

872 Extension Module



IC Pump – 2.872.0010

Manual
8.872.8005EN



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IC Pump – 2.872.0010

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1 Introduction

1.1 Instrument description

Existing 850 Professional IC instruments can be expanded to include additional functions by means of 872 Extension Modules. Every 850 Professional IC instrument can be supplemented with up to 3 extension modules.

The **872 Extension Module – IC Pump** permits the installation of an additional IC high pressure pump «iPump» in a Professional IC System.

Thanks to the 872 Extension Module IC Pump, an isocratic 850 Professional IC System can be supplemented to form a quaternary gradient system. This means more flexibility for the configuration of the required IC system.

The extension module is operated with **MagIC Net** software, just like the IC instrument. When it is connected to an 850 Professional IC instrument, **MagIC Net** recognizes the extension module automatically and checks its functional capability. It controls and monitors the unit IC instrument – extension module(s), evaluates the measured data and administers it in a database.

The **872 Extension Module – IC Pump** comprises 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 fine 2 µm material of the readily and easily replaceable filter platelets removes particles such as bacteria and algae from the solutions.



Pulsation damper

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

1.2 About the documentation



Caution

Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which have to be followed by the user in order to ensure safe operation of the instrument.

1.2.1 Content and scope


This document describes the **872 Extension Module – IC Pump**, its assembly and connection to the IC instrument, as well as the installation, operation and maintenance of the individual components. Technical specifications, troubleshooting and information concerning scope of delivery and optional accessories makes up the rest of the manual.






This document does not on the other hand describe the functions of the IC instrument - IC extension module unit, nor does it describe the capillary connections that proceed from the extension module. For this purpose, please refer to the manual for the IC instrument and that for the sample processor.

Additional information concerning the configuration of MagIC Net can be found on the online help for MagIC Net.

1.2.2 Symbols and conventions

The following symbols and styles are used in this documentation:

(5-12)	<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>

	Warning This symbol draws attention to a possible hazard due to electrical current.
	Warning This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	Warning This symbol draws attention to a possible biological hazard.
	Caution This symbol draws attention to a possible damage of instruments or instrument parts.
	Note This symbol marks additional information and tips.

1.3 Safety instructions

1.3.1 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.

1.3.2 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.

1.3.3 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.

1.3.4 Flammable solvents and chemicals

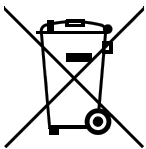


Warning

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.

1.3.5 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.

2.2 Rear

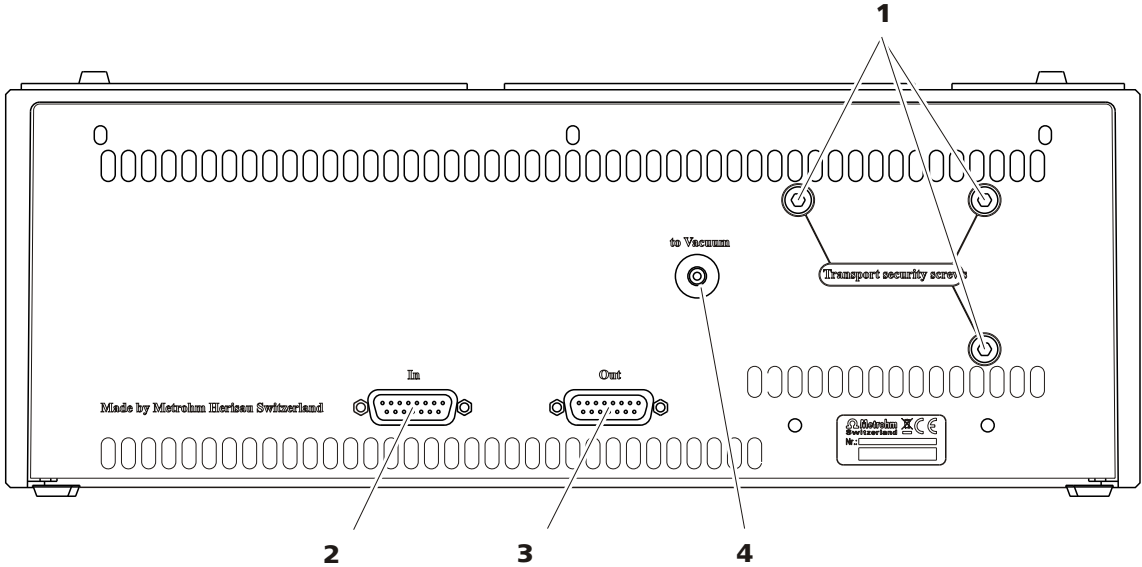


Figure 2 Rear 872 Extension Module IC Pump

- | | |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 1 Transport locking screws | 2 Connector In
To connect the extension module to the IC instrument or to a previous extension module. |
| 3 Connector Out
To connect an additional extension module. | 4 Connector to Vacuum
To connect the vacuum chamber of the extension module to the vacuum chamber of the IC instrument. |



3 Assembly

3.1 General

The extension modules are fitted directly to the 850 Professional IC instrument and connected with it via 6.2156.060 connection cable. Extension modules have no power supply of their own, but rather draw the electricity they require from the instrument with which they are connected.

Up to three extension modules can be connected to an 850 Professional IC instrument. The following restrictions are to be taken into account:

Restrictions

The 850 Professional IC instruments and their extension modules must not have more than 4 identical components in common, i.e.:

- a maximum of 4 high pressure pumps,
 - a maximum of 4 peristaltic pumps,
 - a maximum of 4 injection valves,
 - a maximum of 4 suppressors (MSM, SPM incl.),
- BUT**
- only a maximum of 3 degassers
 - and a maximum of 3 CO₂ suppressors (MCS)



Note

If all 4 high pressure pumps are being used at once, then not all of them are permitted to run at maximum flow for longer periods of time.

Extension modules can be mounted in the following setup versions:

- above, between instrument and bottle holder (**3-A**), or
- below, between instrument and base tray (**3-B**), or
- next to the instrument (**3-C**) with a separate 6.2061.110 base tray and a 6.2061.100 bottle holder (to be ordered additionally). For this, the longer 6.2156.070 connection cable (to be ordered additionally), is necessary, too.

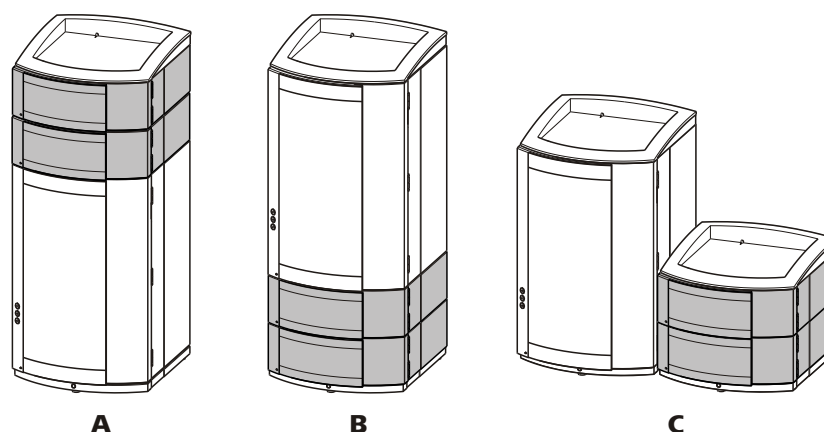


Figure 3 Setup versions

A Extension module above the IC instrument

Between the 850 Professional IC and the bottle holder.

B Extension module on the below the IC instrument

Between the base plate and the 850 Professional IC.

C Extension module next to the IC instrument

With its own base plate and its own bottle holder next to the 850 bottle holder.

Position the extension module in such a way that the capillary connections can be kept as short as possible. If several extension modules are used, then they should all be installed in the same location if possible – either above, below or next to the IC instrument. If this is not possible, then the extension modules that are located at greater distances from one another must be connected with one another by means of the longer 6.2156.070 connection cable (available as optional accessory).

3.2 Mounting the extension module onto the IC instrument

1 Switching off the IC instrument

Switch the IC instrument off and disconnect the mains cable.

2 Clearing the bottle holder

If there are bottles and other items on the bottle holder, remove them.

3 Removing drainage tubings

Loosen the drainage tubing from the drainage tubing connector on the bottle holder.



4 Dismounting the bottle holder

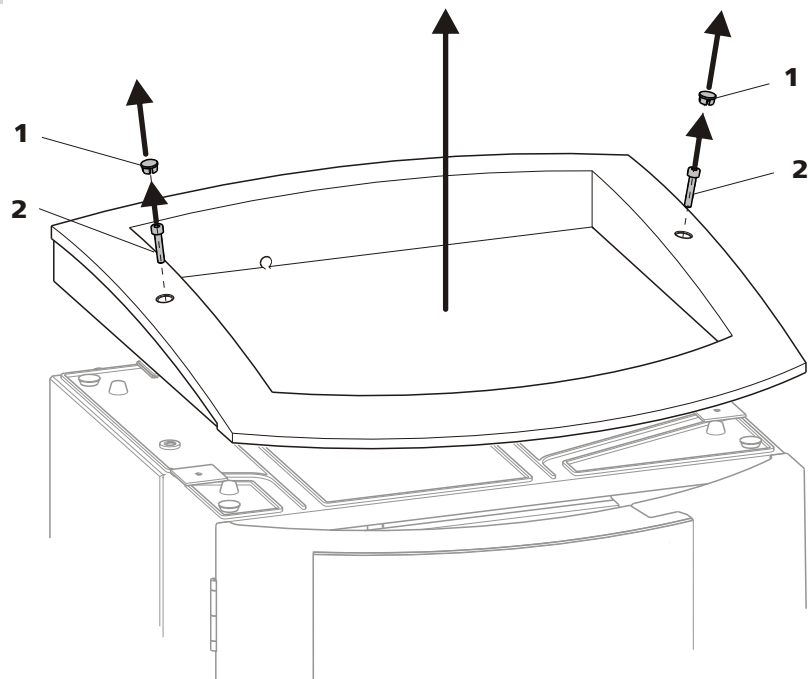


Figure 4 Dismounting the bottle holder

1 Cover stoppers

2 Cylinder screws

- Remove covering stoppers (4-**1**).
- Loosen the cylinder screws with a 6.2621.100 3 mm hexagon key.
- Remove the bottle holder

5 Attaching the extension module(s)

Place the extension module(s) on the IC instrument.

