IC equipment

IC equipment: Inline Ultrafiltration 2 - MiPT

Manual

8.0108.8027EN / v6 / 2024-07-02

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6.05330.210

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Technical Communication
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1 Introduction

1.1 Description of the IC equipment: Inline Ultrafiltration 2 - MiPT

The IC equipment: Inline Ultrafiltration 2 - MiPT (6.05330.210) contains all the required accessory parts for the Inline Ultrafiltration and for the Metrohm intelligent Partial Loop Injection Technique (MiPT).

Combining the Inline Ultrafiltration and MiPT allows for the samples to be filtered and subsequently be filled into the sample loop with an accurately measured volume.

The main component of the Inline Ultrafiltration is the high-performance ultrafiltration cell. This cell is suitable for the filtration of samples with high requirements regarding filtration effectiveness and sample throughput.

MiPT allows you to fill the 250 µL sample loop with a precisely measured volume. In this process, the 800 Dosino with a 807 Dosing Unit 2 mL performs the precise dosing steps. MiPT enables calibration with only one standard solution, as the injection volume can be selected freely. The same applies to sample injection. This means, for example, that a small injection volume can be selected for a highly concentrated sample.

The sample needle is rinsed with ultrapure water in the rinsing unit of the Liquid Handling Station (6.2841.120) after each sample aspiration. The Liquid Handling Station can be mounted on any sample changer equipped with a Swing Head.

1.2 About the documentation

This manual describes the correct assembly and maintenance of the IC equipment: Inline Ultrafiltration 2 - MiPT, the installation of the capillary connections and the assembly of the holder to the sample changer.

The installation of the peristaltic pump is not described in this manual. The installation of the peristaltic pump is described in the respective manuals for the ion chromatograph or for the sample changer.

CAUTION

Please read through this documentation carefully before putting the IC equipment: Inline Ultrafiltration 2 - MiPT into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the IC equipment: Inline Ultrafiltration 2 - MiPT.

Additional documentation

Topic	Document
Mounting the Liquid Handling Station on the sample changer	8.108.8011 Manual for Liquid Handling Station
Installation of the Dosino	8.800.8002 Manual for 800 Dosino
Care and maintenance of the 807 Dosing Unit	8.807.8002 Manual for 807 Dosing Unit

1.3 Symbols and conventions

The following symbols and formatting may appear in this documentation:

*(5-**12**)*	**Cross-reference to figure legend** The first number refers to the figure number, the second to the instrument part in the figure.
1	**Instruction step** Perform the steps one after the other.
Method	**Dialog text**, **parameter** in the software
File ► New	Menu or menu item
[Continue]	**Button** or **key**
	**WARNING** This symbol draws attention to a possible life-threatening hazard or risk of injury.
	**WARNING** This symbol draws attention to a possible hazard due to electrical current.
	**WARNING** This symbol draws attention to a possible hazard due to heat or hot instrument parts.

	**WARNING** This symbol draws attention to a possible biological hazard.
	**WARNING** Warning of optical radiation
	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
	**NOTICE** This symbol highlights additional information and tips.

2 Mode of operation of ultrafiltration and intelligent Partial Loop Injection Technique

The following procedure describes the combination of Inline Ultrafiltration and the intelligent Partial Loop Injection Technique (MiPT):

1. Empty the 807 Dosing Unit.
   At the beginning of the determination, the 807 Dosing Unit 2 mL of the 800 Dosino is emptied.
2. Aspirate the sample.
   The peristaltic pump between the sample changer and the ultrafiltration cell aspirates the sample.
3. Filtrate the sample.
   The peristaltic pump delivers the sample continuously at a high flow rate through the sample chamber of the ultrafiltration cell. The sample flows along the filtration membrane to the sample outlet and into the waste container.
   At the same time, the Dosino generates a vacuum in the filtrate chamber of the ultrafiltration cell, thus aspirating the sample solution through the filtration membrane. The filtrate enters the transfer capillary.
   At an aspiration rate of 0.75 mL/min, less than 20% of the original sample solution is analyzed as filtrate. At an aspiration rate of 1.5 mL/min, less than 40% is analyzed as filtrate. The remainder of the sample solution flows into the waste container.
4. Fill the sample loop.
   a. The injector is switched to the **Fill** position.
   b. The Dosino doses the injection volume from the transfer capillary to the 250 µL sample loop.
      The Dosino doses the required ultrapure water from the ultrapure water bottle into the transfer capillary and to the sample loop.
   c. Excess sample and ultrapure water are discharged as waste via port 4 of the 807 Dosing Unit.
5. Inject the sample.
   The injector is switched to the **Inject** position. The sample is injected into the separation column with the eluent.
6. Rinse the sample needle.
   a. The sample needle moves to the rinse position of the Liquid Handling Station.
   b. The peristaltic pump between the ultrapure water bottle and the Liquid Handling Station delivers ultrapure water to the Liquid Handling Station.
   c. The sample needle is rinsed in the Liquid Handling Station.

