General Information

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Waters’ Technical Communications organization invites you to report any errors that you encounter in this document or to suggest ideas for otherwise improving it. Help us better understand what you expect from our
documentation so that we can continuously improve its accuracy and usability.

We seriously consider every customer comment we receive. You can reach us at tech_comm@waters.com.

Contacting Waters

Contact Waters® with enhancement requests or technical questions regarding the use, transportation, removal, or disposal of any Waters product. You can reach us via the Internet, telephone, or conventional mail.

Waters contact information:

<table>
<thead>
<tr>
<th>Contacting medium</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone and fax</td>
<td>From the USA or Canada, phone 800 252-4752, or fax 508 872 1990. For other locations worldwide, phone and fax numbers appear in the Waters Web site.</td>
</tr>
</tbody>
</table>
| Conventional mail        | Waters Corporation  
34 Maple Street  
Milford, MA 01757  
USA |

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 safety representative for guidance.
Considerations specific to the ISM

High voltage hazard

⚠️ **Warning:** To avoid electric shock, do not remove the device’s protective panels. The components within are not user-serviceable.

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.

Canada spectrum management emissions notice

This class A digital product apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003.

Electrical power safety notice

Do not position the instrument so that it is difficult to operate the disconnecting device.

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 which have to be taken.

Equipment misuse notice

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
Safety advisories

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

Operating this device

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

Applicable symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Manufacturer" /></td>
<td>Manufacturer</td>
</tr>
<tr>
<td><img src="image" alt="Authorized representative of the European Community" /></td>
<td>Authorized representative of the European Community</td>
</tr>
<tr>
<td><img src="image" alt="CE" /></td>
<td>Confirms that a manufactured product complies with all applicable European Community directives</td>
</tr>
<tr>
<td><img src="image" alt="Australia C-Tick EMC compliant" /></td>
<td>Australia C-Tick EMC compliant</td>
</tr>
<tr>
<td><img src="image" alt="Consult instructions for use" /></td>
<td>Consult instructions for use</td>
</tr>
<tr>
<td><img src="image" alt="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." /></td>
<td>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.</td>
</tr>
</tbody>
</table>
Audience and purpose

This guide is intended for personnel who install, operate and maintain the ACQUITY isocratic solvent manager. It gives an overview of the technology and operation of the isocratic solvent manager.

Intended use of the isocratic solvent manager

Waters designed the isocratic solvent manager for use in liquid chromatography applications. The isocratic solvent manager is not intended for use in diagnostic applications.

Industrial scientific and medical classification

Industrial scientific and medical classification: Industrial Scientific and Medical Group 1 Class B

This classification has been assigned in accordance with IEC CISPR 11 Industrial scientific and medical 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

Waters Corporation (Micromass UK Ltd.)
Floats Road
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Manchester M23 9LZ
United Kingdom

Telephone: +44-161-946-2400
Fax: +44-161-946-2480
Contact: Quality manager
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Waters designed the ACQUITY Isocratic Solvent Manager (ISM) to control the delivery of isocratic solvent as a make-up pump in a UPC\textsuperscript{2} system. The ISM, a single pump, operates at a maximum pressure of 103,421 kPa (1034 bar, 15,000 psi), and flow rates as high as 1 mL/min. The pressure decreases linearly, to 62,053 kPa (621 bar, 9000 psi), at flow rates up to 2 mL/min. The ISM can also function as the primary pump in a UPLC system.

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<tr>
<td>Flow path through the ISM with an installed Flow-splitter or Post-column Addition kit</td>
<td>22</td>
</tr>
</tbody>
</table>
Location of the ISM in a system

The following diagram shows the location of the ISM as a make-up pump in a typical system that includes a QDa (Quadrupole Dalton) mass detector:

**Note:** The ISM is typically located in the rightmost stack in a system.
The following diagram shows the major components of the ISM:

**ISM components:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulator pump</td>
<td></td>
<td>Receives solvent from the primary pump and delivers it to the system.</td>
</tr>
</tbody>
</table>
### ISM components: (Continued)

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulator check valve</td>
<td>A ball check valve that allows flow in only one direction.</td>
</tr>
<tr>
<td>Degasser vent tubing</td>
<td>Vents exhaust from the degasser pump.</td>
</tr>
<tr>
<td>Drip tray</td>
<td>Collects and routes fluid leaks.</td>
</tr>
<tr>
<td>Drip tray drain fitting</td>
<td>Conducts leakage from the drip tray and routes it to a waste vessel.</td>
</tr>
<tr>
<td>Flow-splitter and Post-column Addition kits (optional)</td>
<td>Several ISM kits are available for flow splitting and post-column addition.</td>
</tr>
<tr>
<td>Inline 22-μL filter</td>
<td>Filters the solvent before it reaches the pump outlet.</td>
</tr>
<tr>
<td>Leak sensor</td>
<td>Continuously monitors the ISM for leaks and stops the system flow when its optical sensor detects approximately 1.5 mL of accumulated, leaked liquid in its surrounding reservoir. <strong>Note:</strong> The leak sensor is part of the system kit and should be installed and configured in the software.</td>
</tr>
<tr>
<td>Low-pressure inlet filter</td>
<td>A filter that removes particulates from the solvent.</td>
</tr>
<tr>
<td>ISM mobile phase degasser chamber</td>
<td>Removes dissolved gasses from mobile phase solvent and exhausts them, and any condensates, through the vent valve waste tube. <strong>Note:</strong> Vacuum degassing can change the composition of mixed solvents.</td>
</tr>
<tr>
<td>On/off switch</td>
<td>Powers the ISM on or off.</td>
</tr>
<tr>
<td>Power LED</td>
<td>Indicates when the ISM is powered on or off.</td>
</tr>
<tr>
<td>Pressure transducer cable connectors</td>
<td>The electrical connections for the pressure transducers located on the front of the actuators.</td>
</tr>
<tr>
<td>Primary check valve</td>
<td>A ball check valve that allows flow in only one direction.</td>
</tr>
</tbody>
</table>
Optional ISM kits

Several optional ISM kits provide for flow splitting and post-column addition. The flow-splitter kits allow you to adjust the amount of analytical flow diluted and diverted to the QDa detector. Four splitter kits are available, each specific to a Waters instrument class:

- ACQUITY® LC (UPLC®, H-Class, and I-Class) Flow-splitter kit
- Alliance® Flow-splitter kit
- ACQUITY UPC²® Dual-Detection Flow-splitter kit
- ACQUITY UPC²® Triple-Detection Flow-splitter kit

The Post-column Addition kit is used to add additional liquid to the analytical flow stream before it enters the QDa detector. This kit is compatible with ACQUITY UPLC and Alliance systems.

---

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary pump</td>
<td>Draws solvent, transferring it to the accumulator pump and system as part of the serial flow design.</td>
</tr>
<tr>
<td>Run LED</td>
<td>Indicates the ISM status.</td>
</tr>
<tr>
<td>Sample manager purge solvent degasser chamber (optional)</td>
<td>Degasses the purge solvent which then flows through the sample manager. <strong>Note:</strong> Vacuum degassing can change the composition of mixed solvents.</td>
</tr>
<tr>
<td>Seal-wash pump</td>
<td>The pump that circulates solvent, to keep the actuators’ high-pressure seals free of contaminants.</td>
</tr>
<tr>
<td>Seal-wash waste tube</td>
<td>Conducts seal-wash waste to a waste vessel.</td>
</tr>
<tr>
<td>Solvent selection valve (optional)</td>
<td>A valve that allows selection of up to six different solvents used isocratically.</td>
</tr>
<tr>
<td>Vent valve waste tube</td>
<td>Tubing that vents solvent to waste during priming.</td>
</tr>
<tr>
<td>Vent valve</td>
<td>A valve that automatically switches to waste during priming and a block position during the leak test.</td>
</tr>
</tbody>
</table>
Note: The Post-column Addition kit is not compatible with the UPC\textsuperscript{2} Flow-splitter kits.

Visit www.waters.com/wqp for information about optional ISM kits, including how to order them.

**Split ratio**

The split ratio depends on various factors including, but not limited to, all flow-path components downstream of the split and chromatographic conditions (flow rate and solvent composition for both LC and make-up flows).

Restrictor modules in the ACQUITY UPLC and Alliance flow-splitter kits are used to tune the magnitude of the split ratio. The numeric labels on the restrictor modules correspond to the magnitude of the split ratio, as shown in the following tables. Restrictor modules with higher numeric labels result in higher split ratios.

**Label descriptions for the ACQUITY UPLC Flow-splitter kit restrictor module:**

<table>
<thead>
<tr>
<th>Restrictor module label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Allows the largest amount of analytical flow to the QDa detector.</td>
</tr>
<tr>
<td>100</td>
<td>Allows a smaller amount of analytical flow to the QDa detector.</td>
</tr>
<tr>
<td>250</td>
<td>Allows the smallest amount of analytical flow to the QDa detector.</td>
</tr>
</tbody>
</table>

**Label descriptions for the Alliance Flow-splitter kit restrictor module:**

<table>
<thead>
<tr>
<th>Restrictor module label</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Allows the largest amount of analytical flow to the QDa detector.</td>
</tr>
<tr>
<td>10</td>
<td>Allows a smaller amount of analytical flow to the QDa detector.</td>
</tr>
<tr>
<td>100</td>
<td>Allows the smallest amount of analytical flow to the QDa detector.</td>
</tr>
</tbody>
</table>
General guidelines

When using the ACQUITY UPLC and Alliance Flow-splitter kits, observe these guidelines:

- If the signal intensity in the QDa detector is low, switch to a restrictor module with a lower numeric label that allows more analytical flow to the QDa detector.
- If the signal intensity in the QDa detector is high, switch to a restrictor module with a higher numeric label that allows less analytical flow to the QDa detector.

The following tables provide expected ranges of mobile phase concentration at the QDa detector (percent mobile phase in make-up flow/mobile phase mixture entering QDa detector) over a gradient elution for a selected restrictor module, make-up flow organic, and make-up flow composition. The tables are valid for a make-up flow rate of 0.3 mL/min and an LC flow rate of 0.6 mL/min over a 0 to 90% organic gradient with methanol, acetonitrile, or isopropanol.

Expected ranges of mobile phase concentration at the QDa detector for the ACQUITY UPLC Flow-splitter kit

Restrictor module 10:

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th>Mobile phase concentration at QDa detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>Minimum %</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>10% organic</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
</tr>
<tr>
<td>Methanol</td>
<td>10% organic</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>10% organic</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
</tr>
</tbody>
</table>
### Expected ranges of mobile phase concentration at the QDa detector for the Alliance Flow-splitter kit

#### Restrictor module 100:

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th>Mobile phase concentration at QDa detector</th>
<th>Organic Composition</th>
<th>Minimum %</th>
<th>Maximum %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Isopropanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>1.5</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>0.5</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Methanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>1.5</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>1.4</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acetonitrile</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>1.5</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>1.6</td>
<td>4.4</td>
</tr>
</tbody>
</table>

#### Restrictor module 250:

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th>Mobile phase concentration at QDa detector</th>
<th>Organic Composition</th>
<th>Minimum %</th>
<th>Maximum %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Isopropanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>0.6</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>0.2</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Methanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>0.6</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acetonitrile</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>0.6</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>0.6</td>
<td>1.8</td>
</tr>
</tbody>
</table>

#### Restrictor module 5:

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th>Mobile phase concentration at QDa detector</th>
<th>Organic Composition</th>
<th>Minimum %</th>
<th>Maximum %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Isopropanol</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10% organic</td>
<td>5.2</td>
<td>26.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% organic</td>
<td>3.6</td>
<td>17.7</td>
</tr>
</tbody>
</table>
### Restrictor module 5: (Continued)

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th></th>
<th>Mobile phase concentration at QDa detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>Composition</td>
<td>Minimum %</td>
</tr>
<tr>
<td>Methanol</td>
<td>10% organic</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>5.1</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>10% organic</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>5.8</td>
</tr>
</tbody>
</table>

### Restrictor module 10:

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th></th>
<th>Mobile phase concentration at QDa detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>Composition</td>
<td>Minimum %</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>10% organic</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>1.7</td>
</tr>
<tr>
<td>Methanol</td>
<td>10% organic</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>2.3</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>10% organic</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>2.6</td>
</tr>
</tbody>
</table>

### Restrictor module 100:

<table>
<thead>
<tr>
<th>Make-up flow</th>
<th></th>
<th>Mobile phase concentration at QDa detector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>Composition</td>
<td>Minimum %</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>10% organic</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>0.1</td>
</tr>
<tr>
<td>Methanol</td>
<td>10% organic</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>0.2</td>
</tr>
<tr>
<td>Acetonitrile</td>
<td>10% organic</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>50% organic</td>
<td>0.2</td>
</tr>
</tbody>
</table>
Flow path through the ISM with an installed Flow-splitter or Post-column Addition kit

The following diagrams show the flow path through the ISM with an installed Flow-splitter or Post-column Addition kit.

