

Waters Post-Column Reaction Module

Installation Guide

71500017204/Revision B

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

Contacting Waters

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

Waters contact information

Contacting medium	Information
Internet	The Waters Web site includes contact information for Waters locations worldwide. Visit www.waters.com .
Telephone and fax	From the USA or Canada, phone 800 252-HPLC, or fax 508 872 1990. For other locations worldwide, phone and fax numbers appear in the Waters Web site.
Conventional mail	Waters Corporation 34 Maple Street Milford, MA 01757 USA

Safety considerations

Some reagents and samples used with Waters instruments and devices can pose chemical, biological, and radiological hazards. You must know the potentially hazardous effects of all substances you work with. Always follow Good Laboratory Practice, and consult your organization's safety representative for guidance.







Safety advisories

Consult [Appendix A](#) for a comprehensive list of warning and caution advisories.

Operating this instrument

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

Applicable symbols

Symbol	Definition
 Waters Corporation 34 Maple Street Milford, MA 01757 U.S.A.	Manufacturer location
 Waters Corporation Floats Road Wythenshawe Manchester M23 9LZ United Kingdom	Authorized representative of the European Community
	Confirms that a manufactured product complies with all applicable European Community directives
 ABN 49 095 444 751	Australia C-Tick EMC Compliant
	Confirms that a manufactured product complies with all applicable United States and Canadian safety requirements
	Consult instructions for use

Audience and purpose

This guide is intended for personnel who install the Waters Post-Column Reaction Module.

Intended use of the Waters Post-Column Reaction Module

The Waters Alliance Post-Column Reaction Module is for research use only.

Calibrating

To calibrate LC systems, follow acceptable calibration methods using at least five standards to generate a standard curve. The concentration range for standards should 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 operator's guide, accompanies the instrument, consult 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. 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.

ISM classification

ISM Classification: ISM Group 1 Class B

This classification has been assigned in accordance with CISPR 11 Industrial Scientific and Medical (ISM) instruments requirements. Group 1 products apply to intentionally generated and/or used conductively coupled radio-frequency energy that is necessary for the internal functioning of the equipment. Class B products are suitable for use in both commercial and

residential locations and can be directly connected to a low voltage, power-supply network.

EC authorized representative



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1 Introduction

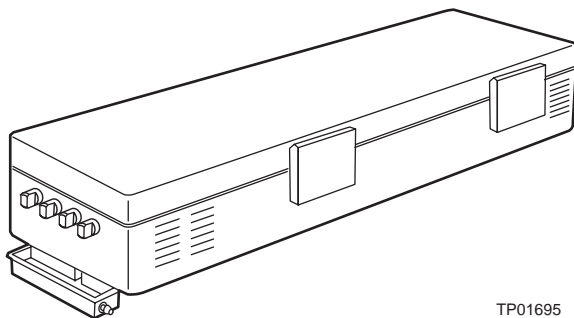
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Design features

The Waters® Post-Column Reaction Module (PCRM) is shown below.

Post-Column reaction module



TP01695

There are four bulkhead fittings on the front panel of the module. Three bulkhead fittings provide fluidic paths into a two-stage, Post-Column Reaction Module. The fourth bulkhead fitting provides a fluidic path out of the module to a detector. (Refer to Figure C-1 for information about using the PCRM for applications requiring a one-stage reaction.)

The post-column reaction module includes an oven containing a RXN™ 1000 Reaction Coil and a CHEX™ Countercurrent Heat Exchanger.

Tip: The Waters Temperature Control Module is required for operating the PCRM.

The analytical column is maintained in a separate column heater. Each analyte exiting the column is prewarmed as it passes through the Countercurrent Heat Exchanger (CHEX) to the post-column reactor oven.

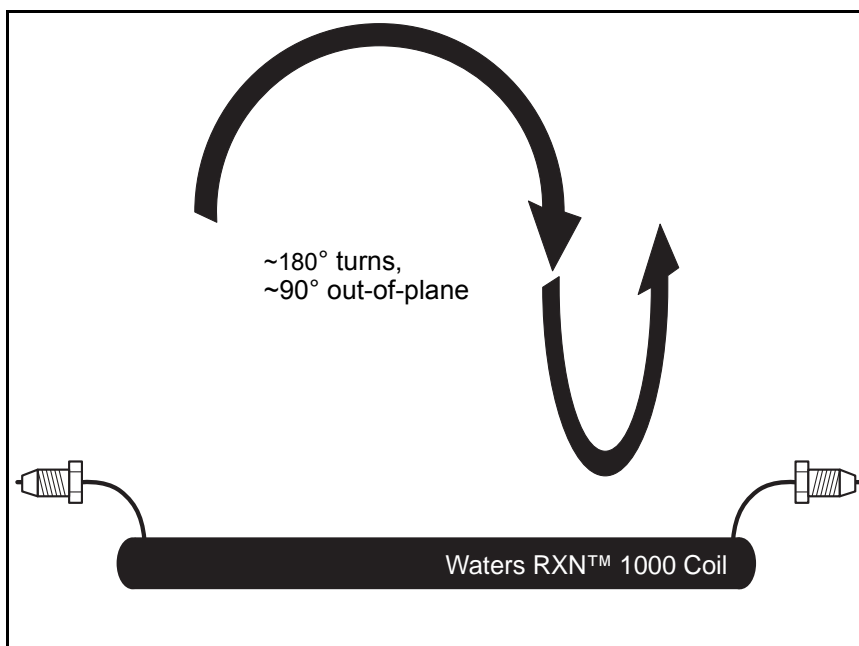
At the first junction inside the reactor oven, the column effluent merges with a stream of reagent solution that has also been preheated by passage through the CHEX unit. The two streams mix and pass through the RXN 1000 Reaction Coil where the 1-mL volume coil is maintained at constant temperature to cause the desired reaction.