3 Overview

3.1 Parts of the IC equipment: Inline Ultrafiltration 2 - MiPT

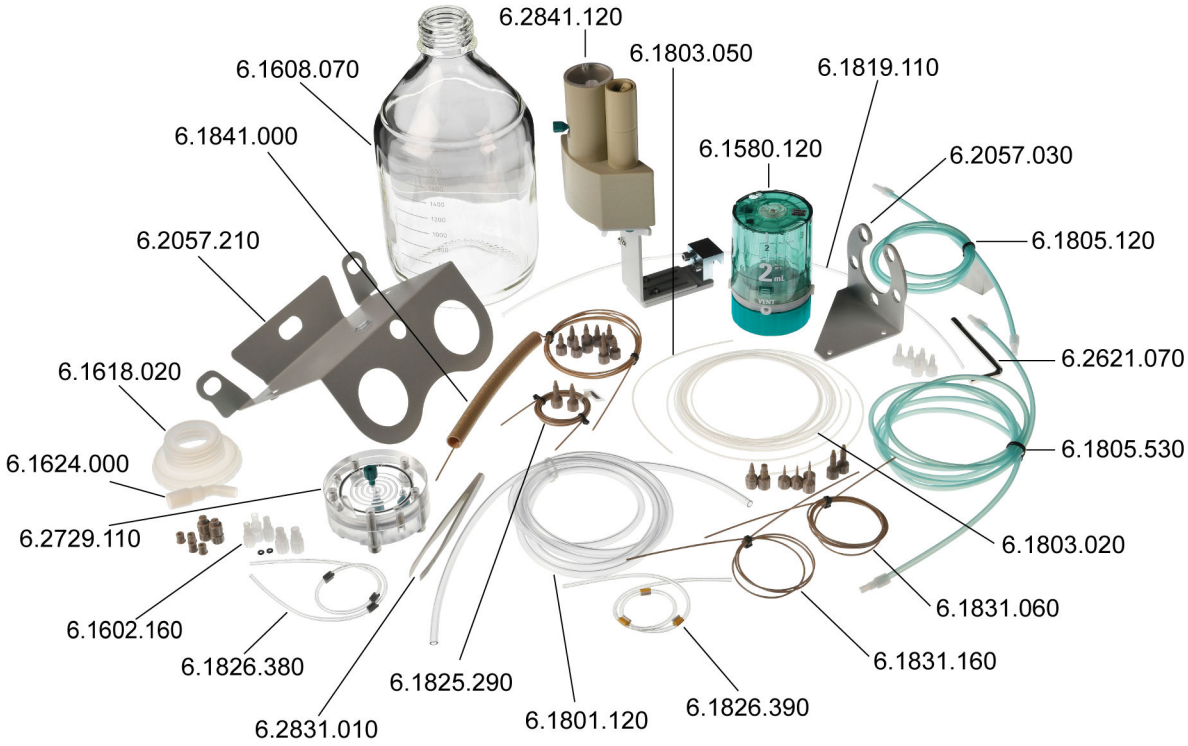


Figure 1 IC equipment: Inline Ultrafiltration 2 - MiPT – Parts

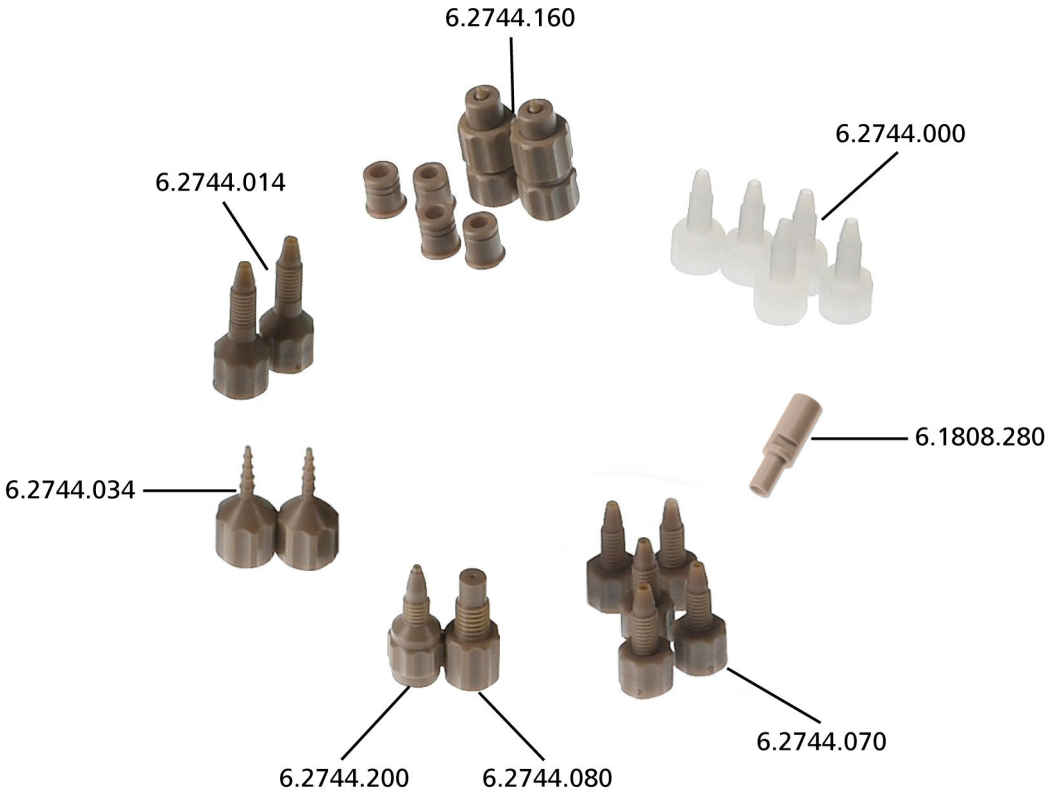


Figure 2 Couplings, adapters and screws of the IC equipment: Inline Ultrafiltration 2 - MiPT

Table 1 Parts of the IC equipment: Inline Ultrafiltration 2 - MiPT

Article number	Article name	Number
6.2714.020	Filtration membrane 1	1
6.1803.040	PTFE capillary, 0.5 mm ID / 1 m	1
6.1608.070	Eluent bottle / 2 L / GL 45	1
6.2841.120	Liquid Handling Station, left	1
6.1803.050	PTFE capillary, 0.5 mm ID / 20 cm	1
6.1580.120	807 Dosing Unit 2 mL without accessories	1
6.1819.110	FEP aspiration tubing for canister	1
6.1805.120	FEP tubing / M6 / 100 cm	1
6.02057.030	Filtration cell holder	1
6.2621.030	Hex key 4 mm	1
6.1805.530	FEP tubing / M6 / 2 m	1
6.1803.020	PTFE capillary, 0.97 mm ID / 5 m	1
6.1831.160	PEEK capillary, 0.5 mm ID / 70 cm	1
6.1826.390	Pump tubing LFL (yellow/yellow), 3 stoppers	1

Article number	Article name	Number
6.1801.120	PVC tubing / 4 mm / 6 mm / 2 m	1
6.1825.290	PEEK sample loop 250 µL	1
6.2831.010	Plastic tweezers	1
6.1826.380	Pump tubing LFL (gray/gray), 3 stoppers	1
6.1602.160	Bottle cap GL 45 for eluents and reagents	1
6.02729.110	Ultrafiltration cell 2	1
6.1624.000	Adapter SGJ 14 for the adsorber tube 6.1619.XXX	1
6.1618.020	Thread adapter / S40 on GL 45	1
6.2057.210	Dosino holder for IC devices	1
6.1841.000	PEEK transfer capillary 2 mL, 5 m	1
6.2744.160	Pump tubing connection with locking nut	2
6.2744.000	Pressure screw PVDF, 5x	1
6.1808.280	Adapter Dosino port 4, M6 inner	1
6.2744.070	Pressure screw, short, 5x	1
6.2744.080	M6 thread / UNF 10/32 adapter	1
6.2744.200	Adapter UNF 10/32 outer / M6 inner	1
6.2744.034	Coupling olive/UNF 10/32, 2x	1
6.2744.014	Pressure screw, 2x	1

3.2 Flow diagram of the IC equipment: Inline Ultrafiltration 2 - MiPT

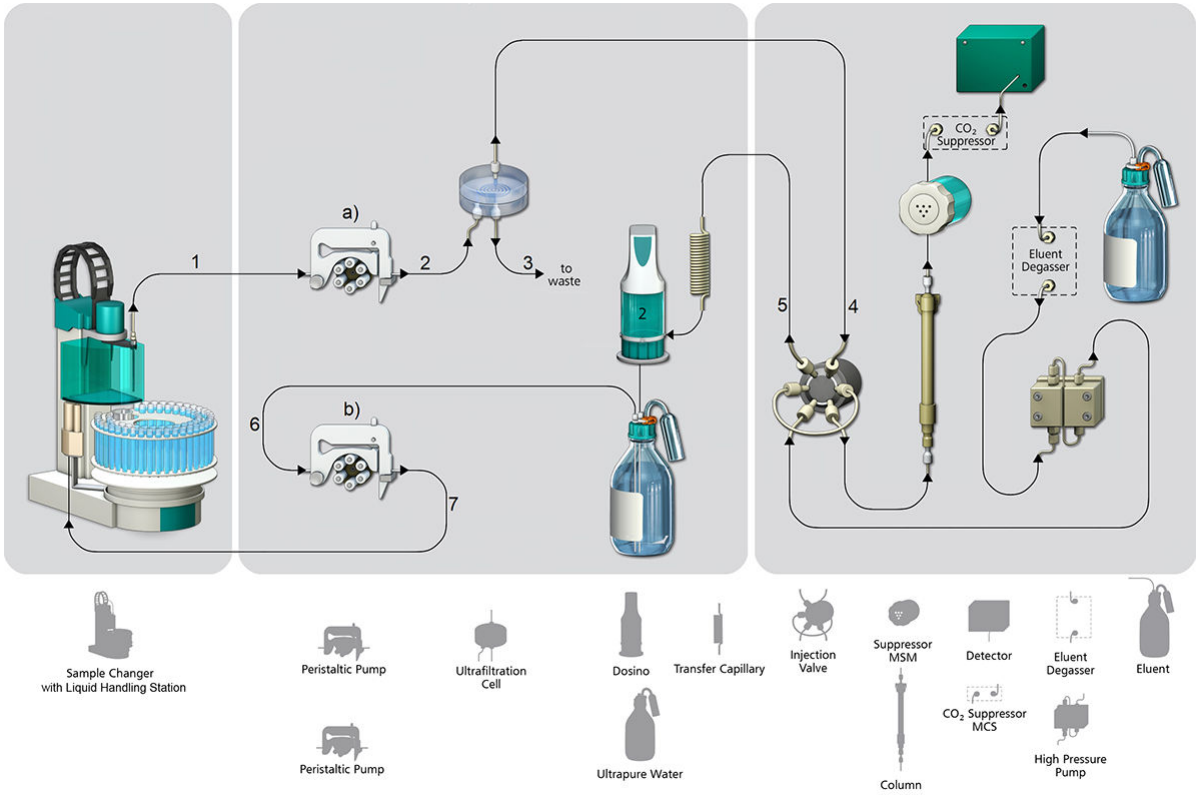


Figure 3 Flow diagram of the IC equipment: Inline Ultrafiltration 2 - MiPT

1	**6.1831.160** PEEK capillary, 0.5 mm ID / 70 cm	**2**	**6.1803.050** PTFE capillary, 0.5 mm ID / 20 cm
3	**6.1803.020** PTFE capillary, 0.97 mm ID / 5 m This capillary is cut in 3 pieces *(see "Connecting the ultrafiltration cell", page 17)*.	**4**	**6.1803.040** PTFE capillary, 0.5 mm ID / 1 m
5	**6.1841.000** PEEK transfer capillary 2 mL, 5 m	**6**	**6.1803.020** PTFE capillary, 0.97 mm ID / 5 m This capillary is cut in 3 pieces *(see "Connecting the ultrafiltration cell", page 17)*.