Flow through the ISM with an installed ACQUITY UPLC or Alliance Flow-splitter kit:

Note: The splitter is configured with one of the three restrictor modules.

Solvent flows through the ISM with an installed ACQUITY UPLC or Alliance Flow-splitter kit as follows:

1. Solvent is degassed through the in-line vacuum degasser.
2. The solvent is filtered before entering the primary check valve.
3. The filtered solvent flows through the primary check valve and into the piston chamber of the primary piston, then through the accumulator, the vent valve, and the inline 22-µL filter.
4. The accumulator piston delivers solvent, under pressure, to the vent valve and the inline 22-µL filter.

5. From the inline 22-µL filter, the solvent flows to the ACQUITY UPLC or Alliance flow-splitter.

6. The flow-splitter splits the solvent flow exiting the column into two streams:
   - One stream is diluted with ISM solvent and diverted to the source of the QDa detector.
   - The other stream is diverted toward the optical detector, undiluted.

**Flow through the ISM with an installed UPC² Dual-Detection Flow-splitter kit:**

![Diagram of ISM with Flow-splitter kit](image)

Solvent flows through the ISM with an installed UPC² Flow-splitter kit as follows:

1. Solvent is degassed through the in-line vacuum degasser.
2. The solvent is filtered before entering the primary check valve.
3. The filtered solvent flows through the primary check valve and into the piston chamber.
4. The primary piston delivers solvent to the accumulator, the vent valve, and the inline 22-µL filter during transfer.

5. The accumulator piston delivers solvent, under pressure, to the vent valve and the inline 22-µL filter.

6. From the inline 22-µL filter, the solvent flows to the UPC² Flow-splitter.

7. The UPC² flow-splitter adds the ISM solvent to the LC mobile phase and then splits the diluted mobile phase into two streams, one flowing to the convergence manager and the other to the QDa detector.

**Flow through the ISM with an installed UPC² Triple-Detection Flow-splitter kit:**

Solvent flows through the ISM with an installed UPC² Flow-splitter kit as follows:

1. Solvent is degassed through the in-line vacuum degasser.

2. The solvent is filtered before entering the primary check valve.

3. The filtered solvent flows through the primary check valve and into the piston chamber.
4. The primary piston delivers solvent to the accumulator, the vent valve, and the inline 22-µL filter during transfer.

5. The accumulator piston delivers solvent, under pressure, to the vent valve and the inline 22-µL filter.

6. From the inline 22-µL filter, the solvent flows to the UPC² Flow-splitter.

7. The UPC² flow-splitter adds the ISM solvent to the LC mobile phase and then splits the diluted mobile phase into three streams, one flowing to the convergence manager, one flowing to the QDa detector, and one flowing to the third detector.

**Flow through the ISM with an installed Post-column Addition kit:**

Solvent flows through the ISM with an installed Post-column Addition kit as follows:

1. Solvent is degassed through the in-line vacuum degasser.
2. The solvent is filtered before entering the primary check valve.
3. The filtered solvent flows through the primary check valve and into the piston chamber.
4. The primary piston delivers solvent to the accumulator, the vent valve, and the inline 22-µL filter during transfer.
5. The accumulator piston delivers solvent, under pressure, to the vent valve and the inline 22-µL filter.
6. From the inline 22-µL filter, the solvent flows to the post-column addition tee.
7. The post-column addition tee adds ISM solvent to the solvent.
8. The diluted solvent then flows into the source of the QDa detector.
Preparing the ISM for operation involves installing the leak sensors and flow-splitters, plumbing the waste tubing, priming the device, and monitoring system status.

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</table>

**Warning:** Observe Good Laboratory Practices when you handle solvents. For reference, see the Material Safety Data Sheets for the solvents you use.

**Requirement:** To maintain the efficiency of the ISM and to obtain accurate, reproducible chromatograms, use only MS-grade solvents, water, and additives (99.9% pure) or better. For details, see the Solvent Considerations
information and *Controlling Contamination in Ultra Performance LC/MS and HPLC/MS Systems* on the ACQUITY Chromatography System CD.

⚠️ **Caution**: To avoid damaging components of the ISM, do not pressurize solvent reservoirs in excess of 34.5 kPa (0.34 bar, 5 psi).

**Recommendation**: To ensure the solvent manager’s optimal performance, elevate the solvent bottles above the pump inlet and vent properly.

## Stacking system modules

⚠️ **Warning**: To avoid spinal and muscular injury, do not attempt to lift the ISM without assistance.

**To stack modules:**

1. Place the rear feet of the ISM atop the QDa detector, and slide it backward until its rear alignment pin rests in the rear alignment slot on the QDa detector.

![Alignment pin (2) Alignment slot (2)](image)

2. Lower the front of the ISM so that its front alignment pin rests in the front alignment slot on the QDa detector.

3. Place the rear feet of the next module in the system stack atop the ISM, and slide the added module backward until its rear alignment pin rests in the rear alignment slot on the ISM.
**Note:** If the next module does not have alignment pins and slots, place it atop the ISM.

4. Lower the front of the added module so that its front alignment pin rests in the front alignment slot on the ISM.

Repeat step 3 and step 4 for the remaining system modules.

---

### Installation recommendations for fittings

**Warning:** To avoid personal contamination with biohazards, compounds that are toxic or corrosive, or the residues of such compounds, wear clean, chemical-resistant, powder-free gloves when reinstalling fittings.

The system uses gold-plated compression screws and two-piece ferrules. See the diagram below for assembly orientation:

![Diagram of stainless-steel ferrule with locking ring and tubing](image)

**Recommendations:**

- To prevent bandspreading, ensure the tubing is fully bottomed in the fitting hole before tightening the compression fitting.
- For easier accessibility, use long compression screws to attach tubes to the injector and vent valve.
- Perform the solvent manager leak test whenever you replace or loosen fittings during maintenance (see the ACQUITY online Help).
- Whenever you loosen fittings during maintenance, examine for cracks, stripped threads, and deformations.
- Do not re-use stainless-steel fittings more than six times.

**Required material**

Gloves: clean, powder-free, chemical-resistant
When tightening system fittings, consult the following table.

**Installation recommendations for ACQUITY ISM fittings:**

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Recommended tightening</th>
</tr>
</thead>
<tbody>
<tr>
<td>First use or reinstalled Long 1/4-28 fitting with flangeless ferrule and stainless-steel lock ring, installed on 1/8-inch outside diameter (OD) tubing.</td>
<td>Finger-tight</td>
</tr>
<tr>
<td>First use or reinstalled Long 1/4-28 fitting with flangeless ferrule and stainless-steel lock ring, installed on .062-inch OD tubing.</td>
<td>Finger-tight</td>
</tr>
</tbody>
</table>
### Installation recommendations for ACQUITY ISM fittings: (Continued)

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Recommended tightening</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First use or reinstalled</strong></td>
<td></td>
</tr>
<tr>
<td>Short 1/4-28 fitting with flangeless ferrule and stainless-steel lock ring, installed on .062-inch OD tubing.</td>
<td>Finger-tight</td>
</tr>
<tr>
<td><strong>First use</strong></td>
<td></td>
</tr>
<tr>
<td>Stainless-steel (gold-plated) fitting with long flats and 2-piece stainless-steel ferrule.</td>
<td>Finger-tight, plus 3/4-turn using wrench</td>
</tr>
<tr>
<td><strong>Reinstalled</strong></td>
<td></td>
</tr>
<tr>
<td>Stainless-steel (gold-plated) fitting with long flats and 2-piece stainless-steel ferrule.</td>
<td>Finger-tight, plus up to 1/6-turn using wrench</td>
</tr>
</tbody>
</table>
## Installation recommendations for ACQUITY ISM fittings: (Continued)

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Recommended tightening</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First use</strong>&lt;br&gt;Stainless-steel (gold-plated) fitting with short flats and 2-piece stainless-steel ferrule.</td>
<td>Finger-tight, plus 3/4-turn using wrench</td>
</tr>
<tr>
<td><img src="image1.png" alt="Diagram" /> Short flats 2-piece ferrule</td>
<td><img src="image2.png" alt="Diagram" /> 3/4-turn</td>
</tr>
<tr>
<td><strong>Reinstalled</strong>&lt;br&gt;Stainless-steel (gold-plated) fitting with short flats and 2-piece stainless-steel ferrule.</td>
<td>Finger-tight, plus up to 1/6-turn using wrench</td>
</tr>
<tr>
<td><img src="image3.png" alt="Diagram" /> Short flats 2-piece ferrule</td>
<td><img src="image4.png" alt="Diagram" /> 1/6-turn</td>
</tr>
</tbody>
</table>
Installing the optional leak sensor

The ISM can employ an optional leak sensor for detecting and collecting leakage.

Warning: To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

Warning: The leak sensor can be contaminated with biohazardous and/or toxic materials. Always wear clean, chemical-resistant, powder-free gloves when performing this procedure.

Caution: To avoid damaging electrical parts, never disconnect an electrical assembly while power is applied to an instrument. To completely interrupt power, set the power switch to Off, and then unplug the power cord from the AC source. Wait 10 seconds thereafter before you disconnect an assembly.

Required materials

- Gloves: clean, powder-free, chemical-resistant
- Leak sensor

To install the leak sensor:

1. Power-off the ISM.
2. Open the door of the ISM, gently pulling its right-hand edge toward you.
3. Turn the vent tubing retainer counterclockwise, and then lift the vent tubing from the drip tray by pulling upward on it and moving it to the right-hand side of the leak sensor.

4. Carefully unpack the new leak sensor.

5. Align the leak sensor’s T-bar with the slot in the side of the leak sensor reservoir, and slide the leak sensor into place.

6. Reinsert the vent tubing into the drip tray.

7. Turn the vent tubing retainer, which holds the vent tubing in place, clockwise.
8. Plug the leak sensor connector into the receptacle on the front of the instrument.

9. Power-on the ISM.

10. In the Instrument console, select Isocratic Solvent Manager from the system tree.

11. In the ISM information window, click Control > Reset ISM, to reset the ISM.

12. In the console, enable the leak sensor, to activate the leak sensor’s leak detection capability.

---

**Resolving leak sensor errors**

After approximately 1.5 mL of liquid accumulates in the leak sensor reservoir, an alarm sounds, indicating that the leak sensor detected a leak.

> **Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

> **Warning:** To avoid personal contamination with biohazards, compounds that are toxic or corrosive, or the residues of such compounds, wear clean, chemical-resistant, powder-free gloves when reinstalling fittings.

