

881 Compact IC pro



881 Compact IC pro – Anion

Manual
8.881.8013EN



Metrohm AG
CH-9100 Herisau
Switzerland
Phone +41 71 353 85 85
Fax +41 71 353 89 01
info@metrohm.com
www.metrohm.com

881 Compact IC pro

881 Compact IC pro – Anion

2.881.0020

Manual

Teachware
Metrohm AG
CH-9100 Herisau
teachware@metrohm.com

This documentation is protected by copyright. All rights reserved.

Although all the information given in this documentation has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please send us your comments using the address given above.

Documentation in additional languages can be found on <http://products.metrohm.com> under **Literature/Technical documentation**.

Table of contents

1	Introduction	1
1.1	Instrument description	1
1.2	Intended use	3
1.3	About the documentation	3
1.3.1	Symbols and conventions	3
1.4	Safety instructions	4
1.4.1	General notes on safety	4
1.4.2	Electrical safety	4
1.4.3	Tubing and capillary connections	5
1.4.4	Flammable solvents and chemicals	5
1.4.5	Recycling and disposal	6
2	Overview of the instrument	7
2.1	Front	7
2.2	Rear	9
3	Installation	11
3.1	About this chapter	11
3.2	Initial installation	11
3.3	Installation diagram	14
3.4	Setting up the instrument	16
3.4.1	Packaging	16
3.4.2	Checks	16
3.4.3	Location	16
3.5	Capillary connections in the IC system	17
3.6	Rear of the instrument	19
3.6.1	Transport locking screws	19
3.6.2	Leak sensor	20
3.6.3	Drainage tubings	21
3.7	Capillary and cable feed-throughs	23
3.8	Eluent	25
3.8.1	Connecting eluent bottle	25
3.9	Eluent degasser	29
3.10	High pressure pump	31
3.10.1	Capillary connections high pressure pump/purge valve	31
3.10.2	Deaerating the high pressure pump	33
3.11	Inline filter	35



3.12	Pulsation absorber	36
3.13	Injection valve	37
3.13.1	Connecting the injection valve	37
3.13.2	Mode of operation of the injection valve	39
3.13.3	Selecting the sample loop	40
3.14	Column heater	40
3.15	Peristaltic pump	44
3.15.1	Principle of the peristaltic pump	44
3.15.2	Installing the peristaltic pump	46
3.16	Metrohm Suppressor Module (MSM)	50
3.16.1	Connecting the suppressor	50
3.17	Connecting the instrument	53
3.17.1	Connecting the instrument to the PC	53
3.17.2	Connecting the instrument to mains supply	53
3.18	Guard column	54
3.19	Separation column	56
4	Start-up	58
4.1	Initial start-up	58
4.2	Conditioning	59
5	Operation and maintenance	61
5.1	General notes	61
5.1.1	Care	61
5.1.2	Maintenance by Metrohm Service	61
5.1.3	Operation	62
5.1.4	Shutting down	62
5.2	Capillary connections	62
5.2.1	Operation	62
5.3	Door	63
5.4	Eluent	63
5.4.1	Production	63
5.4.2	Operation	64
5.5	High pressure pump	64
5.5.1	Protection	64
5.5.2	Maintenance	65
5.6	Inline filter	75
5.6.1	Maintenance	75
5.7	Inline sample preparation	77
5.8	Rinsing the sample path	77

5.9	Injection valve	78
5.9.1	Protection	78
5.10	Peristaltic pump	79
5.10.1	Operation	79
5.10.2	Maintenance	79
5.11	Metrohm Suppressor Module (MSM)	81
5.11.1	Protection	81
5.11.2	Operation Suppressor	82
5.11.3	Maintenance	83
5.12	Separation column	88
5.12.1	Separating efficiency	88
5.12.2	Protection	88
5.12.3	Storage	89
5.12.4	Regeneration	89
5.13	Quality Management and validation with Metrohm	89
6	Troubleshooting	91
6.1	Problems and their solutions	91
7	Technical specifications	95
7.1	Reference conditions	95
7.2	Instrument	95
7.3	Leak sensor	95
7.4	Ambient conditions	95
7.5	Housing	96
7.6	Eluent degasser	96
7.7	High pressure pump	96
7.8	Injection valve	97
7.9	Column heater	97
7.10	Peristaltic pump	98
7.11	Metrohm Suppressor Module (MSM)	98
7.12	Mains connection	98
7.13	Interfaces	98
7.14	Safety specification	99
7.15	Electromagnetic compatibility (EMC)	99
7.16	Weight	100
8	Conformity and warranty	101
8.1	Declaration of Conformity	101



8.2	Quality Management Principles	102
8.3	Warranty (Guarantee)	103
9	Accessories	105
9.1	Scope of delivery	105
9.2	Optional accessories	114
	Index	117

Table of figures

Figure 1	Front 881 Compact IC pro – Anion	7
Figure 2	Rear 881 Compact IC pro – Anion	9
Figure 3	Installation diagram 881 Compact IC pro – Anion	15
Figure 4	Connection of capillaries with pressure screws	17
Figure 5	leak sensor – plugging in	21
Figure 6	Drainage tubings	22
Figure 7	Capillary and cable feed-throughs	24
Figure 8	Installing eluent bottle attachment	26
Figure 9	Mounting aspiration filter	26
Figure 10	Install tubing weighting and aspiration filter	27
Figure 11	Eluent aspiration tubing fully equipped.	27
Figure 12	Eluent bottle – connected	28
Figure 13	Eluent degasser	30
Figure 14	Capillary connections high pressure pump/purge valve	31
Figure 15	High pressure pump – Connect inlet	32
Figure 16	Deaerate the high pressure pump	34
Figure 17	Connecting the inline filter	36
Figure 18	Pulsation absorber – Connection	37
Figure 19	Injection valve – connected	38
Figure 20	Injection valve – Positions	39
Figure 21	Column heater	41
Figure 22	Column heater – Installing capillaries	43
Figure 23	Peristaltic pump	45
Figure 24	Installing the pump tubing	46
Figure 25	Install pump tubing connection with filter	47
Figure 26	Install pump tubing connection without filter	48
Figure 27	Suppressor – connection capillaries	51
Figure 28	Pump head – removing the piston	66
Figure 29	Components of the piston cartridge	67
Figure 30	Tool for piston seal	68
Figure 31	Removing the piston seal	69
Figure 32	Inserting the piston seal into the tool	69
Figure 33	Inserting the piston seal into the pump head	70
Figure 34	Removing valves	71
Figure 35	Dismantling valve	72
Figure 36	Components of the inlet valve and outlet valve	73
Figure 37	Change filters (of the inline filter)	75
Figure 38	Pump tubing connection – Changing the filter	81
Figure 39	Parts of the suppressor	83

1 Introduction

1.1 Instrument description

The instrument **881 Compact IC pro – Anion** is one of the model versions of the 881 Compact IC pro line of instruments manufactured by the Metrohm Company. The 881 Compact IC pro line of instruments is distinguished by:

- the **intelligence** of its components, which are able to monitor and optimize all functions and to provide documentation according to FDA requirements.
- its **compact style of construction**.
- its **transparency**. All components are easily accessible and arranged in a clear manner.
- its **safety**. Chemicals and electronics are separated and a leak sensor is integrated in the wet end.
- its **environmental compatibility**.
- its **low noise emission**.

The instrument is operated with **MagIC Net™** software. It is connected via a USB connection to a PC on which MagIC Net™ is installed. The software automatically recognizes the instrument and checks its functional readiness. MagIC Net™ controls and monitors the instrument, evaluates the measured data and administers it in a database. The operation of MagIC Net™ is described in the online help or in the tutorial for MagIC Net™.

The instrument contains the following components:

Eluent degasser

The eluent degasser removes gas bubbles and dissolved gases from the eluent. For degassing, the eluent flows into a vacuum chamber through a special fluoropolymer capillary.

High pressure pump

The intelligent and low pulsation high pressure pump pumps the eluent through the system. It is equipped with a chip on which its technical specifications and "life history" (operating hours, service data, ...) are saved.

Inline filter

Inline filters protect the separation column securely against possible contamination from the eluent. Inline filters can however also just as well be used for the purpose of protecting other sensitive components against contaminations in the solutions used. The filter platelets with a pore size



of 2 µm can be replaced quickly and easily. They remove particles like e. g. bacteria and algae from the solutions.

Pulsation absorber

The pulsation absorber protects the separation column from damage caused by pressure fluctuations when switching the injection valve, and reduces interfering pulsations during highly sensitive measurements.

Injection valve

The injection valve connects the eluent and sample path through rapid and precise valve switchover. A precisely measured amount of sample solution is injected and rinsed with eluent onto the separation column.

Column heater

The perfect isolation of the column chamber ensures thermally stable conditions for the separation column. The temperature of the column heater can be set in the software.

Peristaltic pump

The Peristaltic pump is used for pumping sample and auxiliary solutions. It can rotate in both directions.

Metrohm Suppressor Module (MSM)

The MSM is used for chemical suppression in anion analysis with conductivity detection or UV detection. It is pressure-stable, robust and resistant to solvents.

Separation column

The intelligent separation column is the heart of the ion chromatographic analysis. It separates the different components corresponding to their interactions with the column. Metrohm separation columns are equipped with a chip on which their technical specifications and their history (first use / setting up, operating hours, injections, ...) are saved.

1.2 Intended use





The instrument **881 Compact IC pro – Anion** is used for the ion chromatographic determination of anions or polar substances with chemical suppression by the Metrohm Suppressor Module (MSM) . If required, it can also be used for the determination of anions without chemical suppression or for the determination of cations.

This instrument is suitable for processing chemicals and flammable samples. The usage of the 881 Compact IC pro – Anion therefore requires that the user has basic knowledge and experience in the handling of toxic and caustic substances. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories is also mandatory.

1.3 About the documentation

1.3.1 Symbols and conventions

The following symbols and styles are used 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 Carry out these steps in the sequence shown.
	Warning This symbol draws attention to a possible life 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.



	<p>Caution</p> <p>This symbol draws attention to a possible damage of instruments or instrument parts.</p>
	<p>Note</p> <p>This symbol marks additional information and tips.</p>

1.4 Safety instructions

1.4.1 General notes on safety



Warning

This instrument may only be operated in accordance with the specifications in this documentation.

This instrument has left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.4.2 Electrical safety

The electrical safety when working with the instrument is ensured as part of the international standard IEC 61010.



Warning

Only personnel qualified by Metrohm are authorized to carry out service work on electronic components.



Warning

Never open the housing of the instrument. The instrument could be damaged by this. There is also a risk of serious injury if live components are touched.

There are no parts inside the housing which can be serviced or replaced by the user.

Mains voltage



Warning

An incorrect mains voltage can damage the instrument.

Only operate this instrument with a mains voltage specified for it (see rear panel of the instrument).

Protection against electrostatic charges



Warning

Electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

Do not fail to pull the mains cable out of the mains connection socket before you set up or disconnect electrical plug connections at the rear of the instrument.

1.4.3 Tubing and capillary connections



Caution

Leaks in tubing and capillary connections are a safety risk. Tighten all connections well by hand. Avoid applying excessive force to tubing connections. Damaged tubing ends lead to leakage. Appropriate tools can be used to loosen connections.

Check the connections regularly for leakage. If the instrument is used mainly in unattended operation, then weekly inspections are mandatory.

1.4.4 Flammable solvents and chemicals



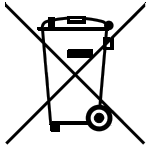
Warning

All relevant safety measures are to be observed when working with flammable solvents and chemicals.

- Set up the instrument in a well-ventilated location (e.g. laboratory flue).
- Keep all sources of flame far from the workplace.
- Clean up spilled fluids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.



1.4.5 Recycling and disposal



This product is covered by European Directive 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

The correct disposal of your old equipment will help to prevent negative effects on the environment and public health.

More details about the disposal of your old equipment can be obtained from your local authorities, from waste disposal companies or from your local dealer.

2 Overview of the instrument

2.1 Front

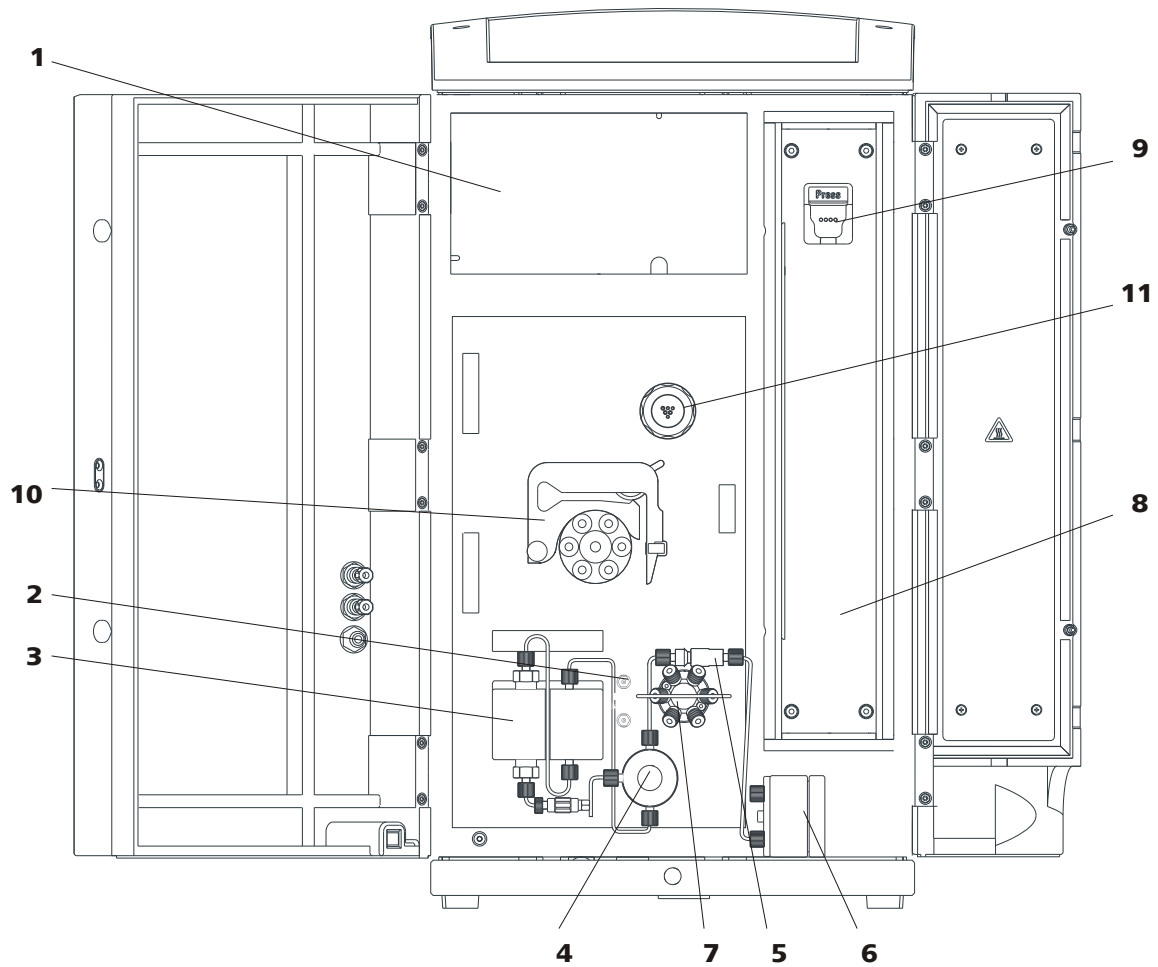


Figure 1 Front 881 Compact IC pro – Anion

1	Detector chamber Space for the detector.	2	Eluent degasser
3	High pressure pump	4	Purge valve
5	Inline filter	6	Pulsation absorber
7	Injection valve	8	Column heater



9 Column holder
With column recognition.

10 Peristaltic pump

11 Metrohm Suppressor Module (MSM)

2.2 Rear

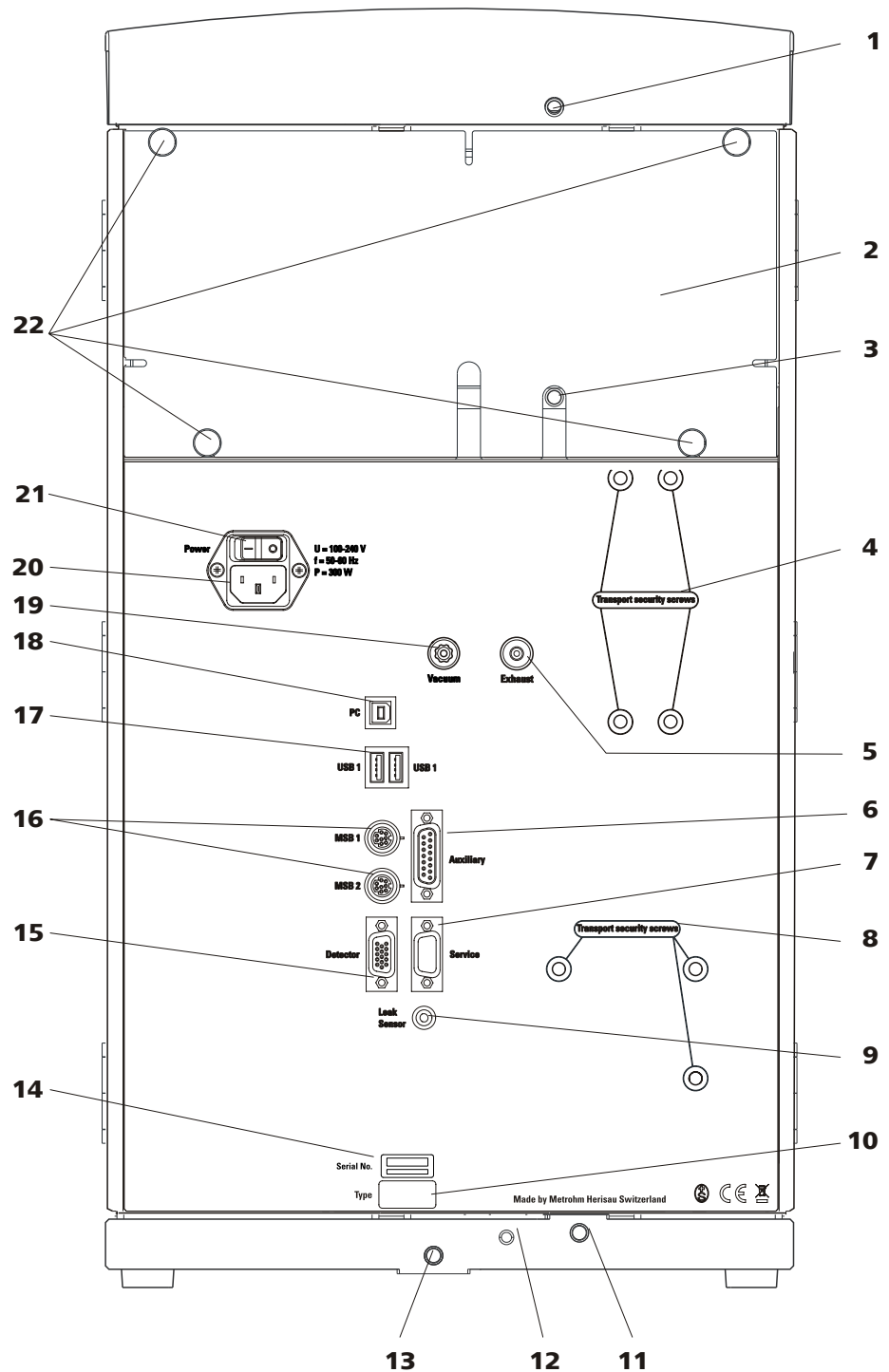


Figure 2 Rear 881 Compact IC pro – Anion

1 Drainage tubing connector
For connecting the drainage tubing which leads away escaped fluids from the flask holder.

2 Rear panel
Removable. Access to the detector chamber.



<p>3 Drainage tubing connector For connecting the drainage tubing which leads away escaped fluids from the detector chamber.</p>	<p>4 Transport locking screws For securing the vacuum pump when transporting the instrument.</p>
<p>5 Exhaust air opening For extracting the air from the vacuum chamber. Labeled with Exhaust.</p>	<p>6 Auxiliary connection socket For connecting a 891 Professional Analog out (2.891.0010).</p>
<p>7 Service connection socket For Metrohm service only.</p>	<p>8 Transport locking screws For securing the high pressure pump when transporting the instrument.</p>
<p>9 Leak sensor connection socket For connecting the leak sensor connection cable.</p>	<p>10 Type plate</p>
<p>11 Drainage tubing connector For connecting the drainage tubing which leads escaped fluids to the leak sensor.</p>	<p>12 Leak sensor connection cable Extractable. For connecting the leak sensor.</p>
<p>13 Drainage tubing connector For connecting the drainage tubing which leads escaped fluids to the waste vessel.</p>	<p>14 Serial number</p>
<p>15 Detector connection socket For connecting Metrohm detectors. Labeled with Detector.</p>	<p>16 MSB connectors 2 MSB connectors for connecting MSB devices. Labeled with MSB 1 and MSB 2. MSB = Metrohm Serial Bus</p>
<p>17 USB connectors 2 USB connectors labeled with USB 1 and USB 2.</p>	<p>18 PC connection socket For connecting the instrument to the computer with the USB cable (6.2151.020).</p>
<p>19 Vacuum connection Plugged with a stopper. Not Used.</p>	<p>20 Mains connection socket For connecting the mains cable.</p>
<p>21 Mains switch For switching the instrument on and off. I = On O = Off</p>	<p>22 Knurled screws For fastening the removable rear panel.</p>

3 Installation

3.1 About this chapter

The Installation chapter contains:

- this overview.
- a brief set of instructions for the initial installation of the 881 Compact IC pro – Anion . At each step you will find cross-references to more detailed installation instructions for individual components, should you require such aids.
- an installation diagram (*see Figure 3, page 15*), showing a completely installed 881 Compact IC pro – Anion.
- several chapters with detailed installation instructions for all components, including those that are already installed at the time the instrument is delivered.

3.2 Initial installation



Note

A number of the capillaries is already connected at the time the instrument is delivered.

The following work steps must still be carried out:

Installing 881 Compact IC pro – Anion

1 Setting up the instrument

(*see Chapter 3.4, page 16*).

2 Installations on the rear of the instrument

- Place the detector in the instrument and connect it (*see manual of the detector*).
- Remove transport locking screws (*see Chapter 3.6.1, page 19*).
- Connect the leak sensor (*see Chapter 3.6.2, page 20*).
- Connect the drainage tubings (*see Chapter 3.6.3, page 21*).



3 Connecting the eluent path

- Lead the eluent aspiration tubing (6.1834.080) out of the instrument through a capillary feed-through and connect it with the eluent bottle (*see Chapter 3.8.1, page 25*).
- Connect the column inlet capillary (6.1831.150) and the capillary of the MSM labeled with **in** to one another using a coupling (6.2744.040) and two short pressure screws (6.2744.070).
- Connect the detector inlet capillary and the capillary of the MSM labeled with **out** to one another using a coupling (6.2744.040) and two short pressure screws (6.2744.070).

