:
   - Use isopropanol as the wash solvent.
   - Remove air bubbles from the syringe.
6. Fit a new Teflon gasket on the syringe.
   Tip: The syringe includes a Teflon syringe gasket.

7. Connect the plunger of the filled syringe to the syringe drive by pushing it straight onto the clip.

   Requirement: Keep the top threaded end below the syringe valve.

8. Raise the syringe, and screw it firmly into the connector.
9. In the Replace Sample Syringe dialog box, click Reset.

   Result: The syringe moves to the home position and dispenses its contents to waste.

10. On the 2707 Console, click Control > Wash/prime needle.

    Result: All tubing connected to the syringe valve refills and flushes.

11. Purge all air bubbles from the syringe and buffer tubing by repeatedly washing the needle or removing and repriming the syringe with degassed, nonaqueous organic solvent.

3.8.1 Replacing syringe plungers and plunger tips

You can replace the plunger or plunger tip separately or together.

Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- Pliers
- Plunger or plunger tip
- Isopropanol

To replace the plunger or plunger tip:

1. From the 2707 Console, click Maintain > Replace > Syringe.

   Result: The syringe plunger lowers.

2. Unscrew the syringe from syringe valve.

   Requirement: Keep the connector in the valve intact.

3. Disconnect the plunger from the syringe drive by sliding it straight back and out of the holding clip.
4. Slide the plunger out of the syringe barrel.
5. Using pliers, remove the plunger tip.
6. Dampen the new tip with an appropriate solvent (e.g., isopropanol).
7. Mount the new tip on the plunger.
8. Insert the plunger into the syringe barrel.
9. Fill the new syringe with degassed wash solvent.

   Recommendations:

   - Use isopropanol as the wash solvent.
   - Remove air bubbles from the syringe.

10. Connect the plunger of the filled syringe to the syringe drive by pushing it straight onto the clip.

    Requirement: Keep the top threaded end below the syringe valve.

11. Raise the syringe, and screw it firmly into the connector.
12. In the Replace Sample Syringe dialog box, click Reset.

    Result: The syringe moves to the home position and dispenses its contents to waste.
13. On the 2707 Console, click Control > Wash/prime needle.

    Result: All tubing connected to the syringe valve refills and flushes.
14. Purge all air bubbles from the syringe and buffer tubing by repeatedly washing the needle or removing and repriming the syringe with degassed, nonaqueous organic solvent.

3.8.2 Replacing the syringe dispenser valve

The syringe valve is a 4-port selection valve. One port is unused.

Table 3–6: Port assignments for 4-port selection valve:

Port	Description
Waste	Drain for the syringe dispenser
Wash	Port for aspirating wash liquid from the wash bottle
Needle	Connects to the buffer tubing
Unused	Unused

The valve can accommodate both syringe sizes:

- 500 µL (standard, analytical syringe)
- 2,500 µL (preparative syringe, included in the optional prep kit)

Requirement: Make all connections to the syringe valve using finger-tight fittings.

Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- 2-mm socket-head driver
- Sample syringe
- Methanol

Tip: When the syringe valve is in the "Remove" position, the mounting screws are in line with the holes.

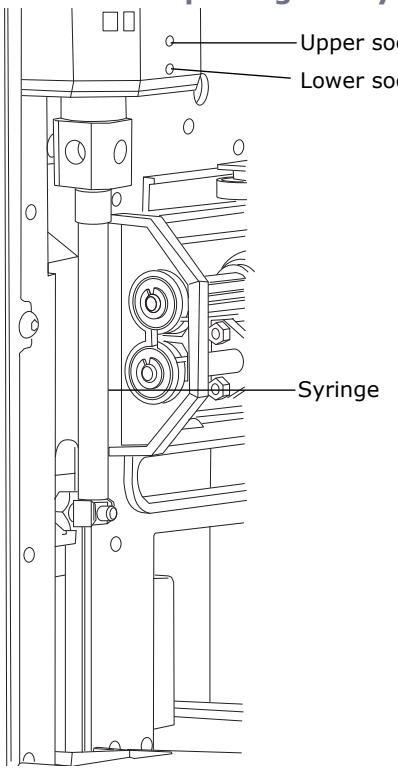
To replace the syringe dispenser valve:

1. From the 2707 Console, click Maintain > Replace > Syringe.

   Result: The syringe plunger lowers.
2. Unscrew the syringe from syringe valve.
3. Disconnect the plunger from the syringe drive by sliding it straight back and out of the holding clip.
4. Unscrew the needle wash tube fitting and the holding loop fitting from the syringe valve.