7	**6.1803.020** PTFE capillary, 0.97 mm ID / 5 m This capillary is cut in 3 pieces *(see "Connecting the ultrafiltration cell", page 17)*.
a)	**6.1826.380** Pump tubing LFL (gray/gray), 3 stoppers
b)	**6.1826.390** Pump tubing LFL (yellow/yellow), 3 stoppers

3.3 Components of the ultrafiltration cell

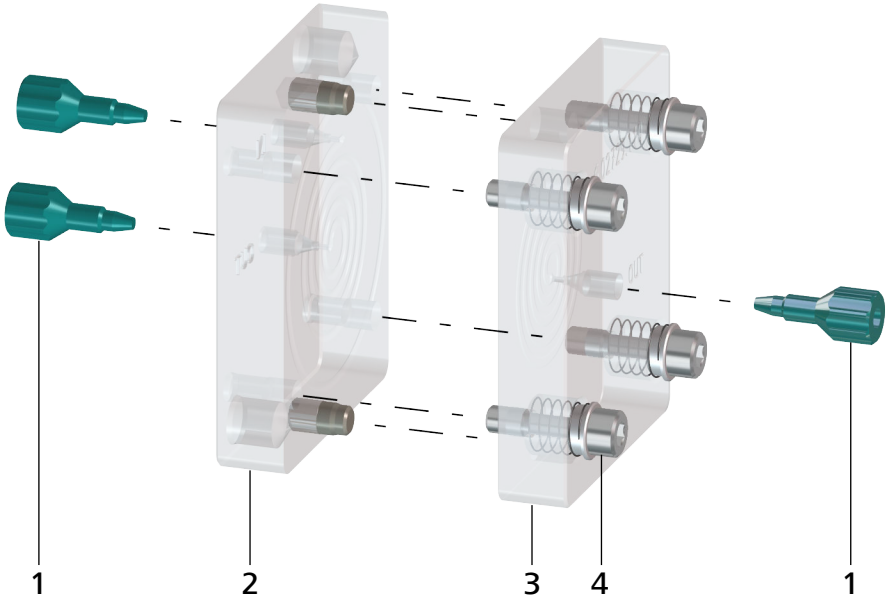


Figure 4 Ultrafiltration cell – Parts

1 **Stopper**	**2** **Sample chamber**
3 **Filtrate chamber**	**4** **Screws** for screwing together the sample chamber and the filtrate chamber

3.4 Connectors of the ultrafiltration cell

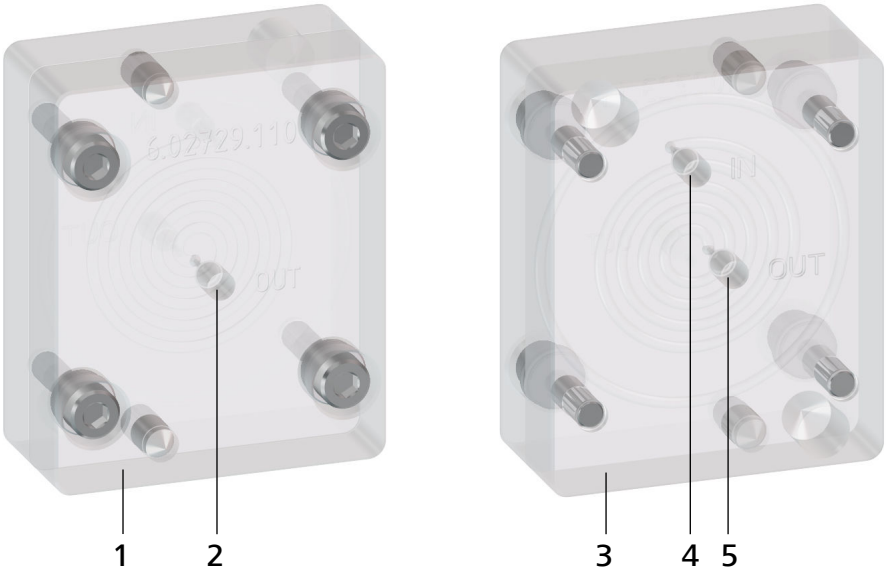


Figure 5 Ultrafiltration cell – Connectors

1 **Filtrate chamber**	**2** **Filtrate outlet** labeled *OUT*
3 **Sample chamber**	**4** **Sample inlet** labeled *IN*
5 **Sample outlet** labeled *OUT*	

3.5 Parts of the Liquid Handling Station

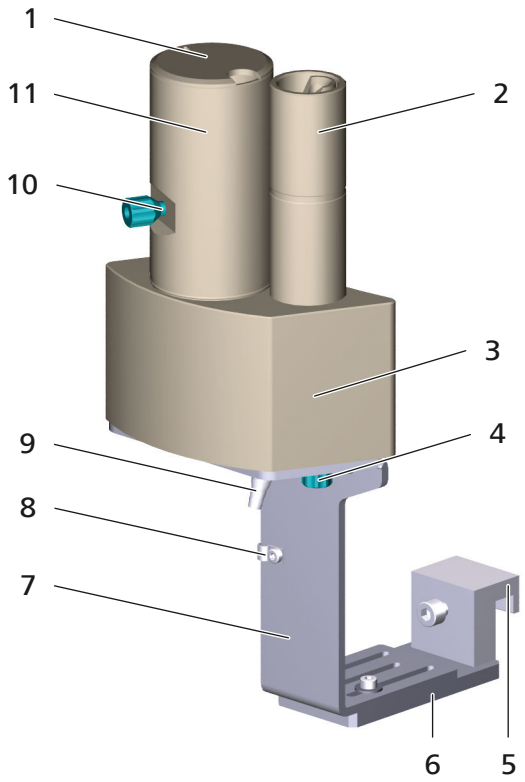


Figure 6 Liquid Handling Station – Parts

1	**Lid** For the mixing vessel.	**2**	**Rinsing unit**
3	**Main body** With magnetic stirrer dummy.	**4**	**Rinsing unit inlet** Sealed with threaded stopper.
5	**Clamping fastener**	**6**	**Base plate**
7	**Support bracket**	**8**	**Cable clip**
9	**Waste connector**	**10**	**Mixing vessel outlet** Sealed with threaded stopper.
11	**Mixing vessel**		

4 Installation

4.1 Installing the ultrafiltration cell

The following figure shows a schematic overview of the installation of the IC equipment: Inline Ultrafiltration 2 - MiPT. In this chapter, the part of the figure within the orange margin is described.

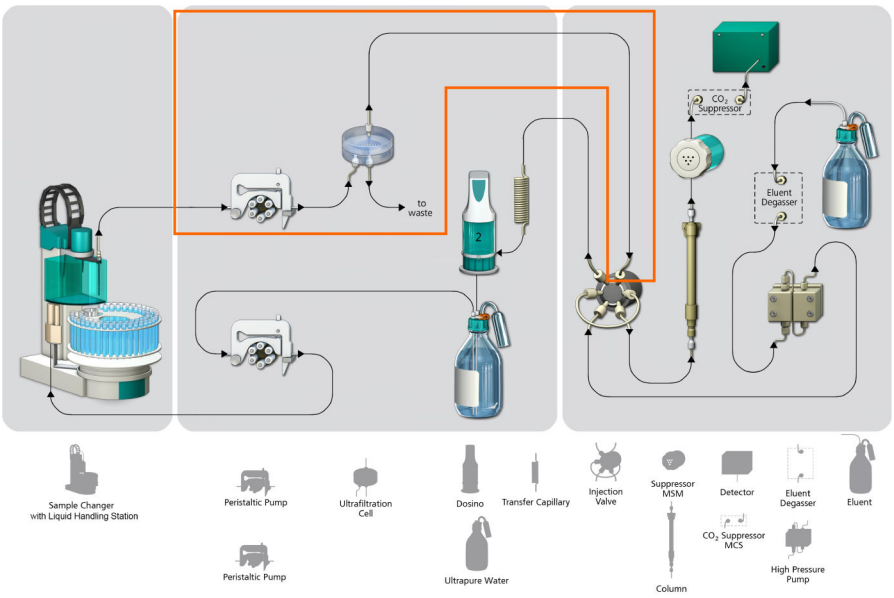


Figure 7 Connecting the ultrafiltration cell – Overview

4.1.1 Preparing the ultrafiltration cell

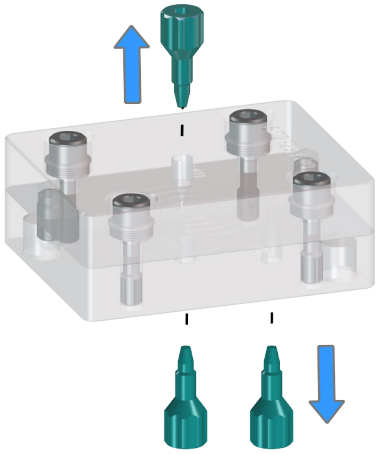
Inserting the filtration membrane

Accessories

- Ultrafiltration cell 2 (6.02729.110)
- Filtration membrane 1 (6.2714.020)
- 4 mm hex key (6.2621.030)