6 Mounting the bottle holder

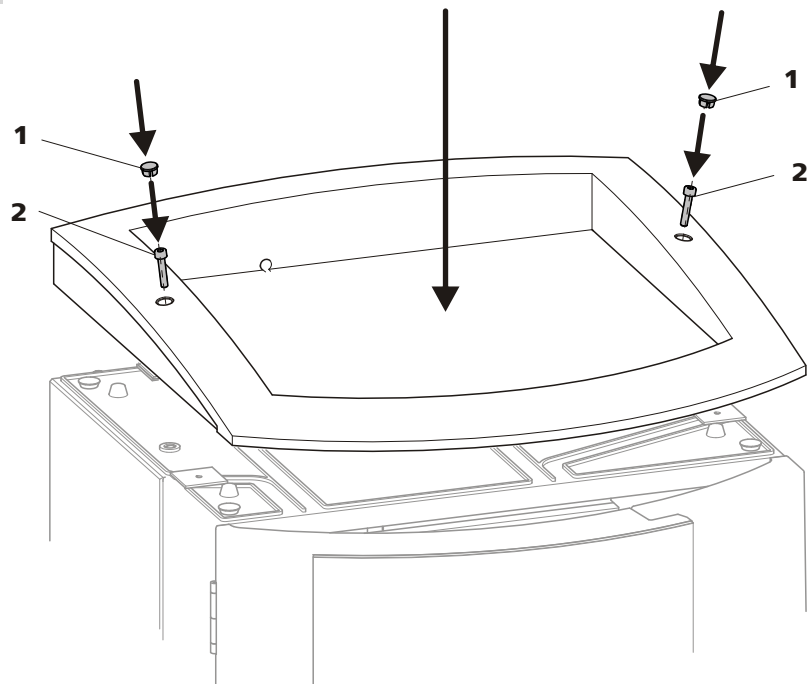


Figure 5 Mounting the bottle holder

1 Cover stoppers

2 Cylinder screws

- Attach the bottle holder on the extension module.
- Tighten the cylinder screws (4-2) with an 6.2621.100 3 mm hexagon key
- Insert covering stoppers (4-1).

7 Connecting the extension module

- Plug a 6.2156.060 cable into the connector **In** of the extension module and screw it tight.
- Plug the other end of the cable into the **Extension module** connector of the IC instrument and screw it tight.

8 Optional: Connecting a further extension module

- Plug the cable 6.2156.060 or a longer 6.2156.070 cable (optional accessory) into the connector **In** of the second extension module and screw it tight.
- Plug the other end of the cable into the **Out** connector of the first extension module and screw it tight.

**9 Mounting the drainage tubing**

Reconnect the drainage tubing to the drainage tubing connector of the bottle holder.

Possibly, a longer section of silicone tubing 6.186.020 must be cut to fit and mounted (*see also the manual for the IC instrument*).

3.3 Mounting the extension module below the IC instrument

1 Switching off the IC instrument

Switch the IC instrument off and disconnect the mains cable.

2 Clearing the bottle holder

If there are bottles and other things on the bottle holder, remove them.

3 Disconnecting all connections on the rear of the instrument

- Disconnect the mains cable,
- Disconnect the MSB cable,
- Disconnect the USB cable,
- Disconnect the leak sensor,
- Remove the drainage tubings.

4 Removing the detector(s)

Disconnect the detector cable(s) and remove the detector(s) from the IC instrument (*see manual for the IC instrument*).

5 Removing the base tray

- Tilt the IC instrument sideways and lay it down flat.
- Loosen the cylinder screws with a 6.2621.100 3 mm hexagon key.
- Remove base tray.

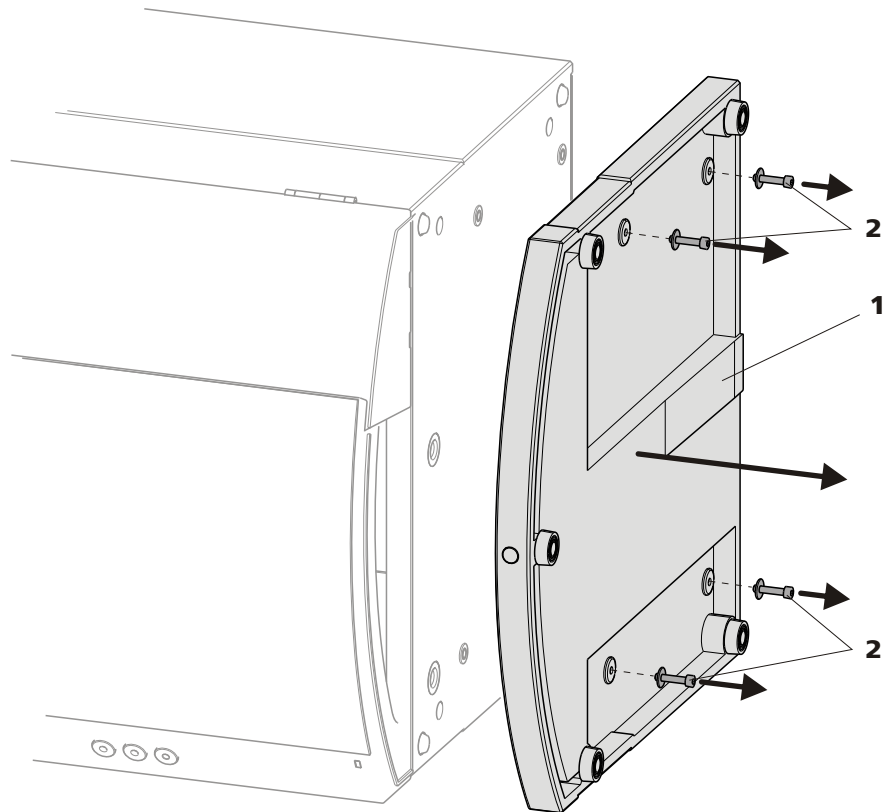


Figure 6 Removing the base tray

1 Base tray

2 Cylinder screws
With washer.

6 Mounting the base tray

- Tilt the extension module sideways and lay it down flat.
- Attach base tray.
- Slide the washers onto the cylinder screws (7-2) and tighten these with a 3 mm hexagon key (6.2621.100).

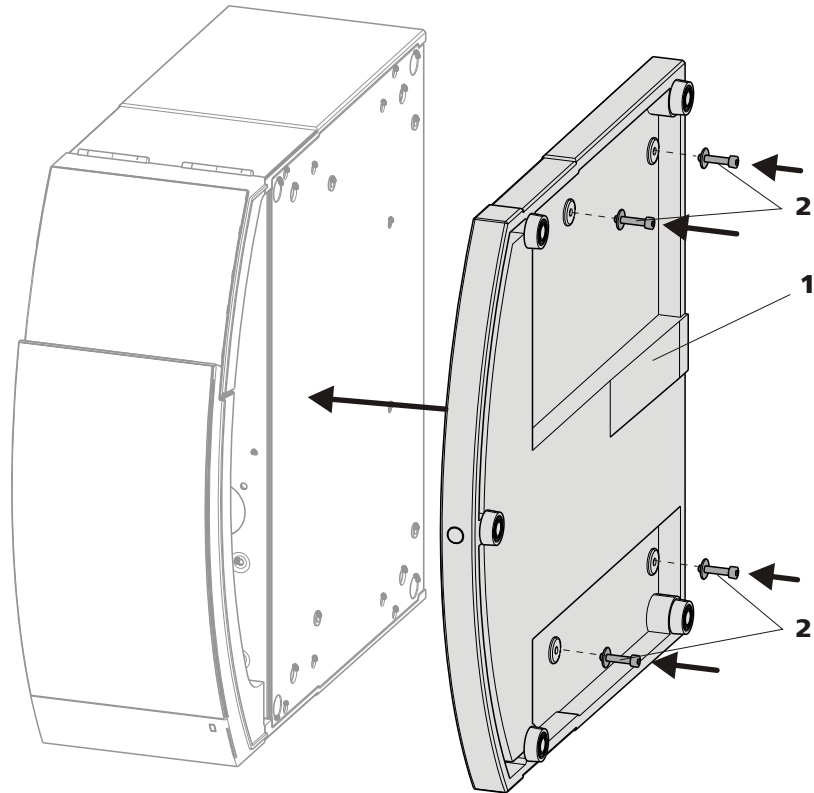


Figure 7 Mounting the base tray

1 Base tray

2 Cylinder screws

With washer.

- Set up the extension module.
- Optional: Set up further extension modules.
- Set up the IC instrument.

7 Connecting the extension module

- Plug a 6.2156.060 cable into the connector **In** of the extension module and screw it tight.
- Plug the other end of the cable into the **Extension module** connector of the IC instrument and screw it tight.

8 Optional: Connecting a further extension module

- Plug the cable 6.2156.060 or a longer 6.2156.070 cable (optional accessory) into the connector **In** of the second extension module and screw it tight.
- Plug the other end of the cable into the **Out** connector of the first extension module and screw it tight.

9 Inserting the detector(s) again and connecting it (them)

See manual for the IC instrument.

10 Restoring the loosened connections

- Reconnect the drainage tubings,
Possibly, a longer section of silicone tubing 6.186.020 must be cut to fit and mounted (*see also the manual for the IC instrument*).
- Connect the leak sensor (*see manual for the IC instrument*),
- Connect the USB cable,
- Connect the MSB cable,
- Plug in the mains cable.

3.4 Setting up the extension module next to the IC instrument

1 Switching off the IC instrument

Switch the IC instrument off and disconnect the mains cable.

2 Mounting the base tray

- Tilt the extension module sideways and lay it down flat.
- Attach base tray.
- Tighten the washers and the cylinder screws (8-2) with a 3 mm hexagon key (6.2621.100).