4 Connecting the sample path

- Guide the sample aspiration capillary connected to the sample input of the injection valve out of the instrument through a capillary feed-through and connect it with the Sample Processor, if applicable (*see Sample Processor manual*).
- Guide the sample outlet capillary connected to the sample output of the injection valve out of the instrument through a capillary feed-through and onward to the waste container and then fasten it there.

5 Installing the peristaltic pump

(*see Chapter 3.15.2, page 46*)

Prepare the pump tubing for the regeneration solution:

- Plug a tubing olive (6.2744.034) into one end of the pump tubing (6.1826.320).
Plug a pump tubing connection (6.2744.180) onto the other end of the pump tubing.
- Connect one end of the aspirating capillary (6.1803.020) for the regeneration solution to the tubing olive on the pump tubing using a short pressure screw (6.2744.070).
Guide the other end of the aspirating capillary out of the instrument through a capillary feed-through, slide it through a bottle attachment (6.1602.150) and screw the bottle attachment onto the bottle (6.1608.020) containing the regeneration solution. Ensure that the end of the aspirating capillary reaches down to the bottom of the bottle.
- Place the pump tubing into a tubing cartridge.

Prepare a second pump tubing for the rinsing solution:

- Plug a tubing olive (6.2744.034) into one end of the pump tubing (6.1826.320).
Plug a pump tubing connection (6.2744.180) onto the other end of the pump tubing.
- Connect one end of the aspirating capillary (6.1803.020) for the rinsing solution to the tubing olive on the pump tubing using a short pressure screw (6.2744.070).
Guide the other end of the aspirating capillary out of the instrument through a capillary feed-through, slide it through a bottle attachment (6.1602.150) and screw the bottle attachment onto the bottle (6.1608.020) containing the rinsing solution. Ensure that the end of the aspirating capillary reaches down to the bottom of the bottle.
- Place the pump tubing into a tubing cartridge.

Place both tubing cartridges into the peristaltic pump.

6 Connecting the MSM

(see Chapter 3.16, page 50)

- Connect the capillary of the MSM labeled with **regenerant** to the pump tubing connection of the pump tubing for the regeneration solution using a short pressure screw (6.2744.070).
- Connect the capillary of the MSM labeled with **rinsing solution** to the pump tubing connection of the pump tubing for the rinsing solution using a short pressure screw (6.2744.070).
- Guide the two capillaries of the MSM labeled with **waste reg.** and **waste rins.** out of the instrument through a capillary feed through to a waste container and fasten them there.

7 Connecting the instrument

- Connect the instrument to a computer (see Chapter 3.17.1, page 53) on which the software MagIC Net™ is installed using the USB cable (6.2151.020).
- Connect the instrument to the mains supply (see Chapter 3.17.2, page 53).

8 Initial start-up

(see Chapter 4.1, page 58)

- Switch on the PC and start MagIC Net™.
- Switch on the instrument.
- Deaerate the high pressure pump (see Chapter 3.10.2, page 33).
- Set contact pressure of the peristaltic pump (see "Set flow rate", page 49).



- Rinse the instrument without column with eluent for 5 minutes.

9 Installing guard and separation column

- Remove the coupling (6.2744.040) between the column inlet capillary and the capillary of the MSM labeled with **in**.
- (Optional) Connect guard column (*see Chapter 3.18, page 54*)
 - Fasten the guard column to the end of the column inlet capillary (*see leaflet to the guard column*).
 - Rinse the guard column with eluent for approx. 5 minutes.
- Connect the separation column (*see Chapter 3.19, page 56*)
 - Connect the inlet of the separation column either with the end of the column input capillary using a PEEK pressure screw (6.2744.070).
 - or
 - Connect the inlet of the separation column with the guard column (if used) (*see leaflet to the separation column*)
 - Connect the MSM capillary labeled with **in** with the output of the separation column using a PEEK pressure screw (6.2744.070).
- Hang separation column with chip in the column holder of the instrument.

10 Conditioning the instrument

(*see Chapter 4.2, page 59*)

The instrument is now ready for measuring samples.

3.3 Installation diagram

The following installation diagram shows the schematics of the front of the instrument after installation is complete. Many capillaries are already installed at the time the instrument is delivered; these capillaries are not numbered in the diagram. Numbered capillaries must be connected at the time of installation.

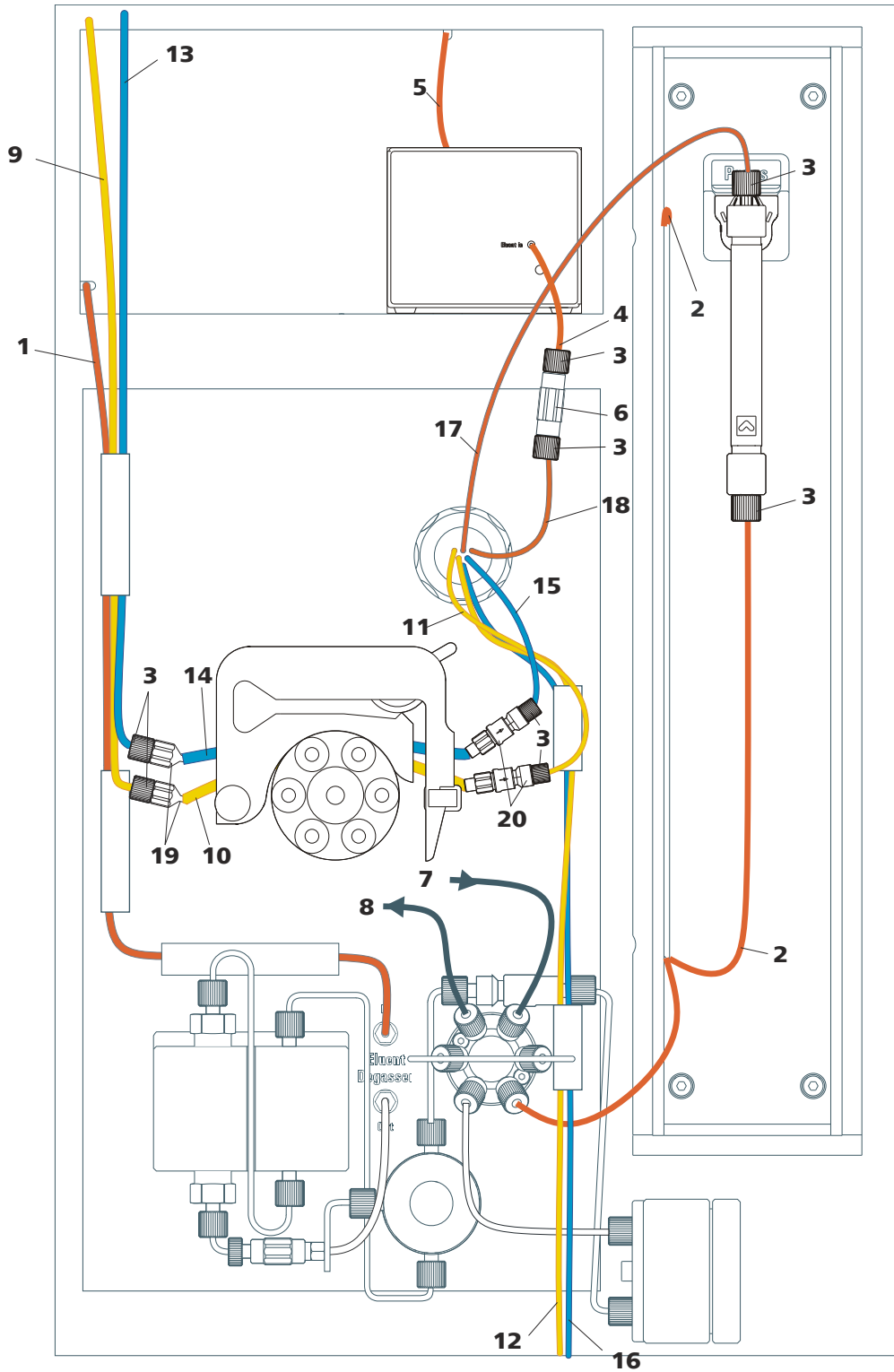


Figure 3 Installation diagram 881 Compact IC pro – Anion

1 Eluent aspiration tubing (6.1834.080)
Connected to the eluent degasser.

2 Column input capillary (6.1831.150)
Connected to the injection valve and threaded into the capillary recesses of the column heater.



3	PEEK pressure screws, short (6.2744.070)	4	Detector inlet capillary
5	Detector outlet capillary	6	Coupling (6.2744.040)
7	Sample aspirating capillary (6.1803.040)	8	Sample outlet capillary (6.1803.040)
9	Regeneration solution aspirating capillary (6.1803.020)	10	Pump tubing (6.1826.320) With orange/yellow stoppers, for the regeneration solution.
11	MSM regeneration solution inlet capillary Labeled with regenerant .	12	MSM regeneration solution outlet capillary Labeled with waste reg.
13	Rinsing solution aspirating capillary (6.1803.020)	14	Pump tubing (6.1826.320) With orange/yellow stoppers, for the rinsing solution.
15	MSM rinsing solution inlet capillary Labeled with rinsing solution .	16	MSM rinsing solution outlet capillary Labeled with waste rins.
17	MSM eluent inlet capillary Labeled with in .	18	MSM eluent outlet capillary Labeled with out .
19	Tubing olive (6.2744.034) For connecting capillaries to the aspiration side of the peristaltic pump.	20	Pump tubing connection (6.2744.180) With safety device and filter, for connecting capillaries to the outlet side of the peristaltic pump.

3.4 Setting up the instrument

3.4.1 Packaging

The instrument is supplied in highly protective special packaging together with the separately packed accessories. Keep this packaging, as only this ensures safe transportation of the instrument.

3.4.2 Checks

Immediately after receipt, check whether the shipment has arrived complete and without damage by comparing it with the delivery note.

3.4.3 Location

The instrument has been developed for operation indoors and may not be used in explosive environments.

Place the instrument in a location of the laboratory which is suitable for operation, free of vibrations, protected from corrosive atmosphere, and contamination by chemicals.

The instrument should be protected against excessive temperature fluctuations and direct sunlight.

3.5 Capillary connections in the IC system

This chapter contains general information concerning the capillary connections in the IC instruments and systems.

Generally speaking, capillary connections between two components of an IC system are made up of one connection capillary and two pressure screws with which the capillary is connected to the respective components.

Pressure screws

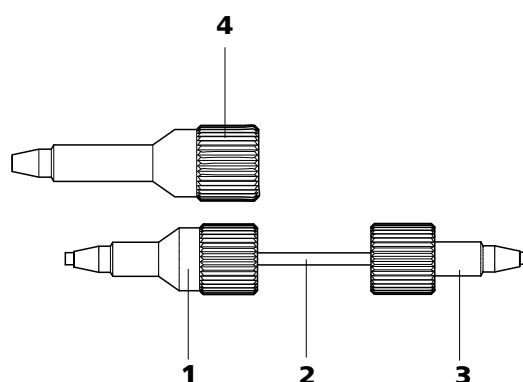


Figure 4 Connection of capillaries with pressure screws

1 PEEK pressure screw (6.2744.014)

Use on the injection valve.

2 Connection capillary

3 PEEK pressure screw, short (6.2744.070)

For use on the high pressure pump, the purge valve, the inline filter, the pulsation absorber, the guard column and the separation column.

4 PEEK pressure screw, long (6.2744.090)

Use on special components. Is not used on all instruments.



Note

In order to keep the dead volume as low as possible, capillary connections should generally be as short as possible.



Note

For an improved overview, capillary and tubing connections can be bundled with the 6.1815.010 spiral band.



Connection capillaries

PEEK capillaries and PTFE capillaries are used in the IC system.

PEEK capillaries (poly-etheretherketone)

PEEK capillaries are temperature-resistant up to 100°C, stable under pressure up to 400 bar, flexible, chemically inert and exhibit an extremely smooth surface. They can be readily cut down to the desired length with the 6.2621.080 capillary cutter.

Usage:

- PEEK capillaries (6.1831.010) with an internal diameter of 0.25 mm for the entire high pressure range.
- PEEK capillaries (6.1831.030) with an internal diameter of 0.75 mm for sample handling in the ultra trace range.



Caution

For the capillary connections between the injection valve and detector, PEEK capillaries with an internal diameter of 0.25 mm must be used. These are already connected to a newly delivered instrument.

PTFE capillaries (poly-tetrafluoroethylene)

PTFE capillaries are transparent and enable visual tracing of the liquids to be pumped. They are chemically inert, flexible and temperature-resistant up to 80°C.

Usage:

PTFE capillaries (6.1803.0x0) are used for the low pressure range.

- PTFE capillaries with internal diameter of 0.5 mm for sample handling.
- PTFE capillaries with internal diameter of 0.97 mm for sample handling as well as for rinsing solutions (they do not have to be in the scope of delivery of the instrument).

Capillary connections

In order to achieve optimum analysis results, capillary connections in an IC system must be absolutely tight and free of dead volume. Dead volume occurs if two capillary ends connected to each other do not fit exactly, thus allowing liquid to escape. There are two possible reasons for this:

- The capillaries do not have exactly cut edges.
- The two capillary ends do not completely meet.

One prerequisite for dead volume free capillary connection is, that both capillary ends are cut exactly plane. Therefore we recommend only to cut PEEK capillaries with the capillary cutter (6.2621.080).

Creating dead volume free capillary connections

To create dead volume free capillary connections, proceed as follows:

- 1 Slide the pressure screw over the capillary. Ensure that the capillary protrudes 1–2 mm from the tip of the pressure screw.
- 2 Plug the capillary all the way into the connection or coupling until the stop.
- 3 Only then start turning the pressure screw, while keeping the capillary pressed in space.

Colored sleeves for PEEK capillaries

The enclosed set of varicolored sleeves for PEEK capillaries (6.2251.000) serves to easily differentiate the various flows of liquid in the system through color coding. Each capillary leading a given liquid (e. g. eluent) can be highlighted with sleeves of the same color.

To highlight a capillary, proceed as follows:

- 1 Slide a sleeve of a selected color over a capillary and move it to an easily visible position.

If the capillary heats up, the sleeve shrinks and adapts to the form of the capillary.

3.6 Rear of the instrument

3.6.1 Transport locking screws

To avoid damage to the high pressure pump and the vacuum pump during transport, the pumps are secured with transport locking screws.

Remove these transport locking screws before the initial start-up.

Removing transport locking screws

- 1 Remove all of the transport locking screws with the 4 mm hexagon key (6.2621.030) and keep them in a safe place.



Warning

In order to avoid damage to the pumps, the transport locking screws must be remounted each time the instrument undergoes major transport.

3.6.2 Leak sensor

The leak sensor detects escaping liquid which collects in the base tray of the instrument.

For the leak sensor to function correctly, the following preconditions must be met:

- The leak sensor connector plug (5-2) is plugged into the **Leak Sensor** socket.
- The instrument is switched on.
- In the software, the leak sensor is set to **active**.

Connecting the leak sensor

Connect the leak sensor as follows:

- 1 Pull out the leak sensor connection cable (5-3) from the base tray.
- 2 Plug the leak sensor connector plug (5-2) into the leak sensor connection socket (5-1) on the rear of the instrument.

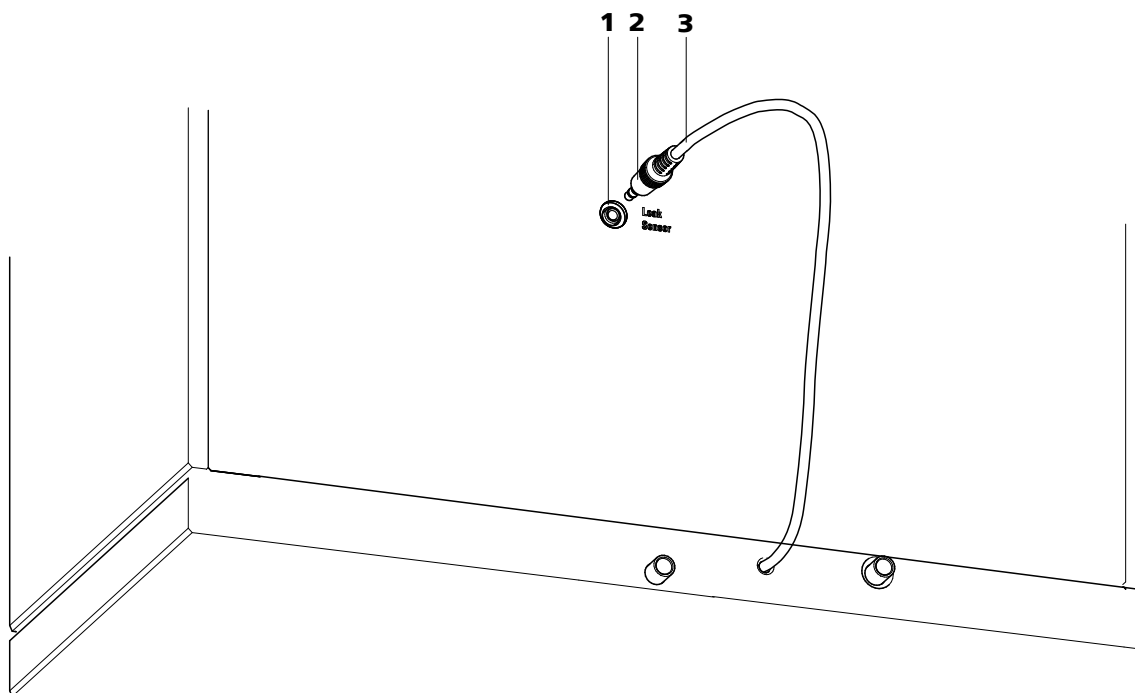


Figure 5 leak sensor – plugging in

1 Leak sensor connection socket
Is labeled with **Leak Sensor**.

2 Leak sensor connector plug

3 Leak sensor connection cable
Extractable. Coiled up in the base tray.

3.6.3 Drainage tubings

Fluid that escapes in the covering plate or in the detector chamber flows through the drainage tubings into the base tray and past the leak sensor into the waste container. This ensures that any leaks in the system will be detected by the leak sensor.

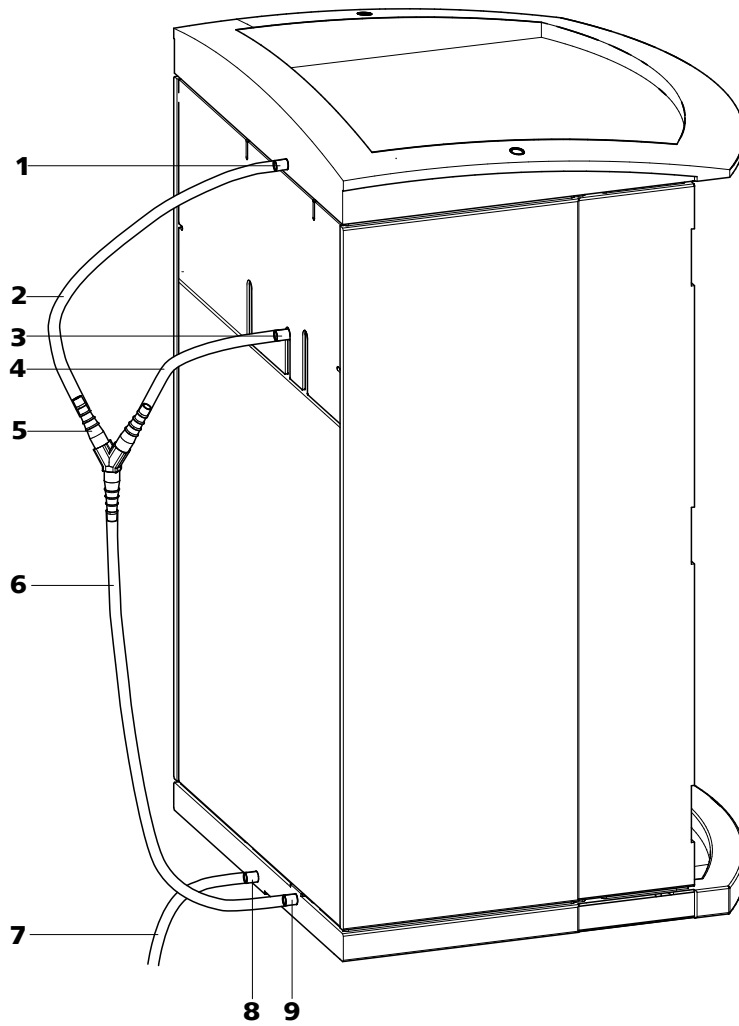


Figure 6 Drainage tubings

<p>1 Drainage tubing connection For draining escaped liquid from the cover.</p>	<p>2 Drainage tubing Section of the 6.1816.020 silicon tubing. For draining escaped liquid from the cover.</p>
<p>3 Drainage tubing connection For draining escaped fluid from the detector chamber.</p>	<p>4 Drainage tubing Section of the 6.1816.020 silicon tubing. For draining escaped fluid from the detector chamber.</p>
<p>5 Y connector (6.1807.010) For connecting the two drainage tubings (6-2) and (6-4).</p>	<p>6 Drainage tubing Section of the 6.1816.020 silicon tubing. Guides escaped fluid to the leak sensor.</p>
<p>7 Drainage tubing Section of the 6.1816.020 silicon tubing. Guides escaped fluid into a waste container.</p>	<p>8 Drainage tubing connection For draining escaped fluid.</p>
<p>9 Drainage tubing connection Leads to the leak sensor.</p>	

Installing drainage tubings

Proceed as follows to install the drainage tubings:

- 1** Connect drainage tubing (6-2) to the drainage tubing connection (6-1) and shorten to the required length.
- 2** Connect drainage tubing (6-4) to the drainage tubing connection (6-3) and shorten to the required length.
- 3** Connect drainage tubing (6-2) and drainage tubing (6-4) to the Y connector (6-5).
- 4** Connect drainage tubing (6-6) to the Y connector (6-5), shorten to the required length and connect the other end of the drainage tubing to the drainage tubing connection (6-9).
- 5** Connect drainage tubing (6-7) to the drainage tubing connection (6-8) and guide the other end into a waste container.

3.7 Capillary and cable feed-throughs

Several openings have been integrated for feeding through capillaries and cables. These can be found at the door, at the rear panel, and below the bottle holder and above the base tray (see Figure 7, page 24).