> **Caution:** To avoid scratching or otherwise damaging the leak sensor,
  - do not allow buffered solvents to accumulate and dry on it;
  - do not submerge it in a cleaning bath.
Required materials

- Cotton swabs
- Gloves: clean, powder-free, chemical-resistant
- Nonabrasive, lint-free wipes

To resolve a leak sensor error:

1. In the Instrument console’s Leak Sensors dialog box, confirm that the ISM’s leak sensor detected a leak.

   Tip: If a leak is detected, a “Leak Detected” error message appears.

   ! Caution: To avoid damaging electrical components or circuitry of a system module, do not disconnect an electrical assembly from the module while the module remains connected to the ac supply source.

   Follow this procedure to completely interrupt power to the module:
   1. Set the module’s power switch to Off.
   2. Disconnect the module’s electrical supply cord from the ac source.

      Afterward, wait 10 seconds thereafter before you disconnect an assembly.

2. Power-off the ISM.

3. Open the ISM’s door, gently pulling its right-hand edge toward you.

4. Locate the source of the leak, and make the repairs necessary to stop the leak.
5. Turn the vent tubing retainer counterclockwise, and then lift the vent tubing from the drip tray by pulling upward on it and moving it to the right-hand side of the leak sensor.

6. Remove the leak sensor from its reservoir, grasping it by its serrations, and pull upward on it.

**Tip:** If you cannot easily manipulate the leak sensor after removing it from its reservoir, detach the connector from the receptacle on the front of the instrument.

**Caution:** To avoid damaging the leak sensor, do not grasp it by the ribbon cable.
7. Use a nonabrasive, lint-free wipe to dry the leak sensor ISM.

8. Roll up a nonabrasive, lint-free wipe, and use it to absorb the liquid from the leak sensor reservoir and its surrounding area.

9. With a cotton swab, absorb any remaining liquid from the corners of the leak sensor reservoir and its surrounding area.
10. Align the leak sensor’s T-bar with the slot in the side of the leak sensor reservoir, and slide the leak sensor into place.

11. If you detached the connector from the receptacle on the front of the instrument, reattach it.

12. Power-on the ISM.

13. In the Instrument console, select Isocratic Solvent Manager from the system tree.

14. In the ISM information window, click Control > Reset ISM, to reset the ISM.
Installing the waste tubing and vent tubing for the degasser

To install the tubing:

**Caution:** To prevent contamination and possible contact with solvent, wear clean, chemical-resistant, powder-free gloves when installing or removing the waste and degasser vent tubing.

1. Wet the barbed drain fitting at the bottom of the ISM with methanol.

**Caution:** To avoid distorting the drip tray or causing the drain cup to leak, restrain the drain cup when attaching or removing the waste tubing.

2. Hold the back of the drain cup, slide the waste tubing over the barbed drain fitting, and route the tubing to a suitable waste container.
Warning: To avoid releasing solvent vapors into the room, route the degasser’s vent tubing to a fume hood or other suitable exhaust system, or to a suitable waste container, ensuring the tubing's discharge end is at all times above the fluid level.

Warning: To avoid spills and the subsequent release of solvent vapors, empty the waste container at regular intervals.

Caution: To avoid fluid backup, you must ensure proper drainage of waste:

- Place the waste container below the system stack.
- Ensure that the waste and degasser vent tubes are not crimped or bent. A crimp or bend can impede flow to the waste container.
- Ensure the exit of the waste and degasser vent tubes is not immersed in waste solvent. If necessary, shorten each tube so that no portion of it drops below the top of the waste container (see next figure).

3. Route the degasser vent tubing to a fume hood or other suitable exhaust system, or to a suitable waste container.
Installing the optional ACQUITY UPLC or Alliance Flow-splitter kit

Install the flow-splitter kit on the ISM to dilute the eluent entering the detector. On an ACQUITY UPLC, ACQUITY UPLC H-Class, ACQUITY UPLC I-Class, or Alliance system, a small portion of the eluent is split and then diluted by the ISM flow before entering the detector. The dilution compensates for that instrument’s increased sensitivity, as compared with the system’s parallel UV/UV-VIS or PDA detector. The eluent concentration directed to the second detector (usually an ACQUITY UPLC PDA detector) remains unchanged. This technology increases the linear, dynamic-range overlap of the two detectors.
Note: The ACQUITY UPLC and Alliance Flow-splitter kits are similar in design, but include different restrictor modules.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- ACQUITY UPLC or Alliance Flow-splitter kit

**Required tool**

T10 TORX® driver (startup kit)

**To install the optional ACQUITY UPLC or Alliance Flow-splitter kit:**

1. Disconnect the finger-tight fittings from the outlet and inlet of the degasser.
2. Using the T10 TORX driver, remove the five screws that secure the blank face plate to the front face of the ISM chassis.

3. Disconnect the vacuum tubing that is attached to the back of the degassing chamber.
4. Using the T10 TORX driver, remove the screw that secures the degassing chamber and label to the front of the face plate, and then remove them from the face plate.

5. Install the degasser and label on the flow-splitter face plate assembly. Secure the degasser and label to the face plate assembly with the screw removed in step 4, using the T10 TORX driver to tighten the screw.
6. Reconnect the vacuum tubing that was removed in step 3 to the back of the degassing chamber that is now attached to the flow-splitter face plate assembly.

7. Install the flow-splitter face plate assembly in the front face of the ISM chassis. Secure the face plate to the ISM with the screws removed in step 2, using the T10 TORX driver to tighten the screws.

**Note:** The ACQUITY UPLC Flow-splitter face plate assembly is shown above. The Alliance Flow-splitter face plate assembly contains restrictor modules with the numeric labels 5, 10, and 100.
8. Connect the tubing to one of the three restrictor modules, as shown in the following diagram.

**Recommendations:**

- Use one-piece, finger-tight, PEEK fittings for all restrictor module tubing connections.
- When installing the Alliance Flow-splitter kit, use a .009-inch ID × 40.6 cm (16 inches) length of tubing to connect outlet 1 to the optical detector.

**Notes:**

- Remove the black O-rings prior to installing the tubing. The O-rings on the tubing are used to hold the fittings in place during shipping.
- When making the tubing connection to inlet 2, connect the gold fitting to the ISM filter and the PEEK fitting to inlet 2.
- The optical detector inlet tubing and ISM outlet tubing are supplied in the ACQUITY UPLC Flow-splitter kit.
- Only the ISM outlet tubing is supplied in the Alliance Flow-splitter kit.

**Tip:** To prevent contamination, install fluoropolymer plugs on any unused restrictor modules.
9. Reconnect the finger-tight fittings to the outlet and inlet of the degasser.

**Recommendation:** Waters recommends connecting a 1724 kPa (17 bar, 250 psi) backpressure regulator assembly to the outlet of the optical detector when splitting in an Alliance or ACQUITY UPLC system. For an Alliance system, the backpressure regulator is included in the Alliance splitter kit; for an ACQUITY UPLC system, the backpressure regulator is included with the ACQUITY detector.

**Changing the split ratio**

Change the split ratio to adjust the amount of analytical flow split to the QDa detector.

**General guidelines**

When using the ACQUITY UPLC and Alliance Flow-splitter kits, observe these guidelines:

- If the signal intensity in the QDa detector is low, switch to a restrictor module with a lower numeric label that allows more analytical flow to the QDa detector.
- If the signal intensity in the QDa detector is high, switch to a restrictor module with a higher numeric label that allows less analytical flow to the QDa detector.
To change the split ratio:

1. Disconnect the inlet 1, outlet 1, inlet 2, and outlet 2 tubing from the restrictor module.

   Tip: To prevent contamination, install fluoropolymer plugs on any unused restrictor modules.

2. Connect the inlet 1, outlet 1, inlet 2, and outlet 2 tubing to the desired restrictor module.

Installing the optional ACQUITY UPC² Flow-splitter kits

Install the optional ACQUITY UPC² Flow-splitter kit to use an ACQUITY QDa Detector in an ACQUITY UPC² system.

Note: To ensure compliance with Japan's High Pressure Gas Safety Act, stainless steel versions of the ACQUITY UPC² Flow Splitter kits are available.

Installing the optional ACQUITY UPC² Dual-Detection Flow-splitter kit

Required materials

- Gloves: clean, powder-free, chemical-resistant
- ACQUITY UPC² Dual-Detection Flow-splitter kit
Required tool

T10 TORX driver (startup kit)

To install the optional ACQUITY UPC² Dual-Detection Flow-splitter kit:

1. Disconnect the finger-tight fittings from the outlet and inlet of the degasser.

2. Using the T10 TORX driver, remove the five screws that secure the blank face plate to the front face of the ISM chassis.
3. Disconnect the vacuum tubing that is attached to the back of the degassing chamber.

4. Using the T10 TORX driver, remove the screw that secures the degassing chamber and label to the front of the face plate, and then remove them from the face plate.

5. Install the dual-detection flow-splitter restrictor module on the flow-splitter face plate assembly.
6. Using the T10 TORX driver, tighten the captive screws on the restrictor module to the extent possible.

7. Install the degasser and label on the flow-splitter face plate assembly. Secure the degasser and label to the face plate assembly with the screw removed in step 4, using the T10 TORX driver to tighten the screw.
8. Reconnect the vacuum tubing that was removed in step 3 to the back of the degassing chamber that is now attached to the flow-splitter face plate assembly.

9. Install the Flow-splitter assembly in the front face of the ISM chassis. Secure the face plate to the ISM with the screws removed in step 2, using the T10 TORX driver to tighten the screws.
10. Connect outlet 1 to inlet 3, as shown in the following diagram. Tighten the fittings 3/4 to 7/8-turn past finger-tight.

**Notes:**

- Remove the black O-rings prior to installing the tubing. The O-rings on the tubing are used to hold the fittings in place during shipping.
- The outlet 1 to inlet 3 tubing is supplied in the splitter kit.

11. Connect the tubing as shown in the following diagram. Tighten the inlet 2 (from ISM filter) and outlet 2 (to convergence manager tee) fittings 3/4 to 7/8-turn past finger-tight. Finger-tighten the outlet 3 (to QDa detector source) fitting until it clicks.

**Notes:**

- Remove the black O-rings prior to installing the tubing. The O-rings on the tubing are used to hold the fittings in place during shipping.
- If you are installing the stainless steel version of the Flow-splitter kit, tighten all fittings 3/4-turn.
• The optical detector outlet tubing, ISM filter outlet tubing, and Convergence Manager tee inlet tubing are supplied in the splitter kit.

12. Reconnect the finger-tight fittings to the outlet and inlet of the degasser.
Installing the optional ACQUITY UPC² Triple-Detection Flow-splitter kit

Required materials

• Gloves: clean, powder-free, chemical-resistant
• ACQUITY UPC² Triple-Detection Flow-splitter kit

To install the optional ACQUITY UPC² Triple-Detection Flow-splitter kit:

1. Disconnect the finger-tight fittings from the outlet and inlet of the degasser.

2. Using the T10 TORX driver, remove the five screws that secure the blank face plate to the front face of the ISM chassis.
3. Disconnect the vacuum tubing that is attached to the back of the degassing chamber.

![Diagram of vacuum tubing location]

4. Using the T10 TORX driver, remove the screw that secures the degassing chamber and label to the front of the face plate, and then remove them from the face plate.

![Diagram of screw securing degasser and label to face plate]

5. Install the triple-detection flow-splitter restrictor module on the flow-splitter face plate assembly.
6. Using the T10 TORX driver, tighten the captive screws on the restrictor module to the extent possible.

![Captive screws](image)

7. Install the degasser and label on the flow-splitter face plate assembly. Secure the degasser and label to the face plate assembly with the screw removed in step 4, using the T10 TORX driver to tighten the screw.

![Screw securing degasser and label to face plate](image)
8. Reconnect the vacuum tubing that was removed in step 3 to the back of the degassing chamber that is now attached to the flow-splitter face plate assembly.

9. Install the Flow-splitter assembly in the front face of the ISM chassis. Secure the face plate to the ISM with the screws removed in step 2, using the T10 TORX driver to tighten the screws.
10. Connect outlet 1 to inlet 3, as shown in the following diagram. Tighten the fittings 3/4 to 7/8-turn past finger-tight.

