942 Extension Module Vario

942 Extension Module Vario LQH

Manual

8.942.8003EN / v4 / 2023-12-31

Metrohm

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

942 Extension Module Vario

942 Extension Module Vario LQH

2.942.0070

Manual

8.942.8003EN / v4 / 2023-12-31

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

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.

Table of contents

Table of figures

1 Introduction

1.1 Instrument description

942 Extension Module Vario are extension modules used to expand existing 940 Professional IC Vario devices with additional functions. Each 940 Professional IC Vario device can be expanded with up to 3 942 Extension Module Vario devices.

The **942 Extension Module Vario LQH** expands a 940 Professional IC Vario by adding extensive options for inline sample preparation and liquid handling. Up to 6 auxiliary solutions can be provided in the instrument. The 942 Extension Module Vario LQH enables guard column reactions, pH adjustments and much more.

The 942 Extension Module Vario is operated using **MagIC Net** software, just like the IC device. If a 942 Extension Module Vario is connected to a 940 Professional IC Vario device, MagIC Net automatically detects the 942 Extension Module Vario and checks its functional capability. It controls and monitors the entire IC system including all connected devices; it evaluates the measured data and manages it in a database.

The 942 Extension Module Vario LQH consists of the following components:

10-port valve

The 10-port valve is used during sample preparation and serves as a unit for switching between different liquids.

Peristaltic pump

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

6-port valve

The 6-port valve mimics the injection valve in its design. It is used during sample preparation. The 6-port valve serves as a switch-over point between two different liquids, such as switching between sample and auxiliary solution during Inline Matrix Elimination.

1.2 Intended use

Using a 942 Extension Module Vario LQH allows a 940 Professional IC Vario to be expanded to utilize a wide variety of additional sample preparation options without having to reconfigure the instrument in between. These could include calibration, ion exchange, guard column reactions or a combination of several options.

This device is suitable for processing chemicals and flammable samples. Usage of the 942 Extension Module Vario LQH 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 About the documentation

CAUTION

Read through this documentation carefully before putting the device into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the device.

1.3.1 Content and scope

This document describes the **942 Extension Module Vario LQH** (2.942.0070), its assembly and connection to the IC instrument, as well as the installation, operation and maintenance of individual modules. Technical specifications, troubleshooting and information concerning scope of delivery and optional accessories make up the rest of the manual.

However, this document does not describe the functions of a unit combining a 940 Professional IC Vario and 942 Extension Module Vario LQH, nor does it describe the capillary connections that go beyond the 942 Extension Module Vario LQH. Refer to the manual for the 940 Professional IC Vario and Sample Processor in this regard.

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

1.3.2 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.

1.4 Safety instructions

1.4.1 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.

1.4.2 Electrical safety

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

WARNING

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

WARNING

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

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

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.

1.4.3 Tubing and capillary connections

CAUTION

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

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

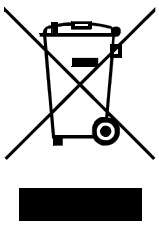
1.4.4 Flammable solvents and chemicals

WARNING

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

- Set up the instrument in a well-ventilated location (e.g. 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.

1.4.5 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.

2 Overview of the device

2.1 Front

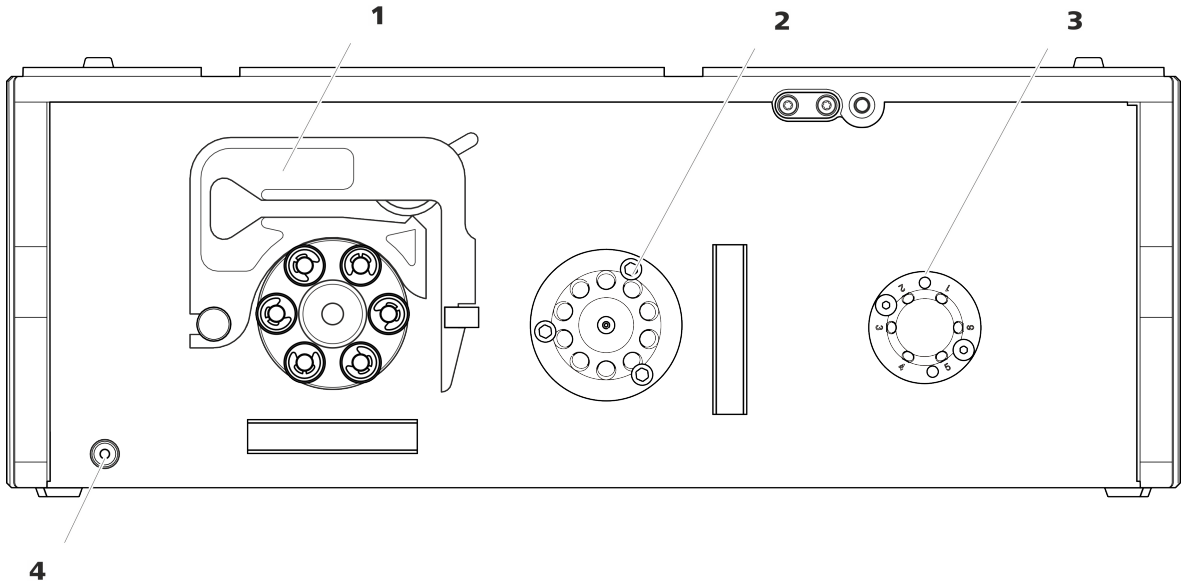


Figure 1 Front

1	**Peristaltic pump**	**2**	**10-port valve**
3	**Injection valve**	**4**	**Standby indicator**

2.2 Rear

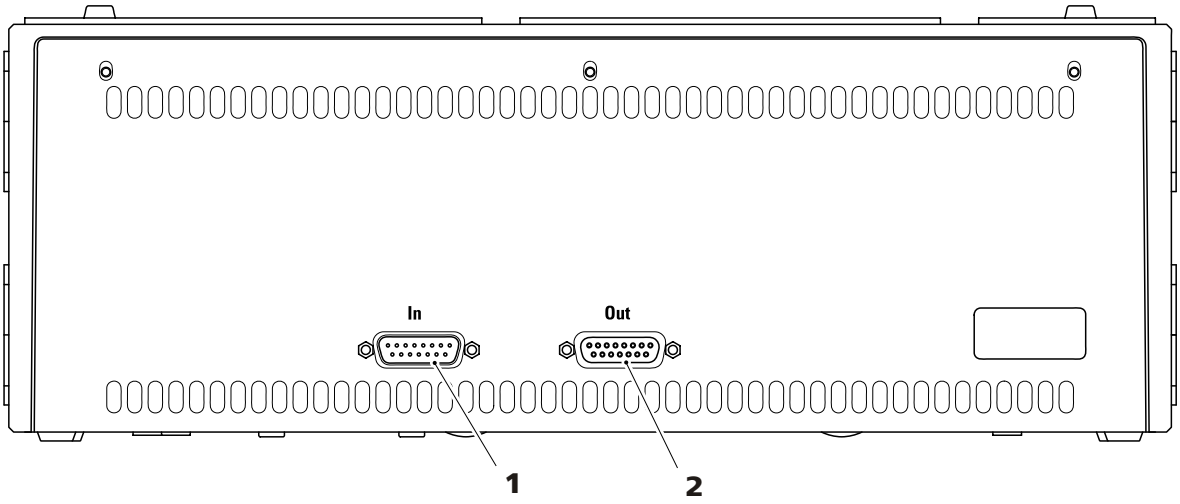


Figure 2 Rear

1 In connection
To connect the Extension Module to the IC instrument or to a previous Extension Module.

2 Out connection
To connect an additional Extension Module.

2.3 Extension Module and 940 Professional IC Vario

The 942 Extension Module Vario units are fitted directly to the 940 Professional IC Vario and connected to it via the connection cable provided. Extension modules have no power supply of their own, but rather draw the electricity they require from the instrument to which they are connected.