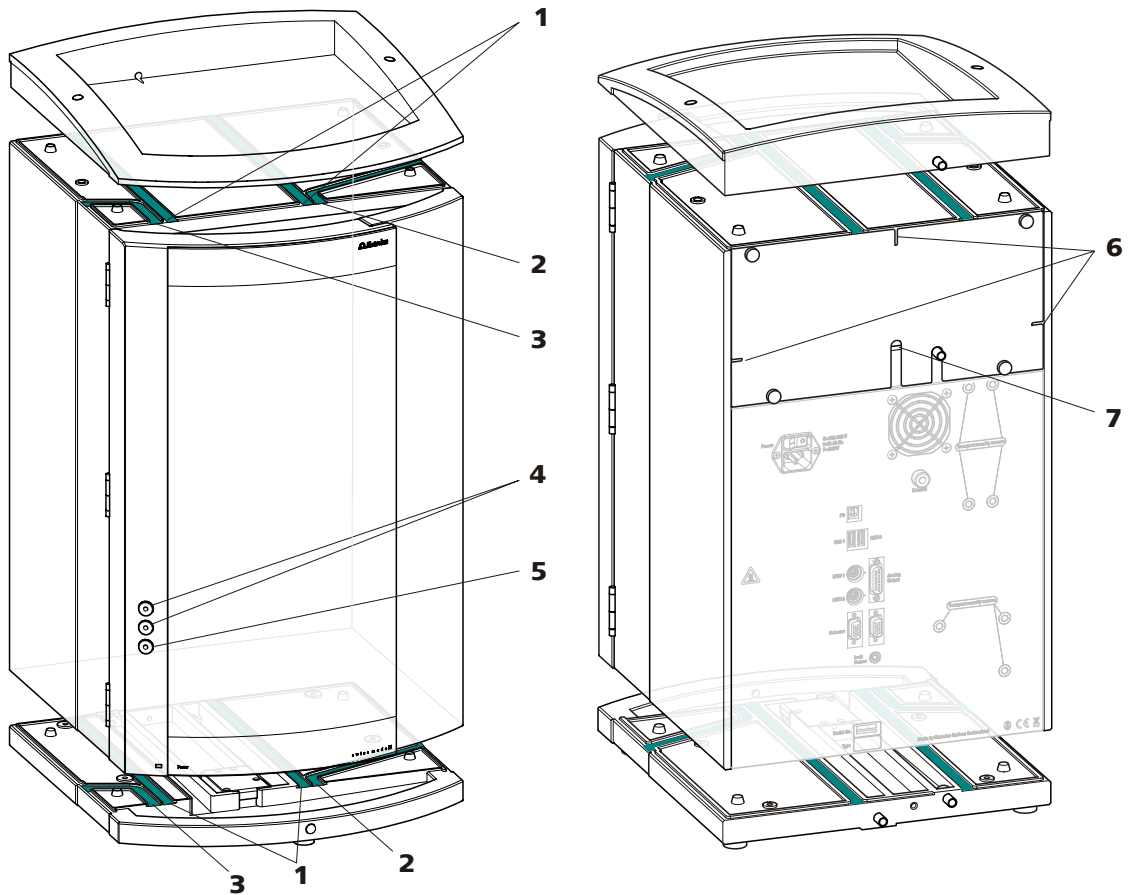


Figure 7 Capillary and cable feed-throughs

- | | |
|---|--|
| <p>1 Capillary feed-through
For feeding capillaries from the front to the rear of the instrument.</p> | <p>2 Capillary feed-through
For feeding capillaries from the front to the right side of the instrument.</p> |
| <p>3 Capillary feed-through
For feeding capillaries from the front to the left side of the instrument.</p> | <p>4 Luer connector
For connecting a (6.2816.020) syringe. For manual sample feeding.</p> |
| <p>5 Capillary feed-through
At the door of the instrument. For feeding capillaries out of the instrument.</p> | <p>6 Capillary feed-through
At the rear of the instrument. For feeding capillaries out of the detector chamber.</p> |
| <p>7 Cable feed-through
At the rear of the instrument. For feeding the detector cable out of the detector chamber.</p> | |

Do not feed capillaries through the Luer connectors (7-4). The capillaries are fastened with PEEK pressure screws (6.2744.070) from inside to the Luer connector. From outside, liquid can be aspirated or injected with a syringe.

3.8 Eluent

3.8.1 Connecting eluent bottle

The eluent is aspirated out of the eluent bottle via the eluent aspiration tubing (8-1).

The eluent aspiration tubing is connected to the eluent degasser (see Chapter 3.9, page 29). The tubing must be threaded through a suitable capillary feed-through of the instrument before the other end can be equipped.

You will require the parts from the following accessories for equipping the eluent aspiration tubing:

- 6.1602.160 Eluent bottle attachment GL 45
- 6.2744.210 tubing adapter for aspiration filter
- 6.2821.090 aspiration filter

To equip the eluent aspiration tubing proceed as follows:

Assembling eluent aspiration tubing

- 1 Guide the free end of the eluent aspiration tubing (8-1) out of the instrument through a suitable capillary feed-through.
- 2 **Installing eluent bottle attachment 6.1602.160**
 - Slide tubing nipple (8-2) and O-ring (8-3) onto the eluent aspiration tubing (8-1).
 - Push eluent aspiration tubing (8-1) through the bottle attachment (8-4) and screw tight.

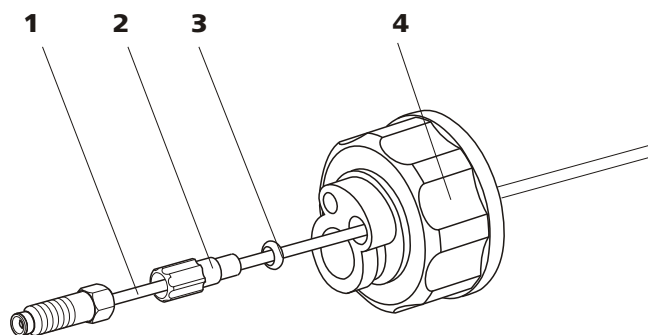


Figure 8 Installing eluent bottle attachment

1 Eluent aspiration tubing 6.1834.080

2 Tubing nipple

From accessories set 6.1602.160.

3 O-ring

From accessories set 6.1602.160.

4 Bottle attachment

From accessories set 6.1602.160.

3 Mounting aspiration filter

- Insert filter holder (9-1) into the aspiration filter (9-2) and screw tight.

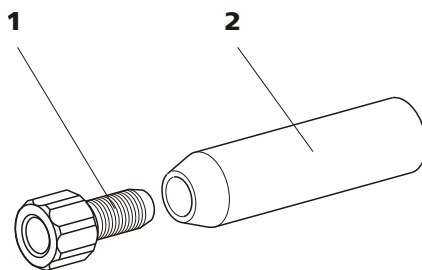


Figure 9 Mounting aspiration filter

1 Filter holder

From accessories set 6.2744.210.

2 Aspiration filter 6.2821.090

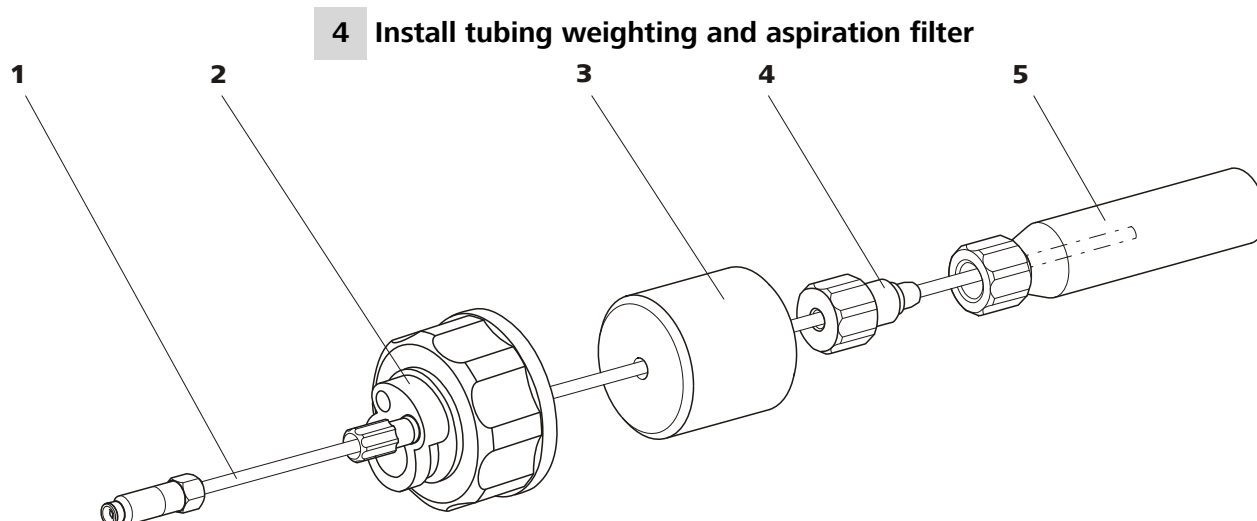


Figure 10 Install tubing weighting and aspiration filter

1 Eluent aspiration tubing 6.1834.080

2 Eluent bottle attachment 6.1602.160

3 Tubing weighting
From accessories set 6.2744.210.

4 Clamping screw
From accessories set 6.2744.210.

5 Aspiration filter 6.2821.090
With filter holder from accessories set 6.2744.210.

- Slide the tubing weighting (10-3) onto the eluent aspiration tubing (10-1).
- Slide the clamping screw (10-4) onto the eluent aspiration tubing (10-1).
- Insert the eluent aspiration tubing (10-1) into the aspiration filter (10-5). The end of the tubing should approximately reach to the center of the aspiration filter.
- Screw together clamping screw (10-4) and filter holder (9-1).

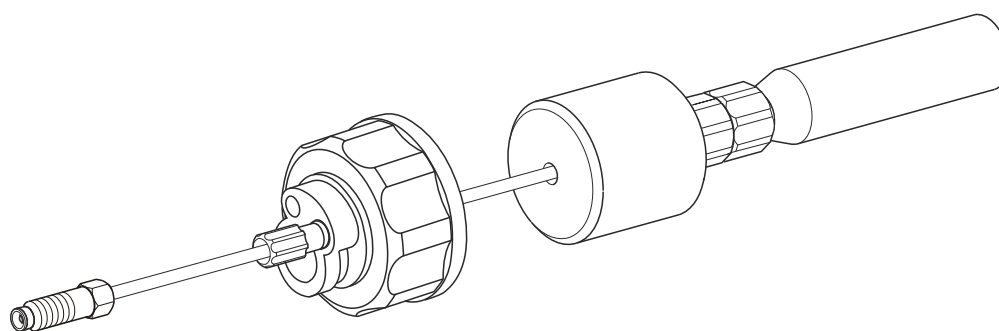


Figure 11 Eluent aspiration tubing fully equipped.

5 Mounting eluent aspiration tubing to the eluent bottle

- Insert the eluent aspiration tubing into the eluent bottle (12-10).



- Fasten the completely equipped bottle attachment (12-10) on the eluent bottle. The aspiration filter (12-6) must rest on the base of the eluent bottle.
- Close the remaining small opening on the bottle attachment with a threaded stopper from the accessories set.

6 Mounting the adsorber tube



Note

In the case of alkaline eluents and eluents with lower buffer capacity, the eluent bottle must be equipped with a CO₂ adsorber (12-4).

- First, place a piece of cotton (12-3), then the CO₂ adsorber (12-4) in the large opening of the adsorber tube (12-2) and close with the plastic cover.
- Fasten the adsorber tube (12-2) using the SGJ clip (12-12) onto the bottle attachment (12-11).

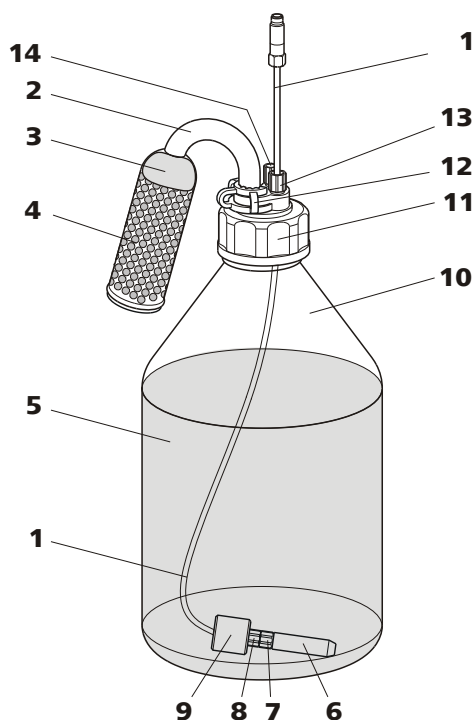


Figure 12 Eluent bottle – connected

1 Eluent aspiration tubing 6.1834.080
For aspirating the eluent. Pre-installed.

2 Adsorber tube 6.1609.000

3	Wadding	4	CO₂ adsorber Adsorbs CO ₂ from the air (e.g. Merck soda lime with indicator, no. 6839.10).
5	Eluent	6	Aspiration filter 6.2821.090
7	Filter holder From accessories set 6.2744.210.	8	Clamping screw From accessories set 6.2744.210.
9	Tubing weighting From accessories set 6.2744.210.	10	Eluent bottle 6.1608.070
11	Bottle attachment 6.1602.160	12	SGJ clip 6.2023.020
13	Tubing nipple	14	Threaded stopper

3.9 Eluent degasser

Gas bubbles in the eluent lead to an unstable baseline, as high pressure pumps can transport liquids, but not gases. The eluent therefore has to be degassed, before it reaches the high pressure pump.

The eluent degasser removes gas bubbles and dissolved gases from the eluent. For degassing, the eluent flows into a vacuum chamber through a special fluoropolymer capillary.



Note

The eluent degasser is already installed in the newly delivered instrument. The following installation instructions must only be followed, if the connections to the degasser had to be disconnected for maintenance.



Connecting the eluent degasser

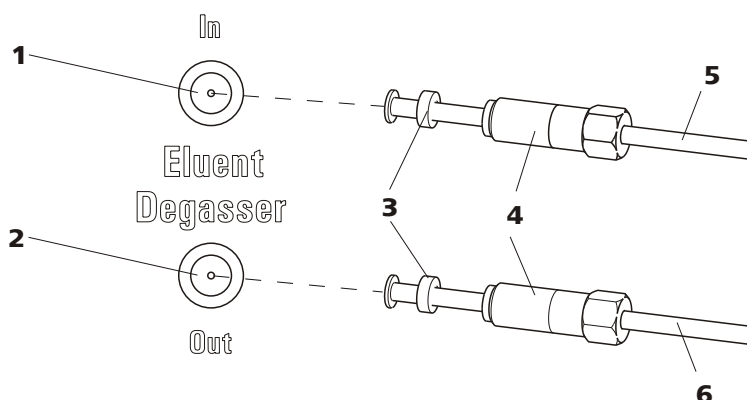


Figure 13 Eluent degasser

1	Eluent degasser input	2	Eluent degasser output
3	Tubing flare With tubing nipple.	4	Clamping screw
5	Eluent aspiration tubing (6.1834.080) For aspirating the eluent. The clamping screw (13-4) is firmly mounted.	6	Connection tubing (6.1834.090) Connection from the eluent degasser to the high pressure pump (see Chapter 3.10, page 31). The clamping screw (13-4) is firmly mounted.

1



Caution

The clamping screws (13-4) must be tightened carefully. Use the wrench (6.2621.050) to do this.

- Insert the eluent aspiration tubing (13-5) into the eluent degasser input (13-1).
- Carefully tighten the clamping screw (13-4).

2

- Insert connection capillary (13-6) (the end with the longer clamping screw (13-4)) into the eluent degasser output (13-2).
- Carefully tighten the clamping screw (13-4).
- Connect the other end of the connection capillary (13-6) (with the shorter clamping screw) to the high pressure pump (14-9) (see "Connecting inlet to the high pressure pump", page 32).

3.10 High pressure pump

The intelligent and low pulsation high pressure pump pumps the eluent through the system. It is equipped with a chip on which its technical specifications and "life history" (operating hours, service data, ...) are saved.

The purge valve is used for deaerating (see Chapter 3.10.2, page 33) the high pressure pump.

3.10.1 Capillary connections high pressure pump/purge valve



Note

All of the capillary connections of the high pressure pump and the purge valve are already installed in the newly delivered instrument.

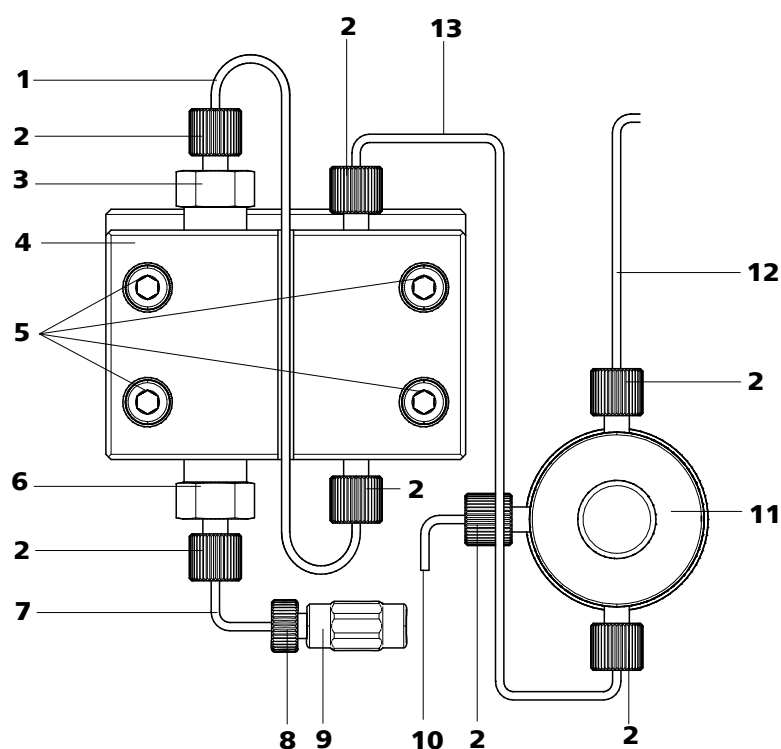


Figure 14 Capillary connections high pressure pump/purge valve

1 Connection capillary
PEEK capillary, connects main piston and auxiliary piston.

3 Outlet valve holder

2 PEEK pressure screw, short
(6.2744.070)

4 Pump head (6.2824.110)

5 Fastening screws

For fastening the pump head.

7 Pump head inlet capillary

PEEK capillary at the input of the pump head.

9 Coupling

For the connection of the eluent path at the input of the high pressure pump. Can be ordered together with the pressure screw (14-8) under the number (6.2744.230).

11 Purge valve

For deaerating the high pressure pump. With rotary knob in the center and pressure sensor.

13 Connection capillary

Connects the output of the pump head with the purge valve.

6 Inlet valve holder**8 Pressure screw**

For connecting a PEEK capillary to the coupling (14-9).

10 Deaerating capillary

For aspirating the eluent when deaerating the high pressure pump (see Chapter 3.10.2, page 33).

12 Connection capillary

For connecting the inline filter (see Chapter 3.11, page 35).

**Note**

The eluent aspiration capillary is already installed in the newly delivered instrument. The following installation instructions need **not** be carried out at the time of initial installation.

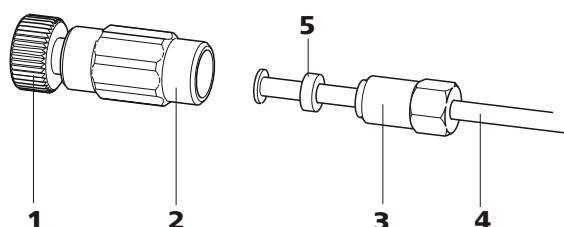
Connecting inlet to the high pressure pump

Figure 15 High pressure pump – Connect inlet

1 Pressure screw

For connecting the coupling (15-2) to the pump head inlet capillary (14-7). Can be ordered together with the coupling under the number (6.2744.230).

2 Coupling (6.2744.230)

For connecting the eluent connection capillary (15-4) to the input of the high pressure pump.

3 Clamping screw**4 Eluent aspiration tubing**

Eluent aspiration tubing (6.1834.080) or (6.1834.090).

5 Backup ring**1 Connecting coupling**

Fasten the coupling (15-2) with a pressure screw (15-1) on the pump head inlet capillary (14-7).

2 Connecting eluent aspiration tubing**Caution**

The clamping screws must be tightened carefully. To tighten, grip the coupling (15-2) with the key (6.2739.000) and grip the clamping screw (15-3) with the wrench (6.2621.050).

- Plug the eluent aspiration tubing (15-4) into the coupling (15-2).
- Tighten the clamping screw (15-3).

3.10.2 Deaerating the high pressure pump

The high pressure pump will only operate perfectly if the pump head contains no more air bubbles. Therefore it must be deaerated during initial start-up and after every change of eluent.

**Caution**

The high pressure pump must **not** be deaerated before the initial start-up (see Chapter 4.1, page 58).

Deaerate the high pressure pump as follows (see Figure 16, page 34):

Deaerate the high pressure pump

The instrument must be connected to the PC and switched on to deaerate the high pressure pump.

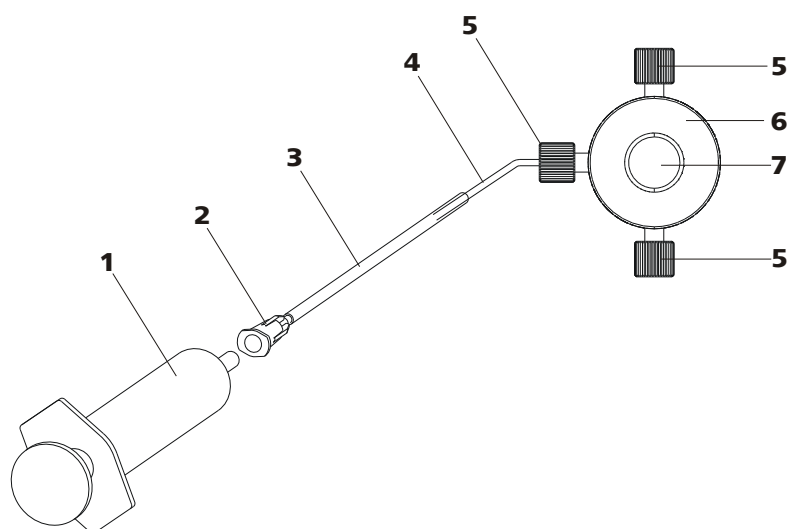


Figure 16 Deaerate the high pressure pump

1	Syringe 10 mL (6.2816.020) For aspirating the eluent.	2	Luer connector Part of the purging needle (6.2816.040)
3	Purging needle (6.2816.040)	4	Deaerating capillary
5	PEEK pressure screws, short (6.2744.070)	6	Purge valve
7	Purge valve rotary knob		

1 Connecting the purging needle

- Push the end of the purging needle (16-3) over the end of the deaerating capillary (16-4) on the purge valve.

2 Connecting the syringe

- Insert syringe (16-1) in the Luer connector (16-2) of the purging needle (see Figure 16, page 34).

3 Opening purge valve

- Open the rotary knob (16-7) by approx. ½ rotation counterclockwise.

4 Setting the flow rate

- Start MagIC Net™ (if not yet started).
- Ensure that the eluent aspiration tubing is immersed sufficiently in the eluent.
- Let the high pressure pump run.

