

# 940 Professional IC Vario



940 Professional IC Vario ONE/ChS

## Manual

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# **940 Professional IC Vario**

## **940 Professional IC Vario ONE/ChS**

2.940.1200

# **Manual**

Technical Communication  
Metrohm AG  
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# 1 Introduction

## 1.1 Instrument description

The 940 Professional IC Vario is a professional ion chromatograph. It is distinguished by:

- Its intelligence: All of the functions are monitored, optimized and documented in an FDA-compatible manner. Intelligent components, such as iColumns, save important data onto a chip.
- Its compact design: It has a small footprint.
- Its modularity: It provides flexibility for use in various applications. It can hold up to three modules for different functions in its three drawers. Individual modules can be swapped or added as needed.
- Its transparency: All components are easily accessible and located for simple visibility and can be monitored during operation through a large window.
- Its safety: The wet end and the electronics are physically separated. This prevents fluids from coming into contact with the electronics to a large extent. A leak sensor is integrated into the wet end.
- Its environmental compatibility.
- Its low noise emission.
- The intelligent MagIC Net™ software

The 940 Professional IC Vario is operated solely using the MagIC Net software. A USB cable is used to connect the device to a computer with MagIC Net installed. The intelligent software detects the device automatically and checks its functionality. The software controls and monitors the device, evaluates the measured data and manages it in a database.

The 940 Professional IC Vario ONE/ChS consists of the following modules:

### Housing

The sturdy housing contains the instrument's electronic components, including their interfaces and three connections for separation columns (two of which are built into the installed column thermostat). In addition, the housing provides space for two detectors (conductivity detectors or amperometric detectors) and up to three plug-ins with different functions. Capillaries and cables can be fed into and out of the instrument through several openings.

### Leak sensor

The leak sensor detects leaking liquid that collects in the instrument's base tray. Liquid that leaks in the instrument is routed to the base tray using drainage tubing and detected there.



### **Column thermostat**

The column thermostat regulates the temperature for the separation columns and the eluent, thereby providing stable measuring conditions. The interior of the column thermostat can be heated and cooled. There are two column holders with chip readers in the column thermostat.

### **Eluent degasser**

The eluent degasser removes gas bubbles and dissolved gases from the eluent.

### **High-pressure pump**

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

### **Inline filter**

Inline filters protect the separation column reliably from potential contamination from the eluent. The filter pads with 2 µm pore size can be replaced quickly and easily. They remove particles from the solutions, such as bacteria and algae.

### **Pulsation absorber**

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

### **Injection valve**

The injection valve connects the eluent path to the sample path. By a quick and precise switching of the valve, a quantity of sample solution defined by the size of the sample loop is injected and flushed to the separation column with the eluent.

### **Metrohm Suppressor Module (MSM)**

The chemical suppressor MSM consists of the suppressor drive, a rotor and, where applicable, an adapter. The suppressor drive gives you the flexibility to use different rotors according to the principle "one drive – many rotors". Suppression rotors with different capacities and construction or a rotor for sample preparation (SPM Rotor) are readily interchangeable with appropriate adapters as needed. The rotors are not included in the instrument's scope of delivery. The rotor required for the application and any adapter that is required must be ordered separately.

### **Detector**

Metrohm offers a series of different detectors for various analysis tasks. A suitable detector type must be ordered as a separate device.

### Sample degasser

The sample degasser removes gas bubbles and dissolved gases from the sample.

### Separation column

The intelligent separation column separates different components according to their interactions with the column. Metrohm separation columns are equipped with a chip where their technical specifications and history (start-up, operating hours, injections etc) are stored.

## 1.2 Intended use



### NOTE

The instrument is exclusively for indoor use.

The 940 Professional IC Vario ONE/ChS is used for the determination of anions or polar substances with chemical suppression using ion chromatography.

It can also be used as needed for the determination of cations, polar substances or anions without chemical suppression.

This device is suitable for processing chemicals and flammable samples. Usage of the 940 Professional IC Vario therefore requires the user to have basic knowledge and experience in handling toxic and caustic substances. Knowledge regarding the application of fire prevention measures prescribed for laboratories is also mandatory.

## 1.3 Safety instructions

### 1.3.1 General notes on safety



### WARNING

Operate this instrument only according to the information contained in this documentation.

This instrument 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.



### 1.3.3 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

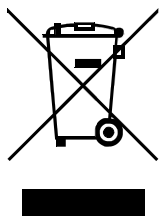


#### WARNING

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. fume cupboard).
- Keep all sources of flame far from the workplace.
- Clean up spilled liquids and solids immediately.
- Follow the safety instructions of the chemical manufacturer.








### 1.3.5 Recycling and disposal



Properly dispose of chemicals and of the product to reduce negative effects on the environment and public health. Local authorities, waste disposal companies or dealers provide more detailed information on disposal. Observe the WEEE EU directive (WEEE = Waste Electrical and Electronic Equipment) for the proper disposal of waste electronic equipment within the European Union.

## 1.4 Symbols and conventions

The following symbols and formatting may appear in this documentation:

<i>(5-12)</i>	<b>Cross-reference to figure legend</b> The first number refers to the figure number, the second to the instrument part in the figure.
<b>1</b>	<b>Instruction step</b> Perform the steps one after the other.
<b>Method</b>	<b>Dialog text, parameter</b> in the software
<b>File ► New</b>	Menu or menu item
<b>[Continue]</b>	<b>Button</b> or <b>key</b>
	<b>WARNING</b> This symbol draws attention to a possible life-threatening hazard or risk of injury.
	<b>WARNING</b> This symbol draws attention to a possible hazard due to electrical current.
	<b>WARNING</b> This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	<b>WARNING</b> This symbol draws attention to a possible biological hazard.
	<b>WARNING</b> Warning of optical radiation
	<b>CAUTION</b> This symbol draws attention to possible damage to instruments or instrument parts.
	<b>NOTICE</b> This symbol highlights additional information and tips.

## 2 Overview of the instrument

### 2.1 Front

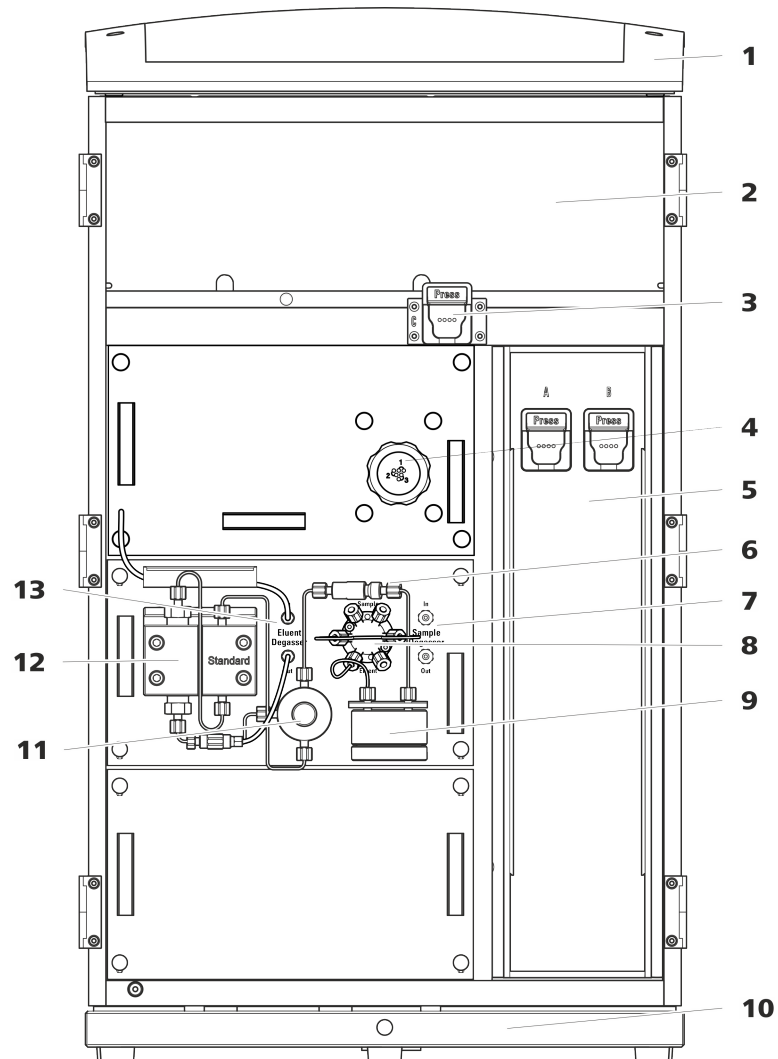


Figure 1 Front

**1 Bottle holder**

Offers space for the eluent bottle(s) and additional accessories.

**3 Column holder**

For a third separation column outside the column thermostat.

**2 Detector chamber**

Offers space for two embedded detectors and additional accessories.

**4 Metrohm Suppressor Module (MSM)**



**5 Column thermostat**  
With two column holders for two separation columns.

**7 Sample degasser**

**9 Pulsation absorber**

**11 Purge valve**  
For purging the high-pressure pump.

**13 Eluent degasser**

**6 Inline filter**

**8 Injection valve**

**10 Base tray**  
With leak sensor.

**12 High-pressure pump**

## 2.2 Rear

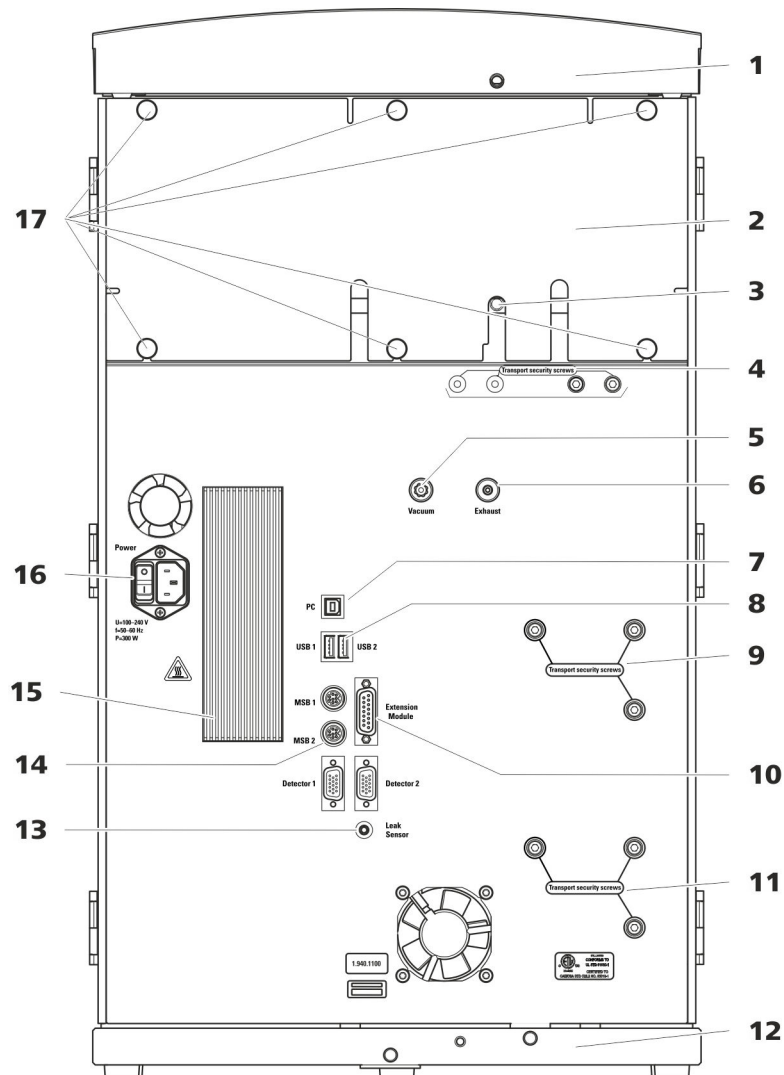


Figure 2 Rear

### 1 Bottle holder

Offers space for the eluent bottle(s) and additional accessories.

### 3 Drainage tubing connection

For connecting the drainage tubing, which guides escaped liquids away from the detector chamber.

### 2 Back panel

Removable. Enables access to the detector chamber.

### 4 Transport locking screws

For securing the vacuum pump(s) when transporting the instrument. Up to two vacuum pumps can be installed in an instrument. Only two transport locking screws are used if just one vacuum pump is installed.



<p><b>5 Vacuum connection</b> For connecting an Extension Module that has a degasser but not its own vacuum pump. This connection has to be firmly sealed with a stopper when not in use.</p>	<p><b>6 Exhaust opening</b> Labeled <i>Exhaust</i>. For extracting the air from the vacuum chamber.</p>
<p><b>7 PC connection socket</b> For connecting the instrument to the computer with the USB cable (6.2151.020).</p>	<p><b>8 USB connection sockets</b> Labeled <i>USB 1</i> and <i>USB 2</i>. For connecting USB devices.</p>
<p><b>9 Transport locking screws</b> For securing the high-pressure pump (in the middle plug-in) when transporting the instrument.</p>	<p><b>10 Extension Module connection socket</b> Labeled <i>Extension Module</i>. For connecting the cable (6.2156.060) used for connecting the instrument to the Extension Module.</p>
<p><b>11 Transport locking screws</b> For securing the high-pressure pump (in the bottom plug-in) when transporting the instrument. These screws are only installed if a plug-in with a high-pressure pump is used in the bottom slot.</p>	<p><b>12 Base tray</b> With leak sensor and leak sensor cable.</p>
<p><b>13 Leak sensor connection socket</b> Labeled <i>Leak Sensor</i>. For connecting the leak sensor connection cable coiled up in the base tray.</p>	<p><b>14 MSB connection sockets</b> Labeled <i>MSB 1</i> and <i>MSB 2</i>. For connecting MSB devices.</p>
<p><b>15 Cooler</b> For cooling the power supply unit. May become hot!</p>	<p><b>16 Power socket</b> Power socket for connecting the power cable and power switch for switching the instrument on and off.</p>
<p><b>17 Knurled screws</b> For fastening the removable back panel.</p>	

## 2.3 Feed-throughs for capillaries and cables

Multiple openings are available for leading capillaries into the instrument and for leading capillaries and cables out of the instrument:

- Openings on the door (*see figure 3, page 11*)
- Openings on the back panel
- Ducts between the instrument and the base tray as well as between the instrument and the bottle holder (*see figure 5, page 13*)

## Openings on the door



Figure 3 Feed-throughs on the door

### 1 Luer connector

For connecting a capillary from inside and for inserting a syringe (6.2816.020) from outside. For manual sample injection.

### 2 Opening for capillaries

For up to 3 capillaries.

An opening for up to 3 capillaries is located on the door of the instrument.

The two Luer connections above are not actually openings; the capillaries are fastened to the Luer connection from within using PEEK pressure screws. You can use a syringe to inject or draw out liquid from the outside.



### Openings on the back panel

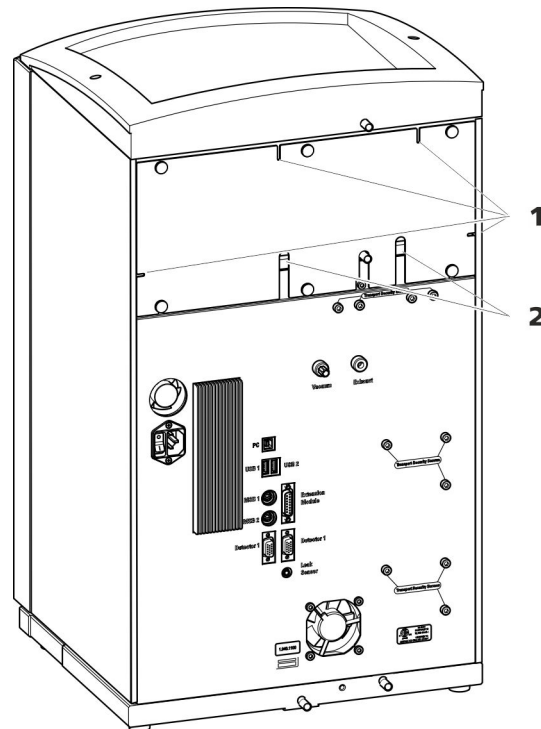


Figure 4 Openings for capillaries and cables

#### 1 Openings for capillaries

#### 2 Openings for cables

The removable back panel is outfitted with openings through which capillaries and cables can be lead out of the detector chamber.

### Ducts for capillaries

There are ducts for capillaries between the instrument and base tray as well as between the instrument and the bottle holder. The capillaries can be fed to the front of the instrument from both sides of the instrument and from the front of the instrument to the back of the instrument.

