

ACQUITY UPLC 30-cm Column Heater/Cooler

Overview and Maintenance Guide

General information

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Safety considerations

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

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.

Considerations specific to the 30-cm Column Heater/Cooler



Warning: To avoid electric shock, observe these precautions:

- Use SVT-type power cords in the United States and HAR-type power cords, or better, in Europe. For requirements elsewhere, contact your local Waters distributor.
- Inspect the power cords for damage and replace them if necessary.
- Power-off and unplug each module before performing any maintenance operation on it.
- Connect each module to a common ground.



Warning: To avoid electric shock, do not remove protective panels from system modules. The components within are not user-serviceable.



Warning: To prevent burn injuries, set the column temperature to Off, and then allow the column compartment and its components to cool for 60 minutes before touching them. Monitor the column compartment's internal temperature to ensure that all components are cool.



Warning: To avoid combustion, do not use the column compartment with solvents whose autoignition temperatures are below 150 °C.

FCC radiation emissions notice

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

Electrical power safety notice

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

Equipment misuse notice

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

Safety advisories











Consult the "Safety advisories" appendix in this publication for a comprehensive list of warning advisories and notices.

Operating the device

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

Applicable symbols

The following symbols can be present on the device, system, or packaging.

Symbol	Definition
	Manufacturer
	Date of manufacture
	Authorized representative of the European Community
	Confirms that a manufactured product complies with all applicable European Community directives
	Australia EMC compliant
	Confirms that a manufactured product complies with all applicable United States and Canadian safety requirements
	Consult instructions for use
	Alternating current
	Electrical and electronic equipment with this symbol may contain hazardous substances and should not be disposed of as general waste. For compliance with the Waste Electrical and Electronic Equipment Directive (WEEE) 2012/19/EU, contact Waters Corporation for the correct disposal and recycling instructions.
	Serial number

Symbol	Definition
REF	Part number, catalog number

Audience and purpose

This guide is intended for use by individuals who operate and maintain the 30-cm Column Heater/Cooler (30-cm CHC).

Intended use of the 30-cm CHC

Waters designed the 30-cm CHC for use in liquid chromatography (LC) applications. The 30-cm CHC is not intended for use in diagnostic applications.

Calibrating

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

When calibrating mass spectrometers, consult the calibration section of the operator's guide for the instrument you are calibrating. In cases where an overview and maintenance guide, not an operator's guide, accompanies the instrument, consult the system guide or the instrument's online Help system for calibration instructions.

Quality control

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

EMC considerations

Canada spectrum management emissions notice

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

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

ISM classification: ISM group 1 class B

This classification has been assigned in accordance with CISPR 11 Industrial Scientific and Medical (ISM) instrument 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



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1 Overview

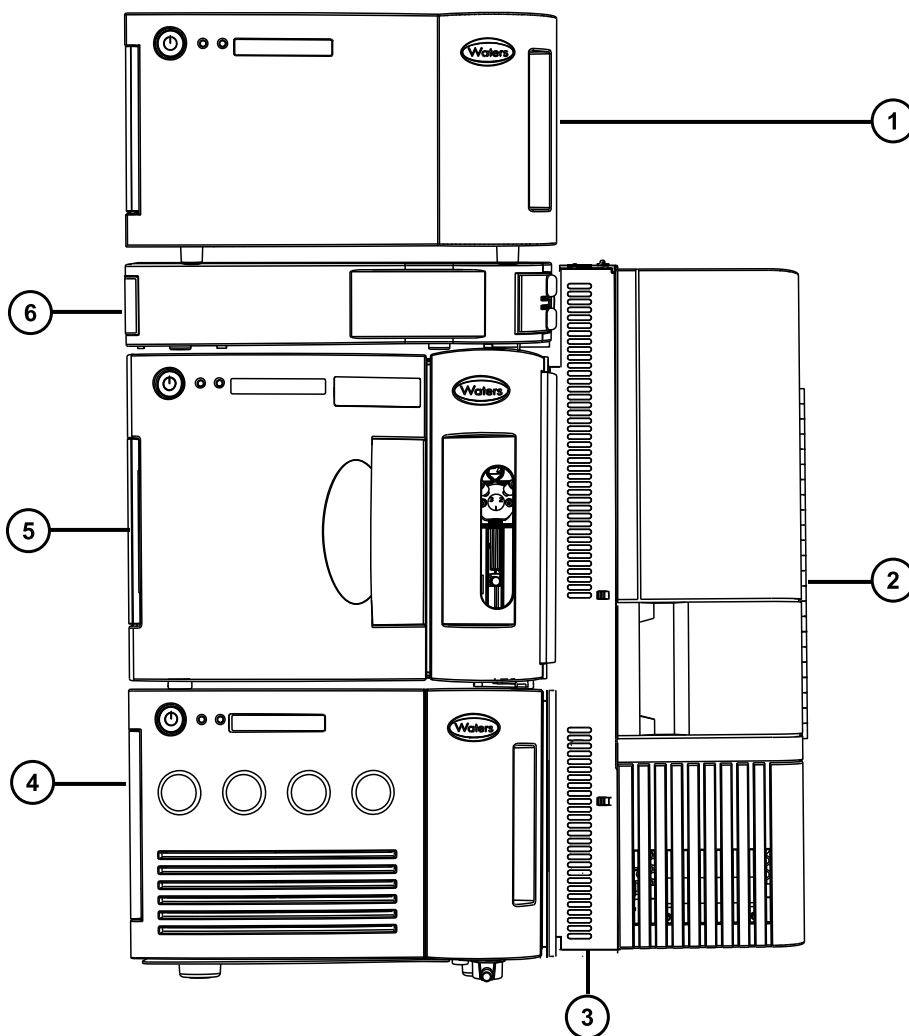
The 30-cm Column Heater/Cooler (30-cm CHC) is a column heating/cooling module that manages and maintains column temperature for ACQUITY UPLC systems. For ACQUITY UPLC H-Class Series, ACQUITY UPLC H-Class Bio Series, and ACQUITY UPLC I-Class Series systems equipped with a CH-A module, the 30-cm CHC module serves as an alternate 30-cm column heating/cooling module for the system. Additionally, for ACQUITY UPLC H-Class Series or H-Class Bio Series systems equipped with a CM-A module, the 30-cm CHC module serves as an auxiliary 30-cm column heating/cooling module when the 30-cm CHC is directly connected to the CM-A module's switching valves.

The 30-cm CHC column compartment accommodates LC columns with dimensions as large as 7.8-mm internal diameter (ID) and 300-mm length. For additional information about supported columns, see "[Column configurations](#)".

Restriction: You can operate the system using only one column heater compartment at a time.

The 30-cm CHC module is mounted next to the ACQUITY UPLC system stack, as shown in the following figure.

Figure 1–1: 30-cm CHC module mounted next to the ACQUITY UPLC system stack

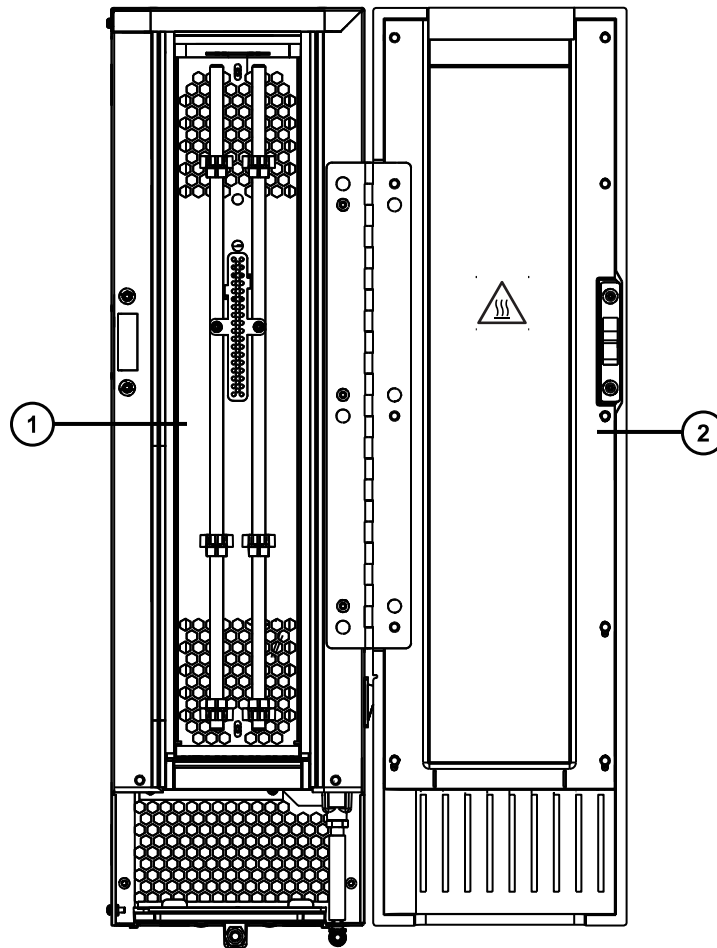


- ① Detector
- ② 30-cm CHC module
- ③ 30-cm column-compartment adapter bracket
- ④ Solvent manager
- ⑤ Sample manager
- ⑥ CH-A (or CM-A, depending on system configuration)

1.1 Major components

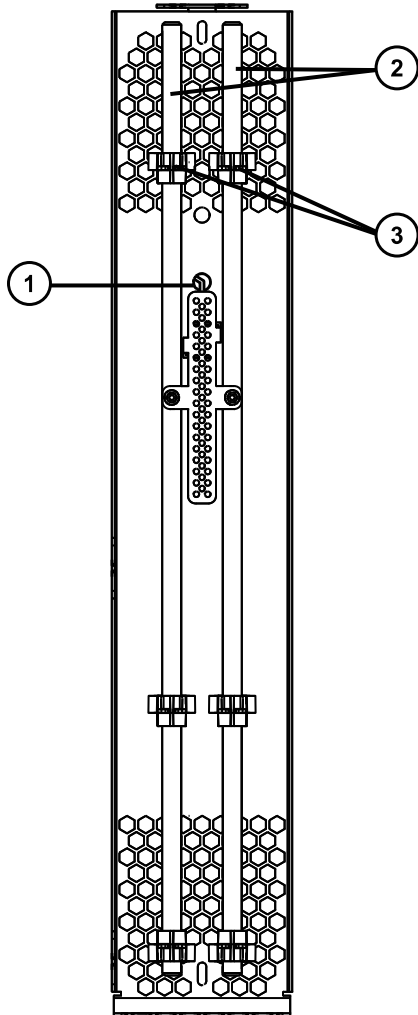
The following figures show the major components of a 30-cm CHC module.

Figure 1–2: Front view, with door open



- ① Column-compartment interior
- ② Column-compartment door

Figure 1–3: Compartment interior



- ① Compartment thermistor
- ② Column rails (2)
- ③ Rail-mounted column clips (6)

1.2 Column heater/cooler

You can set the 30-cm CHC module compartment temperature from 4.0 to 65.0 °C, in 0.1 °C increments. The compartment controllable temperatures range from 15 °C below ambient to 65.0 °C.

In addition to a thermoelectric engine, for heating and cooling, and a fan, for exhausting engine heat, the module incorporates an internal onboard power supply, external power-entry module,

and power on/off switch. The power supply is necessary for additional power required to operate the thermoelectric heater/cooler engine circuit.

1.2.1 Column heater/cooler operation

The 30-cm CHC module is a combination forced-air convection heater and cooler. When the compartment temperature is set, either directly from the console or within a method, a command is sent to the column heater/cooler to switch the compartment heating element on or off. On the basis of feedback from the compartment thermistor, the thermoelectric device continues to heat, or cool, until the compartment achieves the specified temperature set point.

Recommendation: When sample and column temperature are important to an application, in addition to specifying explicit temperature set points in the method, specify appropriate temperature limits. Together, these settings ensure that system operation occurs only within the defined limits and that any occurrence of an unacceptable deviation from the set points is flagged by an error message acknowledging the variance.

1.3 Column configurations

You can install multiple chromatographic columns, in series, of varying sizes, within the 30-cm CHC module's column compartment. The table below lists the supported column configurations.

Note: Columns are not provided with the column heating/cooling module.

Table 1–1: Supported column configurations

Quantity	Description
Up to 6 columns, serially connected	Column length = 300 mm; column ID = 7.8 mm, maximum; column guard or column in-line filter = 20 mm, maximum

2 Preparation and operation

Before you prepare a 30-cm CHC module for operation, prepare the sample manager and the solvent manager.

Before running samples, you must prepare the 30-cm CHC module for operation.

To do so, perform these tasks:

- Install the 30-cm CHC module onto the system stack.
- Make the column-tubing connections and install the column.
- Make the power and signal connections.
- Configure and control the 30-cm CHC module using the console or the method editor in the chromatography data software.

For ACQUITY UPLC H-Class Series, ACQUITY UPLC H-Class Bio Series, and ACQUITY UPLC I-Class Series systems equipped with a CH-A module, the 30-cm CHC module serves as an alternate 30-cm column heating/cooling module for the system. Additionally, for ACQUITY UPLC H-Class Series or H-Class Bio Series systems equipped with a CM-A module, the 30-cm CHC module serves as an auxiliary 30-cm column heating/cooling module when the 30-cm CHC is directly connected to the CM-A module's switching valves. This chapter describes how to prepare and operate the 30-cm CHC module for both of these column-compartment setups.

2.1 Column compartment installation

If the 30-cm CHC module is not installed as part of the system stack, do as follows:

- Attach the adaptor bracket to the system stack.
- Secure the column compartment to the system stack.
- Install the column compartment's drip tray and drain.



Warning: To avoid a fault condition that can result in personal injury or death from electric shock, do not disconnect or otherwise interrupt the continuity of an electrical socket's protective grounding conductor or the power cord's grounding conductor.



Warning: To avoid electric shock, do not remove protective panels from system modules. The components within are not user-serviceable.

2.1.1 Attaching the column-compartment adaptor bracket

To secure the 30-cm CHC module to the system stack, you must attach the adaptor bracket to the right-hand side of the sample-manager chassis and the right-hand side of the solvent-manager chassis, as viewed from the front of the system stack. Then you must attach the three standoff assemblies to the adaptor bracket.