5 Aspirating eluent

- Aspirate with the syringe (16-1) until bubble-free eluent flows into the syringe.

6 Completing deaerating

- Switch off high pressure pump.
- Close rotary knob (16-7).
- Remove syringe (16-1) from the Luer connector (16-2).
- Pull the purging needle (16-3) out of the deaerating capillary (16-4).

3.11 Inline filter

Between the purge valve and the pulsation absorber the inline filter (6.2821.120) is installed as protection against particles.

Inline filters protect the separation column securely against possible contamination from the eluent. Inline filters can however also just as well be used for the purpose of protecting the suppressor against contaminations in the regeneration or rinsing solutions. The filter platelets with a pore size of 2 µm can be replaced quickly and easily. They remove particles like e. g. bacteria and algae from the solutions.



Note

The inline filter is already installed in the newly delivered instrument. The following installation instructions need **not** be carried out at the time of initial installation.

Installing the inline filter



Caution

Observe the flow direction marked on the filter housing for the connection of the inline filter.

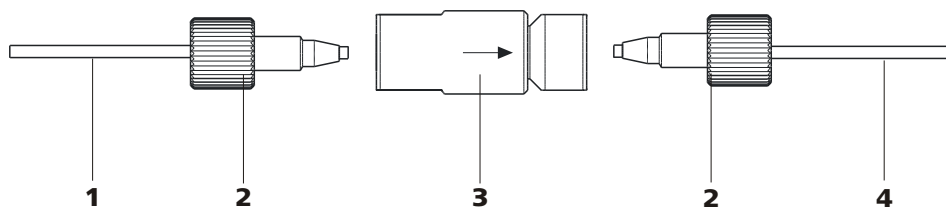


Figure 17 Connecting the inline filter

1 Connection capillary

Connects the purge valve with the inline filter

2 PEEK pressure screws, short (6.2744.070)

3 Inline filter (6.2821.120)

Protects against particles.

4 Connection capillary

Connects the inline filter with the pulsation absorber.

- 1 Screw on the connection capillary running from the purge valve to the input side of the inline filter using a pressure screw (6.2744.070).
- 2 Screw on the connection capillary running to the pulsation absorber to the output side of the inline filter using a pressure screw (6.2744.070).

3.12 Pulsation absorber



Note

The pulsation absorber is already installed in the newly delivered instrument.



Caution

The pulsation absorber is maintenance-free and may not be opened.

The pulsation absorber protects the separation column from damage caused by pressure fluctuations when switching the injection valve, and reduces interfering pulsations during highly sensitive measurements. In order to ensure these functionalities, it must be connected between the high pressure pump (see Chapter 3.10, page 31) and injection valve (see Chapter 3.13, page 37).

The pulsation absorber can be operated in both directions.

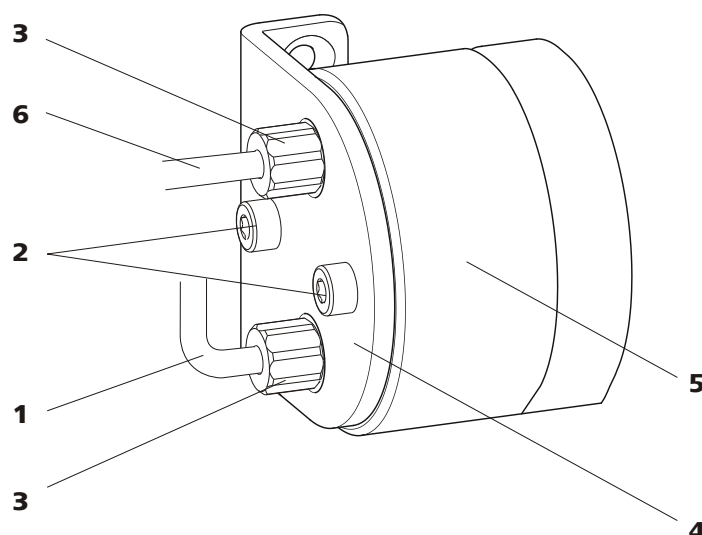


Figure 18 Pulsation absorber – Connection

1 Connection capillary Connection to the inline filter.	2 Fastening screws
3 PEEK pressure screws, short (6.2744.070)	4 Holder for pulsation absorber
5 Pulsation absorber (6.2620.150)	6 Connection capillary Connection to the injection valve.

3.13 Injection valve

The injection valve connects the eluent and sample path. Through rapid and precise valve switchover a precise amount of sample solution defined by the size of the sample loop is injected and rinsed with eluent onto the separation column.

3.13.1 Connecting the injection valve

The injection valve has six connectors: two for the sample path (connectors 1 and 2), two for the eluent path (connectors 4 and 5) and two for the sample loop (connectors 3 and 6).



Note

The capillaries of the eluent path and the sample path and the sample loop are already installed in the newly delivered instrument.

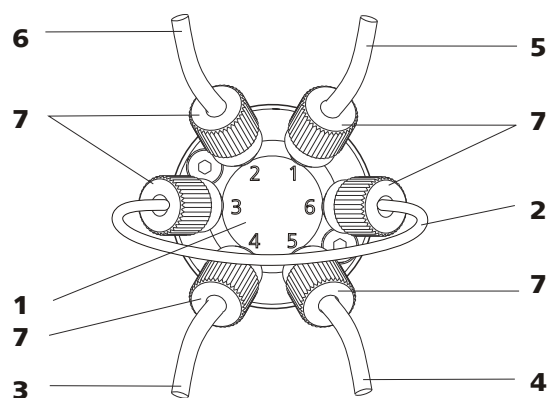


Figure 19 Injection valve – connected

1 Injection valve	2 Sample loop Connected to connectors 3 and 6.
3 Connection capillary Connected to connector 4. Carries eluent to the injection valve.	4 Connection capillary (column inlet capillary) Connected to connector 5. Carries eluent to the separation column.
5 Connection capillary Connected to connector 1. Carries sample to the injection valve.	6 Connection capillary Connected to connector 2. Carries sample to the waste container.
7 PEEK pressure screw 6.2744.010	

Replacing the sample loop

The sample loop can be replaced, depending on requirements. For additional information concerning selection of the appropriate sample loop, see *Chapter 3.13.3, page 40*.



Note

Use only 6.2744.010 PEEK pressure screws for connecting capillaries and sample loop to the injection valve.

1 Removing existing sample loop

- Loosen 6.2744.010 pressure screws at connector 3 and connector 6.
- Remove sample loop.

2 Mounting new sample loop

- Fasten one end of the sample loop (19-2) with a 6.2744.010 PEEK pressure screw (19-7) to connector 3.
- Fasten the other end of the sample loop (19-2) with a second 6.2744.010 PEEK pressure screw (19-7) to connector 6.

3.13.2 Mode of operation of the injection valve

The injection valve (see Figure 20, page 39) can adopt two valve positions - **FILL** and **INJECT**. Switching back and forth between the two valve positions determines whether the sample path or the eluent path is guided through the sample loop. The following figure provides a schematic display of the flow paths of the two valve positions.

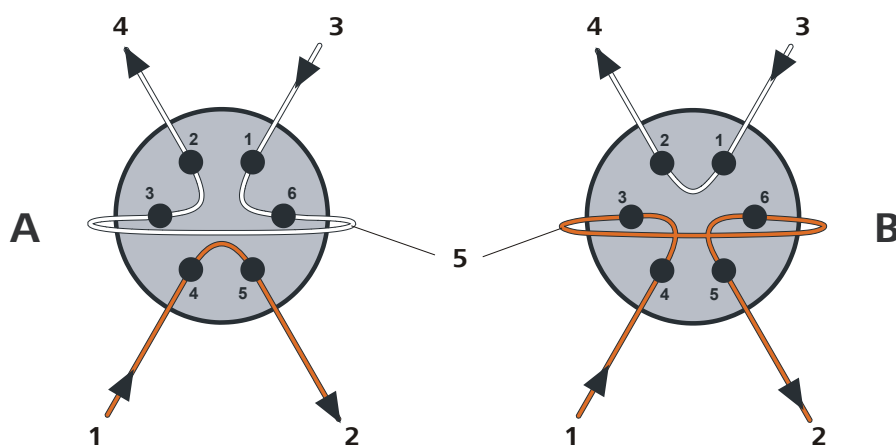


Figure 20 Injection valve – Positions

A	Position FILL	B	Position INJECT
1	Eluent input Capillary coming from the high pressure pump.	2	Eluent output Capillary to the column.
3	Sample input Sample aspirating capillary.	4	Sample output Capillary to waste container.
5	Sample loop		

Position A

In the position **FILL**, the sample solution flows through the sample loop to the waste container. The eluent flows directly to the separation column at the same time.

Position B

In the position **INJECT**, the eluent flows through the sample loop to the separation column. If sample solution is to be found in the sample loop at the time of the valve switchover, then this will be conveyed along with the eluent, thus making its way to the separation column. The flow in the sample path is either stopped or the sample flows directly to the waste container.



3.13.3 Selecting the sample loop

The amount of sample solution injected depends on the volume of the sample loop. The choice is made on the basis of the application. The following sample loops are normally used:

Cation determination	10 µL
Anion determination with suppression	20 µL
Anion determination without suppression	100 µL

3.14 Column heater

The perfect isolation of the column chamber ensures thermally stable conditions for the separation column. The temperature of the column heater can be set in the software.

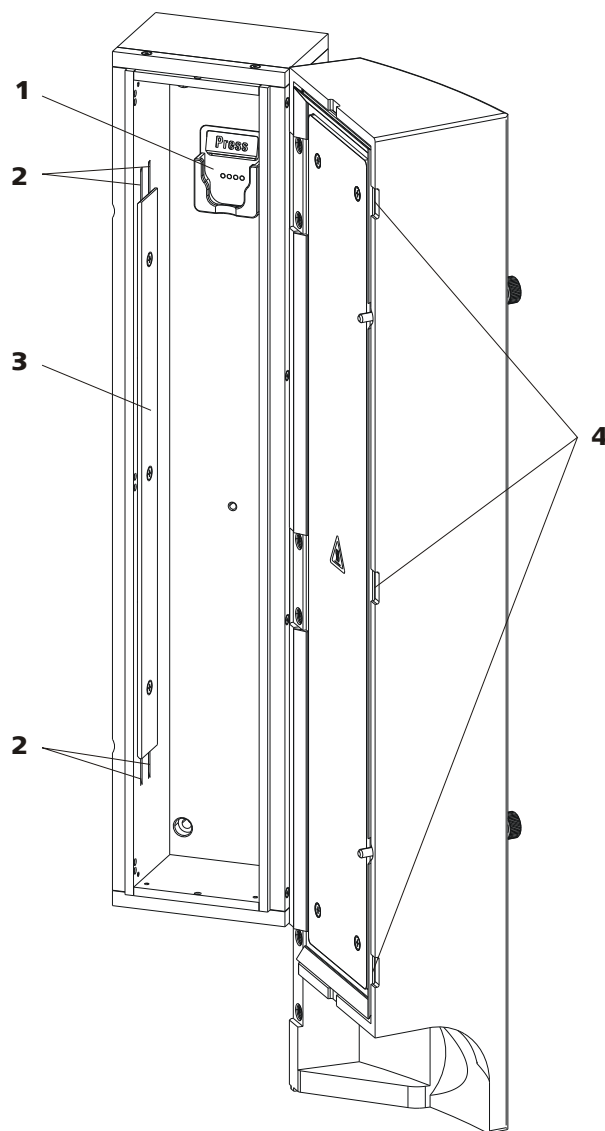


Figure 21 Column heater

1 Column holder

For engaging the column. With column detection.

2 Capillary recesses

For threading in the capillaries to be tempered

3 Holder plate

For fixing the capillaries that have been threaded in.

4 Capillary feed-throughs

For guiding the capillaries in and/or out of the column chamber.

The column heater contains a column holder (21-1) equipped with chip recognition. The separation column (see Chapter 3.19, page 56) is clicked into the column holder with the chip.

The capillaries must be guided into and out of the column heater via suitable capillary feed-throughs (21-4).



In order to bring the eluent to the required temperature, the capillaries must be guided through the capillary recesses (21-2) before connection to the separation column.



Note

The column input capillary is already installed in newly delivered instruments. The following installation instructions need **not** be carried out at the time of initial installation.

Installing capillaries in the column heater

1 Opening column heater

Loosen the knurled screw(s) at the door to the column chamber and open the door.

2 Retracting capillaries

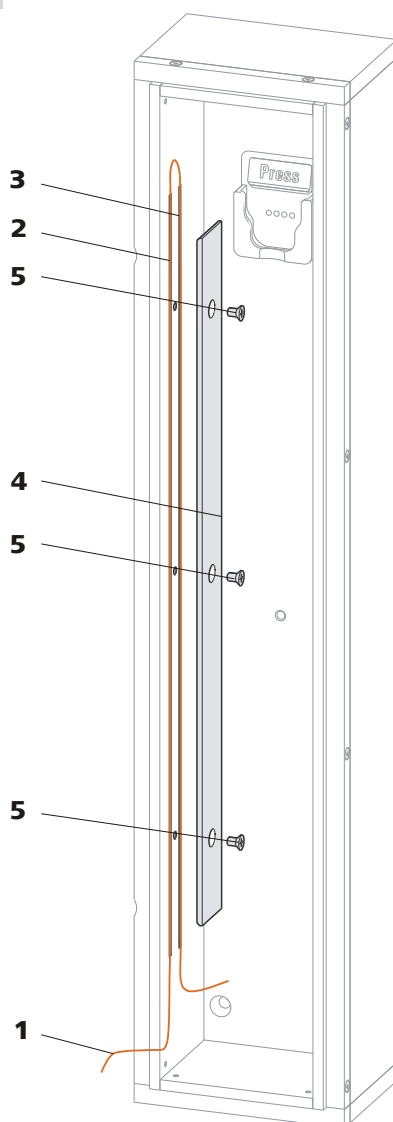


Figure 22 Column heater – Installing capillaries

1 Column input capillary

Leading from the injection valve

3 Inner capillary recess

5 Screws

For fastening the holder plate

2 Outer capillary recess

4 Holder plate

- Slide the column input capillary (22-**1**) from below into the outer of the two capillary recesses (22-**2**). Slide it through under the holder plate (22-**4**) until it emerges again at the top.



- Carefully bend the column input capillary (22-1) downward and slide it from top to bottom through the inner capillary recess (22-3) until it emerges at the lower edge of the holder plate (22-4).
- At the end of the column input capillary (22-1), connect the coupling 6.2744.040 (first-time installation) or the guard column or the separation column (after first-time start-up) (see "Connecting and rinsing the guard column", page 55) or (see "Connecting and rinsing the separation column", page 57).



Note

If it is difficult to slide the capillary under the holding plate, then you can loosen the holding plate somewhat by undoing the screws slightly. Carefully retighten the loosened screws as soon as the capillary has been pulled into the recesses.

3 Closing the column chamber

Press the door to the column heater shut and close it tightly with the knurled screws.



Note

When closing the door, take care to ensure that the capillaries are in place in the capillary feed-throughs in the door and that they are not squeezed shut.

3.15 Peristaltic pump

3.15.1 Principle of the peristaltic pump

The Peristaltic pump is used for pumping sample and auxiliary solutions. It can rotate in both directions.

The peristaltic pump pumps liquids according to the principle of displacement. The pump tubing is clamped between the rollers (23-3) and the tubing cartridge (23-5). During operation, the peristaltic pump drive rotates the roller hub (23-2), so that the rollers (23-3) push the liquid forward in the pump tubing.

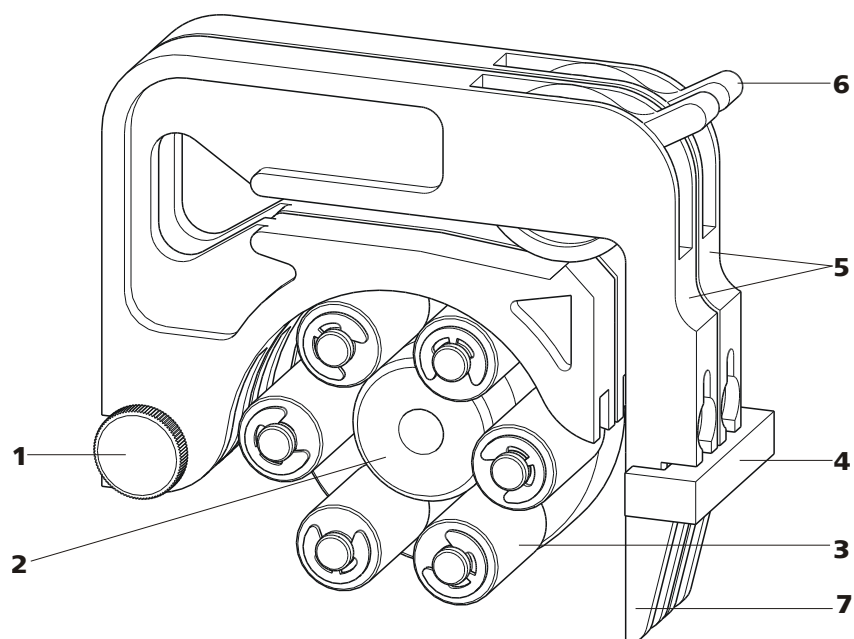


Figure 23 Peristaltic pump

1 Knurled screw in the mounting pin

3 Rollers

5 Tubing cartridges 6.2755.000

7 Snap-action lever

2 Roller hub

4 Cartridge holder

6 Contact pressure lever



3.15.2 Installing the peristaltic pump

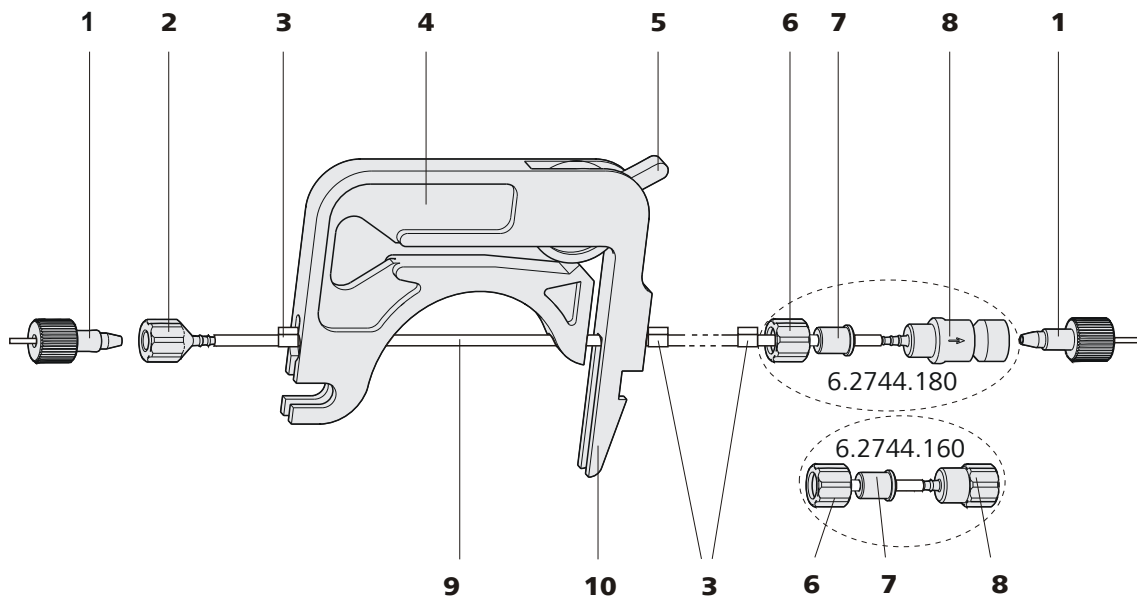


Figure 24 Installing the pump tubing

1	PEEK pressure screws, short (6.2744.070)	2	Tubing olive (6.2744.034)
3	Stopper The colors of the stopper indicate the inner diameter of the pump tubing.	4	Tubing cartridge (6.2755.000)
5	Contact pressure lever	6	Union nut
7	Adapter	8	Tubing olive Either with filter holder (6.2744.180) or without filter holder (6.2744.160).
9	Pump tubing (6.1826.xx0)	10	Snap-action lever

Mount the pump tubing as follows:

1 Removing the tubing cartridge

Release the tubing cartridge from the cartridge holder by pressing the snap-action lever and unhooking from the mounting pins (23-1).

2 Connecting the aspiration side

Place a 6.2744.034 tubing olive (24-2) on the aspiration side of the pump tubing.

3 Connecting the pressure side



Note

Depending on the use of the peristaltic pump, on the pressure side you can either connect:

- **Case A:** a 6.2744.180 pump tubing connection **with filter** (see Figure 25, page 47) or
- **Case B:** a 6.2744.160 pump tubing connection **without filter** (see Figure 26, page 48).

For pumping the auxiliary solutions to the MSM or to the SPM, a 6.2744.180 pump tubing connection **with filter must** be used.

Case A: 6.2744.180 pump tubing connection with filter:

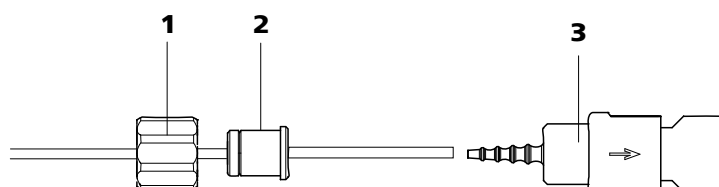


Figure 25 Install pump tubing connection with filter

1 Union nut

2 Adapter

3 Tubing olive with filter holder

- Slide union nut (25-1) onto the pump tubing.
- Select a suitable adapter (25-2) and slide it onto the pump tubing. The type of adapter depends on the pump tubing (see Table 1, page 48).
- Place the tubing olive with filter holder (25-3) onto the pump tubing.
- Screw the union nut (25-1) onto the tubing olive (25-3).

or

Case B: 6.2744.160 pump tubing connection without filter:

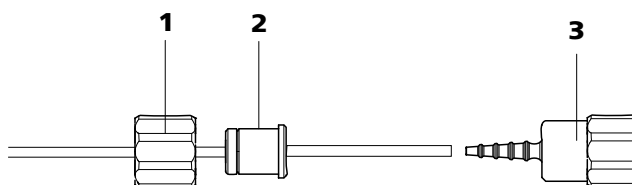


Figure 26 Install pump tubing connection without filter

1	Union nut	2	Adapter
3	Tubing olive		

- Slide union nut (26-1) onto the pump tubing.
- Select a suitable adapter (26-2) and slide it onto the pump tubing. The type of adapter depends on the pump tubing (see Table 1, page 48).
- Place the tubing olive (26-3) onto the pump tubing.
- Screw the union nut (26-1) onto the tubing olive (26-3).

4 Inserting the pump tubing

- Press the contact pressure lever all the way down.
- Place the pump tubing in the tubing cartridge. The stoppers (24-3) must snap into the corresponding holders of the tubing cartridge.