Extension modules can be placed in 3 different ways:

- Installed between the instrument and bottle holder *(3-**A**)*.
- Installed between the instrument and base tray *(3-**B**)*.
- Stacked next to the instrument *(3-**C**)*. In this case, we recommend ordering a separate base tray (6.2061.110) and a separate bottle holder (6.2061.100) for the stack.

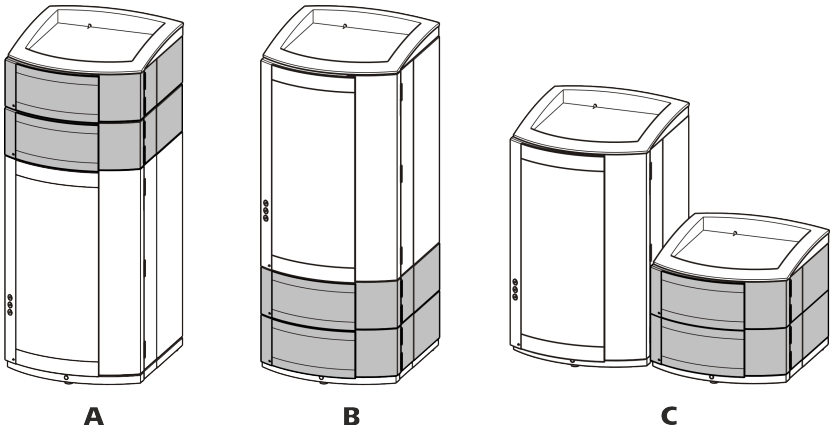


Figure 3 Proposed setup

A **Extension module on top**
Between the 940 Professional IC Vario and the bottle holder.

B **Extension module below**
Between the base plate and the 940 Professional IC Vario.

C **Extension module separately**
Next to the 940 Professional IC Vario with its own base plate and bottle holder.

Up to three extension modules can be connected to an 940 Professional IC Vario. The following restrictions are to be taken into account:

Restrictions

Together, the 940 Professional IC Vario and its extension modules must not contain more than 4 identical components, this means that:

- A maximum of 4 high-pressure pumps,
- A maximum of 4 peristaltic pumps,
- A maximum of 4 injection valves,
- A maximum of 4 suppressors (MSM, incl. SPM),
  BUT
- Only a maximum of 3 degassers
- And a maximum of 3 CO_2 suppressors (MCS)

NOTE

If all four high-pressure pumps are being used simultaneously, then all of them must not be operating with their maximum flow for long periods.

Position the Extension Module in such a way that the capillary connections can be kept as short as possible. If several extension modules are being used, they should all be installed at the same location above or below each other. If this is not possible, extension modules that are farther apart have to be connected together using a longer connecting cable (6.2156.070).

3 Installation

3.1 Installation diagram

Depending on the application, the peristaltic pump, injection valve and 10-port valve of the 942 Extension Module Vario LQH can be installed differently.

The installation shown below only represents one of many possible installation setups. The graphic arrangement of the modules corresponds to the front of the Extension Module. The liquid containers and components of the IC instrument are not shown in the diagram.

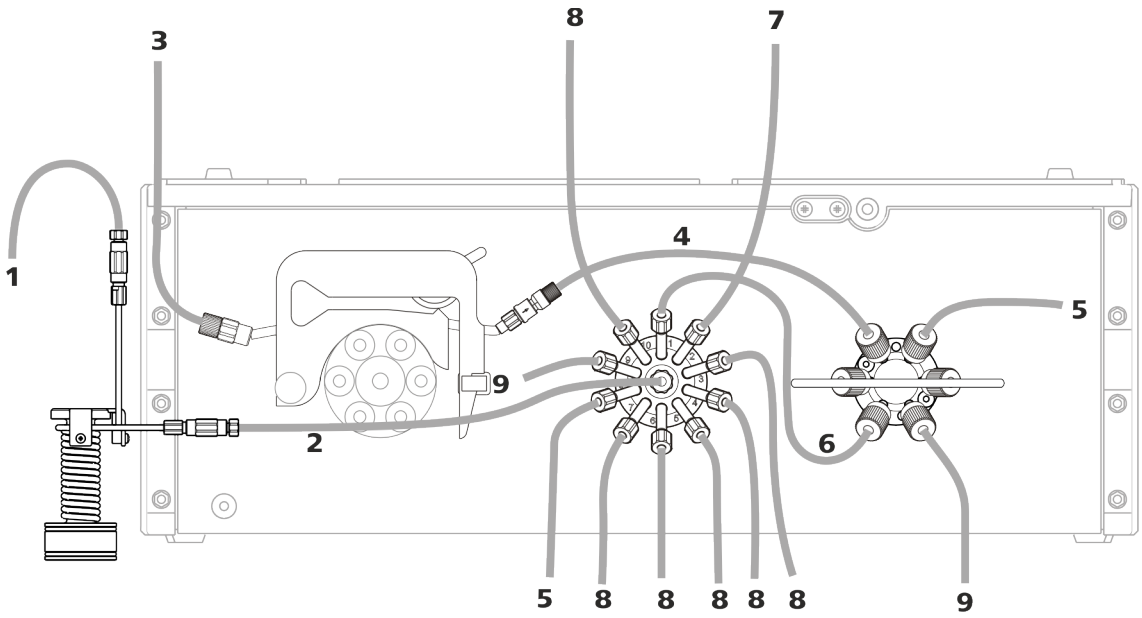


Figure 4 Installation diagram

1 Connection to a Dosino	**2 Transfer tubing connection – 10-port valve** The transfer tubing is connected to the central port of the 10-port valve.
3 Sample aspiration capillary	**4 Peristaltic pump connection – Injection valve on the extension module**
5 Capillary to the waste container	**6 10-port valve connection – Injection valve on the extension module**

7	**10-port valve connection – Injection valve on the IC instrument**
8	**10-port valve connection – Any auxiliary solution and vessels**
9	**Capillary to the container with transfer solution**

3.2 Setting up the instrument

3.2.1 Packaging

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

3.2.2 Checks

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

3.2.3 Location

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

Place the instrument in a location of the laboratory which is suitable for operation and free of vibrations and which provides protection against corrosive atmosphere and contamination by chemicals.

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

3.3 Base tray and bottle holder

3.3.1 Basic information on base tray and bottle holder

The base tray (6.2061.110) and bottle holder (6.2061.100) protect IC instruments from dust, dirt and leaking fluids. The supply bottles for eluent and auxiliary solutions can be positioned neatly on the bottle holder.

In a complex IC system, several different instruments may be used, such as an analyzer, an extension module and a detector. These instruments can be set up in one or more stacks. We recommend that a base tray and bottle holder be mounted for each stack of IC instruments.

The bottle holder and base tray must be removed or set up if one of the following instruments is to be mounted on or under a 940 Professional IC Vario:

- One or more 942 Extension Module Vario
- Or another instrument with the same-sized footprint

3.3.2 Mounting base tray and bottle holder (optional)

The base tray and bottle holder come fully assembled on a new ion chromatograph. To install an Extension Module on the ion chromatograph, remove the bottle holder and put it back on top of the topmost instrument. To install an Extension Module under the ion chromatograph, remove the base tray and set it under the lowest instrument.