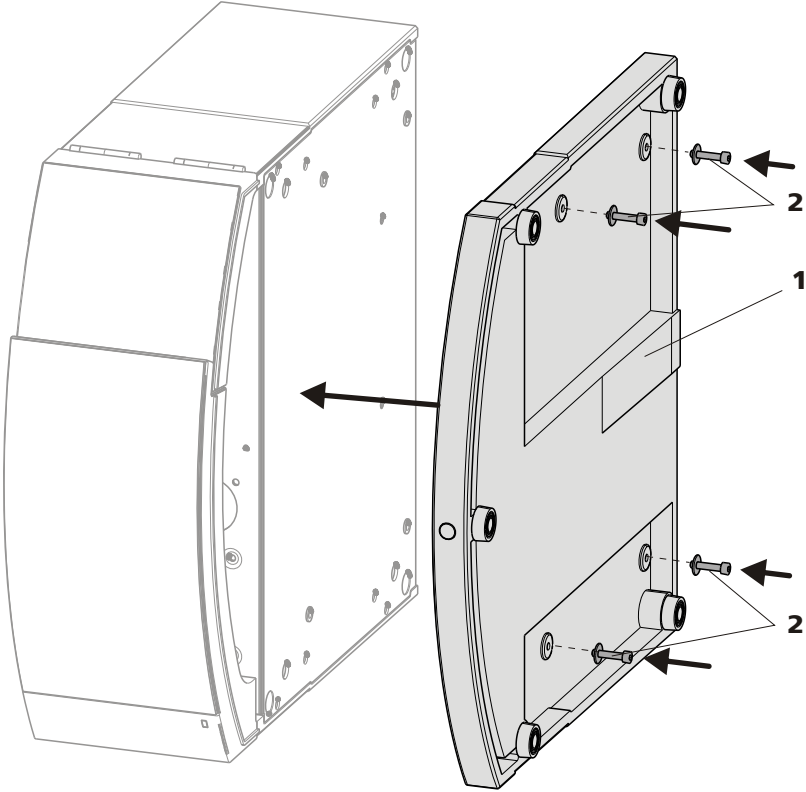


Figure 8 Mounting the base tray

1 Base tray

2 Cylinder screws
With washer.

- Set up the extension module.
- Optional: Set up further extension modules.

3 Mounting the bottle holder

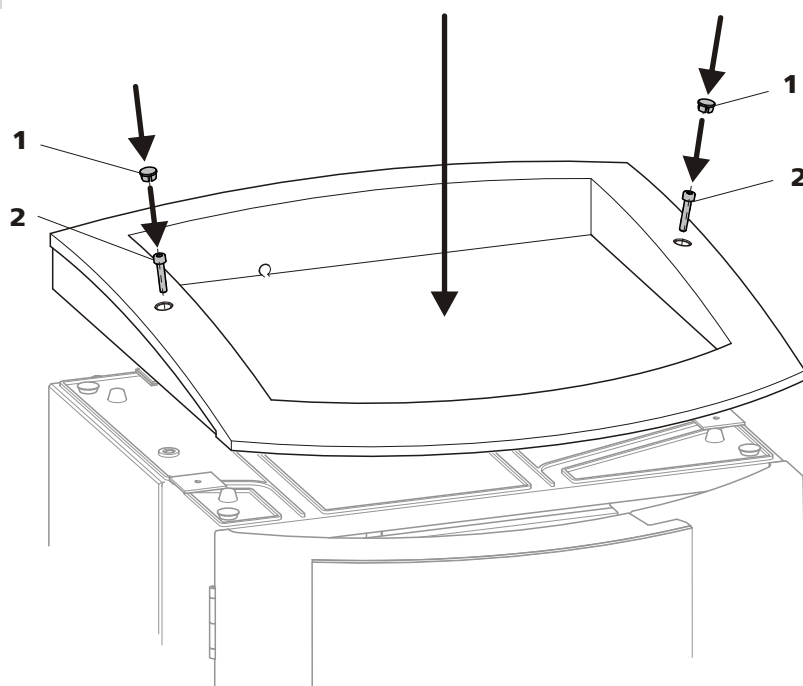


Figure 9 Mounting the bottle holder

1 Cover stoppers

2 Cylinder screws

- Place the bottle holder on the extension module.
- Tighten the cylinder screws (9-2) with an 6.2621.100 3 mm hexagon key.
- Insert covering stoppers (9-1).

4 Connecting the extension module

- Plug a 6.2156.060 cable into the connector **In** of the extension module and screw it tight.
- Plug the other end of the cable into the **Extension module** connector of the IC instrument and screw it tight.

5 Optional: Connecting a further extension module

- Plug the cable 6.2156.060 or a longer 6.2156.070 cable (optional accessory) into the connector **In** of the second extension module and screw it tight.
- Plug the other end of the cable into the **Out** connector of the first extension module and screw it tight.



6 Connecting the leak sensor

- Plug the 6.2103.170 adapter into the leak sensor connector of the IC instrument.
- Connect the leak sensor cable of the IC instrument to the adapter.
- Connect the leak sensor cable of the extension module to the adapter.

7 Connecting the drainage tubings

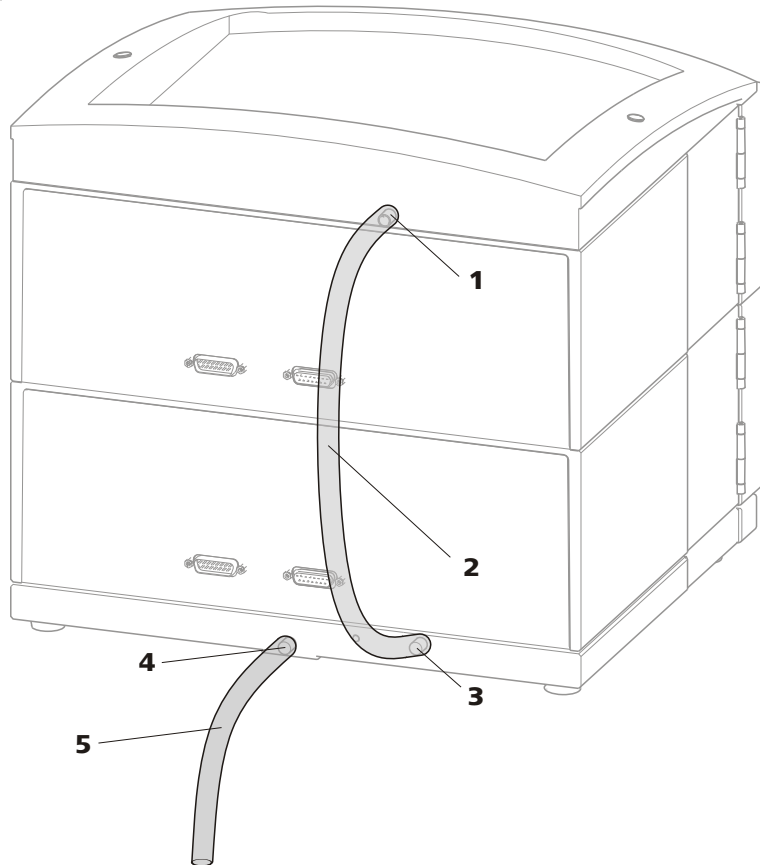


Figure 10 Connecting the drainage tubings

1 Drainage tubing connector
For draining escaped liquid from the bottle holder.

2 Drainage tubing
Section of the 6.1816.020 silicon tubing. For draining escaped liquid from the bottle holder.

3 Drainage tubing connection

For supplying escaped liquid through the connected drainage tubing to the leak sensor.

4 Drainage tubing connector

For draining escaped liquid from the base tray through the connected drainage tubing.

5 Drainage tubing

Section of the 6.1816.020 silicon tubing. Guides escaped liquid into a waste container.

- Plug the drainage tubing (10-2) onto the drainage tubing connector (10-1) of the bottle holder and shorten to required length.
- Plug the other end of the drainage tubing (10-2) onto the drainage tubing connector (10-3) of the base tray.
- Plug the drainage tubing (10-5) onto the drainage tubing connector (10-4) and guide the other end into a waste container.

3.5 Connecting the vacuum pump(s)

The 872 Extension Module – IC Pump has no vacuum pump of its own. In order to use the eluent degasser the extension module has to be connected to the vacuum pump of the IC instrument.

Connect the vacuum pump as follows:

Connecting the vacuum pump

- 1** Connect one end of the 6.1805.060 FEP tubing to the connector **to Vacuum** of the extension module.
- 2** Connect the other end of the FEP tubing to the connector **Vacuum** of the IC instrument.

Optional: Connecting a second extension module to the vacuum pump

In order to connect two extension modules to the vacuum pump of an IC instrument, the parts of the 6.5332.000 IC tubing set for 2 extension modules are needed:

- Two 6.1805.050 FEP tubings
- A 6.1808.060 T connector

This tubing set is available as part of the optional accessories.

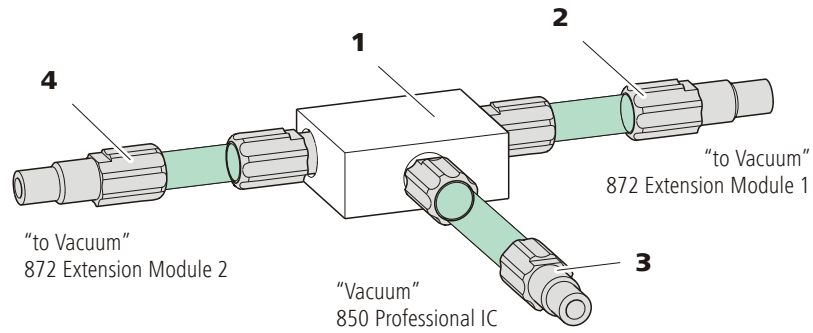


Figure 11 Connecting the vacuum pump

<p>1 T connector 6.1808.060 For connecting several FEP tubings.</p>	<p>2 FEP tubing 6.1805.050 Connect to the connector <i>to Vacuum</i> on the first 872 Extension Module IC Pump.</p>
<p>3 FEP tubing 6.1805.050 Connect to the connector <i>to Vacuum</i> on the second 872 Extension Module IC Pump.</p>	<p>4 FEP tubing 6.1805.060 Connect with the connector <i>Vacuum</i> on the 850 Professional IC instrument.</p>

- 1** Connect one end of the 6.1805.050 FEP tubing (11-**2**) to the connector **to Vacuum** of the 872 Extension Module IC Pump.
Connect the other end of the FEP tubing to the 6.1806.060 T connector (11-**1**).
- 2** Connect one end of the second 6.1805.050 FEP tubing (11-**3**) to the connector **to Vacuum** of the second 872 Extension Module IC Pump.
Also connect the other end of the FEP tubing to the 6.1808.060 T connector.
- 3** Connect one end of the 6.1805.060 FEP tubing (11-**4**) to the third output of the 6.1808.060 T connector.
Connect the other end of the FEP tubing to the connector **Vacuum** of the 850 Professional IC instrument.

