

881 Compact IC pro



881 Compact IC pro – Cation

Manual
8.881.8012EN



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 – Cation

2.881.0010

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	2
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	5
2	Overview of the instrument	7
2.1	Front	7
2.2	Rear	8
3	Installation	10
3.1	About this chapter	10
3.2	Initial installation	10
3.3	Installation diagram	12
3.4	Setting up the instrument	14
3.4.1	Packaging	14
3.4.2	Checks	14
3.4.3	Location	14
3.5	Capillary connections in the IC system	14
3.6	Rear of the instrument	17
3.6.1	Transport locking screws	17
3.6.2	Leak sensor	17
3.6.3	Drainage tubings	18
3.7	Capillary and cable feed-throughs	20
3.8	Eluent	22
3.8.1	Connecting eluent bottle	22
3.9	Eluent degasser	26
3.10	High pressure pump	28
3.10.1	Capillary connections high pressure pump/purge valve	28
3.10.2	Deaerating the high pressure pump	30
3.11	Inline filter	32



3.12 Pulsation absorber	33
3.13 Injection valve	34
3.13.1 Connecting the injection valve	34
3.13.2 Mode of operation of the injection valve	36
3.13.3 Selecting the sample loop	37
3.14 Column heater	37
3.15 Connecting the instrument	41
3.15.1 Connecting the instrument to the PC	41
3.15.2 Connecting the instrument to mains supply	42
3.16 Guard column	42
3.17 Separation column	44
4 Start-up	47
4.1 Initial start-up	47
4.2 Conditioning	48
5 Operation and maintenance	50
5.1 General notes	50
5.1.1 Care	50
5.1.2 Maintenance by Metrohm Service	50
5.1.3 Operation	51
5.1.4 Shutting down	51
5.2 Capillary connections	51
5.2.1 Operation	51
5.3 Door	52
5.4 Eluent	52
5.4.1 Production	52
5.4.2 Operation	53
5.5 High pressure pump	53
5.5.1 Protection	53
5.5.2 Maintenance	54
5.6 Inline filter	64
5.6.1 Maintenance	64
5.7 Inline sample preparation	66
5.8 Rinsing the sample path	66
5.9 Injection valve	67
5.9.1 Protection	67
5.10 Separation column	68
5.10.1 Separating efficiency	68
5.10.2 Protection	68
5.10.3 Storage	68
5.10.4 Regeneration	69

5.11	Quality Management and validation with Metrohm	69
6	Troubleshooting	70
6.1	Problems and their solutions	70
7	Technical specifications	73
7.1	Reference conditions	73
7.2	Instrument	73
7.3	Leak sensor	73
7.4	Ambient conditions	73
7.5	Housing	74
7.6	Eluent degasser	74
7.7	High pressure pump	74
7.8	Injection valve	75
7.9	Column heater	75
7.10	Mains connection	76
7.11	Interfaces	76
7.12	Safety specification	77
7.13	Electromagnetic compatibility (EMC)	77
7.14	Weight	77
8	Conformity and warranty	78
8.1	Declaration of Conformity	78
8.2	Quality Management Principles	79
8.3	Warranty (guarantee)	80
9	Accessories	82
9.1	Scope of delivery	82
9.2	Optional accessories	89
	Index	92



Table of figures

Figure 1	Front 881 Compact IC pro – Cation	7
Figure 2	Rear 881 Compact IC pro – Cation	8
Figure 3	Installation diagram 881 Compact IC pro – Cation	13
Figure 4	Connection of capillaries with pressure screws	15
Figure 5	leak sensor – plugging in	18
Figure 6	Drainage tubings	19
Figure 7	Capillary and cable feed-throughs	21
Figure 8	Installing eluent bottle attachment	23
Figure 9	Mounting aspiration filter	23
Figure 10	Install tubing weighting and aspiration filter	24
Figure 11	Eluent aspiration tubing fully equipped.	24
Figure 12	Eluent bottle – connected	25
Figure 13	Eluent degasser	27
Figure 14	Capillary connections high pressure pump/purge valve	28
Figure 15	High pressure pump – Connect inlet	29
Figure 16	Deaerate the high pressure pump	31
Figure 17	Connecting the inline filter	33
Figure 18	Pulsation absorber – Connection	34
Figure 19	Injection valve – connected	35
Figure 20	Injection valve – Positions	36
Figure 21	Column heater	38
Figure 22	Column heater – Installing capillaries	40
Figure 23	Pump head – removing the piston	55
Figure 24	Components of the piston cartridge	56
Figure 25	Tool for piston seal	57
Figure 26	Removing the piston seal	58
Figure 27	Inserting the piston seal into the tool	58
Figure 28	Inserting the piston seal into the pump head	59
Figure 29	Removing valves	60
Figure 30	Dismantling valve	61
Figure 31	Components of the inlet valve and outlet valve	62
Figure 32	Change filters (of the inline filter)	64

1 Introduction

1.1 Instrument description

The instrument **881 Compact IC pro – Cation** 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.

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

This instrument is suitable for processing chemicals and flammable samples. The usage of the 881 Compact IC pro – Cation 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:

<i>(5-12)</i>	<p>Cross-reference to figure legend</p> <p>The first number refers to the figure number, the second to the instrument part in the figure.</p>
1	<p>Instruction step</p> <p>Carry out these steps in the sequence shown.</p>
	<p>Warning</p> <p>This symbol draws attention to a possible life hazard or risk of injury.</p>
	<p>Warning</p> <p>This symbol draws attention to a possible hazard due to electrical current.</p>
	<p>Warning</p> <p>This symbol draws attention to a possible hazard due to heat or hot instrument parts.</p>
	<p>Warning</p> <p>This symbol draws attention to a possible biological hazard.</p>
	<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.

Always pull the mains cable out of the mains connection socket before connecting or disconnecting electrical appliances on the rear panel 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

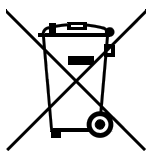


Warning

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

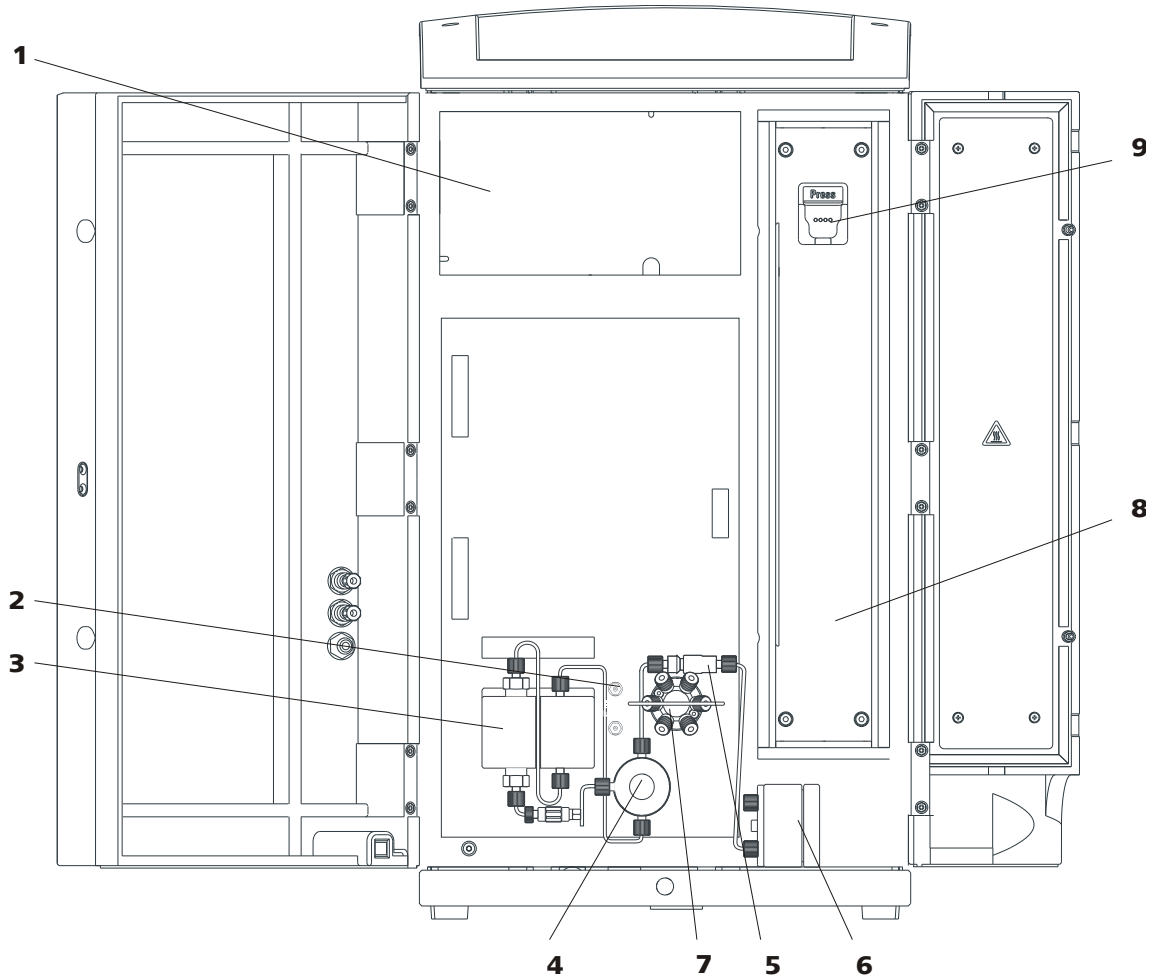


Figure 1 Front 881 Compact IC pro – Cation

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.		