5 Inserting the tubing cartridge





- Hang the tubing cartridge in the mounting pin and press in the cartridge holder until the snap-action lever snaps in.

6 Connecting the capillaries

- Screw the respective capillaries tightly to the two tubing olives with PEEK pressure screws (24-1).

Table 1 Pump tubings and suitable adapters

Pump tubing	Adapter
6.1826.020 (blue/blue)	
6.1826.310 (orange/green)	
6.1826.320 (orange/yellow)	
6.1826.330 (orange/white)	

Pump tubing	Adapter
6.1826.340 (black/black)	
6.1826.360 (white/white)	
6.1826.380 (gray/gray)	
6.1826.390 (yellow/yellow)	

Set flow rate

The contact pressure of the tubing cartridge must be adjusted in order to regulate the flow rate. Proceed as follows:

Set the contact pressure

- 1
 - Fully loosen the contact pressure lever (24-5), i.e. press it all the way down.
 - Switch on the peristaltic pump.
 - Raise the contact pressure lever one step at a time until liquid flows.
 - When liquid starts flowing, raise the contact pressure lever by an additional 2 ratchet increments.

The contact pressure is now set optimally.

The delivery rate depends not only on the correct contact pressure but also on the interior diameter of the pump tubing and the rotational speed of the drive.



Note

Pump tubings are consumable material. The service life of the pump tubings depends on the contact pressure amongst other factors.

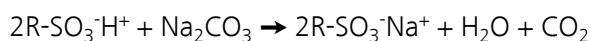


3.16 Metrohm Suppressor Module (MSM)

The MSM is used for chemical suppression during anion analysis with conductivity detection or UV/VIS detection. It consists of 3 suppressor units in total, which are, in rotation, used for suppression – regenerated with 100 mmol/L sulfuric acid – rinsed with ultrapure water.

Suppression reaction in the MSM

When using a carbonate eluent, the following reaction (amongst others) occurs in the MSM:



3.16.1 Connecting the suppressor

The three inputs and outputs of the suppressor units, numbered with 1, 2 and 3 on the connecting piece, each have 2 fixed mounted PTFE capillaries.

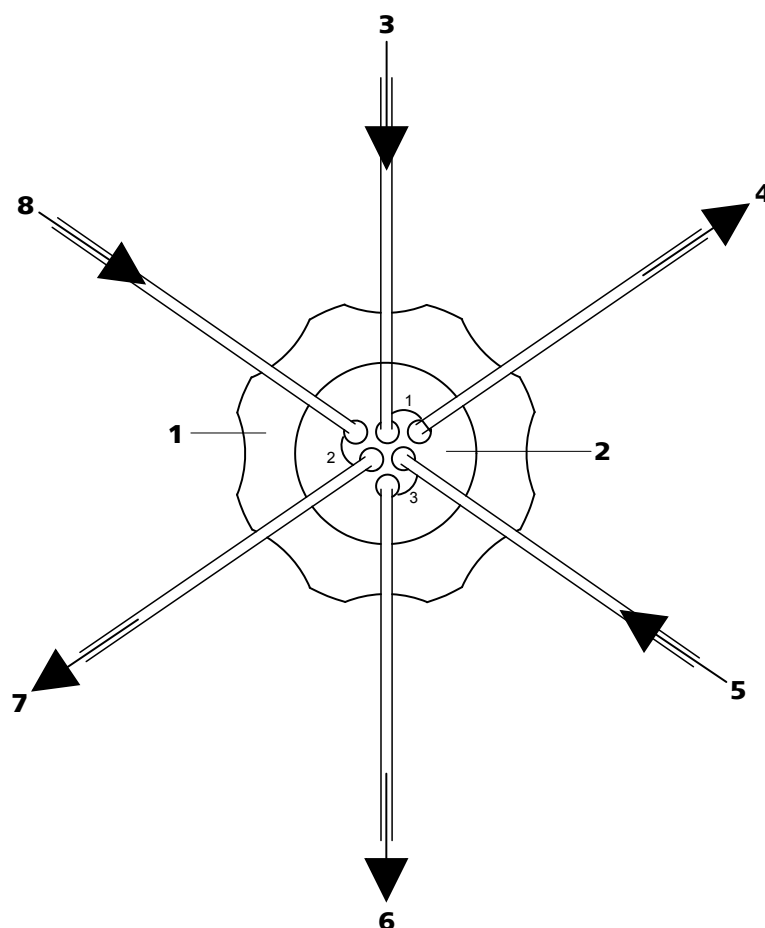


Figure 27 Suppressor – connection capillaries

1	Union nut	2	Connecting piece (6.2832.010)
3	Eluent inlet capillary Labeled with in.	4	Eluent outlet capillary Labeled with out.
5	Rinsing solution inlet capillary Labeled with rinsing solution.	6	Rinsing solution outlet capillary Labeled with waste rins..
7	Regeneration solution outlet capillary Labeled with waste reg..	8	Regeneration solution inlet capillary Labeled with regenerant.

The rinsing solution and regeneration solution are pumped with a peristaltic pump (see Chapter 3.15, page 44).



Caution

To protect the suppressor against foreign particles or bacterial growth, a pump tubing connection with filter (6.2744.180) (25-3) must be mounted between the peristaltic pump and the inlet capillaries of the suppressor.



Connect the PTFE capillaries firmly mounted on the connecting piece to the other components of the IC system as follows:

Connecting the capillaries of the suppressor

In order to protect the Suppressor from foreign particles or bacterial growth, the following precondition must be fulfilled:

- Pump tubing connections with filter (6.2744.180) are installed at the pump tubing outlets of the peristaltic pump.



Caution

As the PTFE capillaries are very soft, the pressure screws should not be overtightened.

Squeezed capillary ends can be shortened with the capillary cutter (6.2621.080).

1 Connecting the eluent inlet capillary

- Fasten the end of the inlet capillary labeled with **in** to the output of the column with a short PEEK pressure screw (6.2744.070).

2 Connecting the eluent outlet capillary



Note

Depending on the instrument type, the suppressor is either connected directly with the detector or, if available and used, with the MCS.

- Connect the output capillary labeled with **out** either with the **detector** (*see manual of the detector*).

or

- Connect the output capillary labeled with **out** with the input **in** of the **MCS**, using a long PEEK pressure screw (6.2744.090).

3 Connecting the rinsing solution inlet capillary

- With a short PEEK pressure screw (6.2744.070), fasten the end of the inlet capillary labeled with **rinsing solution** to the pump tubing connection of the pump tubing which carries the rinsing solution.

4 Connecting the rinsing the solution outlet capillary

- Guide the other end of the outlet capillary labeled with **waste rins.** into a sufficiently large waste container and fasten it there.

5 Connecting the regeneration solution inlet capillary

- With a short PEEK pressure screw (6.2744.070), fasten the end of the inlet capillary labeled with **regenerant** to the pump tubing connection of the pump tubing which carries the regeneration solution.

6 Connecting the regeneration solution outlet capillary

- Guide the other end of the outlet capillary labeled with **waste reg.** into a sufficiently large waste container and fasten it there.

3.17 Connecting the instrument**3.17.1 Connecting the instrument to the PC****Note**

The instrument must be switched off when connecting the PC.

1 Connect the USB cable

Connect the PC connection socket of the instrument to a USB connector of the computer via the USB cable (6.2151.020).

3.17.2 Connecting the instrument to mains supply**Warning**

The power supply unit must not get wet. Protect it against the direct effect of liquids.

Mains cable

Which mains cable is supplied depends on the location:

- 6.2122.020 with plug SEV 12 (Switzerland, ...)
- 6.2122.040 with plug CEE(7), VII (Germany, ...)
- 6.2122.070 with plug NEMA 5-15 (USA, ...)



The mains cable is three-core and provided with a plug with grounding. If another plug has to be mounted, the yellow/green conductor (IEC standard) must be connected to the protective ground (protection class I).

1 Connect the mains cable

- Plug the mains cable into the mains connection socket .
- Connect the mains cable to the mains supply.

2 Switch on the instrument

Switch on the instrument using the mains switch .

After switching on, the LED on the front of the instrument flashes while a system test is carried out and the connection to the software is established. Once the system test is complete and the connection to the software has been established, the LED lights up continuously.

3.18 Guard column

The use of guard columns serves for protecting the separation columns and increasing their service life considerably. The guard columns available from Metrohm represent either actual guard columns or are so-called guard column cartridges which are used together with a cartridge holder. The installation of a guard column cartridge in the associated holder is described in the leaflet of the guard columns.



Note

Information regarding which guard column is suitable for your separation column can be found in the **Metrohm IC Column Program** (which is available from your Metrohm agent), the leaflet provided along with your separation column, the product information on the separation column at <http://www.metrohm.com> (product area Ion Chromatography), or obtained directly from your agent.



Caution

New guard columns are filled with solution and are sealed on both sides with stoppers or caps, respectively. Before using the guard column, you need to ensure that this solution is miscible with the eluents used (observe manufacturer's data).

**Note**

The guard column may only be installed after the **initial start-up** (see *Chapter 4.1, page 58*) of the instrument. Until then, use the coupling (6.2744.040) instead of the guard and separation column.

**Note**

Metrohm recommends, always to work with guard columns. These protect the separation column and can be exchanged regularly.

Connecting and rinsing the guard column**1 Connecting the guard column****Caution**

When inserting the guard column, always ensure that it is inserted correctly corresponding to the flow direction (if indicated).

- Remove sealing caps and/or stoppers from the guard column.
- Fasten the input of the guard column to the column inlet capillary (3-2) using a short PEEK pressure screw (6.2744.070).
- In case the guard column is mounted on the separation column with a connecting capillary, connect the included connection capillary, which is included with the guard column, to the output of the guard column using the PEEK pressure screw, which is also included.

2 Rinsing the guard column

- Place beaker under the outlet capillary of the guard column.
- Set the flow rate of the high pressure pump according to the data given in the leaflet of the separation column.
- Start the high pressure pump and rinse the guard column approx. 5 minutes with eluent.
- Switch off the high pressure pump again.



3.19 Separation column

The intelligent separation column (iColumn) is the heart of the ion chromatographic analysis. It separates the different components corresponding to their interactions with the column. Metrohm separation columns are equipped with a chip on which their technical specifications and their history (first use / setting up, operating hours, injections, ...) are saved.



Note

Information regarding which separation column is suitable for your application can be found in the **Metrohm IC Column Program**, the product information for your separation column at <http://www.metrohm.com> in the product area ion chromatography, or obtained directly from your agent.



Caution

New separation columns are filled with solution and are sealed on both sides with stoppers. Before using the column, you need to ensure that this solution is miscible with the eluents used (observe manufacturer's data).

You can find the separation columns and guard columns currently available from Metrohm in the Metrohm IC Column Program, or in the Internet at <http://www.metrohm.com> in the product area Ion Chromatography. A test chromatogram and an leaflet are provided along with each column. You can request detailed information on special IC applications in the corresponding "**Application Bulletins**" or "**Application Notes**", available in the Internet at <http://www.metrohm.com> in the Applications area or via the Metrohm agent responsible free of charge.



Note

The separation column may only be installed after the **initial start-up** (see Chapter 4.1, page 58) of the instrument. Until then, use the coupling (6.2744.040) instead of the guard and separation column.

Connecting and rinsing the separation column

1 Connect the separation column



Caution

When inserting the columns, always ensure that these are correctly inserted corresponding to the flow direction indicated.

- Remove stoppers from the separation column.
- Attach the guard column to the input of the separation column.

OR

Connect the input of the separation column to the outlet capillary of the guard column, using the PEEK pressure screw (6.2744.070) included.

OR

If no guard column is used (not recommended), connect the column input capillary (3-2) to the input of the separation column, using a PEEK pressure screw (6.2744.070).

2 Rinsing the separation column

- Place beaker under the outlet end of the separation column.
- Set the flow rate of the high pressure pump according to the data given in the leaflet of the separation column.
- Start the high pressure pump and rinse the separation column approx. 10 minutes with eluent.
- Switch off the high pressure pump again.

3 Mounting the separation column

- Fasten the column output capillary to the output of the separation column using a PEEK pressure screw (6.2744.070).
- Hang separation column with chip into the column holder.



Note

The iColumns are equipped with a chip on which their operating data is saved. The chip has to be hooked into the chip holder provided for this so that the column recognition can function.



4 Start-up

The chapter *Start-up* is divided into 2 sections:

Initial start-up	The initial start-up is carried out during the initial installation .
Conditioning	Conditioning is carried out as a final installation step and each time after the system is started.

4.1 Initial start-up

The initial start-up is carried out during the initial installation. The entire system is rinsed before guard column and separation column are installed.



Caution

The separation column and guard column may not be installed for the initial start-up.

Make sure that the coupling (6.2744.040) is being used instead of the columns.

Perform the following steps during the initial start-up:

1 Preparing the software

- Start the PC program **MagIC Net™**.
- Open the **Equilibration** tab in MagIC Net™.
- Select (or create) a suitable method.

2 Preparing the instrument

- Ensure that the eluent aspiration tubing is immersed in the eluent and that there is enough eluent in the eluent bottle.
- Ensure that the aspiration tubings for the auxiliary solutions (regeneration solution and rinsing solution) are immersed into the respective solutions and that there is enough solution in the bottles.
- Switch on the instrument.

3 Starting equilibration

- In MagIC Net™, start the equilibration.

4 Deaerate the high pressure pump

- Deaerate the high pressure pump(s) via the purge valve (see Chapter 3.10.2, page 33).

5 Set the contact pressure of the peristaltic pump**Note**

This work step needs to be performed only if a peristaltic pump is being used.

- If peristaltic pumps are used, set the contact pressure (see "Set flow rate", page 49).

6 Rinsing the instrument without columns

- Rinse the instrument (without columns) with eluent for 5 minutes.

The instrument is now ready for the installation of the columns (see Chapter 3.18, page 54).

4.2 Conditioning

After the installation and after switching on the instrument, the system must be conditioned with eluent until a stable baseline is reached.

**Note**

After a change of eluent (see Chapter 5.4.2.3, page 64), the conditioning time can lengthen considerably.

Conditioning the system**1 Preparing the software****Caution**

Ensure that the flow set is not higher than the flow permissible for the corresponding column (see column leaflet and chip data set).

- Start the PC program **MagIC Net™**.
- Open the **Equilibration** tab in MagIC Net™.



- Select (or create) a suitable method.

2 Preparing the instrument

- Ensure that the column is correctly mounted according to the flow direction indicated on the label (arrow must point in the direction of flow).
- Ensure that the eluent aspiration tubing is immersed in the eluent and that there is enough eluent in the eluent bottle.
- Ensure that the aspiration tubings for the auxiliary solutions (regeneration solution and rinsing solution) are immersed into the respective solutions and that there is enough solution in the bottles.

3 Checking leak-tightness

- In MagIC Net™, start the equilibration.
- Check all capillaries and their connections from the high pressure pump to the detector for signs of liquid escaping. If eluent escapes anywhere, tighten the corresponding pressure screw or loosen the connection, check the end of the capillary, shorten it with a capillary cutter if necessary, and restore the connection.

4 Conditioning the system

Rinse the system with eluent until the required stability of the baseline is attained (normally 30 minutes).

During this time, step the MSM to the next position every 10 minutes.

The instrument is now ready for measuring samples.

5 Operation and maintenance

5.1 General notes

5.1.1 Care



Warning

The instrument housing must not be opened by untrained personnel.

The instrument requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the service life of the sturdy mechanics and electronics.



Caution

Although this is prevented to a great extent by design measures, the mains plug should be unplugged immediately if aggressive media has penetrated the inside of the instrument, so as to avoid serious damage to the instrument electronics. In such cases, the Metrohm Service must be informed.

On the rear of the instrument, the drainage tubings must be mounted and the leak sensor must be plugged in and activated as protection against escaping liquids.

Spillages of chemicals and solvents should be cleaned up immediately. In particular, the plug connections on the rear panel of the instrument (especially the mains plug) should be protected from contamination.

5.1.2 Maintenance by Metrohm Service

Maintenance of the instrument is best carried out as part of an annual service, which is performed by specialist personnel from Metrohm. If working frequently with caustic and corrosive chemicals, a shorter maintenance interval is recommended. The Metrohm service department offers every form of technical advice for maintenance and service of all Metrohm instruments.



5.1.3 Operation



Caution

In order to avoid disturbing temperature influences, the entire system including the eluent bottle must be protected against direct sunlight.

5.1.4 Shutting down

If the instrument is not used for a longer period, the whole IC system (except the columns) must be rinsed salt free with methanol/ultrapure water (1:4), in order to prevent eluent salts from forming crystals which may cause subsequent damage.

Rinsing salt free the IC system

To rinse the system, proceed as follows:

- 1 Remove the separation column from the eluent path. Connect the connection capillaries directly with each other using a coupling (6.2744.040).
- 2 Rinse the IC system with methanol/ultrapure water (1:4) for 15 minutes.

Rinse with eluent for at least 15 minutes at starting up again and before connecting the guard column and separation column.

5.2 Capillary connections

5.2.1 Operation

All connections between injection valve, separation column and detector must be as short as possible, have a low dead volume and be completely leak-tight. The PEEK capillary after the detector must be free of blockages. Only use PEEK capillaries with an internal diameter of 0.25 mm in the high pressure range between the high pressure pump and the detector.

5.3 Door



Caution

The door is made of PMMA (polymethylmetacrylate). It must never be cleaned with abrasive media or solvents.



Caution

Never use the door as a handle.

5.4 Eluent

5.4.1 Production

The chemicals used for the production of eluents should have a degree of purity of at least "p.a.". Only ultra pure water (resistance > 18.2 MΩ *cm) may be used for dilution (this generally applies for reagents which are used in ion chromatography).

Newly produced eluents should always be microfiltered (filter 0.45 µm).



Caution

Only microfiltered (filter 0.45 µm) eluents may be used.

The composition of the eluent has a crucial effect on the chromatographic analysis:

Concentration	An increase in the concentration generally leads to shorter retention times and faster separation, but also to higher background conductivity.
pH	pH changes result in shifts in the dissociation equilibria and hence changes in the retention times.
Organic solvents	The addition of an organic solvent (e.g. methanol, acetone, acetonitrile) to aqueous eluents generally accelerates lipophilic ions.



5.4.2 Operation

5.4.2.1 Supply bottle

The supply bottle with the eluent must be connected as indicated in *chapter 3.8.1, page 25*. This is above all important for eluents with volatile solvents (e.g. acetone).

Moreover, condensation must also be prevented in the eluent bottle. Drop formation can change the concentration ratio in the eluent.

5.4.2.2 Aspiration filter

To protect the IC system against foreign particles, we recommend aspirating the eluents via a 6.2821.090 aspiration filter (**9-2**). This aspiration filter must be replaced should it show signs of yellow discoloration (but no later than every 3 months).

In the case of very sensitive measurements, the eluent should be stirred constantly with a magnetic stirrer.

5.4.2.3 Changing the eluent

When changing the eluent, it must be ensured that no precipitates can occur. Solutions following one another in direct succession must therefore be miscible. If the system has to be rinsed organically, several solvents with rising or falling lipophilia must be used.

5.5 High pressure pump

5.5.1 Protection



Caution

The pump head is filled ex works with methanol/ultrapure water. It must be ensured that the eluent used is freely miscible with the solvent remaining in the pump head.

To protect the high pressure pump against **foreign particles**, we recommend that the eluent undergoes a **microfiltration** (filter 0.45 µm) before being aspirated via a 6.2821.090 aspiration filter (*see "Assembling eluent aspiration tubing", page 25*).

Salt crystals between the piston and seal cause abrasion particles which can find their way into the eluent. These lead to contaminated valves, a rise in pressure and in extreme cases scratched pistons. It is therefore essential to ensure that **no precipitates** can occur (*see Chapter 5.4.2.3, page 64*).

**Caution**

In order to spare the pump seals, the pump should not be operated dry. Therefore ensure that the eluent supply is correctly connected and that there is enough eluent in the eluent bottle each time before switching on the pump.

5.5.2 Maintenance**Caution**

Maintenance work on the high pressure pump may not be carried out unless the **instrument is switched off**.

Pump head maintenance

An unstable baseline (pulsation, flow fluctuations) is in many cases the result of contaminated valves (34-2), (34-3) or defective, leaking piston seals on the high pressure pump. Proceed as follows for cleaning contaminated valves and/or replacing worn parts such as pistons, piston seal and valves:

This maintenance work should be carried out at least once a year.

Removing the pump head

- 1 Switch off high pressure pump and wait until pressure is released.
- 2 Loosen the pressure screw on the inlet valve holder (14-6) and unscrew the pump head input capillary (14-7), the coupling (14-9), and the eluent aspiration tubing from the pump head.
In the process, eluent will spill. Hold the eluent aspiration tubing up high and allow the eluent to flow back into the eluent bottle.
- 3 Unscrew the pump head outlet capillary (14-13) from the pump head.
- 4 Remove pump head from the pump housing by loosening the 4 fastening screws (14-5) using the hexagon key (6.2621.030). The main piston is on the left (viewed from the front), and the auxiliary piston is on the right.



Cleaning/replacing the zirconium oxide piston

Clean one piston after the other as follows:

1 Removing the piston cartridge from the pump head

Loosen the piston cartridge with a wrench and unscrew from the pump head by hand.

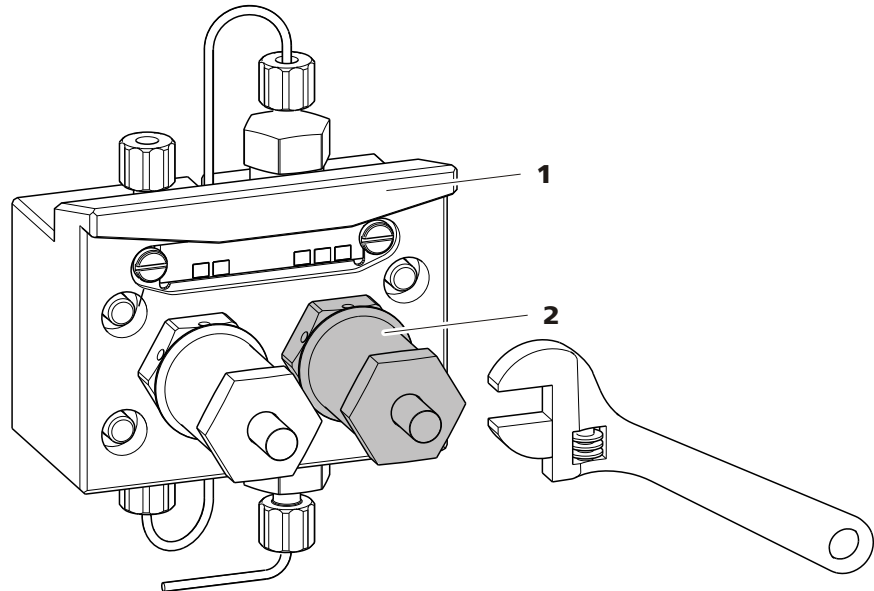


Figure 28 Pump head – removing the piston

1 Pump head

2 Piston cartridge

2 Dismantling the piston



Caution

On the inside of the piston cartridge there is a taut spring than can jump out of the piston cartridge if suddenly losing tension.