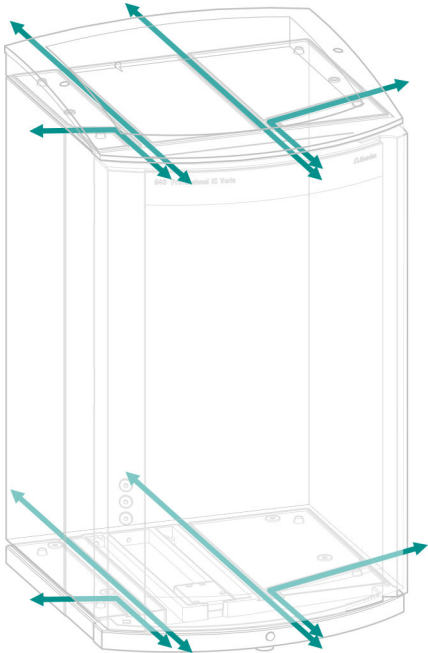


Figure 5 Ducts for capillaries



Also see: *PEEK pressure screws 1x1* video on the Internet <http://ic-help.metrohm.com>.

### Connection capillaries

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

*PEEK capillaries (polyetheretherketone)*

PEEK capillaries are pressure-stable up to 400 bar (depending on the inner diameter), flexible, chemically inert and have an extremely smooth surface. They can be readily cut down to the desired length with the capillary cutter (6.2621.080).

Use:

- PEEK capillaries with an inner diameter of 0.25 mm (6.1831.010) for the entire high-pressure section.
- PEEK capillaries with an inner diameter of 0.5 mm (6.1831.180) for the sample path.

*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. They can be readily cut down to the desired length with the capillary cutter (6.2621.080).

Use:

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

- PTFE capillaries with an inner diameter of 0.5 mm for sample processing and for the transfer of rinsing solutions (they are not necessarily included in the scope of delivery of the instrument).

### Capillary connections



#### NOTE

#### Sprays of chemicals caused by capillaries slipping out

If you work with an increased system pressure (> 15 MPa), capillaries may slip out of the pressure screws. This can lead to sprays of chemicals.

To avoid this, we recommend

- degreasing the ends of the capillaries before installing them. Dampen a cloth with acetone and wipe off the ends of the capillaries before connecting them with the pressure screws.
- tightening the pressure screws firmly using a wrench (6.2739.000).

In order to achieve optimum analysis results, capillary connections in an IC system must be absolutely tight and free of dead volume. Dead volume



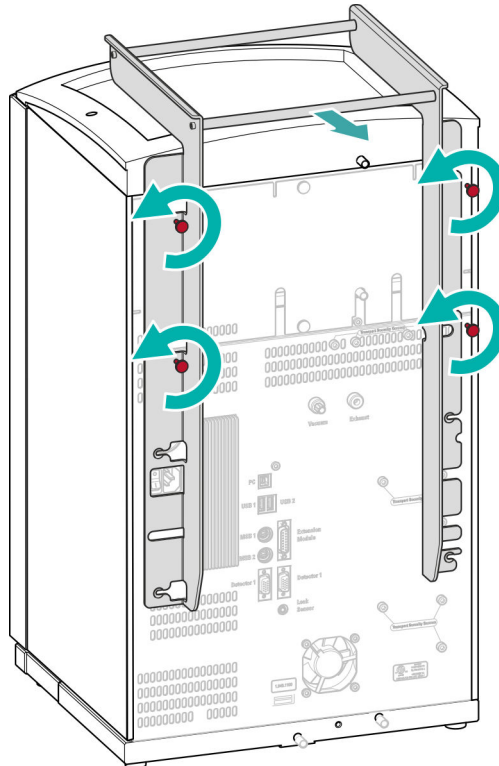
### 3.3 Removing the handle

The instrument is equipped with a handle in order to make it easier to transport. The handle can be removed once the instrument is in place in the lab.

*Accessories*

You do not need any accessories for the following work steps.

#### Removing the handle



#### 1 Removing the handle

- Unscrew the four knurled screws.
- Remove the handle.



### 3.4 Removing transport locking screws

To avoid damage to the drives for the high-pressure pump and the vacuum pump during transport, the pumps are secured with transport locking screws. These are located at the rear of the instrument and labeled with **Transport security screws**.

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

*Accessories*

For this step you need:

- 4 mm hex key (6.2621.030)

#### Removing the transport locking screws

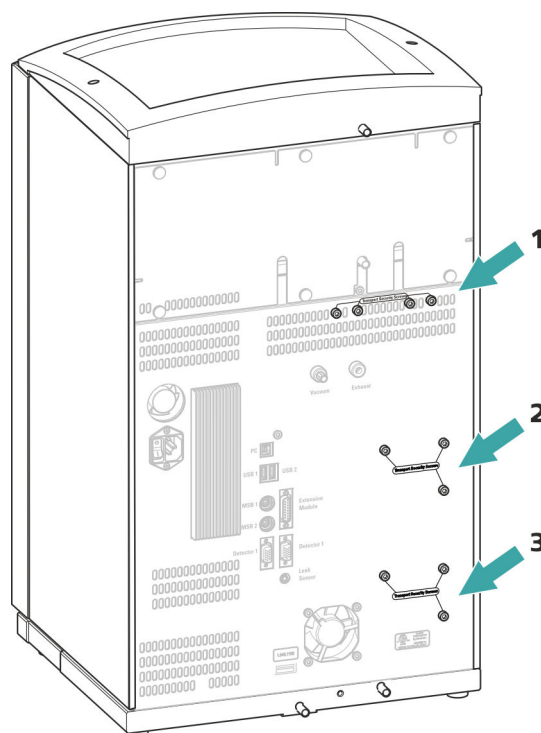


Figure 6 Removing the transport locking screws

**1 Transport locking screws**  
For the vacuum pump.

**2 Transport locking screws**  
For the high-pressure pump.

**3 Transport locking screws**  
For an additional high-pressure pump in the bottom drawer.

- 1 Remove all of the transport locking screws with the hex key.

Store the transport locking screws in a safe place. Reinsert the transport locking screws each time you transport the instrument a significant distance.



#### CAUTION

The pumps may be damaged if you transport the instrument without inserting the transport locking screws.

## 3.5 Connecting the drainage tubing and leak sensor

The leak sensor detects leaking liquid that collects in the instrument's base tray. Liquid that leaks in the bottle holder or in the detector chamber is conveyed to the base tray using drainage tubing and is detected there.

If the leak sensor detects a leak in the IC system, the IC instrument is switched off. The software displays a warning.

The leak sensor functions properly only if the following preconditions are met:

- The drainage tubing is connected.
- The leak sensor connection cable is inserted into the leak sensor connection socket.
- The 940 Professional IC Vario is switched on.
- The leak sensor is switched to **active** in the software.

### 3.5.1 Installing the drainage tubing

Liquid that leaks in the bottle holder or detector chamber flows to the rear of the instrument. Openings on the bottle holder and in the detector chamber allow the liquid to drain. The drainage tubing has to be mounted at these openings. This drainage tubing guides the leaking liquid to the base tray where the leak sensor is located.

#### *Accessories*

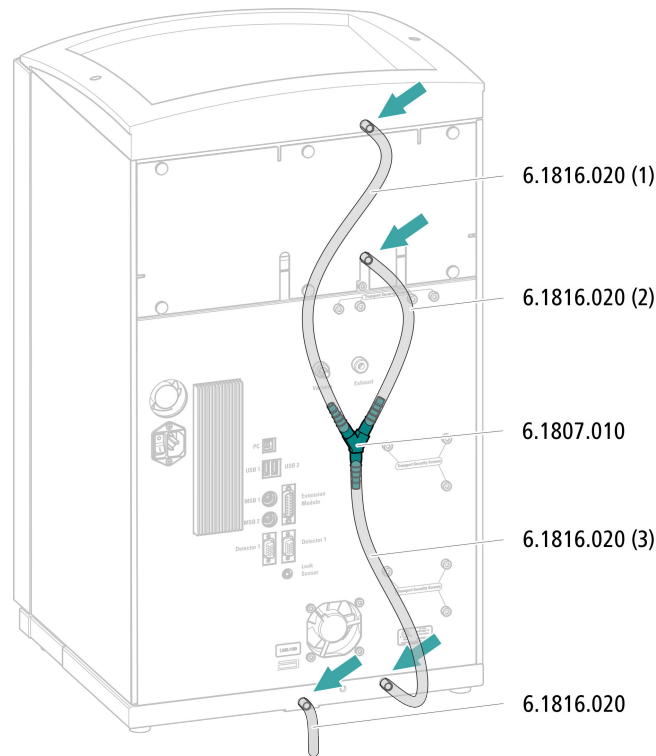
For this step you need the following parts from the accessory kit: Vario/Flex Basic (6.5000.000):

- 2 × silicone tubing (6.1816.020)
- Y connector (6.1807.010)

You also need scissors.



### Connecting the drainage tubing



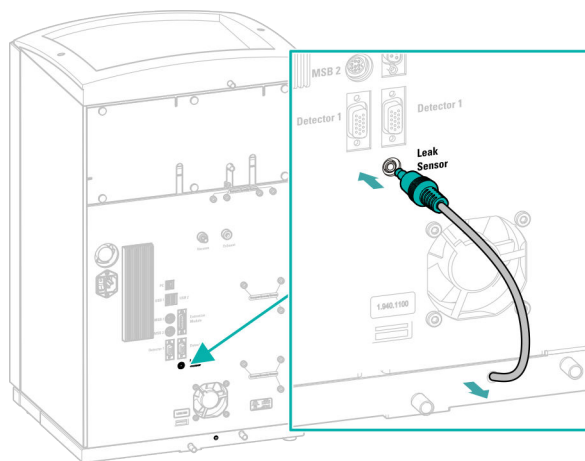
- 1** Cut a piece of silicone tubing into three pieces using scissors: 2 × approx. 40 cm and 1 × 20 cm.
- 2** Attach one end of the 40 cm long piece to the drainage tubing connection on the bottle holder.
- 3** Attach one end of the 20 cm long piece to the drainage tubing connection on the detector chamber.
- 4** Attach each of the loose ends of both pieces of silicone tubing to one end of the Y connector.
- 5** Attach one end of the second 40 cm long piece to the third end of the Y connector.  
Attach the loose end to the right-side drainage tubing connection on the base tray.
- 6** Attach one end of the second piece of silicone tubing to the left-side drainage tubing connection on the base tray.

Route the loose end into a waste container.

### 3.5.2 Connecting the leak sensor

#### Plugging in the leak sensor connection cable

The leak sensor connection cable is coiled up in the base tray.



- 1 Pull the leak sensor connection cable out of the base tray as far as needed.
- 2 Plug the plug for the leak sensor connection cable into the leak sensor connection socket (labeled **Leak Sensor**).

### 3.6 Column thermostat

The column thermostat ensures that the flow of eluent and the separation column(s) are at a constant temperature. It is firmly sealed by the instrument's smaller door and is well insulated. The capillaries are fed through small openings on the inner front edge, so that they do not get pinched when the door is closed.

The column thermostat is completely connected. No installation work is required.

## 3.7 Connecting the eluent bottle

The eluent is aspirated out of the eluent bottle via the eluent aspiration tubing. The eluent aspiration tubing is installed on the entry to the eluent degasser.

The tubing must be fed out of the instrument through a suitable opening (see "Openings on the back panel", page 12) before the loose end can be connected to the eluent bottle.

### Accessories

For this step, you need the following accessories:

These parts are part of the *Vario/Flex ONE* accessory kit (6.5000.010).

- Eluent bottle (6.1608.070)
- The *eluent bottle cap GL 45* accessory set (6.1602.160)  
This accessory set contains the bottle cap, an M6 tubing nipple, an M8 tubing nipple, two O-rings and an M6 and M8 threaded stopper.
- The *tubing adapter for aspiration filter* accessory set (6.2744.210)  
This accessory set contains a filter holder, a clamping screw and tubing weighting.
- An aspiration filter (6.2821.090)
- The adsorber tube (6.1609.000)
- The SGJ clip (6.2023.020)

### Connecting the eluent aspiration tubing

#### 1 Installing the eluent bottle cap (6.1602.160)

- Start by pushing the M8 tubing nipple onto the loose end of the eluent aspiration tubing, followed by the O-ring.
- Push the loose end of the eluent aspiration tubing through the M8 opening of the bottle cap and screw it on for the time being.

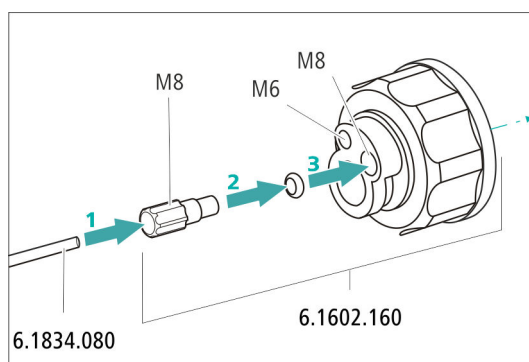


Figure 7 Installing the eluent bottle cap

## 2 Mounting the tubing adapter

Install the parts of the *tubing adapter for aspiration filter* (6.2744.210) accessory set:

- Start by pushing the tubing weighting onto the loose end of the eluent aspiration tubing.
- Then push the clamping screw onto the loose end of the eluent aspiration tubing.
- Lastly, push the filter holder onto the loose end of the eluent aspiration tubing and screw it onto the tubing nipple. The end of the tubing should extend approximately 1 cm.

## 3 Pre-rinsing the aspiration filter



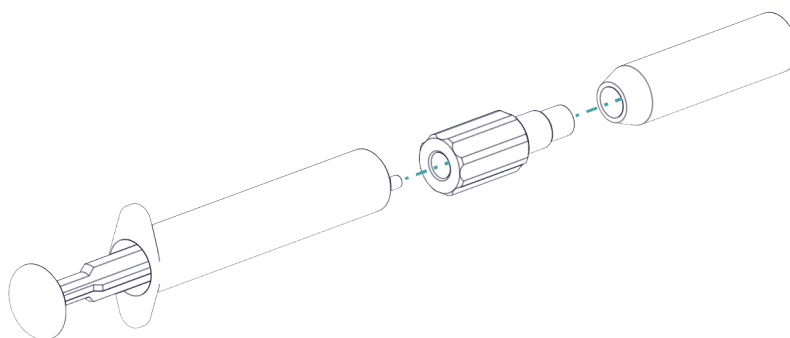
### NOTE

Always wear gloves when handling the aspiration filter.

In order to avoid air bubbles after the installation of the aspiration filter, we recommend pre-rinsing the aspiration filter with ultrapure water or eluent.

For pre-rinsing, you will need the adapter Luer inner, M6 outer (6.02744.050), a syringe and a vessel with ultrapure water or eluent.

- Screw the adapter to the aspiration filter.
- Insert the syringe into the adapter.



- Immerse the aspiration filter in a vessel with ultrapure water or eluent.
- Fill the syringe completely with ultrapure water or eluent 3 times and then empty it again each time.

#### 4 Mounting the aspiration filter



##### NOTE

Always wear gloves when handling the aspiration filter.

- Place the loose end of the eluent aspiration tubing into the aspiration filter. The end of the tubing should reach approximately to the center of the aspiration filter.
- Tighten the aspiration filter to the filter holder.

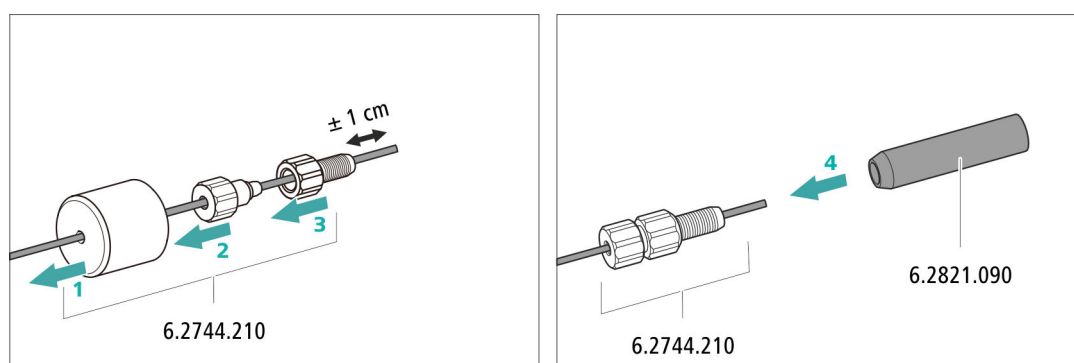
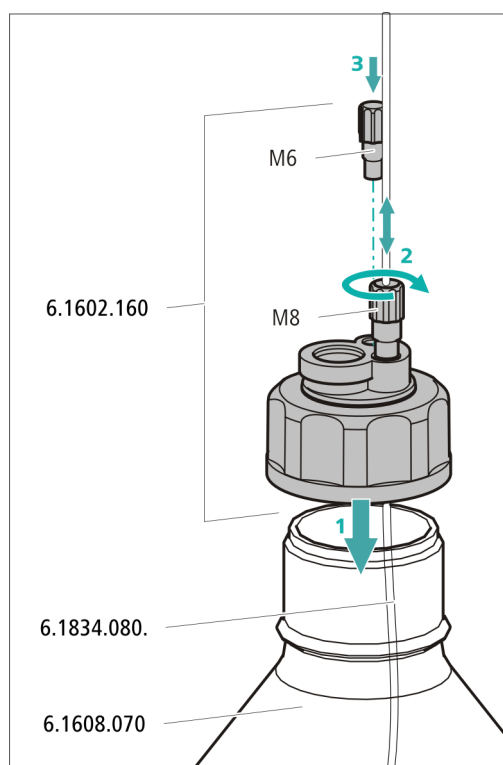


Figure 8 Installing the tubing weighting and aspiration filter

#### 5 Installing the eluent bottle cap on the eluent bottle

- Insert the eluent aspiration tubing into the eluent bottle (6.1608.070).
- Tighten the bottle cap on the eluent bottle.
- Adjust the length of the eluent aspiration tubing so that the aspiration filter is at the bottom of the eluent bottle. Then fix it in place using the M8 tubing nipple.
- Seal the M6 opening on the bottle cap with the M6 threaded stopper from the accessory set.



