

940 Professional IC Vario



940 Professional IC Vario ONE/HPG

Manual – Short Instructions

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

940 Professional IC Vario

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2.940.1140

Manual – Short Instructions

Technical Communication
Metrohm AG
CH-9100 Herisau
techcom@metrohm.com

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This documentation has been prepared with great care. However, errors can never be entirely ruled out. Please send comments regarding possible errors to the address above.

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1 About these short instructions

This short instruction manual contains important chapters from the comprehensive manual. In addition to an introduction, safety instructions and an overview of the instrument, you will also find information about installing and operating the 940 Professional IC Vario ONE/HPG as well as information regarding the warranty. You can download the comprehensive manual as a PDF file from the Internet.

Downloading the manual

You can find the detailed manual on the Internet under <http://www.metrohm.com/>:

1. Enter the order number for your instrument as the search term (e.g. **2.940.1140**).
2. Click on **>More information**.
3. Click on **Documents**.
All available documents for the instrument will be displayed.
4. Click on the PDF link to download the desired manual.

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.

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.

High-pressure gradient module (HPG)

The second high-pressure pump in the instrument allows a gradient to be created from two eluents. The software is used to control the amount of eluent.

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.

2.2 Intended use

The 940 Professional IC Vario ONE/HPG is used for the determination of cations and anions without suppression using ion chromatography when the complex separation problem requires the use of gradients.

The second high-pressure pump in the lower plug-in allows for the controlled mixing of two eluents.

This instrument 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.

2.3 Safety instructions

2.3.1 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.

2.3.2 Electrical safety

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



WARNING

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



WARNING

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

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

Supply voltage



WARNING

An incorrect supply voltage can damage the instrument.

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

Protection against electrostatic charges



WARNING

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

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

The device is to be operated only with the door closed.

2.4 Symbols and conventions

The following symbols and formatting may appear in this documentation:

(5- 12)	Cross-reference to figure legend The first number refers to the figure number, the second to the instrument part in the figure.
1	Instruction step Carry out these steps in the sequence shown.
Method	Dialog text, parameter in the software
File ► New	Menu or menu item
[Next]	Button or key
	WARNING This symbol draws attention to a possible life-threatening hazard or risk of injury.
	WARNING This symbol draws attention to a possible hazard due to electrical current.
	WARNING This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	WARNING This symbol draws attention to a possible biological hazard.
	CAUTION This symbol draws attention to possible damage to instruments or instrument parts.
	NOTE This symbol highlights additional information and tips.