5. In the Replace Sample Syringe dialog box, click Reset.
6. On the 2707 Console, select Interactive Display from the directory tree.
7. Click (Control On).
   Result: Syringe valve control is enabled.
8. Click the syringe valve position text, select "Remove (Used to replace syringe valve)" in the dialog box, and click (OK).
9. Press Enter.
   Result: The set screws align with the holes.
10. Using a 2-mm socket-head driver, loosen the lower socket-head screw 2 turns.
    Recommendation: Complete no more than 2 turns.

Table 3–7: Replacing the syringe dispenser valve:



11. Using the 2-mm socket-head driver, loosen the upper socket-head screw 2 turns.
    Recommendation: Complete no more than 2 turns.
12. Slide the syringe valve downward, out of the instrument.
13. Remove the syringe valve.
14. Remove the waste fitting at the rear of the valve.
15. Attach the waste fitting of the new valve.
16. Install the new syringe valve with the flat side of the top axle facing forward.
17. Install the set screws.

18. Connect the needle wash tube fitting and the holding loop fitting to the syringe valve.
19. On the 2707 Console, exit the interactive display by selecting 2707 Autosampler from the directory tree.
20. Click Maintain > Replace > Syringe.
21. At the syringe connection port, install the Teflon seal in the syringe valve.

    Recommendation: Install a new seal in the valve. If you choose to reuse the seal from the old valve, be sure to orient it in its original position.
22. Fill the new syringe with degassed wash solvent, preferably methanol.

    Recommendation: Remove air bubbles from the syringe.
23. Connect the plunger of the filled syringe to the syringe drive by pushing it straight onto the clip.

    Requirement: Keep the top threaded end below the syringe valve.
24. Raise the syringe, and screw it firmly into the connector.
25. In the Replace Sample Syringe dialog box, click Reset.

    Result: The syringe moves to the home position and dispenses its contents to waste.
26. On the 2707 Console, click Control > Wash/prime needle.

    Result: All tubing connected to the syringe valve refills and flushes.
27. Purge all air bubbles from the syringe and buffer tubing by repeatedly washing the needle or removing and repriming the syringe with degassed, nonaqueous, organic solvent.

3.9 Removing or replacing the injection valve rotor seal

The plastic rotor seal of the autosampler's injection valve requires periodic cleaning and replacing.

Tip: While injection frequency and solvent cleanliness determine the seal's cleaning and replacement intervals, most seals require annual replacement.

Required tools and materials

- Gloves: clean, powder-free, chemical-resistant
- #2 Phillips® screwdriver
- 2.5-mm hex key wrench
- Rotor seal
- Methanol

To remove or replace the injection valve rotor seal:

1. Open the door, and disconnect all tubing from the valve.

   Exception: Keep the sample loop intact.

2. Using a 2.5-mm hex key wrench, remove the 3 screws from the stator part of the valve.

   Recommendation: Loosen each screw a half-turn each in rotation until all screws disengage.

3. Gently open the valve, and remove the rotor seal.
4. Clean or replace the seal.
5. Clean the stator face, place it back on the rotor, and fasten the screws.

   Recommendation: Tighten each screw a half-turn each in rotation until all screws are tight.

6. Reconnect all tubing to the valve.
7. On the 2707 Console, click Control > Wash/prime needle.

   Result: All tubing connected to the syringe valve refills and flushes.

3.10 Cleaning the autosampler

In general, the autosampler needs little maintenance. You can clean the autosampler as recommended in the table, Cleaning recommendations.

Required materials

- Gloves: clean, powder-free, chemical-resistant
- Cloth dampened with nonaggressive cleaning liquid

Table 3–8: Cleaning recommendations:

Autosampler part	Recommendation
Exterior surfaces	Clean with a damp cloth and nonaggressive cleaning liquid.
Drip tray and sample tray	Clean with a damp cloth and nonaggressive cleaning liquid.
Drain tubing	Regularly flush with solvent to prevent clogging and ensure disposal of liquids and condensate.

3.11 Replacing fuses

Warning: To protect against fire hazard, replace fuses with those of the correct type and rating.