After exiting the coil, the effluent immediately enters a second junction where it merges with a second pre-warmed reagent solution if a secondary post-column reaction is desired. The fluid stream leaves the oven, is cooled to ambient temperature by passing through the CHEX unit, and then passes out of the Post-Column Reaction Module and into the detector cell.

RXN 1000 reaction coil

A knitted open tubular design has been used to create one milliliter of reactor volume with minimal bandspreading in a compact linear shape. This RXN 1000 Reaction Coil is constructed of 0.018-in. ID PTFE using a series of tight 180° turns with each successive turn 90° out-of-plane. The effect of this method of construction is to cause effective mixing or turbulence in the radial direction while disrupting the laminar flow profile which would otherwise lead to significant axial broadening of the chromatographic bands in an open tube of this internal diameter.

Waters RXN 1000 reaction coil design

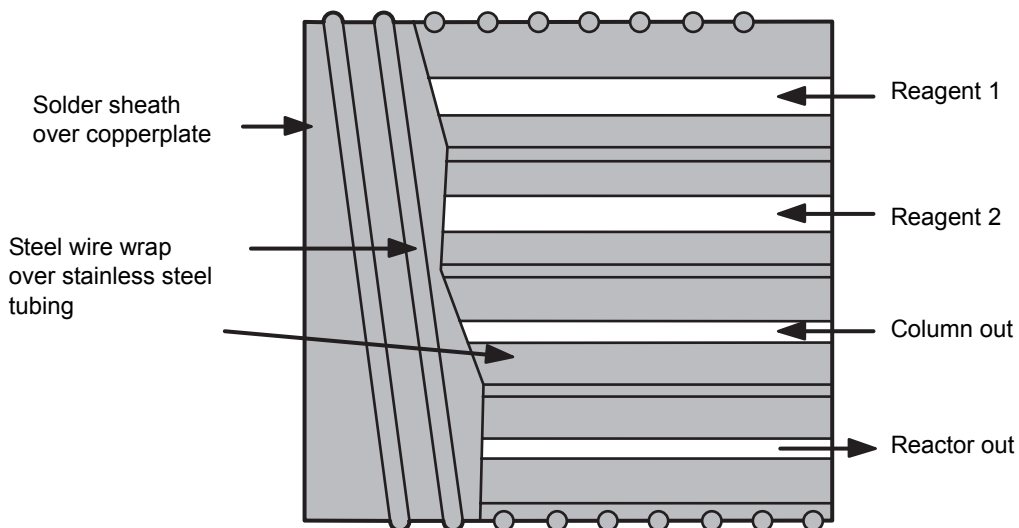


CHEX countercurrent heat exchanger

The CHEX Countercurrent Heat Exchanger performs several tasks concurrently. As shown in the figure below, post-column reagents 1 and 2 as well as the effluent from the HPLC column pass in parallel through the CHEX unit into the post-column reactor. The total flow of these three streams is

balanced by the countercurrent flow of the reactor effluent which passes back through the CHEX unit on its way to the detector.

CHEX countercurrent heat exchanger design



Because of the intimate thermal contact between the fluid paths, the heat from the reactor effluent is transferred to the incoming streams, thereby prewarming the reactants for more uniform reactions. At the same time, the reactor effluent is cooled to nearly ambient temperature which not only improves detector performance but also protects the reagent solution and the possibly unstable derivatives, once formed, from thermal degradation.

For example, in carbamate analysis exposing the reagent solution to excessive heat results in a higher level of background fluorescence appearing as baseline noise. Also, the isoindole derivative can be destroyed by heat and light. Thus, cooling the reactor effluent quickly maximizes the amount of derivative that reaches the detector cell while minimizing background fluorescence, thereby ultimately lowering the limit of detection.

2

Installing the Post-Column Reaction Module

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Selecting the site

The module contains solvent drains to direct solvent away from the unit in the event of a leak. The module should be installed on a level surface to insure proper drainage.

Install the Post-Column Reaction Module in an area free from extremes of temperature, humidity, appreciable shock, and vibration. Make sure the system is connected to a properly grounded power source that is free of transients and fluctuation.

Unpacking the PCRM

The Waters® Post-Column Reaction Module is shipped in one carton that contains the following items:

- Waters Post-Column Reaction Module
- Post-Column Reaction Module Startup Kit (see the Startup Kit List for a list of contents)
- Certificate of Validation
- Installation Manual

Before opening the shipping container, inspect it for damage or evidence of mishandling. If it has been damaged or mishandled, notify the carrier before opening the container. See [Appendix C](#) for more information.

Tip: Save the shipping container for future use.