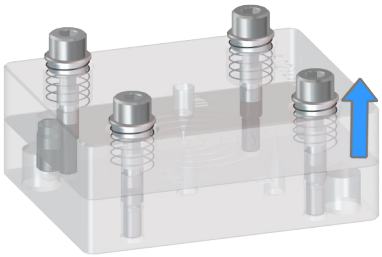
- Plastic tweezers (6.2831.010)

1 Removing the stoppers



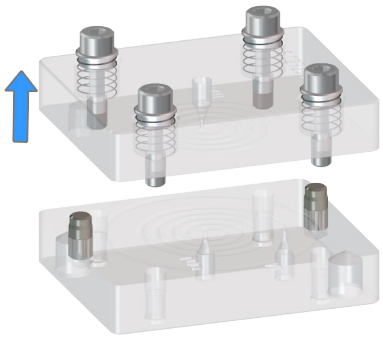
- Remove the 3 green stoppers by hand.
- Place the ultrafiltration cell on the table with the filtrate chamber facing upwards. The screws face upwards.

2 Removing the screws



- Loosen the screws with the hex key.
  The screws cannot be removed from the filtrate chamber.

3 Disassembling the ultrafiltration cell



Remove the filtrate chamber of the ultrafiltration cell.

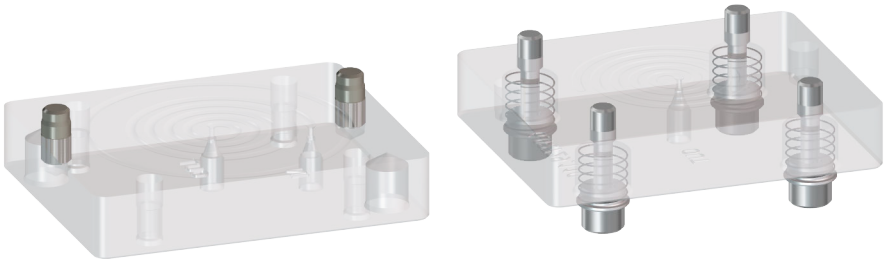
4 Cleaning the ultrafiltration cell

CAUTION

Damage to the ultrafiltration cell

Organic solvents (e.g. acetone) corrode and damage the ultrafiltration cell material (PMMA).

Use ultrapure water or a water-ethanol mixture (70:30) for cleaning the ultrafiltration cell.



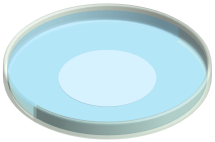
- Rinse both chambers with ultrapure water.
- Dry both chambers with a lint-free cloth.

5 Wetting the filtration membrane

NOTE

The package of the filtration membranes contains sheets of different thicknesses and colors:

- The thin white sheets are the filtration membranes. Only insert filtration membranes into the ultrafiltration cell.
- The firm white cardboard is a cover. The cover protects the filtration membranes. Do not insert the cover into the ultrafiltration cell.
- The thin light-blue sheets are separation sheets. The separation sheets are placed between 2 filtration membranes. Do not insert the separation sheets into the ultrafiltration cell.

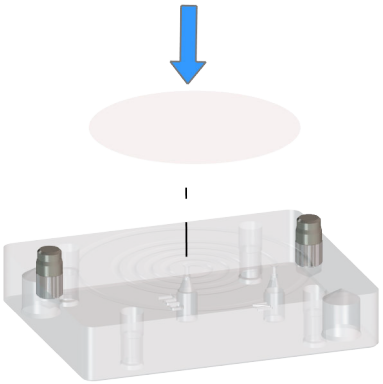


- Using the tweezers, take a filtration membrane out of the package.
- Place the filtration membrane in a petri dish filled with ultrapure water and allow to hydrate for approx. 2 minutes.

6 Inserting the filtration membrane

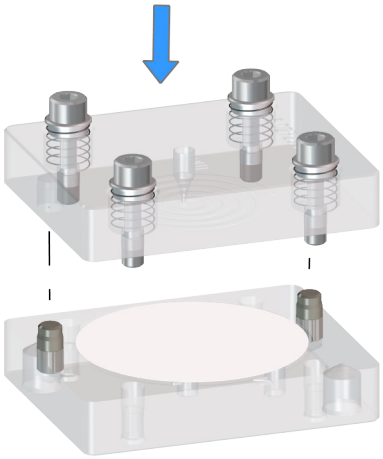
NOTE

The filtration membrane must not dry out before it is inserted!



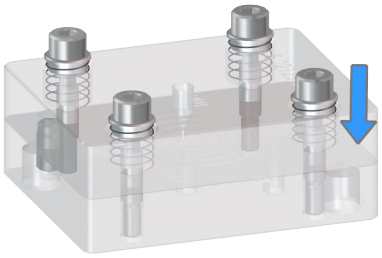
Using the tweezers, place the wet filtration membrane within the circular engraving on the sample chamber.

7 Assembling the ultrafiltration cell



Place the filtrate chamber on the sample chamber in such a way that the 2 guide bolts of the sample chamber fit into the bore holes of the filtrate chamber.

8 **Screwing the ultrafiltration cell together**



- Screw the screws entirely into the ultrafiltration cell using a hex key.
- Additionally, tighten each screw by a $^1/_4$ rotation.

9 If the ultrafiltration cell is not used immediately, seal the sample inlet, the sample outlet and the filtrate outlet with the 3 green stoppers. This allows for the filtration membrane to stay moist.

4.1.2 Connecting the ultrafiltration cell

This chapter describes how to establish the capillary connections in the filtration system. This chapter does not describe how the peristaltic pumps are connected. Information on the installation of the peristaltic pumps can be found in the *chapter "Installing the peristaltic pump" in the manual for the ion chromatograph or in the manual for the sample changer*.

The following figure shows a schematic overview of the capillary connections of the ultrafiltration cell.

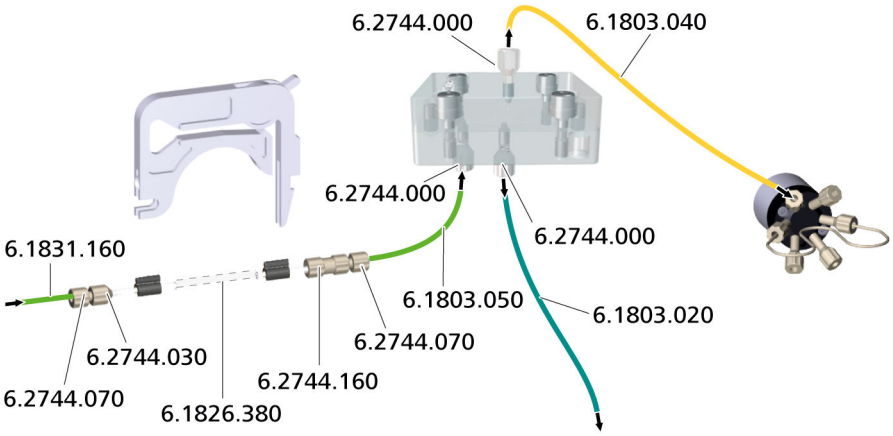


Figure 8 Connecting the ultrafiltration cell

NOTE

- In order to keep dead volume to a minimum, the capillaries of the IC equipment: Inline Ultrafiltration 2 - MiPT are as short as possible.
- To prevent the capillaries leading into the ion chromatograph from being pinched, always guide them through the capillary feed-throughs provided for this purpose (*see the manual for the ion chromatograph*).