**Notes:**

- Remove the black O-rings prior to installing the tubing. The O-rings on the tubing are used to hold the fittings in place during shipping.
- The outlet 1 to inlet 3 tubing is supplied in the splitter kit.

11. Connect the tubing as shown in the following diagram. Tighten all fittings 3/4 to 7/8-turn past finger-tight.

**Notes:**

- Remove the black O-rings prior to installing the tubing. The O-rings on the tubing are used to hold the fittings in place during shipping.
- If you are installing the stainless steel version of the Flow-splitter kit, tighten all fittings 3/4-turn.
• The optical detector outlet tubing, ISM filter outlet tubing, and Convergence Manager tee inlet tubing are supplied in the splitter kit.

12. Reconnect the finger-tight fittings to the outlet and inlet of the degasser.

Installing the optional Post-column Addition kit

On an ACQUITY UPLC, ACQUITY UPLC H-Class, ACQUITY UPLC I-Class, or Alliance system, install the Post-column Addition kit in the ISM to modify the composition of mobile phase entering the QDa detector. Doing so facilitates ionization of compounds that are relatively nonpolar. The kit
introduces additional solvent immediately upstream from the QDa detector. Any additional detectors upstream from the QDa detector remain unaffected by the kit's installation.

**Required materials**
- Gloves: clean, powder-free, chemical-resistant
- Post-column Addition kit

**Required tool**
T10 TORX driver (startup kit)

**To install the optional Post-column Addition kit:**

1. Hold the post-column addition bracket securely against the blank plate on the front face of the ISM chassis as shown in the image below.
2. Secure the post-column addition bracket with the two bracket screws that are provided in the Post-Column Addition kit, and then use the T10 TORX driver to tighten them.

![Diagram showing the post-column addition bracket, bracket screw, and blank plate.]

3. Connect the tubing as shown in the following diagram.

**Notes:**
- Remove the black O-rings prior to installing the tubing. The O-rings on the tubing are used to hold the fittings in place during shipping.
- When making the tubing connection to inlet 2, connect the gold fitting to the ISM filter and the PEEK fitting to inlet 2.

![Diagram showing the connections to the tubing.]

**Tip:** To prevent contamination, install fluoropolymer plugs when the post-column addition kit is not in use.
Connecting to the electricity source

Each system module requires a separate, grounded power source. The ground connection in all electrical outlets must be common and physically close to the system.

**Warning:** To avoid electrical shock, observe these precautions:
- Use only the power-supply cable provided when the system module was installed.
- Power-off and unplug the module before performing any maintenance operation on it.
- Connect each module to a common ground.

To connect to the electricity source:

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

1. Connect the female end of the power cord to the receptacle on the rear panel of the ISM.
2. Connect the male end of the power cord to a suitable wall outlet.

Priming the seal-wash system

Priming the seal wash system lubricates the ISM’s plungers, fills its tubing paths with solvent, and flushes away solvent or any precipitated salts that have been dragged past the plunger seals from the high-pressure side of the piston chambers.

Prime the plunger seal wash on these occasions:
- After using buffered mobile phase
- When the ISM has been inactive for a few hours or longer
- When the ISM is dry
Caution:

- To avoid damaging the solenoid valve seats and seals in the solvent path, do not use a nonvolatile buffer as the seal-wash solvent.
- To avoid clogging system tubing, ensure the seal-wash solvent is 100% compatible with the mobile phase conditions.
- To avoid spreading contamination, do not recycle seal wash.
- Ensure that seal-wash contains at least 10% organic solvent, a concentration that prevents microbial growth and ensures that the seal wash can solubilize the mobile phase.

Mobile phase and seal-wash compatibility:

<table>
<thead>
<tr>
<th>Mobile phase</th>
<th>Buffer</th>
<th>Seal Wash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous</td>
<td>Yes/No</td>
<td>Water with at least 10% organic and is fully miscible with the mobile phase.</td>
</tr>
<tr>
<td>Non-aqueous</td>
<td>Yes/No</td>
<td>Mobile phase without buffer or 100% IPA if miscible with mobile phase.</td>
</tr>
<tr>
<td>Aqueous/non-aqueous mixture</td>
<td>Yes</td>
<td>Mobile phase without buffer.</td>
</tr>
<tr>
<td>Aqueous/non-aqueous mixture</td>
<td>No</td>
<td>Mobile phase.</td>
</tr>
</tbody>
</table>

Note: Buffered additives must be the highest grade available.

Before priming the plunger seals, ensure the volume of seal-wash is adequate for priming.

See also: *Controlling Contamination in Ultra Performance LC/MS and HPLC/MS Systems* on the ACQUITY Chromatography System CD.

Required materials

- Gloves: clean, powder-free, chemical-resistant
- Seal wash solution
- 30-mL syringe (startup kit)
- Tubing adapter (startup kit)
**Tip:** The seal-wash routine is self-priming. Nevertheless, using a syringe to draw seal wash through the system hastens the process.

**To prime the seal-wash system:**

1. Remove the seal wash outlet tubing from the seal wash waste fitting (on the right-hand side of the drip tray).

2. Push the syringe plunger fully into the syringe barrel.

3. Connect the tubing adapter to the syringe, and then connect the syringe assembly to the seal wash system’s outlet tubing.

4. In the ACQUITY Console, from the system tree, select Isocratic Solvent Manager.

5. Click Control > Prime seal wash, and then click Yes to begin the seal wash priming process.

6. Slowly draw back on the syringe plunger, to pull solvent through the system.

7. When the seal wash solution begins to flow into the syringe with relatively few air bubbles, click Control > Prime seal wash, to stop the priming process.

8. Disconnect the tubing from the syringe assembly, and reconnect it to the fitting on the drip tray.
Priming the ISM

You must prime the ISM when it or the system that it is part of has never been used. You must also prime it when you restart a system, after the system has been idle for more than four hours, or when you change reservoirs or solvents. During priming, the vent valve moves to the vent position, ensuring minimal backpressure and directing the flow to waste. The flow rate during priming is 4 mL/min.

![Caution: To prevent salts from precipitating in the system, introduce an intermediate solvent, such as water, when changing from buffers to high-organic-content solvents. Be sure to consult the solvent miscibility tables in the Solvent Considerations section.](image)

Ensure the solvent reservoirs contain sufficient solvent for adequate priming and that the waste container can hold all the used solvent. For example, at 4 mL/min, priming for 5 minutes uses about 20 mL of solvent.

![Warning: To avoid spills, empty the waste container at regular intervals.](image)

**Requirement:** You must ensure that the solvent tubing is primed with solvent in order for the degasser to function properly.

### Priming a dry ISM via the console

**To prime the ISM:**

1. Open the instrument’s front door.
2. Locate the appropriate solvent vent tubing.
3. In the Instrument console, select Isocratic Solvent Manager from the system tree.
4. In the ISM information window, click Control > Prime solvents.
5. In the Prime Solvents dialog box, select ISM solvent.
6. In the Time box, specify the number of minutes from 0.1 through 60.0.
   **Default:** 2.0 minutes
   **Requirement:** All solvent tubing must contain solvent. Prime the ISM until a steady flow exits the vent tubing (typically requires 7 to 10 minutes).

7. Click Start.
   **Result:** When solvent flows out the vent tubing without bubbles, the path is primed.

**Priming a dry ISM using a syringe**

⚠️ **Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

⚠️ **Caution:** To prevent contamination, wear clean, chemical-resistant, powder-free gloves when priming a dry ISM using a syringe.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- 30-mL syringe (startup kit)
- Short length of Pharmed® tubing (startup kit)
- Tubing adapter (startup kit)

**To prime a dry ISM:**

1. Open the device’s front door.
2. Follow the stainless-steel solvent vent tubing from port 4 on the vent valve, and lift it from the drip tray.

3. Push the syringe plunger fully into the syringe barrel.

4. Connect the tubing adapter to the syringe.

5. Connect the syringe assembly to a short length of Pharmed tubing, and then connect the short length of Pharmed tubing to the solvent vent tubing you lifted from the drip tray in step 2.

6. In the ACQUITY Console, select Isocratic Solvent Manager from the system tree.

7. In the isocratic solvent manager information window, click Control > Prime solvents.

8. In the Prime Solvents dialog box, select the line you want to prime.
9. In the Time box, specify the number of minutes, from 0.1 through 60.0. 
   **Recommendation:** The default setting is 2.0 minutes. Nevertheless, 
   prime the isocratic solvent manager until a steady flow exits the vent 
   tubing (typically 3 minutes).

10. Click Start.

11. Slowly withdraw the syringe plunger.

12. When solvent flows out the vent tubing without bubbles, remove the 
    syringe from the vent tubing and reconnect the vent tubing to the drip 
    tray.

   **Requirements:**
   • Ensure that the solvent reservoir contains enough solvent for future 
     methods.
   • All solvent tubing must contain solvent.

---

**Monitoring LEDs**

Light emitting diodes on the ISM indicate its state of functioning.

**Power LED**

The power LED, on the left-hand side of the ISM’s front panel, indicates when 
the ISM is powered-on or powered-off.

**Power LED indications:**

<table>
<thead>
<tr>
<th>LED mode and color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Power is applied to the ISM.</td>
</tr>
<tr>
<td>Black (unlit)</td>
<td>Power is not applied to the ISM.</td>
</tr>
</tbody>
</table>

**Status LED**

The flow LED, on the right-hand side of the power LED on the ISM’s front 
panel, indicates the flow status.
Flow LED indications:

<table>
<thead>
<tr>
<th>LED mode and color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlit</td>
<td>ISM is idle.</td>
</tr>
<tr>
<td>Steady green</td>
<td>Solvent is flowing.</td>
</tr>
<tr>
<td>Flashing green</td>
<td>Initializing and preparing for normal operation.</td>
</tr>
<tr>
<td>Flashing red</td>
<td>Error state. Refer to the instrument console for information about the error.</td>
</tr>
<tr>
<td>Steady red</td>
<td>Indicates a failure of the ISM that prevents its further operation. Power-off the module, and then restart it. If the LED is still steady red, contact your Waters service representative.</td>
</tr>
</tbody>
</table>

ISM control panel

The control panel of the ISM displays flow status, system pressure and total flow rate.

**Rule:** You can edit these settings when the system is idle by clicking on the underlined value. You cannot edit ISM settings while the system is running samples.

ISM control panel:
The following table describes the items in the ISM control panel.

**ISM control panel items:**

<table>
<thead>
<tr>
<th>Control panel item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow LED</td>
<td>Displays on the front panel of the solvent manager the status of the flow state, unless communications are lost.</td>
</tr>
<tr>
<td>Status</td>
<td>Displays the status of the current operation.</td>
</tr>
<tr>
<td>System pressure</td>
<td>Displays system pressure, in kPa, bar, or psi. You can customize pressure units via the console.</td>
</tr>
<tr>
<td>Currently selected solvent</td>
<td>Displays the currently selected solvent (S1, S2, and so on). If the optional solvent selection valve is not installed, only S1 will display.</td>
</tr>
<tr>
<td>Flow rate</td>
<td>Displays the flow rate of solvent through all lines of the ISM, from 0.000 to 2.000 mL/min, under normal operation, and 0.000 to 4.000 mL/min, when priming.</td>
</tr>
<tr>
<td>(Stop flow)</td>
<td>Immediately stops all flow from the ISM.</td>
</tr>
</tbody>
</table>

You can access these additional functions by right-clicking anywhere in the ISM control panel.