The autosampler has two 2.5-A fuses in its rear fusebox. Install fuses of the same type and rating.

Tip: An unlit LED may indicate a blown fuse.

If any of an autosampler's fuses rupture or become otherwise faulty, replace it with a fuse of the type and rating shown in the following table:

Table 3–9: Fuse information:

Location	Type	Current rating	Rupture capacity	Voltage rating
Fusebox in rear panel	T	2.5 A	1500 A	250 V

If fuse problems recur, contact Waters Service.

A Safety Advisories

Waters instruments and devices display hazard symbols that alert you to the hidden dangers associated with a product's operation and maintenance. The symbols also appear in product manuals where they accompany statements describing the hazards and advising how to avoid them. This appendix presents the safety symbols and statements that apply to all of Waters' product offerings.

A.1 Warning symbols

Warning symbols alert you to the risk of death, injury, or seriously adverse physiological reactions associated with the misuse of an instrument of device. Heed all warnings when you install, repair, or operate any Waters instrument or device. Waters accepts no liability in cases of injury or property damage resulting from the failure of individuals to comply with any safety precaution when installing, repairing, or operating any of its instruments or devices.

The following symbols warn of risks that can arise when you operate or maintain a Waters instrument or device or component of an instrument or device. When one of these symbols appear in a manual's narrative sections or procedures, an accompanying statement identifies the applicable risk and explains how to avoid it.

Warning: (General risk of danger. When this symbol appears on an instrument, consult the instrument's user documentation for important safety-related information before you use the instrument.)

Warning: (Risk of burn injury from contacting hot surfaces.)

Warning: (Risk of electric shock.)

Warning: (Risk of fire.)

Warning: (Risk of sharp-point puncture injury.)

Warning: (Risk of hand crush injury.)

Warning: (Risk of injury caused by moving machinery.)

Warning: (Risk of exposure to ultraviolet radiation.)

Warning: (Risk of contacting corrosive substances.)

Warning: (Risk of exposure to a toxic substance.)

Warning: (Risk of personal exposure to laser radiation.)

Warning: (Risk of exposure to biological agents that can pose a serious health threat.)

Warning: (Risk of tipping.)

Warning: (Risk of explosion.)

Warning: (Risk of high-pressure gas release.)

A.1.1 Specific warnings

The following warnings (both symbols and text) can appear in the user manuals of particular instruments and devices and on labels affixed to them or their component parts.

A.1.1.1 Burst warning

This warning applies to Waters instruments and devices fitted with nonmetallic tubing.

Warning: To avoid injury from bursting, nonmetallic tubing, heed these precautions when working in the vicinity of such tubing when it is pressurized:

- Wear eye protection.
- Extinguish all nearby flames.
- Do not use tubing that is, or has been, stressed or kinked.
- Do not expose nonmetallic tubing to compounds with which it is chemically incompatible: tetrahydrofuran, nitric acid, and sulfuric acid, for example.
- Be aware that some compounds, like methylene chloride and dimethyl sulfoxide, can cause nonmetallic tubing to swell, significantly reducing the pressure at which the tubing can rupture.

A.1.1.2 Biohazard warning

The following warning applies to Waters instruments and devices that can process material containing biohazards, which are substances that contain biological agents capable of producing harmful effects in humans.

Warning: To avoid infection with potentially infectious, human-sourced products, inactivated microorganisms, and other biological materials, assume that all biological fluids that you handle are infectious.

Specific precautions appear in the latest edition of the US National Institutes of Health (NIH) publication, *Biosafety in Microbiological and Biomedical Laboratories* (BMBL).

Observe Good Laboratory Practice (GLP) at all times, particularly when working with hazardous materials, and consult the biohazard safety representative for your organization regarding the proper use and handling of infectious substances.

A.1.1.3 Biohazard and chemical hazard warning

These warnings apply to Waters instruments and devices that can process biohazards, corrosive materials, or toxic materials.

Warning: To avoid personal contamination with biohazards, toxic materials, or corrosive materials, you must understand the hazards associated with their handling.

Guidelines prescribing the proper use and handling of such materials appear in the latest edition of the National Research Council's publication, *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards.*

Observe Good Laboratory Practice (GLP) at all times, particularly when working with hazardous materials, and consult the safety representative for your organization regarding its protocols for handling such materials.