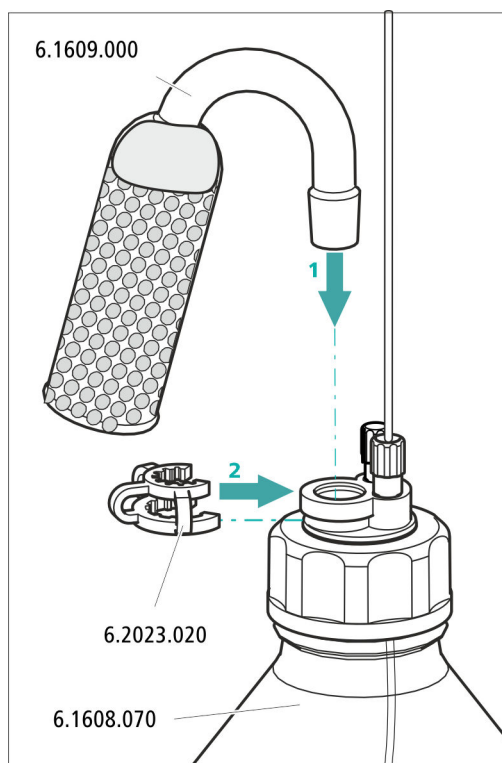
## 6 Mounting the adsorber tube



### NOTE

Depending on the eluent used, the adsorber tube (6.1609.000) must be filled differently:

- For alkaline eluents or eluents with a low buffer capacity: first a little cotton, then with CO<sub>2</sub> adsorber material.
  - For all other eluents: only with cotton.
- Remove the plastic cover from the large opening of the adsorber tube. Fill the adsorber tube and close it again using the plastic cover.
  - Insert the adsorber tube into the bottle cap's large opening. Fasten it to the bottle cap using the ground-joint clip (6.2023.020).



### 3.8 Connecting the eluent degasser

The high-pressure pump cannot generate uniform flow if the eluent contains small gas bubbles or dissolved gas. As a result, the baseline cannot be stabilized correctly. In order to achieve good measurement results, the eluent has to be degassed before it goes into the high-pressure pump.

The eluent degasser is completely connected. No installation work is required.

### 3.9 Installing the high-pressure pump

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

The high-pressure pump consists of:

- The pump head, which pumps the eluent through the system.
- The purge valve used for bleeding the pump head.

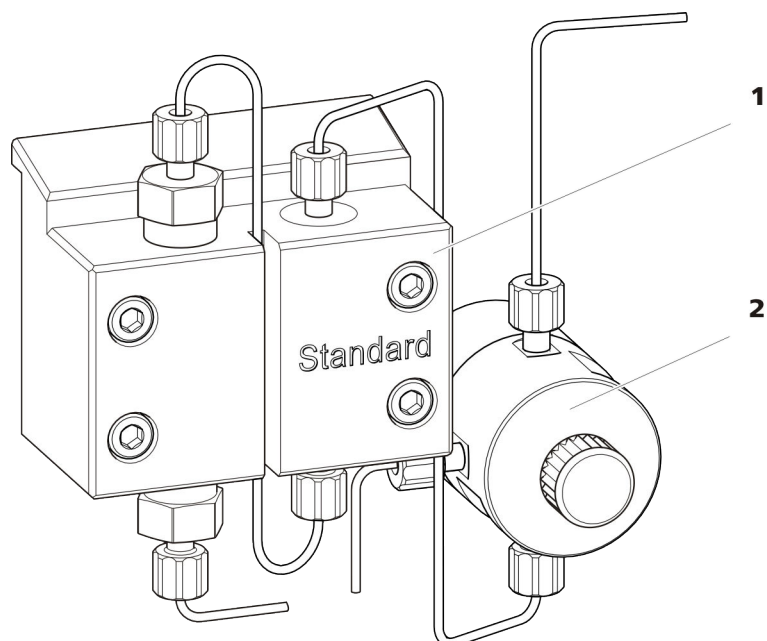


Figure 9 High-pressure pump with purge valve

**1 Pump head**

**2 Purge valve**

The high-pressure pump is completely connected. No installation work is required.

### 3.10 Installing an inline filter

Inline filters protect the separation column reliably from potential contamination from the eluent. The small filter pads with 2  $\mu\text{m}$  pore size can be replaced quickly and easily. They remove particles from the solutions.

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

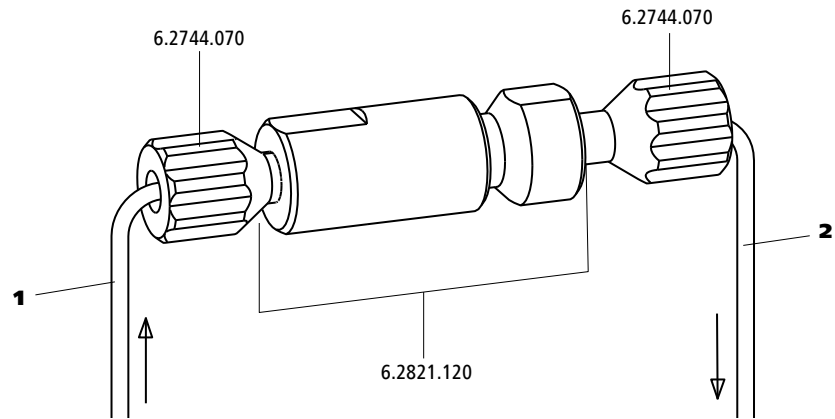


Figure 10 Inline filter

- |   |   |
|---|---|
| <b>1 Inlet capillary</b><br>Connected to the purge valve. | <b>2 Outlet capillary</b><br>Connected to the pulsation absorber. |
|---|---|

The inline filter is completely connected. No installation work is required.

### 3.11 Installing the pulsation absorber

The pulsation absorber is installed between the high-pressure pump and the injection valve. It protects the separation column from damage caused by pressure fluctuations, e.g. when the injection valve is switched, and reduces interfering pulsations during highly sensitive measurements.

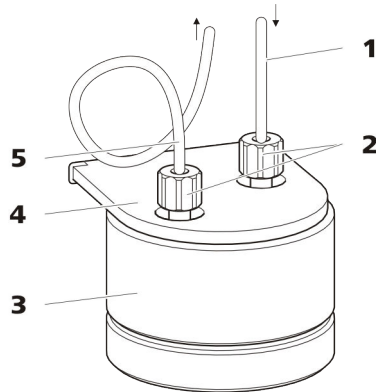


Figure 11 Pulsation absorber

- |   |   |
|---|---|
| <b>1 Connection capillary</b><br>Connection to inline filter.   | <b>2 PEEK pressure screws, short (6.2744.070)</b> |
| <b>3 Pulsation absorber (6.2620.150)</b>                        | <b>4 Holder for pulsation absorber</b>            |
| <b>5 Connection capillary</b><br>Connection to injection valve. |   |

The pulsation absorber is completely connected. No installation work is required.

## 3.12 Injection valve

The injection valve connects the eluent path to the sample path. By a quick and precise switching of the valve a defined quantity of sample solution is injected and flushed to the separation column with the eluent.

The quantity of sample solution injected is determined by:

- the volume of the sample loop or
- by an 800 Dosino when the Metrohm intelligent Partial Loop Injection Technique (MiPT), the Metrohm intelligent Pick-up Injection Technique (MiPuT) or the Metrohm Inline Preconcentration (MiPCT, MiPCT-ME) is used.

The choice of sample loop depends on the application. The following sample loops are normally used:

Table 1 Which sample loop do I need?

Application	Sample loop
Cation determination	20 µL
Anion determination with suppression	20 µL
Anion determination without suppression	100 µL
MiPT, MiPuT	250 µL
MiPCT, MiPCT-ME	Preconcentration column

The injection valve is completely connected. No installation work is required.

### Optional: Exchanging the sample loop

The sample loop can be replaced to match the application (see table 1, page 29).



#### NOTE

Only use PEEK pressure screws (6.2744.010) to connect capillaries and the sample loop to the injection valve.

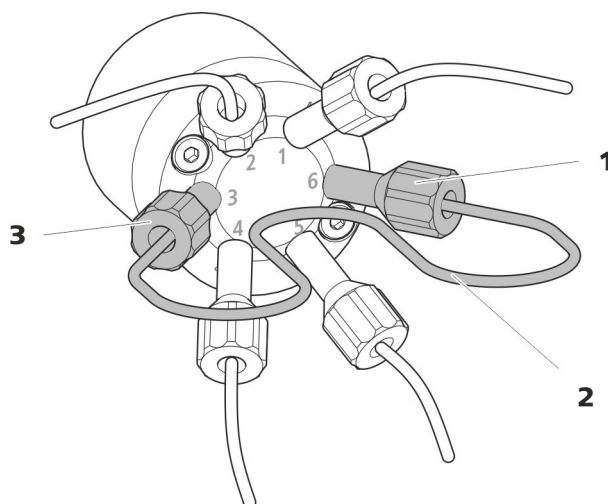


Figure 12 Exchanging the sample loop

**1 Pressure screw**  
Fastened to Port 6.

**2 Sample loop**

**3 Pressure screw**  
Fastened to Port 3.

### Exchanging the sample loop



#### NOTE

Observe a dead-volume-free installation of the sample loop (see "Creating dead-volume-free capillary connections", page 16).

#### 1 Removing the existing sample loop

- Loosen the pressure screws (6.2744.010) at Port 3 and Port 6.
- Remove the sample loop.

#### 2 Installing a new sample loop

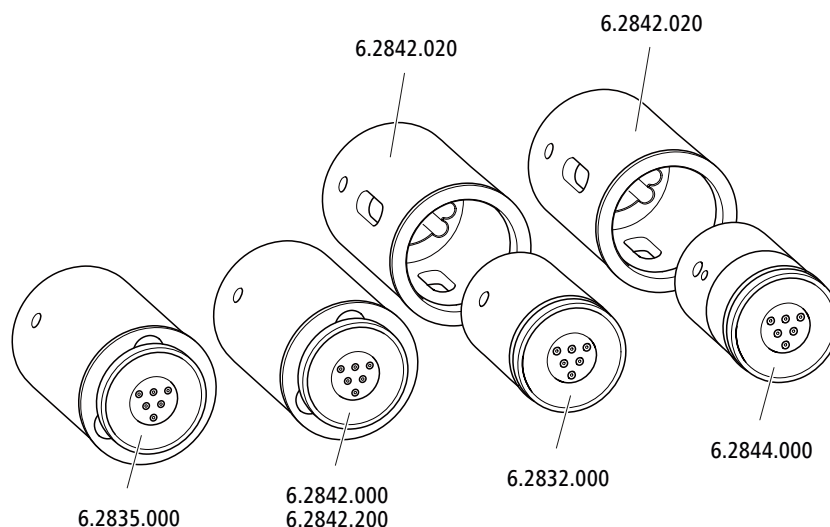
- Fasten one end of the sample loop to Port 3 using a PEEK pressure screw (6.2744.010).
- Use the second PEEK pressure screw (6.2744.010) to fasten the other end of the sample loop to Port 6.

### 3.13 Metrohm Suppressor Module (MSM)

The suppressor drive of the 940 Professional IC Vario can hold various rotors. The large rotors, such as the SPM Rotor A (6.2835.000), the MSM-HC Rotor A (6.2842.000) and the MSM-HC Rotor C (6.2842.200) can be inserted directly.

The small rotors, such as the MSM Rotor A (6.2832.000) and the MSM-LC Rotor A (6.2844.000), must first be fitted into the adapter (6.2842.020), which can then be inserted into the suppressor housing.

A connecting piece (6.2835.010) is used for all rotors for connecting the Metrohm Suppressor Module (MSM) to the IC system.



#### NOTE

The instruments are supplied without rotor and without adapter. The suitable rotor and the adapter, if required, must be ordered separately.

#### 3.13.1 Inserting the rotors

##### Accessories

For this step, you need the following accessories:

- For suppression: MSM Rotor A (6.2832.000) or MSM-HC Rotor A (6.2842.000), MSM-LC Rotor A (6.2844.000) or MSM-HC Rotor C (6.2842.200) or MSM-HC Rotor C (6.2842.200)
- Optional: Adapter (6.2842.020)
- Connecting piece (6.2835.010)

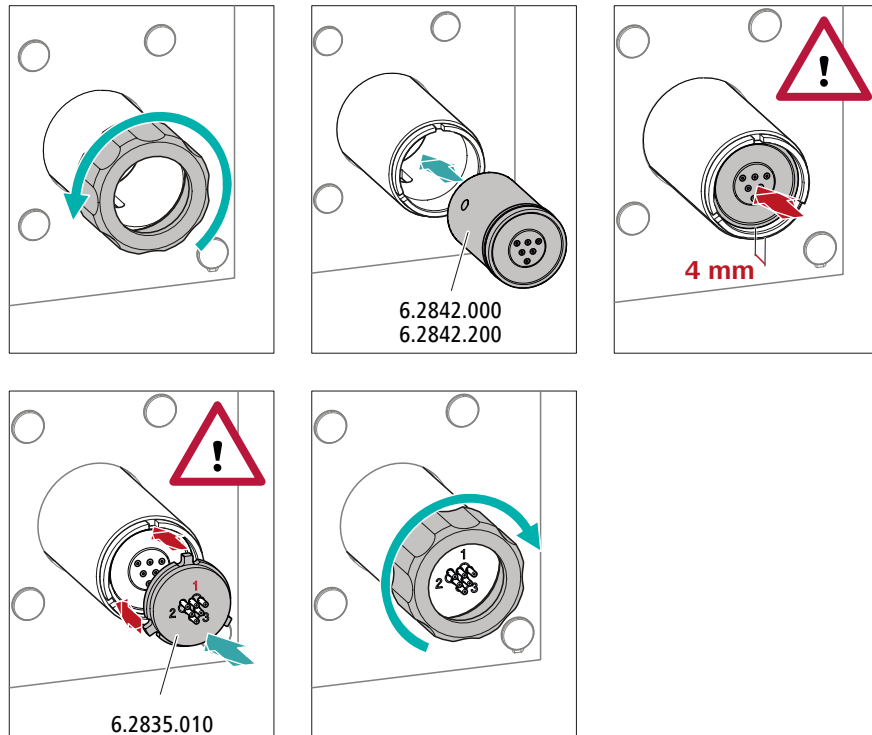
Large rotors can be inserted directly into the rotor housing.



### CAUTION

The rotor may be destroyed during start-up if not inserted correctly. Therefore, follow the following instructions exactly.

### Inserting large rotors



#### 1 Removing the union nut

Loosen the union nut and remove it.

#### 2 Inserting the rotor

- Clean the sealing surface of the rotor with ethanol using a lint-free cloth.
- Insert the rotor into the suppressor drive so that the tubing connections on the rear of the rotor fit into the corresponding recesses inside the suppressor drive and one of the three holes of the rotor is visible from below in the slot of the suppressor drive.

**NOTE**

The rotor's sealing surface is located approx. 4 mm deep inside the suppressor drive if the rotor is inserted correctly.

If this is not the case, then the rotor must be moved into the correct position using careful turning. If the rotor cannot be turned or removed, it can be moved into the correct position from below by means of a pointed object (e.g. a screwdriver).

**3 Inserting the connecting piece**

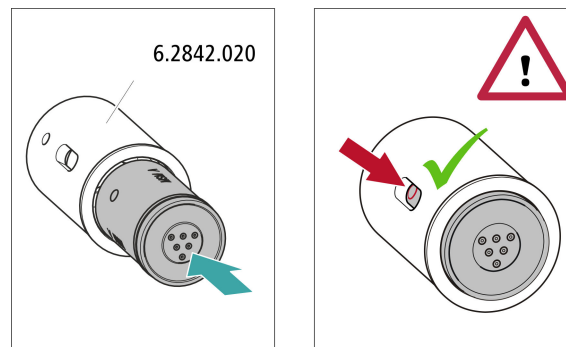
- Clean the sealing surface of the connecting piece with ethanol using a lint-free cloth.
- Insert the connecting piece into the suppressor drive so that connector 1 is on top and the 3 pins of the connecting piece fit into the corresponding recesses on the suppressor drive.

**4 Attaching the union nut**

Tighten the union nut on the thread of the suppressor drive by hand (do not use any tools).

**Inserting small rotors**

You need the adapter (6.2842.020) in order to insert a small rotor into the suppressor drive.