Connecting the ultrafiltration cell

Accessories

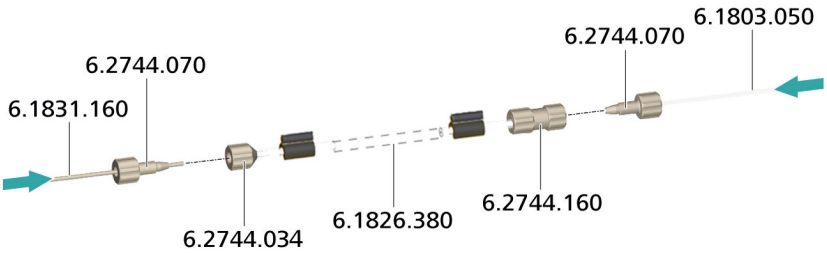
- Ultrafiltration cell 2 (6.02729.110)
- PEEK capillary, 0.5 mm ID / 70 cm (6.1831.160)
- PTFE capillary, 0.5 mm ID / 20 cm (6.1803.050)
- PTFE capillary, 0.97 mm ID / 5 m (6.1803.020)
- PTFE capillary, 0.5 mm ID / 1 m (6.1803.040)
- Pump tubing LFL (gray/gray), 3 stoppers (6.1826.380)
- Pump tubing connection with locking nut (6.2744.160)
- Coupling olive/UNF 10/32 (6.2744.034)
- Pressure screw, short (6.2744.070)
- Pressure screw PVDF (6.2744.000)
- Capillary cutter (6.2621.080)
  The capillary cutter is not included in the IC equipment: Inline Ultrafiltration 2 - MiPT.
- Pressure screw (6.2744.014)
  The pressure screw (6.2744.014) is not part of the IC equipment: Inline Ultrafiltration 2 - MiPT.

1 Preparing the pump tubing

Use the pump tubing with gray stoppers (6.1826.380) for conveying the sample.

- Attach the coupling olive/UNF 10/32 (6.2744.034) to the inlet.
- Attach the pump tubing connection with locking nut (6.2744.160) to the outlet *(see chapter "Installing the peristaltic pump" in the manual for the ion chromatograph or in the manual for the sample changer)*.

2 Connecting the capillaries to the pump tubing



- Screw the PEEK capillary (6.1831.160) to the inlet of the pump tubing (6.1826.380) using a pressure screw (6.2744.070).
- Screw the PTFE capillary (6.1803.050) to the outlet of the pump tubing (6.1826.380) using a pressure screw (6.2744.070).

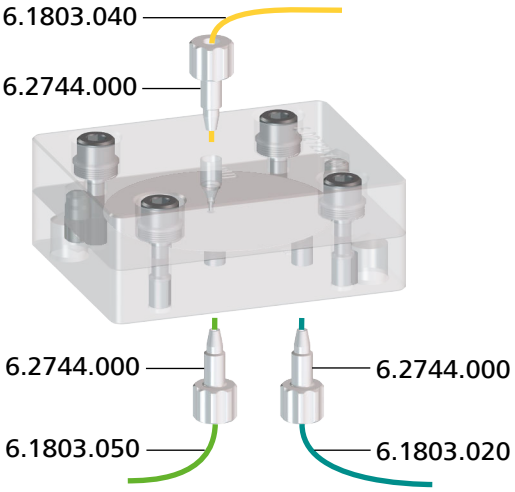
3 Connecting capillaries to the ultrafiltration cell

CAUTION

Damage to the ultrafiltration cell caused by using the wrong pressure screws

PEEK pressure screws are too hard. PEEK pressure screws can damage the ultrafiltration cell material.

- Use only transparent PVDF pressure screws (6.2744.000) to tighten capillaries to the ultrafiltration cell.



- Tighten the PTFE capillary (6.1803.050) to the inlet *IN* of the sample chamber using a PVDF pressure screw (6.2744.000).

- Cut the PTFE capillary (6.1803.020) into 3 pieces of the same size with the capillary cutter.
  Tighten one PTFE capillary (6.1803.020) to the outlet *OUT* of the sample chamber using a PVDF pressure screw (6.2744.000).
- Tighten the PTFE capillary (6.1803.040) to the outlet *OUT* of the filtrate chamber using a PVDF pressure screw (6.2744.000).

4 Connecting the remaining capillaries

- Tighten the free end of the PEEK capillary (6.1831.160) to the sample needle using a pressure screw (6.2744.014) (*see the manual for the sample changer*).
- Tighten the free end of the PTFE capillary (6.1803.040) to port 1 of the injector using a pressure screw (6.2744.014) (*see the manual for the ion chromatograph*).
- Either tighten the free end of the PTFE capillary (6.1803.020) to the waste collector or guide it directly to the waste container and tighten it there using a PVDF pressure screw (6.2744.000).

4.1.3 Inserting the ultrafiltration cell

Fastening the ultrafiltration cell to the sample changer

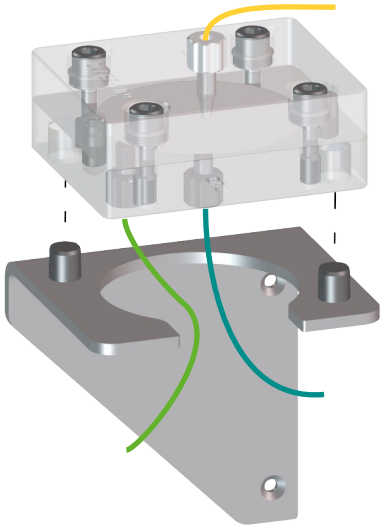
Accessories

- Filtration cell holder (6.02057.030)
- Ultrafiltration cell 2 (6.02729.110)

1 Attaching the holder

Tighten the filtration cell holder (6.02057.030) to the sample changer (*see manual for the sample changer*).

2 Inserting the ultrafiltration cell



Insert the ultrafiltration cell in such a way that the positioning pins of the filtration cell holder are located in the openings of the ultrafiltration cell provided for this purpose.

4.2 Equipping the ultrapure water bottle

Mounting the bottle cap

Accessories

- Eluent bottle / 2 L / GL 45 (6.1608.070) filled with ultrapure water
- Bottle cap GL 45 for eluents and reagents (6.1602.160)
- Adsorber tube for 807 Dosing Unit (6.1619.000)
- Adapter SGJ 14 for the adsorber tube 6.1619.XXX (6.1624.000)
- FEP aspiration tubing for the canister (6.1819.110)
- Threaded stopper / M8 (6.1446.080)
  included in the accessories for the bottle cap for eluents and reagents GL 45 (6.1602.160)
- PTFE capillary, 0.97 mm ID / 5 m (6.1803.020)
- Capillary cutter (6.2621.080)
  The capillary cutter is not included in the IC equipment: Inline Ultrafiltration 2 - MiPT.

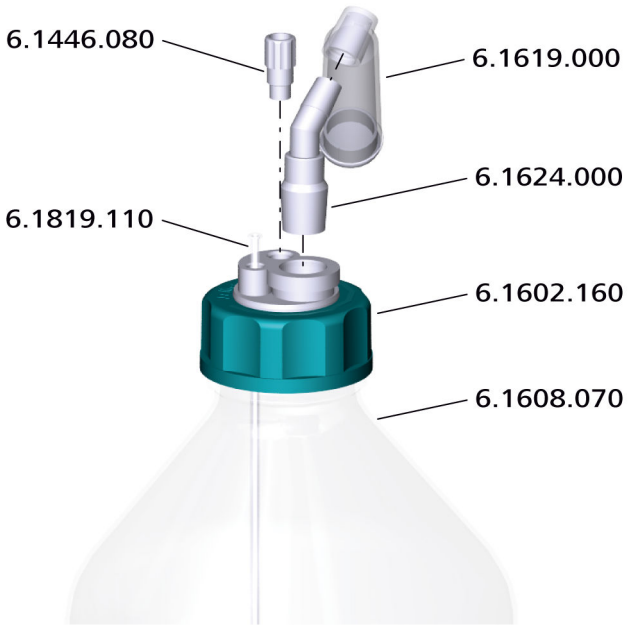


Figure 9 Equipping the ultrapure water bottle

1 Mounting the FEP aspiration tubing

- Place the FEP aspiration tubing (6.1819.110) in the M6 opening of the bottle cap.

- Use the capillary cutter to cut the FEP aspiration tubing (6.1819.110) to such a length that it touches the bottom of the bottle.

2 Inserting the stopper

Tighten the PTFE capillary (6.1803.020) with the threaded stopper / M8 (6.1446.080) to the M8 opening of the bottle cap.

3 Mounting the adsorber tube

- Fill the adsorber tube with some cotton and adsorber material.
- Place the adsorber tube onto the adapter.
- Insert the adapter into the SGJ opening of the bottle cap.

4 Mounting the bottle cap

Screw the bottle cap onto the bottle.