To unpack the module:

1. Open the carton and remove the Startup Kit and other items from the slot at one end of the carton.
2. Using both hands, lift the module and its foam packing material out of the carton.
3. Carefully set the module down, then remove the foam packing material from the ends of the unit.
4. Check the contents of the Startup Kit against the Startup Kit parts list to confirm that all items are included.

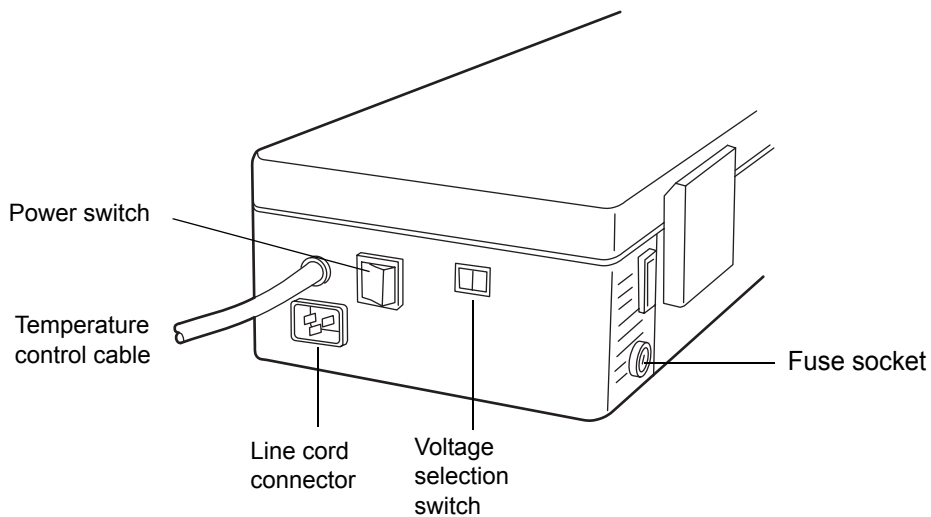
5. Verify that the serial number on the back of the module matches the serial number on the Certificate of Validation. Keep the Certificate of Validation for future reference.

For more information about the warranty, refer to [Appendix C](#).

6. Inspect all items for damage. Immediately report any shipping damage to both the shipping company and your Waters representative. Contact Waters Technical Service at 800-252-4752, *U.S. and Canadian customers only*. Other customers, call your local Waters subsidiary, or call Waters corporate headquarters at 508-478-2000 (U.S.A.). Refer to [Appendix C](#), for complete information on reporting shipping damages and submitting claims.

Electrical connections

PCRM electrical controls and connections



Selecting PCRM voltage

The PCRM can be adjusted to operate at the two nominal voltages listed in the table below.

PCRM voltage ranges and fuse ratings

Nominal voltage	Frequency range	Fuse rating
115 Vac	60 Hz (57-63)	2.5 A
230 Vac	50 Hz (47-53)	1.25 A

To select the desired voltage on the PCRM:

1. Make sure that the PCRM power switch is **Off**. Disconnect the power cord.
2. Reposition the voltage selection switch (red switch, see [figure “PCRM electrical controls and connections” on page 2-3](#) for location) with a flat-head screwdriver so that the desired voltage is displayed.
3. The fuse socket is located on the side of the PCRM near the rear (see [figure “PCRM electrical controls and connections” on page 2-3](#)). Remove the cover with a flat-head screwdriver.
4. Install a properly rated fuse as specified in [table titled “PCRM voltage ranges and fuse ratings” on page 2-4](#). Replace the fuse receptacle cover using a flat-head screwdriver.
5. Connect the power cord. Turn the module **On** when you are ready to perform an analysis.

Making electrical connections

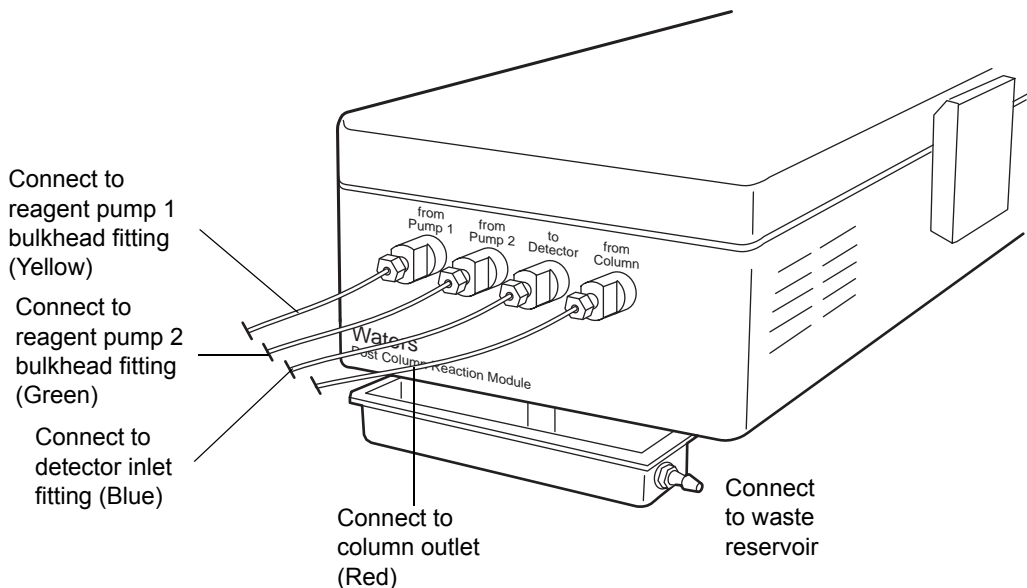
Make the following PCRM electrical connections:

1. Connect the 9-pin connector of the temperature control cable that is attached to the PCRM to any of the three external device connectors on a Temperature Control Module (TCM) rear panel and tighten the screws.
2. Connect a power cord to the PCRM. Connect the other end into a power supply outlet which meets the requirements in [table titled “PCRM voltage ranges and fuse ratings” on page 2-4](#).

Making fluidic connections

Connect the inlet tubing provided with the Post-Column Reaction Module as shown in [figure “PCRM electrical controls and connections” on page 2-3](#) to ensure proper operation.

PCRM fluidic connections



To connect the tubing to the bulkhead fittings on the PCRM:

1. Connect the tubing (color coded red) from the outlet connection of the analytical column to the bulkhead fitting labeled “from Column.”
2. Connect the tubing (color coded yellow) from the outlet connector of the reagent pump delivering reagent 1 to the bulkhead fitting labeled “from Pump 1”
3. Connect the tubing (color coded green) from the outlet connector of the reagent pump delivering reagent 2 to the bulkhead fitting labeled “from Pump 2.”
4. Connect the tubing (color coded blue) from the bulkhead fitting labeled “to Detector” to the inlet of the detector cell.
5. Connect the tubing from the drip tray outlet to the waste reservoir.

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Operating the Post-Column Reaction Module

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Powering up the PCRM

Power up the PCRM and any devices connected to the data system as follows:

Tip: Refer to the installation guides for each device for powerup procedures.

1. Power up all the equipment not controlled by the data system.
2. Power up the Post-Column Reaction Module, the Temperature Control Module (TCM), and all other equipment controlled through the IEEE-488 bus.
3. Power up the printer and the monitor.
4. Power up the computer.

Operating the PCRM

Tip: Make sure the selected operating temperature is compatible with the solvent(s) used.

To operate the Post-Column Reaction Module:

1. Turn the power switch of the PCRM to **1** (On).
2. Turn the ON/OFF switch on the TCM to **On - 1**. The TCM undergoes a brief self-test routine, then enters Control mode.
3. Press any key to enter Input mode.
4. If more than one module is connected, make sure that you select the proper unit number. Press **SELECT**, then enter the number (1-3) of the module. The corresponding SELECT UNIT LED illuminates. The TEMPERATURE display shows the measured temperature for that module.

Tip: The preset values are ambient for the lower limit and 120°C for the upper limit for the Post-Column Reaction. Setting a temperature outside prescribed limits may cause the alarm to trigger.

5. Press **SET**, then enter the desired operating temperature in degrees and tenths of degrees, then press **ENTER**. The display responds by showing the measured temperature for that channel. The TCM then begins to control that channel.

Tip: Refer to the Waters documentation for information about temperature settings for your application.

6. If you want to set the temperature for another module, repeat the procedure from step 2.

Tip: Over or Under temperature limits should not be set until the module unit has equilibrated to temperature.

To reset the system, follow the procedure described in Shutting Down the Temperature Limit at the end of this section.

Correcting an erroneous entry

If you make a mistake in entering temperature values and have not yet pressed **ENTER**, press **CLEAR**. The TEMPERATURE display then reverts to the value originally displayed for that parameter. Enter the new value and press **ENTER**.

If you have already pressed **ENTER**, press the number of the unit, then the key corresponding to the parameter containing the error. Enter the corrected value, then press **ENTER**.

Reentering control mode

When you have finished programming the TCM, press **ENTER**. The unit automatically reverts to Control mode in 5 seconds or when **ENTER** is pressed. The TCM executes the parameters programmed into it in Input mode and resumes its scan of the three channels.

Turning off the Post-Column Reaction Module

To turn the Post-Column Reaction Module off:

1. Press **SELECT** and the number of the module which you wish to turn off.
2. Press **Set**, **CLEAR**, and then **ENTER**. The Post-Column Reaction turns off and the TEMPERATURE display reads **OFF** for that channel.

Checking the temperature setting

If you wish to check the set or limit temperature of a Post-Column Reaction during operation, select the number of the unit you want to check, then press

the desired temperature parameter (OVER, UNDER, or SET). The TEMPERATURE display shows the desired parameter, then reverts to scanning all connected units after 5 seconds.

If a channel is not connected to a module, the TEMPERATURE display shows the status message **UC** (unconnected). If a device is connected but is not turned on, the TEMPERATURE display reads **OFF**.

Shutting down the temperature limit

If the actual temperature of a Post-Column Reaction Module exceeds the OVER temperature limit, the PCRМ automatically shuts that channel off and sounds the alarm. The **OVER LED** then illuminates. If the temperature of the module falls below the UNDER temperature limit, the alarm sounds, but the PCRМ does not shut the module off. The alarm continues to sound until the condition is corrected.