4 Installation

4.1 About this chapter

The *Installation* chapter contains

- this overview
- a brief set of instructions for the installation of the 872 Extension Module IC Pump (see *Chapter 4.2, page 21*). At each step you will find cross-references to detailed installation instructions for individual components, should you require such aids.
- two installation diagrams (see *Chapter 4.3, page 22*), which show two possible applications of the instrument.
- several chapters with detailed installation instructions for all components, including those that are already installed at the time the instrument is delivered.

4.2 Installation overview



Note

A number of the capillary connections are already connected at the time the instrument is delivered.

The following work steps must still be carried out:

Installing 872 Extension Module IC Pump

1 Installing the eluent path

- Equip the eluent aspiration tubing (12-1)/(13-1) and connect with the eluent bottle (see *Chapter 4.4, page 24*).
- Connect the eluent degasser input (see *Chapter 4.5, page 28*).
- Shorten the 6.1831.100 connection capillary (12-2)/(13-2) to the required length using the 6.2621.080 capillary cutter and connect it to the pulsation damper with a 6.2744.070 pressure screw (12-3)/(13-3) (see *Chapter 4.8, page 35*).



- Connect the other end of the 6.1831.100 connection capillary (12-2)/(13-2) either with
 - a 6.2744.070 pressure screw to the T distributor (12-7) of the gradient mixing coil (gradient system)
 - or
 - a 6.2744.014 pressure screw to the injection valve of the 850 Professional IC instrument (isocratic system).

2 Putting extension module into operation

See Chapter 5, Page 37

- Put IC instrument into operation together with extension module
- Deaerate the high pressure pump (see Chapter 4.6.2, page 32).

4.3 Installation diagram

The 872 Extension Module – IC Pump can be used as an additional pump for a high pressure gradient system or it can extend an 850 Professional IC instrument with an additional isocratic channel. The following installation diagrams show the capillary connections for these two possible applications.

Figure 12: Installation diagram – gradient shows the capillary connections of the 872 Extension Module IC Pump used as component of a high pressure gradient system.

Figure 13: Installation diagram – isocratic shows the capillary connections of the 872 Extension Module IC Pump used as additional isocratic pump.

The arrangement of the modules in the diagram corresponds to the front view of the extension module. Liquid containers are not shown in the diagram.

A few of the capillaries are already pre-installed at the time the instrument is delivered. Capillaries on which nothing needs to be done at the time of initial installation are not numbered in the diagram.

High pressure gradient system

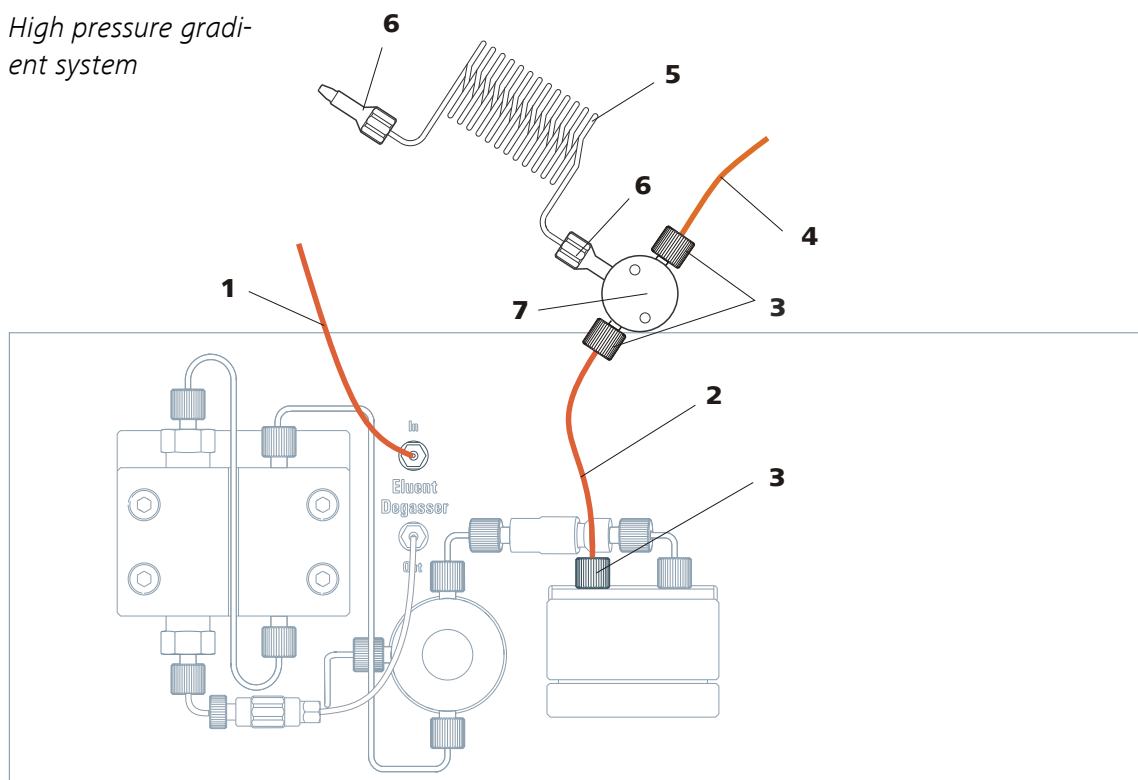


Figure 12 Installation diagram – gradient

1 Eluent aspiration tubing 6.1834.080
Connection eluent bottle – eluent degasser

3 PEEK pressure screw, short 6.2744.070

5 Gradient mixing coil 6.2758.000

7 T distributor
Component 6.2758.000 gradient mixing coil. Can also be replaced by a 6.2744.240 cross connector for three eluents.

2 Connection capillary 6.1831.100
Connection pulsation damper – gradient mixing coil

4 Connection capillary 6.1831.100
Connection to another high pressure pump

6 PEEK pressure screw 6.2744.010



Isocratic system

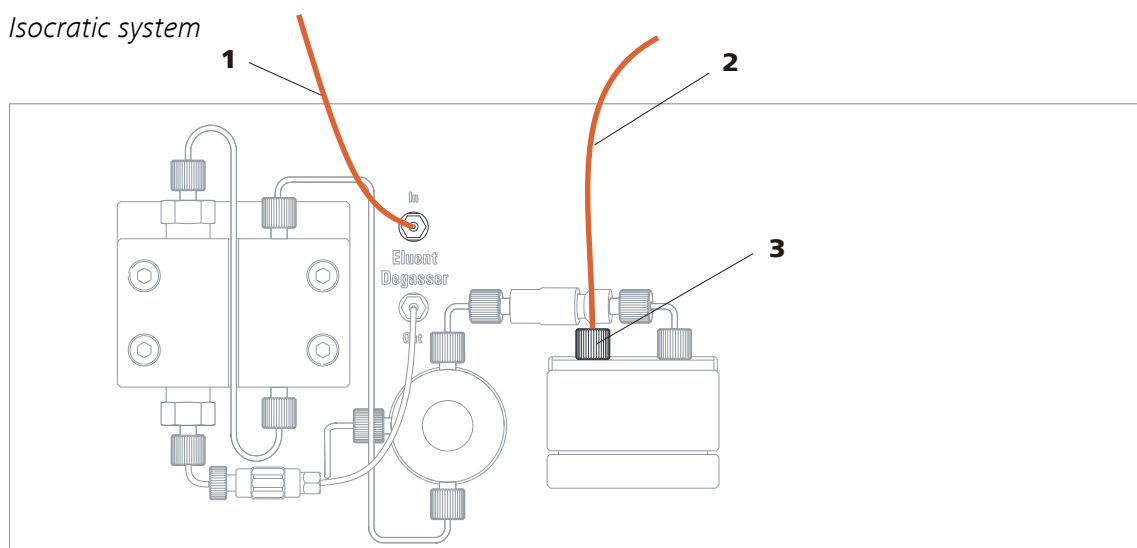


Figure 13 Installation diagram – isocratic

1 Eluent aspiration tubing 6.1834.080
Connection eluent bottle – eluent degasser

2 Connection capillary 6.1831.100
Connection pulsation damper – IC instrument

3 PEEK pressure screw, short 6.2744.070

The following chapters describe the individual installation steps in detail.

4.4 Eluent

4.4.1 Connecting eluent bottle

The eluent is aspirated out of the eluent bottle via the eluent aspiration tubing (14-**1**).

The eluent aspiration tubing is connected to the eluent degasser (see Chapter 4.5, page 28). 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 (14-1) out of the instrument through a suitable capillary feed-through.

2 Installing the 6.1602.160 eluent bottle attachment

- Slide tubing nipple (14-2) and O-ring (14-3) onto the eluent aspiration tubing (14-1).
- Push eluent aspiration tubing (14-1) through the bottle attachment (14-4) and screw tight.

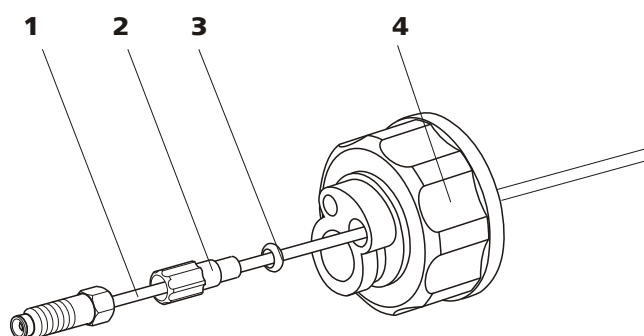


Figure 14 Installing eluent bottle attachment

1 Eluent aspiration tubing 6.1834.080

2 Tubing nipple

From accessory set 6.1602.160.