2.2 Rear

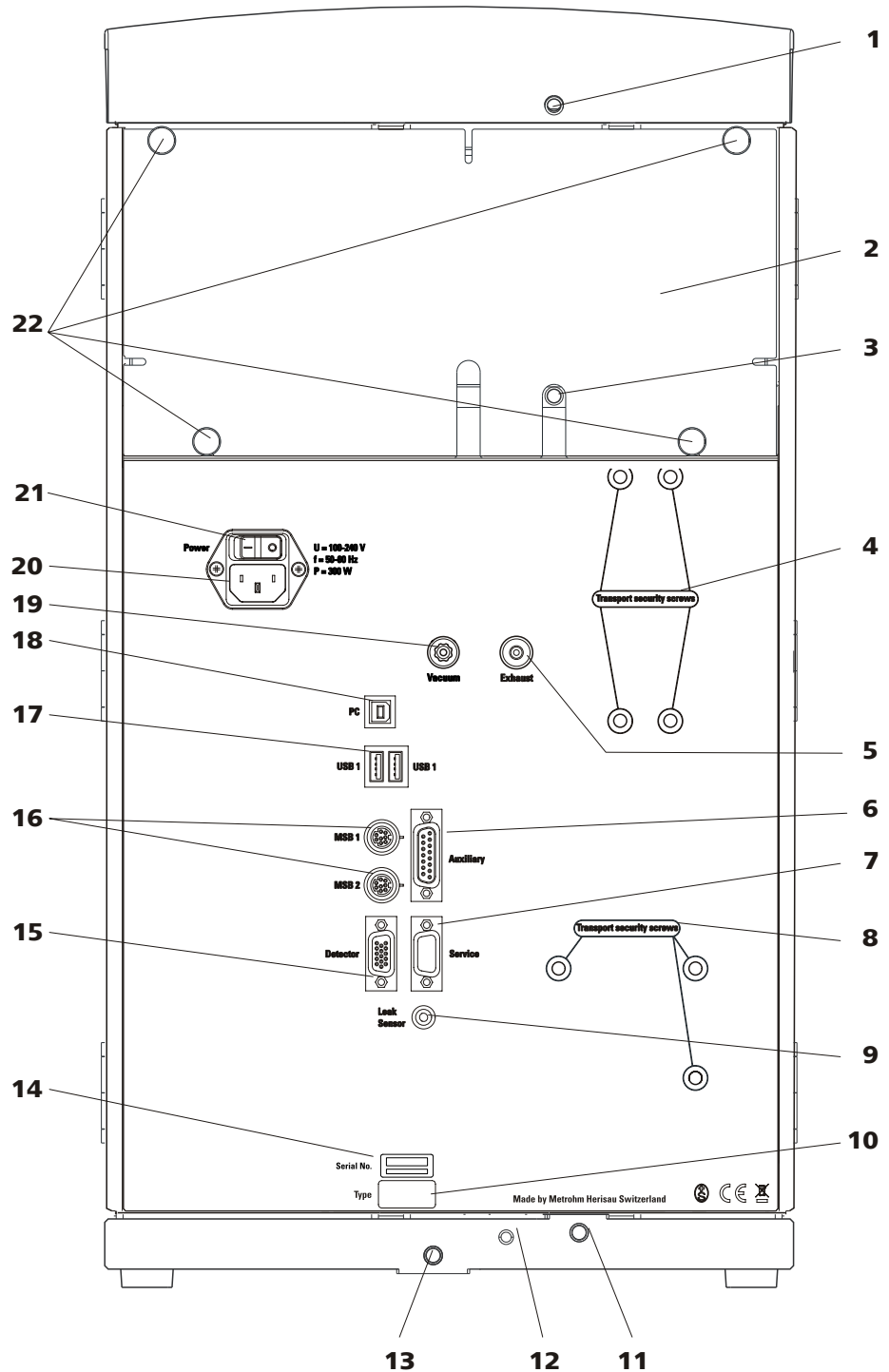


Figure 2 Rear 881 Compact IC pro – Cation

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.

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



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 – Cation. 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 13*), showing a completely installed 881 Compact IC pro – Cation.
- 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 – Cation

1 Setting up the instrument

(see *Chapter 3.4, page 14*).

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 (2-4) and (2-8) keep them in a safe place (see *Chapter 3.6.1, page 17*).
- Connect the leak sensor (see *Chapter 3.6.2, page 17*).
- Connect the drainage tubings (see *Chapter 3.6.3, page 18*).

3 Installing the eluent path

- Lead the eluent aspiration tubing (3-1) out of the instrument through a capillary feed-through and connect it with the eluent bottle (see Chapter 3.8.1, page 22).
- Connect the (3-2) column inlet capillary and the detector inlet capillary (3-3) with 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 (3-5) 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 (3-6) 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 Connecting the instrument

- Connect the instrument to a computer on which the software MagIC Net™ is installed using the USB cable (6.2151.020) (see Chapter 3.15.1, page 41).
- Connect the instrument to the mains supply (see Chapter 3.15.2, page 42).

6 Initial start-up

(see Chapter 4.1, page 47)

- Switch on the PC and start MagIC Net™.
- Switch on the instrument.
- Deaerate the high pressure pump.
- Rinse instrument without column.

7 Installing guard and separation column

- Remove the coupling (6.2744.040) between the column inlet capillary and the detector inlet capillary.
- (Optional) Connect guard column (see Chapter 3.16, page 42)
 - Fasten the guard column to the end of the column inlet capillary (see leaflet to the guard column).
 - Rinse guard column.



- Connect the separation column (*see Chapter 3.17, page 44*)
 - Fasten the inlet of the separation column either to the end of the column inlet capillary (**3-2**) or to the guard column (if used) (*see leaflet to the separation column*).
 - Fasten the detector inlet capillary (**3-3**) using a PEEK pressure screw (6.2744.070) to the output of the separation column.
- Hang separation column with chip in the column holder of the instrument.

8 Conditioning the instrument

See Chapter 4.2, Page 48.

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.