3.3.2.1 Removing/mounting the base tray

Remove the base tray to install another instrument under the IC instrument.

CAUTION

Do not pinch capillaries or leak sensor cables

Capillaries are fed through the guide ducts between the base tray and the instrument. Pinches in the leak sensor cable or the capillaries may lead to malfunctions.

- Unplug the leak sensor cable before you remove the base tray.
- Remove all the capillaries from the capillary ducts before you remove the base tray.

Removing the base tray

Prerequisites

- The instrument is switched off.
- The bottle holder is cleared.
- All of the cable connections on the rear have been disconnected.
- The capillaries are removed from the guide ducts between the instrument and the base tray.
- There are no loose parts in the instrument.

Accessories

- 3 mm hex key (6.2621.100)

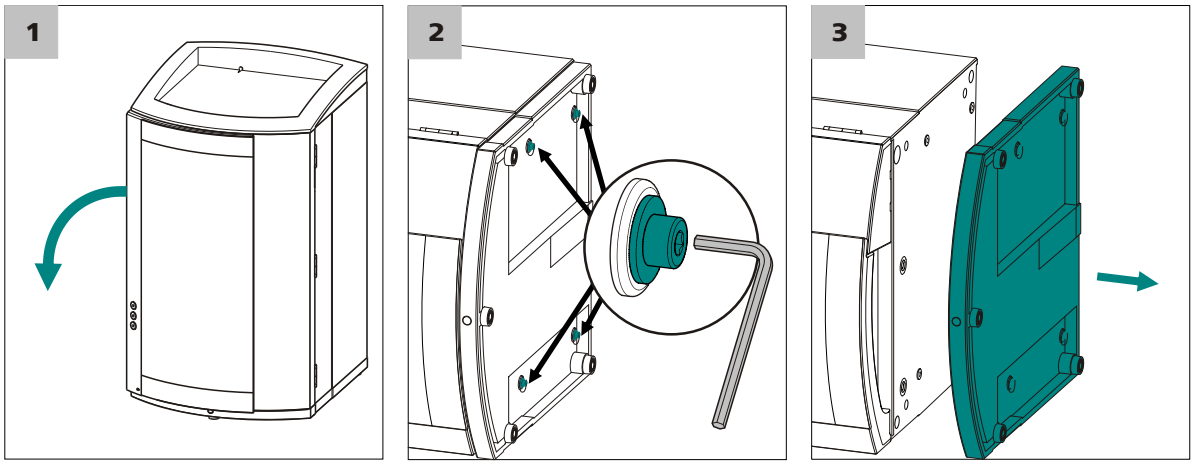


Figure 5 Removing the base tray

1 Tilt the instrument sideways and lay it down flat.

2 Loosen the 4 cylinder screws with the 3 mm hex key. Remove the cylinder screws and their washers.

3 Remove the base tray.

Always mount the base tray under the lowermost instrument of the stack.

Mounting the base tray

Prerequisites

- The instrument is switched off.
- The bottle holder is cleared.
- All of the cable connections on the rear have been disconnected.
- There are no loose parts in the instrument.
- The instrument is lying on its side, and the bottom surface is visible.

Accessories

- 3 mm hex key (6.2621.100)

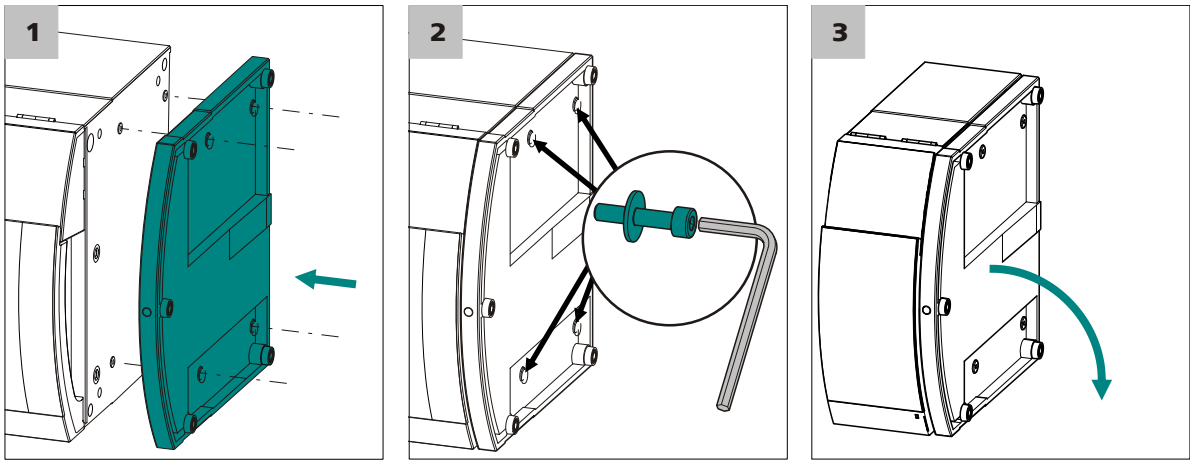


Figure 6 Mounting the base tray

1 Mount the base tray in such a way that the openings in the base tray match exactly the screw threads in the bottom of the instrument.

2 Slide the washers onto the cylinder screws. Insert the cylinder screws with the washers and tighten them with the 3 mm hex key.

3 Set the instrument back up on the base tray.

Stack other instruments in the required order. Mount the bottle holder (6.2061.100) onto the topmost instrument on the stack *(see "Mounting the bottle holder", page 14)*.

3.3.2.2 Removing/mounting the bottle holder

Remove the bottle holder if you want to install another instrument onto the IC instrument.

Removing the bottle holder

Prerequisites

- The instrument is switched off.
- The bottle holder is cleared.
- Drainage tubing is disconnected from the drainage tubing connection of the bottle holder.
- The capillaries are removed from the guide ducts between the instrument and the bottle holder.

Accessories

- 3 mm hex key (6.2621.100)

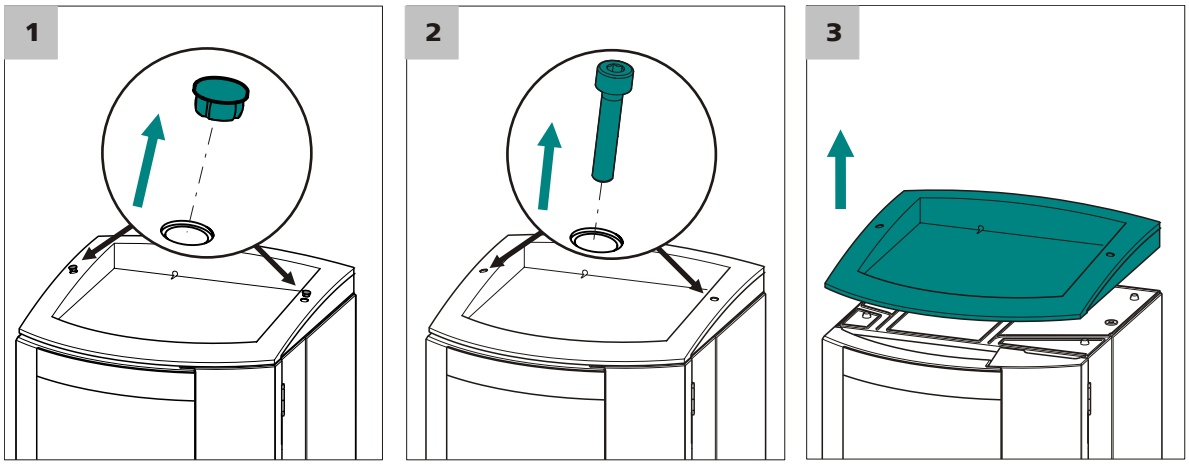


Figure 7 Removing the bottle holder

1 Remove the 2 covering stoppers.

2 Loosen the 2 cylinder screws with the 3 mm hex key and remove them.

3 Remove the bottle holder.

Stack other instruments in the required order. Mount the bottle holder (6.2061.100) onto the topmost instrument on the stack.