**1 Inserting the rotor into the adapter****CAUTION**

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



- Clean the sealing surface of the rotor with ethanol using a lint-free cloth.
- Insert the rotor into the adapter so that the tubing connections on the rear of the rotor fit into the corresponding recesses inside the adapter and one of the 3 holes of the rotor is visible in the slot of the adapter.

## 2 Inserting the adapter

Insert the adapter into the suppressor drive just like a large rotor (see "Inserting large rotors", page 32).

### 3.13.2 Connecting the Metrohm Suppressor Module (MSM)

The 3 entries and exits of the suppressor units, numbered 1, 2 and 3 on the connecting piece, each have 2 permanently installed PTFE capillaries.

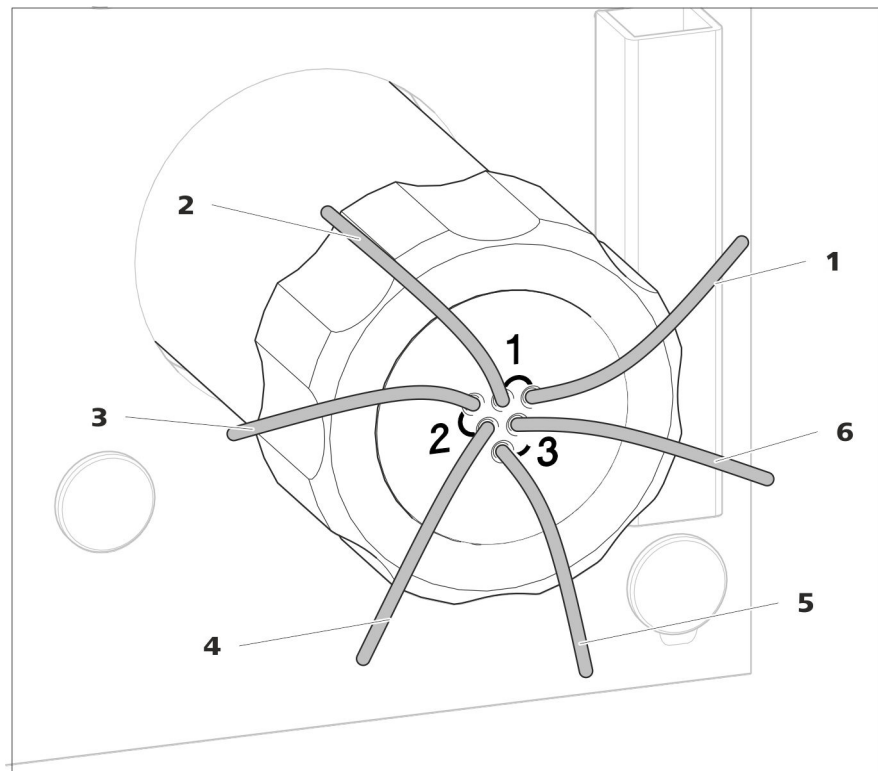


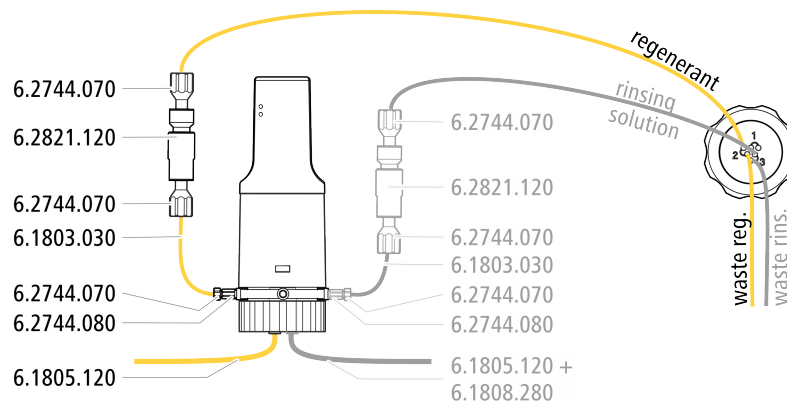
Figure 13 Metrohm Suppressor Module (MSM) – Connection capillaries

**1 out**  
Outlet capillary for the eluent.

**2 in**  
Inlet capillary for the eluent.







- 1** Connect the capillary labeled *regenerant* to the exit of the inline filter (6.2821.120) using a pressure screw (6.2744.070).
- 2** Use a pressure screw (6.2744.070) to fasten a piece of the PTFE capillary (6.1803.030) to the entry of the inline filter.
- 3** Use a pressure screw (6.2744.070) and an adapter (6.2744.080) to fasten the other end of the PTFE capillary to Port 1 of the Dosino.
- 4** Connect the FEP tubing (6.1805.120) from the bottle with the regeneration solution to Port 2 of the Dosino.

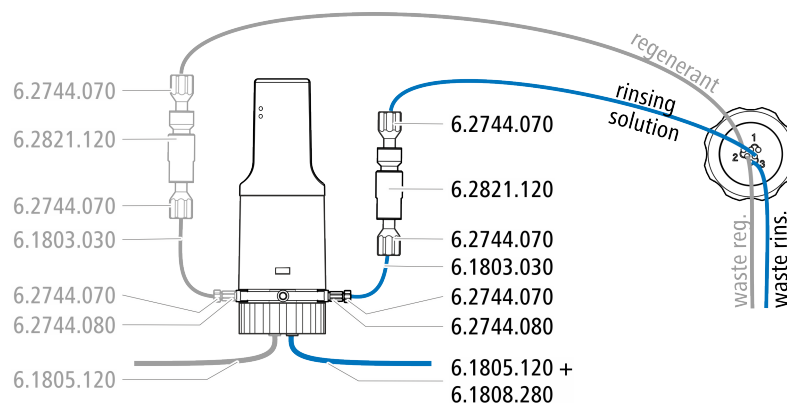
#### 3.13.2.4 Connecting the rinsing solution

Various possibilities exist for rinsing the Metrohm Suppressor Module:

- Rinsing solution via STREAM (recommended)  
Use the eluent from the conductivity detector as rinsing solution.
- Rinsing solution via Dosino  
Prepare the rinsing solution in a separate bottle and convey it with a Dosino.

The rinsing solution is connected to the *rinsing solution* capillary.





- 1 Fasten the capillary labeled *rinsing solution* to the exit of an inline filter (6.2821.120) using a pressure screw (6.2744.070).
- 2 Use a pressure screw (6.2744.070) to fasten a piece of the PTFE capillary (6.1803.030) to the entry of the inline filter.
- 3 Use a pressure screw (6.2744.070) and an adapter (6.2744.080) to fasten the other end of the PTFE capillary to Port 3 of the Dosino.
- 4 Connect the FEP tubing (6.1805.120) from the bottle with the rinsing solution with the adapter (6.1808.280) to Port 4 of the Dosino.

### 3.14 Installing the conductivity detector

The 940 Professional IC Vario provides enough space for two detectors and additional accessories in the detector chamber. The detectors are available as separate devices and are supplied with separate manuals.

#### Placing the detector in the instrument

Follow the instructions in the chapter *Inserting the detector* in the manual for the detector.

#### Connecting the detector to the eluent path



#### NOTE

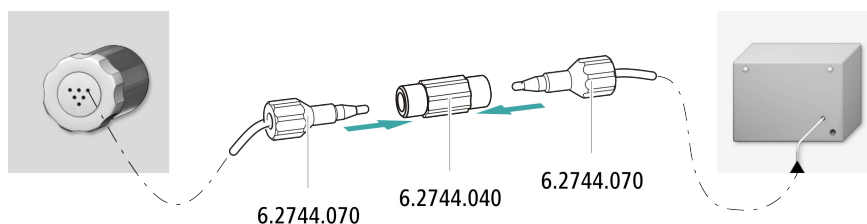
The separation column is not inserted into the instrument until it is being started up for the first time. Until then, the detector inlet capillary has to be connected to the *out* capillary of the Metrohm Suppressor Module (MSM) using a coupling (6.2744.040).

#### Accessories

For this step, you need the following accessories:



- Coupling (6.2744.040)
- 2 × pressure screw (6.2744.010)



- 1 Connect the *out* capillary of the Metrohm Suppressor Module (MSM) and the detector inlet capillary to each other using a coupling (6.2744.040) and two short pressure screws (6.2744.070).

### 3.15 Installing the amperometric detector

The 940 Professional IC Vario provides enough space for two detectors and additional accessories in the detector chamber. The detectors are available as separate devices and are supplied with separate manuals.

#### Placing the detector in the instrument

Follow the instructions in the chapter *Inserting the detector* in the manual for the detector.

### 3.16 Connecting the sample degasser (optional)

Gas bubbles in the sample lead to poor reproducibility, as the amount of sample in the sample loop is not always the same. Therefore, we recommend degassing samples that contain gas before injection.



#### NOTE

The sample degasser does not have to be connected. We recommend only using the sample degasser if the application requires it.

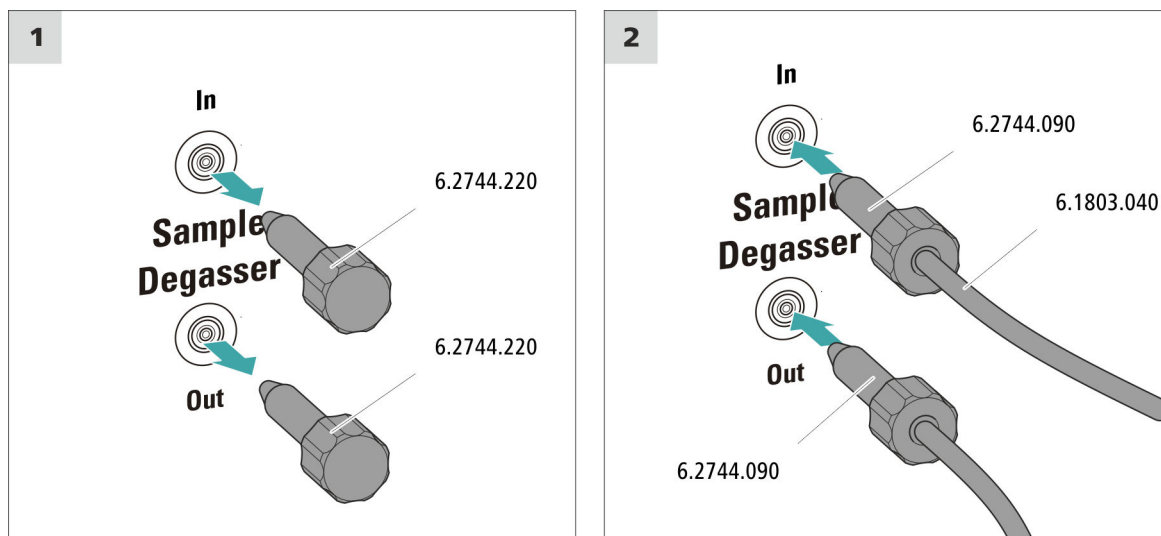
The rinsing time increases by at least two minutes when the sample degasser is connected.

#### Accessories

For this step, you need the following accessories:

- 2 × pressure screw, long (6.2744.090)
- PTFE capillary (6.1803.040)

## Connecting the sample degasser



### CAUTION

If the sample degasser is not used, the inlet and outlet **must** be sealed with threaded stoppers (6.2744.220).

#### 1 Removing the threaded stoppers

Remove and keep the threaded stoppers (6.2744.220) from the inlet and outlet of the sample degasser.

#### 2 Connecting the outlet capillary

- Push a long pressure screw over the loose end of the capillary connected to Port 1 of the injection valve.
- Tighten the pressure screw to the outlet of the sample degasser (labeled **Out**).  
Try to ensure the shortest possible connections (shorten the capillary if necessary).

#### 3 Connecting the inlet capillary

- Push a long pressure screw over one end of the PTFE capillary (6.1803.040) and tighten the pressure screw to the inlet of the sample degasser (labeled **In**).



## 3.18 Connecting the instrument to the power grid



### WARNING

#### Electric shock from electrical potential

Risk of injury by touching live components or through moisture on live parts.

- Never open the housing of the instrument while the power cord is still connected.
- Protect live parts (e.g. power supply unit, power cord, connection sockets) against moisture.
- Unplug the power plug immediately if you suspect that moisture has gotten inside the instrument.
- Only personnel who have been issued Metrohm qualifications may perform service and repair work on electrical and electronic parts.

#### Connecting the power cord

#### Accessories

Power cord with the following specifications:

- Length: max. 2 m
- Number of cores: 3, with protective conductor
- Instrument plug: IEC 60320 type C13
- Conductor cross-section 3x min. 1.0 mm<sup>2</sup> / 18 AWG
- Power plug:
  - according to customer requirement (6.2122.XX0)
  - min. 10 A



### NOTE

Do not use a not permitted power cord!

#### 1 Plugging in the power cord

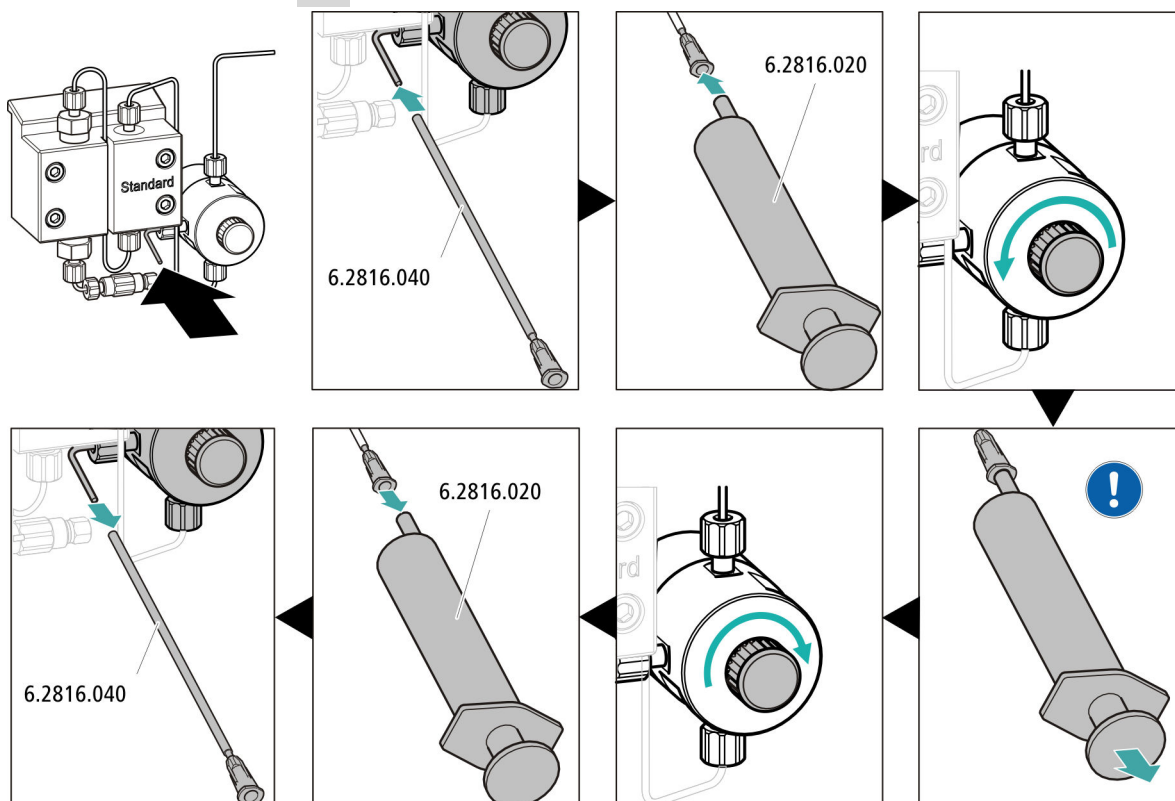
- Plug the power cord into the instrument's power socket.
- Connect the power cord to the power grid.



### 3 Starting the equilibration

- Start the equilibration in MagIC Net: **Workplace ► Run ► Equilibration ► Start HW.**

### 4 Deaerating the high-pressure pump



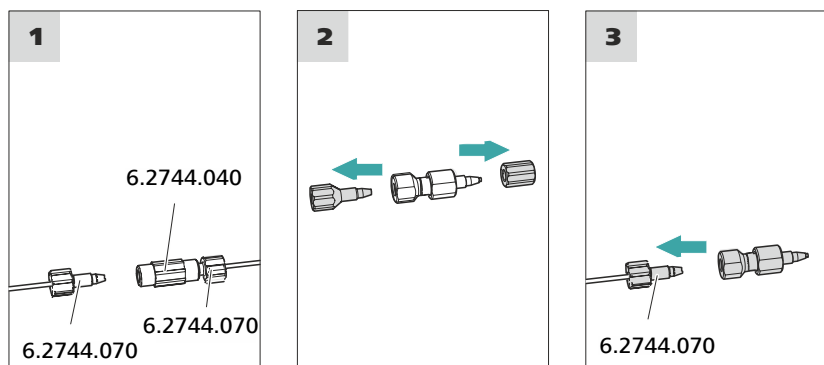
- Push the end of the purge needle (6.2816.040) over the end of the purge capillary on the purge valve.
- Insert the syringe (6.2816.020) in the Luer connector of the purge needle.
- Open the purge valve using the rotary knob (approx.  $\frac{1}{2}$  turn).
- Switch on the high-pressure pump in MagIC Net.
- Use the syringe to aspirate eluent until there are no more air bubbles in the eluent aspiration tubing.
- Switch off the high-pressure pump in MagIC Net.
- Seal the purge valve using the rotary knob.
- Remove the syringe from the purge needle.
- Pull the purge needle out of the purge capillary.