3 O-ring

From accessory set 6.1602.160.

4 Bottle attachment

From accessory set 6.1602.160.

3 Mounting aspiration filter

- Insert filter holder (15-1) into the aspiration filter (15-2) and screw tight.

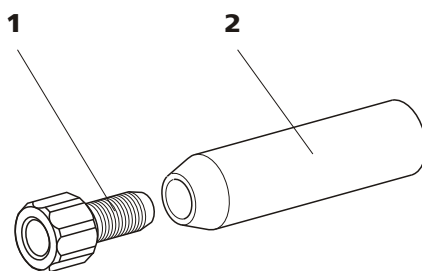


Figure 15 Mounting aspiration filter

1 Filter holder

From accessory set 6.2744.210.

2 Aspiration filter 6.2821.090

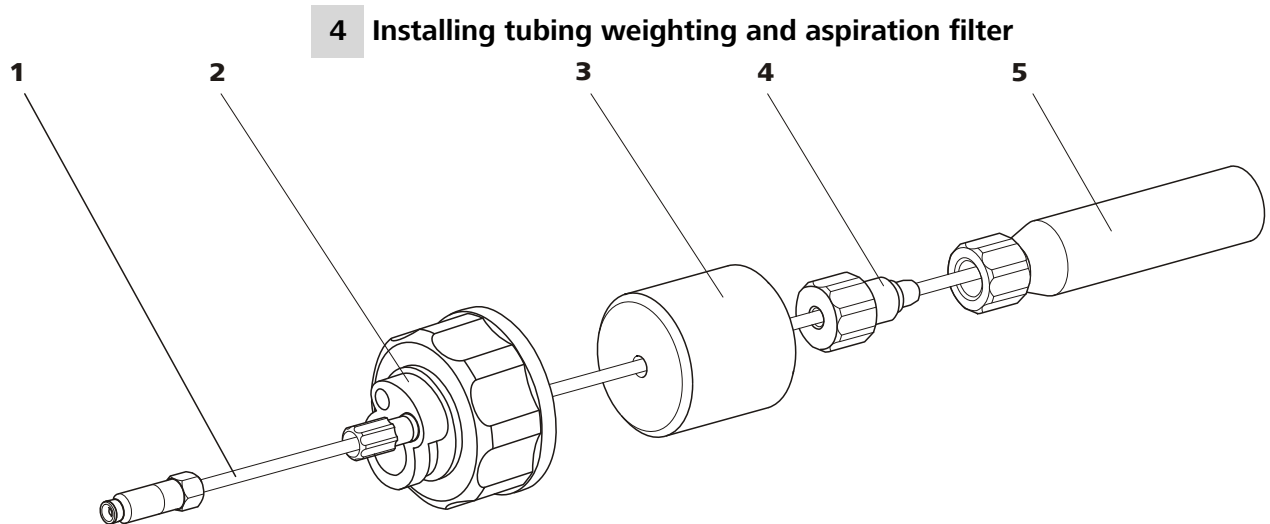


Figure 16 Installing tubing weighting and aspiration filter

1 Eluent aspiration tubing 6.1834.080

2 Eluent bottle attachment 6.1602.160

3 Tubing weighting
From accessory set 6.2744.210.

4 Clamping screw
From accessory set 6.2744.210.

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

- Slide the tubing weighting (16-3) onto the eluent aspiration tubing (16-1).
- Slide the clamping screw (16-4) onto the eluent aspiration tubing (16-1).
- Insert eluent aspiration tubing (16-1) into the aspiration filter (16-5). The end of the tubing must touch the base of the filter.
- Screw together clamping screw (16-4) and filter holder (15-1). The end of the tubing must still touch the base of the filter.

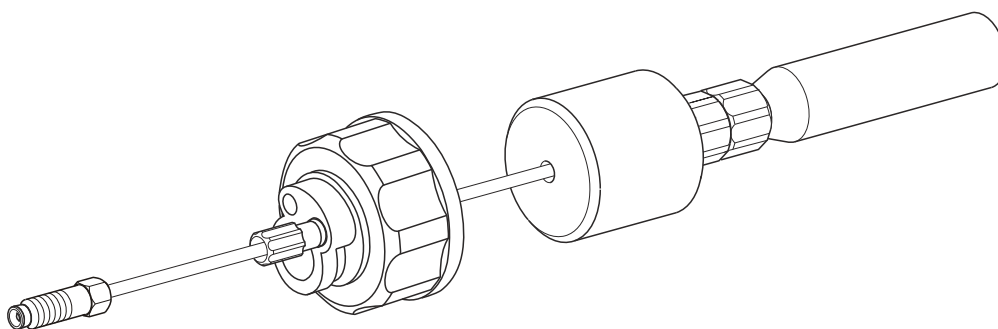


Figure 17 Eluent aspiration tubing fully equipped.

5 Mounting eluent aspiration tubing to the eluent bottle

- Insert the eluent aspiration tubing into the eluent bottle (18-10).

- Fasten the bottle attachment (16-2) on the eluent bottle (18-10). The aspiration filter (18-6) must rest on the base of the eluent bottle.

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 (18-4).

- First, place a piece of wadding (18-3), then the CO₂ adsorber (18-4) in the large opening of the adsorber tube (18-2) and close with the plastic cover.
- Fasten the adsorber tube (18-2) using the SGJ clip (18-12) onto the bottle attachment (18-11).

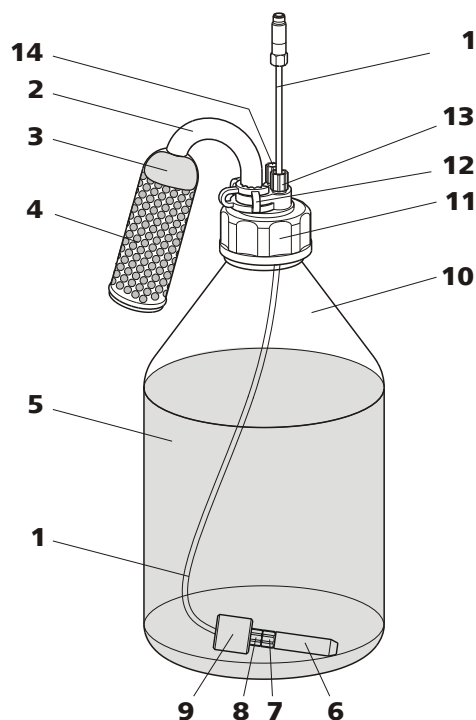


Figure 18 Eluent bottle – connected

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

3 Wadding

2 Adsorber tube 6.1609.000

4 CO₂ adsorber

Adsorbs CO₂ 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 accessory set 6.2744.210.	8 Clamping screw From accessory set 6.2744.210.
9 Tubing weighting From accessory 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 Thread stopper

4.5 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 need **not** be carried out at the time of initial installation.

Connecting the eluent degasser

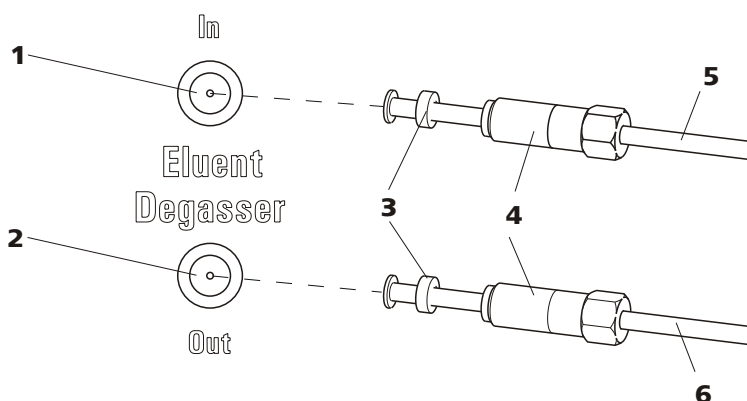


Figure 19 Eluent degasser

1 Eluent degasser input

2 Eluent degasser output

3 Tubing flare
With tubing nipple.

5 Eluent aspiration tubing 6.1834.080
For aspirating the eluent. The clamping screw (19-4) is firmly mounted.

4 Clamping screw

6 Connection capillary 6.1834.090
Connection from the eluent degasser to the high pressure pump (see Chapter 4.6, page 29). The clamping screw (19-4) is firmly mounted.

1



Caution

The clamping screws (19-4) must be tightened carefully. Use the 6.2621.050 wrench for this.

- Insert the eluent aspiration tubing (19-5) in the eluent degasser input (19-1).
- Carefully tighten clamping screw (19-4).

2

- Insert connection capillary (19-6) (the end with the longer clamping screw (19-4)) into the eluent degasser output (19-2).
- Carefully tighten clamping screw (19-4).
- Connect the other end of the connection capillary (19-6) (with the shorter clamping screw) to the high pressure pump (see "Connecting inlet to the high pressure pump", page 31).

4.6 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 4.6.2, page 32) the high pressure pump.

4.6.1 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.