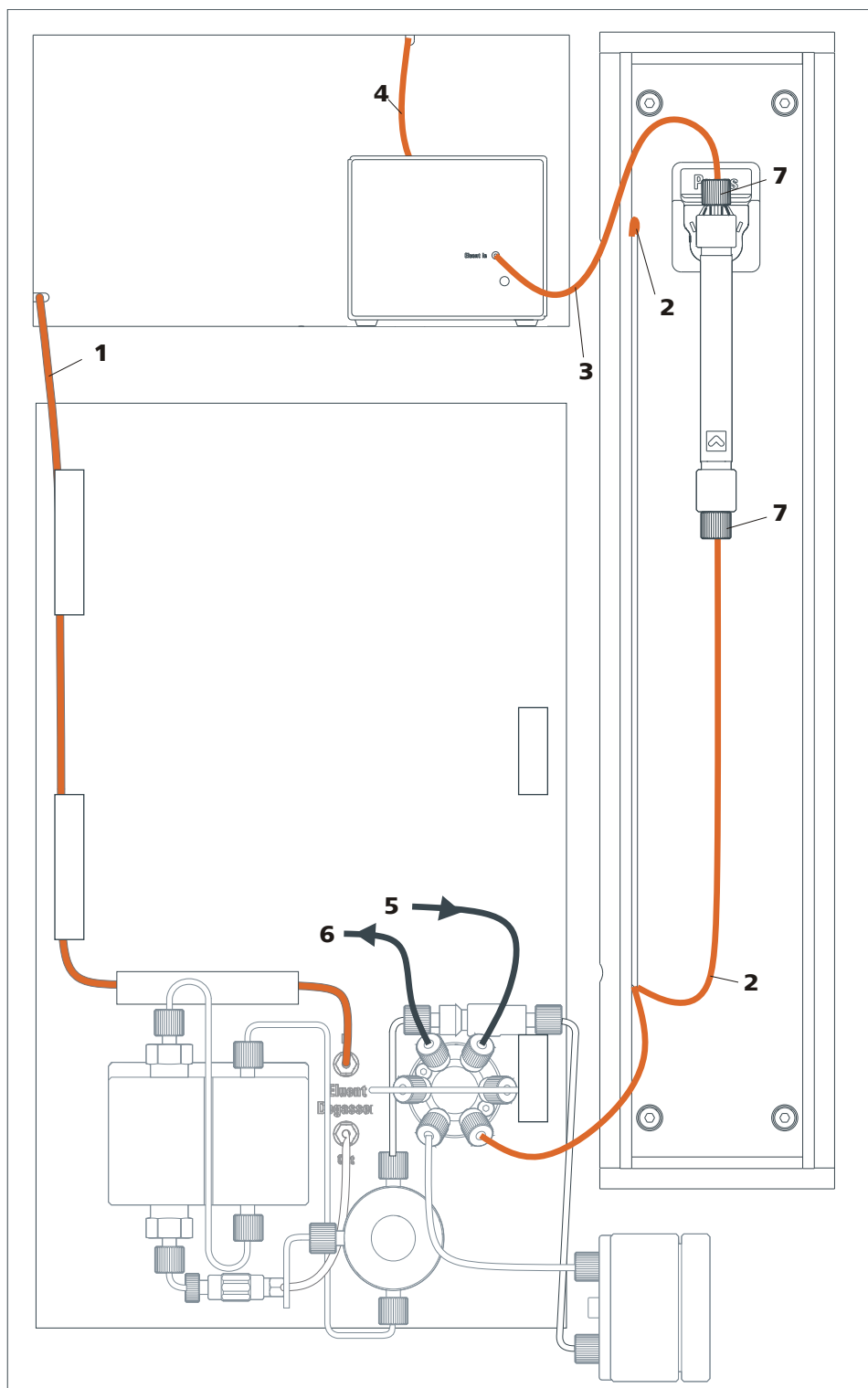


Figure 3 Installation diagram 881 Compact IC pro – Cation

1 Eluent aspiration tube 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	Detector input capillary	4	Detector output capillary
5	Sample aspirating capillary 6.1803.040	6	Sample output capillary 6.1803.040
7	PEEK pressure screws, short 6.2744.070		

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

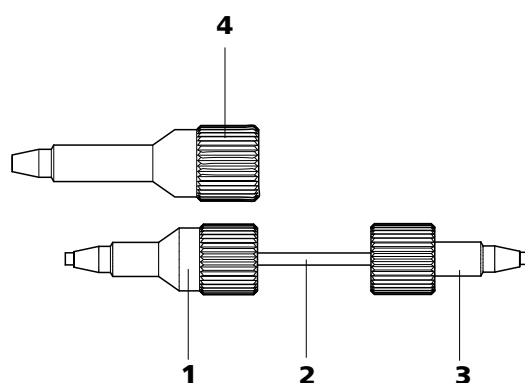


Figure 4 Connection of capillaries with pressure screws

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 (polyetheretherketone)

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.

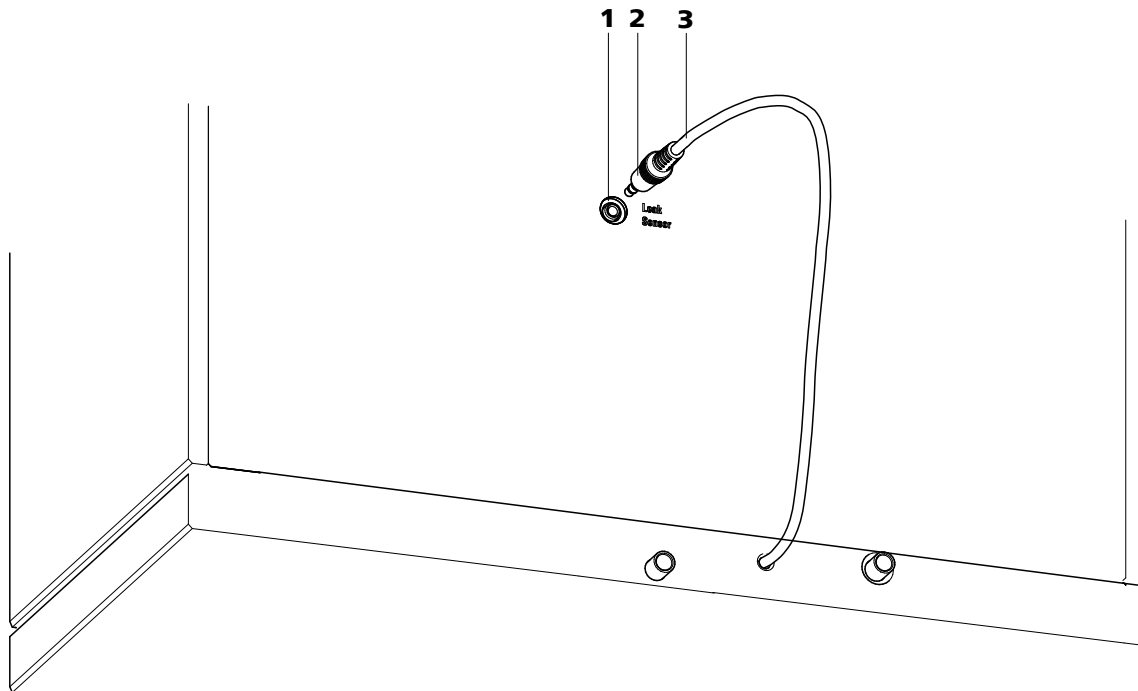


Figure 5 leak sensor – plugging in

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.

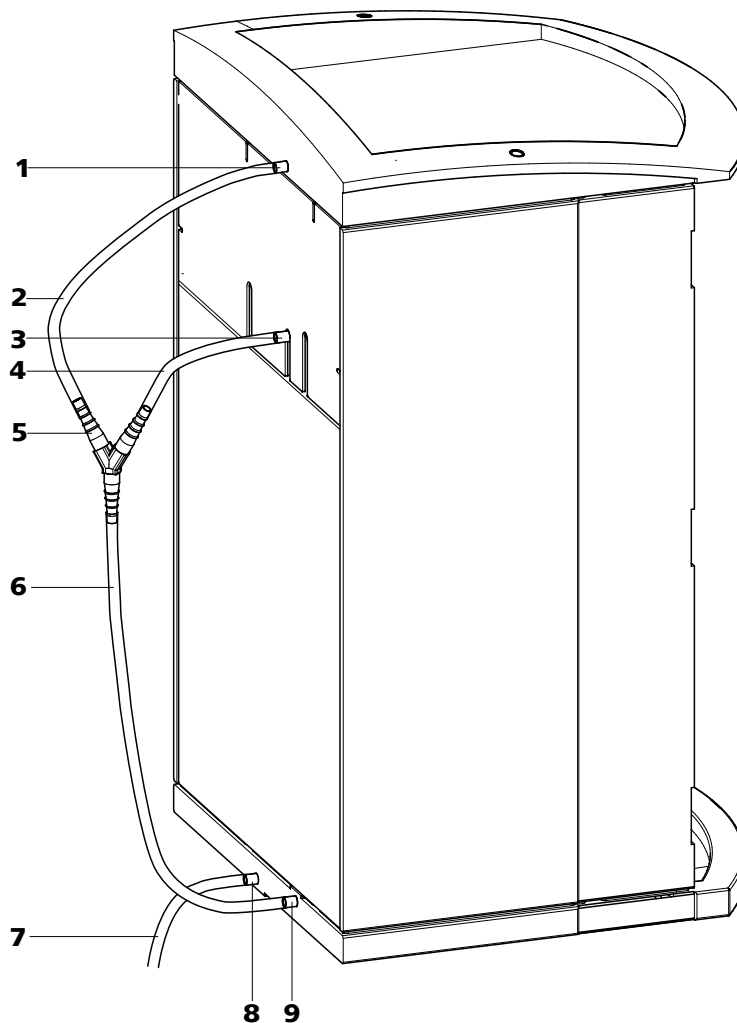


Figure 6 Drainage tubings

<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 21*).