When opening the piston cartridge, hold pressure towards the spring and unscrew carefully.

- Loosen the screw of the piston cartridge with a wrench and unscrew carefully by hand and by holding pressure towards the taut spring.
- Remove the zirconium oxide piston and lay on a tissue.
- Remove the spring retainer, spring and the inner plastic sleeve from the piston cartridge and lay by.

- Remove the backup ring from the pump head and lay to the other parts.

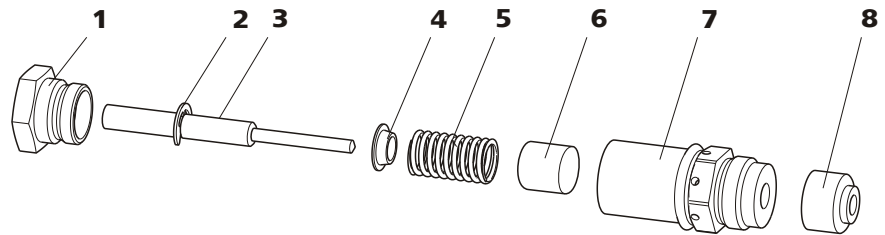


Figure 29 Components of the piston cartridge

1	Piston cartridge screw	2	Retaining washer
3	Zirconium oxide piston with piston shaft Order number: 6.2824.070	4	Spring retainer
5	Spring Order number: 6.2824.060	6	Inner plastic sleeve Protects from metallic abrasion.
7	Piston cartridge	8	Backup ring

3 Cleaning the components of the piston

- Clean zirconium oxide pistons contaminated by abrasion or deposits with fine abrasive cleaning powder, rinse particle free with ultrapure water and dry.
Replace highly contaminated or scratched zirconium oxide pistons (spare part: 6.2824.070 zirconium oxide piston).
- Rinse the other parts of the piston and dry with a lint-free cloth.

4 Assembling the piston

- Insert the inner plastic sleeve, spring and spring retainer into the piston cartridge.
- Slide the zirconium oxide piston carefully into the piston cartridge until its tip emerges from the small opening of the piston cartridge.
- Attach screw and tighten by hand.

Replacing the piston seal

The special tool (6.2617.010) (see Figure 30, page 68) is necessary to remove the piston seal from the pump head. It consists of two parts: a tip



for removing the old piston seal and a sleeve for inserting the new piston seal.

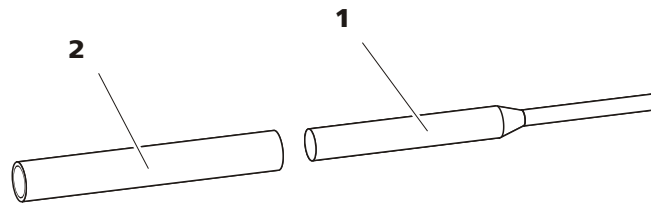


Figure 30 Tool for piston seal

1 Pin
Tip for removing the old piston seal.

2 Sleeve
Sleeve for inserting the new piston seal.



Caution

Screwing the special tool for the piston seal (6.2617.010) into the piston seal destroys this completely!

1 Removing the piston seal



Caution

Avoid touching the sealing surface in the pump head (14-4) with the tool.

Screw the special tool for the piston seal (30-1) with the narrow side just as far into the piston seal as the same can be removed.

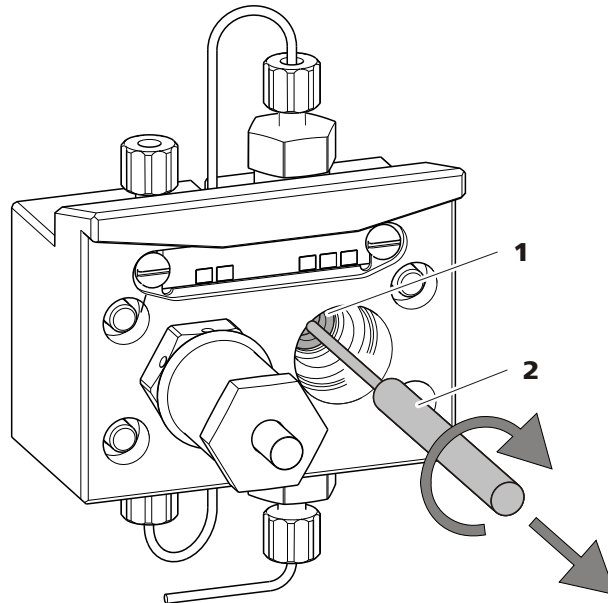


Figure 31 Removing the piston seal

1 Piston seal

2 Tool for piston seal
Pin of the tool.

2 Inserting the new piston seal into the tool

Insert the new piston seal tightly by hand into the recess of the sleeve of the tool for the piston seal (30-2). The sealing springs must be visible from the outside.

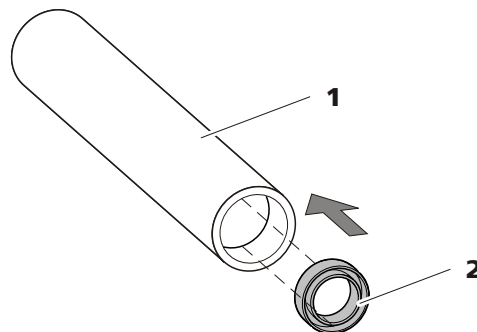


Figure 32 Inserting the piston seal into the tool

1 Tool for piston seal (6.2617.010)
Sleeve for inserting the new piston seal.

2 Piston seal
Order number: 6.2741.020

3 Inserting the new piston seal into the pump head

Guide the sleeve of the tool for the piston seal (30-2) with inserted piston seal into the pump head and press the seal with the wide end of the tool for the piston seal (30-1) into the pump head recess.

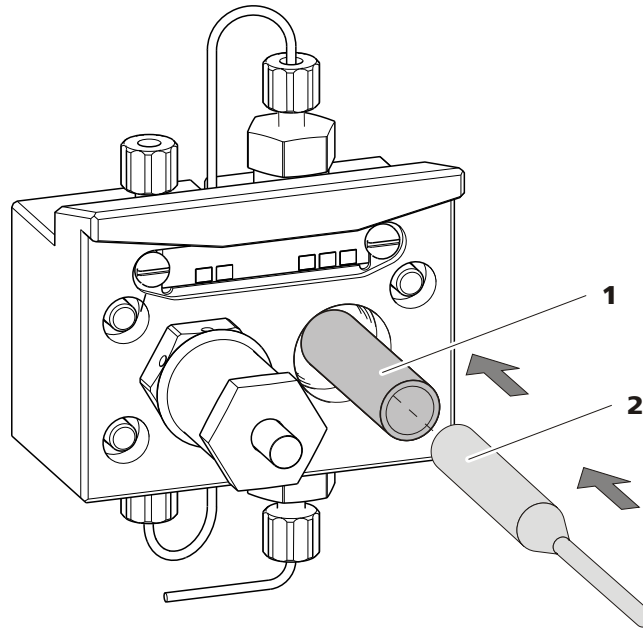


Figure 33 Inserting the piston seal into the pump head

4 Replacing the piston cartridge

Screw the assembled piston cartridge back into the pump head and tighten, first by hand, then additionally by approx. 15° with a wrench.

Cleaning the inlet valve and outlet valve

1 Removing valves

- Unscrew the connection capillary for the auxiliary piston (14-1) from the outlet valve holder.
- Unscrew the holders for the inlet and outlet valves and remove the valves (34-3) and (34-2).

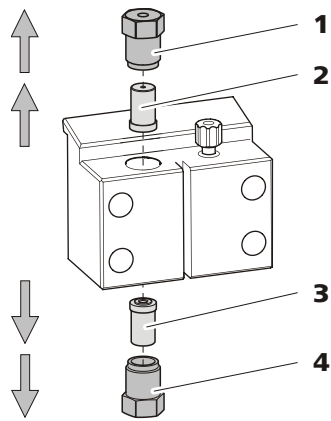


Figure 34 Removing valves

1 Outlet valve holder**2 Outlet valve**

Order number: 6.2824.160

3 Inlet valve

Order number: 6.2824.170

4 Inlet valve holder**2 Cleaning undissected valve**

Clean contaminated or blocked valves initially **without** dismantling them completely.

- Rinse the valve in eluent flow and counterflow direction using a spray bottle filled with ultrapure water, RBS solution or acetone.
- The rinsing effect is further increased through a short treatment (lasting for a maximum of 20 s) in an ultrasonic bath.

**Note**

Longer lasting ultrasonic baths can damage the ruby ball of the valve.

Only if this cleaning is useless, dismantle the valves separately and clean the components.

3 Dismantling valve

Dismantle every valve separately.

**Note**

For dismantling the valve the tool for valve cartridges (6.2617.020) is required.



- Place the valve with the seal faced downwards above the recess in the holder.
- Push the valve components out of the valve housing using the needle of the tool.

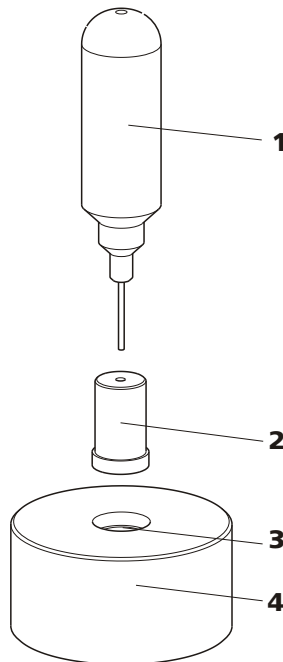


Figure 35 Dismantling valve

1 Needle

For pushing the valve components out of the valve housing.

2 valve

3 Recess

For collecting the valve components.

4 Holder

The components of the valve are collected in the recess of the holder.



Note

The components of the valve are very small. In order not to lose them, put the components into a dish.

- The inlet valve and the outlet valve consist of the same, just differently arranged components (see Figure 36, page 73).

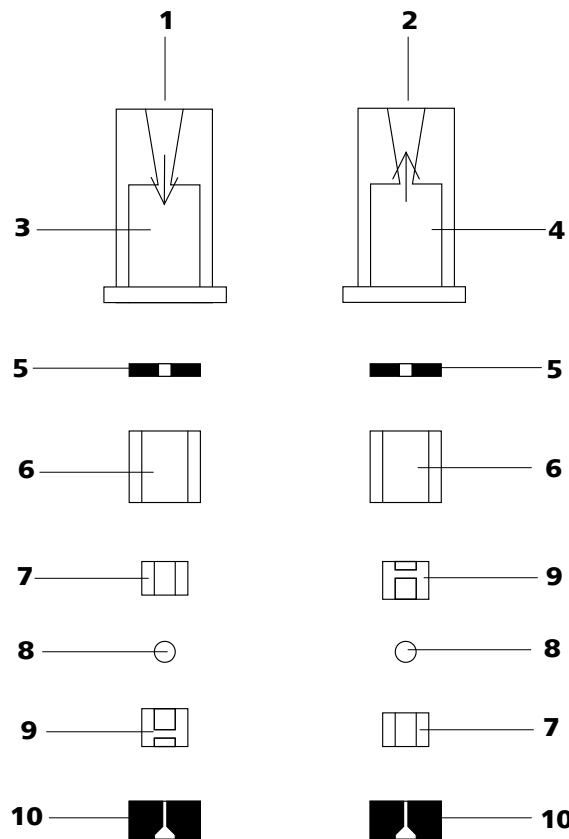


Figure 36 Components of the inlet valve and outlet valve

1	Inlet valve (6.2824.170)	2	Outlet valve (6.2824.160)
3	Inlet valve housing	4	Outlet valve housing
5	Sealing ring (black)	6	Sleeve
7	Sapphire sleeve The shiny side must point to ruby ball.	8	Ruby ball
9	Ceramic holder for ruby ball	10	Seal The larger opening must point outwards.

4 Cleaning the components of the valve

Rinse the valve components with ultrapure water and/or acetone and dry with a lint-free cloth.

5 Reassembling the valve

Reassemble valve components *according to figure 36, page 73*.

- Insert the seal with the larger opening faced downwards into the recess of the tool.
- Lay the other valve components above another in the correct sequence (*see Figure 36, page 73*).



- Place over the valve housing and hold it tightly.
- By tilting the tool, the valve components slide into the valve housing.
- Press the seal by hand well on the valve housing.

6 Checking the flow direction

Rinse the valve in the direction of the arrow on the valve housing and check whether liquid is escaping on the other end.

If this is not the case, the valve has to be dismantled again and be reassembled correctly (see Figure 36, page 73).

7 Inserting the valves back into the pump head



Caution

If by mistake, the inlet valve is mounted instead of the outlet valve, an extreme pressure builds up within the working cylinder, which can destroy the piston seal!

When inserting the valves, please take into account that the liquid is being pumped through the pump head from bottom to top.

- Insert the inlet valve into the inlet valve holder the way the seal is visible.
- Screw the inlet valve holder into the bottom of the pump head and tighten with a wrench (34-4).
- Insert the outlet valve into the outlet valve holder the way the seal is visible.
- Screw the outlet valve holder into the top of the pump head and tighten with a wrench (34-1).

Mounting the pump head



Note

To prevent the pump head from being positioned the wrong way, it is provided with different bore hole depths for the fastening bolts, i. e. a fastening bolt is longer than all others. The bore hole with the greatest depth must therefore be assigned to the longest bolt. If this is not the case, the pump will not function perfectly.

- 1** Mount the pump head on the pump again using the four fastening screws (14-5). Firmly tighten the screws with the hexagon key (6.2621.030).
- 2** Screw connection capillaries (14-1), (14-7) and (14-13) onto the pump head again.

5.6 Inline filter

5.6.1 Maintenance

The inline filter (6.2821.120) comprises the filter housing (37-2), the filter screw (37-4) and the filter (37-3). New filters (37-3) are available under the order number 6.2821.130 (10 items).

The filters (6.2821.130) (37-3) should be changed every 3 months (more frequently at higher backpressure).

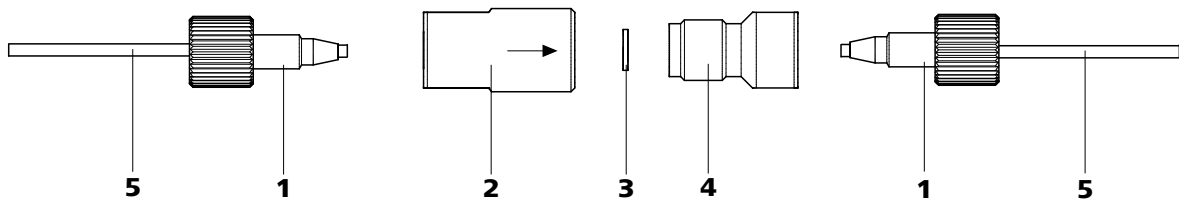


Figure 37 Change filters (of the inline filter)

1 PEEK pressure screws, short
(6.2744.070)

3 Filter (6.2821.130)
Packaging contains 10 items.

5 Connection capillaries

2 Filter housing
Housing of the inline filter. Part of the 6.2821.120 accessories.

4 Filter housing
Screw of the inline filter. Part of the 6.2821.120 accessories.



Changing the filter

The flow must be stopped before changing the filter.

1 Removing the inline filter

- Unscrew the pressure screws (37-1) from the inline filter.

2 Unscrewing the filter screw

- Screw the filter screw (37-4) out of the filter housing (37-2) with the aid of two adjustable wrenches (6.2621.000).

3 Inserting the filter

- Remove the old filter (37-3) using tweezers.
- Place the new filter (37-3) flat in the filter housing (37-2) using tweezers.

4 Mounting filter screw

- Screw the filter screw (37-4) back into the filter housing (37-2) and tighten by hand. Then additionally tighten slightly with two adjustable wrenches (6.2621.000).

5 Remounting the inline filter

- Screw pressure screws (37-1) back onto the inline filter.

6 Rinsing the inline filter

- Dismantle the guard column (if present) and the separation column and replace with a coupling (6.2744.040).
- Rinse the instrument with eluent.

5.7 Inline sample preparation

To protect the separation column (see Chapter 3.19, page 56) against foreign particles which can affect the separating efficiency, we recommend that all samples undergo a microfiltration (filter 0.45 µm). The ultrafiltration cell can be used for **filtration** (see manual of the *IC Equipment for Ultrafiltration*).

Matrix-loaded samples (e.g. blood, oil) should be prepared for the measurement by means of dialysis (see manual on the *IC Equipment for Dialysis*).

If the concentration of the sample is too high, the sample should be **diluted** before feeding (see documentation on the *IC Equipment for Sample Dilution*).

For an overview of all Metrohm inline sample preparation methods go to the following website: <http://misp.metrohm.com>

5.8 Rinsing the sample path

Before a new sample can be measured, the sample path must be rinsed with it so that the measuring result is not falsified by the previous sample (**Sample carry-over**).

In the case of automated sample feeding, the rinsing time should be at least 3 times the **transfer time**.

The transfer time is the time required by the sample to flow from the sample vessel to the end of the sample loop. ##NO_MATCH##.

Ascertaining the transfer time

To ascertain the transfer time, proceed as follows:

1 Emptying the sample path

Pump air through the sample path (pump tubing, tubing connections, sample loop) for several minutes until all liquid is displaced by the air.

2 Aspirating the sample and measuring time

Aspirate a sample typical for the later application and use a stop watch to measure the time required by the sample to travel from the sample vessel to the end of the sample loop.



The time measured corresponds to the "transfer time". The rinsing time should be at least 3 times the transfer time.

Checking the rinsing time

It is possible to determine whether the rinsing time is adequate via a direct measurement of the sample carry-over. Proceed as follows:

1 Preparing two samples

- **Sample A:** A typical sample for the application.
- **Sample sample B:** Ultrapure water.

2 Determining "Sample A"

Let "Sample A" pass through the sample path for the duration of the rinsing time, then inject and measure.

3 Determining "Sample B"

Let "Sample B" pass through the sample path for the duration of the rinsing time, then inject and measure.

4 Calculating the sample carry-over

The degree of the sample carry-over corresponds to the ratio of the peak areas of the measurement for sample B to the measurement for sample A. The lower the ratio, the lower the sample carry-over. This ratio can be modified by varying the rinsing time – thus allowing the rinsing time required for the application to be ascertained.

5.9 Injection valve

5.9.1 Protection

To prevent contamination of the injection valve, a 6.2821.120 inline filter (see Chapter 3.11, page 35) should be mounted between the high pressure pump and the pulsation damper.

5.10 Peristaltic pump

5.10.1 Operation

The pumping capacity of the peristaltic pump depends on the drive speed (set via software), the contact pressure and, above all, the internal diameter of the pump tubing. Depending on the application, different pump tubings are used.



Caution

The service life of the pump tubings also depends on the contact pressure. Therefore fully lift the tubing cartridges by loosening the snap-action lever (**24-10**) on the right-hand side if the peristaltic pump is to be turned off for a longer period. Once set, the contact pressure remains unaffected.



Caution

The 6.1826.xxx pump tubings consist of PVC or PP and therefore must not be used for rinsing with solutions containing acetone. In this case, use other pump tubings or use another pump for rinsing.

5.10.2 Maintenance

5.10.2.1 Pump tubing

The pump tubing used in the peristaltic pump is a consumable whose service life is restricted.

The LFL pump tubing with 3 stoppers is stretched in the tubing cartridge in such a way that it comes to rest between two stoppers. This results in two possible positions for the tubing cartridge. If the pump tubing should exhibit clear signs of wear, then this can be stretched a second time, in the respective alternate position.

Therefore replace the pump tubing periodically, or when used permanently approx. every 4 weeks .

Selecting the pump tubing

The pump tubing differs in material, diameter and hence also pumping capacity. Depending on the application, different pump tubings are used.

The following table provides information on the properties and use of the pump tubing:



Table 2 Pump tubing

Order number	Name	Material	Inner diameter	Use
6.1826.020	Pump tubing (blue/blue), 2-stopper	PVC (Tygon ST)	1.65 mm	Pump tubing for online IC instruments and automation in voltammetry
6.1826.310	Pump tubing LFL (orange/green), 3-stopper	PVC (Tygon)	0.38 mm	Pump tubing for bromate determination using the triiodide method.
6.1826.320	Pump tubing LFL (orange/yellow), 3-stopper	PVC (Tygon)	0.48 mm	For suppressor solutions, acceptor solutions for inline dialysis and for inline ultrafiltration.
6.1826.330	Pump tubing LFL (orange/white), 3-stopper	PVC (Tygon)	0.64 mm	No special applications.
6.1826.340	Pump tubing LFL (black/black), 3-stopper	PVC (Tygon)	0.76 mm	For the sample solution in inline dialysis.
6.1826.360	Pump tubing LFL (white/white), 3-stopper	PVC (Tygon)	1.02 mm	For sample transfer.
6.1826.380	Pump tubing LFL (gray/gray), 3-stopper	PVC (Tygon)	1.25 mm	For inline sample dilution.
6.1826.390	Pump tubing LFL (yellow/yellow), 3-stopper	PVC (Tygon)	1.37 mm	For the sample solution in inline ultrafiltration.

5.10.2.2 Pump tubing connection with filter

The 6.2821.130 filters (38-2) should be changed every 3 months, more frequently at higher backpressure.

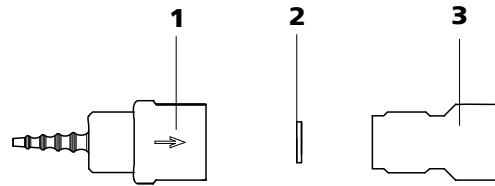


Figure 38 Pump tubing connection – Changing the filter

1 Tubing olive

2 Filter 6.2821.130
Packaging contains 10 items.

3 Filter housing

Replacing the filter

1 Unscrewing filter screw

- Screw the filter screw (38-3) out of the tubing olive (38-1) with the aid of two 6.2621.000 adjustable wrenches.

2 Replacing the filter

- Remove the old filter (38-2) with tweezers.
- Place the new filter (38-2) flat in the tubing olive (38-1) with tweezers.

3 Mounting filter screw

- Screw the filter screw (38-3) back into the tubing olive (38-1) and tighten by hand. Then additionally tighten with two 6.2621.000 adjustable wrenches.

5.11 Metrohm Suppressor Module (MSM)

5.11.1 Protection

To protect the suppressor against foreign particles or bacterial growth, a pump tubing connection with filter (6.2744.180) (see Figure 25, page 47) must be mounted between the peristaltic pump (see Figure 23, page 45) and the inlet capillaries of the suppressor.