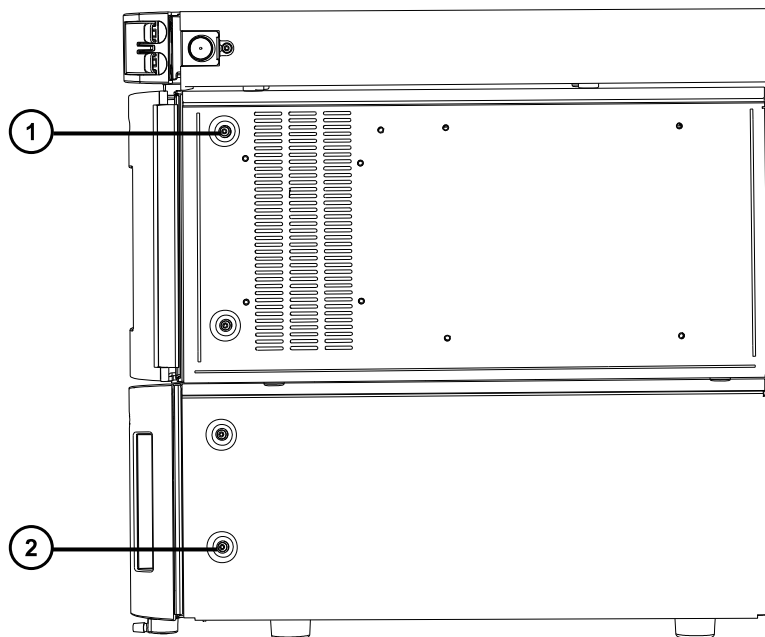
Required tools and materials

- 7-mm open-end wrench
- T20 TORX driver
- 30-cm CHC start-up kit, containing the necessary mounting hardware

To attach the adaptor bracket:

1. Power-off the sample manager and solvent manager.
2. Using the T20 Torx driver, loosen and remove the top screw from the right-hand side of the sample-manager chassis, and the bottom screw from the right-hand side of the solvent-manager chassis.

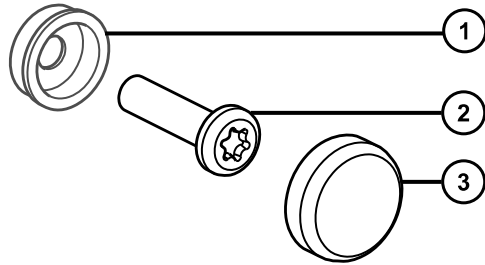
Figure 2–1: Removing the screws for a 30-cm CHC with CH-A (or CM-A) configuration



- ① Top-mounted screw on sample-manager chassis

② Bottom-mounted screw on solvent-manager chassis
3. Insert each of the 2 M4 × 16 screws through a cup washer.

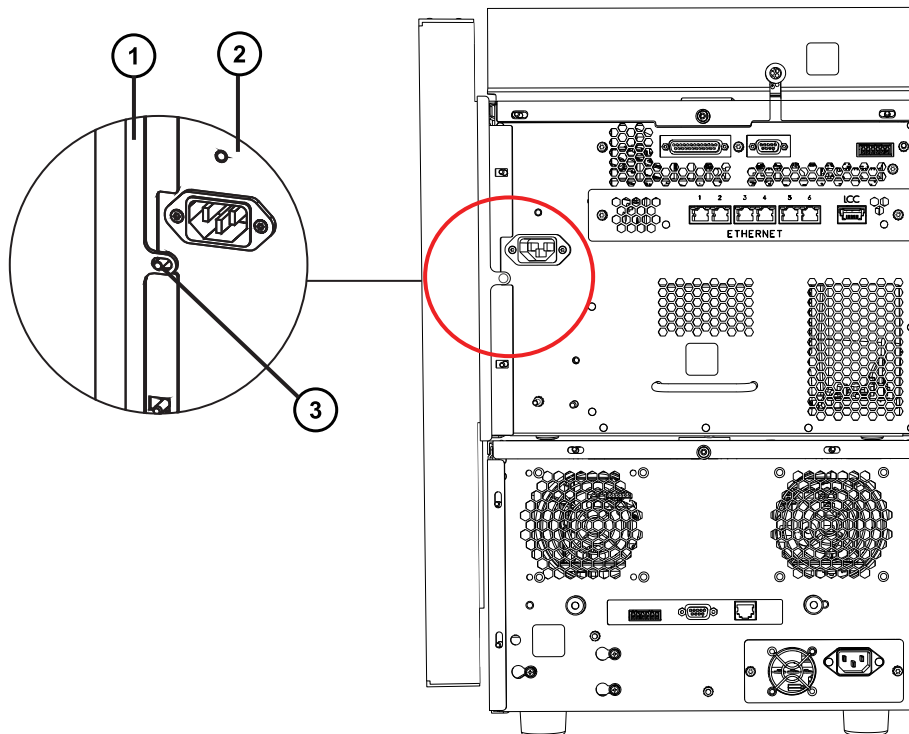
Figure 2–2: Adaptor bracket mounting fasteners assembly



- ① Cup washer
- ② M4 × 16 screw
- ③ Blue cap (placed on M4 screw after bracket is attached)

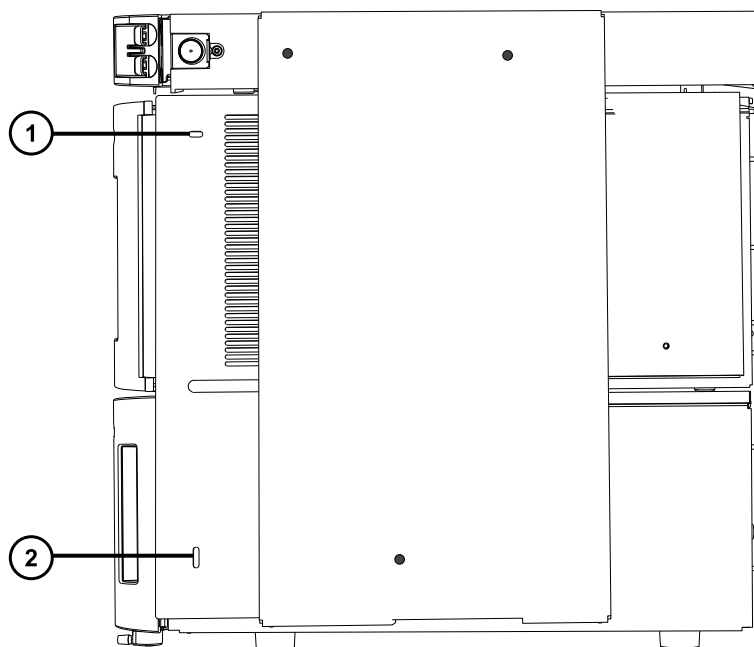
4. Position the adaptor bracket so that its rear tab fits over the ground stud on the rear panel of the sample-manager chassis.

Figure 2–3: Adaptor bracket's rear tab positioned over the rear-panel ground stud of the sample manager



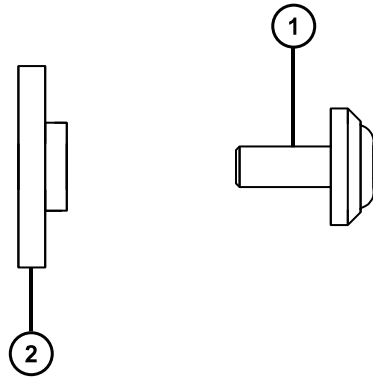
- ① Adaptor bracket
 - ② Sample-manager chassis, rear panel
 - ③ Adaptor bracket's rear tab, positioned over ground stud
5. Align the 2 openings on the adaptor bracket's left panel with the threaded holes in the right-hand side of the sample-manager chassis and the right-hand side of the solvent-manager chassis.

Figure 2–4: Adaptor bracket aligned with threaded holes on sample-manager and solvent-manager chassis



- ① Adaptor bracket top opening
 - ② Adaptor bracket bottom opening
6. Loosely thread the 2 M4 × 16 screws with cup washers in the threaded mounting holes.
7. Using the T20 Torx driver, tighten both screws, to secure the bracket.
8. Using the blue caps from the kit, press a cap onto each of the two screw heads.
9. Obtain the M4 Keps nut from the start-up kit.
10. Thread the M4 Keps nut onto the ground stud at the rear of the sample manager, and then tighten the nut using the 7-mm open-end wrench.
11. Insert each of the 3 M4 column-module mounting screws through a standoff (spacer), so that the standoff's smaller-diameter side faces the M4 screw head when you thread the screw into the bracket.

Figure 2–5: Column-module mounting screw with standoff assembly

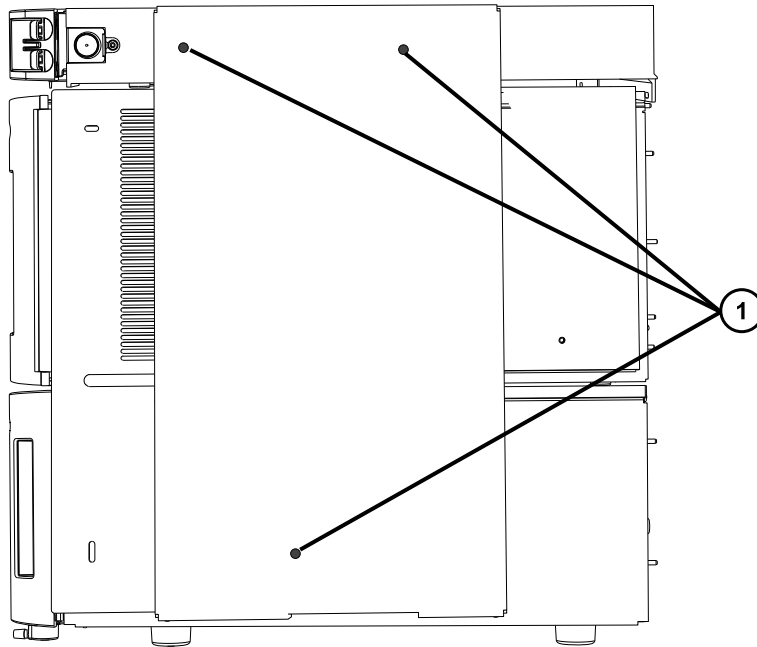


① M4 column-module mounting screw (3)

② Standoff (3) – smaller-diameter side facing screw head

12. Thread the 3 M4 column-module mounting screws with standoffs in the threaded holes in the adaptor bracket, and then tighten the screws, using the T20 Torx driver.

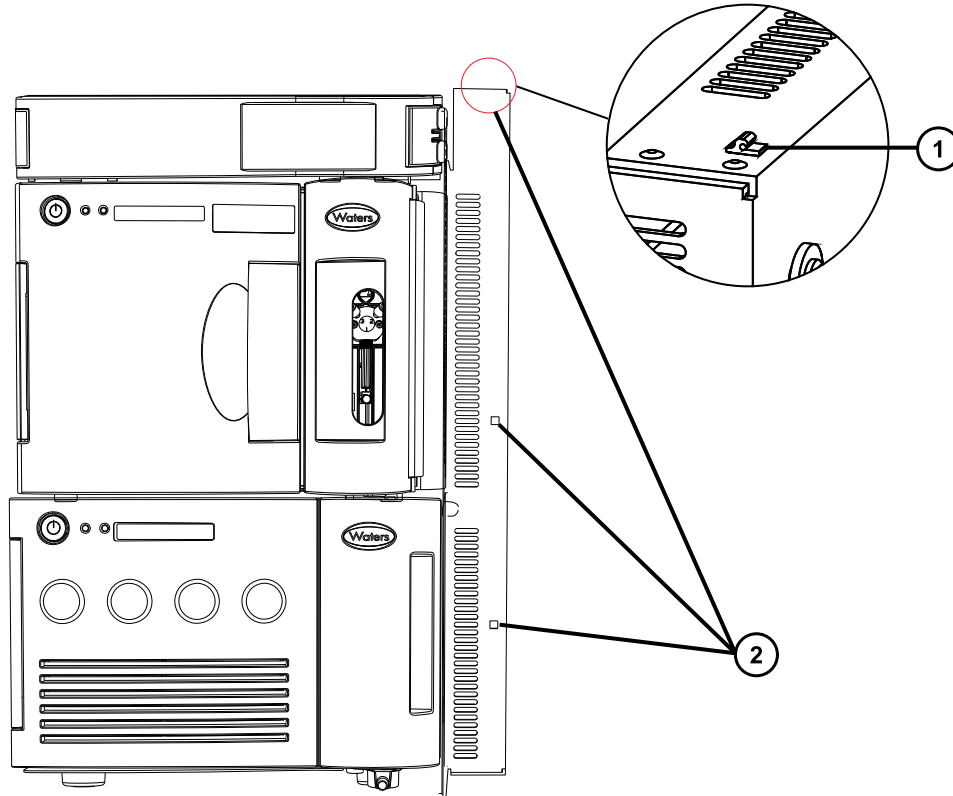
Figure 2–6: Installing standoffs in adaptor bracket



① Location of 3 M4 column-compartment mounting screws with standoffs

13. Attach the tubing clips to the top and front sides of the adaptor bracket by pressing the clips into the designated holes.

Figure 2–7: Attaching tubing clips to adaptor bracket



- ① Tubing clip (3) – shown installed
- ② Location of tubing-clip holes in adaptor bracket

2.1.2 Securing the column compartment to the system stack

When properly installed, the 30-cm CHC module is secured to the system stack by the adaptor bracket's 3 M4 × 10 screws with standoffs. The standoffs, along with each mounting screw, provide proper spacing and support for the installation.

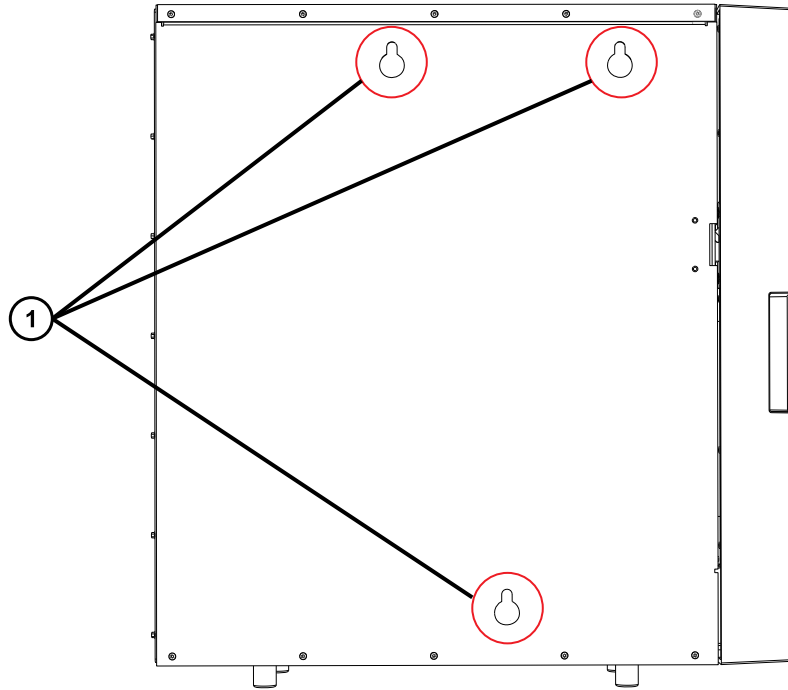
Required tools and materials

- T20 TORX driver
- 30-cm CHC start-up kit, containing the necessary mounting hardware

To secure the column compartment to the system stack:

1. Align the 3 key-hole slots in the left-hand side of the column-compartment chassis with the 3 M4 × 10 screws with standoffs, on the column-compartment adaptor bracket.