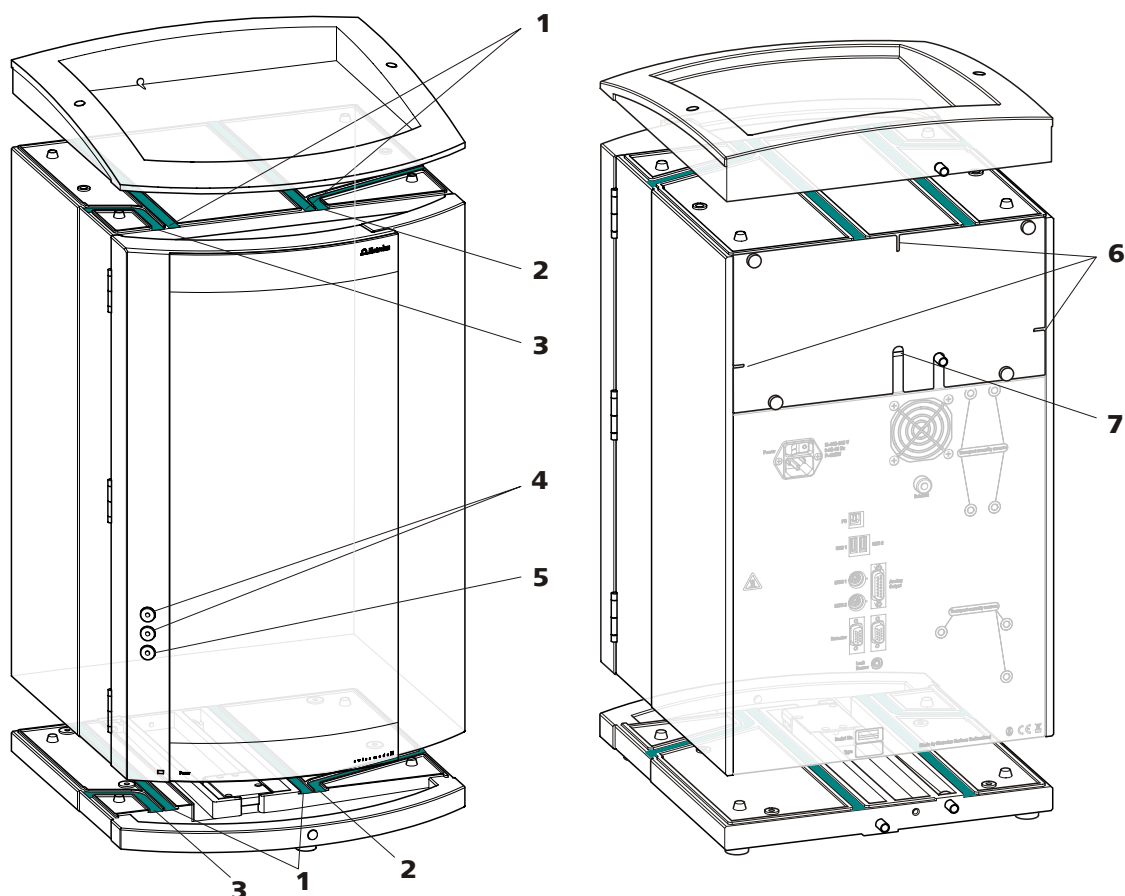


Figure 7 Capillary and cable feed-throughs

1 Capillary feed-through

For feeding capillaries from the front to the rear of the instrument.

3 Capillary feed-through

For feeding capillaries from the front to the left side of the instrument.

5 Capillary feed-through

At the door of the instrument. For feeding capillaries out of the instrument.

7 Cable feed-through

At the rear of the instrument. For feeding the detector cable out of the detector chamber.

2 Capillary feed-through

For feeding capillaries from the front to the right side of the instrument.

4 Luer connector

For connecting a (6.2816.020) syringe. For manual sample feeding.

6 Capillary feed-through

At the rear of the instrument. For feeding capillaries out of the detector chamber.

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 26*). 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.

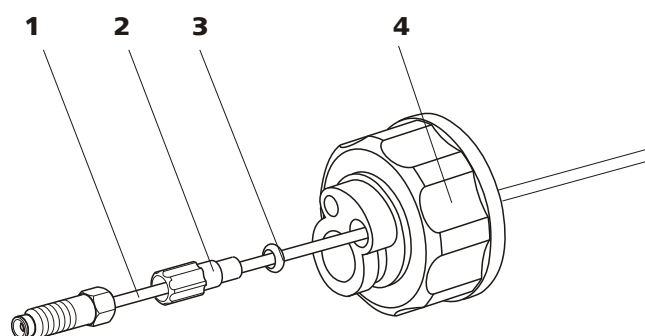


Figure 8 Installing eluent bottle attachment

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.

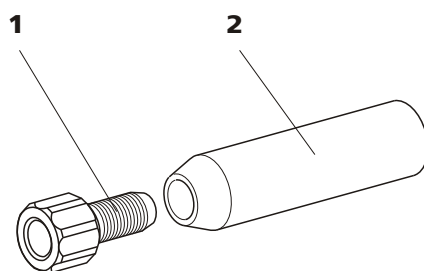


Figure 9 Mounting aspiration filter

1 Filter holder

From accessories set 6.2744.210.

2 Aspiration filter 6.2821.090

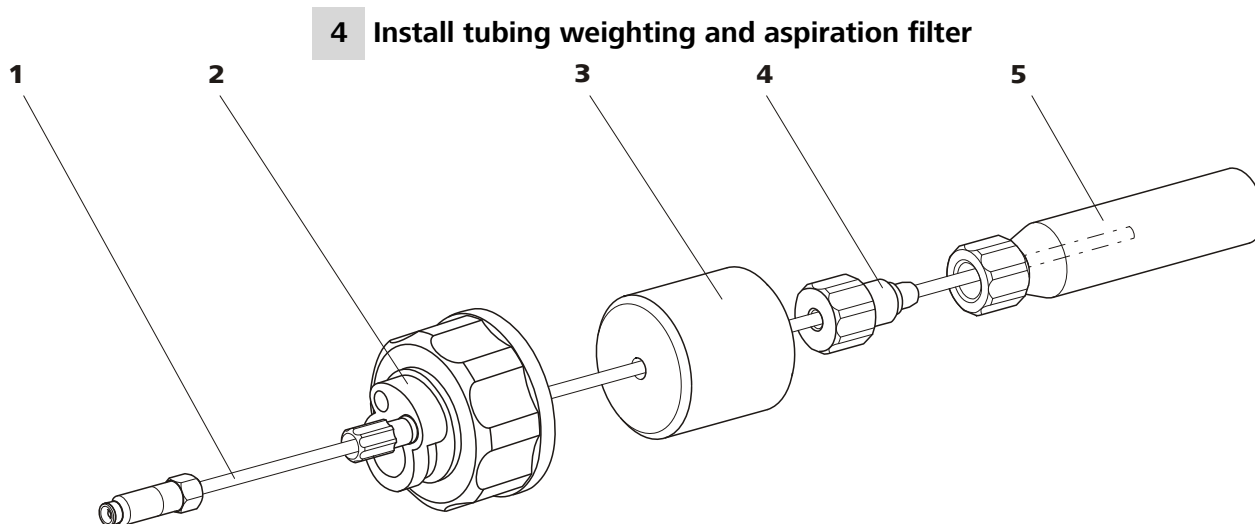


Figure 10 Install tubing weighting and aspiration filter

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).

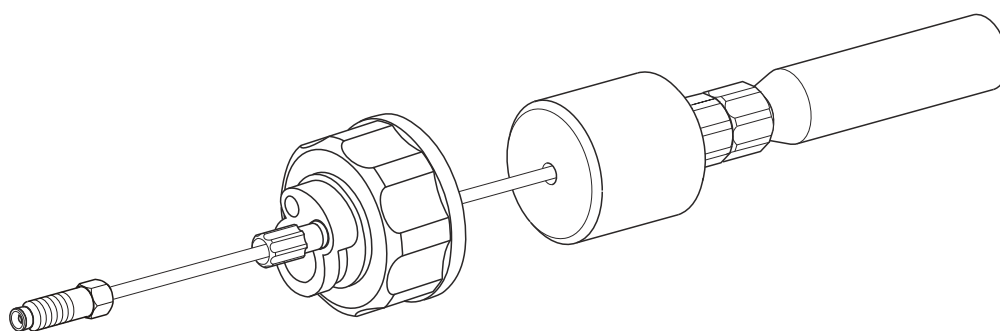


Figure 11 Eluent aspiration tubing fully equipped.

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).