Mounting the bottle holder

Prerequisite

- The instrument is switched off.

Accessories

- 3 mm hex key (6.2621.100)

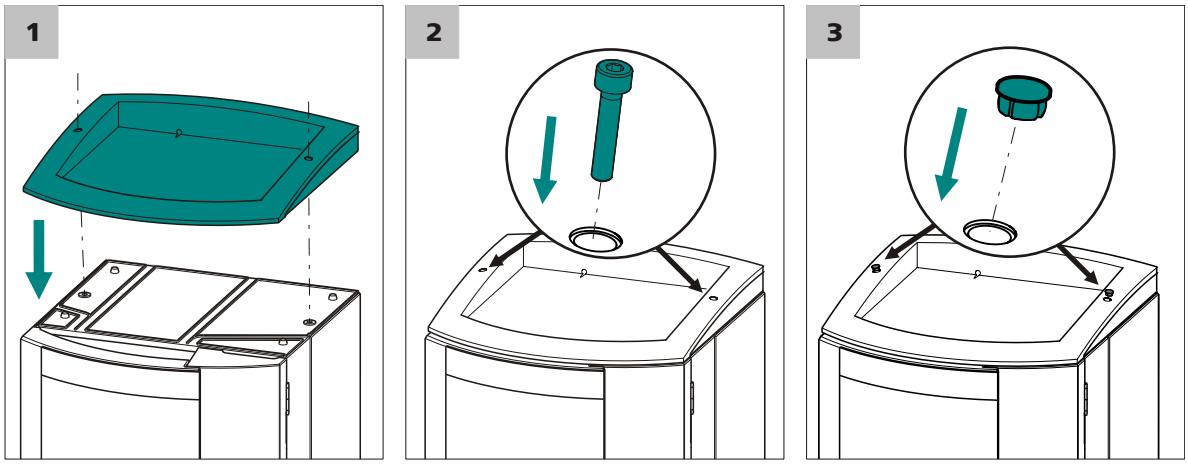


Figure 8 Mounting the bottle holder

1 Mount the bottle holder onto the topmost instrument in such a way that the openings in the bottle holder exactly match the screw threads on the top surface of the instrument.

2 Insert the 2 cylinder screws and tighten them with the 3 mm hex key.

3 Insert both covering stoppers.

After attaching the bottle holder, restore all connections that were loosened at the beginning of the process.

Restoring the loosened connections

1 Plug in all necessary USB cables.

2 Plug in all necessary MSB cables.

3 Plug in the power cord.

4 Mount the drainage tubing again *(see manual of the IC instrument)*.

A longer section of silicone tubing (6.1816.020) may have to be cut to size and mounted *(see also the manual for the IC instrument)*.

5 If one of the instruments in the stack is equipped with a leak sensor connection socket, connect the leak sensor *(see manual of the IC instrument)*.

6 Restore any capillary connections that may have been removed.

3.4 Connecting the 10-port valve

Connecting the 10-port valve

NOTE

Connect all capillaries using long PEEK pressure screws (6.2744.090):

1 Connection to the transfer tubing

- Connect a capillary with a long pressure screw to the central connection of the 10-port valve.
- Fasten the other end of the capillary to the coupling on the transfer tubing.

2 Connecting the transfer tubing and Dosino

- Fasten the capillary to the coupling of the transfer tubing.
- Connect the other end of the capillary to the Dosino *(see manual for the Dosino)*.

3 Remaining capillary connections

The remaining 10 connections can be used as needed for:

- Connecting to the injection valve in the Extension Module.
- Connecting to the injection valve in the IC instrument.
- Connecting to different solutions.
- Connecting to an ion exchanger.
- etc.

3.5 Peristaltic pump

3.5.1 Installing the peristaltic pump

Installing the pump tubing

Pump tubing can differ in terms of material, diameter and thus flow rate. Different pump tubing is used depending on the application.

Table 1 Pump tubings

Order number	Name	Material	Inner diameter	Use
6.1826.310	Pump tubing LFL (orange/green), 3 stoppers	PVC (Tygon®)	0.38 mm	Pump tubing for bromate determination using the triiodide method.
6.1826.320	Pump tubing LFL (orange/yellow), 3 stoppers	PVC (Tygon®)	0.48 mm	For acceptor solutions for Inline Dialysis and for Inline Ultrafiltration.
6.1826.330	Pump tubing LFL (orange/white), 3 stoppers	PVC (Tygon®)	0.64 mm	No special applications.
6.1826.340	Pump tubing LFL (black/black), 3 stoppers	PVC (Tygon®)	0.76 mm	For sample solution in Inline Dialysis.
6.1826.360	Pump tubing LFL (white/white), 3 stoppers	PVC (Tygon®)	1.02 mm	For sample transfer.
6.1826.380	Pump tubing LFL (gray/gray), 3 stoppers	PVC (Tygon®)	1.25 mm	For Inline Dilution.
6.1826.390	Pump tubing LFL (yellow/yellow), 3 stoppers	PVC (Tygon®)	1.37 mm	For sample solution in Inline Ultrafiltration.
6.1826.420	Pump tubing PharMed® (orange/yellow), 3 stoppers	Ismaprene	0.51 mm	For suppressor solutions.

Selecting the pump tubing and adapter

1 Select pump tubing suitable for the application *(see table 1, page 17)*.

2 Select an adapter suitable for the pump tubing. The adapters are included with the pump tubing connection with locking nut and filter (6.2744.180).

Table 2 Pump tubing and suitable adapters

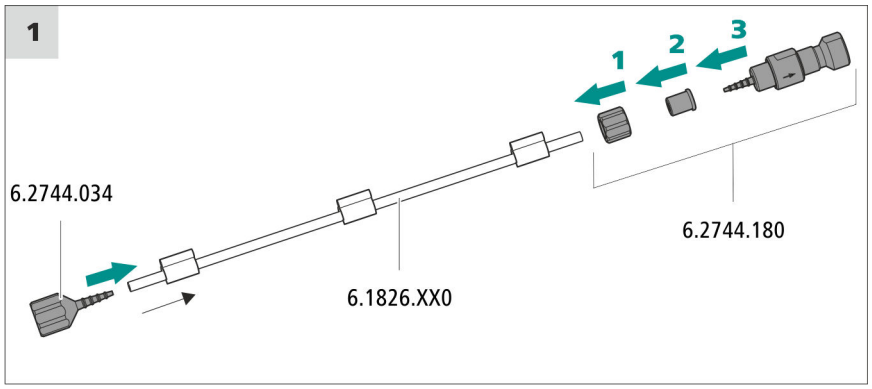
Pump tubing	Adapter
6.1826.310 (orange/green)	
6.1826.320 (orange/yellow)	
6.1826.330 (orange/white)	
6.1826.340 (black/black)	