**Additional functions in the ISM control panel:**

<table>
<thead>
<tr>
<th>Control panel function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start up system</td>
<td>Brings the system to operational conditions after an extended idle period or when switching to different solvents.</td>
</tr>
<tr>
<td>Prime solvent</td>
<td>Displays the Prime Solvent dialog box and allows for manual changeover or refreshing of solvent. Solvents are automatically shunted to waste.</td>
</tr>
</tbody>
</table>
Prime seal wash | Starts priming the seal wash which lubricates the plungers, fills the tubing paths with solvent and flushes away solvent and or any precipitated salts that have been dragged past the plunger seals from the high-pressure side of the piston chambers.

Wash plungers | Initiates the plunger-wash sequence, which fills and then slowly empties the primary and accumulator chambers (with the current solvent composition) while performing a high speed/volume seal wash. This action helps prevent precipitate buildup on the pump plungers. Such a buildup can damage the high pressure seals.

Launch console | Launches the console.

Reset ISM | Resets the ISM after an error condition.

Help | Displays the online Help for the console software.
Keep to a maintenance schedule, and perform maintenance as required and described in this chapter.

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<tr>
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<tr>
<td>Spare parts</td>
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<tr>
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<td>Replacing the seal wash solvent filter</td>
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<td>Replacing the ISM solvent filter</td>
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<td>Cleaning the air filter in the door</td>
<td>83</td>
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<td>83</td>
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<td>Replacing the optional leak sensor</td>
<td>84</td>
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<tr>
<td>Replacing a restrictor module in the optional ACQUITY UPLC or Alliance Flow-splitter kit</td>
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<td>Replacing the inline 22-µL filter</td>
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<td>Replacing the low-pressure filter cartridge</td>
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<td>Replacing the vent-valve cartridge</td>
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<td>Replacing the cartridge in the optional solvent-selection valve</td>
<td>99</td>
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<td>Replacing the primary check valve</td>
<td>101</td>
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<tr>
<td>Replacing the accumulator check valve</td>
<td>104</td>
</tr>
<tr>
<td>Removing the primary head and replacing its seals</td>
<td>107</td>
</tr>
<tr>
<td>Removing the accumulator head and replacing its seals</td>
<td>123</td>
</tr>
<tr>
<td>Cleaning the instrument’s exterior</td>
<td>140</td>
</tr>
</tbody>
</table>
Maintaining the ISM

Perform the procedures in this section when you discover that a component of the solvent manager malfunctioned or during routine maintenance. For information about isolating such problems, consult the Instrument console online Help.

Contacting Waters technical service

If you are located in the USA or Canada, report malfunctions or other problems to Waters Technical Service (800 252-4752). From elsewhere, phone the Waters corporate headquarters in Milford, Massachusetts (USA), or contact your local Waters subsidiary. The Waters website includes phone numbers and e-mail addresses for Waters locations worldwide. Visit www.waters.com.

When you contact Waters, be prepared to provide this information:

- Error message (if any)
- Nature of the symptom
- Serial number of the system module and its firmware version, if applicable
- Flow rate
- Operating pressure
- Solvent(s)
- Detector settings (sensitivity and wavelength)
- Type and serial number of column(s)
- Sample type and diluent
- Data software version and serial number
- ACQUITY system workstation model and operating system version

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

Locating system serial numbers

The serial number on the system’s instruments and devices facilitates service and support. Serial numbers also provide a way to create single log entries for each module, so that you can review the usage history of a particular module.
Be prepared to provide the serial numbers of the instruments or devices in your system when you contact Waters customer support.

**To view the information for a system module:**

1. In the Instrument console, select a module from the system tree.
2. Click Configure > View module information.

**Result:** The Module Information dialog box displays this information:
- Serial number
- Firmware version
- Firmware checksum
- Component software version

**Alternatives:**
- From the main window, place the pointer over the visual representation of the system module for which you want to view information.
- Obtain the serial number from the printed labels affixed to the rear panels of system modules or inside their front doors.

**Maintenance schedule**

Perform the following routine maintenance on the ISM to ensure reliable operation and accurate results. When using the system throughout the day (and on nights and weekends), or when using aggressive solvents such as buffers, perform these maintenance tasks more frequently.

**Recommended routine maintenance schedule:**

<table>
<thead>
<tr>
<th>Maintenance procedure</th>
<th>Required frequency</th>
<th>For information...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace solvent filters</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 80 and page 81.</td>
</tr>
<tr>
<td>Clean the air filter in the door</td>
<td>As needed</td>
<td>See page 83.</td>
</tr>
</tbody>
</table>
### Recommended routine maintenance schedule: (Continued)

<table>
<thead>
<tr>
<th>Maintenance procedure</th>
<th>Required frequency</th>
<th>For information...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace the air filter in the door</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 83.</td>
</tr>
<tr>
<td>Replace the optional leak sensor</td>
<td>As needed</td>
<td>See page 84.</td>
</tr>
<tr>
<td>Replace a restrictor module in the optional flow-splitter assembly</td>
<td>As needed</td>
<td>See page 87 and page 88.</td>
</tr>
<tr>
<td>Replace the inline 22-μL filter</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 90.</td>
</tr>
<tr>
<td>Replace the low-pressure filter cartridge</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 92.</td>
</tr>
<tr>
<td>Replace the vent-valve cartridge</td>
<td>Every five years or as needed</td>
<td>See page 96.</td>
</tr>
<tr>
<td>Replace the cartridge in the optional solvent selection valve</td>
<td>Ever five years or as needed</td>
<td>See page 99.</td>
</tr>
<tr>
<td>Replace the primary check valve</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 101.</td>
</tr>
<tr>
<td>Replace the accumulator check valve</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 104.</td>
</tr>
<tr>
<td>Replace the head seals</td>
<td>During scheduled routine maintenance or as needed</td>
<td>See page 107 and page 123.</td>
</tr>
<tr>
<td>Clean the instrument with a soft, lint-free cloth, or paper dampened with water</td>
<td>As needed</td>
<td>See page 140.</td>
</tr>
</tbody>
</table>
**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.

**Safety and handling**

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

**Warning:** To avoid personal contamination with biohazards, compounds that are toxic or corrosive, or the residues of such compounds, wear clean, chemical-resistant, powder-free gloves when reinstalling fittings.

**Warning:** To prevent injury, always observe Good Laboratory Practice when handling solvents, changing tubing, or operating the instrument. 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 protective panels from the sample manager. The panels cover components serviceable only by Waters technicians.

**Caution:** To avoid damaging electrical components or circuitry of a system module, do not disconnect an electrical assembly from the module while the module remains connected to the ac supply source. Follow this procedure to completely interrupt power to the module:

1. Set the module’s power switch to Off.
2. Disconnect the module’s electrical supply cord from the ac source.

Afterward, wait 10 seconds thereafter before you disconnect an assembly.
Replacing the seal wash solvent filter

**Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

**Caution:** Wear clean, chemical-resistant, powder-free gloves when handling the solvent filter. Oil from your hands can contaminate the seal wash solvent filter.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- New seal wash solvent filter

**To replace a seal wash solvent filter:**

1. Remove the filter end of the solvent tubing from the solvent bottle.
2. Remove the old seal wash solvent filter from the short piece of PTFE tubing.
3. Insert the new seal wash solvent filter into the PTFE tubing, pushing until it contacts the solvent tubing.
4. Insert the filter end of the solvent tubing into the solvent bottle.
5. Shake the filter, to remove any air from it.
6. Prime the ISM (see page 67).
Replacing the ISM solvent filter

**Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

**Caution:** Wear clean, chemical-resistant, powder-free gloves when handling the solvent filter. Oil from your hands can contaminate the ISM solvent filter.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- New ISM solvent filter

**To replace an ISM solvent filter:**

1. Remove the filter end of the solvent tubing from the solvent bottle.

**ISM solvent filter:**
2. Unscrew the finger-tight fitting and remove the old ISM solvent filter, ferrule, and fitting from the solvent tubing.

3. Separate the new filter assembly and place the new finger-tight fitting and ferrule onto the solvent tubing.

4. Insert the solvent tubing into the filter, ensuring that it bottoms out in the filter.

5. Screw the finger-tight fitting and ferrule into the filter to secure the solvent tubing in place.

6. Insert the filter end of the solvent tubing into the solvent bottle.

7. Shake the filter, to remove any air from it.

8. Prime the ISM (see page 67).
Cleaning the air filter in the door

Required materials

Mild detergent and water

To clean the air filter:

1. Lift the air filter, removing it from the frame.

2. Using a mild detergent and water clean the filter and then dry it.

3. Align the cleaned air filter within the air filter frame. Ensure the bottom of the air filter contacts the bottom of the filter frame.

Replacing the air filter in the door

If you cannot clean the air filter by washing, replace it with a new filter.

Required material

ISM air filter
To replace the air filter:

1. Remove the old air filter from the air filter frame, and discard it.

2. Align the new air filter within the air filter frame.

Replacing the optional leak sensor

⚠️ **Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

⚠️ ⚠️ ⚠️ **Warning:** To avoid personal contamination with biohazards, compounds that are toxic or corrosive, or the residues that make up such compounds, wear clean, chemical-resistant, powder-free gloves when handling the leak sensor.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- Leak sensor
To replace the leak sensor:

**Caution:** To avoid damaging electrical components or circuitry of a system module, do not disconnect an electrical assembly from the module while the module remains connected to the ac supply source. Follow this procedure to completely interrupt power to the module:

1. Set the module’s power switch to Off.
2. Disconnect the module’s electrical supply cord from the ac source. Afterward, wait 10 seconds thereafter before you disconnect an assembly.

1. Power-off the ISM.
2. Open the ISM’s door, gently pulling its right-hand edge toward you.
3. Press down on the tab, to detach the leak sensor connector from the front of the instrument.
4. Remove the leak sensor from its reservoir, grasping it by its serrations, and pull upward on it.

5. Unpack the new leak sensor.

6. Align the leak sensor’s T-bar with the slot in the side of the leak sensor reservoir, and slide the leak sensor into place.

7. Connect the leak sensor connector to the front of the instrument.

8. Power-on the ISM.

9. In the Instrument console, select Isocratic Solvent Manager from the system tree.

10. In the ISM information window, click Control > Reset ISM, to reset the ISM.
Replacing a restrictor module in the optional ACQUITY UPLC or Alliance Flow-splitter kit

Required materials

- Gloves: clean, powder-free, chemical-resistant
- Restrictor module

Required tool

T10 TORX driver (startup kit)

To replace a restrictor module:

1. Disconnect the inlet 1, outlet 1, inlet 2, and outlet 2 tubing from the restrictor module that you are replacing.

```
Restrictor module (3)

Inlet 1: From column  
Outlet 1: To optical detector
Inlet 2: From ISM outlet  
Outlet 2: To QDa detector source
```
2. Using the T10 TORX driver, loosen the two captive screws on the restrictor module you are replacing, and then remove the module.

3. Insert the new restrictor module into the flow-splitter assembly.

4. Using the T10 TORX driver, tighten the captive screws on the restrictor module to the extent possible.

5. Connect the inlet 1, outlet 1, inlet 2, and outlet 2 tubing to the new restrictor module.
   Tip: To prevent contamination, install plugs on any unused restrictor modules.

### Replacing the restrictor module in the optional ACQUITY UPC² Flow-splitter kit

#### Required materials
- Gloves: clean, powder-free, chemical-resistant
- Restrictor module

#### Required tool
T10 TORX driver (startup kit)

#### To replace the restrictor module:
1. Disconnect inlet 3, outlet 2, and outlet 3 from the restrictor module.
**Note:** If you are replacing the restrictor module in the ACQUITY UPC$^2$ Triple Detection Flow-splitter kit, you must also disconnect the outlet 4 tubing from the restrictor module.

2. Using the T10 TORX driver, loosen the two captive screws on the restrictor module, and then remove the module.

3. Insert the new restrictor module into the flow-splitter assembly.

4. Using the T10 TORX driver, tighten the captive screws on the restrictor module to the extent possible.

5. Reconnect inlet 3, outlet 2, and outlet 3 to the new restrictor module.
Note: If you are replacing the restrictor module in the ACQUITY UPC\textsuperscript{2} Triple Detection Flow-splitter kit, you must also connect the outlet 4 tubing to the new restrictor module.