Figure 2–8: Key-hole slots on column-compartment chassis



① Key-hole slots on column-compartment chassis

2. Carefully lower the 30-cm CHC module onto the bracket until the module is fully engaged in all 3 key-hole slots.
3. Verify that the 30-cm CHC module is firmly secured to the system stack.

Tip: To remove the module, lift it slightly, releasing it from the bracket's mounting screws, and then move it away from the bracket.

2.1.3 Installing the drip tray and waste tubing for a 30-cm CHC module

In addition to the drip tray, which is provided to collect any leakage from the column compartment, the 30-cm CHC module is equipped with a condensation drain for collecting condensation that forms in, or around, the internal cooler engine. This drain exits through the bottom of the compartment to an elbow fitting. Because both the condensate drain and compartment drip tray drain must be routed to waste, you can use a Y-connector—provided in the system start-up kit—to consolidate the drain lines. You can then route a single waste line from the Y-connector to a suitable waste container. If you do not use the Y-connector, you must route both drain lines to the waste container.

Tools and materials

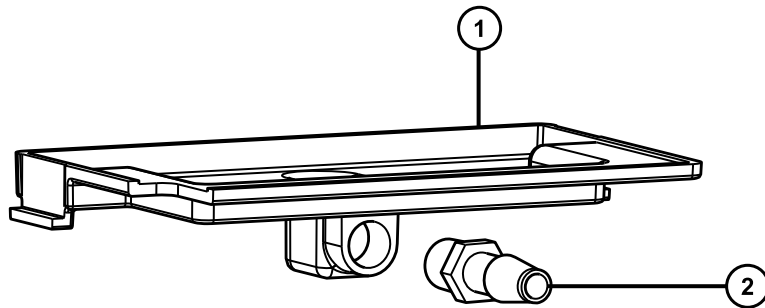
- 7/16-inch open-end wrench
- Tubing cutter
- Drip tray
- Drain fitting and Y-connector
- Sufficient lengths of 0.25-inch ID polymer tubing for connecting the condensation drain and the drip tray to the Y-connector and the waste container
- Suitable waste container

Requirement: The column module must be mounted onto the system stack.

To install the drip tray and waste tubing for the 30-cm CHC module:

1. If not already fitted, thread the barbed, drain fitting into the drip tray's drain opening and tighten using the 7/16-inch open-end wrench.

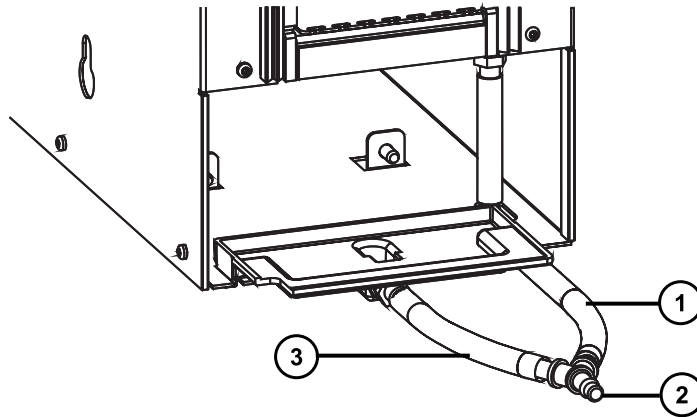
Figure 2–9: Drip tray assembly



- ① Drip tray
- ② Barbed fitting

2. Install the drip tray into the compartment base, so that proper gravity-fed drainage is enabled from the bottom of the compartment.
3. Ensure that sufficient clearance exists between the drip-tray fitting and the laboratory benchtop, to allow connection of the drain tubing.
4. Locate the condensation drain fitting, below the bottom of the compartment.

Figure 2–10: Drain setup for 30-cm CHC column compartment using Y-connector



- ① Condensation drain tubing
- ② Y-connector for consolidating both condensation and drip tray flows
- ③ Drip tray drain tubing

5. Make the tubing connections to the Y-connector for the condensation drain and the drip tray as follows.
 - a. Cut the condensation drain tubing to length (approximately 15 to 20 cm), and connect it from the barbed fitting on the condensation drain to one of the barbed fittings on the Y-connector.
 - b. Cut another tubing section to length (approximately 15 to 20 cm), and connect it from the barbed fitting on the drip tray to the second barbed fitting on the Y-connector.

6. Cut another tubing section to length, and connect it from the remaining barbed fitting (drain egress) on the Y-connector to the waste container.



Warning: To avoid a hazardous condition resulting from leakage or spilling of waste fluid, ensure that the drain tube is properly routed so that it is not crimped or bent. A crimp or bend can prevent adequate flow to the waste container.



Warning: To avoid spills, empty the waste container at regular intervals.

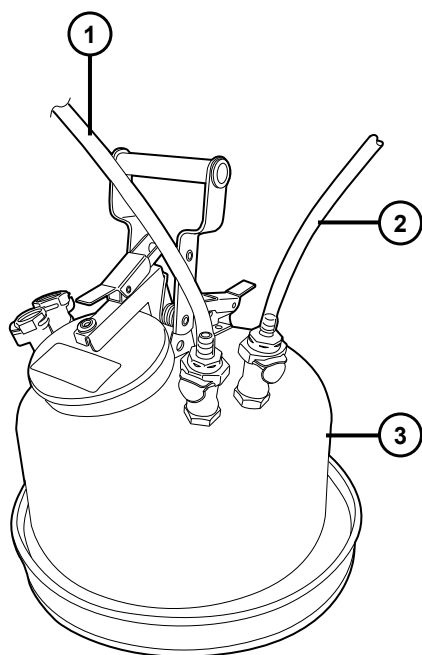


Notice: To avoid fluid backup, ensure proper drainage of waste:

- Place the waste container below the system stack to permit gravity flow.
- Ensure that the exit of the waste tube is not immersed in waste solvent.
- If necessary, shorten the tube so that no portion of it drops below the top of the waste container.

7. Route the tubing, taking care to ensure that liquid can drain through it, freely, to the waste container.

Figure 2–11: Representation of a suitable waste container



- ① Waste tubing (from stack of system modules)
- ② Waste container vent tubing (to fume hood)
- ③ Waste container

2.2 Column compartment plumbing connections

For ACQUITY UPLC systems (including ACQUITY UPLC H-Class Series, ACQUITY UPLC H-Class Bio Series, and ACQUITY UPLC I-Class Series) that are configured with both CH-A and 30-cm CHC modules, you can manually switch column setups between sample runs. You do so by disconnecting the CH-A module's plumbing connections from the system, and then connecting the 30-cm CHC module's plumbing connections to the system. Additionally, for ACQUITY UPLC H-Class Series (or H-Class Bio Series) systems that are configured with both CM-A and 30-cm CHC modules, you can automatically switch between the columns in the CM-A and in the 30-cm CHC by connecting the 30-cm CHC directly to the CM-A module's switching valves and operating it as an auxiliary 30-cm column heating/cooling module. The topics in this section convey instructions for connecting both of these setups.

Note: With the optional Waters Column Module Switch Box, you can physically connect both the CH-A and the 30-cm CHC modules to the SM-FTN and switch the electrical control of the column modules via the SM-FTN console. For instructions on installing the Column Module Switch Box, see *ACQUITY UPLC Column Heater-Active Overview and Maintenance Guide*.

General restrictions:

- You can operate the system using only one column compartment at a time.
- You can configure only one 30-cm column compartment per system: either a CH-30A or a 30-cm CHC. (For configuration information on the CH-30A, see the *ACQUITY UPLC Column Manager - Active and Column Manager - Auxiliary Overview and Maintenance Guide*.)

When making column tubing connections, heed these warnings:



Warning: To prevent burn injuries, set the column temperature to Off, and then allow the column compartment and its components to cool for 60 minutes before touching them. Monitor the column compartment's internal temperature to ensure that all components are cool.



Warning: Observe Good Laboratory Practice (GLP) at all times, particularly when working with hazardous materials. Consult the Material Safety Data Sheets regarding the solvents you use. Additionally, consult the safety representative for your organization regarding its protocols for handling such materials.



Warning: To avoid personal contamination with biologically hazardous or toxic compounds, wear clean, chemical-resistant, powder-free gloves when performing this procedure.



Warning: To avoid eye injury, use eye protection when performing this procedure.

2.2.1 Installation recommendations for fittings

Three types of fittings connect the 30-cm CHC to the system, depending on its configuration: PEEK (polymer-based) fittings and tubing, SST (stainless steel) tubing and fittings, and, for H-Class Bio Series applications, MP35N (a nickel-cobalt-chromium-molybdenum alloy) tubing. When connecting tubing, heed the following recommendations for installing and tightening fittings.

Recommendations:

- To prevent band spreading, ensure that the tubing bottoms in its connection port before you tighten the compression screw.
- Whenever you loosen fittings during maintenance, examine them for cracks, stripped threads, and deformations.
- Do not reuse stainless steel fittings more than six times.

2.2.1.1 Assembling new fittings

For metallic (SST or MP35N) fitting and tubing assemblies with ferrules not previously assembled or set to tubing, you must mark the compression screw and connection port and ensure that the two marks line up when you tighten them.



Warning: To avoid eye injury, use eye protection when performing this procedure.



Notice: To prevent contaminating system components, wear clean, chemical-resistant, powder-free gloves when performing this procedure.

Required tools and materials

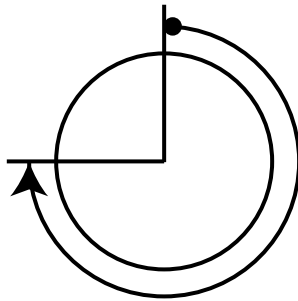
- Chemical-resistant, powder-free gloves
- Protective eyewear
- 1/2-inch open-end wrench
- 1/4-inch open-end wrench – for tightening or loosening stainless steel (gold-plated) fittings with two-piece ferrules
- Column gripping tool – for holding the column while tightening or loosening the dual-threaded fitting
- Permanent marker

To assemble the new fittings:

1. Insert the end of a tube into the hexagonal end of the compression screw.
2. Insert the tube into the larger end of the ferrule.
3. Insert the tube into the connection port.

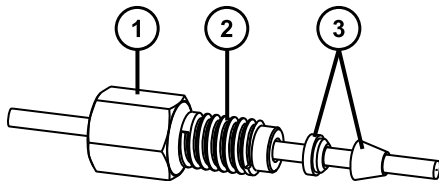
4. Rotate the compression screw, clockwise, into the connection port until the screw is finger-tight.
5. Using a permanent marker, mark the compression screw at the 12-o'clock position.
6. Mark the connection port at the 9-o'clock position.
7. Ensure that the tubing makes contact with the bottom of the connection port, and use the 1/4-inch open-end wrench to rotate the compression screw clockwise 3/4-turn until the two marks line up.

First-use tightening:



2.2.1.2 Stainless steel (gold-plated) fitting with long flats and 2-piece stainless steel ferrule (V-detail)

First use

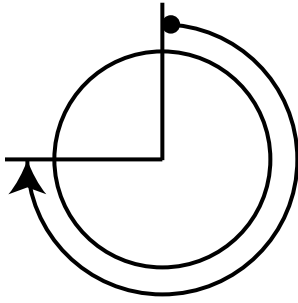


- ① Long flats
- ② Compression screw
- ③ 2-piece stainless steel ferrule

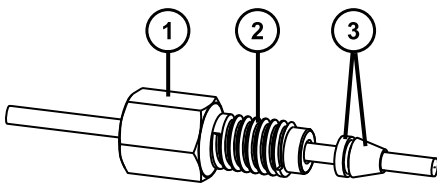
Tighten the fitting finger-tight plus an additional 3/4-turn using a 1/4-inch open-end wrench. For detailed instructions about assembling new fittings, see [Assembling new fittings](#).

Tip: To prevent band spreading, ensure that the tubing is fully bottomed in the connection port before you tighten the compression screw.

First use tightening



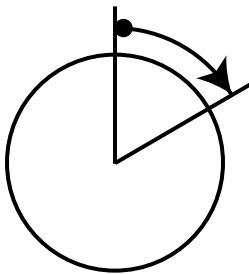
Reinstalled



- ① Long flats
- ② Compression screw
- ③ 2-piece stainless steel ferrule

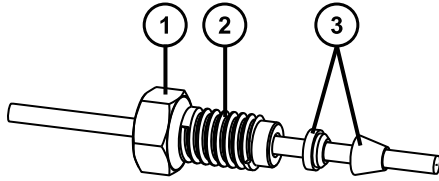
Tighten the fitting finger-tight plus as much as an additional 1/6-turn using a 1/4-inch open-end wrench.

Reinstalled tightening



2.2.1.3 Stainless steel (gold-plated) fitting with short flats and 2-piece stainless steel ferrule (V-detail)

First use

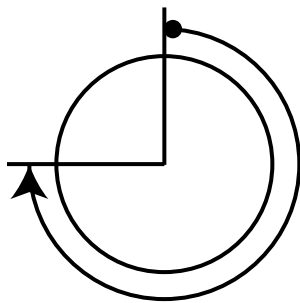


- ① Short flats
- ② Compression screw
- ③ 2-piece stainless steel ferrule

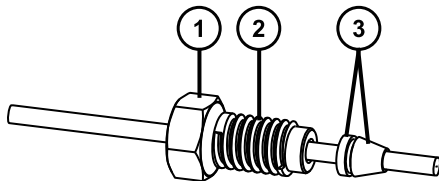
Tighten the fitting finger-tight plus an additional 3/4-turn using a 1/4-inch open-end wrench. For detailed instructions about assembling new fittings, see [Assembling new fittings](#).

Tip: To prevent band spreading, ensure that the tubing is fully bottomed in the connection port before you tighten the compression screw.

First use tightening



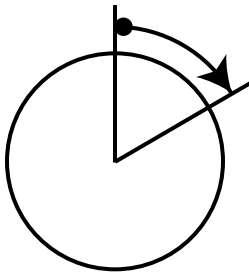
Reinstalled



- ① Short flats
- ② Compression screw
- ③ 2-piece stainless steel ferrule

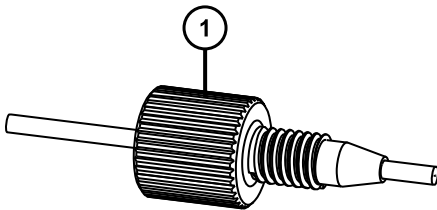
Tighten the fitting finger-tight plus as much as an additional 1/6-turn using a 1/4-inch open-end wrench.