To reset the PCRМ after a limit shutdown, check the set temperature and both limits, then correct the problem or enter new values.

Equilibrating the PCRМ

Allow 1 hour for the Post-Column Reaction Module to stabilize at any set temperature.

Tip: Reaction times vary with temperature. Adequate time must be provided for temperature equilibration.

A Safety Advisories

Waters instruments display hazard symbols designed to alert you to the hidden dangers of operating and maintaining the instruments. Their corresponding user guides also include the hazard symbols, with accompanying text statements describing the hazards and telling you how to avoid them. This appendix presents all the safety symbols and statements that apply to the entire line of Waters products.

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Warning symbols

Warning symbols alert you to the risk of death, injury, or seriously adverse physiological reactions associated with an instrument's use or misuse. Heed all warnings when you install, repair, and operate Waters instruments. Waters assumes no liability for the failure of those who install, repair, or operate its instruments to comply with any safety precaution.

Task-specific hazard warnings

The following warning symbols alert you to risks that can arise when you operate or maintain an instrument or instrument component. Such risks include burn injuries, electric shocks, ultraviolet radiation exposures, and others.

When the following symbols appear in a manual's narratives or procedures, their accompanying text identifies the specific 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 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 eye injury.)

Specific warnings

The following warnings can appear in the user manuals of particular instruments and on labels affixed to them or their component parts.

Burst warning

This warning applies to Waters instruments fitted with nonmetallic tubing.



Warning: Pressurized nonmetallic, or polymer, tubing can burst.

Observe these precautions when working around such tubing:

- 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 incompatible compounds like tetrahydrofuran (THF) and nitric or sulfuric acids.
- Be aware that some compounds, like methylene chloride and dimethyl sulfoxide, can cause nonmetallic tubing to swell, which significantly reduces the pressure at which the tubing can rupture.

Mass spectrometer flammable solvents warning

This warning applies to instruments operated with flammable solvents.



Warning: Where significant quantities of flammable solvents are involved, a continuous flow of nitrogen into the ion source is required to prevent possible ignition in that enclosed space.

Ensure that the nitrogen supply pressure never falls below 690 kPa (6.9 bar, 100 psi) during an analysis in which flammable solvents are used. Also ensure a gas-fail connection is connected to the LC system so that the LC solvent flow stops if the nitrogen supply fails.

Mass spectrometer shock hazard

This warning applies to all Waters mass spectrometers.



Warning: To avoid electric shock, do not remove the mass spectrometer's protective panels. The components they cover are not user-serviceable.

This warning applies to certain instruments when they are in Operate mode.



Warning: High voltages can be present at certain external surfaces of the mass spectrometer when the instrument is in Operate mode. To avoid non-lethal electric shock, make sure the instrument is in Standby mode before touching areas marked with this high voltage warning symbol.

Biohazard warning

This warning applies to Waters instruments that can be used to process material that might contain biohazards: substances that contain biological agents capable of producing harmful effects in humans.



Warning: Waters instruments and software can be used to analyze or process potentially infectious human-sourced products, inactivated microorganisms, and other biological materials. To avoid infection with these agents, assume that all biological fluids are infectious, observe Good Laboratory Practices, and consult your organization's biohazard safety representative regarding their proper use and handling. Specific precautions appear in the latest edition of the US National Institutes of Health (NIH) publication, *Biosafety in Microbiological and Biomedical Laboratories* (BMBL).

Chemical hazard warning

This warning applies to Waters instruments that can process corrosive, toxic, flammable, or other types of hazardous material.



Warning: Waters instruments can be used to analyze or process potentially hazardous substances. To avoid injury with any of these materials, familiarize yourself with the materials and their hazards, observe Good Laboratory Practices (GLP), and consult your organization's safety representative regarding proper use and handling. Guidelines are provided in the latest edition of the National Research Council's publication, *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*.

Caution symbol

The caution symbol signifies that an instrument's use or misuse can damage the instrument or compromise a sample's integrity. The following symbol and its associated statement are typical of the kind that alert you to the risk of damaging the instrument or sample.



Caution: To avoid damage, do not use abrasives or solvents to clean the instrument's case.

Warnings that apply to all Waters instruments

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



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

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

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

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

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

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

注意: 未經有關法規認證部門明確允許對本設備進行的改變或改裝,可能會使使用者喪失操作該設備的合法性。

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

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



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

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

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

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

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

- In der Nähe von unter Druck stehenden Polymerschläuchen stets Schutzbrille tragen.
- Alle offenen Flammen in der Nähe löschen.
- Keine Schläuche verwenden, die stark geknickt oder überbeansprucht sind.
- Nichtmetallische Schläuche nicht für Tetrahydrofuran (THF) oder konzentrierte Salpeter- oder Schwefelsäure verwenden.
- Durch Methylenchlorid und Dimethylsulfoxid können nichtmetallische Schläuche quellen; dadurch wird der Berstdruck des Schlauches erheblich reduziert.



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

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

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

- El usuario deberá protegerse siempre los ojos cuando trabaje cerca de tubos de polímero sometidos a presión.
- Si hubiera alguna llama las proximidades.
- No se debe trabajar con tubos que se hayan doblado o sometido a altas presiones.
- Es necesario utilizar tubos de metal cuando se trabaje con tetrahidrofurano (THF) o ácidos nítrico o sulfúrico concentrados.
- Hay que tener en cuenta que el cloruro de metileno y el sulfóxido de dimetilo dilatan los tubos no metálicos, lo que reduce la presión de ruptura de los tubos.