4.3 Installing the Dosino

The following figure shows a schematic overview of the installation of the IC equipment: Inline Ultrafiltration 2 - MiPT. In this chapter, the part of the figure within the orange margin is described.

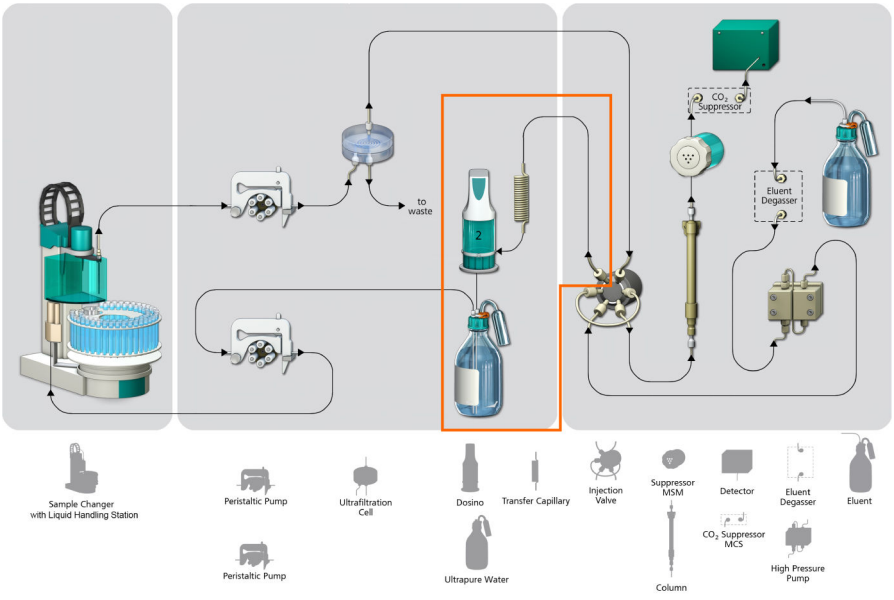


Figure 10 Connecting the Dosino – Overview

4.3.1 Mounting the Dosino

Attaching the Dosino to the 807 Dosing Unit

Accessories

- 800 Dosino (2.800.0010)
  The 800 Dosino is not included in the IC equipment: Inline Ultrafiltration 2 - MiPT.
- 807 Dosing Unit 2 mL without accessories (6.1580.120)

CAUTION

Read through the correct procedure in the Manual for the 800 Dosino *(see 8.800.8002 Manual for 800 Dosino)* before you attach the Dosino to the 807 Dosing Unit.

1 Attach the Dosino to the 807 Dosing Unit.

Fastening the 807 Dosing Unit to the ion chromatograph

Accessories

- 807 Dosing Unit 2 mL without accessories (6.1580.120)
- Dosino holder for IC devices (6.2057.210)
- Thread adapter / S40 on GL 45 (6.1618.020)

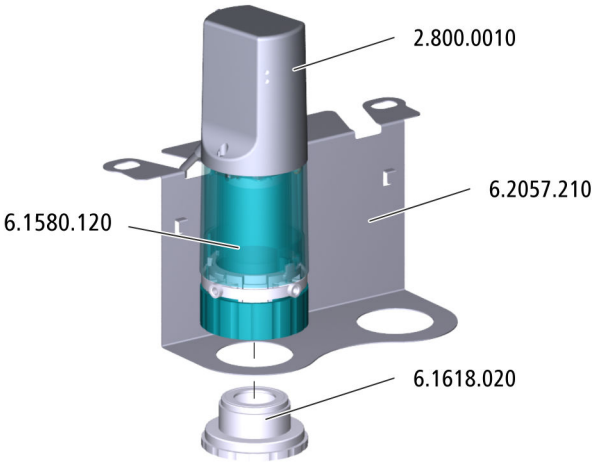


Figure 11 Installing the Dosino

1 Fitting the Dosino holder onto the ion chromatograph

- Loosen the bottle holder on the ion chromatograph.
- Clamp the Dosino holder beneath it.
- Fasten the bottle holder again.

2 Attaching the Dosino to the holder

- Attach the Dosino with the 807 Dosing Unit on the Dosino holder.
- Fasten the 807 Dosing Unit to the Dosino holder by tightening the thread adapter from below.

3 Connecting the Dosino to the ion chromatograph

NOTE

The ion chromatograph must be switched off to plug the Dosino into the MSB connector.

- If the ion chromatograph is switched on, switch off the ion chromatograph.
- Plug the Dosino cable into one of the ion chromatograph's MSB connectors.

Alternatively, the 807 Dosing Unit can also be mounted to the sample changer *(see 8.800.8002 Manual for the 800 Dosino)*.

4.3.2 Connecting the 807 Dosing Unit with the ultrapure water bottle

Mounting the FEP tubing

Accessories

- FEP tubing / M6 / 100 cm (6.1805.120)

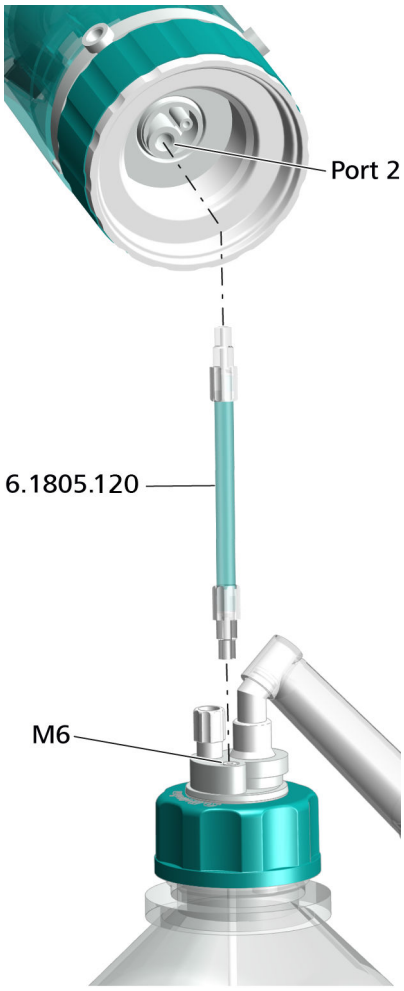


Figure 12 Mounting the FEP tubing

1
- Tighten one end of the FEP tubing (6.1805.120) to the M6 opening of the bottle cap.
- Tighten the other end of the FEP tubing (6.1805.120) to Port 2 of the Dosino.

4.3.3 Connecting the 807 Dosing Unit to the injector

Mounting the transfer capillary

Accessories

- PEEK transfer capillary 2 mL, 5 m (6.1841.000)
- Pressure screw (6.2744.014)
- M6 thread / UNF 10/32 adapter (6.2744.080)
- Pressure screw (6.2744.014)
  The pressure screw (6.2744.014) is not part of the IC equipment: Inline Ultrafiltration 2 - MiPT.

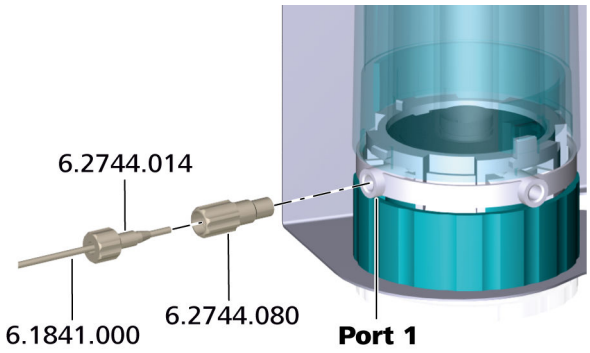


Figure 13 Mounting the transfer capillary

1 Mounting the adapter

Tighten the adapter (6.2744.080) to Port 1 of the 807 Dosing Unit.

2 Mounting the transfer capillary

- Tighten one end of the transfer capillary (6.1841.000) to the adapter using a pressure screw (6.2744.014).
- Guide the free end of the transfer capillary (6.1841.000) through one of the ion chromatograph's capillary feed-throughs.
- Tighten the free end of the transfer capillary (6.1841.000) to Port 2 of the injector using a pressure screw (6.2744.014) (*see Manual for the ion chromatograph*).