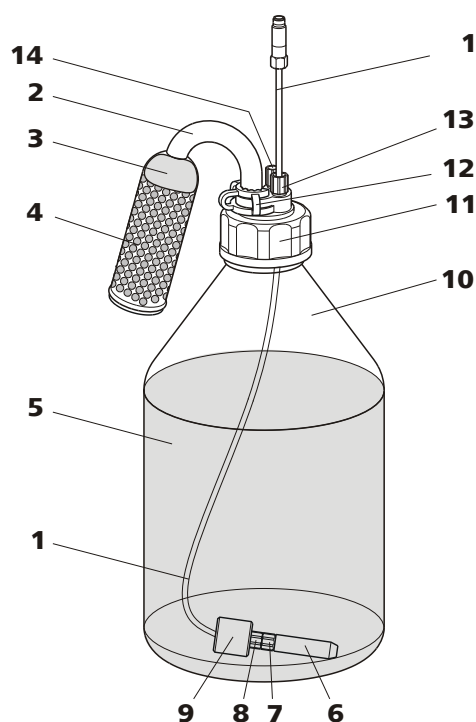


Figure 12 Eluent bottle – connected

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

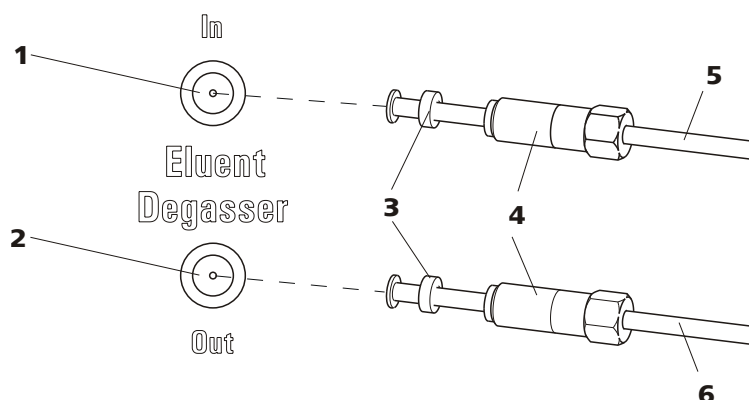


Figure 13 Eluent degasser

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 28). 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).
- 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 29).



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 30) 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.

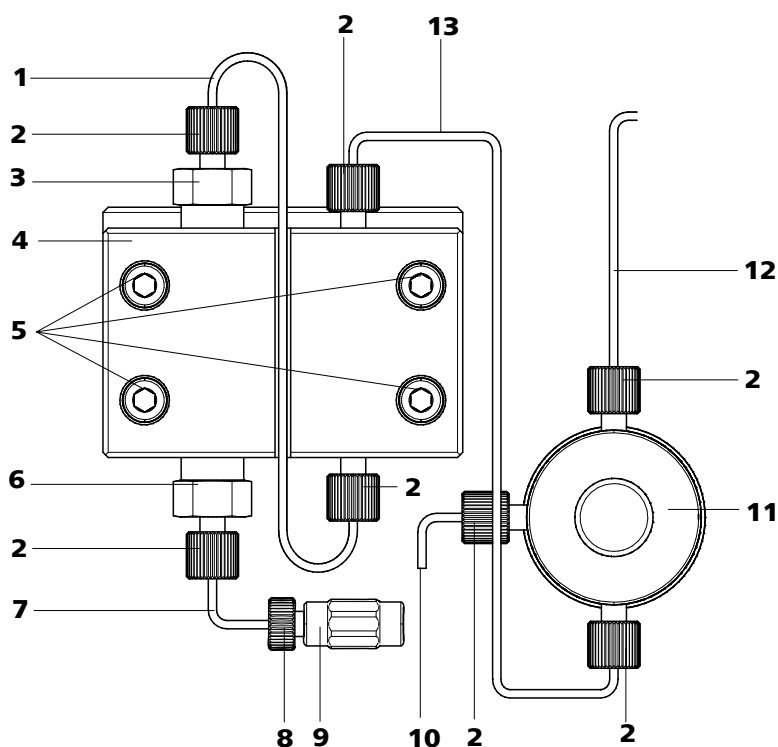


Figure 14 Capillary connections high pressure pump/purge valve

<p>1 Connection capillary PEEK capillary, connects main piston and auxiliary piston.</p>	<p>2 PEEK pressure screw, short (6.2744.070)</p>
<p>3 Outlet valve holder</p>	<p>4 Pump head (6.2824.110)</p>

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 30).

12 Connection capillary

For connecting the inline filter (see Chapter 3.11, page 32).

**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.

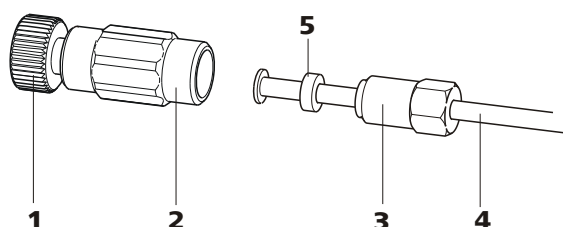
Connecting inlet to the high pressure pump

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 .

Deaerate the high pressure pump as follows (see Figure 16, page 31):

Deaerate the high pressure pump

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

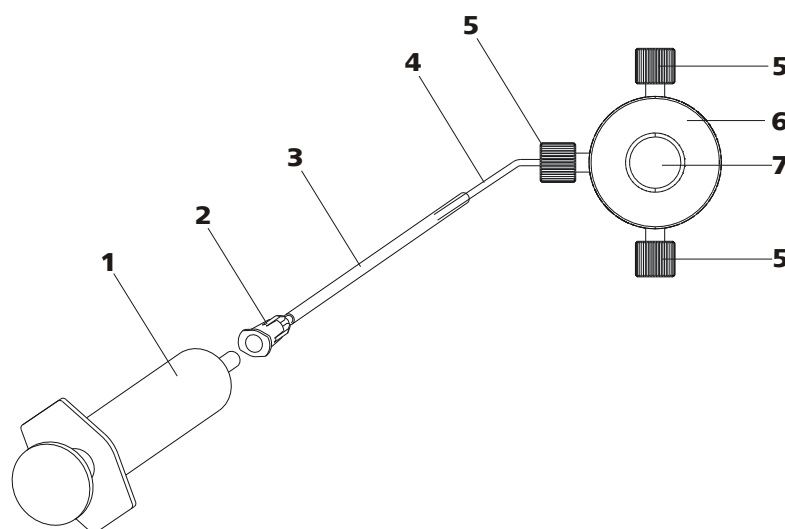


Figure 16 Deaerate the high pressure pump

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 31).

3 Opening purge valve

- Open the rotary knob (16-7) by approx. $\frac{1}{2}$ 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.

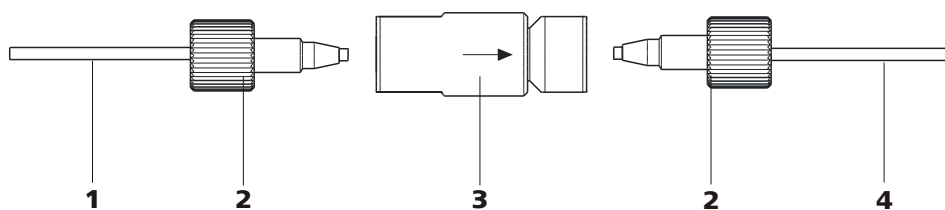


Figure 17 Connecting the inline filter

1 Connection capillary

Connects the purge valve with the inline filter

3 Inline filter (6.2821.120)

Protects against particles.

2 PEEK pressure screws, short (6.2744.070)

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 28) and injection valve (see Chapter 3.13, page 34).

The pulsation absorber can be operated in both directions.

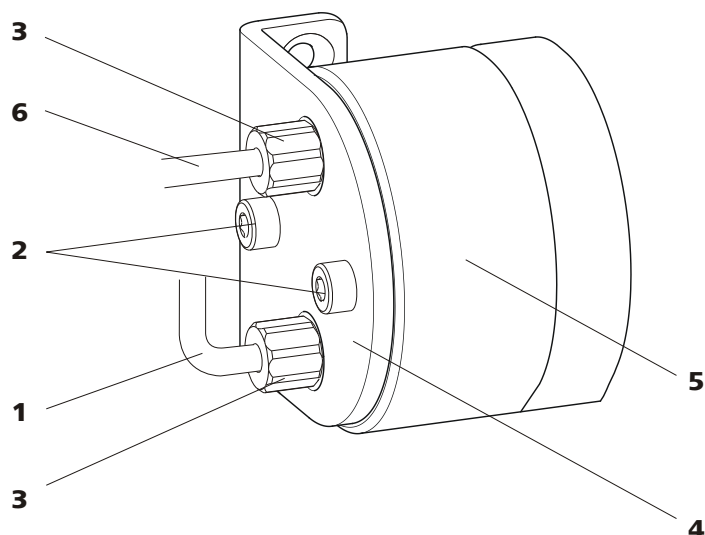


Figure 18 Pulsation absorber – Connection

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.

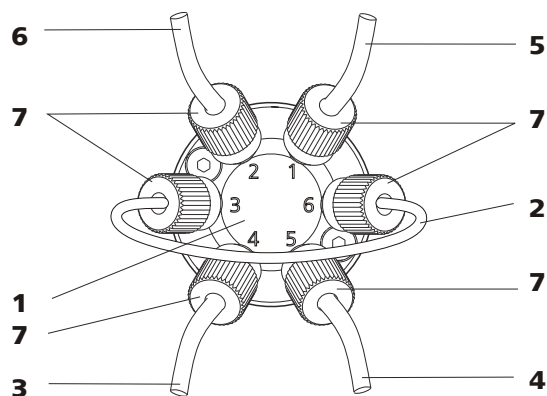


Figure 19 Injection valve – connected

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 37*.