警告: 當在有壓力的情況下使用聚合物管線時，小心注意以下幾點。

- 當接近有壓力的聚合物管線時一定要戴防護眼鏡。
- 熄滅附近所有的火焰。
- 不要使用已經被壓癟或嚴重彎曲管線。
- 不要在非金屬管線中使用四氫呋喃或濃硝酸或濃硫酸。
- 要了解使用二氯甲烷及二甲基亞楓會導致非金屬管線膨脹，大大降低管線的耐壓能力。



警告: 当有压力的情况下使用管线时, 小心注意以下几点:

- 当接近有压力的聚合物管线时一定要戴防护眼镜。
- 熄灭附近所有的火焰。
- 不要使用已经被压瘪或严重弯曲的管线。
- 不要在非金属管线中使用四氢呋喃或浓硝酸或浓硫酸。
- 要了解使用二氯甲烷及二甲基亚砜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ます、その場合、チューブは極めて低い圧力で破裂します。



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

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

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

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

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

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

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 보호 수단이 제대로 작동하지 않을 수 있다는 점을 사용자에게 반드시 인식시켜야 합니다.

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



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



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



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



Attenzione: per garantire protezione contro gli incendi, 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.







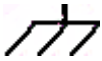
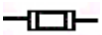



警告: 火災予防のために、ヒューズ交換では機器ヒューズカバー脇のパネルに記載されているタイプおよび定格のヒューズをご使用ください。

Electrical and handling symbols





Electrical symbols

These can appear in instrument user manuals and on the instrument's front or rear panels.

	Electrical power on
	Electrical power off
	Standby
	Direct current
	Alternating current
	Protective conductor terminal
	Frame, or chassis, terminal
	Fuse
	Recycle symbol: Do not dispose in municipal waste.

Handling symbols

These handling symbols and their associated text can appear on labels affixed to the outer packaging of Waters instrument and component shipments.

	Keep upright!
	Keep dry!
	Fragile!
	Use no hooks!

B Specifications

Post-Column Reaction Module	
Power consumption	Nominal 20 W
Environmental Data	Operating temperature: 10 to 40 °C Storage temperature: 40 to 70 °C Humidity: 10 to 90% non-condensing
Dimensions	Length: 9.21 cm (3.625 inches) Height: 58.42 cm (23.0 inches) Width: 16.51 cm (6.5 inches)
Safety features	Line fusing Grounding Solvent spill drainage Overtemperature protection
Temperature Range	Ambient to 120 °C
Maximum temperature Limit	120 °C at 450 psi for 72 hours
Temperature Setpoint Accuracy	+/- 0.5 °C at 80 °C measured with temperature probe at designated point
Temperature Stability	+/- 0.5 °C under identical conditions
Temperature Repeatability	+/- 0.1 °C from day to day
Mechanical Temperature Limit Switch	125 °C +/- 3.9 °C

C Warranty and Service Information

Contents

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Shipments, damages, claims, and returns	C-5

Limited product warranty

Waters[®] Corporation, provides this limited warranty (the Warranty) to protect customers from nonconformity in the product workmanship or materials. The Warranty covers all new products manufactured by Waters and its subsidiaries.

The Warranty is as follows:

Waters warrants that all products sold by them will be of good quality and workmanship. The products will be fit for their intended purpose(s) when used strictly in accordance with Waters instructions for use during the applicable warranty period.

The foregoing warranty is exclusive and in lieu of all other express and implied warranties, including but not limited to fitness for any other purpose(s). In no event will Waters be liable for consequential, economic, or incidental damages of any nature. Waters reserves the right not to honor this warranty if the products are abused by the customer. The Warranty will not be deemed to have failed of its essential purpose so long as Waters is able and willing to repair or replace any nonconforming part or product.

Warranty service

Warranty service will be performed at no charge and at Waters' option in one of three ways:

- A service representative will be dispatched to the customer's facility.
- The product will be repaired at a Waters repair facility.
- Replacement parts with appropriate installation instructions will be sent to the customer.

Nonconforming products or parts will be repaired, replaced with new or like-new parts, or refunded in the amount of the purchase price, when the product is returned. Warranty service will be performed only if the customer notified Waters during the applicable warranty period.

Unless otherwise agreed at the time of sale, warranty service will not be provided by dispatching a service representative when the equipment has been removed from the initial installation location to a new location outside the home country of the selling company.

Warranty service exceptions

Warranty service will not be performed on:

- Any product or part which has been repaired by others, improperly installed, altered, or damaged in any way.
- Products or parts identified before sale as not manufactured by Waters. In such cases, the warranty of the original manufacturer will apply.
- Products that malfunction because the customer has failed to perform maintenance, calibration checks, or observe good operating procedures.

Repair or replacement will not be made:

- For expendable items such as filament devices, panel lights, fuses, batteries, and seals, if such items were operable at the time of initial use
- Because of decomposition due to chemical action
- For used equipment
- Because of poor facility, operating conditions, or utilities

Warranty period

The warranty period begins when the product is installed or, in the case of a customer installation, 15 days after shipment from Waters.