### 5 Rinsing the instrument without columns

- Rinse the instrument (without columns) with eluent for 10 minutes.



### Connecting the guard column



#### 1 Removing the coupling

Remove the coupling (6.2744.040) installed between the column inlet capillary and the column outlet capillary for the initial start-up.

#### 2 Preparing the guard column

- Remove the stoppers or the stopper and the sealing cap from the guard column.

#### 3 Connecting the guard column



#### CAUTION

When inserting the guard column, ensure that it is inserted correctly based on the marked flow direction (if specified).

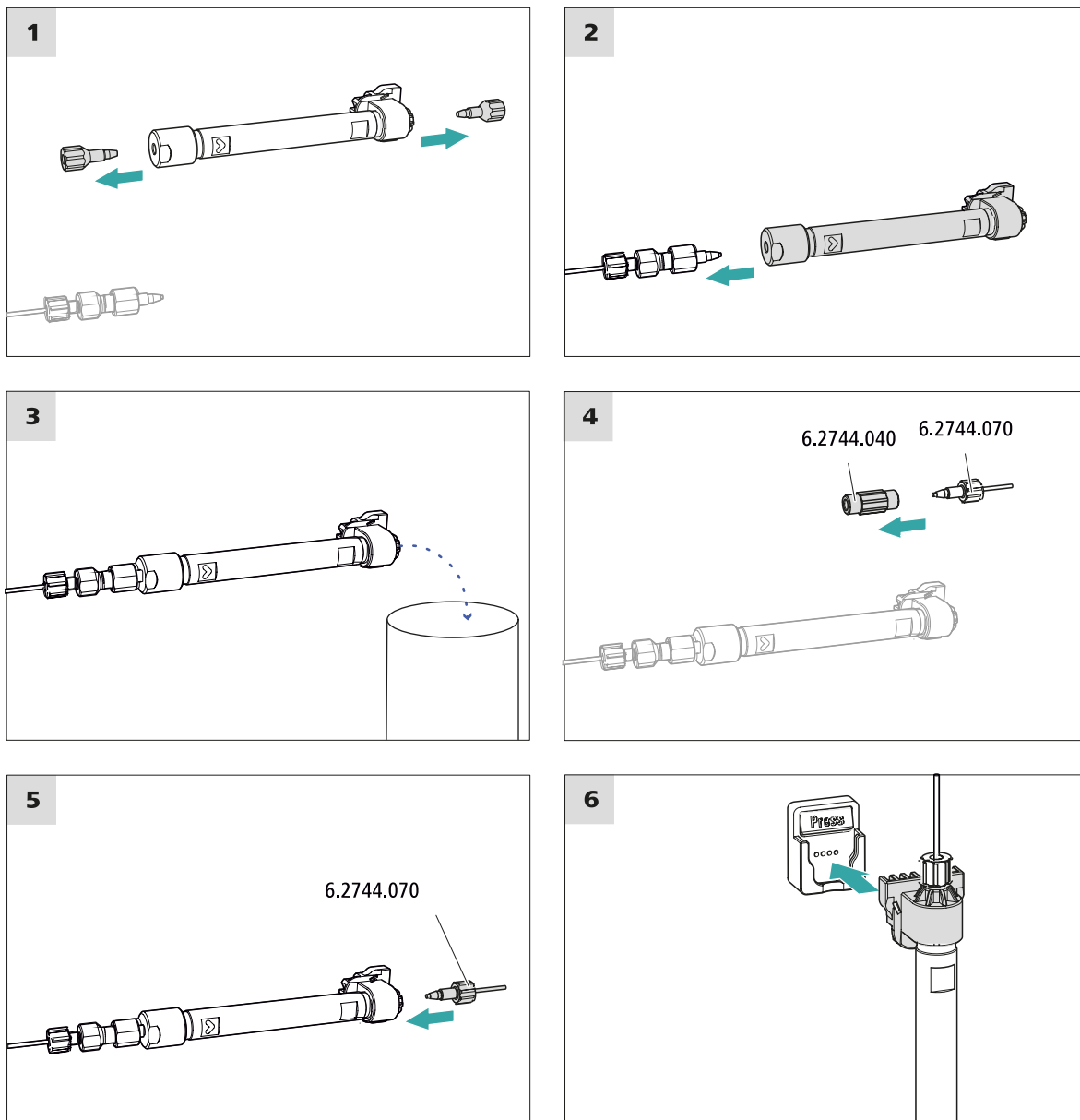
- Fasten the inlet of the guard column to the column inlet capillary using a short pressure screw (6.2744.070).
- If the guard column is connected to the separation column using a connection capillary, fasten this connection capillary to the guard column outlet with a pressure screw.

### Rinsing the guard column

#### 1 Rinsing the guard column

- Place a beaker under the guard column's outlet.
- Start manual control in MagIC Net and select the high-pressure pump: **Manual ► Manual control ► Pump**
  - Flow:** in accordance with column leaflet
  - On**





### Connecting the separation column

#### 1 Removing the stoppers

- Remove the stoppers from the separation column.



## 3.22 Conditioning

In the following cases, the system must be conditioned with eluent until a stable baseline has been reached:

- After installation
- After each time the instrument is switched on
- After each eluent change



### NOTE

The conditioning time can lengthen considerably if the composition of the eluent is modified.

### Conditioning the system

#### 1 Preparing the software



### CAUTION

Ensure that the configured flow rate is not higher than the flow rate permitted for the corresponding column (refer to the column leaflet and chip data record).

- Start the **MagIC Net** computer program.
- Open the **Equilibration** tab in MagIC Net: **Workplace ► Run ► Equilibration**.
- Select (or create) a suitable method.  
See also: *MagIC Net tutorial* and online help.

#### 2 Preparing the instrument

- Check whether the column is inserted correctly in accordance with the flow direction marked on the sticker (arrow has to point in the flow direction).
- Check whether the eluent aspiration tubing is immersed in the eluent and that there is enough eluent in the eluent bottle.

#### 3 Starting the equilibration

- Start the equilibration in MagIC Net: **Workplace ► Run ► Equilibration ► Start HW**.



- Visually inspect whether all capillaries and their connections from the high-pressure pump to the detector are leak-tight. If eluent is leaking out anywhere, tighten the corresponding pressure screw further, or loosen the pressure screw, check the end of the capillary and shorten it using the capillary cutter if necessary and retighten the pressure screw.

#### **4 Conditioning the system**

Continue rinsing the system with eluent until the desired stability level for the baseline has been attained .

The instrument is now ready for measuring samples.

## 4 Operation

The 940 Professional IC Vario ONE/ChS is operated solely using the MagIC Net software. You can find information on operating the software in the tutorial for MagIC Net or in the online help.



### 5.1.4 Shutting down and recommissioning

If the instrument is no longer used for a prolonged period, remove the guard column and the separation column. Rinse the IC system until it is salt-free with a mixture of methanol and ultrapure water (1:4). This prevents eluent salts from crystallizing and then causing damage.

#### Rinsing the IC system to be free of salts

- 1 In the software, stop the hardware and wait until the pressure in the high-pressure pump has been released.
- 2 Remove the guard column and the separation column from the eluent path. Connect the connection capillaries directly with each other using a coupling (6.2744.040).
- 3 Rinse the IC system for 15 minutes with methanol/ultrapure water mixture (1:4).
- 4 Optional: Only if the IC system is equipped with a suppressor.

In the software, switch the Metrohm Suppressor Module (MSM) 2 times during the rinsing process at 5-minute intervals in each case (STEP command).

- 5 Optional: Only if the IC system is equipped with a suppressor and a peristaltic pump.

Rinse the pump tubings used for the peristaltic pump with water for 15 minutes at level 1. Finish by releasing the contact pressure at the peristaltic pump. Finish by releasing the contact pressure at the peristaltic pump.

#### Putting the IC system back into operation

- 1 Check that a coupling (6.2744.040) is installed in place of the guard column and the separation column.
- 2 Rinse the IC system with freshly prepared eluent for 15 minutes.
- 3 Remove the coupling and install the guard column and the separation column (*see Chapter 3.20, page 46 and Chapter 3.21, page 48*).



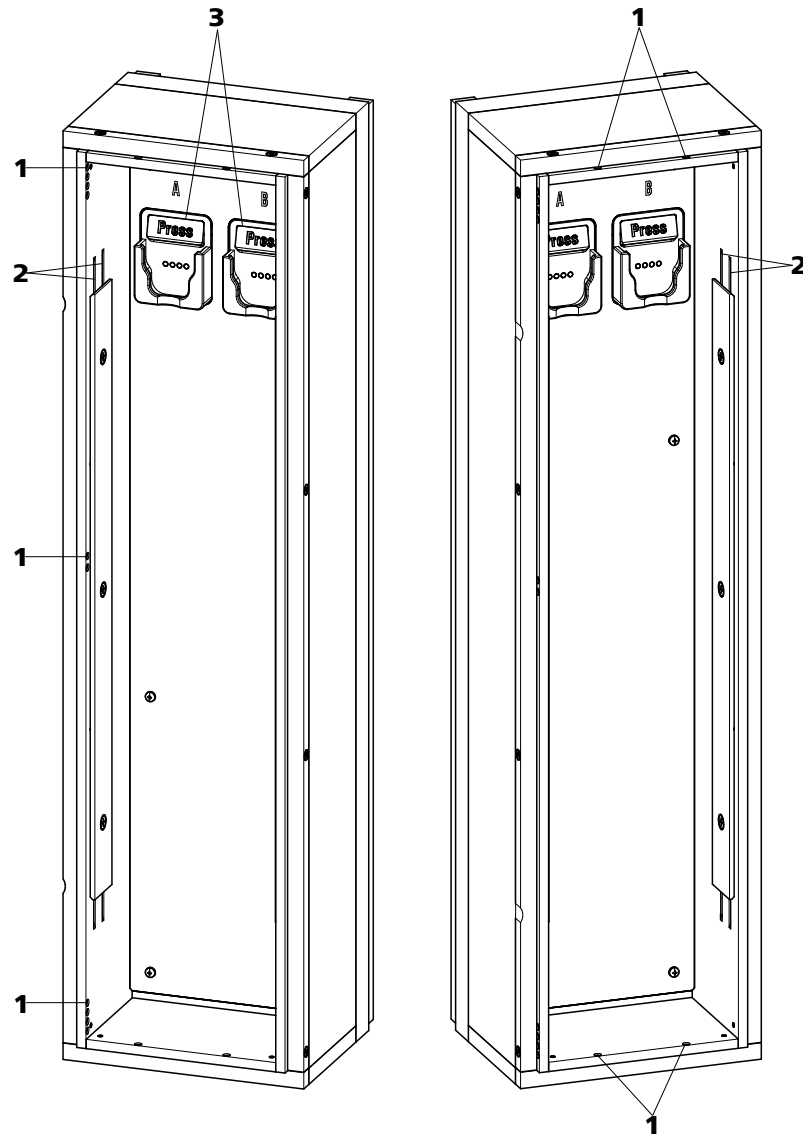


Figure 14 Column thermostat

**1 Openings**

For feeding capillaries into and out of the instrument.

**3 Column holder**

With column recognition. For fastening the column.

**2 Preheating grooves**

For regulating the temperature of the eluent.



### Replacing the preheating capillaries

In order to make threading the column inlet capillary into the column oven's preheating grooves easier, Metrohm recommends loosening the screws for the holder plate a little, but not removing them all the way.

- 1** Guide the column inlet capillary into the column thermostat via a suitable opening (14-1).
- 2** Push the column inlet capillary into the outer preheating groove (14-2) from the bottom. Continue pushing it through under the holder plate until it comes back out the top.
- 3** Carefully bend the column inlet capillary downward and push it through the inner preheating groove until it comes out at the bottom edge of the holder plate.

## 5.5 Handling the eluent

Careful handling of the eluent ensures stable analysis results. Keep the following general measures in mind when handling the eluent:

- The supply bottle with the eluent must be connected as indicated in *chapter 3.7, page 22*. This is particularly important for eluents with volatile solvents (e.g. acetone).
- Avoid condensation in the eluent bottle. Drop formation can change the concentration ratio in the eluent.
- In the case of very sensitive measurements, we recommend that the eluent be stirred constantly with a magnetic stirrer (e. g. the 2.801.0010 with 6.2070.000).
- To protect the IC system from foreign particles, we recommend aspirating the eluent via an aspiration filter (*see chapter 3.7, page 22*) (6.2821.090). This aspiration filter must be replaced as soon as it turns yellow but at least every 3 months.

### 5.5.1 Manufacturing eluent

Chemicals used for manufacturing eluents must have a purity grade of at least "p.a.". They may be diluted only by using ultrapure water (resistance > 18.2 M $\Omega$ \*cm). (These specifications apply generally for all reagents used in ion chromatography.)

Newly manufactured eluents always need to be microfiltered (0.45  $\mu$ m filter).

The composition of the eluent plays a critical role in chromatographic analysis:

<b>Concentration</b>	An increase in the concentration generally leads to shorter retention times and faster separation, but also to a higher background conductivity signal.
<b>pH</b>	pH changes lead to shifts in dissociation equilibria and thus to changes in retention times.
<b>Organic solvents</b>	Adding organic solvents (e.g. methanol, acetone or acetonitrile) to a watery eluent generally speeds up lipophilic ions.

### 5.5.2 Changing the eluent

Ensure that no precipitates can form when changing the eluent. Immediately successive solutions must be miscible. If the system must be rinsed with organic solvents, several solvents with rising or falling lipophilicity must be used.



#### NOTE

To change the eluent, remove the guard column and the separation column. Connect the capillaries using a coupling (6.2744.040) and two pressure screws (6.2744.070).

## 5.6 Eluent degasser maintenance

The pieces of connection tubing are connected to the eluent degasser with clamping screws.

Proceed as follows if you have to loosen and reconnect the connection tubing at the eluent degasser:

#### Accessories

For this step, you need the following accessories:

You can find these parts in the accessory kit: *Vario/Flex Basic* (6.5000.000)

- Wrench (6.2621.050)

#### Loosening the connecting tubing

- 1 ▪ Loosen the clamping screws with the wrench.
  - Unscrew the clamping screws by hand and pull them out of the connector.



## 5.8 Servicing the high-pressure pump



### NOTE

You can find a video sequence for this task in the *Multimedia Guide IC Maintenance* or on the Internet at <http://ic-help.metrohm.com/>.

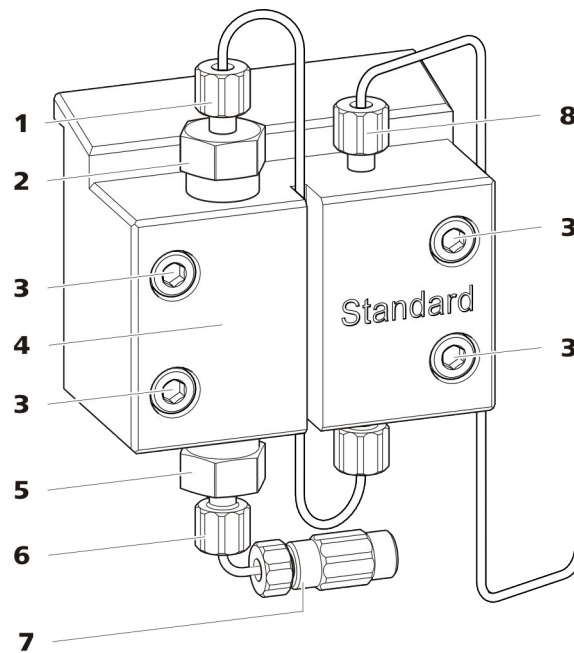


Figure 15 High-pressure pump – Parts

<b>1</b> <b>Pressure screw, short (6.2744.070)</b> Fastened to the outlet valve holder.	<b>2</b> <b>Outlet valve holder</b>
<b>3</b> <b>Fastening screw</b>	<b>4</b> <b>Pump head</b>
<b>5</b> <b>Inlet valve holder</b>	<b>6</b> <b>Pressure screw, short (6.2744.070)</b> Fastened to the inlet valve holder.
<b>7</b> <b>Eluent aspiration tubing connector</b> Consists of a coupling with a pressure screw.	<b>8</b> <b>Pressure screw, short (6.2744.070)</b> Fastened to the pump output.