A.2 Notices

Notice advisories appear where an instrument or device can be subject to use or misuse that can damage it or compromise a non-clinical sample’s integrity. The exclamation point symbol and its associated statement alert you to such risk.

Notice: To avoid damaging the instrument’s case, do not clean it with abrasives or solvents.

A.3 Bottles Prohibited symbol

The Bottles Prohibited symbol alerts you to the risk of equipment damage caused by solvent spills.

Prohibited: To avoid equipment damage caused by spilled solvent, do not place reservoir bottles directly atop an instrument or device or on its front ledge. Instead, place the bottles in the bottle tray, which serves as secondary containment in the event of spills.

A.4 Required protection

The Use Eye Protection and Wear Protective Gloves symbols alert you to the requirement for personal protective equipment. Select appropriate protective equipment according to your organization's standard operating procedures.

Requirement: Use eye protection when refilling or replacing solvent bottles.

Requirement: Wear clean, chemical-resistant, powder-free gloves when handling samples.

A.5 Warnings that apply to all Waters instruments and devices

When operating this device, follow standard quality-control procedures and the equipment guidelines in this section.

Attention: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Important: Toute modification sur cette unité n'ayant pas été expressément approuvée par l'autorité responsable de la conformité à la réglementation peut annuler le droit de l'utilisateur à exploiter l'équipement.

Achtung: Jedwede Änderungen oder Modifikationen an dem Gerät ohne die ausdrückliche Genehmigung der für die ordnungsgemäße Funktionstüchtigkeit verantwortlichen Personen kann zum Entzug der Bedienungsbefugnis des Systems führen.

Avvertenza: qualsiasi modifica o alterazione apportata a questa unità e non espressamente autorizzata dai responsabili per la conformità fa decadere il diritto all'utilizzo dell'apparecchiatura da parte dell'utente.

Atencion: cualquier cambio o modificación efectuado en esta unidad que no haya sido expresamente aprobado por la parte responsable del cumplimiento puede anular la autorización del usuario para utilizar el equipo.

注意：未經有關法規認證部門允許對本設備進行的改變或修改,可能會使使用者喪失操作該設備的權利。

注意：未经有关法规认证部门明确允许对本设备进行的改变或改装，可能会使使用者丧失操作该设备的合法性。

주의: 규정 준수를 책임지는 당사자의 명백한 승인 없이 이 장치를 개조 또는 변경할 경우, 이 장치를 운용할 수 있는 사용자 권한의 효력을 상실할 수 있습니다.

注意：規制機関から明確な承認を受けずに本装置の変更や改造を行うと、本装置のユーザーとしての承認が無効になる可能性があります。

Warning: Use caution when working with any polymer tubing under pressure:

- Always wear eye protection when near pressurized polymer tubing.
- Extinguish all nearby flames.
- Do not use tubing that has been severely stressed or kinked.
- Do not use nonmetallic tubing with tetrahydrofuran (THF) or concentrated nitric or sulfuric acids.
- Be aware that methylene chloride and dimethyl sulfoxide cause nonmetallic tubing to swell, which greatly reduces the rupture pressure of the tubing.

Attention: Manipulez les tubes en polymère sous pression avec precaution:

- Portez systématiquement des lunettes de protection lorsque vous vous trouvez à proximité de tubes en polymère pressurisés.
- Eteignez toute flamme se trouvant à proximité de l'instrument.
- Evitez d'utiliser des tubes sévèrement déformés ou endommagés.
- Evitez d'utiliser des tubes non métalliques avec du tétrahydrofurane (THF) ou de l'acide sulfurique ou nitrique concentré.
- Sachez que le chlorure de méthylène et le diméthylesulfoxyde entraînent le gonflement des tuyaux non métalliques, ce qui réduit considérablement leur pression de rupture.

Vorsicht: Bei der Arbeit mit Polymerschläuchen unter Druck ist besondere Vorsicht angebracht:

- In der Nähe von unter Druck stehenden Polymerschläuchen stets Schutzbrille tragen.
- Alle offenen Flammen in der Nähe löschen.
- Keine Schläuche verwenden, die stark geknickt oder überbeansprucht sind.
- Nichtmetallische Schläuche nicht für Tetrahydrofuran (THF) oder konzentrierte Salpeter- oder Schwefelsäure verwenden.