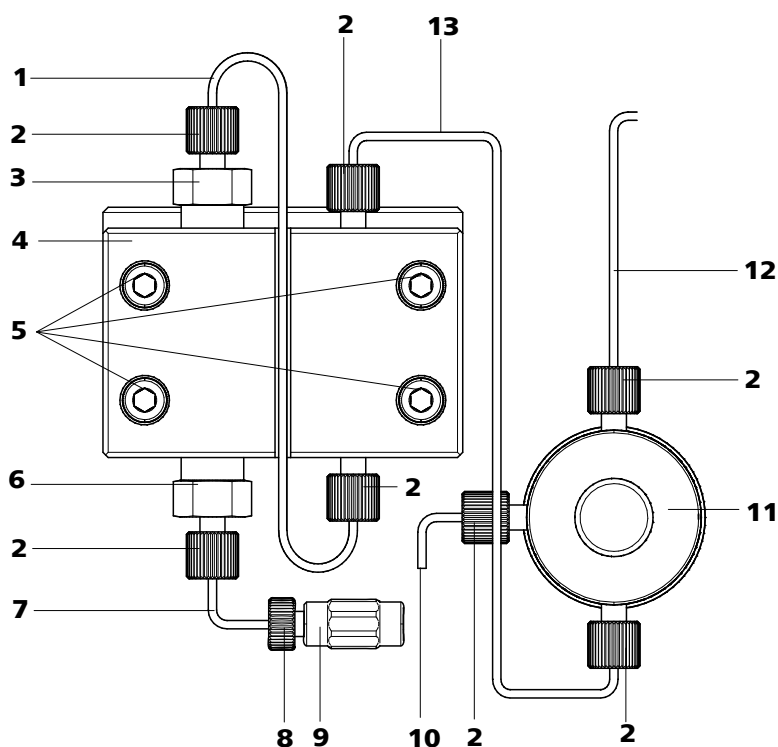


Figure 20 Capillary connections high pressure pump/purge valve

<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>
<p>5 Fastening screws For fastening the pump head.</p>	<p>6 Inlet valve holder</p>
<p>7 Pump head input capillary PEEK capillary at the input of the pump head.</p>	<p>8 Pressure screw For connecting a PEEK capillary to the coupling (20-9).</p>
<p>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 (20-8) under the number 6.2744.230.</p>	<p>10 Deaerating capillary For aspirating the eluent when deaerating the high pressure pump (see Chapter 4.6.2, page 32).</p>
<p>11 Purge valve For deaerating the high pressure pump. With rotary knob in the center and pressure sensor.</p>	<p>12 Connection capillary For connecting the inline filter (see Chapter 4.7, page 34)</p>
<p>13 Connection capillary Connects the output of the pump head with the purge valve.</p>	



Note

The eluent aspiration tubing 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

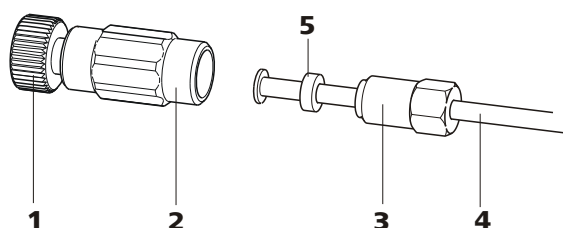


Figure 21 High pressure pump – Connect inlet

1 Pressure screw

For connecting the coupling (21-2) to the pump head input capillary (20-7).
Can be ordered together with the coupling under the number 6.2744.230.

2 Coupling 6.2744.230

For connecting the eluent aspiration tubing (21-4) 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 (21-2) with a pressure screw (21-1) on the pump head input capillary (20-7).

2 Connecting eluent aspiration tubing



Caution

The clamping screws must be tightened carefully. To tighten, grip the coupling (21-2) with the 6.2739.000 key and grip the clamping screw (21-3) with the 6.2621.050 wrench.

- Plug the eluent aspiration tubing (21-4) into the coupling (21-2).
- Tighten clamping screw (21-3).



4.6.2 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 22, page 33*):

Deaerating the high pressure pump

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

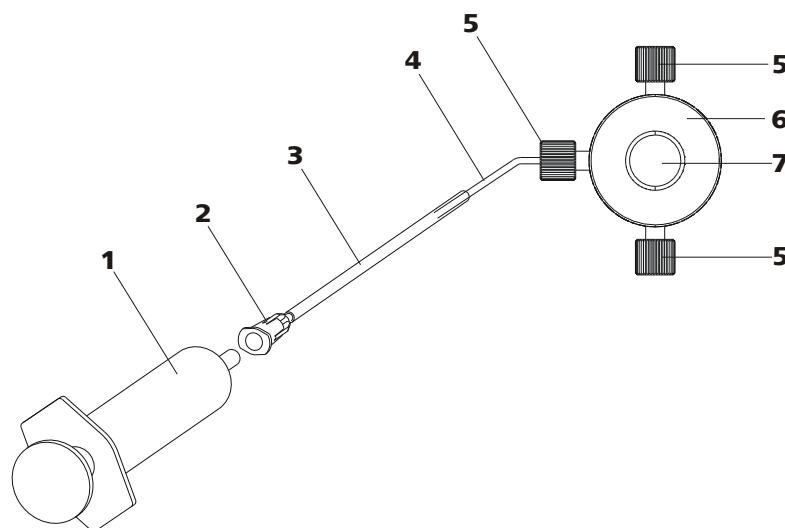


Figure 22 Deaerating the high pressure pump

1 Syringe 10 mL 6.2816.020
For aspirating the eluent.

3 Purging needle 6.2816.040

5 PEEK pressure screws, short 6.2744.070

7 Purge valve rotary knob

2 Luer connector
On purging needle.

4 Deaerating capillary

6 Purge valve

1 Connecting the purging needle

- Push the end of the purging needle (22-3) over the end of the deaerating capillary (22-4) on the purge valve.

2 Connecting the syringe

- Insert syringe (22-1) in the Luer connector (22-2) of the purging needle (see Figure 22, page 33).

3 Opening purge valve

- Open the rotary knob (22-7) by approx. ½ rotation counterclockwise.



4 Setting the flow rate

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

5 Aspirating eluent

- Aspirate with the syringe (22-1) until bubble-free eluent flows into the syringe.

6 Completing deaerating

- Turn off high pressure pump.
- Close rotary knob (22-7).
- Remove syringe (22-1) from the Luer connector (22-2).
- Pull the purging needle (22-3) out of the deaerating capillary (22-4).

4.7 Inline filter

Between the purge valve and the pulsation damper the 6.2821.120 inline filter 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 fine 2 µm material of the readily and easily replaceable filter platelets removes particles such as 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.

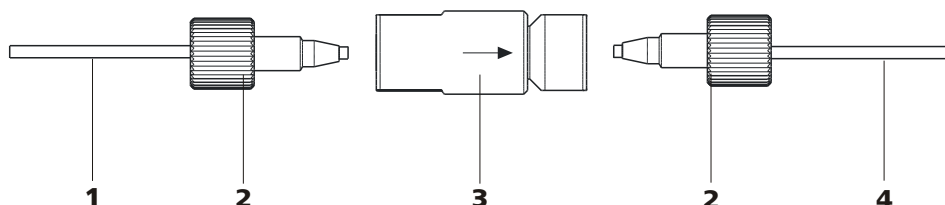


Figure 23 Connecting inline filter

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 damper.

- 1** Screw on the connection capillary running from the purge valve with a 6.2744.070 pressure screw to the input side of the inline filters.
- 2** Screw on the connection capillary running to the pulsation damper with a 6.2744.070 pressure screw to the output side of the inline filter.

4.8 Pulsation damper



Note

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



Caution

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



The pulsation damper 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 4.6, page 29) and injection valve .

The pulsation damper can be operated in both directions.

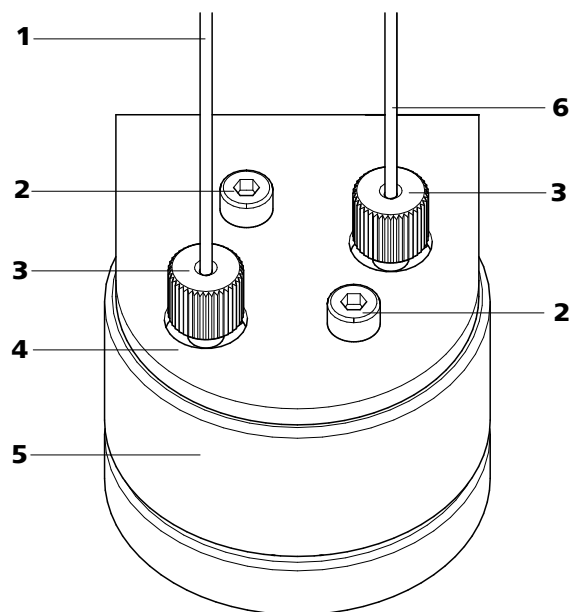


Figure 24 Pulsation damper – Connection

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

5 Start-up

The extension module is put into operation together with the IC instrument.

Putting IC instrument into operation with extension modules

- 1 Start MagIC Net.
- 2 Connect IC instrument to PC and switch on.
The extension module is recognized automatically by MagIC Net.
- 3 Deaerate the high pressure pump (*see Chapter 4.6.2, page 32*).

Additional information can be found in the *Start-up* chapter in the manual for the IC instrument as well as in the MagIC Net online Help.

6.1.4 Shutting down

If the instrument is shut down for a longer period of time, the entire IC system must be rinsed as follows to rid it of salts in order to prevent eluent salts from forming crystals which may cause subsequent damage.

- rinse all capillaries and the Dosino with methanol/ultra pure water (1:4),
- rinse all pump tubings of the peristaltic pump with ultra pure water.

6.2 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.

6.3 Eluent

6.3.1 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.

6.3.2 Operation

6.3.2.1 Supply bottle

The supply bottle with the eluent must be connected as indicated in *Chapter 4.4.1, Page 24*. 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.

6.3.2.2 Aspiration filter

To protect the IC system against foreign particles, we recommend aspirating the eluents via a 6.2821.090 aspiration filter (**15-2**). 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.

6.3.2.3 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.

6.4 High pressure pump

6.4.1 Protection



Caution

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

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

Salt crystals between the piston and seal cause abrasion particles which can find their way into the eluent. These lead to contaminated valves, a rise in pressure and in extreme cases scratched pistons. It is therefore essential to ensure that **no precipitates** can occur (see Chapter 6.3.2.3, page 40).



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 turning on the pump.

6.4.2 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 (31-2), (31-3) 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 Turn off high pressure pump and wait until pressure is released.
- 2 Loosen the pressure screw on the inlet valve holder (20-2) and unscrew the coupling (20-9), the pump head input capillary (20-7) and the eluent aspiration tubing from the pump head.
- 3 Unscrew the pump head output capillary (20-13) from the pump head.
- 4 Remove pump head from the pump housing by loosening the 4 fastening screws (20-5) using the 6.2621.030 hexagon key. 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.