*Maintenance interval* The following parts of the high-pressure pump must be serviced at least once per year:

- Inlet valve (6.2824.170)
- Outlet valve (6.2824.160)
- Piston seal (6.2741.020)
- Zirconium oxide piston (6.2824.070)

Maintenance tasks can also be carried out if the following problems occur:



- Unstable baseline (pulsations, flow fluctuations)



### CAUTION

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

#### *Recommended procedure*

We recommend the following procedure for the maintenance of the pump head:

1. Service the inlet valve and the outlet valve.
2. Remove the pump head.
3. Service both pistons, one after the other.
  - a. Remove piston.
  - b. Dismantle the piston.
  - c. Replace the piston seal.
  - d. Replace the zirconium oxide piston.
  - e. Assemble the piston.
  - f. Insert the piston.
4. Reinstall the pump head.

You can find brief video sequences on the following maintenance steps on the Internet at <http://ic-help.metrohm.com/>.

#### **Servicing the outlet valve and inlet valve**

#### *Accessories*

For this step, you need the following accessories:

You can find these parts in the accessory kit: *Vario/Flex Basic* (6.5000.000).

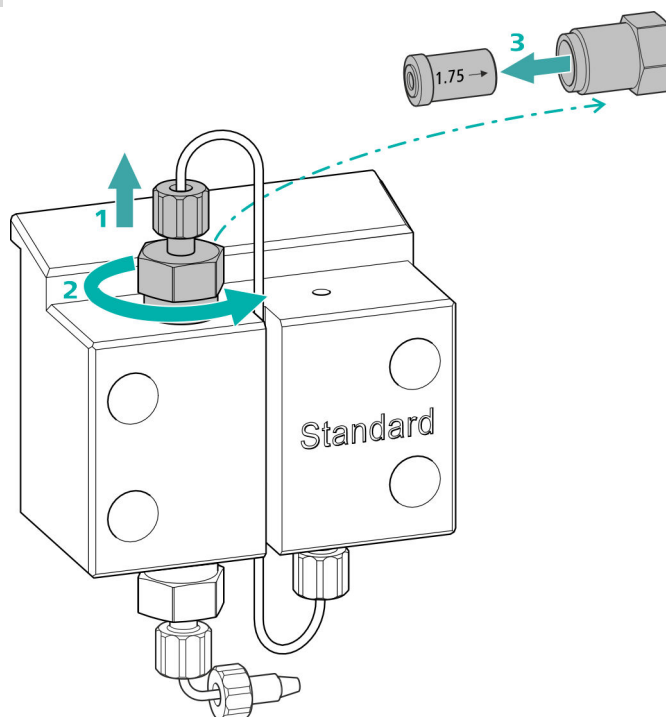
- Adjustable wrench (6.2621.000)

## Cleaning the outlet valve

### Spare parts

If the outlet valve cannot be cleaned, you will need a new outlet valve (6.2824.160) for this step.

### 1 Removing the outlet valve



- Unscrew the connection capillary to the auxiliary piston from the outlet valve holder (15-2) (1).
- Start by loosening the outlet valve holder with the adjustable wrench and then unscrew it by hand (2) and remove it.
- Remove the outlet valve from the outlet valve holder (3).

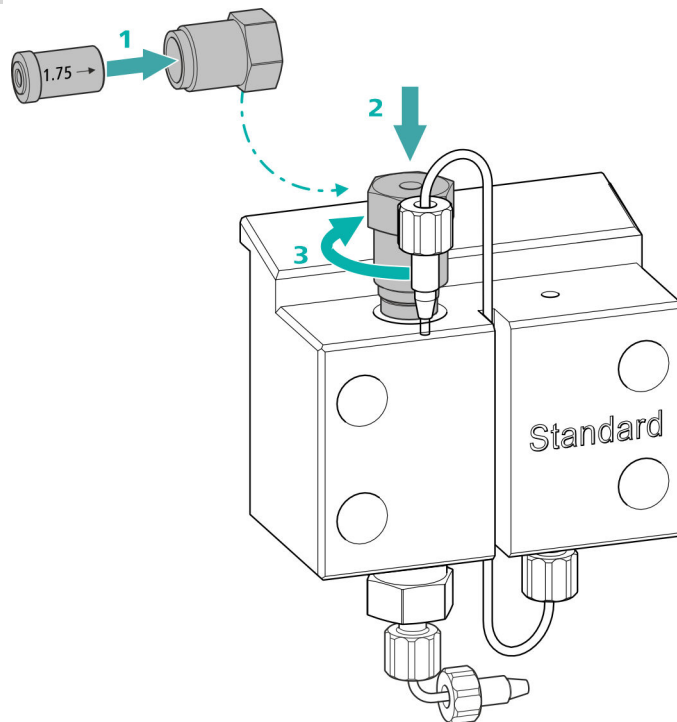
### 2 Cleaning the outlet valve

- Start by rinsing the outlet valve in the direction of eluent flow using a wash bottle filled with ultrapure water, RBS™ solution or acetone. (The direction of eluent flow is marked on the valve by an arrow.)  
The rinsing solution must come out at the valve exit.  
If no more solution comes out, then the valve is blocked.
- Rinse the outlet valve in the direction opposite the eluent flow using a wash bottle filled with ultrapure water, RBS™ solution or acetone.  
The rinsing solution may only come out at the valve exit.

The outlet valve must be replaced if it is still clogged after cleaning.



### 3 Reinserting the outlet valve into the pump head



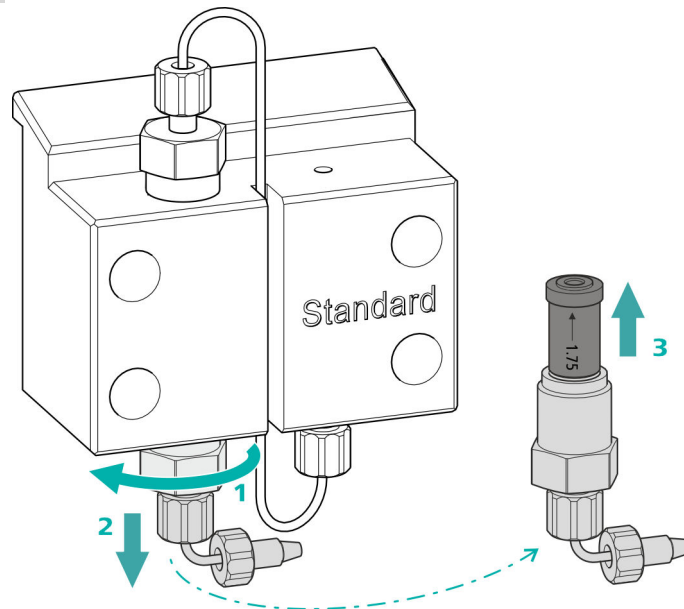
- Insert the outlet valve into the outlet valve holder (the seal must be visible) (1).
- Screw the outlet valve holder up into the pump head (2) and tighten it firmly by hand and then retighten it one additional  $\frac{3}{4}$  turn using the adjustable wrench (3).
- Tighten the connection capillary to the auxiliary piston back onto the outlet valve holder.

## Cleaning the inlet valve

### Spare parts

If the inlet valve cannot be cleaned, you will need a new inlet valve (6.2824.170) for this step.

### 1 Removing the inlet valve



- Unscrew the connection capillary to the connection of the eluent aspiration tubing (15-7).
- Start by loosening the inlet valve holder with the adjustable wrench (1) and then unscrew it by hand (2) and remove it.
- Remove the inlet valve from the inlet valve holder (3).

### 2 Cleaning the inlet valve

- Start by rinsing the inlet valve in the direction of eluent flow using a wash bottle filled with ultrapure water, RBS™ solution or acetone. (The direction of eluent flow is marked on the valve by an arrow.)

The rinsing solution must come out at the valve exit.

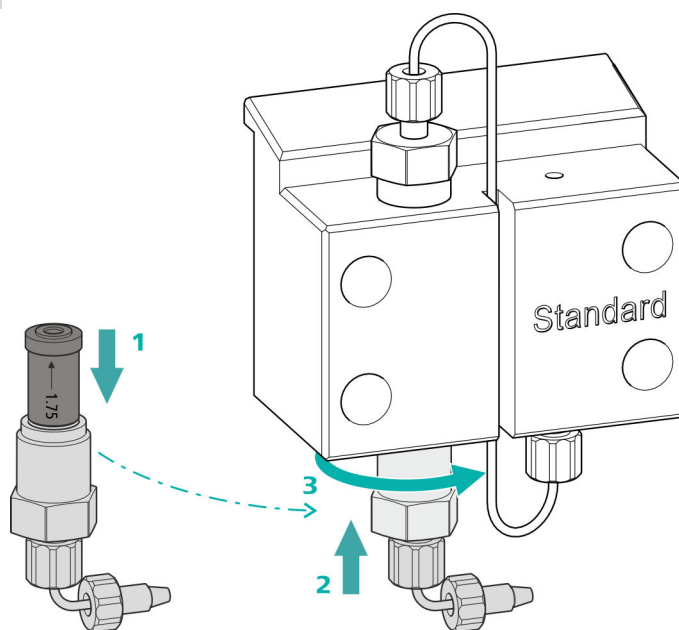
If no more solution comes out, then the valve is blocked.

- Rinse the inlet valve in the direction opposite the eluent flow using a wash bottle filled with ultrapure water, RBS™ solution or acetone.

The rinsing solution may only come out at the valve exit.

The inlet valve must be replaced if it is still clogged after cleaning.

### 3 Reinserting the inlet valve into the pump head



- Insert the inlet valve into the inlet valve holder (the seal must be visible) (1).
- Screw the inlet valve holder up into the pump head (2) and tighten it firmly by hand and then retighten it one additional  $\frac{3}{4}$  turn using the adjustable wrench (3).
- Refasten the connection capillary to the connection of the eluent aspiration tubing (15-7).

### Removing the pump head

#### Accessories

For this step, you need the following accessories:

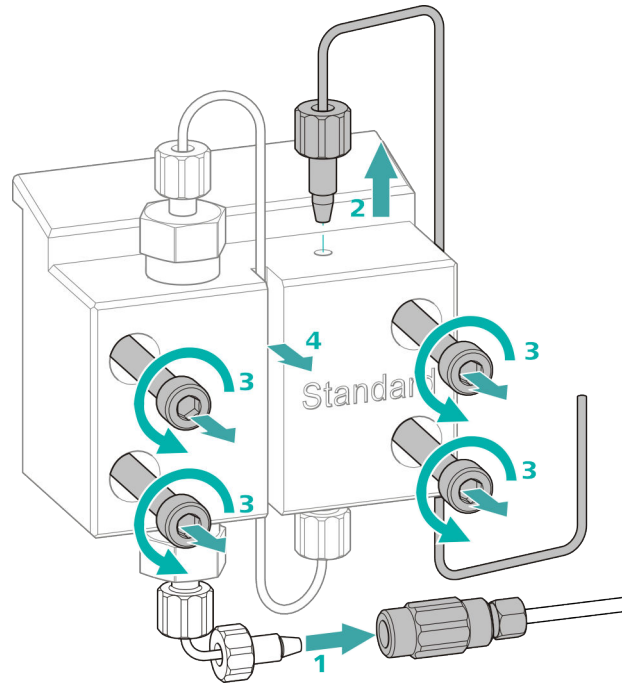
You can find these parts in the accessory kit: *Vario/Flex Basic* (6.5000.000).

- 4 mm hex key (6.2621.030)

### Removing the pump head

Prerequisites:

- Is the high-pressure pump switched off?
- Has the pressure been released?
- Is the instrument switched off?



- 1** Release the coupling from the pressure screw and seal it with a stopper.
- 2** Unscrew and remove the pressure screw on the pump head's outlet (15-8).
- 3** Loosen and remove the four fastening screws (15-3) using the hex key.
- 4** Remove the pump head (15-4).

### Servicing the piston

Carry out the following work on both pistons in turn.

Servicing a piston consists of the following tasks:

1. Replace the piston seal.
2. Clean or replace the zirconium oxide piston.
3. Reinstall the piston.

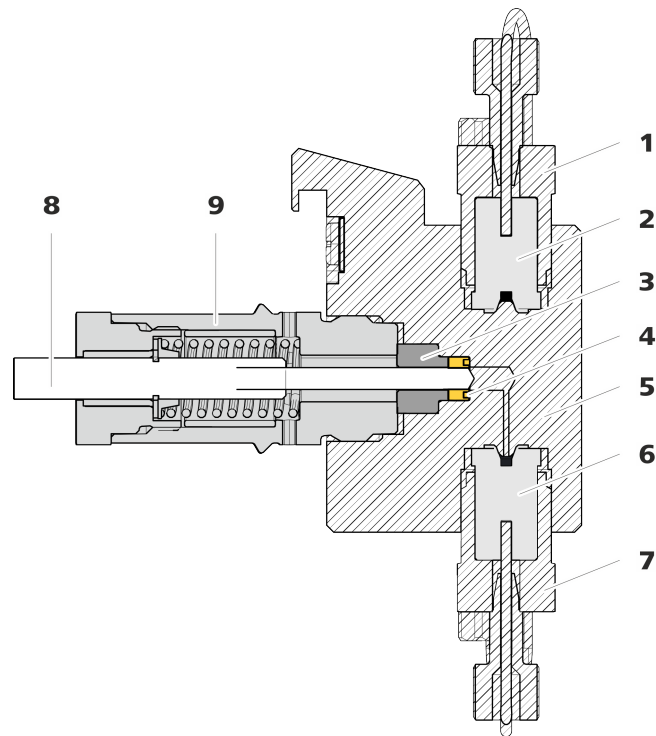


Figure 16 High-pressure pump – Cross-section

<b>1</b>	<b>Outlet valve holder</b>	<b>2</b>	<b>Outlet valve (6.2824.160)</b>
<b>3</b>	<b>Backup ring</b>	<b>4</b>	<b>Piston seal (6.2741.020)</b>
<b>5</b>	<b>Pump head</b>	<b>6</b>	<b>Inlet valve (6.2824.170)</b>
<b>7</b>	<b>Inlet valve holder</b>	<b>8</b>	<b>Zirconium oxide piston (6.2824.070)</b>
<b>9</b>	<b>Piston cartridge</b>		

#### Accessories

For this step, you need the following accessories:

You can find these parts in the accessory kit: *Vario/Flex Basic* (6.5000.000).

- Adjustable wrench (6.2621.000)
- Tool for piston seals (6.2617.010) consisting of a tip (17-1) for removing the old piston seal and a sleeve (17-2) for inserting the new piston seal.

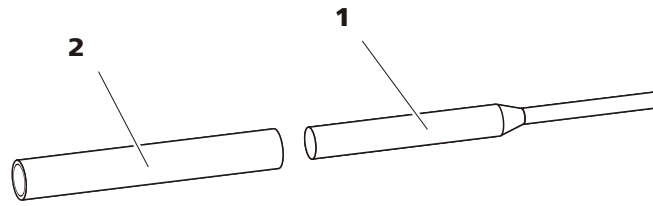


Figure 17 Tool for piston seal (6.2617.010)

**1 Tip**

**2 Sleeve**

*Spare part*

For this step, you need a new piston seal (6.2741.020).

### Replacing the piston seal

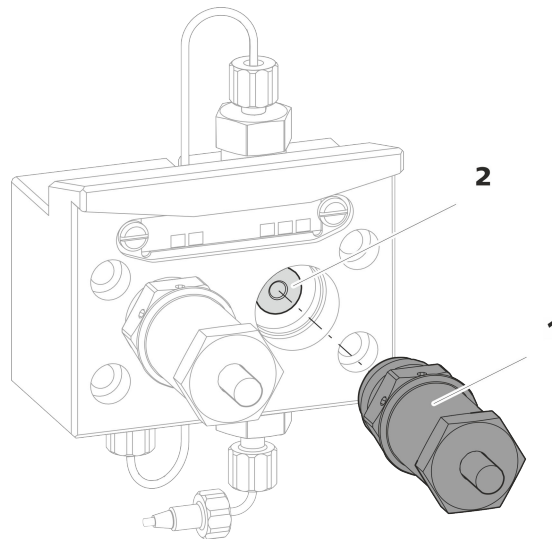


Figure 18 Removing the piston cartridge from the pump head

**1 Piston cartridge**

**2 Backup ring**

#### 1 Removing the piston cartridge

Loosen the piston cartridge (18-1) using the adjustable wrench and then unscrew it from the pump head by hand. Set it aside.

#### 2 Removing the backup ring

Shake the backup ring (18-2) out of the piston opening. Set it aside.



### 3 Removing the old piston seal



#### CAUTION

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



#### CAUTION

Avoid touching the sealing surface in the pump head with the tool!

Only screw the tip (17-1) of the tool for the piston seal far enough into the piston seal that the seal can be pulled out.

### 4 Inserting the new piston seal into the tool

Insert the new piston seal into the recess of the sleeve (19-1) of the tool for piston seal. The sealing spring must be visible from the outside.