In no case will the warranty period extend beyond 15 months from date of shipment. If an item is replaced during its warranty period, the replacement part will be warranted for the balance of the original warranty period.

The warranty period for the Waters Post-Column Reaction Module is as follows:

1 Year Warranty	Switches and Sensors
90 Day Warranty	Cables
30 Day Warranty	Replacement Parts and Service Workmanship
Expendable Items ^a	Ferrules, Compression Screws, Fuses, Tubing, and Column Heater Inserts

a. Waters will replace only if shipped with manufacturing defects.

Ordering information

Where to place orders

Write:

Waters Corporation

34 Maple St.

Milford, MA 01757

Attn: Order Processing Department

Call:*1-800-252-4752 - Customer Sales Department

Telex:174166 or 174128

Fax:1-508-872-1990

International Consult the listing of Waters Sales/Service offices at the end of this manual.

Tip: Confirming orders mailed after a telephone order has been placed must be clearly marked 'CONFIRMING' to avoid duplication.

How to place orders

Delays or errors in processing orders are frequently caused by incorrect or incomplete information. To minimize delays and errors in processing your orders, please list part numbers in ascending numerical order, and provide all of the following information:

1. Catalog numbers and descriptions.
2. Quantity desired.
3. Complete purchase order number - orders cannot be processed without it. Requisition numbers are insufficient.
4. Complete Ship To address and marking if applicable.
5. Complete Bill To address if other than Ship To.
6. Required delivery date.
7. Method of transportation desired.

8. Name and telephone number of person to contact if clarification is required.

Part numbers

[Appendix D](#), contains a list of the recommended replacement parts for the Post-Column Reaction Module.

Pricing

Prices listed are FOB Milford, MA, unless otherwise agreed. Prices and product information contained in any catalog or price list were current at the time of printing. In a continuing effort to provide the finest products available, Waters reserves the right to change specifications, models, or prices without notice and without liability for such changes. Where price changes have occurred, prices prevailing at time of receipt of your order will apply.

Payment terms

Our terms are net 30 days from invoice date with approved credit. If your credit has not been previously established with Waters, our terms are payment in advance or COD.

Shipments, damages, claims, and returns

Shipments

As all shipments are made FOB Milford, MA, we suggest insurance be authorized on all shipments. Instruments and major components will be packed and shipped via surface, unless otherwise required. Supplies and/or replacement parts are packed and shipped via UPS, UPS Blue, air parcel post, or parcel post unless otherwise requested.

Damages

The Interstate Commerce Commission has held that carriers are as responsible for concealed damage as for visible damage in transit. Unpack shipment promptly after receipt as there may be concealed damage even though no evidence of it is apparent. When concealed damage is discovered,

cease further unpacking of the unit involved and request immediate inspection by the local agent or carrier and secure a written report of his findings to support claim. This request must be made within 15 days of receipt. Otherwise, the claim will not be honored by the carrier. Do not return damaged goods to the factory without first securing an inspection report and contacting Waters for a return authorization number.

Claims

After a damage inspection report has been secured, Waters will cooperate fully in supplying replacements and handling of a claim which may be initiated by either party.

Returns

No returns may be made without prior notification and authorization. If for any reason it is necessary to return material to us, please contact our Customer Service Department or your nearest Waters subsidiary/representative for a return authorization number and forwarding instructions.

D RXN 1000 Coil Care and Use

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Introduction

Waters[®] RXN 1000 Reaction Coil is designed for liquid chromatography applications where on-line chemical modification or derivatization of analytes is required. The RXN Coil has several unique features which make it ideal for post-column reaction systems:

- Inert fluid path compatible with most solvents and reagents, even at elevated temperatures
- Proprietary knitted open tube design with minimal bandspreading to maintain analytical resolution from high-performance columns

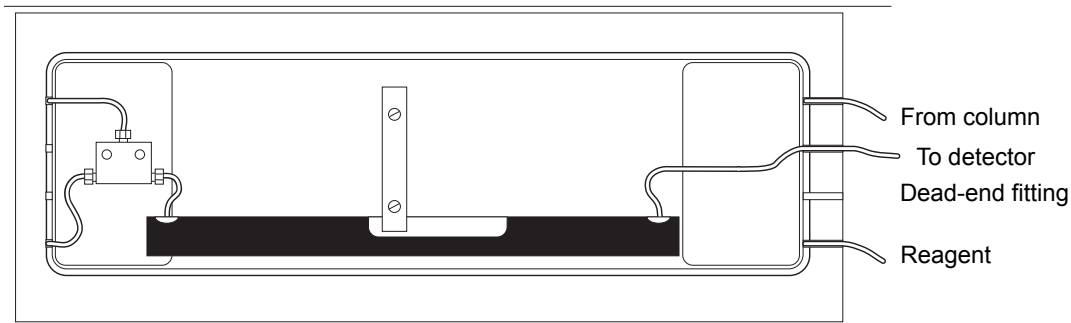
RXN coil materials of construction/specifications

- *Volume:* coil volume in μL is designated by descriptive number; e.g., RXN 1000 Coil has a volume of 1000 μL
- *Coil:* 0.018 inch ID polytetrafluoroethylene tubing knitted in a proprietary manner
- *Fittings:* 1/16" compression screws and ferrules made of PEEK
- *Jacket:* anodized aluminum tube and endcaps
- *Maximum Operating Temperature:* 120 °C
- *Maximum Operating Pressure:* 500 psi (3.4 MPa)
- *Tee:* 316 SS, 90° port, low-dead volume design which accepts 1/16" compression screw fittings

Installation

A typical post-column installation of the tee and RXN Coil is shown schematically in the figure below.