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 36) 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.

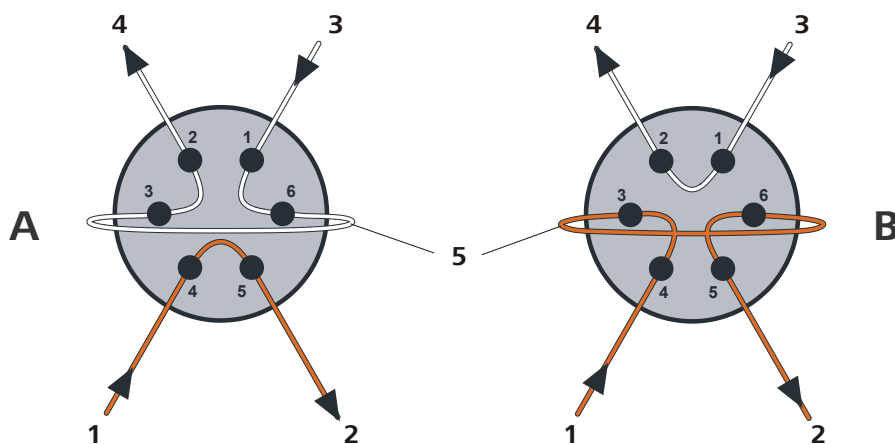


Figure 20 Injection valve – Positions

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.

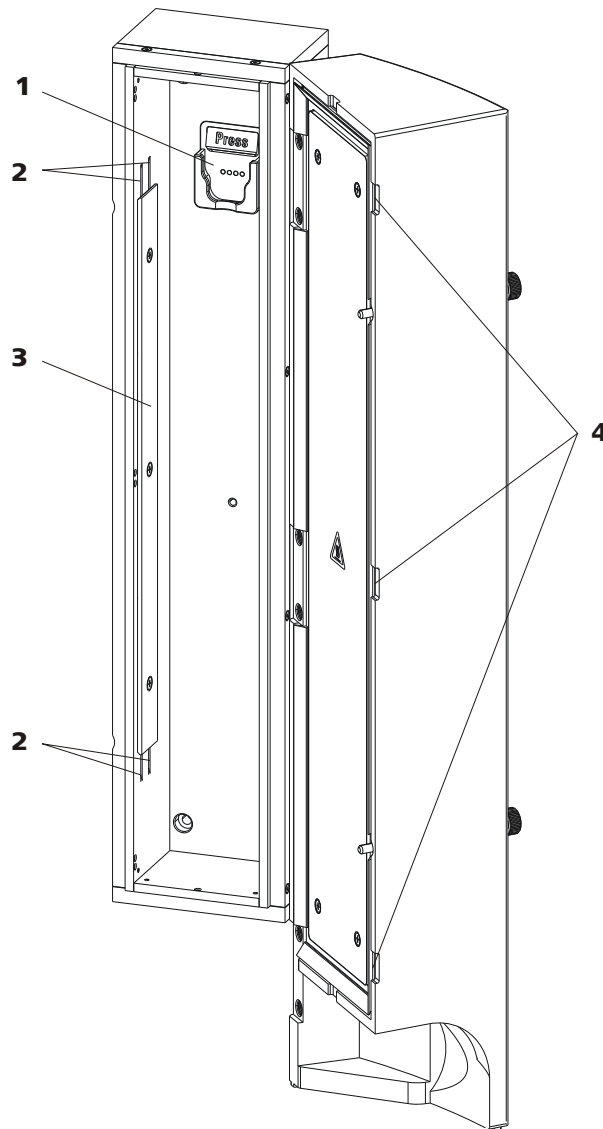


Figure 21 Column heater

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 3.17, page 44) 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

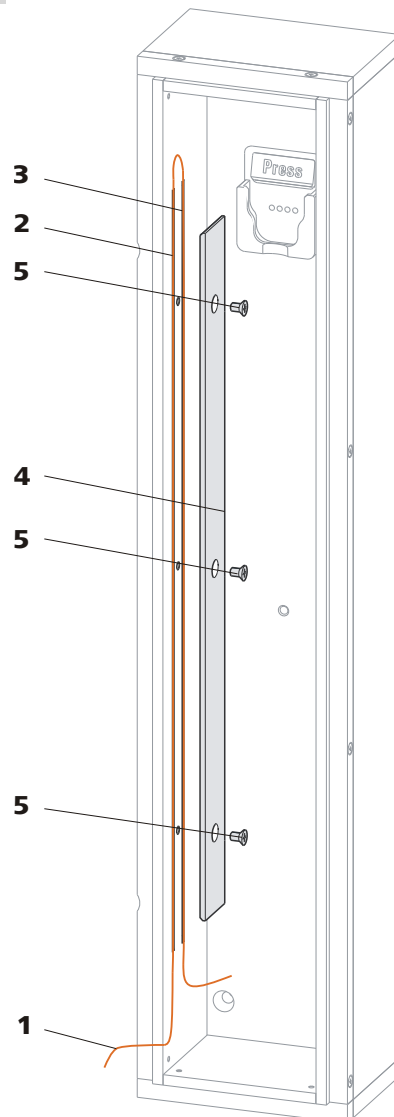


Figure 22 Column heater – Installing capillaries

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 43) or (see "Connecting and rinsing the separation column", page 45).



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 Connecting the instrument

3.15.1 Connecting the instrument to the PC



Note

The instrument must be switched off when connecting the PC.

1 Connecting the USB cable

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

**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 47*) 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.

3.17 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 47) 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.
- Switch on the instrument.

3 Deaerate the high pressure pump

- Deaerate the high pressure pump(s) via the purge valve (*see Chapter 3.10.2, page 30*).

4 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.

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 53), 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.

3 Checking leak-tightness

- In **MagIC Net™**, start the equilibration.
- Check all capillaries and their connections from the high pressure pump to the detector block 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).

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 22*. 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 22*).

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 53*).



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 (29-2), (29-3) 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.

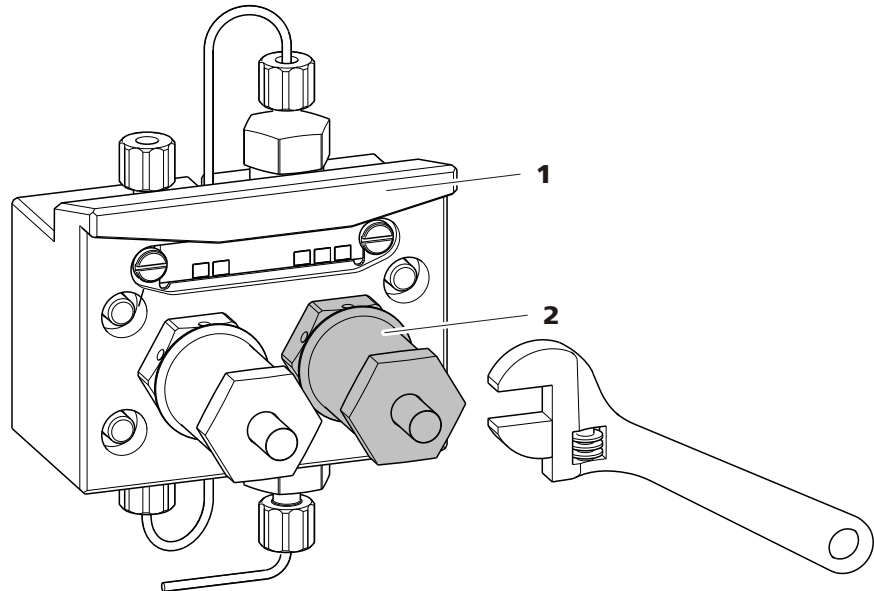


Figure 23 Pump head – removing the piston

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 loosing 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.

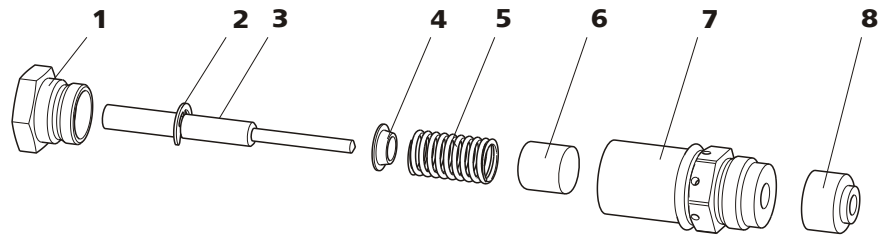


Figure 24 Components of the piston cartridge

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 25, page 57) 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.