Tip: To prevent contamination, install plugs on any unused restrictor modules.

Replacing the inline 22-µL filter

\begin{itemize}
  \item Warning: To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.
  \item Caution: To avoid spreading contamination, wear clean, chemical-resistant, powder-free gloves when replacing the 22-µL mixer/filter.
\end{itemize}

Required material

Gloves: clean, powder-free, chemical-resistant

Required tools

- 1/4-inch, open-end wrench
- 5/8-inch, open-end wrench
- 22-µL mixer/filter

To replace the 22-µL filter:

1. Flush the ISM with non-hazardous solvent.
2. Stop the solvent flow.
3. Holding the 22-µL filter in place with the 5/8-inch, open-end wrench, disconnect the inlet compression fitting using the 1/4-inch, open-end wrench.
Replacing the inline 22-μL filter

**Note:** The inlet side of the filter is denoted by the inscription “INLET”.

4. Holding the 22-μL filter with the 5/8-inch, open-end wrench, disconnect the outlet compression fittings using the 1/4-inch wrench.

5. Remove the old 22-μL filter from the bracket.
6. Unpack the new 22-μL filter.
7. Insert the new 22-μL filter into the bracket.
8. Reattach the compression fittings to the 22-μL filter, and tighten them finger-tight plus an additional 1/6-turn, for existing fittings, or 3/4-turn for new fittings.
Replacing the low-pressure filter cartridge

**Warning:** To avoid the harmful effects of personal contact with solvents, including inhalation, observe Good Laboratory Practice when you handle them. See the Material Safety Data Sheets for the solvents you use.

**Caution:** Wear clean, chemical-resistant, powder-free gloves when handling the low-pressure filter cartridge. Oil from your hands can contaminate the low-pressure filter cartridge.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- Low-pressure filter cartridge

**To replace the low-pressure filter cartridge:**

1. Flush the isocratic solvent manager with nonhazardous solvent.
2. Power-off the isocratic solvent manager.

**Warning:** To avoid injuries arising from contact with spilled solvent (siphoning), move the solvent bottles to a location below the isocratic solvent manager.

3. Move the solvent bottles to a location below the isocratic solvent manager.
4. Unscrew the cap nut on the low-pressure inlet filter assembly.

5. Pull the cap nut off the tube to remove the low-pressure filter cartridge.

**Low-pressure filter cartridge and cap nut:**
6. Put the cap nut over the end of the tube (see the figure following step 8).

7. Slide the metal locking ring onto the tube, ensuring that the thicker end of the metal locking ring is facing toward the cap nut.

**Metal locking ring:**

8. Slide the new low-pressure filter cartridge onto the tube.

**Exploded view of low-pressure filter:**
9. Insert the low-pressure filter cartridge with tubing into the ferrule holder fitting.

10. Screw the cap nut onto the ferrule holder fitting, ensuring that the tube is bottomed out in the in-line filter cartridge. Finger-tighten it to the extent possible.

11. Return the solvent bottles to their original location.


13. Prime the isocratic solvent manager (see page 67).
Replacing the vent-valve cartridge

**Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

**Caution:** To avoid spreading contamination, wear clean, chemical-resistant, powder-free gloves when replacing the vent-valve cartridge.

**Required materials**
- Gloves: clean, powder-free, chemical-resistant
- Vent-valve cartridge

**Required tools**
- 1/4-inch, open-end wrench
- Allen wrench, 2-mm (startup kit)

**To replace the vent-valve cartridge:**
1. In the Instrument console, from the system tree select ISM.
2. In the ISM information window, click Interactive Display.
3. In the ISM Interactive Display dialog box, click Control .
4. Ensure the vent valve is set to the Vent position.

**Tip:** To change the setting to Vent, click the underlined vent-valve position, and select Vent.
5. Use the 1/4-inch wrench to remove the fittings attached to the vent-valve cartridge.

**Vent-valve cartridge:**

6. Use the 2-mm Allen wrench to remove the hex screw at the 10 o’clock position on the vent-valve cartridge.

7. Remove the vent-valve cartridge from the vent-valve assembly by pulling straight forward. Observe the orientation of the vent-valve cartridge when doing so.

8. Unpack the replacement vent-valve cartridge.

9. Ensure that the groove in the cartridge housing aligns with the groove on the drive clamp.

**Tip:** If the grooves fail to align, turn the drive clamp until they align.
10. Insert the new vent valve cartridge into the vent valve cartridge chamber.

**Requirements:**

- Orient the new cartridge exactly as the old one was oriented.
- The vent-valve cartridge must slide fully into the vent-valve assembly. If it does not, contact Waters Technical Service.

11. Insert the 2-mm hex screw at the 10 o’clock position on the vent-valve cartridge.

12. Use the 1/4-inch wrench to reattach all fittings, and tighten existing fittings 1/6-turn beyond finger-tight and new fittings 3/4-turn beyond finger-tight.

13. Prime the ISM (see page 67).
Replacing the cartridge in the optional solvent-selection valve

**Warning:** To prevent injury, always observe Good Laboratory Practice when you handle solvents, change tubing, or operate the isocratic solvent manager. Consult the Material Safety Data Sheets regarding the solvents you use.

**Caution:** To prevent contamination to system components, wear clean, chemical-resistant, powder-free gloves when replacing the solvent-selection valve cartridge.

**Required materials**

- Gloves: clean, powder-free, chemical-resistant
- Solvent-selection valve cartridge

**Required tool**

Allen wrench, 2-mm (startup kit)

**To replace the cartridge in the optional solvent-selection valve:**

1. In the ACQUITY UPLC Console, select Isocratic Solvent Manager from the system tree.
2. Ensure the solvent-selection valve is set to solvent 6.

**Warning:** To avoid solvent spills, move the solvent bottles to a location below the ISM.

3. Move the solvent bottles to a location below the ISM.
4. Remove the finger-tight fittings attached to the solvent-selection valve cartridge.

**Solvent-selection valve cartridge:**

5. Use the 2-mm Allen wrench to remove the hex screw at the 10 o’clock position on the cartridge.

6. Remove the cartridge from the solvent-selection valve assembly by pulling straight forward.

7. Unpack the replacement cartridge.

8. Ensure that the groove in the cartridge housing aligns with the groove on the drive clamp.

   **Tip:** If the grooves fail to align, turn the drive clamp until they do.

   **Note:** Be careful not to scratch the drive clamp or body.

9. Insert the new cartridge into the solvent-selection valve assembly.

   **Requirements:**
   - Orient the new cartridge exactly as the old one was oriented.
Replacing the primary check valve

1. Flush the ISM with non-hazardous solvent.
2. Power-off the ISM.

Tip: Move the solvent bottles to a location below the ISM.

Caution: To prevent contamination, wear clean, chemical-resistant, powder-free gloves when replacing the check valve.

Required materials

- Primary check valve assembly
- Gloves: clean, powder-free, chemical-resistant

Required tool

1/2-inch, open-end wrench

To replace the primary check valve:

1. Flush the ISM with non-hazardous solvent.
2. Power-off the ISM.

Tip: Move the solvent bottles to a location below the ISM.
3. Unscrew the low-pressure filter holder from the primary check valve inlet.

![Diagram of primary check valve inlet and low-pressure filter holder]

**Caution:** When you remove the valve assembly, ensure the PEEK washer, which is normally on the top face of the check valve, does not remain in the head (see the figure after step 6).

4. Use the 1/2-inch, open-end wrench to loosen the check valve, and then remove the check valve assembly from the head.

![Diagram of primary check valve]

5. Unpack the new check valve.
6. Ensure the new PEEK washer is inserted into the new check valve so that its chamfered edge faces away from the check valve.

7. Insert the check valve assembly into the head, and use the 1/2-inch wrench to tighten the check valve nut 1/8-turn beyond finger-tight.

8. Reattach the low-pressure filter holder to the check valve and finger-tighten it to the extent possible.

9. Power-on the ISM.

10. Prime the ISM (see page 67).
Replacing the accumulator check valve

**Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

**Caution:** To prevent contamination, wear clean, chemical-resistant, powder-free gloves when replacing the check valve.

**Required materials**
- Accumulator check valve assembly
- Gloves: clean, powder-free, chemical-resistant

**Required tools**
- 1/2-inch, open-end wrench
- 1/4-inch open-end wrench
- 5/16-inch, open-end wrench

**To replace the accumulator check valve:**
1. Flush the ISM with non-hazardous solvent.
2. Power-off the ISM.
   **Tip:** Move the solvent bottles to a location below the ISM.
3. While holding the check valve in place with the 5/16-inch, open-end wrench, use the 1/4-inch, open-end wrench to disconnect the compression fitting.

![Diagram of check valve and compression fitting]

**Caution:** When you remove the valve assembly, ensure the PEEK washer, which is normally on the top face of the check valve, does not remain in the head (see the figure after step 6).

4. Use the 1/2-inch, open-end wrench to loosen the check valve, and then remove the check valve assembly from the head.

![Diagram of check valve and compression fitting]

5. Unpack the new check valve.
6. Make sure the new PEEK washer is inserted into the new check valve so that its chamfered edge faces away from the check valve.

7. Insert the check valve assembly into the head, and use the 1/2-inch wrench to tighten the check valve nut 1/8-turn beyond finger-tight.

8. Use the 5/16-inch, open-end wrench to hold the check valve in place, and then reattach the compression fitting to the check valve.

   **Tip:** Use the 1/4-inch wrench to tighten the compression fitting 1/6-turn beyond finger-tight for existing stainless-steel tubing assembly, or 3/4-turn beyond finger-tight for a new stainless-steel tubing assembly.

9. Power-on the ISM.

10. Prime the ISM (see page 67).
Removing the primary head and replacing its seals

See the ACQUITY online Help to help determine whether you need to replace the primary head seals.

⚠️ **Warning:** To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

⚠️ **Caution:** To prevent contamination, wear clean, chemical-resistant, powder-free gloves when removing and replacing the head seals.

**Required materials**
- Compressed air
- Gloves: clean, powder-free, chemical-resistant
- Methanol
- Plunger (recommended)
- Plunger seal and plunger-seal spacer
- Fluoropolymer O-ring
- Seal-wash seal

**Required tools**
- 1/4-inch, open-end wrench
- 5/16-inch, open-end wrench
- Plunger removal tool (recommended)
- Seal extraction tool
- Sharp tool
- T27 TORX driver (startup kit)
- Torque wrench
To remove the primary head:

1. Flush the ISM with nonhazardous solvent.
2. In the Instrument console, select Isocratic Solvent Manager from the system tree.
3. In the ISM information window, click Maintain > Heads.
4. In the Head Maintenance dialog box, select the primary head.
5. Click Move Backward, and then wait for the plunger to stop.

Caution: To avoid damaging electrical components or circuitry of a system module, do not disconnect an electrical assembly from the module while the module remains connected to the ac supply source.

Follow this procedure to completely interrupt power to the module:

1. Set the module’s power switch to Off.
2. Disconnect the module’s electrical supply cord from the ac source.

Afterward, wait 10 seconds thereafter before you disconnect an assembly.

6. Power-off the ISM.
7. Move the solvent bottles to a location below the solvent manager.
8. Unscrew the low-pressure filter holder from the primary check valve inlet.
9. Remove the seal wash tubing secured to the seal wash housing by barbed fittings, by using a tool or by pulling on the tubing as close to the pump head as possible.

10. Use the 1/4-inch open-end wrench to disconnect the outlet-tubing from the bottom of the transducer.
11. Disconnect the pressure transducer cable from the bulkhead by squeezing on the tabs and pulling gently.