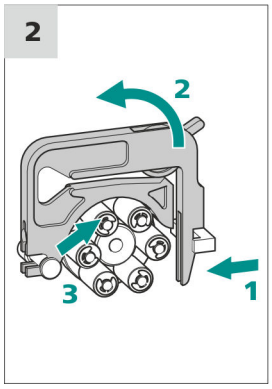
Pump tubing	Adapter
6.1826.360 (white/white)	
6.1826.380 (gray/gray)	
6.1826.390 (yellow/yellow)	
6.1826.420 (orange/yellow)	

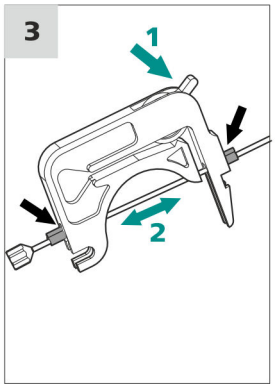
Installing the pump tubing

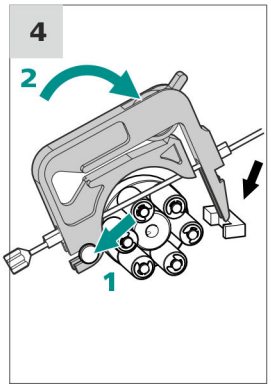
For this step, you need the following accessories:

- Tubing cartridge (6.2755.000)
- Pump tubing (6.1826.XXX)
- Coupling olive/UNF 10/32 (6.2744.034)
- Pump tubing connection with locking nut and filter (6.2744.180): Includes a locknut, 3 adapters and a tubing olive with filter holder.
- 2 × pressure screw, short (6.2744.070)









1 Connecting the pump tubing

- Attach the coupling olive/UNF 10/32 (6.2744.034) to the pump tubing entry. Push the end of the pump tubing over at least the second notch of the olive so that the pump tubing is firmly in place.
- Assemble the pump tubing connection with locking nut and filter (6.2744.180) at the pump tubing exit:
  - Push the locknut onto the pump tubing.
  - Push the appropriate adapter onto the pump tubing.
  - Place the tubing olive with the filter holder into the pump tubing so that the pump tubing is firmly in place; push the end of the pump tubing over at least the second notch of the olive.
  - Tighten it using the union nut.

2 Removing the tubing cartridge

- Press in the tubing cartridge's snap-action lever.
- Tilt the tubing cartridge upwards.
- Unhook the tubing cartridge from the mounting bolt.

3 **Inserting the pump tubing**

- Press the tubing cartridge's contact pressure lever down all the way.
- Place the pump tubing in the tubing cartridge. Fit the tubing cartridge between two stoppers. The stoppers must snap into the corresponding holder of the tubing cartridge.

4 **Inserting the tubing cartridge**

- Hang the tubing cartridge in the mounting bolt and press it in the cartridge holder until you hear the snap-action lever snap in.

Setting the flow rate

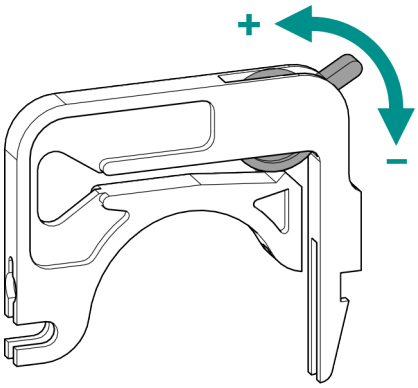
The flow rate of the peristaltic pump depends on many factors:

- The inner diameter of the pump tubing
- The rotational speed of the drive
- The contact pressure of the tubing cartridge

NOTE

Pieces of pump tubing are consumables. The service life of the pump tubing depends on the contact pressure, among other factors.

Setting the contact pressure correctly



1

- Fully loosen the contact pressure lever , i.e. press it all the way down.
- In the software, activate the drive of the peristaltic pump with the desired speed.
- Raise the contact pressure lever one step at a time until liquid flows.

- When liquid starts flowing, raise the contact pressure lever by an additional two ratchet increments.

The contact pressure is now set optimally.

3.5.2 Mode of operation for the peristaltic pump

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

The peristaltic pump pumps liquids based on the principle of displacement. The pump tubing is clamped between the rollers *(9-**5**)* and the tubing cartridge *(9-**2**)*. During operation, the peristaltic pump drive rotates the roller hub *(9-**6**)*, so that the rollers *(9-**5**)* advance the liquid in the pump tubing.

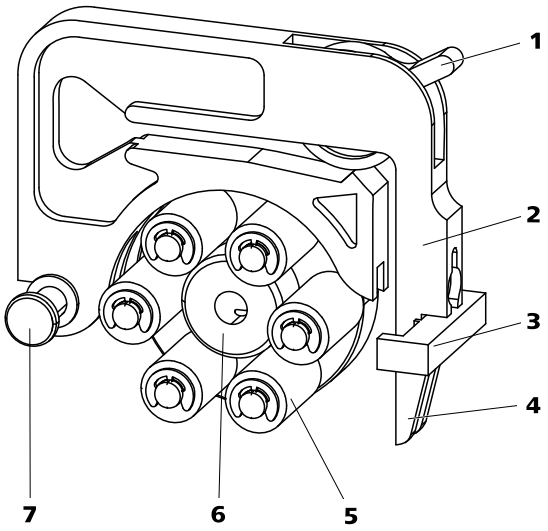


Figure 9 Peristaltic pump

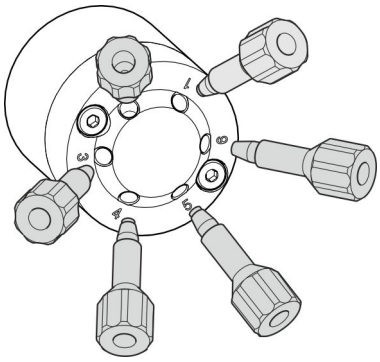
1	**Contact pressure lever**	**2**	**Tubing cartridge (6.2755.000)**
3	**Cartridge holder**	**4**	**Snap-action lever**
5	**Rollers**	**6**	**Roller hub**
7	**Mounting bolt**		

3.6 Installing the 6-port valve

During sample preparation, the 6-port valve is used as a switch between two different flows.

Connectors

The 6-port valve (like the injection valve) has six connections that can be connected together depending on the application.

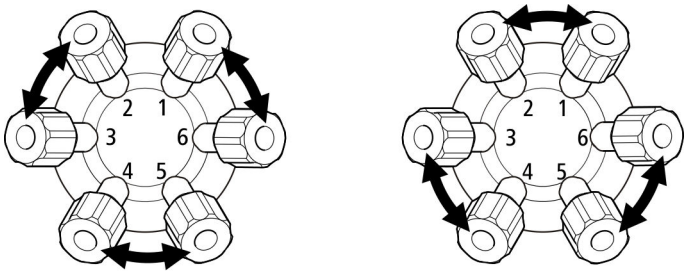


Connecting the 6-port valve

1 Connect all capillaries using PEEK pressure screws (6.2744.010).

Valve positions

The 6-port valve *(see figure 10, page 22)* can have two valve positions: **Filling** and **Injecting**. Switching is used to connect two different connections together in each case.