3 Overview of the instrument

3.1 Front

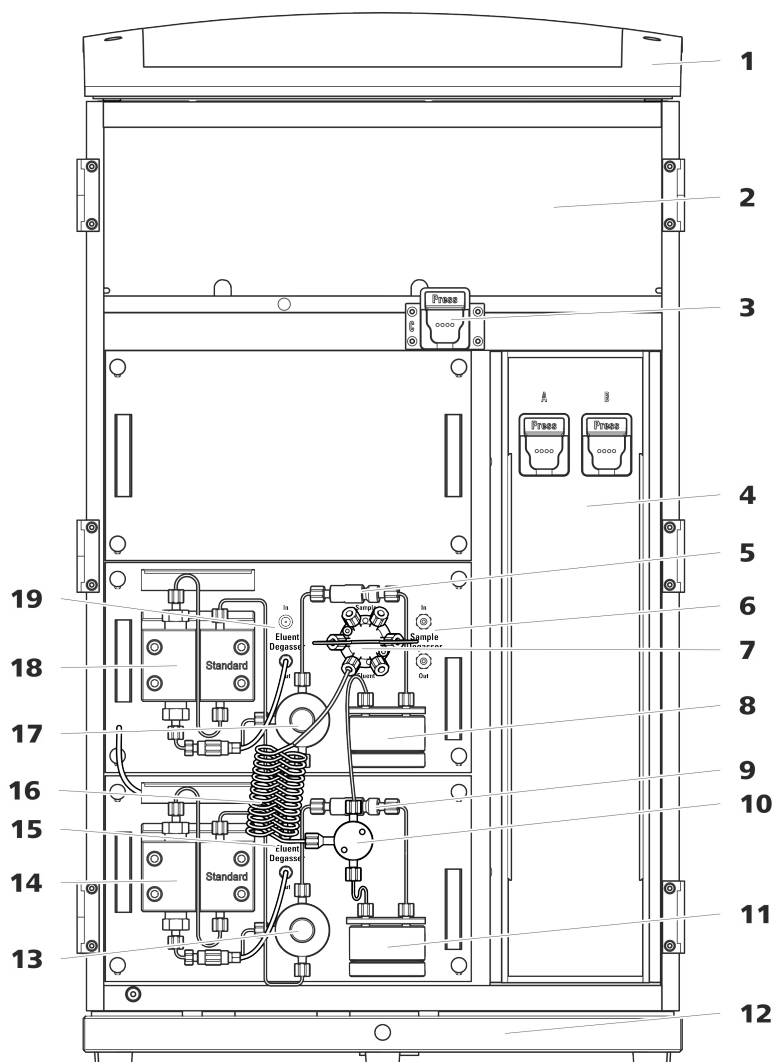


Figure 1 Front

1 Bottle holder Offers space for the eluent bottle(s) and additional accessories.	2 Detector chamber Offers space for two embedded detectors and additional accessories.
3 Column holder For a third separation column outside the column thermostat.	4 Column thermostat With two column holders for two separation columns.
5 Inline filter	6 Sample degasser

[illegible]

3.2 Rear

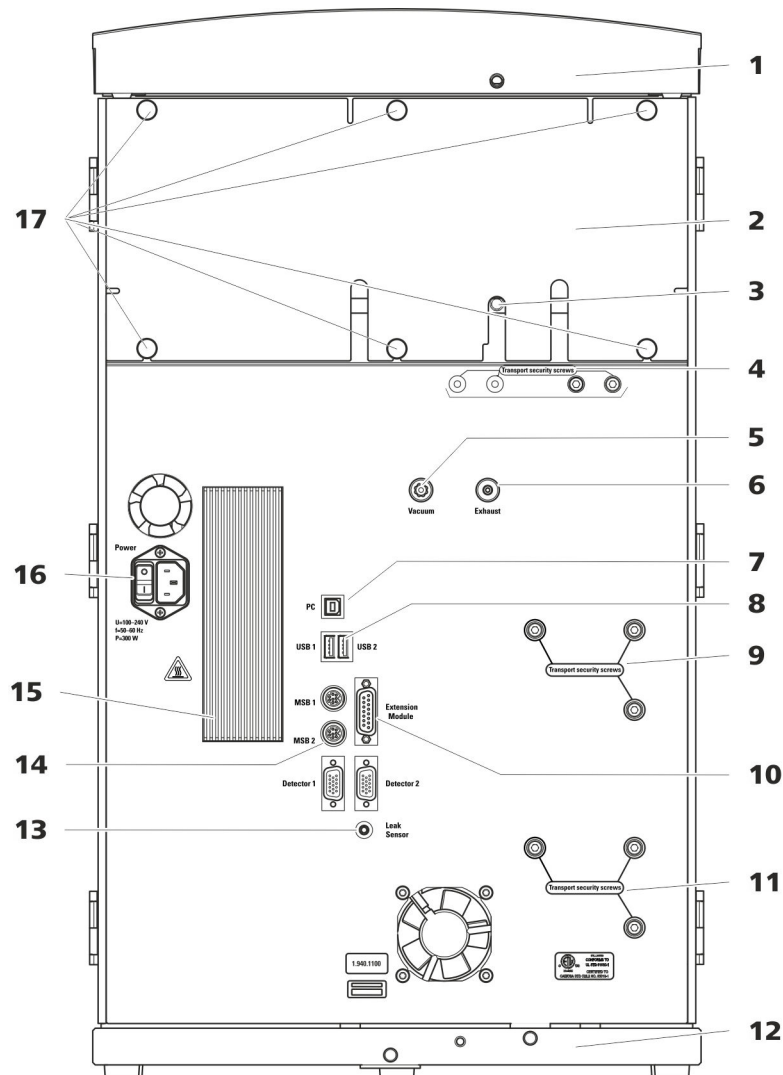


Figure 2 Rear

- | | |
|--|--|
| <p>1 Bottle holder</p> <p>Offers space for the eluent bottle(s) and additional accessories.</p> | <p>2 Back panel</p> <p>Removable. Enables access to the detector chamber.</p> |
| <p>3 Drainage tubing connection</p> <p>For connecting the drainage tubing, which guides escaped liquids away from the detector chamber.</p> | <p>4 Transport locking screws</p> <p>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> |

6 Exhaust opening

Labeled *Exhaust*. For extracting the air from the vacuum chamber.

8 USB connection sockets

Labeled *USB 1* and *USB 2*. For connecting USB devices.

10 Extension Module connection socket

Labeled *Extension Module*. For connecting the cable (6.2156.060) used for connecting the instrument to the Extension Module.

12 Base tray

With leak sensor and leak sensor cable.

14 MSB connection sockets

Labeled *MSB 1* and *MSB 2*. For connecting MSB devices.