5.11.3 Maintenance

5.11.3.1 Parts of the suppressor

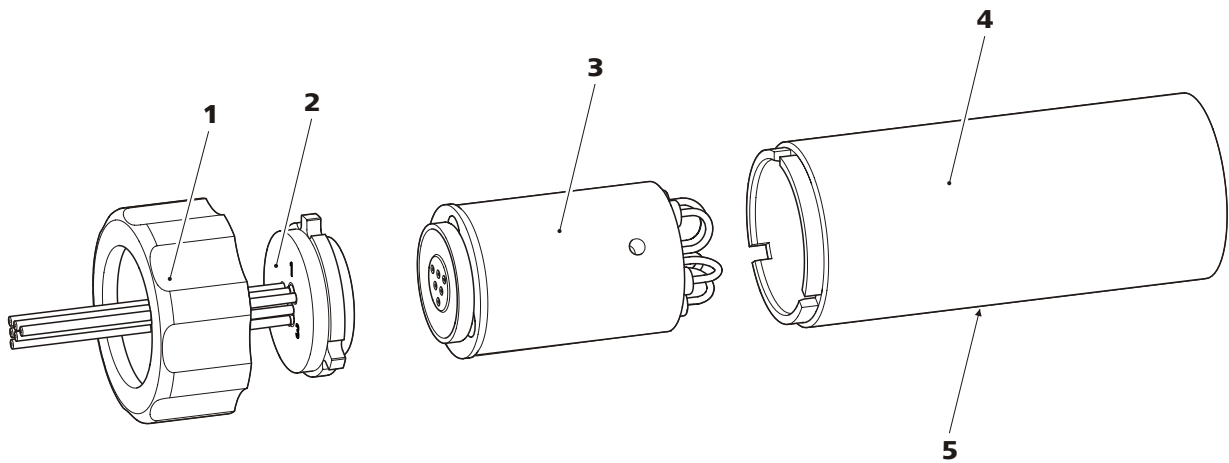


Figure 39 Parts of the suppressor

1	Union nut	2	Connecting piece (6.2832.010)
3	Rotor	4	Housing
5	Slot in the housing		

5.11.3.2 Regenerating the suppressor

If the suppressor units are loaded for a longer period with certain heavy metals (e.g. iron) or organic impurities, these can no longer be completely removed with the standard regeneration solution. The capacity of the suppressor units is consequently affected, which can result in reduced phosphate sensitivity in less serious cases and a significant rise in the baseline in more serious cases.

If such capacity problems occur at one or more positions, all suppressor units must be regenerated with one of the following solutions:

- **Contamination with heavy metals:**
1 mol/L H_2SO_4 + 0.1 mol/L oxalic acid
- **Contamination with organic cationic complexing agents:**
0.1 mol/L H_2SO_4 / 0.1 mol/L oxalic acid / acetone 5%
- **Severe contamination with organic substances:**
0.2 mol/L H_2SO_4 / acetone \geq 20%



Caution

The pump tubings made of PVC must not be used for rinsing with solutions containing organic solvents.

We recommend to use the high pressure pump for regeneration.



Regenerating the suppressor

1 Disconnecting the suppressor from the IC system

- Disconnect the capillaries of the suppressor labeled with *regenerant* and *rinsing solution* from the IC system.

2 Connecting the suppressor to the high pressure pump

- Connect the inlet capillary for the regeneration solution (labeled with *regenerant*) to the outlet of the high pressure pump with the aid of a coupling (6.2744.040)

3 Regenerating the suppressor

- Regenerate the first suppressor unit for about 15 minutes.
- In the software, use the **Step** command to switch to the second suppressor unit and regenerate this for about 15 minutes.
- In the software, use the **Step** command to switch to the third suppressor unit and regenerate this for about 15 minutes.

4 Rinsing the suppressor

After regeneration, the three suppressor units must be rinsed with degassed ultra pure water for about 15 minutes.

- Remove the inlet capillary for the regeneration solution (labeled with *regenerant*) from the outlet of the high pressure pump.
- Connect the inlet capillary for the rinsing solution (labeled with *rinsing solution*) to the outlet of the high pressure pump with the aid of a coupling (6.2744.040).
- Rinse the first suppression unit with degassed ultra pure water for about 15 minutes.
- In the software, use the **Step** command to switch to the second suppressor unit and rinse this for about 15 minutes.
- In the software, use the **Step** command to switch to the third suppressor unit and rinse this for about 15 minutes.

5 Connect the suppressor to the IC system

- Reconnect the capillaries labeled *regenerant* and *rinsing solution* to the IC system.

5.11.3.3 Cleaning the suppressor

In the following cases, it may be necessary to clean the suppressor:

- Increased backpressure onto the connection tubings of the suppressor..
- Blockage of the suppressor which cannot be eliminated (solutions can no longer be pumped through the suppressor).
- Jamming of the suppressor which cannot be eliminated (suppressor can no longer be switched over).

Cleaning the suppressor

Clean the suppressor as follows:

1 Disconnecting the suppressor from the IC system

- Switch off the instrument.
- Disconnect all capillaries of the suppressor from the IC system.

2 Dismantling the suppressor

- Unscrew union nut (39-1) from the housing (39-4).
- Pull the connecting piece (39-2) and the rotor (39-3) out of the housing.
The connecting piece and the rotor normally stick to one another – if this is not the case: Take a sharp object, insert it into the slot of the housing (39-5) and pull out the rotor in this way.
- Detach the connecting piece from the rotor.

3 Cleaning the inlets and outlets

- Connect in turn each of the 6 PTFE capillaries fastened on the connecting piece (39-2) to the high pressure pump (see Chapter 3.10, page 31) and pump through ultrapure water.
- Check whether solution emerges at the connecting piece. If one of the inlets or outlets remains blocked, the connecting piece must be replaced (order number 6.2835.010) (see "Replacing parts of the suppressor", page 87).

4 Cleaning the rotor

- Clean the surface of the rotor (39-3) with ethanol using a lint-free cloth.



5 Inserting the rotor



Caution

An incorrectly inserted rotor can be **destroyed** during start-up.

- Insert the rotor (39-3) into the housing (39-4) in such a way that the tubing connections on the rear of rotor fit into the corresponding recesses inside the housing and one of the three holes of the rotor is visible from below in the slot of the housing (39-5).
- If the rotor is correctly inserted, its sealing surface will be approx. 4 mm within the housing. If this is not the case, the rotor must be moved into the right position from below using a sharp object.

6 Cleaning the connecting piece

- Clean the surface of the connecting piece (39-2) with ethanol using a lint-free cloth.

7 Inserting the connecting piece

- Insert the connecting piece (39-2) into the housing in such a way that the connector 1 is on top and the three pins of the connecting piece fit into the corresponding recesses on the housing.
- Reattach the union nut (39-1) onto the housing and tighten by hand (do not use a tool).

8 Connecting and conditioning the suppressor

- Reconnect the suppressor to the IC system.
- Before switching the suppressor over for the first time, rinse each of the three suppressor units with solution for 5 minutes.

5.11.3.4 Replacing parts of the suppressor

In the following cases, it might be necessary to replace parts of the suppressor:

- Loss of suppression capacity which cannot be eliminated (reduced phosphate sensitivity and/or significant rise in the baseline).
- Blockage of the suppressor which cannot be eliminated (solutions can no longer be pumped through the suppressor).

Both the rotor and the connecting piece can be replaced.

Replacing parts of the suppressor

Replace the parts of the suppressor as follows:

1 Disconnecting the suppressor from the IC system

- Switch off the instrument.
- Disconnect all capillaries of the suppressor from the IC system.

2 Dismantling the suppressor

- Unscrew union nut (39-1) from the housing (39-4).
- Pull the connecting piece (39-2) and the rotor (39-3) out of the housing.

The connecting piece and the rotor normally stick to one another – if this is not the case: Take a sharp object, insert it into the slot of the housing (39-5) and pull out the rotor in this way.

- Detach the connecting piece from the rotor.

3 Cleaning the new rotor

- Clean the surface of the new rotor (39-3) with ethanol using a lint-free cloth.

4 Inserting the new rotor



Caution

An incorrectly inserted rotor can be **destroyed** during start-up.

- Insert the new rotor (39-3) into the housing (39-4) in such a way that the tubing connections on the rear of rotor fit into the corresponding recesses inside the housing and one of the three holes of the rotor is visible from below in the slot of the housing (39-5).
- If the rotor is correctly inserted, its sealing surface will be approx. 4 mm within the housing. If this is not the case, the rotor must be moved into the right position from below using a sharp object.

5 Cleaning the new connecting piece

- Clean the surface of the new connecting piece (39-2) with ethanol using a lint-free cloth.



6 Inserting the new connecting piece

- Insert the connecting piece (39-2) into the housing (39-4) in such a way that the connector 1 is on top and the three pins of the connecting piece fit into the corresponding recesses on the housing.
- Reattach the union nut (39-1) onto the coupling and tighten by hand..

7 Connecting and conditioning the suppressor

- Reconnect all capillaries of the suppressor to the IC system.
- Before switching the suppressor over for the first time, rinse the three suppressor units with solution for 5 minutes.

5.12 Separation column

5.12.1 Separating efficiency

Which analysis quality can be attained, depends to a great extent on the separating efficiency of the separation column used. The separating efficiency of the selected separation column must be sufficient for the analysis problems present. If difficulties occur, you should always first check the quality of the separation column by recording a standard chromatogram.

You can find detailed information on the separation columns available from Metrohm in the leaflet provided along with your separation column, in the **Metrohm IC-Column Program** (available via your Metrohm agent) or in the Internet at <http://www.metrohm.com> in the product area Ion chromatography. You can request free information on special IC applications in the corresponding "**Application Bulletins**" or "**Application Notes**", which are available in the Internet at <http://www.metrohm.com> in the Applications area or via the Metrohm agent responsible.

5.12.2 Protection

To protect the separation column against foreign particles, which can affect the separating efficiency, we recommend that both the eluent and the samples undergo a microfiltration (filter 0.45 µm) before being aspirated via the aspiration filter (6.2821.090).

We recommend always to use a guard column (*see Chapter 3.18, page 54*). This protects the separation column and considerably increases its service life. Information regarding which guard column is suitable for your separation column can be found in the **Metrohm IC Column Program** (which is available from your Metrohm agent), the leaflet provided along with your separation column, the product information on the separation

column at <http://www.metrohm.com> (product area Ion Chromatography) or obtained directly from your agent.

The pulsation absorber (see Chapter 3.12, page 36) must be installed in order to protect the column material from pressure concussion caused by injection.

5.12.3 Storage

Always store the separation columns sealed and filled according to the data of the column manufacturer when not using them.

5.12.4 Regeneration



Note

The regeneration is considered as the last measure, and not to be carried out regularly.

If the separating properties of the column have deteriorated, the column can be regenerated according to the specifications of the column manufacturer. In the case of separation columns available from Metrohm, the specification for regeneration can be found on the leaflet provided along with each column.

5.13 Quality Management and validation with Metrohm

Quality Management

Metrohm offers you comprehensive support in implementing quality management measures for instruments and software. Further information on this can be found in the brochure «**Quality Management with Metrohm**» available from your local Metrohm agent.

Validation

Please contact your local Metrohm agent for support in validating instruments and software. Here you can also obtain validation documentation to provide help for carrying out the **Installation Qualification** (IQ) and the **Operational Qualification** (OQ). IQ and OQ are also offered as a service by the Metrohm agents. In addition, various application bulletins are also available on the subject, which also contain **Standard Operating Procedures** (SOP) for testing analytical measuring instruments for reproducibility and correctness.

Maintenance

Electronic and mechanical functional groups in Metrohm instruments can and should be checked as part of regular maintenance by specialist personnel from Metrohm. Please ask your local Metrohm agent regarding the



precise terms and conditions involved in concluding a corresponding maintenance agreement.



Note

You can find information on the subjects of quality management, validation and maintenance as well as an overview of the documents currently available at www.metrohm.com/com/ under **Support**.

6 Troubleshooting

6.1 Problems and their solutions

Problem	Cause	Remedy
Marked drop in pressure	<i>Leak in the system.</i>	Check all capillary connections and seal leaks, if necessary (see Chapter 3.5, page 17).
	<i>Inline filter (6.2821.120) blocked.</i>	Replace the filter (6.2821.130) (see Chapter 5.6, page 75).
	<i>Suppressor – blocked.</i>	<ul style="list-style-type: none"> Regenerate the suppressor (see Chapter 5.11.3.2, page 83). <p>Note: 6.2821.180 pump tubing connection with filter must be used.</p>
	<i>Guard column – blocked.</i>	Replace guard column (see Chapter 3.18, page 54).
	<i>Separation column – blocked.</i>	<ul style="list-style-type: none"> Regenerate separation column (see Chapter 5.12.4, page 89). Replace separation column (see "Connecting and rinsing the separation column", page 57). <p>Note: Samples should always be microfiltered (see Chapter 5.7, page 77).</p>
	<i>Injection valve – valve blocked.</i>	Have the valve cleaned (by Metrohm service technicians).
Drift of the baseline	<i>Thermal equilibrium not yet attained.</i>	Condition instrument with the column heater (see Chapter 3.14, page 40) switched on (see Chapter 4.2, page 59).
	<i>Leak in the system.</i>	Check all capillary connections and seal leaks, if necessary (see Chapter 3.5, page 17).
	<i>Eluent – Evaporation of the organic solvent in the eluent.</i>	Check the eluent bottle attachment (see Figure 10, page 27).
Peak areas lower than expected	<i>Sample – leak in the sample path.</i>	Check the sample path.



Problem	Cause	Remedy
	<i>Sample – blockage in the sample path.</i>	Check the sample path.
	<i>Sample – sample loop not (completely) filled.</i>	Prolong the sample transfer time.
Peristaltic pump – insufficient or no delivery rate	<i>Peristaltic pump – contact pressure too weak.</i>	Correctly set contact pressure (see "Set flow rate", page 49).
	<i>Peristaltic pump – filter blocked.</i>	Replace the filter (see Chapter 5.10.2.2, page 80).
	<i>Peristaltic pump – pump tubing defective.</i>	Replace pump tubing (see Chapter 5.10.2.1, page 79).
Very noisy baseline	<i>High pressure pump – contaminated pump valves.</i>	Clean pump valves (see Chapter 5.5.2, page 65).
	<i>Eluent – Leak in the eluent path.</i>	Check the eluent path
	<i>Eluent – Blockage in the eluent path.</i>	Check the eluent path
	<i>High pressure pump – defective piston seals.</i>	Replace (see Chapter 5.5.2, page 65) piston seals .
	<i>Pulsation absorber not connected. or defective.</i>	Connect pulsation absorber (see Chapter 3.12, page 36). or replace it.
Background conductivity too high	<i>Suppressor – not connected.</i>	Connect the suppressor (see Chapter 3.16.1, page 50).
	<i>Incorrect eluent.</i>	Change eluent (see Chapter 5.4.2.3, page 64).
	<i>Suppressor – regeneration or rinsing solution flow problems.</i>	Check the flow of the regeneration solution and the rinsing solution.
Data of the separation column cannot be read.	<i>Column chip contaminated.</i>	Clean the contact surfaces of the column chip (with alcohol).
	<i>Column chip defective.</i>	1. Save column configuration in MagIC Net™. 2. Notify Metrohm Service.
Individual peaks greater than expected	<i>Sample – carry-over of the samples from previous measurement.</i>	Rinse system longer between two samples.

Problem	Cause	Remedy
Poor reproducibility of the retention times	<i>Eluent – Leak in the eluent path.</i>	Check the eluent path
	<i>Eluent – Blockage in the eluent path.</i>	Check the eluent path
Suppressor – No (or insufficient) pumping of regeneration or rinsing solution	<i>Leak in the system.</i>	Check connections.
	<i>Peristaltic pump – contact pressure too weak.</i>	Correctly set contact pressure (see "Set the contact pressure", page 49).
	<i>Peristaltic pump – filter blocked .</i>	Replace the filter (see "Replacing the filter", page 81).
	<i>Suppressor – backpressure too high.</i>	Clean the suppressor (see Chapter 5.11.3.3, page 85) or replace parts (see Chapter 5.11.3.4, page 86).
Chromatograms have poor resolution	<i>Peristaltic pump – pump tubing defective.</i>	Replace pump tubing.
	<i>Separation column – diminished separating efficiency.</i>	<ul style="list-style-type: none"> ▪ Regenerate separation column (see Chapter 5.12.4, page 89). ▪ Replace separation column (see "Connecting and rinsing the separation column", page 57).
Extreme spread of the peaks in the chromatogram. Splitting (dual peaks)	<i>Capillary connections – dead volume in the system.</i>	Check connections (see Chapter 3.5, page 17) (use PEEK capillaries with an internal diameter of 0.25 mm between the injection valve and detector).
	<i>Guard column – diminished performance.</i>	<ul style="list-style-type: none"> ▪ Replace guard column (see Chapter 3.18, page 54).
	<i>Separation column – dead volume at column head.</i>	<ul style="list-style-type: none"> ▪ Install the separation column in reverse flow direction (if permitted by the leaflet) and rinse into a beaker. ▪ Replace separation column (see "Connecting and rinsing the separation column", page 57).
Greater rise in the baseline	<i>Suppressor – reduced capacity.</i>	Regenerate the suppressor (see Chapter 5.11.3.2, page 83).



Problem	Cause	Remedy
Precision problems - significant scattering of the measured values	<i>Injection valve – sample loop.</i>	Check installation of the sample loop (see Chapter 3.13.1, page 37).
	<i>Sample – rinsing volume too low.</i>	Increase rinsing time (see Chapter 5.8, page 77).
	<i>Injection valve – defective.</i>	Request Metrohm Service.
Unexpected change to the retention times in the chromatograms	<i>Separation column – diminished separating efficiency.</i>	<ul style="list-style-type: none"> ▪ Regenerate separation column (see Chapter 5.12.4, page 89). ▪ Replace separation column (see "Connecting and rinsing the separation column", page 57).
	<i>Eluent – Gas bubbles in the eluent.</i>	Check connections of the eluent degasser (see Chapter 3.9, page 29).
	<i>High pressure pump – defective.</i>	Request Metrohm Service.
Vacuum is not being built	<i>Eluent Degasser – Connector Vacuum on the rear of the instrument not (tightly) sealed.</i>	<ul style="list-style-type: none"> ▪ Seal the connector Vacuum tightly with a 6.1446.040 threaded stopper.

7 Technical specifications

7.1 Reference conditions

The technical data listed in this Chapter refers to the following reference conditions:

<i>Ambient temperature</i>	+25 °C (± 3 °C)
<i>Instrument status</i>	> 40 minutes in operation (equilibrated)

7.2 Instrument

<i>IC system</i>	<ul style="list-style-type: none"> ▪ Metal-free IC system ▪ Compact system with modular design
<i>Material</i>	Painted polyurethane hard foam without CFCs, fire class V0
<i>Operating pressure range</i>	<ul style="list-style-type: none"> ▪ 0...50 MPa (500 bar) high pressure pump ▪ 0...35 MPa (350 bar) standard-PEEK system
<i>Intelligent components</i>	iPump, iDetector, iColumn, intelligent Dosino, MagIC Net

7.3 Leak sensor

<i>Type</i>	Electronic, no calibration necessary
-------------	--------------------------------------

7.4 Ambient conditions

<i>Operation</i>	
<i>Ambient temperature</i>	+5...+45 °C
<i>Humidity</i>	20...80 % relative humidity
<i>Storage</i>	
<i>Ambient temperature</i>	-20...+70 °C
<i>Transport</i>	
<i>Ambient temperature</i>	-40...+70 °C



7.5 Housing

Dimensions

<i>Width</i>	302 mm
<i>Height</i>	562 mm
<i>Depth</i>	368 mm

Material of base tray, housing and covering plate Polyurethane hard foam (PUR) with flame retardation for fire class UL94V0, CFC-free, coated

Operating elements

<i>Indicators</i>	LED for power display
<i>On/Off switch</i>	On the rear panel of the instrument

7.6 Eluent degasser

<i>Material</i>	fluoropolymer
<i>Resistance to solvents</i>	No restriction (apart from PFC)
<i>Build-up time for the vacuum</i>	< 60 s

7.7 High pressure pump

<i>Type</i>	<ul style="list-style-type: none"> ▪ Serial dual-piston pump ▪ Intelligent pump head recognition ▪ Chemically inert ▪ Metal-free pump heads ▪ Materials in contact with eluent: PEEK, ZrO₂, PTFE/PE ▪ Self-optimizing flow and pressure
-------------	--

Flow rate

<i>Adjustable flow range</i>	0.001...20.0 mL/min
<i>Flow increment</i>	1 µL/min
<i>Reproducibility of the eluent flow</i>	< 0.1 % deviation

Pressure range

<i>Pump</i>	0...50.0 MPa (0...500 bar)
<i>Pump head</i>	0...35.0 MPa (0...350 bar) (applies for the standard PEEK pump head)
<i>Residual pulsation</i>	< 1 %

Safety shutdown

<i>Function</i>	Automatic shutdown upon reaching the pressure limit values
<i>Maximum pressure limit</i>	<ul style="list-style-type: none"> ▪ Adjustable from 0.1...50 MPa (1...500 bar) ▪ The pump is automatically shut down at the first piston stroke above the maximum limit value
<i>Minimum pressure limit</i>	<ul style="list-style-type: none"> ▪ Adjustable from 0...49 MPa (0...490 bar) ▪ The shutdown mechanism is inactive at 0 MPa ▪ The shutdown mechanism only becomes active 2 minutes after system start ▪ The pump is automatically shut down after 3 piston strokes below the minimum pressure limit

7.8 Injection valve

<i>Actuator time</i>	typ.100 ms
<i>Max. operating pressure</i>	35 MPa (350 bar)
<i>Material</i>	PEEK

7.9 Column heater

<i>Type</i>	Resistance heater for the thermostatzation of one integrated column with a length of up to 300 mm.
<i>Adjustable temperature range</i>	+ 0...+ 80 °C, in increments of 0.1 °C
<i>Heating</i>	Ambient temperature + 5 °C ... Ambient temperature + 40 °C
<i>Temperature reproducibility</i>	± 0.2 °C
<i>Stability</i>	< 0.05 °C
<i>Heating up time</i>	< 30 minutes from 20 to 40 °C



7.10 Peristaltic pump

<i>Type</i>	2-channel peristaltic pump
<i>Rotating direction</i>	Counterclockwise/Clockwise rotation
<i>Rotational speed</i>	0...42 rpm in 7 stages at 6 rpm.
<i>Pumping properties</i>	0.3 mL/min at 18 rpm; with 6.1826.320 standard pump tubing.
<i>Material of pump tubings</i>	recommended: Tygon Long Flex Life

7.11 Metrohm Suppressor Module (MSM)

<i>Resistance to solvents</i>	100 % no restriction
<i>Switching time</i>	typ.100 ms

7.12 Mains connection

<i>Required voltage</i>	100...240 V \pm 10 % (autosensing)
<i>Required frequency</i>	50...60 Hz \pm 3 Hz (autosensing)
<i>Power consumption</i>	<ul style="list-style-type: none"> ▪ 65 W for typical analysis application ▪ 25 W standby (conductivity detector to 40 °C)
<i>Power supply unit</i>	<ul style="list-style-type: none"> ▪ Up to 300 W maximum, electronically monitored ▪ internal fuse 3.15 A

7.13 Interfaces

<i>USB</i>	
<i>Input</i>	1 USB upstream, type B (for connection to the PC)
<i>Output</i>	2 USB downstream, type A
<i>MSB</i>	2 MSB Mini-DIN 8-pin (female) (for Dosino, stirrer, remote lines, ...)