Durch Methylenchlorid und Dimethylsulfoxid können nichtmetallische Schläuche quellen; dadurch wird der Berstdruck des Schlauches erheblich reduziert.

Attenzione: fare attenzione quando si utilizzano tubi in materiale polimerico sotto pressione:

- Indossare sempre occhiali da lavoro protettivi nei pressi di tubi di polimero pressurizzati.
- Spegnere tutte le fiamme vive nell'ambiente circostante.
- Non utilizzare tubi eccessivamente logorati o piegati.
- Non utilizzare tubi non metallici con tetraidrofurano (THF) o acido solforico o nitrico concentrati.
- Tenere presente che il cloruro di metilene e il dimetilsolfossido provocano rigonfiamenti nei tubi non metallici, riducendo notevolmente la pressione di rottura dei tubi stessi.

Advertencia: se recomienda precaución cuando se trabaje con tubos de polímero sometidos a presión:

- El usuario deberá protegerse siempre los ojos cuando trabaje cerca de tubos de polímero sometidos a presión.
- Si hubiera alguna llama las proximidades.
- No se debe trabajar con tubos que se hayan doblado o sometido a altas presiones.
- Es necesario utilizar tubos de metal cuando se trabaje con tetrahidrofurano (THF) o ácidos nítrico o sulfúrico concentrados.

Hay que tener en cuenta que el cloruro de metileno y el sulfóxido de dimetilo dilatan los tubos no metálicos, lo que reduce la presión de ruptura de los tubos.

警告：當在有壓力的情況下使用聚合物管線時，小心注意以下幾點。

- 當接近有壓力的聚合物管線時一定要戴防護眼鏡。
- 熄滅附近所有的火焰。
- 不要使用已經被壓癟或嚴重彎曲管線。
- 不要在非金屬管線中使用四氫呋喃或濃硝酸或濃硫酸。

要了解使用二氯甲烷及二甲基亞楓會導致非金屬管線膨脹，大大降低管線的耐壓能力。

警告：当有压力的情况下使用管线时，小心注意以下几点：

- **当接近有压力的聚合物管线时一定要戴防护眼镜。**
- **熄灭附近所有的火焰。**
- **不要使用已经被压瘪或严重弯曲的管线。**
- **不要在非金属管线中使用四氢呋喃或浓硝酸或浓硫酸。**

要了解使用二氯甲烷及二甲基亚枫会导致非金属管线膨胀，大大降低管线的耐压能力。

경고: 가압 폴리머 튜브로 작업할 경우에는 주의하십시오.

- 가압 폴리머 튜브 근처에서는 항상 보호 안경을 착용하십시오.
- 근처의 화기를 모두 끄십시오.
- 심하게 변형되거나 꼬인 튜브는 사용하지 마십시오.
- 비금속(Nonmetallic) 튜브를 테트라히드로푸란(Tetrahydrofuran: THF) 또는 농축 질산 또는 황산과 함께 사용하지 마십시오.

염화 메틸렌 (Methylene chloride) 및 디메틸술폭시드 (Dimethyl sulfoxide) 는 비금속 튜브를 부풀려 튜브의 파열 압력을 크게 감소시킬 수 있으므로 유의하십시오 .

警告：圧力のかかったポリマーチューブを扱うときは、注意してください。

- 加圧されたポリマーチューブの付近では、必ず保護メガネを着用してください。
- 近くにある火を消してください。
- 著しく変形した、または折れ曲がったチューブは使用しないでください。
- 非金属チューブには、テトラヒドロフラン(THF)や高濃度の硝酸または硫酸などを流さないでください。

塩化メチレンやジメチルスルホキシドは、非金属チューブの膨張を引き起こす場合があり、その場合、チューブは極めて低い圧力で破裂します。

Warning: The user shall be made aware that if the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Attention: L'utilisateur doit être informé que si le matériel est utilisé d'une façon non spécifiée par le fabricant, la protection assurée par le matériel risque d'être défectueuses.

Vorsicht: Der Benutzer wird darauf aufmerksam gemacht, dass bei unsachgemäßer Verwendung des Gerätes die eingebauten Sicherheitseinrichtungen unter Umständen nicht ordnungsgemäß funktionieren.

Attenzione: si rende noto all'utente che l'eventuale utilizzo dell'apparecchiatura secondo modalità non previste dal produttore può compromettere la protezione offerta dall'apparecchiatura.