Reinstalled tightening



2.2.1.4 One-piece PEEK fitting

Figure 2–12: First use or reinstalled



- ① Compression screw

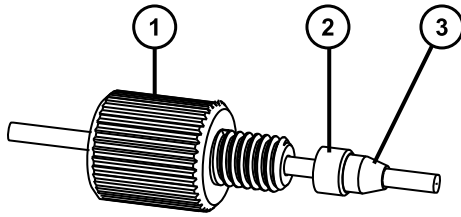
Tighten the fitting finger-tight.

Tips:

- You can also use the column gripping tool when tightening this fitting.
- To prevent band spreading, ensure that the tubing is fully bottomed in the connection port before tightening the fitting.

2.2.1.5 PEEK fitting with PEEK ferrule and stainless steel lock ring

First use or reinstalled



- ① Compression screw
- ② Lock ring
- ③ Ferrule

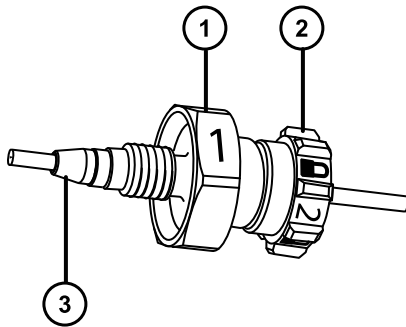
Tighten the fitting finger-tight.

2.2.1.6 Dual threaded fitting with locking cap nut

Required tools and materials

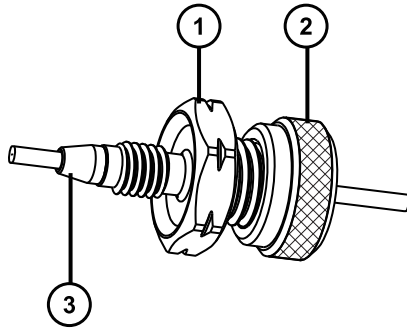
- Column gripping tool
- 1/2-inch open-end wrench

Figure 2–13: Hex compression fitting with captive ferrule and locking cap nut first use or reinstalled



- ① #1 hex compression fitting
- ② #2 locking cap nut
- ③ Back-locking PEEK ferrule

Figure 2–14: Legacy fitting first use or reinstalled



- ① Hex compression fitting
- ② Locking cap nut
- ③ Back-locking or standard PEEK ferrule

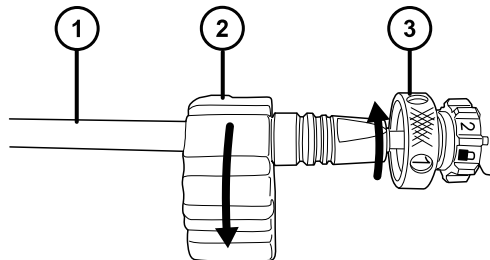
To tighten the fitting:

1. Loosen the cap nut from the compression fitting.
2. Slide the compression fitting together with the ferrule into the inlet of the column (or in-line filter).

Important: To prevent band spreading, ensure that the tubing bottoms in the connection port before you tighten the compression fitting.

3. Finger-tighten the compression fitting into the inlet of the column (or in-line filter).
4. Place the column gripping tool onto the column.
5. While holding the column with the column gripping tool, tighten the column onto the compression fitting.

Figure 2–15: Tightening the column onto the compression fitting



- ① Compression fitting
- ② Column gripping tool
- ③ Column

Tip: If you are operating the system at, or close to, its maximum system operating pressure limit and the fitting is a hex, use the 1/2-inch open-end wrench to tighten the compression fitting an additional 1/8- to 1/6-turn.

6. Tighten the cap nut onto the compression fitting.

Tip: When reinstalling the fitting:

- Examine the PEEK ferrule for damage and replace it if necessary.
- Always loosen the locking cap nut before reconnecting the fitting.

2.2.2 Connections for a 30-cm CHC and CH-A setup

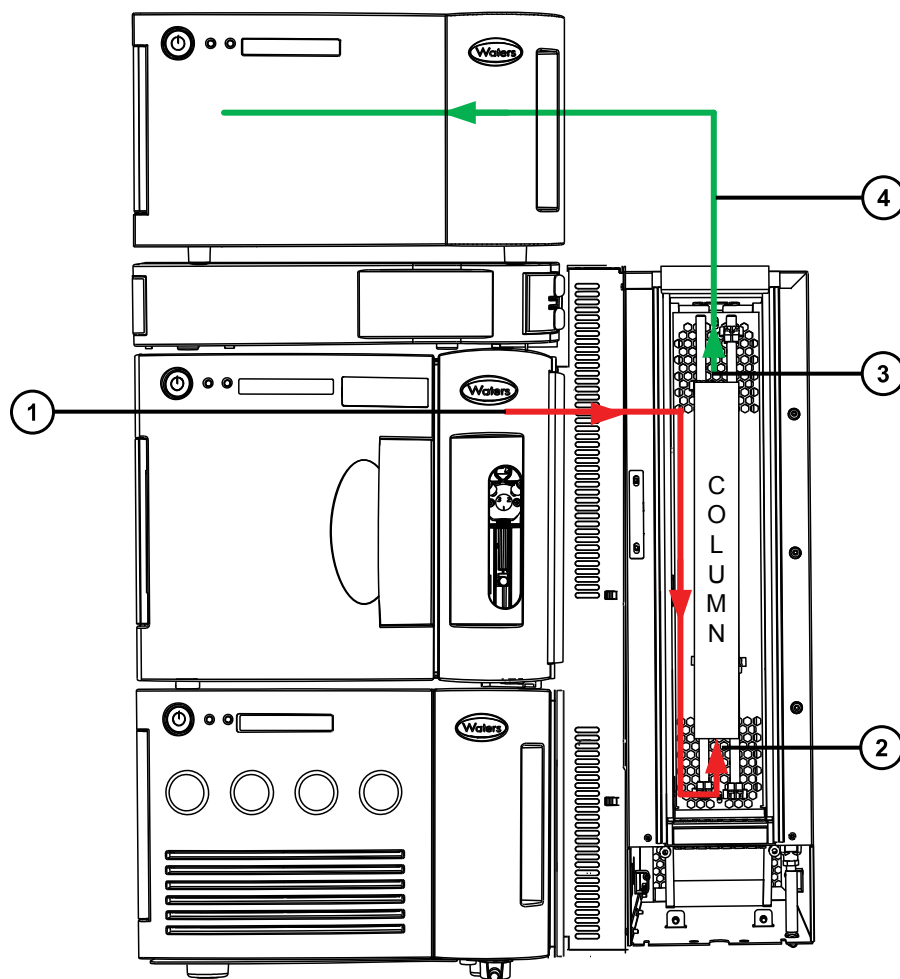
When plumbed as an alternate column-heating module for an ACQUITY UPLC H-Class Series, ACQUITY UPLC H-Class Bio Series, or ACQUITY UPLC I-Class Series system equipped with a CH-A module, the 30-cm CHC module connects one or more columns (serially connected) directly to the sample manager's injection valve via a pre-configured tubing assembly. An additional tubing assembly connects the column outlet to the detector inlet. Also, you can install an optional column in-line filter before the column. For instructions on installing a column in-line filter, see the document *ACQUITY UPLC Column In-Line Filter Unit Installation Instructions*.

2.2.2.1 Connecting the 30-cm CHC to the system

The tubing for the column compartment extends from the sample manager's injection valve outlet to the column inlet. It continues from the column outlet and terminates at the detector inlet.

The figures below represent the tubing connections and components required for ACQUITY UPLC H-Class Series, ACQUITY UPLC H-Class Bio Series, and ACQUITY UPLC I-Class Series systems.

Figure 2-16: Flow path for 30-cm CHC connected to the system



- ① Sample-manager-injection-valve-outlet-to-column-inlet tubing
- ② Column inlet
- ③ Column outlet
- ④ Column-outlet-to-detector-inlet tubing

Figure 2–17: Connection diagram for standard configuration

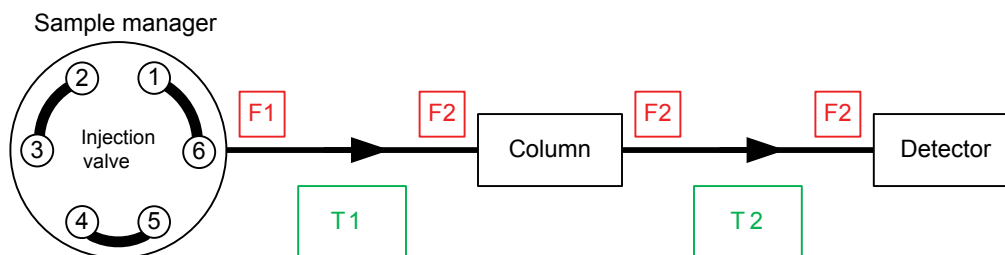


Figure 2–18: Connection diagram for H-Class Bio Series configuration

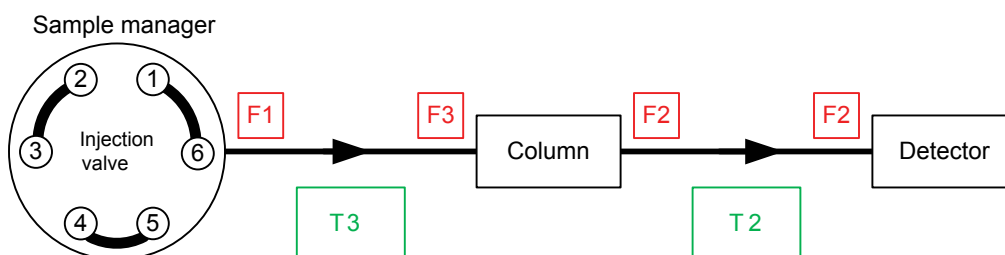


Table 2–1: Legend

Identifier	Description	Length	Material
T1	Pre-configured tubing assembly that connects the sample manager's injector outlet to the column inlet for standard ACQUITY configurations	61 cm (24 inches)	SST
T2	Pre-configured tubing assembly that connects the column outlet to the detector inlet	89 cm (35 inches)	PEEK
T3	Pre-configured tubing assembly that connects the sample manager's injector outlet to the column inlet for H-Class Bio Series configurations	63.5 cm (25 inches)	MP35N (Bio, 0.004-inch ID)
F1	Stainless steel (gold-plated) fitting, with long flats and two-piece stainless steel ferrule	N/A	SST (gold-plated screw)
F2	10-32 PEEK fitting with PEEK ferrule	N/A	PEEK and SST locking ring
F3	Stainless steel (gold-plated) fitting with stainless steel collet	N/A	SST (gold-plated screw)



Warning: To avoid personal contamination with biologically hazardous or toxic compounds, wear clean, chemical-resistant, powder-free gloves when performing this procedure.



Warning: To avoid eye injury, use eye protection when performing this procedure.

Tools and materials

- Chemical-resistant, powder-free gloves
- Protective eyewear
- 1/4-inch open-end wrench
- Collet and compression-screw multi-tool and 5/16-inch open-end wrench (for H-Class Bio Series configuration only)
- Tubing and fittings supplied with the column-module start-up kit

To connect the 30-cm CHC to the system:

1. Using the 1/4-inch open-end wrench, connect one end of the pre-configured tubing assembly that connects the sample manager's injector outlet to the column inlet to port 6 of the sample manager's injection valve and the other end to the column (or column in-line filter) inlet.

Important: Press the tubing ends into the valve and column ports while tightening the valve and column fittings.

Note: For instructions on installing a column in-line filter, see the document *ACQUITY UPLC Column In-Line Filter Unit Installation Instructions*.

2. Tighten the fitting for the column (or column in-line filter) inlet according to the type of fitting used.

Note: For tightening instructions, see [Installation recommendations for fittings](#).

3. Secure the column to the compartment using the mounting clips.

Note: For instructions on using the mounting clips, see [Installing columns in the column compartment](#).

4. Connect the tubing from the column outlet to the detector inlet according to the instructions in the detector's overview and maintenance guide.
5. Route the tubing within the 30-cm CHC column compartment according to the instructions in [Routing column-compartment tubing](#).

2.2.3 Connections for a 30-cm CHC and CM-A setup

When plumbed as a 30-cm column heating/cooling compartment connected to a CM-A, the CM-A module's inlet and outlet switching valves direct flows to, and from, the 30-cm CHC module's column inlet and outlet.

Configuration restrictions:

- You can configure only one CM-Aux, positioned atop the CM-A.
- An SQT is not supported when flow is directed to a column in the CH-30A. An SQT is supported by the UPLC-directed column positioned in the CM-A module.

Configuration recommendation: Use HPLC methods when directing flow to the column in the 30-cm CHC module.

2.2.3.1 Connecting the 30-cm CHC to a CM-A

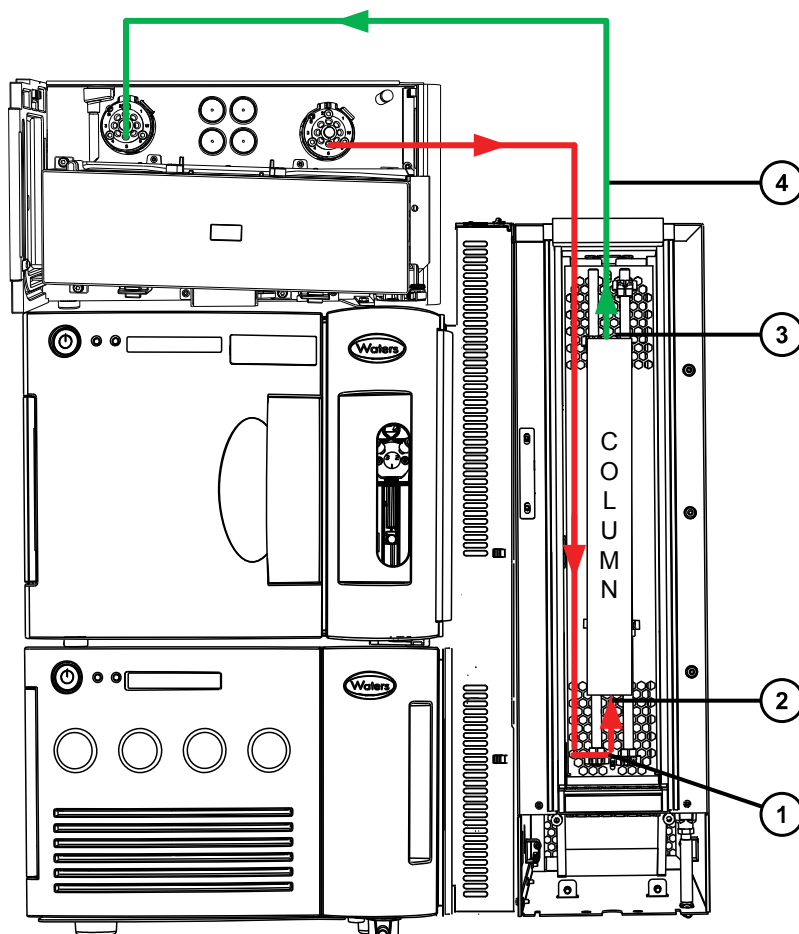
An ACQUITY H-Class Series or H-Class Bio Series system configured with a CM-A and a 30-cm CHC supports as many as three columns and three heating zones. If it is configured with an additional single CM-Aux, these capabilities are expanded to include support for as many as five columns and five heating zones.