12. Using the T27 TORX driver, loosen the two head bolts 1/2-turn. The bolts are accessible from the front of the pressure transducer.
Removing the primary head and replacing its seals

13. Using the T27 TORX driver, loosen and remove the 2 support plate bolts, and then gently pull the head and support plate off the actuator housing, making sure not to tilt the head during the extraction.

**Caution:** To avoid damaging the plunger, support the head from below as you remove it.
**Warning:** To avoid hand lacerations, use care when removing the old plunger. Bending the plunger shaft can cause it to break.

14. Use the recessed side of the plunger removal tool to apply pressure to both sides of the release collar, and then remove the old plunger.

15. Remove the plunger removal tool from the release collar.
To remove the primary plunger seals:

1. Stand the head upright on a clean surface.

2. Using the T27 TORX driver, completely loosen the two head bolts to release the support plate from the pump head.

   **Requirement:** If you remove the transducer and head bolts, be sure to reuse the head bolt washers when reassembling the pump head.

3. Lift the pump head from the support plate.
4. Remove the old seal wash seal and discard it.

**Head seals:**

5. Using the smooth end of the seal extraction tool, remove the plunger seal spacer from the head.
Caution: To avoid scratching any metal surfaces, use care when screwing the threaded end of the seal extraction tool into the plunger seal.

6. Taking care not to scratch any surfaces, screw the threaded end of the seal extraction tool into the plunger seal and carefully withdraw the seal from the head.

Caution: To avoid scratching any metal surfaces, use care when using a sharp tool to remove the fluoropolymer O-ring.

7. Taking care not to scratch any surfaces, use a sharp tool to remove the fluoropolymer O-ring.
8. Inspect the pump head surface, ensuring it is free from scratches and particulates.

9. Lubricate the new fluoropolymer O-ring with methanol, and press the O-ring into its seat with your thumbs.

10. Spray the new plunger seal with compressed air to remove any particulates.

11. Lubricate the new plunger seal with methanol, and use the smooth end of the seal extraction tool to place it in the head.
12. Center the new plunger seal spacer over the plunger seal so that the cross-side faces upward.

13. Orient the seal wash housing so that the holes on its side align with the holes on the side of the head, and then guide it into place.

14. Spray the seal wash seal with compressed air to remove any particulates.
15. Install the new seal wash seal in the seal wash housing.

16. Place the support plate on top of the pump head, ensuring the round side of the plate is oriented toward the bottom side of the head.
17. Holding the assembly together, use the T27 TORX driver, fully tighten the two head bolts until screw bottoms out then unscrew 1/4-turn.

To reattach the primary head:

1. Flip the assembly over, and then lubricate the seals with methanol.

2. Carefully insert the sapphire plunger shaft into the pump head until the plunger shaft is no longer visible, ensuring the shaft does not contact the support plate.
**Recommendation:** Replace the plunger whenever you replace the plunger seal.

![Diagram of plunger shaft and support plate]

**Caution:** To avoid damaging the plunger, ensure that the head assembly is not tilted relative to the actuator housing when you position it on the ISM.

3. Carefully slide the head assembly and sapphire plunger into the actuator housing, making sure not to tilt the head.
4. Hold the head assembly securely against the actuator housing, and then use the T27 TORX driver to tighten the support plate bolts securely.

5. Connect the pressure transducer cable to the bulkhead.

6. Power-on the ISM.

7. In the Instrument console, select Isocratic Solvent Manager from the system tree.

8. In the ISM information window, click Maintain > Heads.

9. In the Head Maintenance dialog box, select the primary head.

10. Click Move Forward, and then wait for the piston to engage the plunger sphere.

   **Caution:** To avoid damaging the plunger, alternately tighten the support plate screws 1/4-turn so that they are uniformly torqued.

11. Use the torque driver to tighten each pump head bolt to 40 inch-pounds of torque.

12. After tightening each pump head bolt to 40 inch-pounds of torque, use the torque driver to tighten each pump head bolt to 60 inch-pounds of torque.

13. Reattach all fittings and seal-wash tubing.

   **Tip:** When reattaching the outlet tubing to the transducer, tighten the inlet-tubing fitting finger-tight plus as much as 1/6-turn, for existing fittings, or 3/4-turn for new fittings.
14. Reattach the low-pressure filter holder to the primary check valve and finger-tighten it to the extent possible.

15. Return the solvent bottles to their original location.

16. Prime the ISM (see page 67).

17. Perform the ISM leak test (see the Instrument console online Help).

If the leak test results are not satisfactory, pressurize the head plunger seals to properly seat them.

**To pressurize the seals:**

Run the ISM at 96,527 kPa (965 bar, 14,000 psi) for a half-hour, or run the leak test until results are satisfactory.
Removing the accumulator head and replacing its seals

See the Instrument console online Help to help determine whether you need to replace the accumulator plunger seals.

**Warning:** To avoid the harmful effects of personal contact with solvents, including inhalation, observe Good Laboratory Practice when you handle them. See the Material Safety Data Sheets for the solvents you use.

**Caution:** To prevent contaminating system components, wear clean, chemical-resistant, powder-free gloves when removing and replacing the plunger seals.

**Required materials**
- Compressed air
- Gloves: clean, powder-free, chemical-resistant
- Methanol
- Plunger (recommended)
- Plunger seal and plunger seal spacer
- Fluoropolymer O-ring
- Seal-wash seal

**Required tools**
- 1/4-inch open-end wrench
- 5/16-inch open-end wrench
- Plunger removal tool (recommended)
- Seal extraction tool
- Sharp tool
- T27 TORX driver (startup kit)
- Torque wrench
To remove the accumulator head:

1. Flush the ISM with nonhazardous solvent.
2. In the Instrument console, select Isocratic Solvent Manager from the system tree.
3. In the Isocratic Solvent Manager information window, click Maintain > Heads.
4. In the Head Maintenance dialog box, select the accumulator head.
5. Click Move Backward, and then wait for the plunger to stop.

⚠️ **Caution:** To avoid damaging electrical parts, never disconnect an electrical assembly while power is applied to an instrument or device. To completely interrupt power, set the power switch to Off, and then unplug the power cord from the AC source. Wait 10 seconds thereafter before you disconnect an assembly.

6. Power-off the ISM.

⚠️ **Warning:** To avoid injuries arising from contact with spilled solvent (siphoning), move the solvent bottles to a location below the ISM.

7. Move the solvent bottles to a location below the ISM.
8. Remove the seal wash tubing secured to the seal wash housing by barbed fittings, by using a tool or by pulling on the tubing as close to the pump head as possible.

9. Using the 1/4-inch open-end wrench, disconnect the outlet tubing from the transducer.
10. Using the 5/16-inch open-end wrench to hold the check-valve cartridge in place, disconnect the tubing connection from the check valve with the 1/4-inch open-end wrench.

11. Disconnect the pressure transducer cable from the bulkhead by squeezing on the tabs and pulling gently.
12. Using the T27 TORX driver, loosen the two head bolts 1/2-turn.

**Tip:** The bolts are accessible from the front of the pressure transducer.

![Diagram showing head bolt (2)]

**Caution:** To avoid damaging the plunger, support the pump head from below as you remove it.

13. Using the T27 TORX driver, loosen and remove the 2 support plate bolts, and then gently pull the head and support plate off the actuator housing, making sure not to tilt the head during the extraction.

![Diagram showing support plate bolt (2)]
Pulling head and support plate off actuator housing:
**Warning:** To avoid hand lacerations, use care when removing the old plunger. Bending the plunger shaft can cause it to break.

14. Use the recessed side of the plunger removal tool to apply pressure to both sides of the release collar, and then remove the old plunger.

15. Remove the plunger removal tool from the release collar.
To remove the accumulator head seals:

1. Stand the head upright on a clean surface.

2. Using the T27 TORX driver, completely loosen the two head bolts to release the support plate from the pump head.

   **Requirement:** If you remove the transducer and head bolts, be sure to reuse the head bolt washers when reassembling the pump head.

3. Lift the pump head from the support plate.
4. Remove the old seal wash seal and discard it.

**Head seals:**

5. Using the smooth end of the seal extraction tool, remove the plunger seal spacer from the head.
6. Taking care not to scratch any surfaces, screw the threaded end of the seal extraction tool into the plunger seal and carefully withdraw the seal from the head.

![Diagram showing seal extraction tool and plunger seal]

**Caution:** To avoid scratching any metal surfaces, use care when screwing the threaded end of the seal extraction tool into the plunger seal.

7. Use a sharp tool to remove the fluoropolymer O-ring.

![Diagram showing fluoropolymer O-ring]

**Caution:** To avoid scratching any metal surfaces, use care when using a sharp tool to remove the fluoropolymer O-ring.

8. Inspect the pump head surface ensuring it is free from scratches and particulates.
9. Lubricate the new fluoropolymer O-ring with methanol, and press the O-ring into its seat with your thumbs.

10. Spray the new plunger seal with compressed air to remove any particulates.

11. Lubricate the new plunger seal with methanol, and use the smooth end of the seal extraction tool to place it in the head.
12. Center the new plunger seal spacer over the plunger seal so that the cross-side faces upward.

13. Orient the seal wash housing so that the holes on its side align with the holes on the side of the head, and then guide it into place.
14. Spray the seal wash seal with compressed air to remove any particulates.

15. Install the new seal wash seal in the seal wash housing.
16. Place the support plate on top of the pump head, ensuring the round side of the plate is oriented toward the bottom side of the head.

17. Holding the assembly together, using the T27 TORX driver, fully tighten the two head bolts until the screws bottom out and then unscrew 1/4 turn.
To reattach the accumulator head:

1. Flip the assembly over, and then lubricate the seals with methanol.

2. Carefully insert the sapphire plunger shaft into the pump head until the plunger shaft is no longer visible, ensuring the shaft does not contact the support plate.
**Recommendation:** Replace the plunger whenever you replace the plunger seal.

**Caution:** To avoid damaging the plunger, ensure that the head assembly is not tilted when you position it onto the actuator housing.

3. Carefully slide the head assembly and sapphire plunger into the actuator housing, making sure not to tilt the head.
4. Hold the head assembly securely against the actuator housing, and then use the T27 TORX driver to tighten the support plate bolts securely.

5. Connect the pressure transducer cable to the bulkhead.

6. Power-on the ISM.

7. In the Instrument console, select Isocratic Solvent Manager from the system tree.

8. In the ISM information window, click Maintain > Heads.

9. In the Head Maintenance dialog box, select the accumulator head.

10. Click Move Forward, and then wait for the piston to engage the plunger sphere.

! Caution: To avoid damaging the plunger, alternately tighten the support plate screws 1/4-turn so that they are uniformly torqued.

11. Use the torque driver to tighten each pump head bolt to 40 inch-pounds of torque.

12. After tightening each pump head bolt to 40 inch-pounds of torque, use the torque driver to tighten each pump head bolt to 60 inch-pounds of torque.

13. Reattach all fittings and seal-wash tubing.

   Tip: When reattaching the outlet tubing to the transducer, tighten the inlet-tubing fitting finger-tight plus as much as 1/6-turn, for existing fittings, or 3/4-turn for new fittings.

14. Return the solvent bottles to their original location.
15. Prime the ISM (see page 67).

16. Perform the ISM leak test (see the ACQUITY online Help).

If the leak test results are not satisfactory, pressurize the head plunger seals to properly seat them.

**To pressurize the seals:**

Run the ISM at 96,527 kPa (965 bar, 14,000 psi) for a half-hour, or run the leak test until results are satisfactory.

**Cleaning the instrument’s exterior**

Clean surfaces of the solvent manager using only a clean, soft, lint-free paper or clean cloth dampened with water.

⚠️ **Warning:** To avoid electric shock, observe these precautions:
- Disconnect the device or instrument from the electrical supply.
- When cleaning the surface of a device or instrument, apply water to a cloth, and then wipe the unit. Do not spray or otherwise directly apply water to any device surface.