16 Power socket

Power socket for connecting the power cable and power switch for switching the instrument on and off.

For fastening the removable back panel.

4.3 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

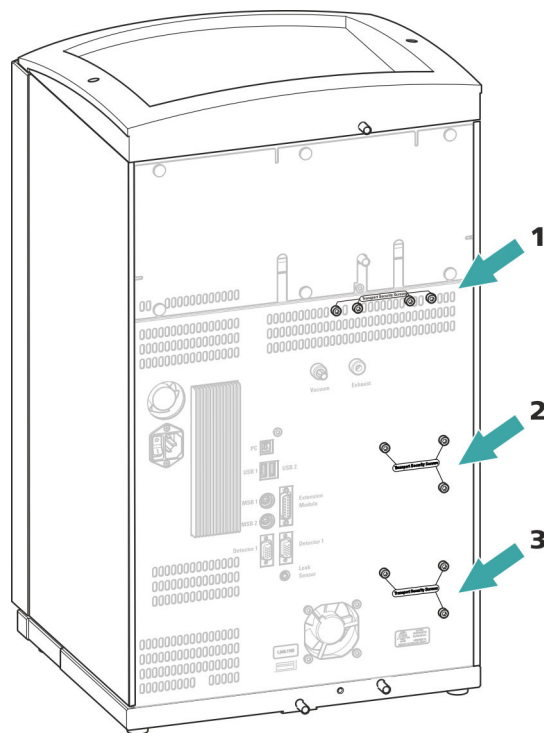


Figure 3 Removing the transport locking screws

- | | |
|---|--|
| <p>1 Transport locking screws
For the vacuum pump.</p> | <p>2 Transport locking screws
For the high-pressure pump.</p> |
| <p>3 Transport locking screws
For an additional high-pressure pump in the bottom drawer.</p> | |

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.

4.4 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.

4.4.1 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.

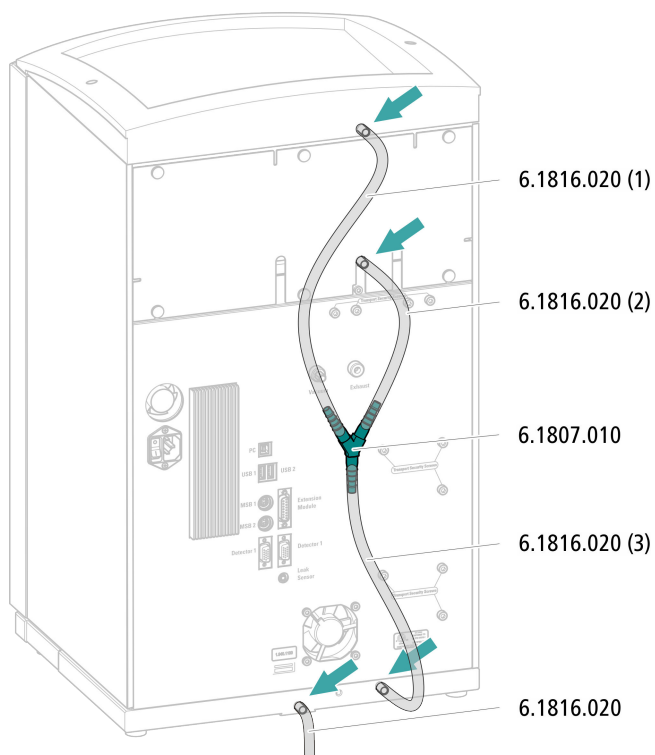
Accessories

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.

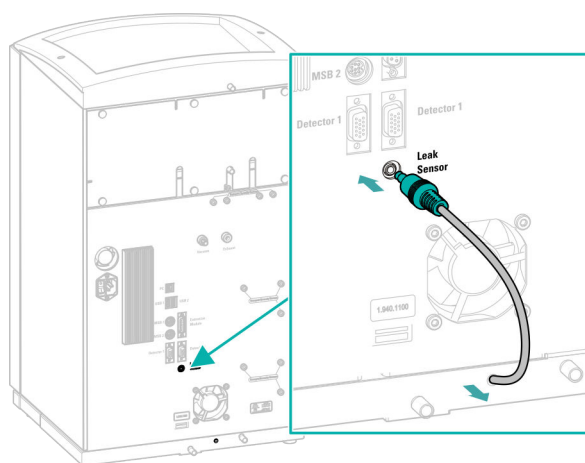
Connecting the drainage tubing



4.4.2 Connecting the leak sensor

Plugging in the leak sensor connection cable

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



4.5 Column thermostat

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

4.6 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.