1 **2**

Figure 10 6-port valve – Positions

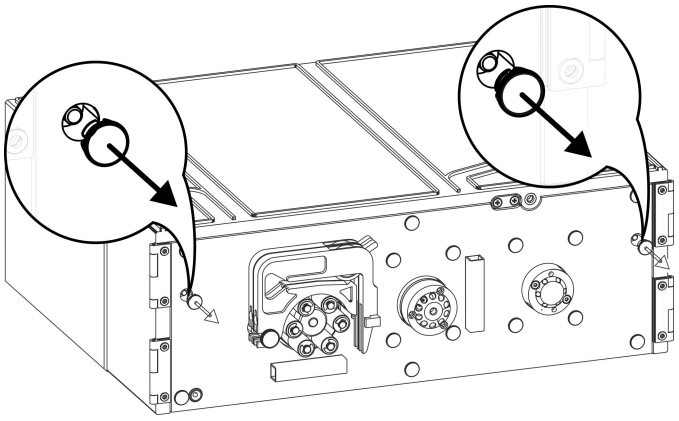
1 Fill		2 Inject	
	Filling		Ports 2 and 3, 4 and 5 as well as 6 and 1 are connected together in the **Filling** position.
	Injecting		Ports 1 and 2, 3 and 4 as well as 5 and 6 are connected together in the **Injecting** position.

3.7 Mounting the accessories

The bottle holder for the 942 Extension Module Vario LQH (6.2057.200) can be installed on the instrument to arrange the various small bottles and the transfer tubing neatly in front of the instrument. This allows the capillary connections to be kept as short as possible.

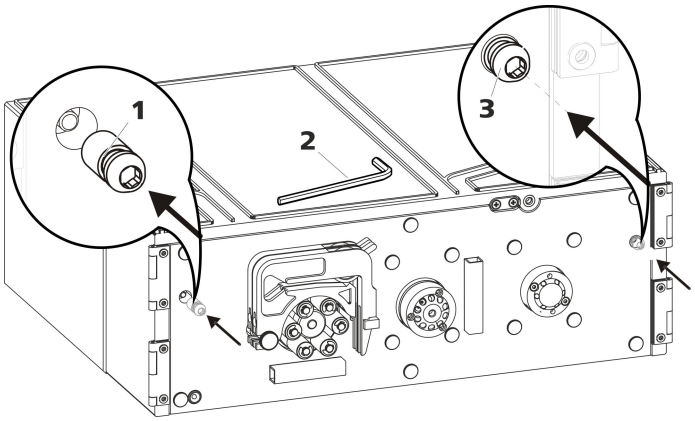
Installing the bottle holder

1 Removing the stoppers



2 Installing the centering pins

Use the hex key to screw in the centering pins as far as they will go.



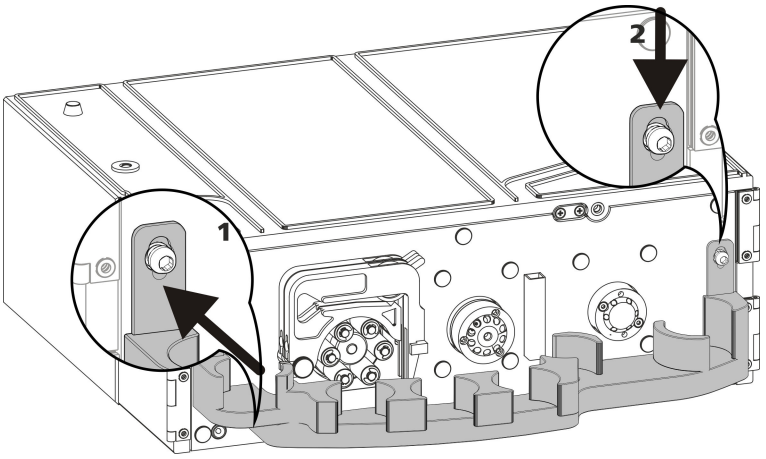
1 Centering pin
Part of the accessories (6.2057.200).

2 Hex key
Part of the accessories (6.2057.200).

3 Centering pin
Screwed in.

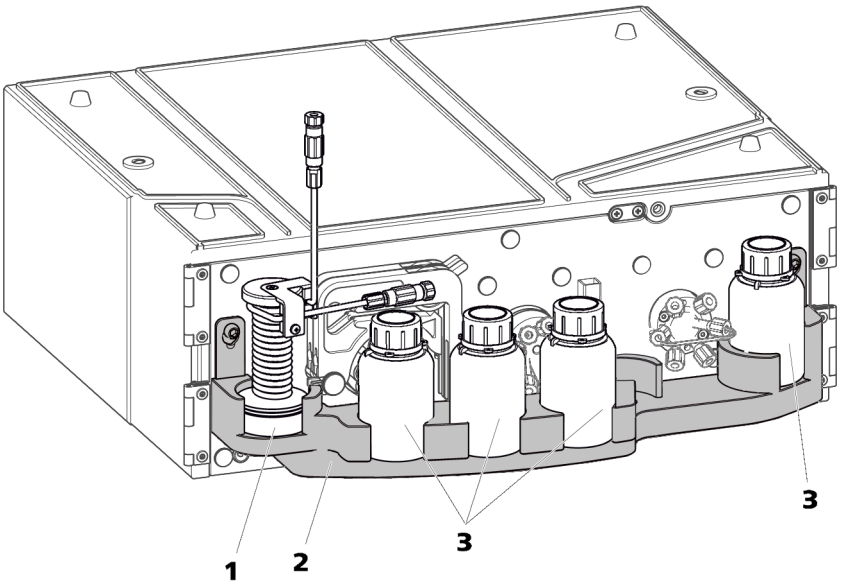
3 Attaching the bottle holder

Hook in the bottle holder (**1**) and push it down (**2**).



4 Loading the bottle holder

Place the transfer tubing and PE bottles into the slots on the bottle holder.



1	**Transfer tubing (6.1562.160)**
2	**Bottle holder (6.2057.200)**
3	**PE bottle (6.1608.100)** 50 mL volume.

3.8 Connecting an Extension Module

CAUTION

The 940 Professional IC Vario **has to be switched off** when connecting the Extension Module!

Accessories

For this step you need the following accessories:

- 6.2156.060 cable Extension Module - Professional IC, 40 cm
  or
- 6.2456.070 cable Extension Module - Professional IC, 1 m (optional accessory)

The connection sockets are located on the rear of the instrument.

Connecting the Extension Module to the IC instrument

1. Plug the connecting cable (6.2156.060) into the **In** connection socket on the Extension Module and tighten it in place.

2. Plug the other end of the connecting cable into the **Extension Module** connection socket on the IC instrument and tighten it in place.

Only one Extension Module can be connected directly to the IC instrument. The second Extension Module has to be connected to the first and the third to the second.

Connecting an Extension Module to another Extension Module

1. Plug the connecting cable (6.2156.060) or the longer connecting cable (6.2156.070) into the **In** connection socket on the second Extension Module and tighten it in place.

2. Plug the other end of the connecting cable into the **Out** connection socket on the first Extension Module and tighten it in place.

4 Start-up

The 942 Extension Module Vario LQH is put into operation together with the IC device.

The following preconditions must be met before initial start-up:

- The 942 Extension Module Vario LQH is installed as outlined in this manual and connected to the 940 Professional IC Vario.

You can find additional information on carrying out initial start-up in the *Start-up* chapter in the manual for the IC device and the MagIC Net online help.

5 Operation and maintenance

5.1 Servicing the door

CAUTION

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

CAUTION

Never hold the instrument by the door when lifting it. Only hold the instrument by the housing.

5.2 Peristaltic pump

5.2.1 Notes on operating the peristaltic pump

The flow rate of the peristaltic pump depends on the drive speed (set using the software), the contact pressure and, above all, the inner diameter of the pump tubing. Depending on the application, different pump tubing is used. Select pump tubing that best matches your application *(see table 1, page 17)*.

CAUTION

The service life of the pump tubing primarily depends on the contact pressure.