Advertencia: el usuario deberá saber que si el equipo se utiliza de forma distinta a la especificada por el fabricante, las medidas de protección del equipo podrían ser insuficientes.

警告：使用者必須非常清楚如果設備不是按照製造廠商指定的方式使用，那麼該設備所提供的保護將被消弱。

警告：使用者必须非常清楚如果设备不是按照制造厂商指定的方式使用，那么该设备所提供的保护将被削弱。

경고: 제조업체가 명시하지 않은 방식으로 장비를 사용할 경우 장비가 제공하는 보호 수단이 제대로 작동하지 않을 수 있다는 점을 사용자에게 반드시 인식시켜야 합니다.

警告：ユーザーは、製造元により指定されていない方法で機器を使用すると、機器が提供している保証が無効になる可能性があることに注意して下さい。

A.6 Warnings that address the replacing of fuses

The following warnings pertain to instruments and devices equipped with user-replaceable fuses. Information describing fuse types and ratings sometimes, but not always, appears on the instrument or device.

Finding fuse types and ratings when that information appears on the instrument or device

Warning: To protect against fire, replace fuses with those of the type and rating printed on panels adjacent to instrument fuse covers.

Attention: pour éviter tout risque d'incendie, remplacez toujours les fusibles par d'autres du type et de la puissance indiqués sur le panneau à proximité du couvercle de la boite à fusible de l'instrument.

Vorsicht: Zum Schutz gegen Feuer die Sicherungen nur mit Sicherungen ersetzen, deren Typ und Nennwert auf den Tafeln neben den Sicherungsabdeckungen des Geräts gedruckt sind.

Attenzione: per garantire protezione contro gli incendi, so8stituire i fusibili con altri dello stesso tipo aventi le caratteristiche indicate sui pannelli adiacenti alla copertura fusibili dello strumento.

Advertencia: Para evitar incendios, sustituir los fusibles por aquellos del tipo y características impresos en los paneles adyacentes a las cubiertas de los fusibles del instrumento.

警告 ：為了避免火災，更換保險絲時，請使用與儀器保險絲蓋旁面板上所印刷之相同類型與規格的保險絲。

警告：为了避免火灾，应更换与仪器保险丝盖旁边面板上印刷的类型和规格相同的保险丝。

경고 **:** 화재의 위험을 막으려면 기기 퓨즈 커버에 가까운 패널에 인쇄된 것과 동일한 타입 및 정격의 제품으로 퓨즈를 교체하십시오 .

警告：火災予防のために、ヒューズ交換では機器ヒューズカバー脇のパネルに記載されているタイプおよび定格のヒューズをご使用く ださい。

Finding fuse types and ratings when that information does not appear on the instrument or device

Warning: To protect against fire, replace fuses with those of the type and rating indicated in the “Replacing fuses” section of the Maintenance Procedures chapter.

Attention: pour éviter tout risque d'incendie, remplacez toujours les fusibles par d'autres du type et de la puissance indiqués dans la rubrique "Remplacement des fusibles" du chapitre traitant des procédures de maintenance.

Vorsicht: Zum Schutz gegen Feuer die Sicherungen nur mit Sicherungen ersetzen, deren Typ und Nennwert im Abschnitt "Sicherungen ersetzen" des Kapitels "Wartungsverfahren" angegeben sind.

Attenzione: per garantire protezione contro gli incendi, sostituire i fusibili con altri dello stesso tipo aventi le caratteristiche indicate nel paragrafo "Sostituzione dei fusibili" del capitolo "Procedure di manutenzione".

Advertencia: Para evitar incendios, sustituir los fusibles por aquellos del tipo y características indicados en la sección "Sustituir fusibles".

警告 ：為了避免火災，更換保險絲時，應使用「維護步驟」章節中「更換保險絲」所指定之相同類型與規格的保險絲。

警告：为了避免火灾，应更换 “维护步骤” 一章的 “更换保险丝” 一节中介绍的相同类型和规格的保险丝。

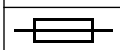
경고 : 화재의 위험을 막으려면 유지관리 절차 단원의 " 퓨즈 교체 " 절에 설명된 것과 동일한 타입 및 정격의 제품으로 퓨즈를 교체하십시오 .