Option: You can add support for an additional column to the configurations mentioned above by plumbing a second column position in the 30-cm CHC to port 6 on the CM-A inlet and outlet switching valves. For details, contact your Waters service representative.

For a 30-cm CHC configuration connected to a CM-A, the tubing for the column compartment's column inlet extends from the CM-A inlet switching-valve outlet. It continues from the column outlet and terminates at the CM-A outlet switching-valve inlet.

The figures below represent the tubing connections and components required for a 30-cm CHC configuration connected to a CM-A.

Figure 2–19: Flow path for 30-cm CHC connected to a CM-A



- ① Pre-configured tubing assembly that connects CM-A inlet switching-valve outlet to the column inlet
- ② Column inlet
- ③ Column outlet
- ④ Pre-configured tubing assembly that connects the column outlet to the CM-A outlet switching-valve inlet

Figure 2–20: Connection diagram for a 30-cm CHC connected to a CM-A

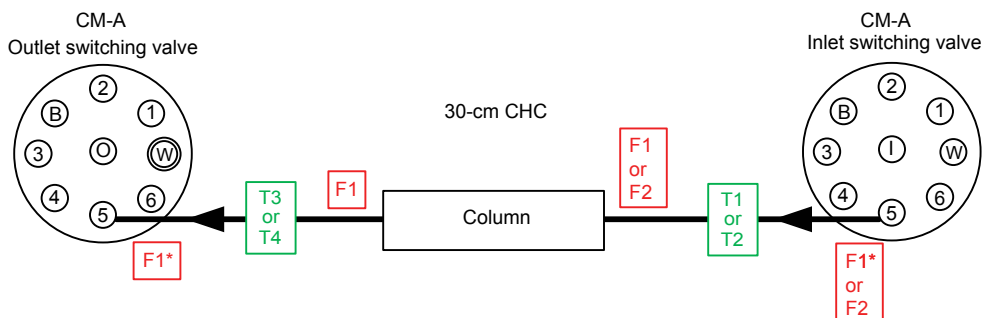


Table 2–2: Legend

Identifier	Description	Length	Material
T1	Pre-configured tubing assembly that connects the CM-A inlet switching-valve outlet to the column inlet	89 cm (35 inches)	PEEK (0.005-inch ID)
T2	Pre-configured tubing assembly that connects the CM-A inlet switching-valve outlet to the column inlet	89 cm (35 inches)	MP35N (Bio, 0.004-inch ID)
T3	Pre-configured tubing assembly that connects the column outlet to the CM-A outlet switching-valve inlet	71 cm (28 inches)	SST
T4	Pre-configured tubing assembly that connects the column outlet to the CM-A outlet switching-valve inlet	76 cm (30 inches)	MP35N (Bio, 0.004-inch ID)
F1*	Stainless steel (gold-plated) fitting with long flats and two-piece stainless steel ferrule	N/A	SST (gold-plated screw)
F1	Stainless steel (gold-plated) fitting with short flats and two-piece stainless steel ferrule	N/A	SST (gold-plated screw)
F2	10-32 PEEK fitting with PEEK ferrule	N/A	PEEK and SST locking ring



Warning: To avoid personal contamination with biologically hazardous or toxic compounds, wear clean, chemical-resistant, powder-free gloves when performing this procedure.



Warning: To avoid eye injury, use eye protection when performing this procedure.

Required tools and materials

- Chemical-resistant, powder-free gloves
- Protective eyewear
- 1/4-inch open-end wrench
- Collet and compression-screw multi-tool and 5/16-inch open-end wrench
- Tubing and fittings supplied with the 30-cm CHC start-up kit and the CM-A start-up kit

To connect the 30-cm CHC to the CM-A:

1. If the CM-A and optional CM-Aux are not installed and connected, do so as described in the *ACQUITY UPLC Column Manager - Active and Column Manager - Auxiliary Overview and Maintenance Guide*.
2. Open the CM-A and the 30-cm CHC column-compartment doors.
3. For valve connections, pull the CM-A's switching-valve forward approximately 2 cm (0.75 inch) and, on each valve, rotate the lock ring clockwise until it rests against the stopper.
4. Route the pre-configured tubing assembly that connects the column inlet to port 5 of the CM-A inlet switching-valve outlet through the right-hand opening in the CM-A's tubing guide.
5. Connect the pre-configured tubing assembly to port 5 of the CM-A inlet switching-valve outlet and the other end to the column (or column in-line filter) inlet as follows:

Important: Press the tubing ends into the valve and column ports while tightening the valve and column fittings.

Note: For instructions on installing a column in-line filter, see the document *ACQUITY UPLC Column In-Line Filter Unit Installation Instructions*.

- For the PEEK (0.005-inch ID) pre-configured assembly, finger-tighten the PEEK fitting to port 5 of the CM-A inlet switching valve.
 - For the MP35N (bio-compatible, 0.004-inch ID) pre-configured assembly, using the 1/4-inch open-end wrench, connect the long flat compression-screw end of the assembly to port 5 of the CM-A inlet switching valve.
6. Tighten the fitting for the column (or column in-line filter) inlet according to the type of fitting used.

Note: For tightening instructions, see [Installation recommendations for fittings](#).

7. Install the columns in the compartment according to the instructions in [Installing columns in the column compartment](#).
8. Insert the column-outlet tubing (pre-configured SST or MP35N assembly) into the outlet of the column and tighten the fitting for the column outlet according to the type of fitting used.

Note: For tightening instructions, see [Installation recommendations for fittings](#).

9. Route the column outlet tubing through the opening in the CM-A's tubing guide.

10. While holding the column, use the 1/4-inch open-end wrench to connect the long, flat, compression-screw end of the assembly to port 5 of the CM-A outlet switching valve.
11. Reposition the CM-A valves by rotating the valves' lock rings counterclockwise to the 12-o'clock position and pushing the switching-valve assembly inward until it stops.
12. Route the tubing within the tubing clips on the mounting bracket and within the 30-cm CHC column compartment according to the instructions in [Routing column-compartment tubing](#).

2.2.4 Installing columns in the column compartment

Columns are secured inside the compartment using adjustable clips on the column rails. The column clips, which are designed to hold onto the exposed area between the end of the column and the head of the compression screw, are adaptable for securing columns from multiple vendors. You can easily reposition the column clips to fit different-sized columns.

Before removing or installing columns, heed these warnings:



Warning: To prevent burn injuries, set the column temperature to Off, and then allow the column compartment and its components to cool for 60 minutes before touching them. Monitor the column compartment's internal temperature to ensure that all components are cool.

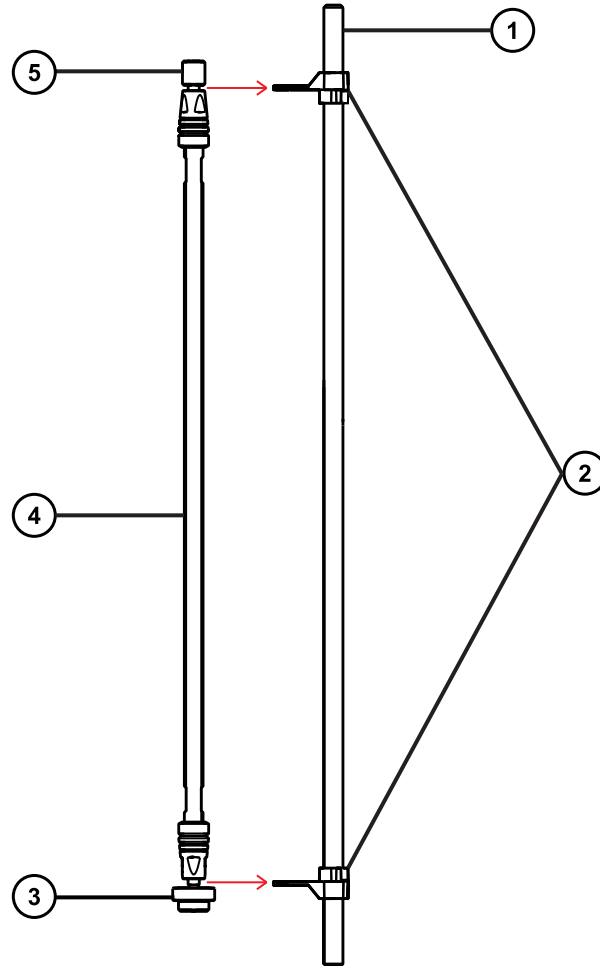


Warning: Observe Good Laboratory Practice (GLP) at all times, particularly when working with hazardous materials. Consult the Material Safety Data Sheets regarding the solvents you use. Additionally, consult the safety representative for your organization regarding its protocols for handling such materials.

To install a column:

1. Align a column clip with the area just below the compression screw head at the top of the column.

Figure 2–21: Column retainer clips – side view



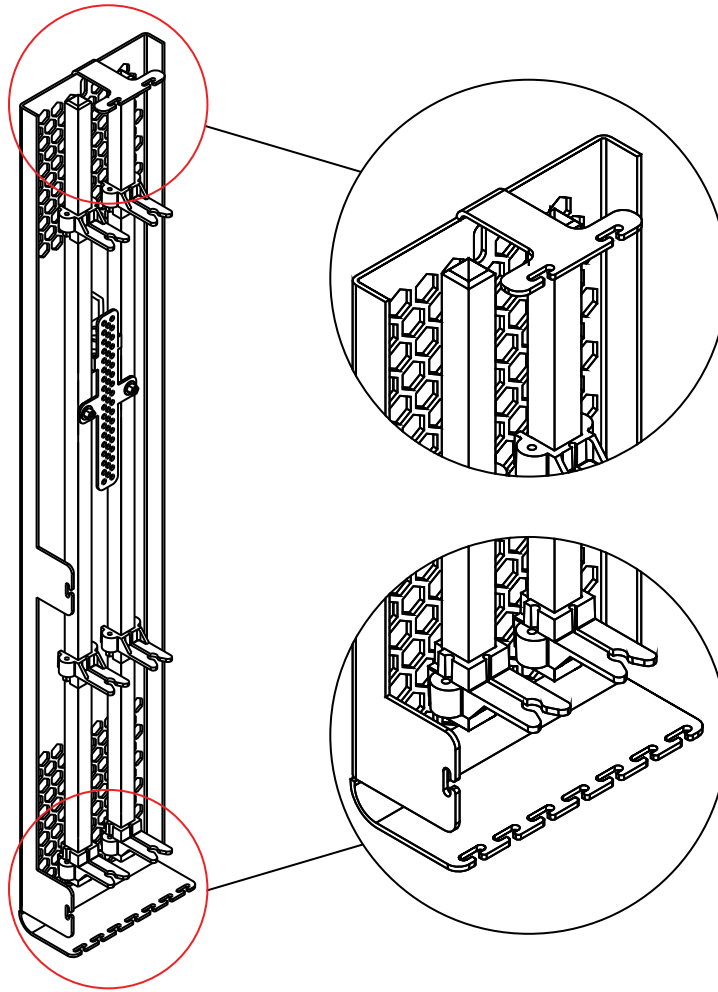
- ① Column rail
- ② Column clips (2 per long column, 1 per short column)
- ③ Column inlet
- ④ Column
- ⑤ Column outlet

2. Align a second clip with the area just above the compression-screw head at the bottom of the column.
3. Using your fingers, press the top and bottom of the column into the clips until the column locks into place.

2.2.5 Routing column-compartment tubing

Tubing retainers are provided along the left-hand side and top and the bottom of the column compartment, to hold the tubing in place. The use of these retainers is highly recommended.

Figure 2–22: Left-hand side and top and bottom tubing retainers



The column compartment functions properly only when the door is properly closed. The sides and top edges of the door gasket and hinge assembly are designed to allow the passage of tubing without damaging the tubing or degrading the seal formed by the door gasket. Nevertheless, the bottom edge of the door gasket is not designed for tubing egress because such a design can cause the compartment door gasket to incompletely seal or the closed door to inadvertently open.

! **Notice:** To avoid less-than-optimal performance of the column compartment and its potentially damaging effect on running samples, ensure that the column-compartment tubing is properly routed and secured in tubing retainers so that the compartment door properly closes during system operation.

2.3 Column compartment power and signal connections

The 30-cm CHC receives power from two sources: a grounded ac receptacle and the sample manager. Communications and control signals for the 30-cm CHC module are provided through the 25-pin, D-series, sub-connector (D-sub) on the rear panel of the sample manager. An interconnect cable connects the 25-pin, D-sub receptacle on the 30-cm CHC to the 25-pin, D-sub receptacle on the sample manager.

For systems configured with both CH-A and 30-cm CHC modules, the 30-cm CHC and CH-A modules must share the same sample-manager connection for communication and control signals. Thus, to switch operation from one column compartment to the other, you must power-off the sample-manager and the CHC and then swap the sample-manager cable connection from the inoperative column compartment to the operative column compartment.

Note: With the optional Waters Column Module Switch Box, you can physically connect both the CH-A and the 30-cm CHC modules to the SM-FTN and switch the electrical control of the column modules via the SM-FTN console. For instructions on installing the Column Module Switch Box, see *ACQUITY UPLC Column Heater-Active Overview and Maintenance Guide*.

For systems configured with both CM-A and 30-cm CHC modules, connect the 30-cm CHC interconnect cable directly to the 25-pin, D-sub receptacle on the rear panel of the sample manager.

The topics in this section convey instructions for connecting both of these setups and for connecting the supplied power cord to the receptacle in the power-entry module to a grounded ac receptacle.

2.3.1 Connecting power and signal cables for a 30-cm CHC and CH-A setup

Requirement: For systems configured with both 30-cm CHC and CH-A modules, the 30-cm CHC and CH-A modules must share the same sample-manager connection for communication and control signals. Thus, to switch operation from one column compartment to the other, you must power off the CHC and the sample-manager and then swap the sample-manager cable connection from the inoperative column compartment to the operative column compartment.