If the peristaltic pump is switched off for long periods, lift up the tubing cartridges on the right side by releasing the snap-action levers. This ensures that the contact pressure will be maintained once it has been set.

CAUTION

The pump tubing (6.1826.xxx) is made of PVC or PP and therefore must not be used for rinsing with solutions containing organic solvents. In this case, use different pump tubing or use another pump for rinsing.

5.2.2 Servicing the peristaltic pump

5.2.2.1 Replacing the pump tubing

Pieces of pump tubing inserted into the peristaltic pump are consumables with a limited service life.

Pieces of pump tubing with 3 stoppers are tensioned in the tubing cartridge so that they end up positioned between two stoppers. This results in two possible positions for the tubing cartridge. Once the pump tubing exhibits significant signs of wear, it can be tensioned a second time in the other respective position.

Maintenance interval

Replace the pump tubing every 2 months.

Replace the pump tubing every 4 weeks if the peristaltic pump is being used continuously.

5.2.2.2 Replacing the filter

The filters inserted into the pump tubing connection with locking nut and filter (6.2744.180) must be replaced regularly.

Maintenance interval

We recommend replacing the filters (6.2821.130) *(11-**2**)* every three months. The filters may need to be replaced more frequently, depending on the application.

Accessories

For this step, you need the following accessories:

- 1 filter from the spare filter set (6.2821.130)
- 2 adjustable wrenches (6.2621.000)
- Tweezers

Replacing the filter

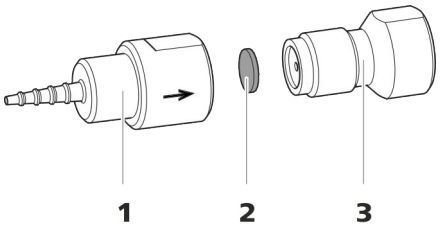


Figure 11 Pump tubing connection – Replacing the filter

1 Tubing olive

2 Filter (6.2821.130)
Pack contains 10 pieces.

3 Filter screw

1 Unscrewing the filter screw

- Unscrew the filter screw *(11-**3**)* from the tubing olive *(11-**1**)* using the two adjustable wrenches.

2 Replacing the filter

- Remove the old filter *(11-**2**)* using tweezers.
- Use tweezers to place the new filter *(11-**2**)* on the filter screw *(11-**3**)* so that it is **flat** and press it firmly into place with the rear of the tweezers.

3 Installing the filter screw

- Screw the filter screw *(11-**3**)* back into the tubing olive *(11-**1**)* and start by tightening it by hand. Finish tightening it using the two adjustable wrenches.

6 Troubleshooting

6.1 Problems and their solutions

Problem	Cause	Remedy
The peristaltic pump is pumping too little.	*Peristaltic pump – Contact pressure too weak.*	Correctly set the contact pressure *(see "Setting the contact pressure correctly", page 20)*.
	Peristaltic pump – Filter blocked.	Replace the filter *(see "Replacing the filter", page 29)*.
	Peristaltic pump – Pump tubing defective.	Replace the pump tubing *(see chapter 5.2.2.1, page 28)*.

7 Mode of operation

7.1 10-port valve

The 10-port valve is used for sample preparation. For this, the central port *(12-**11**)* can be connected to the other 10 ports one after the other using the selector *(12-**13**)*.

The transfer tubing is connected to the central port. Liquids can be aspirated into the transfer tubing by one of the 10 ports with the aid of a Dosino and then transported to any other port by reversing the flow.

The following figure shows a 10-port valve with a potential use setup for the ports:

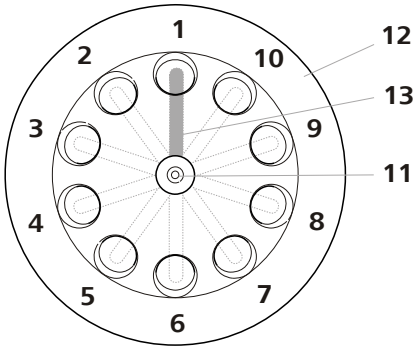


Figure 12 10-port valve – Ports

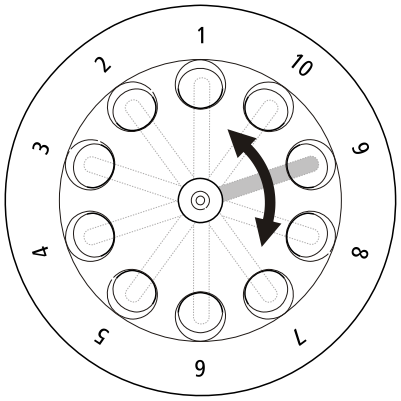
1	**Port 1** Port for connecting to the injection valve in the Extension Module, for example.
2	**Port 2** Port for connecting to the ion exchanger, for example.
3	**Port 3** Port for connecting to an auxiliary solution.
4	**Port 4** Port for connecting to the waste container, for example.
5	**Port 5** Port for connecting to an auxiliary solution.
6	**Port 6** Port for connecting to an auxiliary solution.
7	**Port 7** Port for connecting to an auxiliary solution.
8	**Port 8** Port for connecting to an auxiliary solution.
9	**Port 9** Port for connection.
10	**Port 10** Port for connecting to the injection valve in the IC instrument, for example.

11 Central port
Port connected to the transfer tubing.

12 10-port valve

13 Selector
Can be rotated for selecting the active port.

The selector can rotate in a clockwise or counterclockwise direction. Normally, the shortest path is selected when switching over to a new port.



Secured ports

In order to avoid contamination, any given port can be defined as "secured". The secured port is moved to during switching only if it is the target of the switching procedure.

If the secured port lies along the shortest route during a valve switchover, then the longer path will automatically be selected.

Example:

Switching from port 10 to port 7.

The shorter path leads through ports 9 and 8 *(see figure 13, left)*. If, however, port 8 is defined as the secured port, then the 10-port valve automatically switches via ports 1 – 2 – 3 – 4 – 5 – 6 *(see figure 13, right)*.

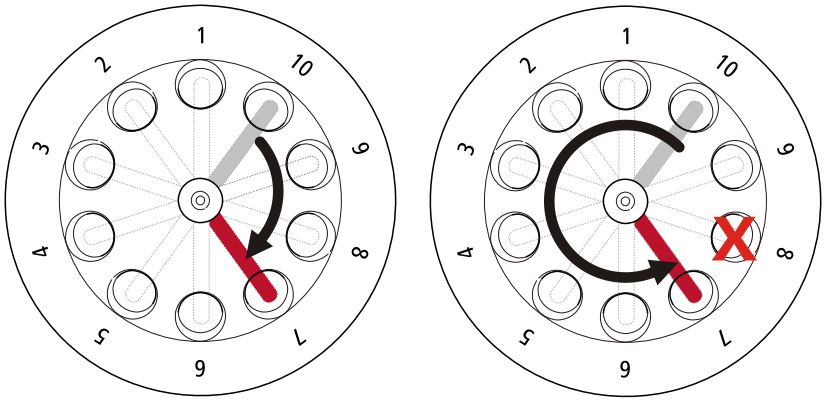


Figure 13 Normal valve switchover and with a secured port

7.2 Transfer tubing

The transfer tubing – a long, coiled tubing (V = 15 mL) – is used for "storing" different liquids. In addition, it prevents the Dosino from being contaminated by these liquids. Different liquid segments can be separated by air bubbles or water. Using the transfer tubing's stand base *(14-**3**)*, there is space for the transfer tubing in one of the slots on the bottle holder.