4.3.4 Connecting the 807 Dosing Unit to the waste collector

Mounting the FEP tubing

Accessories

- FEP tubing / M6 / 2 m (6.1805.530)
- Adapter Dosino Port 4, M6 inner (6.1808.280)
- Adapter UNF 10/32 outer / M6 inner (6.2744.200)

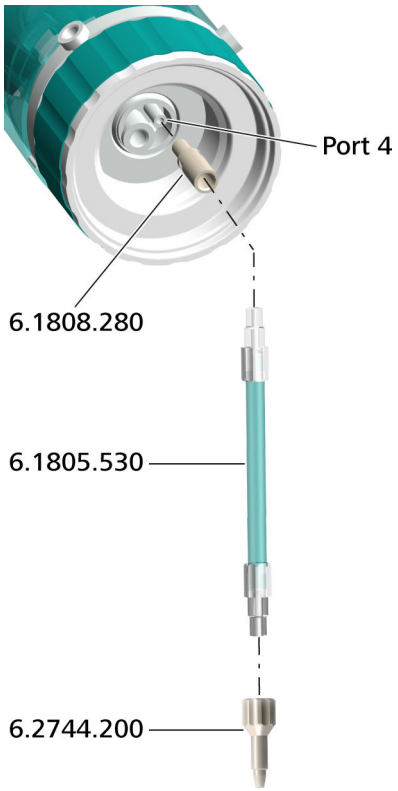


Figure 14 Connecting to the waste container

1 Mounting the adapter

Attach the adapter (6.1808.280) to **Port 4** of the 807 Dosing Unit.

2 Mounting the FEP tubing

- Connect one end of the FEP tubing (6.1805.530) to the adapter (6.1808.280).
- Connect the free end of the FEP tubing (6.1805.530) to the waste collector with the adapter (6.2744.200).

4.4 Exchanging the sample loop

Accessories

- PEEK sample loop 250 µL (6.1825.290)

1 Replace the sample loop on the injector with the 250 µL PEEK sample loop (6.1825.290) (*see the manual for the ion chromatograph*).

4.5 Connecting the Liquid Handling Station

The following figure shows a schematic overview of the installation of the IC equipment: Inline Ultrafiltration 2 - MiPT. In this chapter, the part of the figure within the orange margin is described.

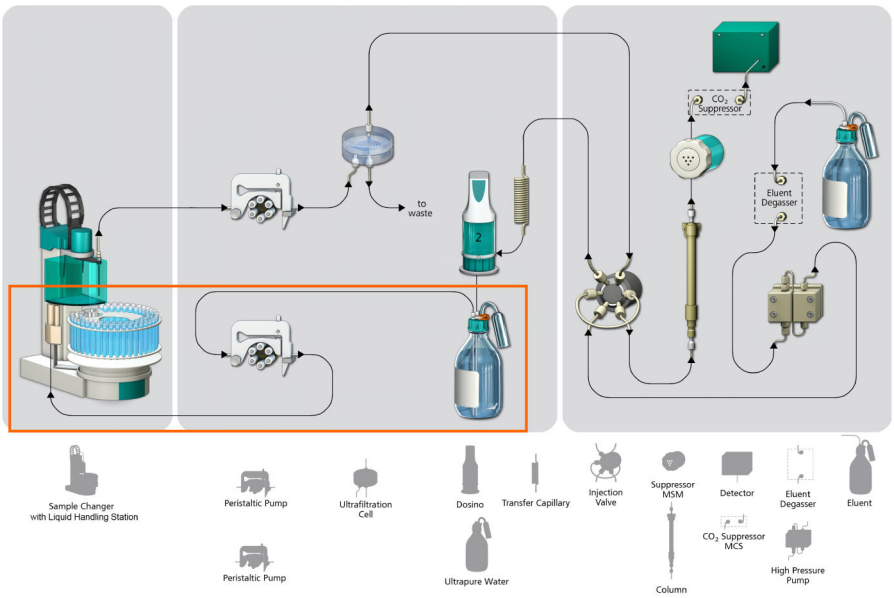


Figure 15 Connecting the Liquid Handling Station – Overview

This chapter describes how to establish the capillary connections in the filtration system. This chapter does not describe how the peristaltic pumps are connected. Information on the installation of the peristaltic pumps can be found in the *chapter "Installing the peristaltic pump" in the manual for the ion chromatograph or in the manual for the sample changer*.

The following figure shows a schematic overview of the capillary connections of the Liquid Handling Station.

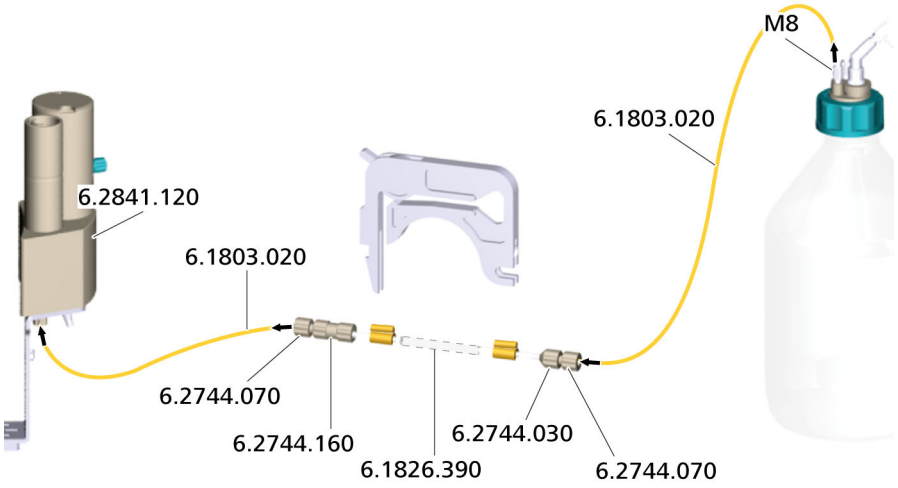


Figure 16 Connecting the Liquid Handling Station

NOTE

- In order to keep dead volume to a minimum, the capillaries of the IC equipment: Inline Ultrafiltration 2 - MiPT are as short as possible.
- To prevent the capillaries leading into the ion chromatograph from being pinched, always guide them through the capillary feed-throughs provided for this purpose (*see the manual for the ion chromatograph*).

Connecting the Liquid Handling Station

Accessories

- Liquid Handling Station , left (6.2841.120)
- Pump tubing LFL (yellow/yellow), 3 stoppers (6.1826.390)
- PTFE capillary, 0.97 mm ID / 5 m (6.1803.020)
- Pump tubing connection with locking nut (6.2744.160)
- Coupling olive/UNF 10/32 (6.2744.034)
- Pressure screw, short (6.2744.070)

1 Installing the Liquid Handling Station

Install the Liquid Handling Station on the left side of the sample changer (*see manual for the Liquid Handling Station*).

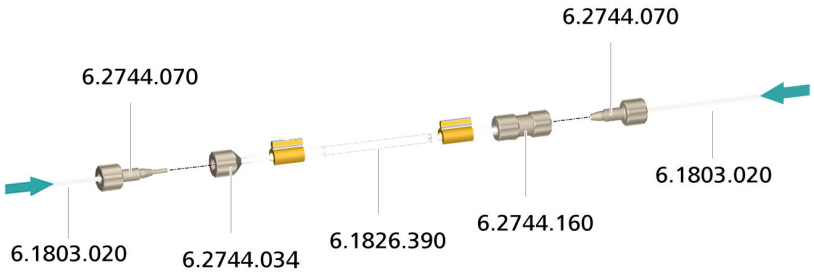
2 Preparing the pump tubing

Use the pump tubing with yellow stoppers (6.1826.390) for conveying the ultrapure water.

- Attach the coupling olive/UNF 10/32 (6.2744.034) to the inlet.

- Attach the pump tubing connection with locking nut (6.2744.160) to the outlet *(see chapter "Installing the peristaltic pump" in the manual for the ion chromatograph or in the manual for the sample changer)*.

3 Connecting the capillaries to the pump tubing



- A PTFE capillary (6.1803.020) was connected to the bottle (6.1608.070) *(see chapter 4.2, page 20)*.
  Tighten the free end of the PTFE capillary (6.1803.020) to the inlet of the pump tubing (6.1826.390) using a pressure screw (6.2744.070).
- Tighten the other PTFE capillary (6.1803.020) to the outlet of the pump tubing (6.1826.390) using a pressure screw (6.2744.070).

4 Connecting the Liquid Handling Station

Tighten the free end of the PTFE capillary (6.1803.020) to the rinsing connector of the Liquid Handling Station using a pressure screw (6.2744.070).

4.6 Purging the ultrafiltration cell

Purge the ultrafiltration cell each time a new filtration membrane is inserted. To accomplish this, rinse all capillaries, with e.g. ultrapure water. The entire filtration system must be completely connected prior to this procedure.