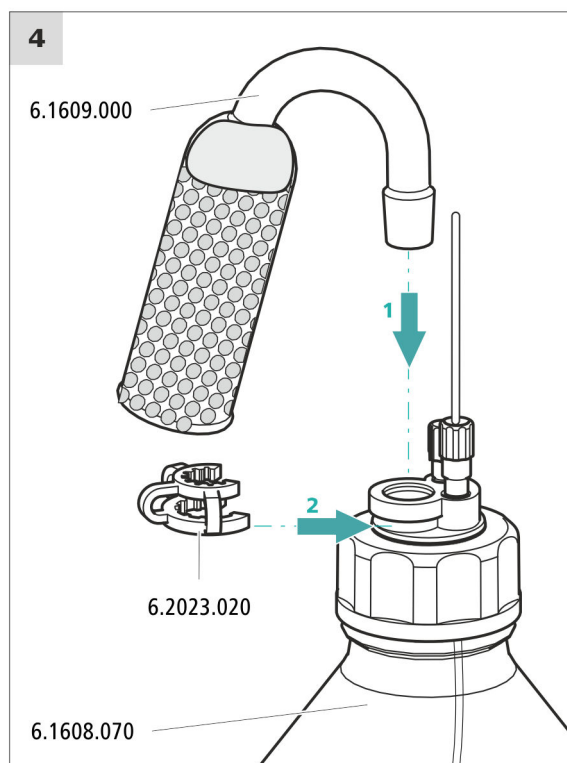
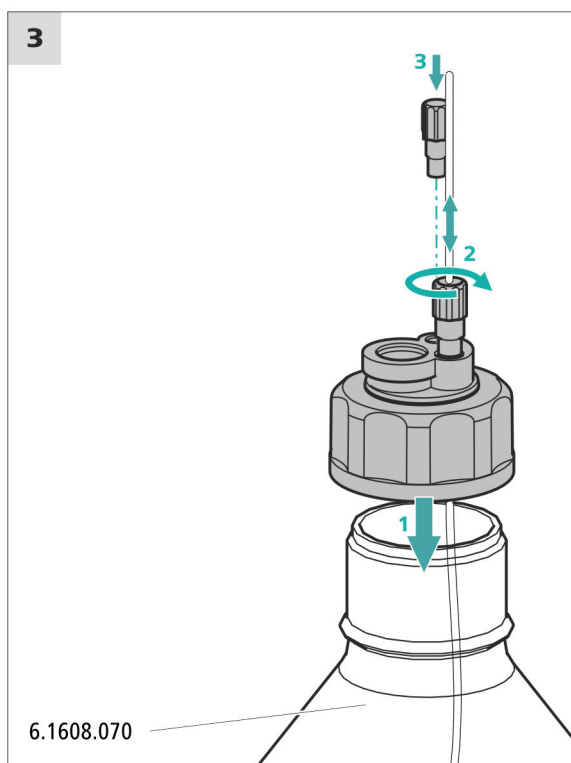
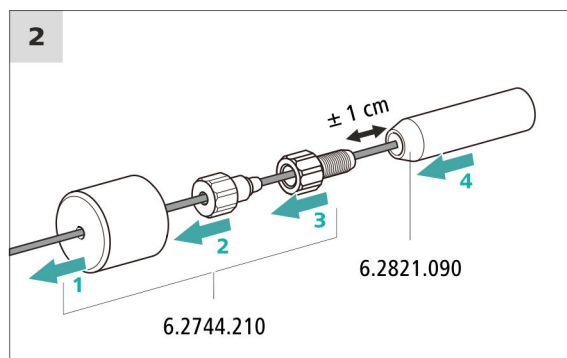
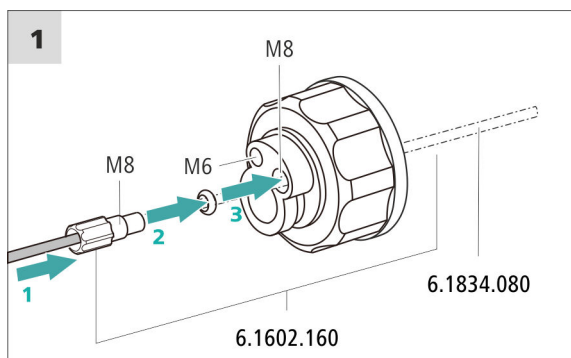
Accessories

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 Pre-rinsing the aspiration filter



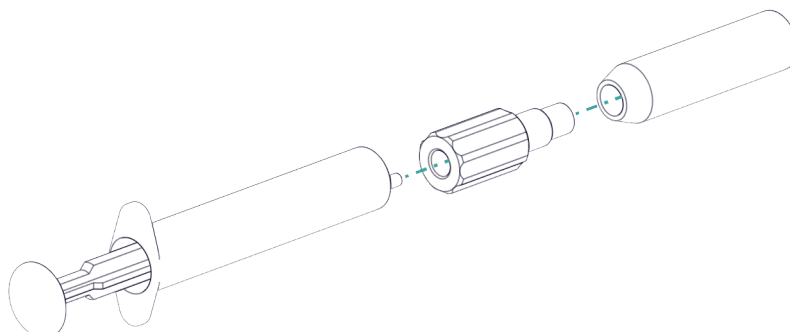
NOTE

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.