Note: With the optional Waters Column Module Switch Box, you can physically connect both the CH-A and the 30-cm CHC modules to the SM-FTN and switch the electrical control of the column modules via the SM-FTN console. For instructions on installing the Column Module Switch Box, see the *ACQUITY UPLC Column Heater-Active Overview and Maintenance Guide*.

For instructions on switching operation between 30-cm CHC and CH-A column compartments, see "[Configuring and controlling a CH-A and 30-cm CHC setup](#)".



Warning: To avoid a fault condition that can result in personal injury or death from electric shock, do not disconnect or otherwise interrupt the continuity of an electrical socket's protective grounding conductor or the power cord's grounding conductor.



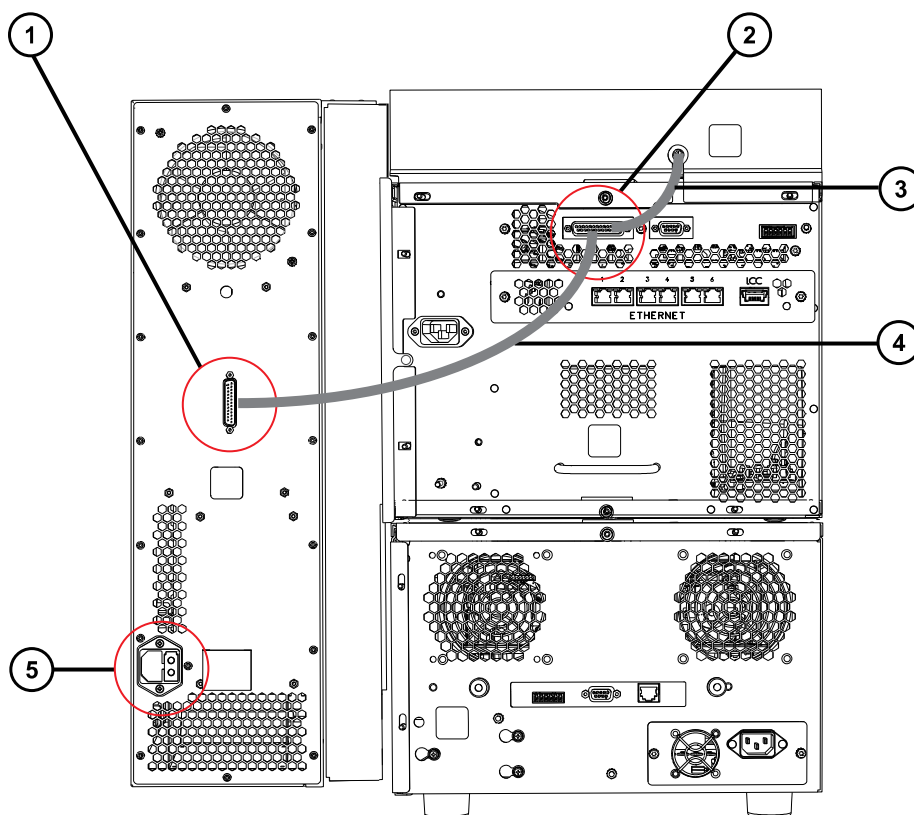
Warning: To avoid electric shock, observe these precautions:

- Use SVT-type power cords in the United States and HAR-type power cords, or better, in Europe. For requirements elsewhere, contact your local Waters distributor.
- Inspect the power cords for damage and replace them if necessary.
- Power-off and unplug each module before performing any maintenance operation on it.
- Connect each module to a common ground.



Notice: To avoid damaging the electronic components of the sample manager and the column heater or column heater/cooler, always power-off the sample manager and column heater/cooler before connecting or disconnecting the interconnect cable.

Figure 2–23: Connecting the 30-cm CHC module to the sample manager



- ① 25-pin, D-sub receptacle on 30-cm CHC module's rear panel
- ② 25-pin, D-sub receptacle on the sample manager's rear panel
- ③ Interconnect cable connecting the CH-A to the sample manager – Disconnect the CH-A interconnect cable to connect the 30-cm CHC interconnect cable

- ④ Interconnect cable connecting the 30-cm CHC to the sample manager
- ⑤ Power-entry module

To make the power and signal connections:

1. Power-off the sample manager.
2. Insert the 30-cm CHC interconnect cable's mated connector into the 25-pin, D-sub receptacle on the 30-cm CHC module's rear panel.
3. If the CH-A interconnect cable is connected to the sample manager's 25-pin, D-sub receptacle, disconnect it from the sample manager.

Tip: For instructions on switching operation between 30-cm CHC and CH-A column compartments, see "[Configuring and controlling a CH-A and 30-cm CHC setup](#)".

4. Insert the 30-cm CHC interconnect cable's mated connector into the sample manager's 25-pin, D-sub receptacle, as shown in the figure "Connecting the 30-cm CHC module to the sample manager".
5. Connect the female end of the power cord to the receptacle in the power-entry module on the 30-cm CHC module's rear panel, and connect the male end to a grounded, ac-power outlet.

2.3.2 Connecting power and signal cables for a 30-cm CHC and CM-A setup

Communications and control signals for the 30-cm CHC module are provided through the 25-pin, D-series, sub-connector (D-sub) on the rear panel of the sample manager. An interconnect cable connects the 25-pin, D-sub receptacle on the 30-cm CHC to the 25-pin, D-sub, receptacle on the sample manager. These power and signal cable connections do not require any modifications to the CM-A module's power and signal connections. For instructions on connecting the CM-A module's power and signal connections, see the *ACQUITY UPLC Column Manager - Active and Column Manager - Auxiliary Overview and Maintenance Guide*.



Warning: To avoid a fault condition that can result in personal injury or death from electric shock, do not disconnect or otherwise interrupt the continuity of an electrical socket's protective grounding conductor or the power cord's grounding conductor.



Warning: To avoid electric shock, observe these precautions:

- Use SVT-type power cords in the United States and HAR-type power cords, or better, in Europe. For requirements elsewhere, contact your local Waters distributor.
- Inspect the power cords for damage and replace them if necessary.
- Power-off and unplug each module before performing any maintenance operation on it.
- Connect each module to a common ground.

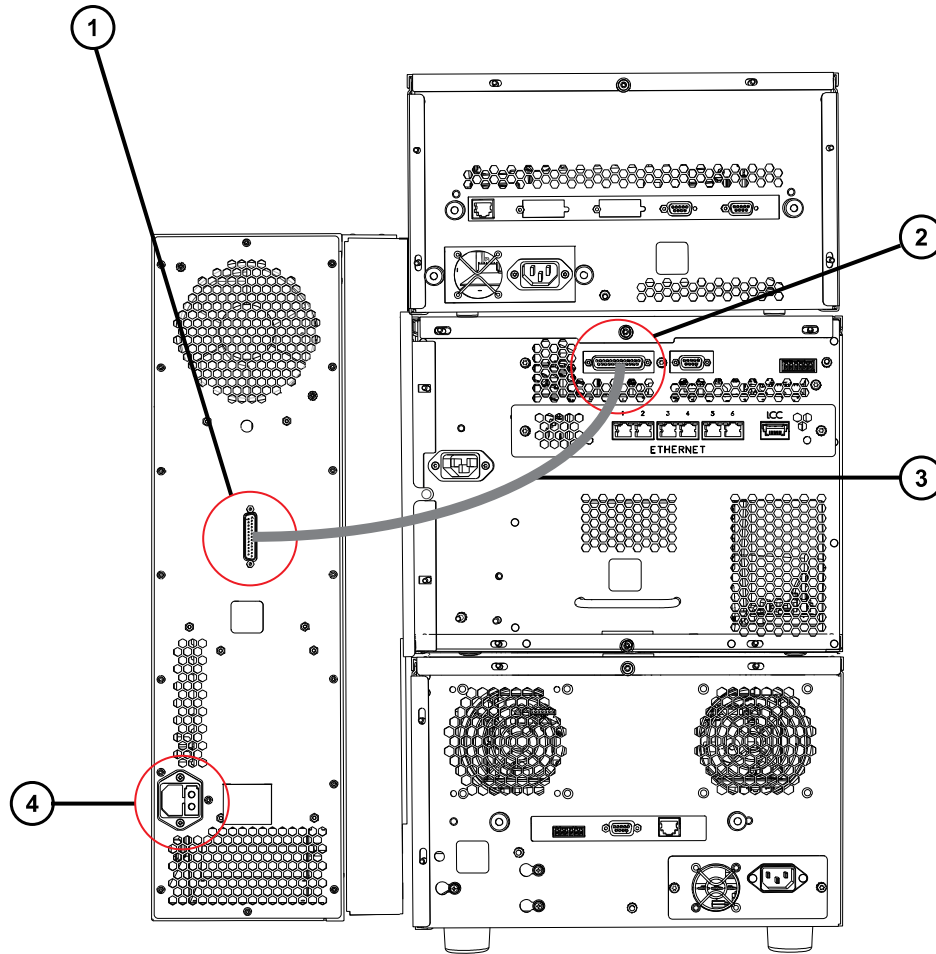


Notice: To avoid damaging the electronic components of the sample manager and the column heater or column heater/cooler, always power-off the sample manager and column heater/cooler before connecting or disconnecting the interconnect cable.

To make the power and signal connections:

1. Power-off the sample manager.
2. Insert the 30-cm CHC interconnect cable's mated connector into the 25-pin, D-sub receptacle on the 30-cm CHC module's rear panel.

Figure 2–24: Connecting the 30-cm CHC module to the sample manager and grounded ac source



- ① 25-pin, D-sub receptacle on the 30-cm CHC module's rear panel
 - ② 25-pin, D-sub receptacle on the sample manager's rear panel
 - ③ Interconnect cable connecting the 30-cm CHC to the sample manager
 - ④ Power-entry module
3. Insert the other end of the interconnect cable into the 25-pin, D-sub receptacle on the sample manager's rear panel.
 4. Connect the female end of the supplied power cord to the receptacle in the power-entry module on the 30-cm CHC module's rear panel, and connect the male end to a grounded, ac-power outlet.

2.4 Powering-on the column compartment

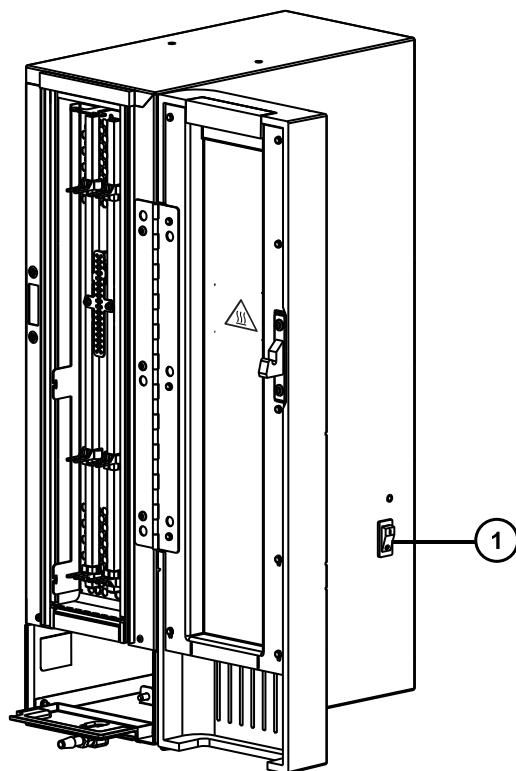
The 30-cm CHC module has a power on/off switch on its lower, right-hand side that you use to power-on or power-off the module.

Requirement: When powering-on the system, power-on the 30-cm CHC module before you power-on the sample manager.

To power-on the column compartment:

1. Move the 30-cm CHC module's power switch to the **on** (I) position.

Figure 2–25: 30-cm CHC module power switch



① 30-cm CHC module's power switch

2.5 Column compartment configuration and control

The topics in this section convey specialized instructions for modifying the settings used to configure and control the 30-cm CHC when it is operated as an alternate, or auxiliary, column-heating compartment for ACQUITY UPLC systems configured with a CH-A, or CM-A, respectively. These topics supplement the information provided in the chromatography data software's online Help.

2.5.1 Configuring and controlling a CH-A and 30-cm CHC setup

For ACQUITY UPLC systems equipped with both 30-cm CHC and CH-A modules, you specify the column compartment temperature settings using the sample manager control panels or method editor in the chromatography data software. During operation, these temperature settings control the operative column compartment—the powered-on 30-cm CHC or the CH-A that is plugged into the sample manager's 25-pin, D-series, sub-connector (D-sub) receptacle when the sample manager is powered-on. For instructions on specifying the column-compartment temperature settings, see the chromatography data software's online Help.

Recommendation: When sample and column temperatures are important to an application, in addition to specifying explicit temperature set points in the method, specify appropriate temperature limits. Together, these settings ensure that system operation occurs only within the defined limits, and that any occurrence of an unacceptable deviation from the set points is flagged by an error message acknowledging the variance.

! **Notice:** To avoid damaging the electronic components of the sample manager and the column heater or column heater/cooler, always power-off the sample manager and column heater/cooler before connecting or disconnecting the interconnect cable.

Guidelines: Without the optional Waters Column Module Switch Box, the 30-cm CHC and CH-A modules must share the same sample-manager connection for communication and control signals. To switch operation between column compartments, follow these rules:

- To switch operation from the CH-A to the 30-cm CHC, power-off the sample manager, disconnect the CH-A interconnect cable from the sample manager's D-sub receptacle, connect the 30-cm CHC interconnect cable to the sample manager's D-sub receptacle, power-on the 30-cm CHC, and then restart the sample manager.
- To switch operation from the 30-cm CHC to the CH-A, power-off both the 30-cm CHC and the sample manager, disconnect the 30-cm CHC interconnect cable from the sample manager's D-sub receptacle, connect the CH-A interconnect cable to the sample manager's D-sub receptacle, and then restart the sample manager.

For more information about the optional Column Module Switch Box, see *ACQUITY UPLC Column Heater-Active Overview and Maintenance Guide*.