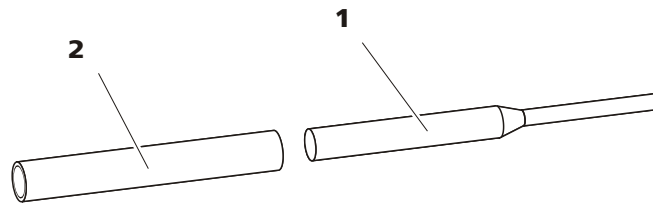


Figure 25 Tool for piston seal

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 (25-1) with the narrow side just as far into the piston seal as the same can be removed.

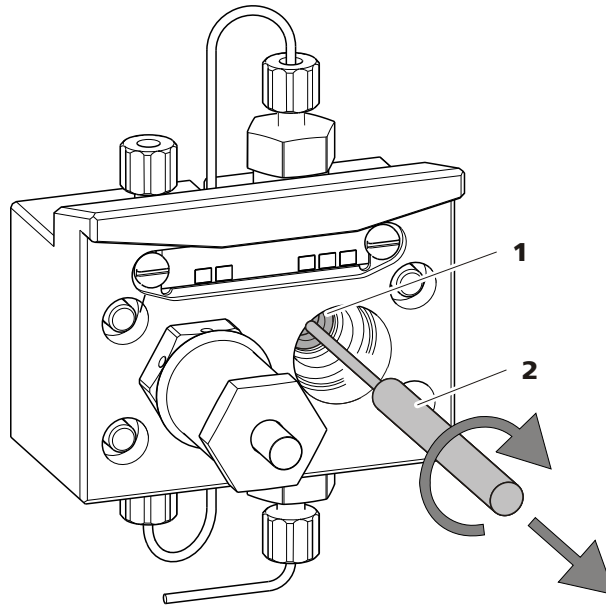


Figure 26 Removing the piston seal

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 (25-2). The sealing springs must be visible from the outside.

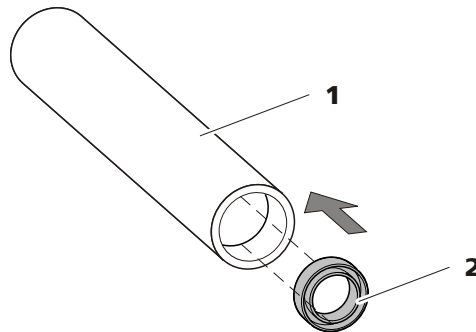


Figure 27 Inserting the piston seal into the tool

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 (25-2) with inserted piston seal into the pump head and press the seal with the wide end of the tool for the piston seal (25-1) into the pump head recess.

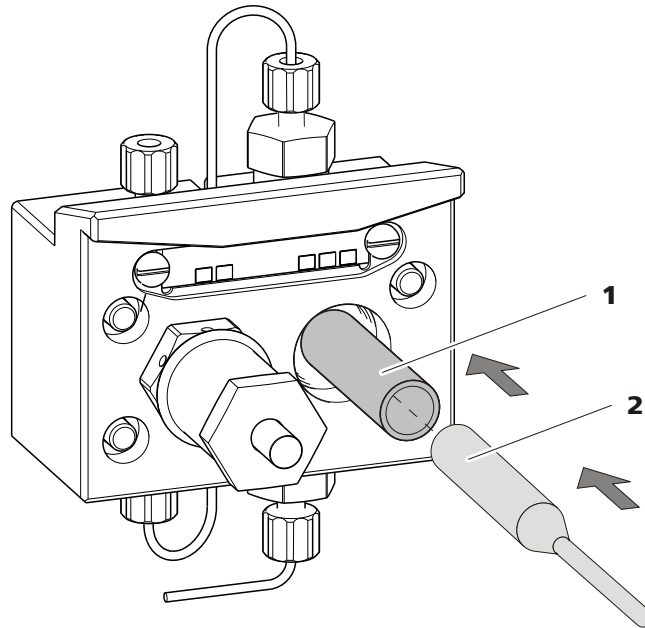


Figure 28 Inserting the piston seal into the pump head

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 (29-3) and (29-2).

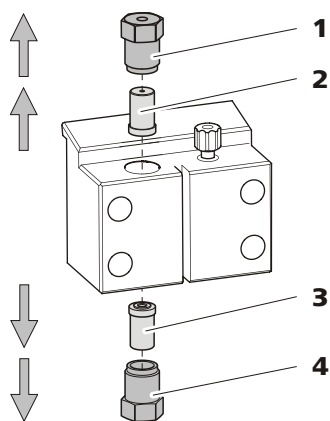


Figure 29 Removing valves

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.

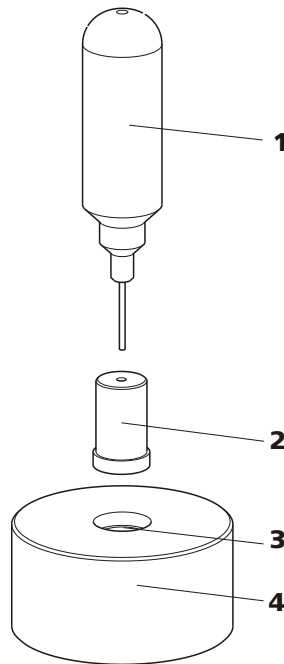


Figure 30 Dismantling valve

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 31, page 62).

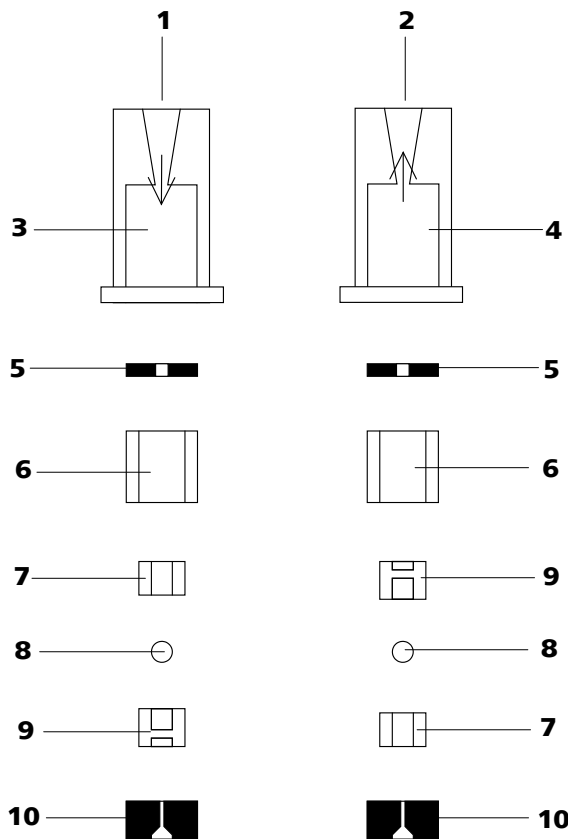


Figure 31 Components of the inlet valve and outlet valve

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 31, page 62*.

- 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 31, page 62*).

- 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 31, page 62).

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 (29-4).
- 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 (29-1).



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 (32-2), the filter screw (32-4) and the filter (32-3). New filters (32-3) are available under the order number 6.2821.130 (10 items).

The filters (6.2821.130) (32-3) should be changed every 3 months (more frequently at higher backpressure).

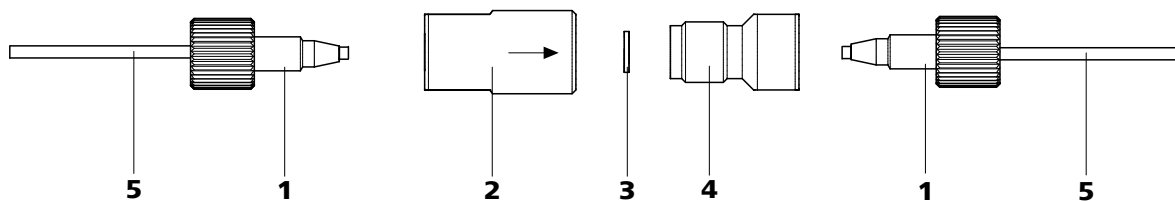


Figure 32 Change filters (of the inline filter)

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 (32-1) from the inline filter.

2 Unscrewing the filter screw

- Screw the filter screw (32-4) out of the filter housing (32-2) with the aid of two adjustable wrenches (6.2621.000).

3 Inserting the filter

- Remove the old filter (32-3) using tweezers.
- Place the new filter (32-3) flat in the filter housing (32-2) using tweezers.

4 Mounting filter screw

- Screw the filter screw (32-4) back into the filter housing (32-2) and tighten by hand. Then additionally tighten slightly with two adjustable wrenches (6.2621.000).

5 Remounting the inline filter

- Screw pressure screws (32-1) 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 3.17, page 44*) 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 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 32) should be mounted between the high pressure pump and the pulsation damper.