Rinsing the ultrafiltration cell

1 Settings in the software

- Immerse the sample needle in the rinsing solution.
- Switch on the peristaltic pump.
- Rinse the filtration system with ultrapure water for approx. 5 min.

2 Monitoring the rinsing process

- Check whether equal amounts of solution are emerging from both feed lines to the waste container.
- Check whether all capillary connections are tight.
  If liquid is escaping somewhere, then tighten the corresponding connection or redo the connection.

3 Removing air bubbles

- Check whether any air bubbles remain trapped in the ultrafiltration cell.
- If air bubbles are trapped in the cell, then unscrew the PTFE capillaries from the filtrate outlet and from the sample outlet and wait until the air bubbles have escaped. Afterwards, tighten the capillaries to the ultrafiltration cell again.

5 Operation

5.1 Ultrafiltration time and sample volume

The ultrafiltration cell was tested with the IC equipment: Inline Ultrafiltration 2 - MiPT. The ultrafiltration time and the sample volume depend on the aspiration rate of the 807 Dosing Unit. The following data was determined for the ultrafiltration time and sample volume:

- Aspiration rate: 1.5 mL/min
  - Ultrafiltration time: 78 s
  - Sample volume: 5 mL
- Aspiration rate: 0.75 mL/min
  - Ultrafiltration time: 162 s
  - Sample volume: 10 mL

These values are guidelines. The ultrafiltration time and the sample volume of your installation may deviate from these values. This is why the actual values for the ultrafiltration time and the sample volume must be determined for each installation.

5.2 Selecting the filtration membrane

Existing sample preparation procedures can be applied to ultrafiltration cell 2 (6.02729.110). If filtration membrane 1 (6.2714.020) is not used, a membrane with suitable pore size does not automatically yield the desired results even if the particle size is known.

Our investigations have shown that the retention capacity of conventional filtration membranes does not always correspond to their specified pore size. The table *Selection of the filtration membrane* shows the qualitative filtration action of filtration membranes with different nominal pore sizes. Aqueous solutions containing silica particles with particle sizes of 1.5 µm and 5 µm were used in the test.

Table 2 Selection of the filtration membrane

Test solutions: Silica particles in water	**Pore size of the filtration membrane[1]**	**Effect**
0.5%, 5 µm	0.15 µm	no permeation
0.5%, 5 µm	3 µm	no permeation
0.5%, 5 µm	8 µm	no permeation
0.5%, 5 µm	10 µm	permeation[2]

Test solutions: Silica particles in water	Pore size of the filtration membrane[1]	Effect
0.5%, 5 µm	12 µm	no permeation
0.5%, 1.5 µm	0.15 µm	no permeation
0.5%, 1.5 µm	3 µm	permeation

[1] Nominal pore size according to manufacturer's statement.

[2] Except for this membrane, all membranes were from the same manufacturer.

Due to the lower filter thickness, the retention capacity of filtration membranes may be lower than that of filters with the same pore size but a higher filter thickness. This must be taken into account when selecting an appropriate filtration membrane.

6 Maintenance

6.1 Service life of the filtration membrane

One common problem in filtration is that solid substances in the sample are deposited on the filtration membrane, causing it to become blocked over time. This effect is reduced with the following design measures.

- The ultrafiltration cell has a symmetrical design.
- The ultrafiltration cell is placed horizontally in the sample changer.
- The sample flows through the sample chamber of the ultrafiltration cell. The filtrate is aspirated on the filtration side. In this way, solid substances adhere less to the membrane.

Monitor the filtration process and replace the filtration membrane if needed.

A declining recovery rate in standard solution analyses is an indicator for an imminent blockage of a filtration membrane. Prepare standard solutions ideally with the sample matrix to be analyzed.

If a large number of samples is analyzed, we at Metrohm recommend measuring check standards regularly. In the case of samples with high particle loads, measure check standards after every 5th to 10th sample Measure the sample check standards. No general prediction regarding the number of filtration processes can be made. Also, the change in the recovery rate may be different with more samples being analyzed. Whereas the recovery rate with one sample matrix may remain constant over many samples and then suddenly drop off drastically, its decline may be slow and continuous with a different sample composition.

The time at which a filtration membrane needs to be replaced depends on the sample matrix and the specifications of the analysis method applied. Experience has shown that minuscule particles and suspended substances in the sample matrix will lead to blockage of the filtration membrane faster than coarser particles will. Coarser particles are more readily propelled past the membrane in the stream of sample material.

The table *Service life of the filtration membrane* contains samples that were filtered with the ultrafiltration cell and a filtration membrane 1 (6.2714.020) with a pore size of 0.2 µm and analyzed on a Metrohm ion chromatograph.

The listed results were obtained with Inline Ultrafiltration (push mode). The results are to be seen as examples, not guidelines. Deviating values for the service life can be found depending on the actual sample matrix.

The concentration of the following 7 anions was determined for each sample type: F^-, Cl^-, NO_2^-, Br^-, NO_3^-, HPO_4^{2-}, SO_4^{2-}.

Table 3 Service life of the filtration membrane

Sample designation	Number of samples per filter
Orange juice with fruit pulp	40
Surface water	500
Drinking water	1,000
Ground water	500
Waste water 1	1,000
+Waste water 2	130
Waste water 3	40
Waste water 4	80
NaCl solution (1%)	5,000
Schöniger digestion solution	100
Acidic earth extracts	1,000
Aqueous earth extracts	200

6.2 Replacing the filtration membrane

The filtration membrane used must be in perfect condition to ensure consistent quality of the analysis results. Replace the filtration membrane in regular intervals for that reason *(see chapter 6.1, page 33)*.

Replacing the filtration membrane

Accessories

- Filtration membrane 1 (6.2714.020)
- 4 mm hex key (6.2621.030)
- Plastic tweezers (6.2831.010)

1 Taking the ultrafiltration cell out of the system

- In the software, stop the system and wait until the pressure has been released.
- Remove all capillaries from the ultrafiltration cell.
- Take the ultrafiltration cell out of the holder.

2 Cleaning the ultrafiltration cell

Carry out the instruction steps 2 to 8 of the procedure *Inserting the filtration membrane on page 12*.

3 Connecting capillaries to the ultrafiltration cell

Carry out instruction step 3 of the procedure *Connecting the ultrafiltration cell on page 16*.

4 Inserting the ultrafiltration cell into the holder

Place the ultrafiltration cell back in the holder *(see chapter 4.1.3, page 19)*.

5 Purging the ultrafiltration cell

Purge the ultrafiltration cell *(see chapter 4.6, page 29)*.

6.3 807 Dosing Unit maintenance

Maintenance work on the 807 Dosing Unit must be performed regularly. Information on the care and maintenance of the 807 Dosing Unit can be found in the Manual for the 807 Dosing Unit *(see Manual 807 Dosing Unit, 8.807.8002)*.

7 Technical specifications

7.1 Ultrafiltration cell 2 (6.02729.110)

Material	PMMA (poly(methyl methacrylate))
Solvent compatibility	Water or water-ethanol mixture (70:30) (**no** other organic solvents)
Cell volume	Sample chamber: 240 µL Filtrate chamber: 120 µL

7.2 Filtration membrane 1 (6.2714.020)

Pore diameter	0.2 µm
Membrane diameter	47 mm
Material	Regenerated cellulose

7.3 Liquid Handling Station (6.2841.120)

The Manual for the Liquid Handling Station contains information about the technical specifications of the Liquid Handling Station *(see 8.108.8011 Manual Liquid Handling Station)*.

7.4 807 Dosing Unit 2 mL without accessories (6.1580.120)

The Manual for the 807 Dosing Unit contains information about the technical specifications of the 807 Dosing Unit *(see 8.807.8002 Manual 807 Dosing Unit)*.

8 Displaying accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website.

1 Searching for a product on the website

- Go to *https://www.metrohm.com*.
- Click on 🔍.
- Enter the article number of the product (e.g. **2.1001.0010**) into the search field and press **[Enter]**.

The search result is displayed.

2 Displaying product information

- To display the products matching the search term, click on **Product models**.
- Click on the desired product.

Detailed information regarding the product is displayed.

3 Displaying accessories and downloading the accessories list

- To display the accessories, scroll down to **Accessories and more**.
  - The **scope of delivery** is displayed.
  - Click on **[Optional parts]** for the optional accessories.
- To download the accessories list, click on **[Download accessories PDF]** under **Accessories and more**.

NOTE

Metrohm recommends keeping the accessories list for reference purposes.

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