2.5.2 Configuring a CM-A (or CM-A and CM-Aux) with a 30-cm CHC

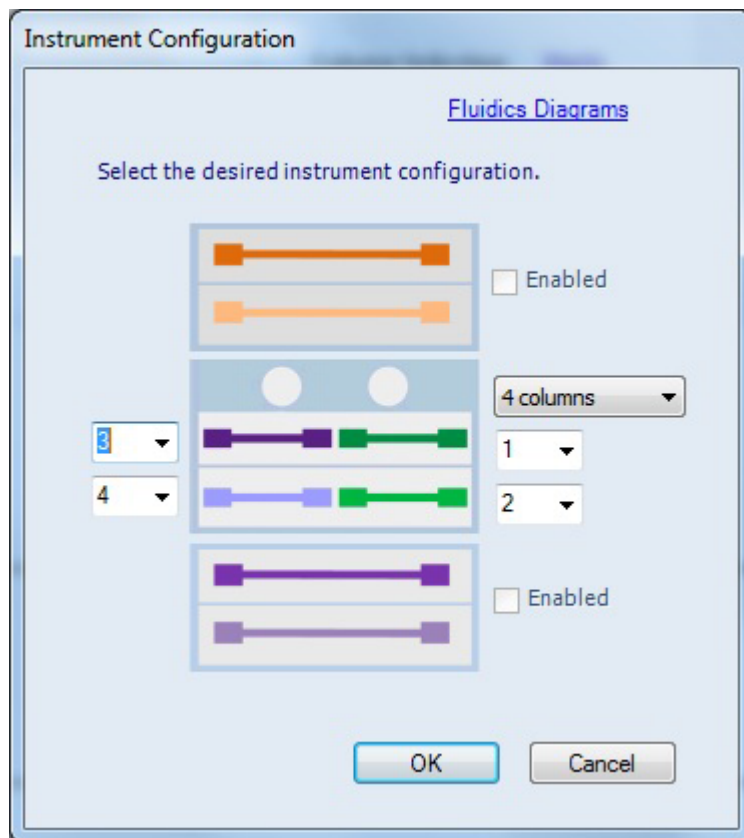
For ACQUITY H-Class Series and H-Class Bio Series systems configured with a 30-cm CHC connected to the CM-A, you configure the required instrument settings in the chromatography data software's console.

Tip: These instructions summarize the steps for systems controlled by Empower, MassLynx, or UNIFI software. For additional details, including how to navigate the software's user interface, refer to its online Help.

To configure the CM-A (or CM-A and CM-Aux) with a 30-cm CHC:

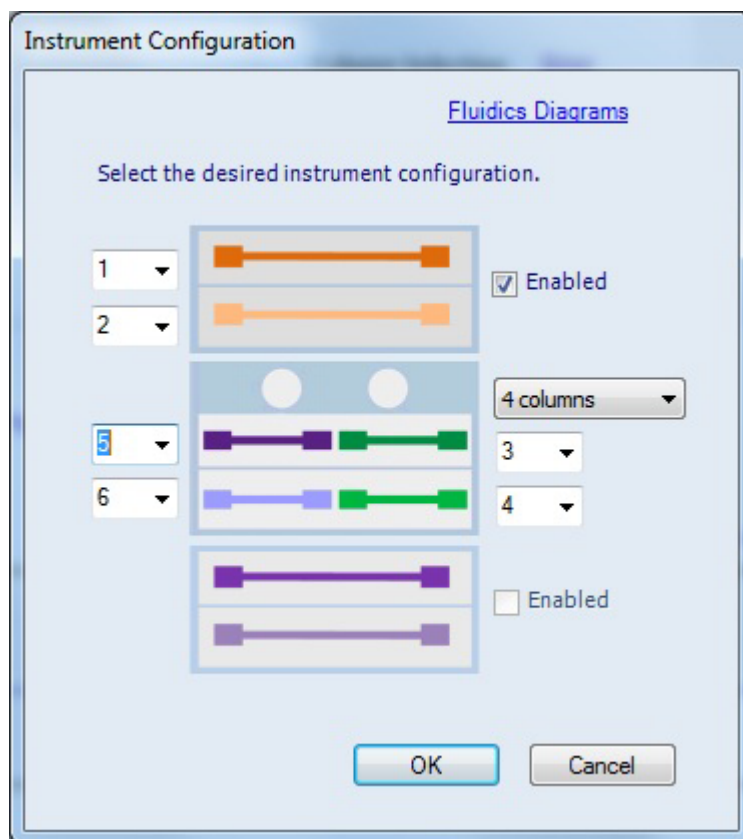
1. From the console's **Column Manager instrument configuration** page, select **4 columns** as the column configuration.
2. Specify the column mapping designations as follows:
 - For a maximum 4-column CM-A with a 30-cm CHC setup, select **1** and **2** for the two columns in the CM-A, and **3** (or **3** and **4**) for one column, or two columns, respectively, in the 30-cm CHC.

Figure 2–26: 3-column CM-A with a CH-30A setup



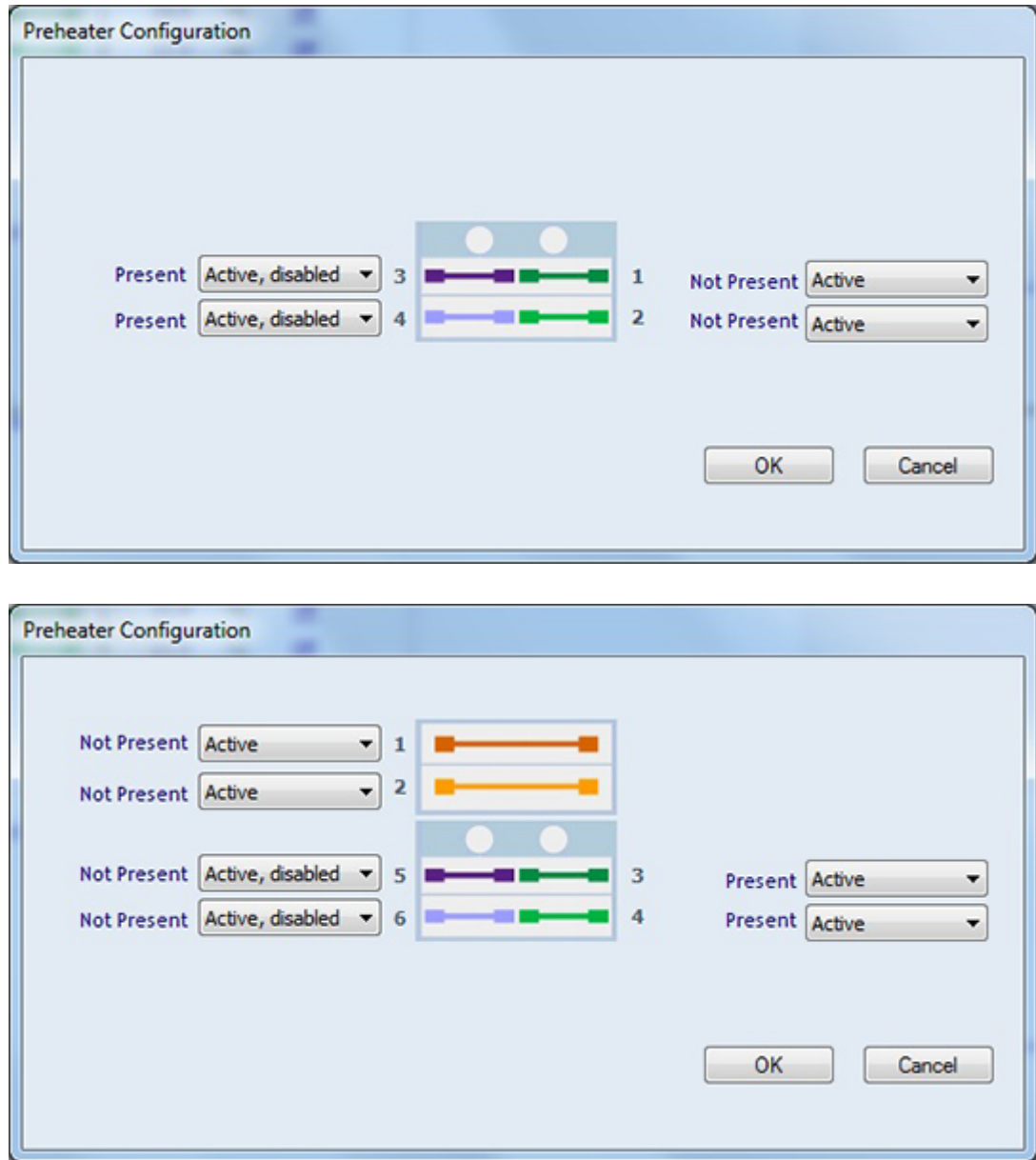
- For a maximum 6-column CM-A and CM-Aux with a 30-cm CHC setup, select **1** and **2** for the two columns in the CM-Aux, **3** and **4** for the two columns in the CM-A, and **5** (or **5** and **6**) for one column or two columns, respectively, in the 30-cm CHC.

Figure 2–27: 5-column CM-A and CM-Aux with a CH-30A setup



3. On the console's **Column Manager Preheater Configuration** page, ensure that the active preheater setting representing the 30-cm CHC column selections (**3** and **4** or **5** and **6**) are set to **Active, disabled**.

Figure 2–28: Preheater configuration for 3-column and 5-column setups



- Specify the remaining column mapping selections for columns in the CM-A and CM-Aux to **Active** (or **Active, disabled**), as necessary.

Note: On the **Preheater Configuration** page, after you click **OK**, the console restarts and you must cycle power to the CM-A.

- In the console, set the eCord preferences as follows:

- Under **Column**, set the preference to **allow sample set operation (acquisitions) when the eCord is not detected**.
- Under **Column Manager**, set the preference to **allow sample set operation (acquisitions) when the eCord is not detected**.

2.5.3 Controlling a 30-cm CHC connected to a CM-A via console settings

For ACQUITY H-Class Series and H-Class Bio Series systems configured with a 30-cm CHC connected to the CM-A, you can use the Column Manager and Sample Manager control panels to control the 30-cm CHC.

Tip: These instructions summarize the steps for systems controlled by Empower, MassLynx, or UNIFI software. For additional details, including how to navigate the software's user interface, refer to its online Help.

To control a 30-cm CHC connected to a CM-A via the console:

1. Before starting the acquisition, from the console, select **Column Manager** and specify the column designated for the 30-cm CHC (typically **3** or **4**).
Tip: Specify **3** if the configuration is for a CM-A and 30-cm CHC setup and the CM-A is configured for two columns. Specify **5** or **6** if the configuration also includes two columns in a CM-Aux.
2. From the console, select **Sample Manager** and specify the desired **column temperature**.

2.5.4 Controlling a 30-cm CHC connected to a CM-A via method settings

For ACQUITY H-Class Series and H-Class Bio Series systems configured with a 30-cm CHC connected to the CM-A, you can control the column selection (the CM-A valve position) and compartment temperature of the 30-cm CHC using the Column Manager and Sample Manager instrument or inlet method settings.

Tip: These instructions summarize the steps for systems controlled by Empower, MassLynx, or UNIFI software. For additional details, including how to navigate the software's user interface, refer to its online Help.

To control a 30-cm CHC connected to a CM-A via method settings:

1. From the software's method editor, select **Column Manager** and specify the column designated for the 30-cm CHC (typically **3** or **4**).
Tip: Specify **3** if the configuration is for a CM-A and single-column 30-cm CHC setup and the CM-A is configured for two columns. Specify **5** if the configuration also includes two

columns in a CM-Aux. Additionally, if the 30-cm is configured for two columns, you can specify a second column at positions **4** or **6**. You can also specify temperatures for the other columns (heating zones) in the CM-A and CM-Aux, if necessary.

2. From the method editor, select **Sample Manager** and specify the desired **column temperature**.

Recommendation: When sample and column temperature are important to an application, in addition to specifying explicit temperature set points in the method, specify appropriate temperature limits to ensure that any occurrence of an unacceptable deviation from the temperature set points is flagged by an error message acknowledging the variance.

3. Specify the remaining settings for the instrument or inlet method.
4. Save the method and run it for acquisitions, according to your chromatography data software.

3 Maintenance

Perform the procedures in this section during routine maintenance or when you discover a problem with a column-module component. For information about isolating problems in the column compartment, consult the troubleshooting section in the Waters console Help.

3.1 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 email 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 or solvents
- Detector settings (sensitivity and wavelength)
- Type and serial number of column or columns
- Sample type and diluent
- Chromatography data software version and serial number
- System workstation model and operating system version

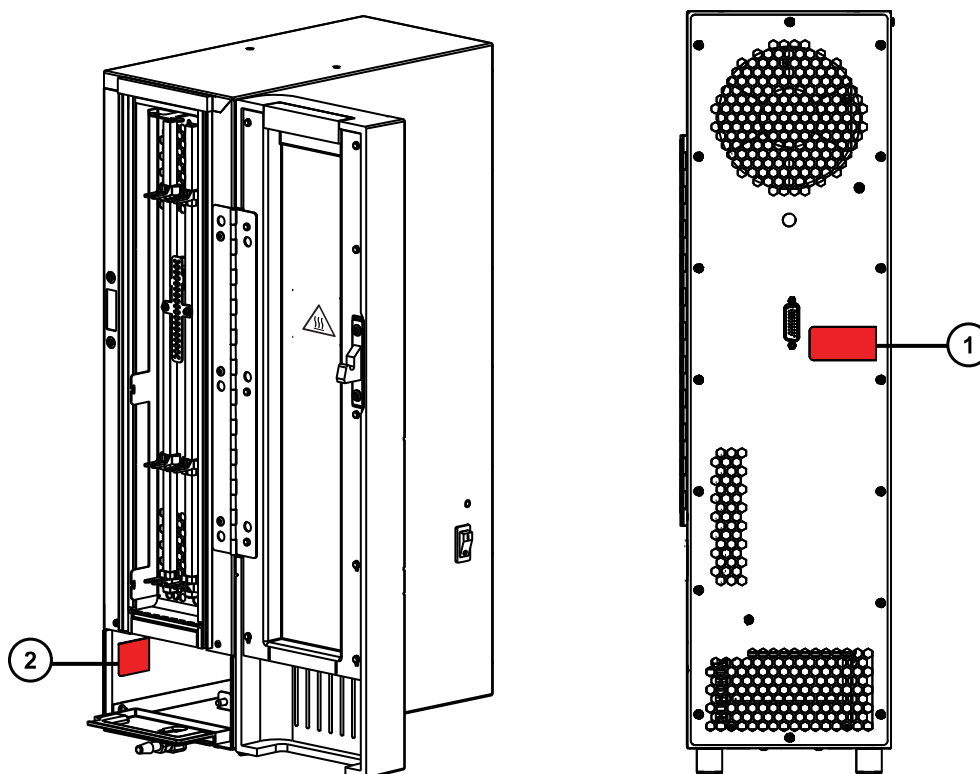
Note: For an explanation about how to report shipping damages and submit claims, see the document *Waters Licenses, Warranties, and Support Services* on the Waters website (www.waters.com).

3.2 30-cm CHC module serial number labels

Each system instrument or device bears a serial number that facilitates service and support. The serial number for the 30-cm CHC module is located on printed labels on the device's rear panel and inside the compartment on the left-hand side panel.