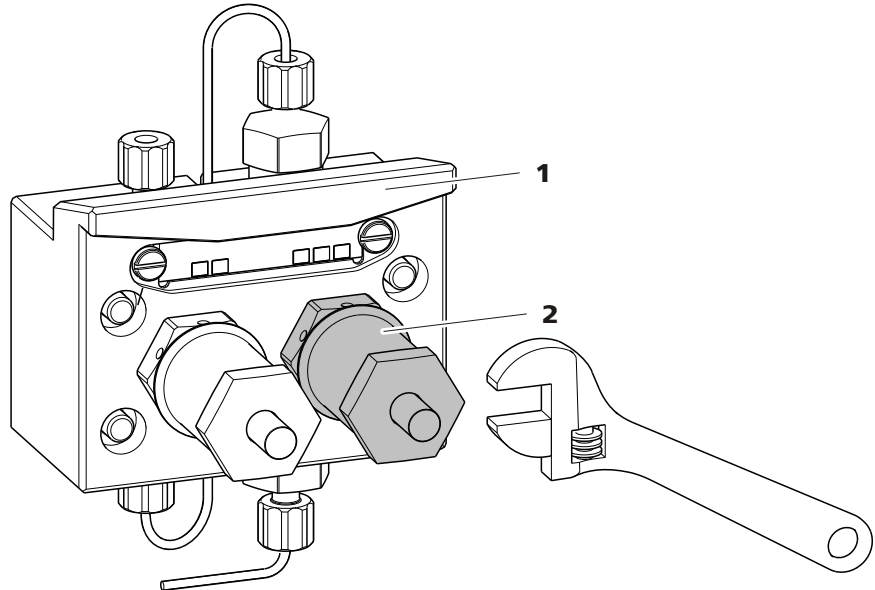


Figure 25 Removing piston

- 1 Pump head**
- 2 Piston**

2 Dismantle 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.

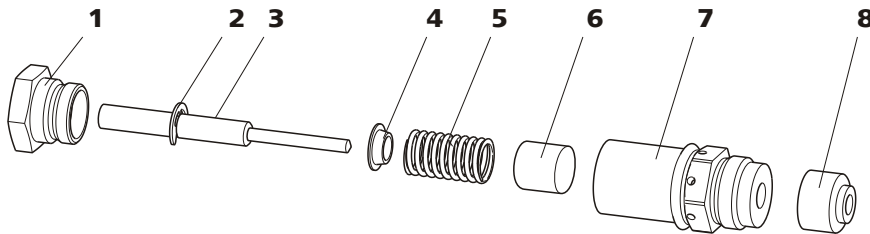


Figure 26 Components of the piston cartridge

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 pure abrasive cleaning powder, rinse particle free with ultra pure 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 6.2617.010 special tool (see Figure 27, page 44) is necessary in order 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.

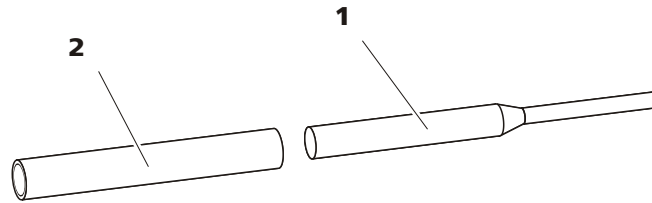


Figure 27 Tool for piston seal 6.2617.010

1 Pin
Pin for removing the old piston seal.

2 Sleeve
Sleeve for inserting the new piston seal.



Caution

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

1 Removing the piston seal



Caution

Avoid touching the sealing surface in the pump head (20-4) with the tool.

Screw the special tool for the piston seal (27-1) with the narrow side just as far into the piston seal as the same can be removed.

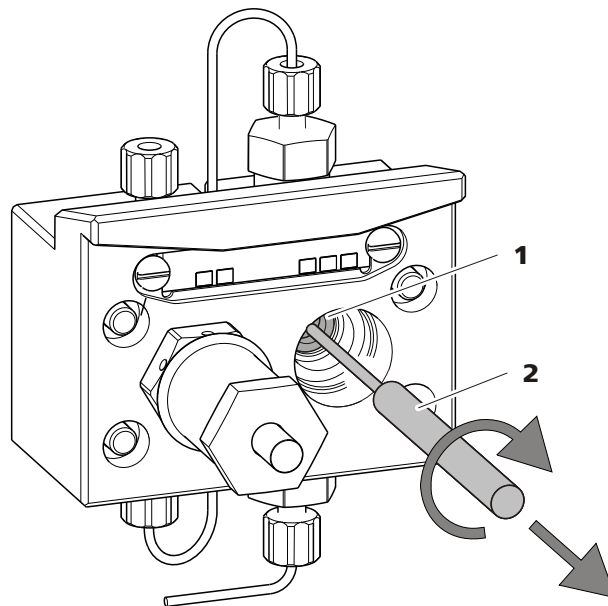


Figure 28 Removing the piston seal

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 (27-2). The sealing springs must be visible from the outside.

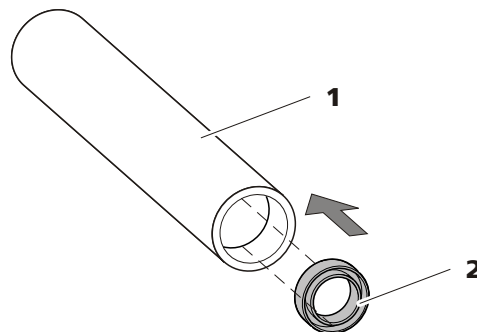


Figure 29 Insert the piston seal into the tool

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 (27-2) with inserted piston seal into the pump head and press the seal with the wide end of the tool for the piston seal (27-1) into the pump head recess.

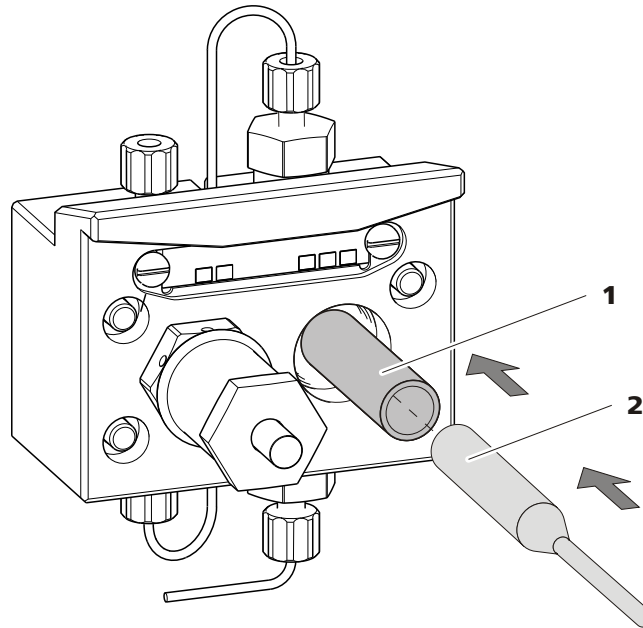


Figure 30 Inserting the piston seal into the pump head

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 (20-1) from the outlet valve holder.
- Unscrew the holders for the inlet and outlet valves and remove valves.

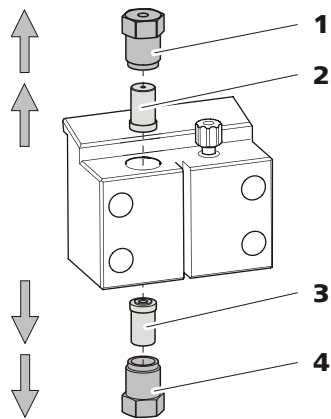


Figure 31 Removing valves

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 ultra pure 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 6.2617.020 tool for valve cartridges 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.

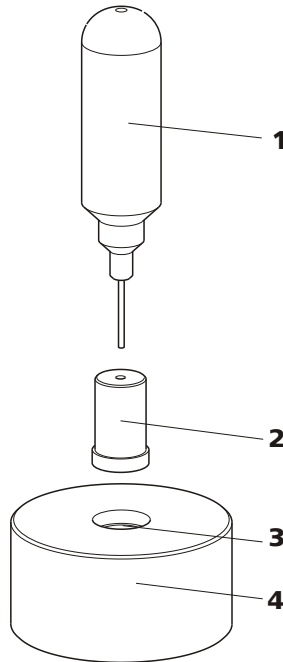


Figure 32 Dismantling valve

<p>1 Needle For pushing the valve components out of the valve housing.</p>	<p>2 Valve</p>
<p>3 Holder</p>	<p>4 Recess For collecting the valve components.</p>

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 33, page 49).

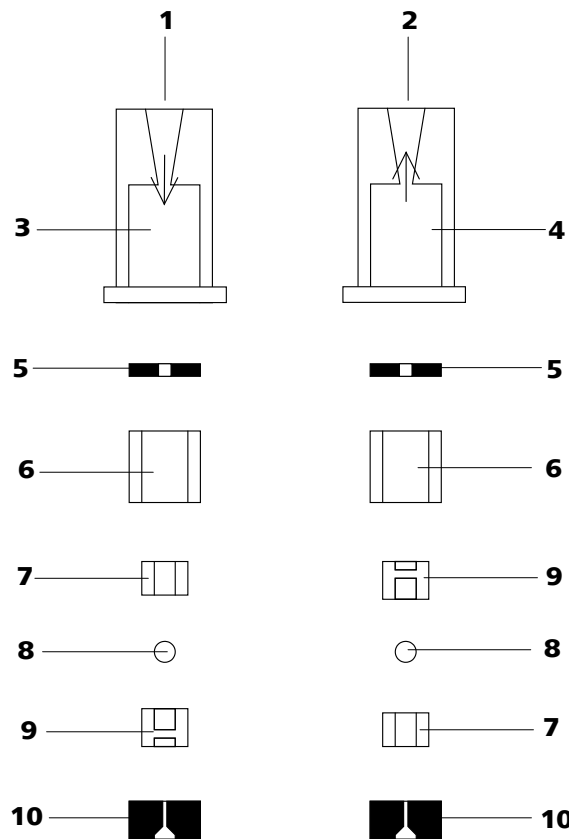


Figure 33 Components of the inlet valve and outlet valve

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 Clean the components of the valve

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

5 Reassemble the valve

Reassemble valve components *according to figure 33, page 49*.