⚠️ **Warning:** To avoid personal injury, use eye and hand protection during the cleaning process.
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 the products that Waters offers.

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Warning symbols

Warning symbols alert you to the risk of death, injury or seriously adverse physiological reactions associated with an instrument’s use or misuse. 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 a 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.)
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.

Good laboratory practices warning

Attention: To prevent injury, always observe Good Laboratory Practices when you handle solvents, change tubing, or operate the ISM. Consult the Material Safety Data Sheets regarding the solvents you use.

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.

Attention: 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, Biohazard 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.
Biohazard and chemical hazard warning

This warning applies 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.


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.

Caution advisory

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

**Caution:** To avoid damaging the instrument’s case, do not clean it with abrasives or solvents.
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：未经有关法规认证部门允许对本设备进行的改变或修改，可能会使使用者丧失操作该设备的权利。

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て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 précaution:
• 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。
- 不要使用已經被壓瘪或嚴重彎曲管線。
- 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。
• 消灭附近所有的火焰。
• 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 고십시오.
• 심하게 변형되거나 꼬인 튜브는 사용하지 마십시오.
• 비금속(Nonmetallic) 튜브를 테트라하이드로푸란(Tetrahydrofuran: THF) 또는 농축 질산 또는 황산과 함께 사용하지 마십시오.
• 염화 메틸렌(Methylene chloride) 및 디메틸 су로시드(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：使用者必须非常清楚如果設備不是按照製造廠商指定的方式使用，那該設備所提供的保護將會被削弱。

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。
## Electrical and handling symbols

### Electrical symbols

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![symbol]</td>
<td>Electrical power on</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Electrical power off</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Standby</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Direct current</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Alternating current</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Protective conductor terminal</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Frame, or chassis, terminal</td>
</tr>
<tr>
<td>![symbol]</td>
<td>Fuse</td>
</tr>
</tbody>
</table>
## 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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Keep upright!]</td>
<td>Keep upright!</td>
</tr>
<tr>
<td>![Keep dry!]</td>
<td>Keep dry!</td>
</tr>
<tr>
<td>![Fragile!]</td>
<td>Fragile!</td>
</tr>
<tr>
<td>![Use no hooks!]</td>
<td>Use no hooks!</td>
</tr>
</tbody>
</table>
The specifications presented here depend on the conditions in individual laboratories. Refer to the ACQUITY System Site Preparation Guide, or contact the Waters® Technical Service organization for additional information about specifications.

## Contents:

<table>
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<td>158</td>
</tr>
</tbody>
</table>

## Physical specifications

The following table lists the physical specifications for the ISM.

### Physical specifications:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>24.5 cm (9.6 inches)</td>
</tr>
<tr>
<td>Width (including tubing guide)</td>
<td>37.7 cm (14.9 inches)</td>
</tr>
<tr>
<td>Depth</td>
<td>61.5 cm (24.2 inches)</td>
</tr>
<tr>
<td>Weight</td>
<td>24.9 kg (55.0 pounds)</td>
</tr>
</tbody>
</table>
## Environmental specifications

The following table lists the environmental specifications for the ISM.

### Environmental specifications:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>4 to 40 °C</td>
</tr>
<tr>
<td>Operating relative humidity range</td>
<td>20 to 80%, non-condensing</td>
</tr>
<tr>
<td>Transportation and storage temperature range</td>
<td>-30 to 60 °C</td>
</tr>
<tr>
<td>Transportation and storage humidity</td>
<td>20 to 85%, non-condensing</td>
</tr>
</tbody>
</table>

## Electrical specifications

The following table lists the electrical specifications for the ISM.

### Electrical specifications:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection class(^a)</td>
<td>Class I</td>
</tr>
<tr>
<td>Overvoltage category(^b)</td>
<td>II</td>
</tr>
<tr>
<td>Pollution degree(^c)</td>
<td>2</td>
</tr>
<tr>
<td>Moisture protection(^d)</td>
<td>Normal (IPX0)</td>
</tr>
<tr>
<td>Power requirements</td>
<td>100 to 240 VAC</td>
</tr>
<tr>
<td>Line frequency</td>
<td>50 to 60 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>200 VA</td>
</tr>
</tbody>
</table>

\(^a\) Protection Class I — The insulating scheme used in the instrument to protect from electrical shock. Class I identifies a single level of insulation between live parts (wires) and exposed conductive parts (metal panels), in which the exposed conductive parts are connected to a grounding system. In turn, this grounding system is connected to the third pin (ground pin) on the electrical power cord plug.

\(^b\) Overvoltage Category II — Pertains to instruments that receive their electrical power from a local level such as an electrical wall outlet.

\(^c\) Pollution Degree 2 — A measure of pollution on electrical circuits that can produce a reduction of dielectric strength or surface resistivity. Degree 2 refers only to normally nonconductive pollution. Occasionally, however, expect a temporary conductivity caused by condensation.
d. **Moisture Protection** – Normal (IPX0) – IPX0 means that no Ingress Protection against any type of dripping or sprayed water exists. The “X” is a placeholder that identifies protection against dust, if applicable.

## Input/output specifications

The following table lists the input and output specifications for the ISM.

### Input and output specifications:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradient start</td>
<td>Maximum input voltage: ±30 VDC</td>
</tr>
<tr>
<td></td>
<td>Logic High: ≥3.0 VDC</td>
</tr>
<tr>
<td></td>
<td>Logic Low: ≤1.9 VDC</td>
</tr>
<tr>
<td></td>
<td>Minimum pulse width: 100 msec</td>
</tr>
<tr>
<td>Stop flow</td>
<td>Maximum input voltage: ±30 VDC</td>
</tr>
<tr>
<td></td>
<td>Logic High: ≥3.0 VDC</td>
</tr>
<tr>
<td></td>
<td>Logic Low: ≤1.9 VDC</td>
</tr>
<tr>
<td></td>
<td>Minimum pulse width: 100 msec</td>
</tr>
</tbody>
</table>

## Performance specifications

### ISM

The following table lists the performance specifications for the ISM.

### ISM performance specifications:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priming</td>
<td>Automated priming at flow rates of 4 mL/min.</td>
</tr>
<tr>
<td>Check valves</td>
<td>Primary and accumulator check valves are passive</td>
</tr>
<tr>
<td>Vent valve</td>
<td>Automated vent valve for priming and automated leak testing</td>
</tr>
<tr>
<td>Number of solvents</td>
<td>One</td>
</tr>
</tbody>
</table>
### ISM performance specifications: (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvent conditioning</td>
<td>One integrated vacuum degassing channel</td>
</tr>
<tr>
<td>Solvent lines</td>
<td>Two factory installed inlet tubing assemblies for solvent and seal wash</td>
</tr>
<tr>
<td>Solvent and seal wash containers</td>
<td>Located in separate bottle tray</td>
</tr>
<tr>
<td>Seal wash pump</td>
<td>Equipped with a wash system to flush the rear of the high pressure seal and the plunger. Provides pulsed flow of 50 ±20 µL per pulse.</td>
</tr>
</tbody>
</table>
| Maximum operating pressure (ISM only) | • 0 to 1 mL/min = 103,425 kPa (1034 bar, 15,000 psi)  
  • 1 to 2 mL/min = 103,425 to 62,055 kPa (1034 to 621 bar, 15,000 to 9000 psi), linear |
| Note: For flow-splitter pressure information, see page 157. |                                                                                                                                 |
| Flow rate range                  | 0.010 to 2.000 mL/min, in 0.001-mL increments.                                                                                               |
| Flow accuracy                    | • 1.0% of set flow at 0.5 to 2.0 mL/min.                                                                                                      |
|                                  | • Back pressure 6895 kPa (69 bar, 1000 psi) ±1379 kPa (14 bar, 200 psi), with degassed methanol using either a volumetric or mass-based method. |
### ISM performance specifications: (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow precision</td>
<td>&lt;0.075% RSD or &lt;0.020 min SD, whichever is greater, based on six replicates.</td>
</tr>
<tr>
<td>Test conditions:</td>
<td></td>
</tr>
<tr>
<td>• Mobile phase:</td>
<td>Mobile phase: 60:40 water/methanol premix</td>
</tr>
<tr>
<td>• Flow rate:</td>
<td>0.5 mL/min</td>
</tr>
<tr>
<td>• Sample:</td>
<td>alkylphenone mix (5.0-μL injection volume)</td>
</tr>
<tr>
<td>• Column:</td>
<td>ACQUITY BEH C18 1.7 μm, 2.1 × 50 mm</td>
</tr>
<tr>
<td>• Column temperature:</td>
<td>35 °C ± 1.0 °C</td>
</tr>
<tr>
<td>• Detector:</td>
<td>254 nm UV</td>
</tr>
<tr>
<td>Dynamic leak test</td>
<td>-50 to 150 nL/min at 20,684 to 96,527 kPa (207 to 965 bar, 3000 to 14,000 psi)</td>
</tr>
<tr>
<td>Static leak test</td>
<td>&lt;500 psi/min at 20,684 to 96,527 kPa (207 to 965 bar, 3000 to 14,000 psi)</td>
</tr>
<tr>
<td>Audible noise</td>
<td>&lt;58 dBA for individual module</td>
</tr>
</tbody>
</table>

### ISM flow-splitter kits

The following tables list the performance specifications for the optional flow-splitter kits.

### ACQUITY® UPLC and Alliance® Flow-splitter kit performance specifications:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compatible ISM flow rate</td>
<td>0.001 to 2.000 mL/min</td>
</tr>
<tr>
<td>Compatible LC flow rate</td>
<td>0.200 to 2.000 mL/min</td>
</tr>
<tr>
<td>Pressure</td>
<td>41,369 kPa (414 bar, 6000 psi)</td>
</tr>
</tbody>
</table>
ACQUITY® UPLC and Alliance® Flow-splitter kit performance specifications:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrictor module reproducibility</td>
<td>± 15.0% of split ratio</td>
</tr>
<tr>
<td>Note: This specification applies to replacing an individual restrictor module only.</td>
<td></td>
</tr>
</tbody>
</table>

Note: For ACQUITY UPLC and Alliance flow-splitter kits, the split ratio and detector offset time are dependent on all chromatographic conditions and on the system configuration.

UPC²® Flow-splitter kit performance specifications:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate</td>
<td>Up to 4.0 mL/min</td>
</tr>
<tr>
<td>Pressure</td>
<td>41,369 kPa (414 bar, 6000 psi)</td>
</tr>
</tbody>
</table>

Wetted materials of construction

ISM

The following table lists the wetted materials of construction for the ISM.

Wetted materials of construction:

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted materials</td>
<td>302 stainless-steel; 316 stainless-steel; DLC; fluoropolymer; fluoroelastomer; UHMWPE blend; PEEK; PEEK with 30% carbon fiber fill; PPS; PPS with 20% fluoropolymer fill; ruby; sapphire; titanium alloy; zirconia</td>
</tr>
</tbody>
</table>
### Wetted materials of construction

#### ACQUITY UPLC Flow-splitter kit

The following table lists the wetted materials of construction for the ACQUITY UPLC Flow-splitter kit.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted materials</td>
<td>316 stainless-steel, fused silica</td>
</tr>
</tbody>
</table>

#### Alliance Flow-splitter kit

The following table lists the wetted materials of construction for the Alliance Flow-splitter kit.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted materials</td>
<td>316 stainless-steel, fused silica</td>
</tr>
</tbody>
</table>

#### UPC² Flow-splitter kit

The following table lists the wetted materials of construction for the UPC² Flow-splitter kit.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted materials</td>
<td>316 stainless-steel, fused silica, PEEK</td>
</tr>
</tbody>
</table>

#### Post-column Addition kit

The following table lists the wetted materials of construction for the Post-column Addition kit.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetted materials</td>
<td>316 stainless-steel, PEEK</td>
</tr>
</tbody>
</table>