2 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.

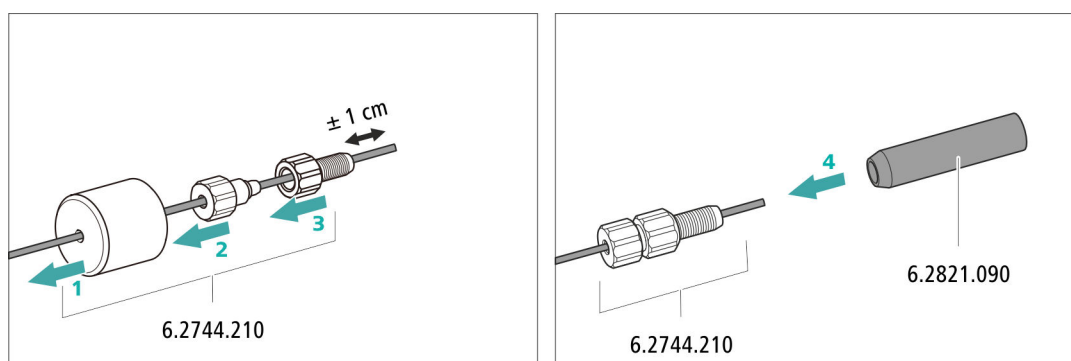


Figure 4 Installing the tubing weighting and aspiration filter

4.7 Connecting the eluent degasser

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

4.8 Installing the high-pressure pump

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

4.9 Installing an inline filter

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

4.10 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.

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

4.11 Injection valve

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

4.12 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



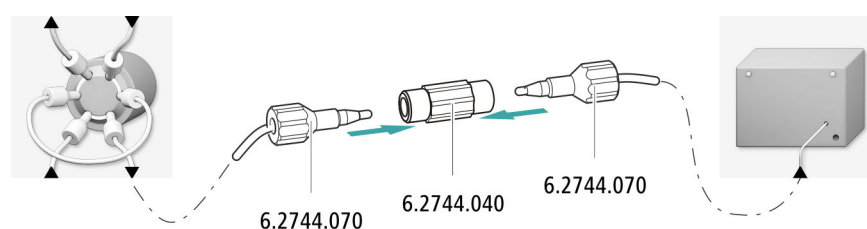
NOTE

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 directly to the column inlet capillary 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)



4.13 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.

4.14 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.

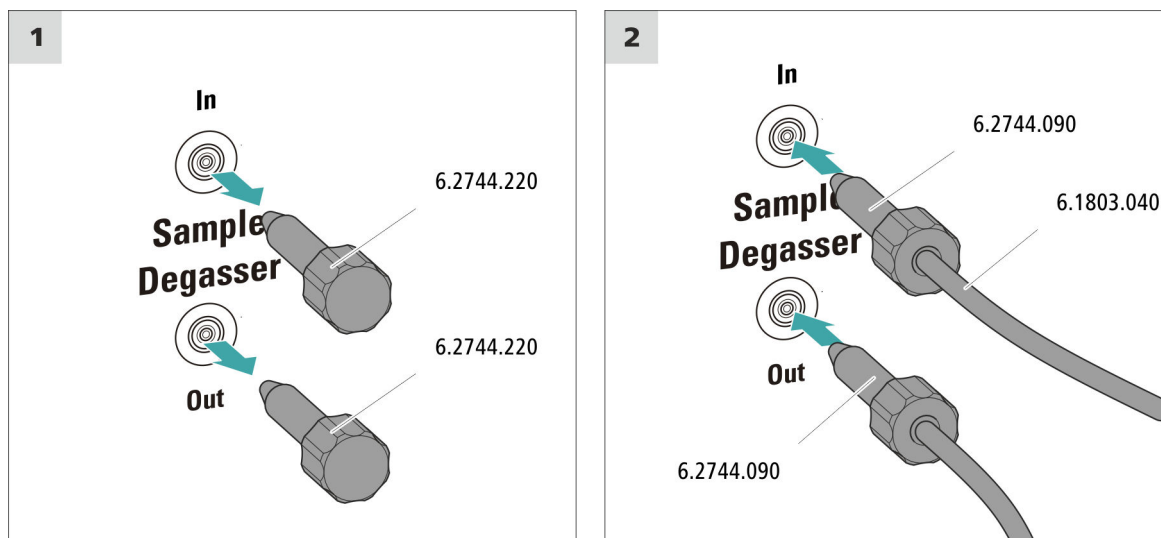
The rinsing time increases by at least two minutes when the sample degasser is connected.