Be prepared to provide the serial numbers of the instruments in your system when you consult Waters customer support.

Figure 3–1: Serial number label locations for the 30-cm CHC module



- ① Serial number label on rear panel
- ② Serial number label on left-hand side panel inside compartment

3.3 Recommended maintenance schedule

Perform the following routine maintenance on the module 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.

3.3.1 Recommended 30-cm CHC routine maintenance schedule

Maintenance procedure	Frequency
Replace the ferrule on the column fitting	During scheduled routine maintenance or as needed
Replace the 30-cm CHC module's fuse	As necessary
Clean the instrument with a soft, lint-free cloth, or paper dampened with water	As necessary

3.4 Spare parts

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

3.5 Safety and handling

Observe these warning and caution advisories when you perform maintenance operations on your system.



Warning: Observe Good Laboratory Practice (GLP) at all times, particularly when working with hazardous materials. Consult the Material Safety Data Sheets regarding the solvents you use. Additionally, consult the safety representative for your organization regarding its protocols for handling such materials.



Warning: To prevent burn injuries, set the column temperature to Off, and then allow the column compartment and its components to cool for 60 minutes before touching them. Monitor the column compartment's internal temperature to ensure that all components are cool.



Warning: To avoid electric shock, do not remove protective panels from system modules. The components within are not user-serviceable.



Notice: To avoid damaging the electronic components of the sample manager and the column heater or column heater/cooler, always power-off the sample manager and column heater/cooler before connecting or disconnecting the interconnect cable.

3.6 Configuring maintenance warnings

Maintenance counters, if available for a particular component, provide information about real-time usage that can help you determine when to schedule routine maintenance for specific

components. You can specify usage thresholds and maintenance warnings that alert you when a component reaches a specified threshold. Thus you can minimize unexpected failures and unscheduled downtime during important work. For information explaining how to specify maintenance warnings, consult the Waters console Help.

3.7 Replacing the ferrule on the column-inlet fitting

Replace the column-inlet ferrule on the APH assembly fitting if the column is leaking or the ferrule looks damaged.



Warning: To prevent burn injuries, set the column temperature to Off, and then allow the column compartment and its components to cool for 60 minutes before touching them. Monitor the column compartment's internal temperature to ensure that all components are cool.



Warning: To avoid personal contamination with biologically hazardous, toxic, and corrosive materials, wear chemical-resistant, powder-free gloves when performing this procedure.



Warning: To avoid eye injury, use eye protection when performing this procedure.

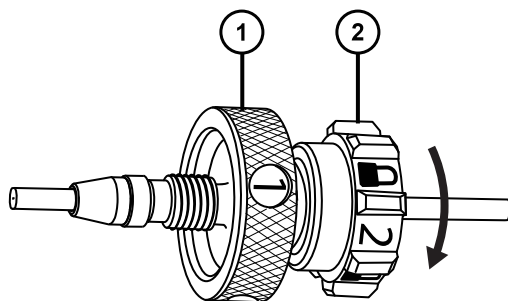
Required tools and materials

- Chemical-resistant, powder-free gloves
- Protective eyewear
- Replacement ferrule

To replace the ferrule on the column fitting:

1. Unscrew the #2 locking cap nut from the #1 knurled compression fitting.

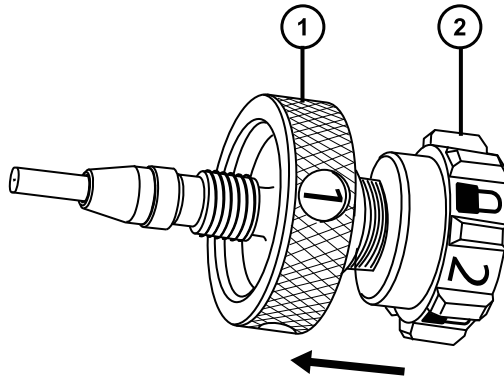
Figure 3–2: Unscrewing cap nut from fitting



- ① #1 knurled compression fitting
- ② #2 locking cap nut

2. Slide the #1 knurled compression fitting off the tubing.

Figure 3–3: Sliding fitting off tubing

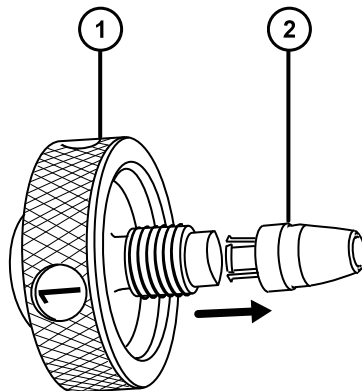


- ① #1 knurled compression fitting
- ② Tubing

Note: If the assembly contains a captive ferrule, the ferrule remains locked in the fitting.

3. If the assembly contains a captive ferrule, remove the ferrule from the fitting.

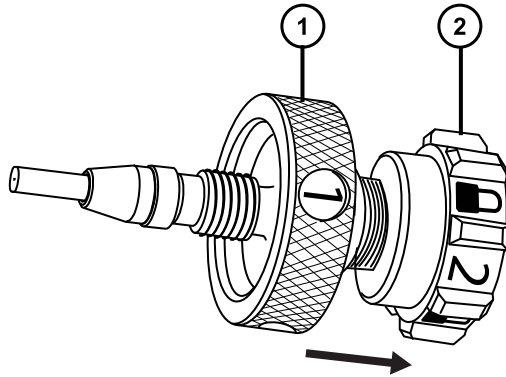
Figure 3–4: Removing ferrule from fitting



- ① #1 knurled compression fitting
- ② Ferrule (captive ferrule shown)

4. Discard the used ferrule.
5. Install the new ferrule on the fitting.
6. Slide the #1 knurled compression fitting and ferrule onto the tubing.

Figure 3–5: Sliding fitting and ferrule onto tubing

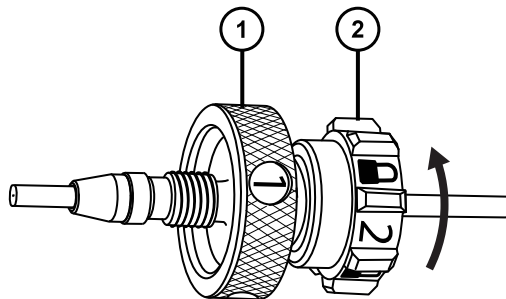


- ① Tubing
- ② #1 knurled compression fitting

Note: If it is a captive ferrule, the ferrule locks into the fitting.

7. Screw the #2 locking cap nut onto the #1 knurled compression fitting.

Figure 3–6: Screwing cap nut onto fitting



- ① #1 knurled compression fitting
- ② #2 locking cap nut

3.8 Replacing the 30-cm CHC module's fuses

The 30-cm CHC module is equipped with fuses that interrupt the electric current when something within the component fails. They protect both the operator and the equipment. Fuse failure is, under normal conditions, an extremely rare occurrence. Fuses that regularly open indicate a probable fault in the component and must be investigated. Contact Waters Customer Support for assistance.

The 30-cm CHC module has these fuse ratings:

- Two fuses
- 3.15 A, 250V Fast-blow, 5 × 20 mm (IEC 60127-2)



Warning: To avoid electrical fire, ensure that replacement fuses comply with the ratings affixed to the rear panel of the module.



Warning: To avoid electrical shock, before removing a fuse, power-off the module, and then remove the power cord from the receptacle on the back of the module.



Notice: To avoid damaging system modules, before replacing an opened fuse, determine the cause of the fuse's failure. It is possible that a serious underlying problem requires attention. Contact Waters Technical Service for assistance.

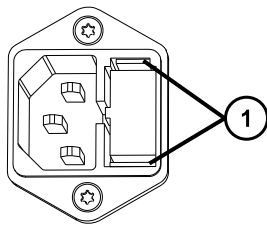
Required tools and materials

- Properly rated replacement fuses

To replace the fuses in the 30-cm CHC module:

1. Move the 30-cm CHC module's power switch to the "off" (0) position, and remove the power cord from its rear panel.
2. Locate the power-entry module on the 30-cm CHC module's rear panel.
3. Insert your fingers into the fuse-holder slots on the power-entry module.
4. Exerting a minimum pressure, pull on the spring-loaded fuse holder tabs, and remove it from the module.

Figure 3–7: Removing fuse holder



① Tabs on spring-loaded fuse holder

5. Remove and discard the old fuse.
6. Insert a new, properly rated fuse into the fuse holder.
7. Insert the fuse holder into the receptacle, and gently push until it locks into position.
8. Connect the power cord to the rear panel power-entry module.
9. Move the 30-cm CHC module's power switch to the "on" (I) position.

3.9 Cleaning the exterior of the equipment



Warning: To avoid electric shock,

- ensure that the electrical power to the equipment is interrupted;
- when cleaning the surface of the equipment, apply water to a cloth, and then wipe the instrument or device. Do not spray or otherwise apply water directly onto any equipment surface.



Warning: To avoid personal injury, use eye and hand protection during the cleaning process.

Required tools and materials

- Chemical-resistant, powder-free gloves
- Protective eyewear

To clean the exterior of the equipment:

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

A Safety advisories

Waters products display safety symbols that identify hazards associated with the product's operation and maintenance. The symbols also appear in product manuals with statements that describe the hazards and advise how to avoid them. This appendix presents all safety symbols and statements that apply to Waters' product offerings. The symbols and statements can apply to a specific product, or apply to other products within the same system.

A.1 Warning symbols

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

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



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



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



Warning: (Risk of electric shock.)



Warning: (Risk of fire.)



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



Warning: (Risk of hand crush injury.)



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



Warning: (Risk of exposure to ultraviolet radiation.)



Warning: (Risk of contacting corrosive substances.)



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



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



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



Warning: (Risk of tipping.)



Warning: (Risk of explosion.)



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

A.1.1 Specific warnings

A.1.1.1 Burst warning

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



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

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

A.1.1.2 Biohazard warning

The following warning applies to Waters instruments and devices that can process biologically hazardous materials. Biologically hazardous materials are substances that contain biological agents capable of producing harmful effects in humans.



Warning: To avoid infection from blood-borne pathogens, inactivated microorganisms, and other biological materials, assume that all biological fluids that you handle are infectious.

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



Warning: Observe Good Laboratory Practice (GLP) at all times, particularly when working with hazardous materials. Consult the Material Safety Data Sheets regarding the solvents you use. Additionally, consult the safety representative for your organization regarding its protocols for handling such materials.

A.1.1.3 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 biologically hazardous, toxic, or corrosive materials, you must understand the hazards associated with their handling.

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

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

A.2 Notices

Notice advisories appear where an instrument, device, or component 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.



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

A.3 Bottles Prohibited symbol

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



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

A.4 Required protection

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



Requirement: Use eye protection when performing this procedure.



Requirement: Wear clean, chemical-resistant, powder-free gloves when performing this procedure.

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

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



Warning: 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.



Avertissement : 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.



Warnung: 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.



Advertencia: 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.



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



警告： 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。



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



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



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

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



Avertissement : 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.



Warnung: 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.



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

- Indossare sempre occhiali da lavoro protettivi nei pressi di tubi di polimero pressurizzati.
- Spegner 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 tetrahydrofurano (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。
- 不要使用已經被壓癢或嚴重彎曲管線。
- 不要在非金屬管線中使用四氫呋喃或濃硝酸或濃硫酸。
- 要了解使用二氯甲烷及二甲基亞楓會導致非金屬管線膨脹，大大降低管線的耐壓能力。



警告： 当有压力的情况下使用管线时，小心注意以下几点：

- 当接近有压力的聚合物管线时一定要戴防护眼镜。
- 熄灭附近所有的火焰。
- 不要使用已经被压瘪或严重弯曲的管线。
- 不要在非金属管线中使用四氢呋喃或浓硝酸或浓硫酸。
- 要了解使用二氯甲烷及二甲基亚枫会导致非金属管线膨胀，大大降低管线的耐压能力。



경고: 가압 폴리머 튜브로 작업할 경우에는 주의하십시오.

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

This warning applies to Waters instruments fitted with nonmetallic tubing. This warning applies to instruments operated with flammable solvents.



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.



Avertissement : 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.



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



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



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



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



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



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



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

A.6 Warnings that address the replacement of fuses

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

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



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



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



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



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



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



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



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



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



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

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



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



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



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



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



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



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



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



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



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

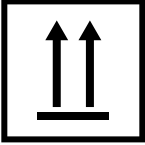



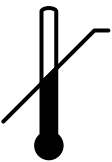

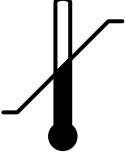
A.7 Electrical symbols

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

Symbol	Description
	Electrical power on
○	Electrical power off
⏻	Standby
≡	Direct current
~	Alternating current
3 ~	Alternating current (3 phase)
⏚	Safety ground
⏏	Frame or chassis terminal connection
⎓	Fuse
⏚	Functional ground
⤵	Input
⤴	Output

A.8 Handling symbols

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

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

B Specifications

The reproducibility of the specifications presented in this document depends on the conditions in individual laboratories. Contact the Waters Technical Service organization for additional information about specifications.

B.1 30-cm CHC physical specifications

Attribute	Specification
Height	55.2 cm (21.7 in)
Width	15.2 cm (6.0 in)
Depth (without drip tray fitting)	35.6 cm (14.0 in)
Weight	12.7 kg (28.0 lb)
Access to column tubing	Inside column compartment via access door
Number of columns	Multiple, up to six, serially connected
Column sizes	7.8-mm ID, maximum 300-mm length, maximum Column guards or in-line filters, 20-mm length, maximum

B.2 30-cm CHC environmental specifications

Attribute	Specification
Acoustic noise	<58 dBA
Ambient operating temperature	4 to 40 °C
Ambient operating humidity	20 to 80%, noncondensing
Airflow requirements	Clearance of 15 cm (6 in) at the module's rear
Ambient shipping and storage temperature	-30 to 60 °C
Ambient shipping and storage humidity	20 to 85%, noncondensing

B.3 30-cm CHC electrical specifications

Attribute	Specification
Protection class ^a	Class I
Overvoltage category ^b	II
Pollution degree ^c	2
Moisture protection ^d	Normal (IPX0)
Line voltages, nominal	Grounded AC
Power requirements	100–240 Vac
Line frequency	50–60 Hz
Power consumption	240 VA

- 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.

B.4 30-cm CHC input/output specifications

Attribute	Specification
25-pin, D-series sub-connector	Control and communication from the sample manager.

B.5 30-cm CHC wetted materials of construction

Component	Material
System tubing and fittings	316 SST, PEEK , MP35N (Bio)
Column outlet tubing and fittings	PEEK
Drip tray	Polyethylene
Drain tubing	Tygon 2475