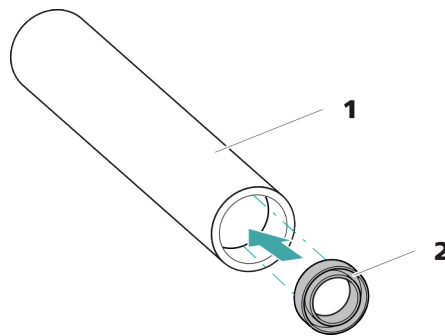


Figure 19 Inserting the piston seal into the tool

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

**2 Piston seal (6.2741.020)**

### 5 Inserting the new piston seal into the pump head

Guide the sleeve (17-2) of the tool for the piston seal with inserted piston seal into the pump head. Press the seal into the pump head recess using the wide end of the tip (17-1) of the tool.

## Cleaning or replacing the zirconium oxide piston

Prerequisites:

- The pump head has been removed (see "Removing the pump head", page 66).
- The piston cartridge is removed (see "Replacing the piston seal", page 69).

For this task, you need the following accessories:

- Zirconium oxide piston (6.2824.070)
- Adjustable wrench (6.2621.000) from the accessory kit: *Vario/Flex Basic* (6.5000.000).

## 1 Breaking down the piston cartridge



### CAUTION

Inside the piston cartridge there is a taut spring that can launch out of the piston cartridge if the tension is released suddenly.

When opening the piston cartridge, counteract the pressure from the spring and carefully unscrew the cartridge.

- Loosen the piston cartridge's screw with an adjustable wrench and carefully unscrew the screw by hand while counteracting the pressure from the taut spring.
- Remove the zirconium oxide piston and place it on a paper towel.
- Remove the spring retainer, the spring and the inner plastic sleeve from the piston cartridge and lay them next to the piston.
- Place the backup ring you put aside with the remaining parts.

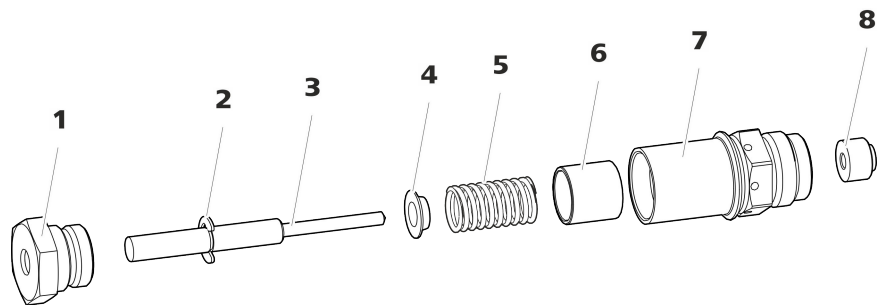


Figure 20 Parts of the piston cartridge

<b>1</b>	<b>Piston cartridge screw</b>	<b>2</b>	<b>Retaining washer</b>
<b>3</b>	<b>Zirconium oxide piston (6.2824.070)</b>	<b>4</b>	<b>Spring retainer</b>
<b>5</b>	<b>Spring (6.2824.060)</b>	<b>6</b>	<b>Inner plastic sleeve</b> Protects from metallic abrasion.
<b>7</b>	<b>Piston cartridge</b>	<b>8</b>	<b>Backup ring</b>



## 2 Cleaning the parts of the piston cartridge

- If the zirconium oxide piston has become contaminated due to abrasion or deposits, then clean it using a fine abrasive cleaning powder, rinse it using ultrapure water until it is free of particles and dry it.

The zirconium oxide piston must be replaced if it is heavily contaminated or scratched.

- Rinse the other parts of the piston with ultrapure water and dry with a lint-free cloth.

## 3 Replacing the zirconium oxide piston

- Remove the retaining washer (20-2) from the old piston. If the retaining washer sits too tightly, use a pointed object to loosen the retaining washer.
- Assemble the retaining washer at the same point on the new piston.

## 4 Putting the piston cartridge together

- Insert the inner plastic sleeve, the spring and the 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 the screw and tighten it by hand.

## Mounting the piston

### 1 Reinserting the backup ring

Clean the backup ring (16-3) with ultrapure water and reinsert it.

### 2 Reinserting the piston cartridge

Screw the assembled piston cartridge back into the pump head and tighten, first by hand, then also using an adjustable wrench by approx. 15°.

Clean the second piston cartridge in the same way.

## Mounting the pump head

For this step, you need the following accessories:

You can find these parts in the accessory kit: *Vario/Flex Basic* (6.5000.000).

*Accessories*

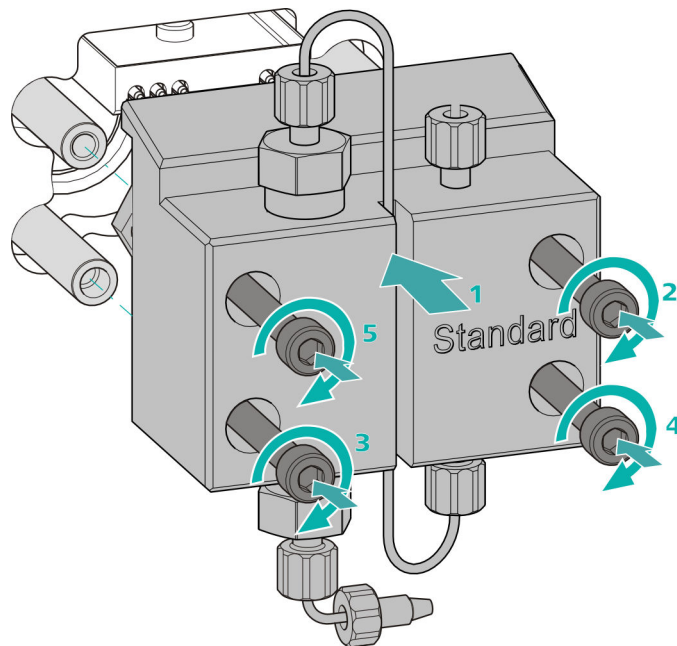
- 4 mm hex key (6.2621.030)

### Mounting the pump head



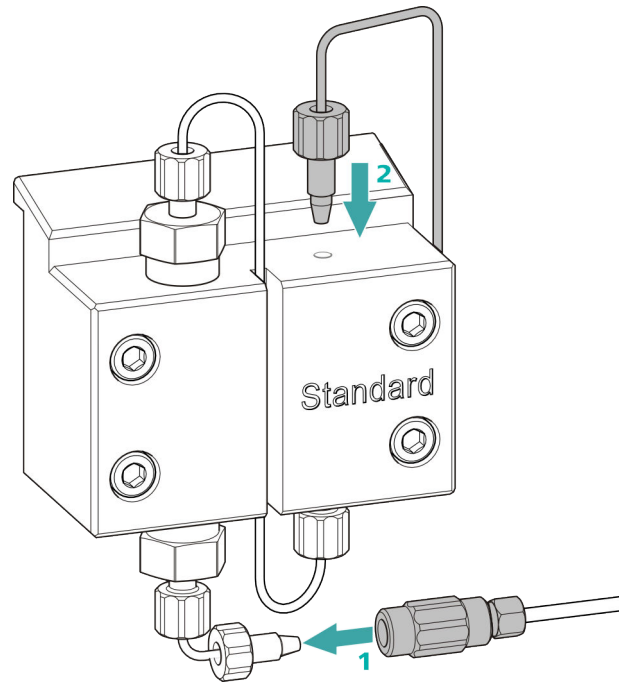
#### NOTE

The pump head cannot be mounted the wrong way, as it has fastening bolts with different bore hole depths, i.e., one fastening bolt is longer than all others. The bore hole with the greatest depth must therefore be aligned with the longest bolt.



- 1
  - Push the pump head onto the four fastening bolts (1).
  - Tighten the four fastening screws using the hex key (6.2621.030) alternating crosswise.

### Connecting the entry and exit for the high-pressure pump



- 1
  - Remove the stopper from the coupling. Tighten the coupling to the pressure screw located on the pump head inlet capillary (1).
  - Reconnect the pump head outlet capillary to the pump head outlet (2).

## 5.9 Servicing the inline filter



### NOTE

You can find a video sequence for this task in the *Multimedia Guide IC Maintenance* or on the Internet at <http://ic-help.metrohm.com/>.

#### Maintenance interval

The filter must be replaced at least every 3 months; it may need to be replaced more frequently, depending on the application.

#### Accessories

For this task, you need the following accessories:

- Two adjustable wrenches (6.2621.000) from the accessory kit: Vario/Flex Basic (6.5000.000)
- Tweezers
- A new filter from the packaging (6.2821.130)

## Removing the filter

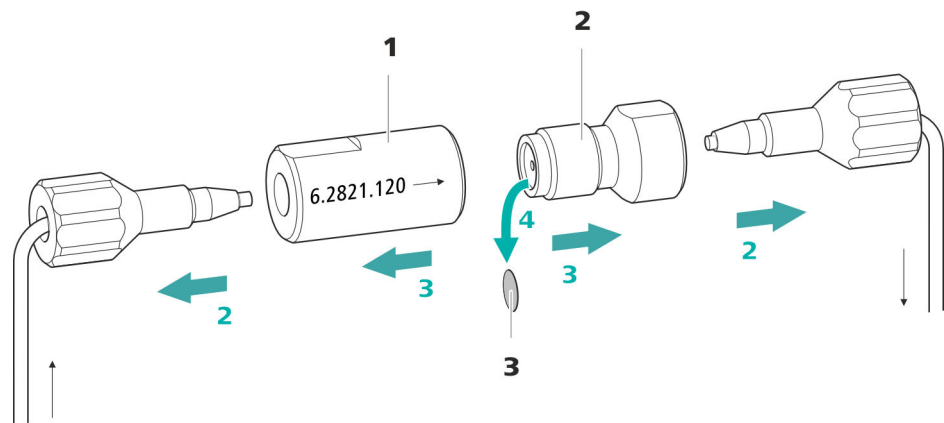


Figure 21 Inline filter – Removing the filter

### 1 Filter housing

Inline filter housing. Part of the accessories (6.2821.120).

### 2 Filter screw

Screw for the inline filter. Part of the accessories (6.2821.120).

### 3 Filter (6.2821.130)

Pack contains 10 pieces.

### 1 Shutting off the flow

Switch off the high-pressure pump in the software.

### 2 Removing the inline filter

Unscrew both pressure screws from the inline filter.

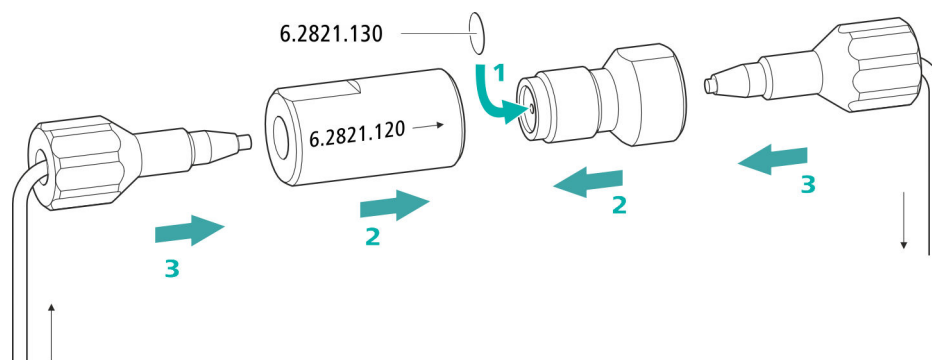
### 3 Unscrewing the filter screw

Use two adjustable wrenches (6.2621.000) to loosen the filter screw (21-2) from the filter housing (21-1) and unscrew it by hand.

### 4 Removing the filter

Remove the old filter (21-3) using tweezers.

### Inserting a new filter



#### 1 Inserting a new filter

- Use tweezers to carefully place a new filter into the filter screw (21-2) so that it is flat and press it firmly into place with the rear of the tweezers.

#### 2 Installing the filter screw

- Screw the filter screw (21-2) back into the filter housing (21-1) and tighten by hand. Then use two adjustable wrenches (6.2621.000) to tighten it slightly.

#### 3 Remounting the inline filter

- Screw pressure screws back onto the inline filter. Take care to ensure that the flow direction matches that inscribed on the inline filter.

#### 4 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.
- Reinsert the columns after 10 minutes.

## 5.10 Servicing the pulsation absorber



### CAUTION

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

## 5.11 Injection valve

Maintenance on the injection valve is best performed by specialist personnel from Metrohm during annual service.

## 5.12 Metrohm Suppressor Module (MSM)

### 5.12.1 Notes for operating the Metrohm Suppressor Module (MSM)



### NOTE

The suppressor units must never be regenerated in the same flow direction the eluent is pumped. Therefore, always mount the inlet and outlet capillaries according to the diagram outlined in *Chapter Connecting the Metrohm Suppressor Module (MSM)*, page 34.

The Metrohm Suppressor Module (MSM) consists of three suppressor units, which, in rotation, are (1) used for suppression, (2) regenerated with regeneration solution and (3) rinsed with ultrapure water or with suppressed eluent. In order to record each new chromatogram under comparable conditions, work is normally performed with a freshly regenerated and rinsed suppressor unit.



### CAUTION

The Metrohm Suppressor Module (MSM) must never be switched over if liquid is not flowing through it, since otherwise it may become jammed. If the Metrohm Suppressor Module (MSM) is in a dry state, it must be rinsed for at least five minutes before it may be switched over.



**CAUTION**

The Metrohm Suppressor Module (MSM) must be regenerated (see chapter 5.12.3.2, page 79), cleaned (see chapter 5.12.3.4, page 81) or replaced (see chapter 5.12.3.5, page 84) if the capacity of the Metrohm Suppressor Module (MSM) is reduced or if the backpressure is high.

**5.12.2 Taking care of the suppressor housing**



**CAUTION**

**The transparent suppressor housing can become fogged.**

The suppressor housing is made of PMMA (poly(methyl methacrylate)). It can become scratched and foggy if cleaned improperly. This can make viewing the rotor difficult or impossible.

- Do **not use any scouring agents** for cleaning.
- Do **not use any solvents** for cleaning.

**5.12.3 Servicing the Metrohm Suppressor Module (MSM)**

**5.12.3.1 Parts of the Metrohm Suppressor Module (MSM)**

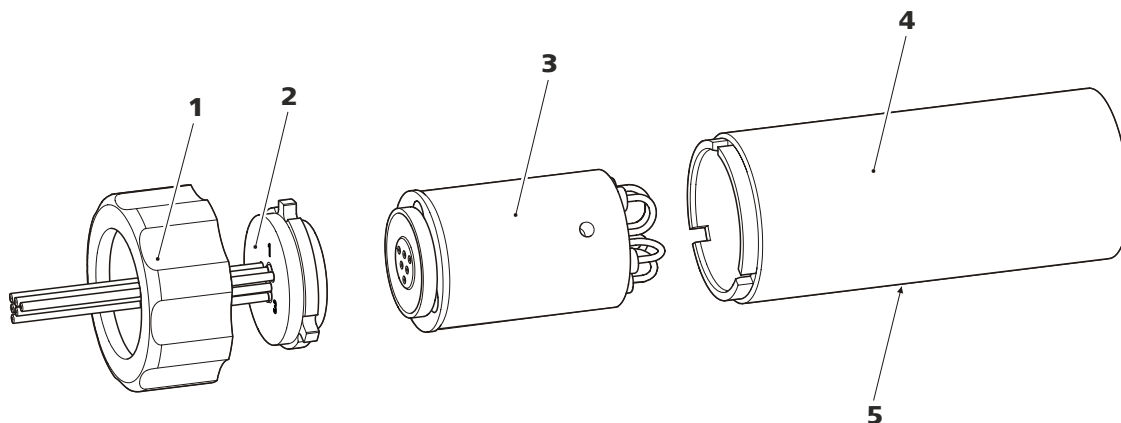


Figure 22 Parts of the Metrohm Suppressor Module (MSM)

<b>1</b>	<b>Union nut</b>	<b>2</b>	<b>Connecting piece</b>
<b>3</b>	<b>Rotor</b>	<b>4</b>	<b>Housing</b>
<b>5</b>	<b>Slot in the housing</b>		

### 5.12.3.2 Regenerating the anion suppression rotor

If the anion suppressor units are loaded with certain heavy metals (such as iron) or organic contamination for long periods, then the standard regeneration solution may no longer be able to completely remove them. This constantly reduces the capacity of the suppressor units, which results in reduced phosphate sensitivity in mild cases and a large increase in the baseline in severe cases.

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

#### Regeneration solutions

- **Contamination with heavy metals or elevated backpressure:**  
1 mol/L  $\text{H}_2\text{SO}_4$  + 0.1 mol/L oxalic acid
- **Contamination with organic cationic complexing agents:**  
0.1 mol/L  $\text{H}_2\text{SO}_4$  / 0.1 mol/L oxalic acid / acetone 5%
- **Heavy contamination with organic substances:**  
0.2 mol/L  $\text{H}_2\text{SO}_4$  / acetone  $\geq 20\%$
- **Contamination by certain environmental samples**  
1 mol/L  $\text{H}_3\text{PO}_4$



#### NOTE

If phosphoric acid has been used once as regeneration solution in an IC system, you will have to continue using phosphoric acid for regeneration. Regenerating it with sulfuric acid again can lead to problems in the baseline.



#### CAUTION

Pump tubing made of PVC must not be used for solutions containing organic solvents.

We recommend using the high-pressure pump for regeneration.