5.10 Separation column

5.10.1 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.

5.10.2 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 3.16, page 42*). 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 33*) must be installed in order to protect the column material from pressure concussion caused by injection.

5.10.3 Storage

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

5.10.4 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.

5.11 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 14).
Marked rise in pressure	<i>Inline filter (6.2821.120) blocked.</i>	Replace the filter (6.2821.130) (see Chapter 5.6, page 64).
	<i>Guard column – blocked.</i>	Replace guard column (see Chapter 3.16, page 42).
	<i>Separation column – blocked.</i>	<ul style="list-style-type: none"> ▪ Regenerate separation column (see Chapter 5.10.4, page 69). ▪ Replace separation column (see "Connecting and rinsing the separation column", page 45). <p>Note: Samples should always be microfiltered (see Chapter 5.7, page 66).</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 37) switched on (see Chapter 4.2, page 48).
	<i>Leak in the system.</i>	Check all capillary connections and seal leaks, if necessary (see Chapter 3.5, page 14).
	<i>Eluent – Evaporation of the organic solvent in the eluent.</i>	Check the eluent bottle attachment (see Figure 10, page 24).
Peak areas lower than expected	<i>Sample – leak in the sample path.</i>	Check the sample path.
	<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.

Problem	Cause	Remedy
Very noisy baseline	<i>High pressure pump – contaminated pump valves.</i>	Clean pump valves (<i>see Chapter 5.5.2, page 54</i>).
	<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 (<i>see Chapter 5.5.2, page 54</i>) piston seals .
	<i>Pulsation absorber not connected. or defective.</i>	Connect pulsation absorber (<i>see Chapter 3.12, page 33</i>). or replace it.
Background conductivity too high	<i>Incorrect eluent.</i>	Change eluent (<i>see Chapter 5.4.2.3, page 53</i>).
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>	<ol style="list-style-type: none"> 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.
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
Chromatograms have poor resolution	<i>Separation column – diminished separating efficiency.</i>	<ul style="list-style-type: none"> ▪ Regenerate separation column (<i>see Chapter 5.10.4, page 69</i>). ▪ Replace separation column (<i>see "Connecting and rinsing the separation column", page 45</i>).
Extreme spread of the peaks in the chromatogram. Splitting (dual peaks)	<i>Capillary connections – dead volume in the system.</i>	Check connections (<i>see Chapter 3.5, page 14</i>) (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 (<i>see Chapter 3.16, page 42</i>).



Problem	Cause	Remedy
	<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 45).
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 34).
	<i>Sample – rinsing volume too low.</i>	Increase rinsing time (see Chapter 5.8, page 66).
	<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 5.10.4, page 69). Replace separation column (see "Connecting and rinsing the separation column", page 45).
	<i>Eluent – Gas bubbles in the eluent.</i>	Check connections of the eluent degasser (see Chapter 3.9, page 26).
	<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 Mains connection

<i>Required voltage</i>	100...240 V \pm 10 % (auto-sensing)
<i>Required frequency</i>	50...60 Hz \pm 3 (auto-sensing)
<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

7.11 Interfaces

USB

<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 MiniDin 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)

7.12 Safety specification

- Design / Test*
- EN/IEC 61010-1
 - UL 61010-1
 - CSA-C22.2 No. 61010-1
 - Protection class I

7.13 Electromagnetic compatibility (EMC)

- Emission*
- EN/IEC 61326-1
 - EN/IEC 61000-6-3
 - EN 55022 / CISPR 22
 - EN/IEC 61000-3-2
 - EN/IEC 61000-3-3

- Immunity*
- 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

7.14 Weight

1.881.0010 19.7 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 from material, design or manufacturing errors. The warranty period is 36 months from the day of delivery; for day and night operation it is 18 months. The warranty remains valid on condition that the service is provided by an authorized Metrohm service organization.

Glass breakage is excluded from the warranty for electrodes and other glassware. The warranty for the accuracy corresponds to the technical specifications given in this manual. For components from third parties that make up a considerable part of our instrument, the manufacturer's warranty provisions apply. Warranty claims cannot be pursued if the Customer has not complied with the obligations to make payment on time.

During the warranty period Metrohm undertakes, at its own choice, to either repair at its own premises, free of charge, any instruments that can be shown to be faulty or to replace them. Transport costs are to the Customer's account.

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



9 Accessories







Note

Subject to change without notice.





9.1 Scope of delivery

2.881.0010 881 Compact IC pro – Cation

Qty.	Order no.	Description	
1	1.881.0010	881 Compact IC pro – Cation	
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
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
			
1	6.1608.070	Eluent bottle / 2 L / GL 45	
		Material:	Clear glass
		Height (mm):	262
		Volume (mL):	2000
			

Qty.	Order no.	Description	
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	6.1803.040	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	







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	
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.	
1	6.2322.020	PRIMUS multi cation standard solution: Promo	





Qty.	Order no.	Description	
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	
1	6.2621.050	1/4 in. wrench For 1/4 in. screws. For IC instruments Length (mm): 73	


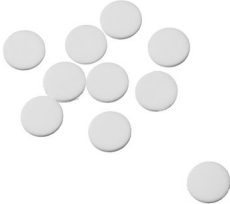



Qty.	Order no.	Description
1	6.2621.080	Capillary cutter For plastic capillaries. For IC instruments Length (mm): 118
		
1	6.2621.100	Hexagon key 3 mm Hexagon key 3 mm. For IC Sample Processors Length (mm): 73
		
1	6.2626.000	Front drain nozzle Drain nozzle for Professional IC instruments to be mounted on the front of the instrument
		
2	6.2739.000	Wrench For tightening connectors Length (mm): 68
		

Qty.	Order no.	Description	
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	
1	6.2744.020	Luer/UNF coupling For IC instruments Material: PEEK Length (mm): 19	
1	6.2744.040	2 x UNF 10/32 coupling For connecting 1/16 in. capillaries. For IC instruments Material: PEEK Length (mm): 24	




Qty.	Order no.	Description	
1	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	
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.	
1	8.881.8012EN	Manual 881 Compact IC pro, 2.881.0010 - Cation, English	

9.2 Optional accessories

2.881.0010 881 Compact IC pro – Cation

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.	



Order no.	Description
-----------	-------------

6.2617.040 Tool for piston seal Macro

For removing and assembling the piston seal for Macro pump heads



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



Order no.	Description	
	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 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.	
6.6059.223	MagIC Net™ 2.2 Multi CD: 3 licenses	
	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.	
6.9988.813	Validation Documentation for 881 (English / German) – CD	

- Further connections 76
Leak sensor 76
- L**
- Leak 54
Leaking piston seals 54
Leak sensor
 Installation 17
 Interface 76
 Technical data 73
Leak-tightness 47, 48
Loop
 see also "Sample loop" 37
- M**
- Mains cable 42
Mains connection 42, 76
Mains voltage 4
Maintenance
 High pressure pump 53
 Injection valve 67
 Pump head 54
Material 74
MSB 76
- O**
- Oil 66
Overview of the instrument 7
 Front 7
- P**
- PC connector 41
Piston seal 54
Pistons of the high pressure pump
 54
Power consumption 76
Power supply unit 76
Precipitates 53
Pressure limit 75
Pressure range 75
Pressure screws
 Connection 15
Protection
 Injection valve 67
- Inline filter 32
Protection class 77
Pulsation 54
Pulsation absorber
 Installation 33
Pump head
 Maintenance 54
Purge valve 28
- Q**
- Quality Management 69
- R**
- Reference conditions 73
Regeneration 50
Rinsing
 Guard column 44
 Sample path 66
 Separation column 45
Rinsing time 67
Rise in pressure 53
- S**
- Safety instructions 4
Safety shutdown 75
Safety specification 77
Sample
 Carry-over 66
 Sample loop 37
 Transfer time 66
Sample loop 37
Sample path
 Rinsing 66
Sample preparation 66
Scope of delivery 82
Screws
 Connection 15
Separation column
 Installation 44
 Protection 2, 33, 68
 Regeneration 69
 Rinsing 45
 Separating efficiency 68
- Storage 68
Service 4, 50
Service Agreement 69
Shutting down 51
Standards 77
Start-up 47
Storage 73
Switch on 42
- T**
- Technical data
 Leak sensor 73
 Reference conditions 73
Technical specifications
 Detector 76
 Eluent degasser 74
 High pressure pump 74
 Instrument 73
 Interfaces 76
Temperature 73
Test
 Safety specification 77
Transfer time 66
Transport 73
Transport locking screws 17
Tubings
 Installation 14
- U**
- USB 76
- V**
- Vacuum pump
 Protection 17
Validation 69
Valve
 see also "Injection valve" 34
Valves of the high pressure pump
 62
Voltage 76
- W**
- Warranty 80