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

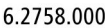


CAUTION

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

4.15 Installing the high-pressure gradient module

The outlets of the two high-pressure pumps are connected to the injection valve's eluent inlet after the pulsation absorber using the mixing coil for high-pressure gradients (6.2758.000).



Connect the two pieces of eluent aspiration tubing to an eluent bottle (see chapter 4.6, page 17).

4.16 Connecting the instrument to a computer



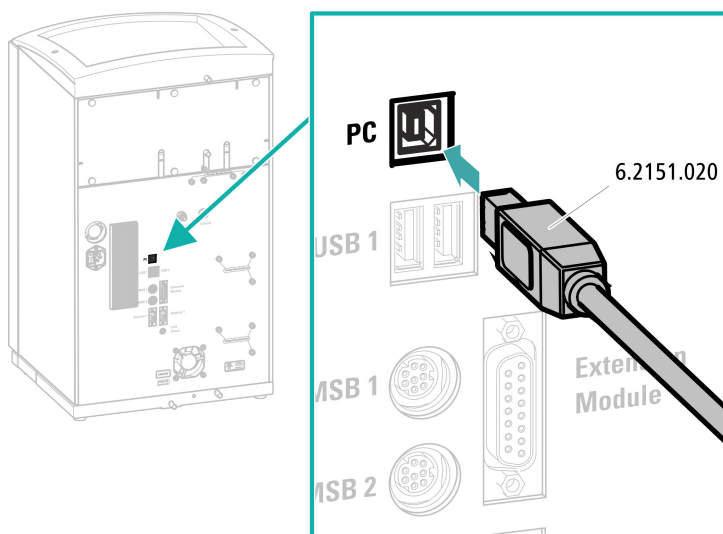
If the instrument is connected to the computer, then it must be switched off.

Accessories

For this step, you need the following accessories:

- USB connecting cable (6.2151.020)

Connecting the USB cable



4.17 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 mm² / 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.

4.18 Initial start-up

Even before the guard column and separation column are installed, the entire system must be completely rinsed with eluent for the first time.

Rinsing the IC system

**CAUTION**

The separation column and the guard column are not permitted to be installed at the time of the initial start-up.

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

1 Preparing the software

- Start the **MagIC Net** computer program.
- Open the **Equilibration** tab in MagIC Net: **Work-place ► Run ► Equilibration**.
- Import (or create) a suitable method.
Also see: *MagIC Net Tutorial* and online help.

2 Preparing the instrument

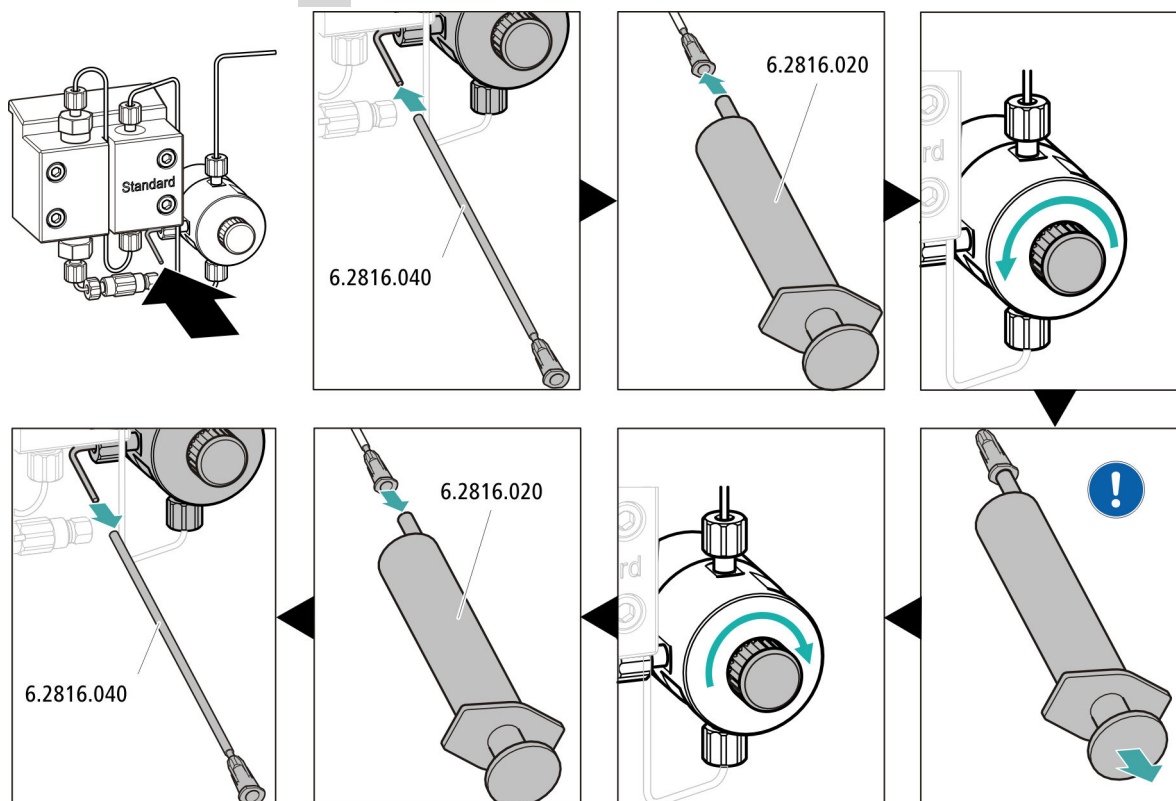
- Ensure that the eluent aspiration tubing is immersed in the eluent and that there is enough eluent in the eluent bottle.
- Switch on the instrument.