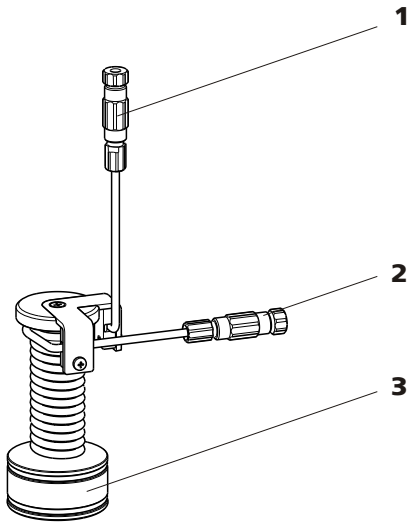


Figure 14 Transfer tubing (6.1562.160)

1 **Connection to Dosino**	**2** **Connection to 10-port valve**
3 **Stand base** For insertion into the bottle holder (6.2057.200).	

The transfer tubing is connected to the central port of the 10-port valve with one connection *(14-**2**)* and to a Dosino with the other connection *(14-**1**)*.

The Dosino takes over transporting and dosing liquids and is filled with a transfer solution (usually water). It can aspirate and expel a defined volume of liquids.

- Aspirating: The liquid is aspirated into the transfer tubing out of the active port on the 10-port valve via the central port.
- Expelling: The liquid collected in the transfer tubing is transported via the central port of the 10-port valve to the active port.

7.3 Peristaltic pump and injection valve

The peristaltic pump and the injection valve are used for precisely measuring small volumes.

The liquid to be dosed, such as the sample *(15-**1**)*, is pumped using the peristaltic pump *(15-**2**)* into the sample loop *(15-**4**)* at the injection valve *(15-**3**)*. The desired volume is defined precisely by the size of the selected sample loop.

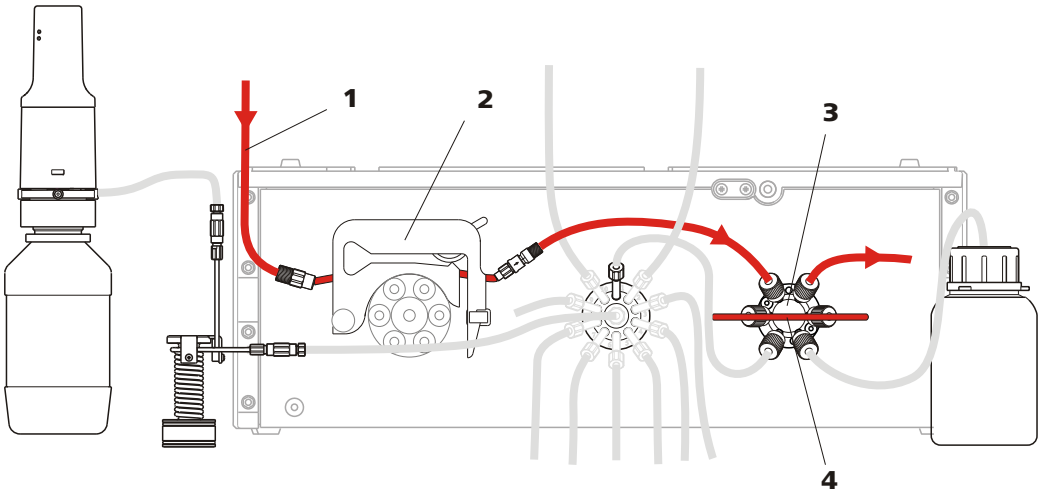


Figure 15 Measuring the volume – Filling the sample loop

1	**Sample**	**2**	**Peristaltic pump**
3	**Injection valve**	**4**	**Sample loop**

After the valve switchover *(16-**2**)*, the measured sample segment is pumped *(16-**5**)* by aspiration using the Dosino *(16-**1**)* through the 10-port valve *(16-**4**)* into the transfer tubing *(16-**6**)* and can be pumped further to another port from there.

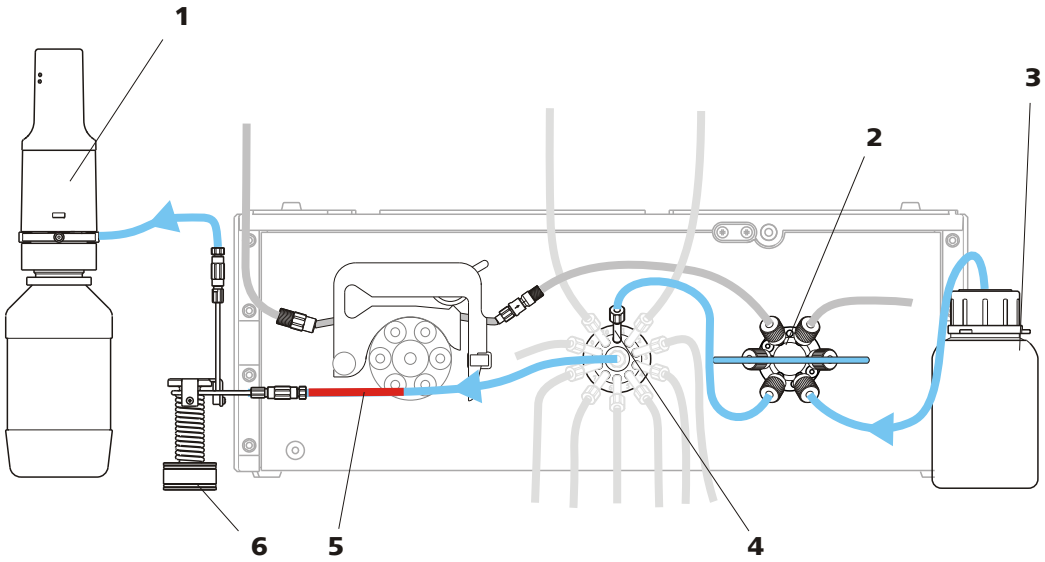


Figure 16 Measuring the volume – Aspirating a sample segment

1	**Dosino**	**2**	**Injection valve**
3	**Container with transfer solution**	**4**	**10-port valve**
5	**Sample**	**6**	**Transfer tubing**

8 Technical specifications

8.1 Reference conditions

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

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

8.2 Ambient conditions

Operation

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

8.3 Housing

Dimensions

Width	365 mm
Height	131 mm
Depth	380 mm
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

8.4 Weight

2.942.0070	7.7 kg (without accessories)

8.5 10-port valve

Connections	1 out of 10
Resistance to solvents	No restrictions
Switching time	Typ. 100 ms
Pressure resistance	2.0 MPa (20 bar) Valve function prevents damage at overpressure.

8.6 Peristaltic pump

Type	2-channel peristaltic pump
Shift direction	Clockwise/counterclockwise
Rotational speed	0 - 42 rpm in 7 levels of 6 rpm each
Pumping characteristics	0.3 mL/min at 18 rpm; with standard pump tubing (6.1826.420)
Pump tubing material	Recommended: PharMed® (Ismaprene)

8.7 6-port valve

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

8.8 Interfaces

In	1 15-pin D-sub plug (male) Connection to the ion chromatograph or to another Extension Module.
Out	1 15-pin D-sub plug (female) Connection to another Extension Module or to an 891 Professional Analog Out (optional).

9 Accessories

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

Downloading the accessories list

1. Enter *https://www.metrohm.com/* into your Internet browser.
2. Enter the article number (e.g. **2.942.0070**) into the search field.
   The search result is displayed.
3. Click on the product.
   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 is created.

NOTE

Once you have received your new product, we recommend downloading the accessories list from the Internet, printing it out and keeping it together with the manual for reference purposes.

Index