- 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 33, page 49*).



- Place the valve housing over the stacked components 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 assembled correctly (see *Figure 33, page 49*).

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 (31-4).
- 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 (31-1).

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 (20-5). Firmly tighten the screws with the 6.2621.030 hexagon key.
- 2** Screw connection capillaries (20-1), (20-7) and (20-13) onto the pump head again.

6.5 Inline filter

6.5.1 Maintenance

The 6.2821.120 inline filters comprise the filter housing (34-2), the filter screw (34-4) and the filter (34-3). New filters (34-3) are available under the order number 6.2821.130 (10 items).

The 6.2821.130 filters (23-3) should be changed every 3 months (more frequently at higher backpressure).

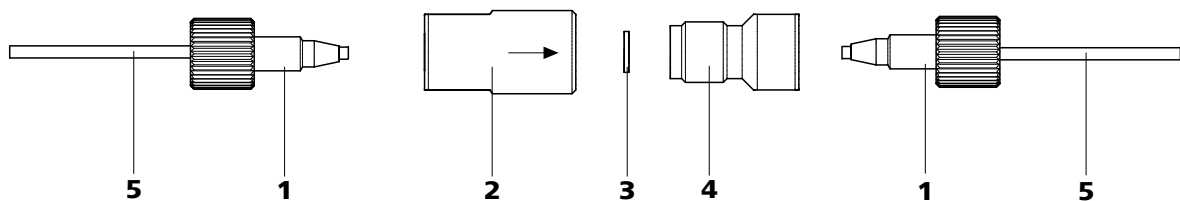


Figure 34 Changing the filter

1 PEEK pressure screws, short
6.2744.070

3 6.2821.130 filter
Packaging contains 10 items.

5 Connection capillaries

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

4 Filter screw
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 (34-1) from the inline filter.

2 Unscrewing the filter screw

- Screw the filter screw (34-4) out of the filter housing (34-2) with the aid of two 6.2621.000 adjustable wrenches.

3 Inserting the filter

- Remove the old filter (34-3) with tweezers.
- Place the new filter (34-3) flat in the filter housing with tweezers (34-2).

4 Mounting filter screw

- Screw the filter screw (34-4) back into the filter housing (34-2) and tighten by hand. Then additionally tighten slightly with two 6.2621.000 adjustable wrenches.

5 Remounting the inline filter

- Screw the pressure screws (34-1) back onto the inline filter.

6 Rinsing the inline filter

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

6.6 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**.



7 Troubleshooting

7.1 Problems and their solutions

Problem	Cause	Remedy
Marked rise in pressure	6.2821.120 inline filter blocked.	Replace 6.2821.130 filter (see Chapter 6.5, page 51).
Drift of the baseline	Eluent – Evaporation of the organic solvent in the eluent.	Check the eluent bottle attachment (see Figure 16, page 26).
Very noisy baseline	High pressure pump – contaminated pump valves.	Clean pump valves (see Chapter 6.4.2, page 41).
	Eluent – Leak in the eluent path.	Check the eluent path.
	Eluent – Blockage in the eluent path.	Check the eluent path.
	High pressure pump – defective piston seals.	Replace piston seals (see Chapter 6.4.2, page 41).
	Pulsation damper not connected.	Connect pulsation damper (see Chapter 4.8, page 35).
Background conductivity too high	Incorrect eluent.	Change eluent (see Chapter 6.3.2.3, page 40).
Poor reproducibility of the retention times	Eluent – Leak in the eluent path.	Check the eluent path.
	Eluent – Blockage in the eluent path.	Check the eluent path.
Unexpected change to the retention times in the chromatograms	Eluent – Gas bubbles in the eluent.	Check connections of the eluent degasser (see Chapter 4.5, page 28).
	High pressure pump – defective.	Request Metrohm Service.
Vacuum is not being built	Eluent Degasser – Connector Vacuum on the rear of the instrument not (tightly) sealed.	<ul style="list-style-type: none"> ▪ Seal the connector Vacuum tightly with a 6.144.6040 threaded stopper. or when using an 872 Extension Module:



Problem	Cause	Remedy
		<ul style="list-style-type: none">▪ Connect an FEP tubing between the IC instrument and the Extension Module and tighten both clamping screws until they seal.



8 Technical specifications

8.1 Reference conditions

The technical specifications 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)

8.2 Instrument

<i>IC system</i>	Metal-free IC system
<i>Material</i>	Painted polyurethane hard foam without CFCs, fire class V0
<i>Intelligent components</i>	MagIC Net

8.3 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

8.4 Housing

Dimensions

<i>Width</i>	365 mm
<i>Height</i>	131 mm
<i>Depth</i>	380 mm

<i>Material of base tray, housing and bottle holder</i>	Polyurethane hard foam (PUR) with flame retardation for fire class UL94V0, CFC-free, coated
---------------------------------------------------------	---------------------------------------------------------------------------------------------

8.5 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

8.6 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
<i>Gradient capacity</i>	Isocratic or gradient (extendable to quaternary)
<i>Profile</i>	Step, linear, convex and concave
<i>Resolution</i>	< 1 nL/min flow increments

8.7 Interfaces

<i>Auxiliary</i>	1 DSUB plug 15-pin (female)
<i>Analog Output</i>	Analog Output (optional)

8.8 Safety specification

<i>Design / testing</i>	<ul style="list-style-type: none"> ▪ EN/IEC 61010-1: 2001 ▪ UL 61010-1: 2004 ▪ CSA-C22.2 No. 61010-1: 2004 ▪ Protection class III
-------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

8.9 Electromagnetic compatibility (EMC)

<i>Emission</i>	<ul style="list-style-type: none"> ▪ EN/IEC 61326-1: 2006 ▪ EN/IEC 61000-6-3: 2004 ▪ EN 55011 / CISPR 11: 2003
<i>Immunity</i>	<ul style="list-style-type: none"> ▪ EN/IEC 61326-1: 2006 ▪ EN/IEC 61000-6-1: 2007 ▪ EN/IEC 61000-4-2: 2001 ▪ EN/IEC 61000-4-3: 2002



9 Conformity and warranty

9.1 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

872 Extension Module

The 872 Extension Module is an expansion tool for upgrading all 850 Professional IC instruments.

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 55011 / CISPR 11: 2003

Immunity: EN/IEC 61326-1: 2006, EN/IEC 61000-6-1: 2007, EN/IEC 61000-4-2: 2001, EN/IEC 61000-4-3: 2002.

Safety specifications

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



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: 2006 Electrical equipment for measurement, control and laboratory use – EMC requirements

EN 61010-1: 2001 Safety requirements for electrical equipment for measurement, control and laboratory use

Manufacturer

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, 31 March, 2008



D. Strohm

Vice President, Head of R&D



Ch. Buchmann

Vice President, Head of Production

Responsible for Quality Assurance

9.2 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.

9.3 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.

10 Accessories



Note

Subject to change without notice.




10.1 Scope of delivery






2.872.0010 872 Extension Module – IC Pump





Qty.	Order no.	Description
1	1.872.0010	872 Extension Module – IC Pump
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



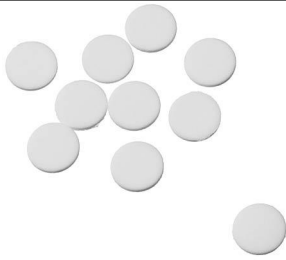
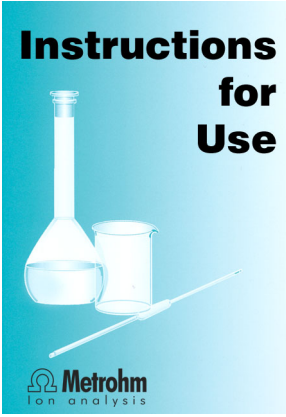




Qty.	Order no.	Description
1	6.1609.000	Adsorber tube / large and bent
		For filling with adsorber material.
		Material: Glass
		Height (mm): 129
		Inner diameter (mm): 32
		SGJ size: B-14/15
		
1	6.1805.060	FEP tubing / M6 / 60 cm
		Protected against light and kink.
		Material: FEP
		Inner diameter (mm): 2
		Length (mm): 600
		
1	6.1831.100	PEEK capillary 0.25 mm i.D. / 1 m
		Material: PEEK
		Outer diameter (inches): 1/16
		Inner diameter (mm): 0.25
		Length (m): 1
		

Qty.	Order no.	Description	
1	6.1834.080	Aspiration tubing, 2 m Aspiration tubing for Professional IC instruments Material: PTFE Outer diameter (mm): 2.5 Inner diameter (mm): 1.5 Length (m): 2	
1	6.2023.020	Clip for SGJ 14/15 Clip for SGJ 14/15 Material: POM	
1	6.2156.060	Cable extension module - Professional IC, 40 cm Cable for the connection of an extension module to a Professional IC instrument Length (m): 0.4	
1	6.2621.030	Hexagon key 4 mm Length (mm): 73	
1	6.2621.100	Hexagon key 3 mm Hexagon key 3 mm. For IC Sample Processors Length (mm): 73	

Qty.	Order no.	Description	
1	6.2744.070	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	6.2758.000	Mixing coil for high pressure gradients For mixing high pressure gradients Material: PEEK	
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	

Qty.	Order no.	Description	
1	6.2816.040	Purging needle With PTFE tubing and Luer connection. For syringes. For aspirating eluents.	
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	8.872.8005EN	Manual for 872 Extension Module, 2.872.0010 - IC Pump, English	



10.2 Optional accessories

2.872.0010 872 Extension Module – IC Pump

Order no.	Description	
6.2061.100	Flask holder (ProfIC) Flask holder for Professional IC instruments	
6.2061.110	Base tray with sensor for Professional IC systems	
6.2103.170	Adapter for leak sensor in Professional IC Adapter for the connection of two leak sensors to one Professional IC instrument	
6.2156.070	Cable extension module - Professional IC, 1 m Cable for the connection of an extension module to a Professional IC instrument Length (m): 1.0	
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	



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