MagIC Net detects the instrument and all of its modules.

3 Starting equilibration

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

4 Deaerating the high-pressure pump



 Use the syringe to aspirate eluent until there are no more air bubbles in the eluent aspiration tubing.

5 Rinsing the instrument without columns

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

4.19 Connecting and rinsing the guard column



CAUTION

New guard columns are filled with a solution and sealed with stoppers or caps on both sides.

Before inserting the guard column, ensure that this solution can be mixed with the eluent being used (follow the information provided by the manufacturer).



NOTE

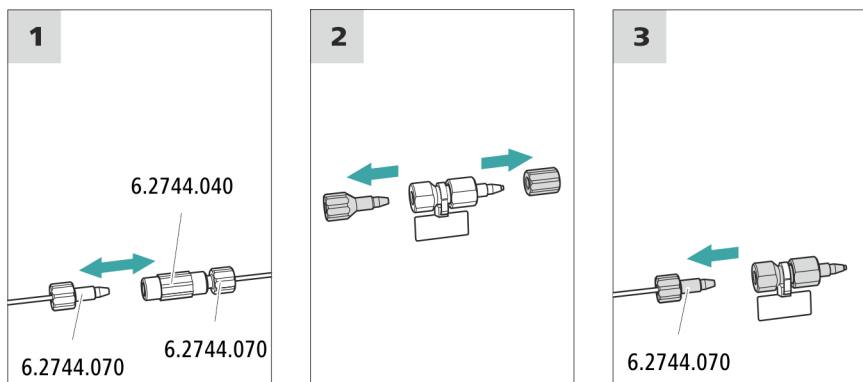
The guard column may not be connected until after the instrument has already been put into operation once (*see chapter 4.18, page 25*). The guard column and the separation column have to be replaced by a coupling (6.2744.040) until then.

Accessories

For this step, you need the following accessories:

- Guard column (suitable for separation column)

Connecting the guard column



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**
- Rinse the guard column with eluent for approx. 5 minutes.
- Stop the high-pressure pump in the manual control in MagIC Net again: **Off**.