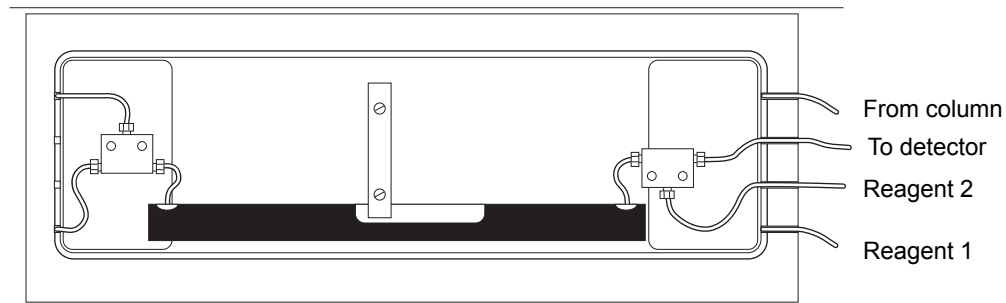
One-stage post-column coil installation



Tip: A second junction tee is present in the PCRM, but is not used for applications that require a one-stage reaction.

A post-column installation for two reagents (using two tees) is shown schematically in the figure below.

Two-stage post-column coil installation



To install the post-column reactor:

1. Use 0.009-in. ID tubing for all sections of the fluid path through which sample will flow. The reagent inlet line may be 0.020-in. ID or larger.
2. Thread the compression screw fittings into the appropriate tee or union until finger tight. Do not overtighten.
3. Place the tee, RXN Coil, and associated tubing in the heating chamber. This permits operation at a controlled temperature while also shielding the coil and protecting it from damage.

Helpful hints and precautions

- Support the coil so as not to place any strain on the exposed ends of the PTFE tubing. Do not kink, stretch, scratch, or damage the exposed PTFE tubing in any way.
- When installing the coil, do not overtighten the compression screws. This can deform the ferrule, which, in turn, may place undue pressure on the PTFE tubing and create a restriction in the fluid path leading to excessively high system operating pressure.
- Filter reagent solutions before use with the Waters Solvent Clarification Kit. Test a mixture of reagent solution and mobile phase beforehand to make certain that precipitation will not occur in fluid path.
- Keep fluid moving through the coil while it is at temperatures above ambient. Do not allow reagent solutions to sit in the coil at elevated temperatures. Flush the RXN Coil clean immediately after use with a suitable solvent.



Caution: If the exposed PTFE tubing at either end of the RXN Coil becomes strained, compressed, or damaged in any way and/or is subjected to internal pressure in excess of the recommended maximum operating pressure, there is a risk that mobile phase or reagent solution may leak in a high-velocity stream from a small hole or break in the tubing. Always wear eye protection, operate the coil in a closed chamber or behind a safety shield, and shut off all fluid pumps, allowing sufficient time for the internal pressure to be relieved, before inspecting, removing, or servicing the coil.

Ordering information

Ordering information for the PCRM

Description	Part number
RXN 1000 Coil Kit	030805
2.5 A Fuse	WAT072919
SS Bulkhead Fitting	WAT070216
SS Tee	WAT075215
Thermal Switch 125 °C	700000978
CHEX Countercurrent Heat Exchanger	700000979
Reaction Coil Clamp	700000980
PEEK Tubing Kit, PCRM	700000984

To order by phone, call 800-252-4752 and then press 1 (U.S. and Canadian customers only). To order by fax, dial 508-482-8449 (U.S.) or 905-678-2350 (Canada).

Send orders to:

Waters Corporation
Mail Stop: CS
34 Maple St.
Milford, MA 01757

Customers outside the U.S. or Canada, call your nearest Waters office.

E System Startup Kit List

PCRM startup kit contents

Part number	Quantity	Item	Description/ Location
WAT021815	12	NM Compression Screw 10-32 Short	Used to make connections to LC system
WAT021816	12	Compression Fitting Knob	Used to make connections to LC system
WAT21817	12	NM PEEK Ferrule 1/16 inch OD	Used to make connections to LC system
WAT031795	1	PEEK Tubing Cutter	Used to cut connection tubings to LC system
WAT038051	1	Fuse Holder	Fuse replacement
WAT038130	1	Fuse, 1.25A 250V	Fuse replacement
WAT072919	1	Fuse, 2.5A	Fuse replacement
WAT097559	1	Fuse Carrier 5 × 20mm	Fuse replacement
289000511	1	Kit, Tubing, PCRM	Used to make Connections to LC system
430000314	1	Tubing, Convolutd	Connects drain outlet to waste container
71500017204	1	Installation Guide, Post Column Reaction Module	User installation and operation information

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