警告：火災予防のために、ヒューズ交換ではメンテナンス項目の「ヒューズの交換」に記載されているタイプおよび定格のヒューズをご使用く ださい。

A.7 Electrical and handling symbols

A.7.1 Electrical symbols

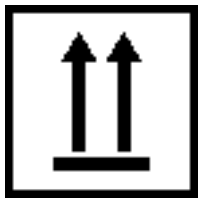
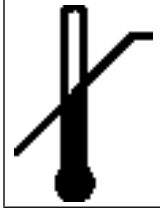
The following electrical symbols and their associated statements can appear in instrument manuals and on an instrument’s front or rear panels.

Symbol	Description
	Electrical power on
	Electrical power off
	Standby
	Direct current
	Alternating current
	Alternating current (3 phase)
	Safety ground
	Frame, or chassis, terminal
	Fuse

Symbol	Description
	Functional ground
	Input
	Output

A.7.2 Handling symbols

The following handling symbols and their associated statements can appear on labels affixed to the packaging in which instruments, devices, and component parts are shipped.

Symbol	Description
	Keep upright!
	Keep dry!
	Fragile!
	Use no hooks!
	Upper limit of temperature

Symbol	Description
	Lower limit of temperature
	Temperature limitation

B Specifications

The specifications presented here depend on the conditions in individual laboratories. Refer to the system's site preparation guide, or contact the Waters® Technical Service organization for additional information about specifications.

B.1 Physical specifications

The following table lists the physical specifications for the 2707 Autosampler.

Table B–1: Physical specifications:

Attribute	Specification
Height	360 mm
Width	300 mm
Depth	Without cooling: 510 mm (D) With cooling: 575 mm (D)
Weight	Without cooling: 19 kg With cooling: 21 kg

The following table lists the general specifications for the autosampler.

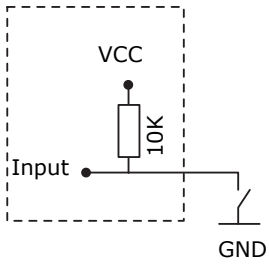
General specifications	
Sound pressure level	< 65 dB
Working temperature	10 to 40 °C (indoor use only)
Storage temperature	–25 to 60 °C
Humidity	20 to 80% RH
Safety and EMC compatibility	According to EC-directives; CSA (UL) approved
Installation class	II
Pollution degree	2
External circuit insulation	Basic (single layer of insulation)
Altitude	Up to 2,000 m
Dimensions	Without cooling: 300 mm (W) × 510 mm (D) × 360 mm (H) With cooling: 300 mm (W) × 575 mm (D) × 360 mm (H)

General specifications	
Weight	Without cooling: 19 kg With cooling: 21 kg
Maximum weight that can be placed on the device	65 kg
Electrical requirements	95 to 240 Volt AC ± 10%; 50 to 60 Hz; 200 VA
Viscosity range	0.1 to 5 cP

The following table lists the programming specifications for the autosampler.

Programming specifications	
Injection methods	Analytical: Partial-loop needle-overfill, full-loop needle-overfill, or partial-loop injections Preparative: Partial-loop needle-overfill injections
Injection volume	Analytical: 0 µL to 5,000 µL (with 1-µL increment), depending on system settings Preparative: 0 µL to 10,000 µL (with 1-µL increment), depending on system settings
Maximum injection volume	Analytical: • Partial-loop using needle-overfill = ½ × loop volume • Full-loop using needle-overfill = loop volume • Partial-loop = (loop volume – [3 × needle volume])/2 Preparative: Partial-loop using needle-overfill = loop volume
Maximum analysis time	9 hr, 59 min, 59 sec
Wash	Between injections
Priority sample	Programmable

The following table lists the communication specifications for the autosampler.

Communication specifications	
Outputs	Relay output, 28V AC/DC max, I_{max} = 0.25A
Inputs	2 programmable TTL inputs, programmable as Hold inject (default) and Stop inject Active low 
Communication port	Ethernet

The following table lists the options for the autosampler.

Options	
Sample tray cooling (factory installed)	Built-in Peltier cooling Range: 4 °C to ambient – 3 °C Air temperature in sample compartment: 4 °C ± 2 °C (at temperature sensor) (Temperature at 80% relative humidity and 25 °C ambient temperature)
Biocompatible sample flow path and valve (user installable)	Inert sample needle (Silcosteel®) and biocompatible valve (PEEK)
Preparative kit (user installable)	2,500-µL syringe, prep valve, 10-mL and 5-mL sample loops, 2,000-µL buffer tubing, large sample volume (LSV) needle, and 2 sample trays for 12, 10-mL vials

B.2 Analytical mode specifications

The following table lists the sampling specifications for the autosampler in analytical mode.