Caution

When connecting an instrument to the MSB connector you **must** switch off the 881 Compact IC pro.

<i>Detector</i>	1 DSUB-15-pin high density (female)
<i>Column recognition</i>	for an intelligent column
<i>Leak sensor</i>	1 jack plug
<i>Further connections</i>	
<i>Auxiliary</i>	1 DSUB 15-pin (female)
<i>Service</i>	1 DSUB 15-pin (female)

7.14 Safety specification

<i>Design and testing</i>	<ul style="list-style-type: none"> ▪ EN/IEC 61010-1 ▪ UL 61010-1 ▪ CSA-C22.2 No. 61010-1 ▪ Protection class I
---------------------------	---

7.15 Electromagnetic compatibility (EMC)

<i>Emission</i>	<ul style="list-style-type: none"> ▪ EN/IEC 61326-1 ▪ EN/IEC 61000-6-3 ▪ EN 55022 / CISPR 22 ▪ EN/IEC 61000-3-2 ▪ EN/IEC 61000-3-3
<i>Immunity</i>	<ul style="list-style-type: none"> ▪ EN/IEC 61326-1 ▪ EN/IEC 61000-6-2 ▪ EN/IEC 61000-4-2 ▪ EN/IEC 61000-4-3 ▪ EN/IEC 61000-4-4 ▪ EN/IEC 61000-4-5 ▪ EN/IEC 61000-4-6 ▪ EN/IEC 61000-4-8 ▪ EN/IEC 61000-4-11 ▪ EN/IEC 61000-4-14 ▪ NAMUR



7.16 Weight

1.881.0020

21.3 kg (without accessories)

8 Conformity and warranty

8.1 Declaration of Conformity

This is to certify the conformity to the standard specifications for electrical appliances and accessories, as well as to the standard specifications for security and to system validation issued by the manufacturing company.

Name of commodity

881 Compact IC pro

The 881 Compact IC pro is an intelligent ion chromatograph in a compact design for the determination of anions, cations or polar substances.

This instrument has been built and has undergone final type testing according to the standards:

Electromagnetic compatibility

Emission: EN/IEC 61326-1: 2006, EN/IEC 61000-6-3: 2004, EN 55022 / CISPR 22: 2006, EN/IEC 61000-3-2: 2006, EN/IEC 61000-3-3: 2005

Immunity: EN/IEC 61326-1: 2006, EN/IEC 61000-6-2: 2005, EN/IEC 61000-4-2: 2001, EN/IEC 61000-4-3: 2002, EN/IEC 61000-4-4: 2004, EN/IEC 61000-4-5: 2001, EN/IEC 61000-4-6: 2001, EN/IEC 61000-4-8: 2001, EN/IEC 61000-4-11: 2004, EN/IEC 61000-4-14: 2004, NAMUR: 2004

Safety specifications

EN/IEC 61010-1: 2001, UL 61010-1: 2004, CSA-C22.2 No. 61010-1: 2004, protection class I



This instrument meets the requirements of the CE mark as contained in the EU directives 2006/95/EC (LVD), 2004/108/EC (EMC). It fulfils the following specifications:

EN 61326-1 Electrical equipment for measurement, control and laboratory use – EMC requirements

EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use



Manufacturer

This instrument meets the requirements of the ETL Listed Mark for the North American market. It conforms to the electrical safety standards UL 61010-1 and CSA-C22.2 No. 61010-1. This product is listed in Intertek's Directory of Listed Products.

Metrohm Ltd., CH-9101 Herisau/Switzerland

Metrohm Ltd. is holder of the SQS-certificate ISO 9001:2000 Quality management system for development, production and sales of instruments and accessories for ion analysis.

Herisau, 27 October, 2008

D. Strohm

Vice President, Head of R&D

Ch. Buchmann

Vice President, Head of Production

Responsible for Quality Assurance

8.2 Quality Management Principles

Metrohm Ltd. holds the ISO 9001:2000 Certificate, registration number 10872-02, issued by SQS (Swiss Association for Quality and Management Systems). Internal and external audits are carried out periodically to assure that the standards defined by Metrohm's QM Manual are maintained.

The steps involved in the design, manufacture and servicing of instruments are fully documented and the resulting reports are archived for ten years. The development of software for PCs and instruments is also duly documented and the documents and source codes are archived. Both remain the possession of Metrohm. A non-disclosure agreement may be asked to be provided by those requiring access to them.

The implementation of the ISO 9001:2000 quality management system is described in Metrohm's QM Manual, which comprises detailed instructions on the following fields of activity:

Instrument development

The organization of the instrument design, its planning and the intermediate controls are fully documented and traceable. Laboratory testing accompanies all phases of instrument development.

Software development

Software development occurs in terms of the software life cycle. Tests are performed to detect programming errors and to assess the program's functionality in a laboratory environment.

Components

All components used in the Metrohm instruments have to satisfy the quality standards that are defined and implemented for our products. Suppliers of components are audited by Metrohm as the need arises.

Manufacture

The measures put into practice in the production of our instruments guarantee a constant quality standard. Production planning and manufacturing procedures, maintenance of production means and testing of components, intermediate and finished products are prescribed.

Customer support and service

Customer support involves all phases of instrument acquisition and use by the customer, i.e. consulting to define the adequate equipment for the analytical problem at hand, delivery of the equipment, user manuals, training, after-sales service and processing of customer complaints. The Metrohm service organization is equipped to support customers in implementing standards such as GLP, GMP, ISO 900X, in performing Operational Qualification and Performance Verification of the system components or in carrying out the System Validation for the quantitative determination of a substance in a given matrix.

8.3 Warranty (Guarantee)

Metrohm guarantees that the deliveries and services it provides are free of errors in materials, design or manufacturing.

The general warranty period is 36 months (exclusions below) from the date of delivery or 18 months in the event of continuous operation. The warranty remains valid on the condition that the service is provided by an authorized Metrohm Service Organization at defined intervals and with a defined scope.

The warranty period for the suppressors "MSM II" and "MSM-HC" is 120 months from the date of delivery or 60 months in the event of continuous operation.

The warranty period for IC separation columns is 12 months from the date of delivery or 6 months in the event of continuous operation. The technical specifications contained in the manual are authoritative for warranty of accuracy.



For third-party components that are recognizable as such, the manufacturer's warranty regulations apply.

Consumables and materials with limited storage life and glass breakage in the case of electrodes or other glass parts are excluded from the warranty.

Warranty claims cannot be asserted if the customer has failed to meet his payment obligations according to schedule.

During the warranty period, Metrohm undertakes either to replace free of charge or to credit the purchaser for any instruments, assemblies or components that can be shown to be faulty. Any transport or customs fees that may apply are the ordering party's responsibility.

The precondition for this is that the ordering party must use the Return Material Authorization (RMA) to report the faulty part, along with specification of the article number, the article designation, an adequate error description, the delivery date and (if applicable) the serial number. In addition, the ordering party undertakes to store the faulty part for at least 2 years in accordance with current storage directives (in compliance with ESD guidelines) and to hold it in readiness for onsite inspection or for return shipment to Metrohm. Metrohm reserves the right to invoice the ordering party for these articles, including retroactively, in the event of noncompliance with these pre-conditions.

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc. are expressly excluded from the warranty.

Metrohm also offers a 120-month spare parts warranty and a 5-year PC software support warranty, calculated from the date on which the product is withdrawn from the market. The content of this warranty is the ability of the customer to obtain functioning spare parts or appropriate software support at market prices during the time of the warranty period.

If Metrohm AG is unable to meet this obligation due to circumstances beyond the control of Metrohm AG, then the ordering party shall be offered alternative solutions at preferential conditions.

9 Accessories








Note




Subject to change without notice.

9.1 Scope of delivery






2.881.0020 881 Compact IC pro – Anion

Qty.	Order no.	Description	
1	1.881.0020	881 Compact IC pro – Anion	
1	6.2122.0x0	Mains cable with C13 line socket IEC-60320-C13	
		Cable plug according to customer requirements.	
		Switzerland:	Type SEV 12 6.2122.020
		Germany, ...:	Type CEE(7), VII 6.2122.040
		USA, ...:	Type NEMA/ASA 6.2122.070
2	6.1602.150	Bottle attachment / GL 45 - 3 x UNF 10/32	
		For connecting capillary tubing 1/16 in. Used with MSM auxiliary solutions and in inline dialysis	
		Material:	Plastic
			
1	6.1602.160	Eluent bottle attachment GL 45	
		For eluent bottles; with connections for adsorber tube and aspiration tubing.	
		Opening ground joint:	A-14/15
			

Qty.	Order no.	Description	
2	6.1608.020	Glass bottle / 1000 mL / GL 45	
		Bottle for auxiliary solutions	
		Width (mm):	96
		Height (mm):	223
		Volume (mL):	1000
			
1	6.1608.070	Eluent bottle / 2 L / GL 45	
		Material:	Clear glass
		Height (mm):	262
		Volume (mL):	2000
			
1	6.1609.000	Adsorber tube / large and bent	
		For filling with adsorber material.	
		Material:	Glass
		Height (mm):	129
		Inner diameter (mm):	32
		SGJ size:	B-14/15
			
1	6.1803.020	PTFE capillary 0.97 mm i.d. / 5 m	
		For all IC instruments	
		Material:	PTFE
		Outer diameter (mm):	1.57
		Inner diameter (mm):	0.97
		Length (m):	5
			

Qty.	Order no.	Description	
1	6.1803.040	PTFE capillary 0.5 mm i.d. / 1 m Capillary for sample handling in IC. Material: PTFE Outer diameter (inches): 1/16 Inner diameter (mm): 0.5 Length (m): 1	
1	6.1807.010	Y connector for tubing i.d. 6-9 mm Connector for waste tubings	
1	6.1815.010	Spiral band / 0.5 m For holding together different cables or tubing. Length (m): 0.5	



Qty.	Order no.	Description	
2	6.1816.020	Silicone tubing 6 mm i.d. / 1 m For drainage tubings. Material: Silicone rubber Outer diameter (mm): 9 Inner diameter (mm): 6 Length (m): 1	
2	6.1826.320	Pump tubing LFL (orange/yellow) , 3-stop- per For suppressor solutions, acceptor solutions for inline dialysis and for inline ultrafiltration.	
1	6.2023.020	Clip for SGJ 14/15 Clip for SGJ 14/15 Material: POM	
1	6.2151.020	Cable USB A - USB B / 1.8 m USB connecting cable Length (m): 1.8	
1	6.2251.000	Colored sleeves for capillaries Colored pieces of heat shrink tubing for capillary coding. Three pieces each of five different colors.	





Qty.	Order no.	Description	
1	6.2322.010	PRIMUS multi anion standard solution: Promo	
1	6.2617.010	Tool for piston seal For removing and assembling the piston seal for all standard pump heads	
2	6.2621.000	Adjustable wrench Maximum opening: 20 mm. For IC instruments Length (mm): 150	
1	6.2621.030	Hexagon key 4 mm Length (mm): 73	



Qty.	Order no.	Description	
1	6.2621.050	1/4 in. wrench For 1/4 in. screws. For IC instruments Length (mm): 73	
1	6.2621.080	Capillary cutter For plastic capillaries. For IC instruments Length (mm): 118	
1	6.2621.100	Hexagon key 3 mm Hexagon key 3 mm. For IC Sample Processors Length (mm): 73	


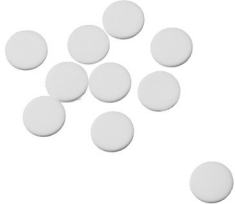
Qty.	Order no.	Description
1	6.2626.000	Front drain nozzle Drain nozzle for Professional IC instruments to be mounted on the front of the instrument.
		
2	6.2739.000	Wrench For tightening connectors Length (mm): 68
		
1	6.2743.080	Stoppers for overflow, 5 pieces For Professional IC instruments
		
1	6.2744.014	Pressure screw 2x With UNF 10/32 connection. For the connection of PEEK capillaries Material: PEEK Length (mm): 26
		



Qty.	Order no.	Description
2	6.2744.020	Luer/UNF coupling For IC instruments Material: PEEK Length (mm): 19
		
1	6.2744.034	Coupling olive/UNF 10/32 2x Connection of pressure screw and pump tubing. 2 pieces. For IC instruments with peristaltic pumps
		
2	6.2744.040	2 x UNF 10/32 coupling For connecting 1/16 in. capillaries. For IC instruments Material: PEEK Length (mm): 24
		
2	6.2744.070	Pressure screw short Short version. With UNF 10/32 connection. 5 pieces. For the connection of PEEK capillaries Material: PEEK Length (mm): 21
		


Qty.	Order no.	Description	
2	6.2744.180	Pump tubing connection with safety device and filter	
		For the connection of a pump tubing and a capillary with built-in filter Material: PEEK	
1	6.2744.210	Tubing adapter for aspiration filter	
		For Professional IC instruments	
1	6.2816.020	Syringe 10 mL with Luer connection	
		For different usage in IC and VA	
		Material: PP	
		Length (mm): 102	
		Volume (mL): 10	
1	6.2816.040	Purging needle	
		With PTFE tubing and Luer connection. For syringes. For aspirating eluents.	



Qty.	Order no.	Description	
1	6.2821.090	Aspiration filter Pore size 20 µm. Set of 5 pieces. For 6.1834.000 aspiration tubing and 6.1821.040 and 6.1821.050 filter tubes. Material: PE Outer diameter (mm): 9.5 Length (mm): 35.5	
1	6.2821.130	Spare filter for inline filter Spare filter for inline filter.	

9.2 Optional accessories

2.881.0020 881 Compact IC pro – Anion

Order no.	Description	
2.850.9010	850 Professional IC Detector – iDetector Compact and intelligent High Performance Conductivity Detector for intelligent IC Instruments. Outstanding temperature stability, the complete signal processing within the protected detector block and the latest generation of «DSP» – Digital Signal Processing – guarantee the highest precision for the measurement. No change of measuring ranges – not even automatic – is required due to the dynamic working range.	



6.2617.040 Tool for piston seal Macro

For removing and assembling the piston seal for Macro pump heads



Order no.	Description	
6.2741.040	PE/PTFE piston seal Macro For all Macro pump heads	
6.2824.130	Macro pump head PEEK Macro pump head for intelligent IC instruments, flow range 0.1...20 mL/min, maximum pressure 12.5 MPa. Material: PEEK (metal-free)	
6.5333.000	IQ/OQ Kit for IC The IQ/OQ Kit contains all parts and standard solutions required for IQ/OQ in ion chromatography.	
6.6059.221	MagIC Net™ 2.2 Compact CD: 1 license Professional PC program for controlling an intelligent Compact IC systems and an Autosampler or a 771 Compact Interface. The software permits control, data acquisition, evaluation and monitoring as well as report generation of ion chromatographic analyses. Graphics user interface for routine operations, extensive database programs, method development, configuration and manual system control; very flexible user administration, efficient database operations, extensive data export functions, individually configurable report generator, control and monitoring of all system components and the chromatography results. MagIC Net™ Compact complies fully with FDA Regulation 21 CFR Part 11 as well as GLP. Dialog languages: German, English, French, Spanish, Chinese, Korean, Japanese, et. al. 1 license.	
6.6059.222	MagIC Net™ 2.2 Professional CD : 1 license Professional PC program for controlling intelligent Professional IC systems, Compact IC systems and their peripherals such as various Autosamplers, 800 Dosino, 771 Compact Interface, etc. The software permits control, data acquisition, evaluation and monitoring as well as report generation of ion chromatographic analyses. Graphics user interface for routine operations, extensive database programs, method development, configuration and manual system control; very flexible user administration, efficient database operations, extensive data export functions, individually configurable report generator, control and monitoring of	



Order no.	Description	
	<p>all system components and the chromatography results. MagIC Net™ Professional complies fully with FDA Regulation 21 CFR Part 11 as well as GLP. Dialog languages: German, English, French, Spanish, Chinese, Korean, Japanese, et. al. 1 license.</p>	
6.6059.223	MagIC Net™ 2.2 Multi CD: 3 licenses	
	<p>Professional PC program for controlling intelligent Professional IC systems, Compact IC systems and their peripherals such as various Autosamplers, 800 Dosino, 771 Compact Interface, etc. The software permits control, data acquisition, evaluation and monitoring as well as report generation of ion chromatographic analyses. Graphics user interface for routine operations, extensive database programs, method development, configuration and manual system control; very flexible user administration, efficient database operations, extensive data export functions, individually configurable report generator, control and monitoring of all system components and the chromatography results. MagIC Net™ Multi complies fully with FDA Regulation 21 CFR Part 11 as well as GLP. Dialog languages: German, English, French, Spanish, Chinese, Korean, Japanese, et. al. Client Server version with 3 licenses.</p>	
6.9988.813	Validation Documentation for 881 (English / German) – CD	

Index

Numbers/Symbols

6.2821.090 aspiration filter 64
 (6.2821.130) Filter 75

A

Accessories 105
 Optional 114
 Scope of delivery 105
 Ambient conditions 95
 Aspiration filter 6.2821.090 64
 Aspiration tubing for eluent 25

B

Baseline
 Conditioning 60
 Unstable 65
 Blood 77

C

Cable feed-throughs 23
 Capillaries
 Installation 17
 Capillary feed-throughs 23
 Carry-over 77
 Changing
 Eluent 64
 Cleaning
 Suppressor 85
 Valves of the high pressure
 pump 70
 Column
 see also "Separation column"
 56
 Column recognition 99
 Conditioning 60
 Connections
 Installation 17
 Connector
 Mains 98
 Contamination
 High pressure pump 64
 Valves in the high pressure
 pump 65
 Contamination suppressor
 Heavy metals 83
 Organic impurities 83
 Crystallization
 High pressure pump 64

D

Deaerating
 High pressure pump 33
 Purge valve 31
 Degasser
 Eluent degasser 29
 Degassing
 Eluent 29
 Design
 Safety specification 99
 Detector
 Interface 99
 Dilution 77
 Dimensions 96
 Door 63
 Drainage tubings
 Installation 21

E

Electromagnetic compatibility ... 99
 Electrostatic charge 5
 Eluent
 Aspiration 25
 Production 63
 Eluent bottle
 Figure 28
 Installation 25
 Operation 64
 Eluent degasser
 Installation 29
 Technical specifications 96
 EMC 99
 Emission 99
 Equilibration 58, 60

F

Feed-throughs
 Capillaries 23
 Fill
 Injection valve 39
 Filter
 see also "inline filter" 35
 Filter (6.2821.130) 75
 Filter 6.2821.090
 Aspiration filter 64
 Flow fluctuations 65
 Flow increment 96
 Flow range 96
 Flow rate 96
 Frequency 98

G

Gas 29
 GLP 89
 Guarantee 103
 Guard column
 Installation 54
 Rinsing 55

H

Heavy metals
 Contamination suppressor . . 83
 High pressure pump
 Installation 31
 Maintenance 64
 Protection 20, 64
 Technical specifications 96
 Tubing connection 31
 Valves 73
 Housing 96
 Humidity 95

I

IC column
 see also "Separation column"
 56
 Immunity 99
 Inject
 Injection valve 39
 Injection valve 2
 Fill 39
 Inject 39
 Installation 37, 97
 Maintenance 78
 Protection 78
 Inline filter 35
 Inline sample preparation 77
 Installation
 Connections 17
 Drainage tubings 21
 Eluent bottle 25
 Eluent degasser 29
 Guard column 54
 High pressure pump 31
 Injection valve 37, 97
 Leak sensor 20
 MSM 50
 Peristaltic pump 46
 Pulsation absorber 36
 Pump tubings 46
 Separation column 56

Index

Suppressor 50
Instrument
 Connect 53
 Rear 9
Interface
 MSB 98
 USB 98
Interfaces 98
 Further connections 99
 Leak sensor 99

L

Leak 65
Leaking piston seals 65
Leak sensor
 Installation 20
 Interface 99
 Technical data 95
Leak-tightness 59, 60
Loop
 see also "Sample loop" 40

M

Mains cable 53
Mains connection 53, 54, 98
Mains voltage 5
Maintenance
 High pressure pump 64
 Injection valve 78
 Peristaltic pump 79
 Pump head 65
Material 96
MSB 98
MSM
 see also "Suppressor" 50
 Technical specifications 98

O

Oil 77
Operation
 Peristaltic pump 79
 Suppressor 82
Organic impurities
 Contamination suppressor .. 83
Overview of the instrument 7
 Front 7

P

PC connection 53
Peristaltic pump
 Installation 46
 Maintenance 79
 Operation 79
 Principle 44
 Technical specifications 98

Piston seal 65
Pistons of the high pressure pump
 65
Power consumption 98
Power supply unit 98
Precipitates 64
Pressure limit 97
Pressure range 97
Pressure screws
 Connection 17
Protection
 Injection valve 78
 Inline filter 35
 Suppressor 81
Protection class 99
Pulsation 65
Pulsation absorber
 Installation 36
Pump head
 Maintenance 65
Pump tubing
 Overview 80
Pump tubings
 Installing 46
 Service life 79
Purge valve 31

Q

Quality Management 89

R

Reference conditions 95
Regeneration 61
 Suppressor 83
Rinsing
 Guard column 55
 Pump tubings 79
 Sample path 77
 Separation column 57
Rinsing time 78
Rise in pressure 64

S

Safety instructions 4
Safety shutdown 97
Safety specification 99
Sample
 Carry-over 77
 Sample loop 40
 Transfer time 77
Sample loop 40
Sample path
 Rinsing 77
Sample preparation 77
Scope of delivery 105

Screws
 Connection 17
Separation column
 Installation 56
 Protection 2, 36, 88
 Regeneration 89
 Rinsing 57
 Separating efficiency 88
 Storage 89
Service 4, 61
Service Agreement 89
Shutting down 62
Standards 99
Start-up 58
Storage 95
Suppressor
 Cleaning 85
 Installation 50
 Operation 82
 Protection 81
 Regeneration 83
 Replacing parts 86
 Switching 82
Switch on 54

T

Technical data
 Leak sensor 95
 Reference conditions 95
Technical specifications
 Detector 99
 Eluent degasser 96
 High pressure pump 96
 Instrument 95
 Interfaces 98
 MSM 98
 Peristaltic pump 98
Temperature 95
Testing
 Safety specification 99
Transfer time 77
Transport 95
Transport locking screws 19
Tubing pump
 See also "Peristaltic pump" . 44
Tubings
 Installation 17

U

USB 98

V

Vacuum pump
 Protection 20
Validation 89

Valve
 see also "Injection valve" 37
Valves of the high pressure pump
..... 73

Voltage 98

W

Warranty 103