4.20 Connecting the separation column



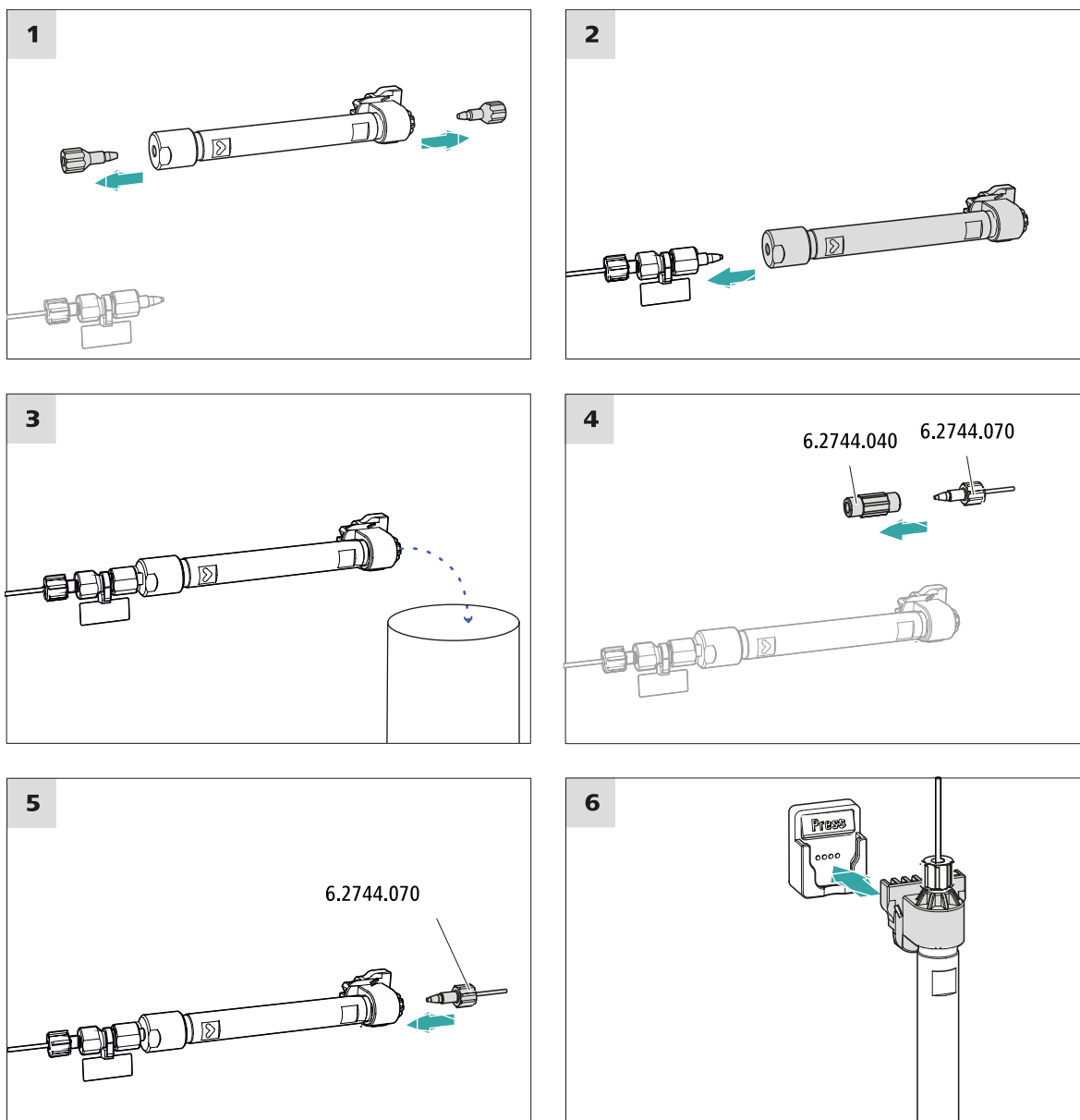
CAUTION

New separation columns are filled with a solution and sealed with stoppers on both sides. Before inserting the column, ensure that this solution can be mixed with the eluent being used (follow the information provided by the manufacturer).



NOTE

Connect the separation column only after the initial start-up of the instrument. Until that point, insert a coupling (6.2744.040) instead of the guard column and separation column.



Connecting the separation column

1 Rinsing the separation column

- Place a beaker under the outlet of the separation column.
- Start manual control in MagIC Net and select the high-pressure pump: **Manual ► Manual control ► Pump**
 - **Flow**: Increase gradually up to the flow rate recommended in the column leaflet.
 - **On**
- Rinse the separation column with eluent for approx. 10 minutes.

- Stop the high-pressure pump in the manual control in MagIC Net again: **Off**.

4.21 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.
- Also see: *MagIC Net Tutorial* and online help.

2 Preparing the instrument

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

3 Starting equilibration

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

- ## 4 Conditioning the system

The instrument is now ready for measuring samples.

6 Accessories

Up-to-date information on the scope of delivery and on optional accessories for your instrument can be found on the Internet. You can download this information using the article number as follows:

Downloading the accessories list

- 1** Type <https://www.metrohm.com/> into your Internet browser.
- 2** Under **Find products, accessories, and applications by**, enter the article number (e.g. **2.940.1140**).
The search result is displayed.
- 3** Under **Products**, click on **More information**.
Detailed information regarding the product is shown on various tabs.
- 4** On the **Included parts** tab, click on **Download the PDF**.
The PDF file with the accessories data will be created.



NOTE

When you receive your new instrument, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

A

B

C

D

E

F

G

H11

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940 Professional IC Vario ONE/HPG (2.940.1140)