Sampling (analytical mode)	
Sample capacity	2 plates or trays according to ANSI/SBS standards: • microtiter plates in 96-well high/low and 384-well low formats • 48-vial trays for 2-mL vials **Important:** Any combination of plates is allowed, except for a 384 low plate on the left and a 96 high plate on the right.
Vial/plate dimensions	Including septa or capmat: Maximum 47 mm height
Loop volume	1 µL to 5,000 µL
Dispenser syringe	500 µL
Buffer tubing	1,000 µL
Vial detection	Missing vial/well plate detection by sensor
Headspace pressure	Built-in compressor, but only for vials with septa
Switching time injection valve	Electrically < 100 msec
Piercing precision needle	± 0.6 mm
Wash solvent	Integrated wash solvent bottle
Wetted parts in flow path	SS316, PTFE, Tefzel®, glass, PEEK®, Vespel®
Injection cycle time	< 60 sec in all injection modes for 1 injection ≤ 100 µL including 300-µL wash

The following table lists the performance specifications for the autosampler in analytical mode.

Performance (analytical mode)	
Reproducibility (valid at 1.0 cP)	RSD ≤ 0.5% for partial-loop needle-overfill injections, injection volumes > 10 µL RSD ≤ 0.3% for full-loop needle-overfill injections RSD ≤ 1.0% for partial-loop injections, injection volumes > 10 µL
Carryover	< 0.05% with programmable needle wash

The following table lists the tubing for the autosampler in analytical mode.

Tubing	Materials/dimensions
Standard sample needle and tubing (label 15 µL)	SS: 97 mm × 0.8 mm OD × 0.25 mm ID ETFE (Tefzel): 200 mm × 1/16” OD × 0.25 mm ID
Buffer tubing from high-pressure valve to syringe valve (label 1,000 µL)	ETFE (Tefzel): 1275 mm × 1/16” OD × 1.0 mm ID
Tubing syringe valve to wash solvent bottle	PTFE: 400 mm × 1/8” OD × 1.6 mm ID
Tubing syringe valve to waste	PTFE: 400 mm × 1/8” OD × 1.6 mm ID
Clear	Plastic tubing for wash solvent
Blue	High-pressure steel tubing, 0.03-inch (0.75-mm) ID; connects the device to the pump
Red	High-pressure steel tubing, 0.009-inch (0.25-mm) ID; connects the device to the column
Drain	Two 0.25-inch clear lines; attach to the openings on the device’s front, at the bottom: one drains solvent and sample spills, while the other drains water from the cooler, sample spills, and mobile phase leaks

Tips: When installing new tubing, be sure to:

- Avoid overtightening nuts, because doing so may block the flow path.
- Use tubing volumes suited for the other items in the flow path.

B.3 Prep mode specifications

This specification lists only items that differ from the standard instrument specification. The preparative version of this device is designed for large sample volumes (LSV).

Sampling (Preparative mode)	
Sampling capacity	24 vials of 10 mL (LSV)
Vial dimensions (cap included)	Maximum vial height: 47 mm
Loop volume	Not programmable; injection volume determines the aspirated sample volume
Dispenser syringe	2,500-µL syringe
Injection volume	0 µL to 10,000 µL, with 1-µL increments
Maximum injection volume	Partial-loop using needle-overfill = loop volume

Sampling (Preparative mode)	
Valve	Valco, 0.75-bore valve
Sample loop	10-mL SS sample loop, 1/8” tubing with 1/16” tubing ends and Valco fittings 5-mL SS sample loop, 1/16” tubing with Valco fittings
Buffer tubing	2,000 µL
Needle	60 µL, LSV needle with LSV air needle
Wetted parts in flow path	SS316, PTFE, Tefzel, glass, PEEK, Valcon-H

Performance (Preparative mode)	
Injection method	Partial-loop using needle-overfill injections
Reproducibility	RSD ≤ 1.0%, injection volumes > 10 µL up to 50% of the installed sample loop
Viscosity range	0.1 – 5 cP
Memory effect	< 0.1% with programmable needle wash