#### Regenerating the anion suppressor rotor

##### 1 Disconnecting the Metrohm Suppressor Module (MSM) from the IC system

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



### 5.12.3.3 Regenerating the cation suppression rotor

If the cation suppressor units are exposed to certain contaminations for prolonged periods, then these contaminations can no longer be removed completely with the standard regeneration solution. The performance of the suppressor units declines continuously, as indicated by a rise of the baseline or asymmetrical peaks.

If such problems occur at one or more positions, then treat all of the cation suppressor units as follows:

#### Regenerating the cation suppressor

##### 1 Stopping the regeneration solution

Stop the regeneration solution feed.

##### 2 Regenerating the first cation suppressor unit

Rinse the system with eluent until the suppressor unit is completely exhausted (indicated by a significant increase in conductivity). This can take up to 240 minutes under standard conditions.

##### 3 Regenerating the second cation suppressor unit

In the software, use the **Step** command to switch to the next suppressor unit. Repeat step 2.

##### 4 Regenerating the third cation suppressor unit

In the software, use the **Step** command to switch to the next suppressor unit. Repeat step 2.

##### 5 Restoring the regeneration solution

As soon as all three suppressor units are completely exhausted, restore the regeneration solution feed.

##### 6 Equilibrating the system

Equilibrate the system as usual (*see chapter "Conditioning" in the manual for the ion chromatograph*).

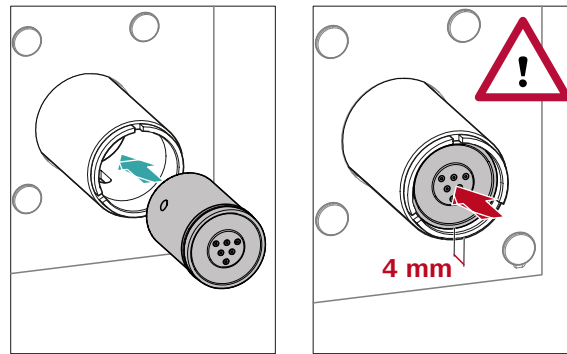
### 5.12.3.4 Cleaning the Metrohm Suppressor Module (MSM)

In the following cases, it may be necessary to clean the Metrohm Suppressor Module (MSM):

- Increased backpressure at the MSM's connection tubing.



For an overview of the rotors, see figure , page 31



- Insert the rotor (22-3) into the housing (22-4) in such a way that the tubing connections on the rear of the rotor fit into the corresponding recesses inside the housing and one of the three holes of the rotor is visible from below in the slot of the housing (22-5).



#### NOTE

The rotor's sealing surface is located approx. 4 mm deep inside the suppressor drive if the rotor is inserted correctly.

If this is not the case, then the rotor must be moved into the correct position using careful turning. If the rotor cannot be turned or removed, it can be moved into the correct position from below by means of a pointed object (e.g. a screwdriver).

## 6 Cleaning the connecting piece

- Clean the sealing surface of the connecting piece (22-2) with ethanol using a lint-free cloth.

## 7 Inserting the connecting piece

See also Chapter 3.13.1, page 31

- Insert the connecting piece (22-2) into the housing in such a way that connector 1 is on top and the three pins of the connecting piece fit into the corresponding recesses on the housing.
- Reattach the union nut (22-1) and tighten by hand (do not use a tool).

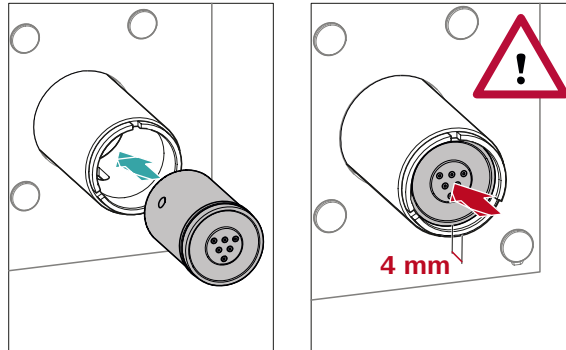
## 8 Connecting and conditioning the Metrohm Suppressor Module (MSM)

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



**NOTE**

The adapter (6.2842.020) (see "Inserting small rotors", page 33) is required in order to insert a small rotor into the suppressor drive.



- Insert the new rotor (22-3) into the housing (22-4) in such a way that the tubing connections on the rear of the rotor fit into the corresponding recesses inside the housing and one of the three holes of the rotor is visible from below in the slot of the housing (22-5).

**NOTE**

The rotor's sealing surface is located approx. 4 mm deep inside the suppressor drive if the rotor is inserted correctly.

If this is not the case, then the rotor must be moved into the correct position using careful turning. If the rotor cannot be turned or removed, it can be moved into the correct position from below by means of a pointed object (e.g. a screwdriver).

**5 Cleaning the new connecting piece**

- Clean the sealing surface of the new connecting piece (22-2) with ethanol using a lint-free cloth.

**6 Inserting the new connecting piece**

See also Chapter 3.13.1, Page 31

- Insert the connecting piece (22-2) into the housing in such a way that connector 1 is on top and the three pins of the connecting piece fit into the corresponding recesses on the housing.
- Reattach the union nut (22-1) and tighten by hand (do not use a tool).



### 3 Aspirating the sample and measuring the time

Aspirate a sample typical for the later application and use a stop-watch to measure the time the sample needs to go from the sample vessel to the end of the sample loop.

The time upon stopping the watch is the "transfer time".

### 4 Tightening the sample loop again

Tighten the sample loop again.

If the sample is injected automatically, the rinsing time must be at least three times the **transfer time**.

## Checking the rinsing time

You can determine if the applied rinsing time is sufficient by measuring the sample carry-over directly. Proceed as follows to do this:

### 1 Preparing two samples

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

### 2 Determining "Sample A"

Allow "Sample A" to run through the sample path for the duration of the rinsing time; inject and then measure it.

### 3 Determining "Sample B"

Allow "Sample B" to run through the sample path for the duration of the rinsing time; inject and then measure it.

### 4 Calculating the sample carry-over

The sample carry-over corresponds to the ratio of the peak areas of the measurement from Sample B to the measurement from Sample A. The smaller this ratio, the smaller the amount of sample carry-over. This ratio can be changed by varying the rinsing time. This can be used to determine the required rinsing time for the application.



**NOTE**

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Regeneration is intended as a last resort. It should not be carried out regularly.

## 6 Troubleshooting

<b>Problem</b>	<b>Cause</b>	<b>Remedy</b>
<b>Marked drop in pressure.</b>	<i>Leak in the system.</i>	Check the capillary connections and seal leaks, if necessary (see chapter 3.2, page 14).
	<i>The eluent is not sufficiently degassed.</i>	Ensure that the connectors for the eluent degasser are firmly connected (see chapter 5.6, page 59).
<b>The baseline has a large amount of noise.</b>	<i>The eluent path has a leak.</i>	Check the eluent path and fix the leak.  If necessary, tighten the pressure screws using a wrench (6.2739.000).
	<i>High-pressure pump – Contaminated pump valves.</i>	Clean the pump valves (see chapter 5.8, page 61).
	<i>The eluent path is blocked.</i>	Check the eluent path and eliminate the blockage.
	<i>Contaminations in the eluent</i>	Check the quality of the chemicals and the water.
	<i>High-pressure pump – Defective piston seals.</i>	Replace the piston seals (see chapter 5.8, page 61).
	<i>The pulsation absorber is not connected or is defective.</i>	Connect (see chapter 3.11, page 28) or replace the pulsation absorber.
	<i>Thermal equilibrium is not yet attained.</i>	Condition the instrument with the column thermostat enabled until the baseline is stable .
<b>The baseline is drifting.</b>	<i>Leak in the system.</i>	Check all capillary connections and seal leaks, if necessary (see chapter 3.2, page 14).
	<i>The organic solvent in the eluent is evaporating.</i>	<ul style="list-style-type: none"> <li>▪ Check the eluent bottle cap (see chapter 3.7, page 22).</li> <li>▪ Constantly stir the eluent.</li> </ul>
	<i>The inline filter (6.2821.120) is blocked.</i>	Replace the filter (6.2821.130) .
<b>The pressure in the system markedly increases.</b>	<i>The inline filter (6.2821.120) is blocked.</i>	Replace the filter (6.2821.130) .

<b>Problem</b>	<b>Cause</b>	<b>Remedy</b>
	<i>The MSM is blocked.</i>	<ul style="list-style-type: none"> <li>Regenerate the MSM (<i>see chapter 5.12.3.2, page 79</i>).</li> </ul> <p>Note: 6.2821.180 pump tubing connection with filter must be used.</p>
	<i>Guard column – Blocked.</i>	Replace the guard column ( <i>see chapter 3.20, page 46</i> ).
	<i>Separation column – Blocked.</i>	<ul style="list-style-type: none"> <li>Regenerate the separation column (<i>see chapter 5.15.4, page 88</i>).</li> <li>Replace the separation column (<i>see "Connecting the separation column", page 49</i>).</li> </ul> <p>Note: Samples should always be microfiltered .</p>
	<i>Injection valve – blocked.</i>	Have the valve cleaned (by a Metrohm service engineer).
<b>The retention times in the chromatogram have changed unexpectedly.</b>	<i>Eluent - Incorrect concentration</i>	Create eluent with correct concentration.
	<i>Separation column – Diminished separating efficiency.</i>	<ul style="list-style-type: none"> <li>Regenerate the separation column (<i>see chapter 5.15.4, page 88</i>).</li> <li>Replace the separation column (<i>see "Connecting the separation column", page 49</i>).</li> </ul>
	<i>The eluent contains gas bubbles.</i>	<ul style="list-style-type: none"> <li>Ensure that the connectors for the eluent degasser are firmly connected .</li> <li>Purge the high-pressure pump (<i>see figure , page 45</i>).</li> </ul>
	<i>High-pressure pump – Defective.</i>	Request Metrohm Service.
<b>Peak areas are lower than expected.</b>	<i>Sample – There is a leak in the sample path.</i>	Find and fix the leak in the sample path.
	<i>Sample – The sample path is blocked.</i>	Find and eliminate the blockage in the sample path.
	<i>Sample – The sample loop is not (completely) filled.</i>	Adjust the transfer time for the sample ( <i>see "Determining the transfer time", page 86</i> ).
	<i>Sample – There are gas bubbles in the sample.</i>	Use the sample degasser .



<b>Problem</b>	<b>Cause</b>	<b>Remedy</b>
<b>Chromatograms have poor resolution</b>	<i>Separation column – Diminished separating efficiency.</i>	<ul style="list-style-type: none"> <li>Regenerate the separation column (see chapter 5.15.4, page 88).</li> <li>Replace the separation column (see "Connecting the separation column", page 49).</li> </ul>
	<i>Capillary connections – Dead volume in the system.</i>	Check the capillary connections (see chapter 3.2, page 14) (use PEEK capillaries with an inner diameter of 0.25 mm between the injection valve and the detector).
<b>Extreme spread of the peaks in the chromatogram. Splitting (dual peaks)</b>	<i>Guard column – Diminished efficiency.</i>	Replace the guard column (see chapter 3.20, page 46).
	<i>Separation column – Dead volume at the column head.</i>	<ul style="list-style-type: none"> <li>Install the separation column in the opposite flow direction (if the leaflet says this is permissible) and rinse into a beaker.</li> <li>Replace the separation column (see "Connecting the separation column", page 49).</li> </ul>
	<i>Injection valve – Sample loop.</i>	Check the installation of the sample loop (see "Optional: Exchanging the sample loop", page 29).
<b>Precision problems - the measured values are highly scattered.</b>	<i>Sample – There are gas bubbles in the sample.</i>	Use the sample degasser .
	<i>Sample – The rinsing volume is too small.</i>	Increase the rinsing time (see chapter 5.14, page 86).
	<i>Injection valve – Defective.</i>	Request Metrohm Service.
	<i>Eluent degasser – Vacuum connection on the rear of the instrument is not (tightly) sealed.</i>	<ul style="list-style-type: none"> <li>Seal the <b>Vacuum</b> connector tightly with a threaded stopper (6.1446.040).</li> </ul>
<b>Vacuum is not being built</b>		



## 7 Technical specifications

### 7.1 Reference conditions

The technical specifications listed in this chapter refer to the following reference conditions:

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

### 7.2 Ambient conditions

#### *Operation*

<i>Nominal function range</i>	+5 to +45 °C at max. 80% relative humidity, non-condensing
-------------------------------	---

<i>Storage</i>	+5 to +45 °C at max. 80% relative humidity, non-condensing
----------------	---

<i>Altitude / Pressure range</i>	max. 3,000 m above sea level / min. 700 mbar
----------------------------------	--

<i>Overvoltage category</i>	II
-----------------------------	----

<i>Pollution degree</i>	2
-------------------------	---

### 7.3 Housing

#### *Dimensions*

*Width* 365 mm

*Height* 642 mm

*Depth* 380 mm

#### *Controls*

*Indicators* LED for standby indicator

*On/off switch* On the rear of the instrument

#### *Housing*

*Base tray, housing and bottle holder material* Polyurethane hard foam (PUR) with flame retardation for fire class UL 94 V-0, CFC-free, coated

IP degree of protection IP 20

## 7.4 Weight

2.940.1200 33.92 kg (without accessories)

## 7.5 Leak sensor

Type Electronic, no calibration necessary

## 7.6 Column thermostat

Type Thermostat using Peltier technology for two intelligent separation columns

Adjustable temperature range 0 to +80 °C, in 0.1 °C increments

Heating Up to 50 °C above the ambient temperature

Cooling Down to 20 °C below the ambient temperature

Temperature reproducibility  $\pm 0.2$  °C

Stability < 0.05 °C

Heating time < 30 minutes from 20 to 50 °C

Cooling time < 40 minutes from 50 to 20 °C

## 7.7 Eluent degasser

Material Fluoropolymer

Resistance to solvents No restriction (except PFC)

Time to establish vacuum < 60 s



## 7.8 High-pressure pump

<i>Type</i>	<ul style="list-style-type: none"> <li>▪ Serial dual-piston pump</li> <li>▪ Intelligent pump head recognition</li> <li>▪ Chemically inert</li> <li>▪ Metal-free pump heads</li> <li>▪ Materials in contact with the eluent: PEEK, ZrO<sub>2</sub>, PTFE/PE</li> <li>▪ Self-optimizing flow and pressure</li> </ul>
<i>Flow rate</i>	
<i>Adjustable flow range</i>	0.001–20 mL/min 0.01–5 mL/min with standard PEEK pump head
<i>Flow increment</i>	1 µL/min
<i>Reproducibility of the eluent flow</i>	< 0.1% deviation
<i>Pressure range</i>	
<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%
<i>Safety shutdown</i>	
<i>Function</i>	Automatic shutdown upon reaching the pressure limits
<i>Maximum pressure limit</i>	<ul style="list-style-type: none"> <li>▪ Adjustable from 0.1–50 MPa (1–500 bar)</li> <li>▪ The pump is automatically shut down at the first piston stroke above the maximum limit value</li> </ul>
<i>Minimum pressure limit</i>	<ul style="list-style-type: none"> <li>▪ Adjustable from 0–49 MPa (0–490 bar)</li> <li>▪ The shutdown mechanism is inactive at 0 MPa</li> <li>▪ The shutdown mechanism becomes active two minutes after system start</li> <li>▪ The pump is automatically shut down after three piston strokes below the minimum pressure limit</li> </ul>
<i>Gradient capability</i>	Isocratic or gradient (extendable to quaternary)
<i>Profile</i>	Step, linear, convex and concave
<i>Resolution</i>	< 1 nL/min

## 7.9 Injection valve

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

## 7.10 Metrohm Suppressor Module (MSM)

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

## 7.11 Detector

You can find the technical specifications for the detector in the manual for the detector.

## 7.12 Sample degasser

<i>Material</i>	Fluoropolymer
<i>Resistance to solvents</i>	No restriction (except PFC)
<i>Time to establish vacuum</i>	< 60 s

## 7.13 Energy supply

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



## 7.14 Interfaces

### *USB*

*Input* 1 USB upstream, type B (labeled **PC** for connecting to a computer)

*Output* 2 USB downstream, type A (labeled **USB 1** and **USB 2**)

### *MSB*

2 MSB 8-pin Mini DIN (female) (labeled **MSB 1** and **MSB 2** for Dosino, stirrer, remote lines, etc.)

### *Detector*

2 15-pin high-density D-sub (female) (labeled **Detector 1** and **Detector 2**)

### *Column recognition*

3 (including 2 in the column thermostat )

### *Leak sensor*

1 jack plug (labeled **Leak Sensor**)

### *Further connections*

- 1 15-pin D-sub (female) (labeled **Extension Module**)

## 8 Accessories and additional information

Additional information is available on the Metrohm website (<https://www.metrohm.com>):

- Product family
- Product versions
- Accessories
- Documents about the product

### Downloading the accessories list



#### NOTE

The accessories list is a part of the product documentation. Download the accessories list and store it as a reference.

1. Use the search function to search for the product.
2. Open the desired product version.
3. Download the accessories list.



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