

# 947 Professional UV/VIS Detector Vario



2.947.00x0

Manual

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

# **947 Professional UV/VIS Detector Vario**

**2.947.00x0**

**Manual**

Technical Communication  
Metrohm AG  
CH-9100 Herisau

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# 1 Introduction

## 1.1 Instrument description

The **947 Professional UV/VIS Detector Vario** is an independent device for the photometric determination of light-absorbing substances in the UV/VIS range. It serves as UV/VIS detector within an ion chromatography system.

The 947 Professional UV/VIS Detector Vario is operated with the **MagIC Net** software. It is connected to a PC on which MagIC Net is installed with a USB cable. The software detects the device automatically and checks its functionality. MagIC Net controls and monitors the device, evaluates the measured data and manages it in a database.

Additional information on operating MagIC Net can be found in the document "*MagIC Net Tutorial*" or in the software's online help.

## 1.2 Product versions

The 947 Professional UV/VIS Detector Vario is available in the following versions:

Table 1 Product versions

Art. no.	Designation	Version feature: Detection
2.947.0010	Professional UV/VIS Detector Vario - SW	1 wavelength, variable
2.947.0020	Professional UV/VIS Detector Vario - MW	1-8 wavelengths, variable

The required numbers for the customer service can be found on the type plate (see example):

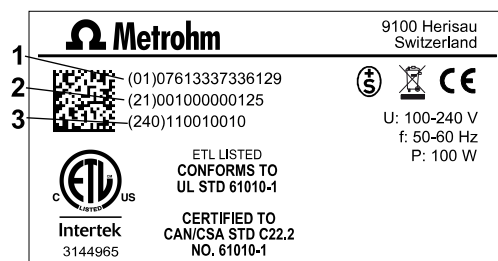


Figure 1 Type plate – Example

**1** (01) = External article number

**2** (21) = Serial number

**3** (240) = Metrohm article number

**NOTE**

Information on the accessories for the respective product version can be obtained either on the Internet at <http://www.metrohm.com> or from your regional Metrohm representative.

## 1.3 Intended use

The 947 Professional UV/VIS Detector Vario is used as an independent detector with various analyzers of the Metrohm line of devices.

This device is suitable for processing chemicals and flammable samples. Therefore, the use of the 947 Professional UV/VIS Detector Vario 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.

## 1.4 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.

### 1.4.1 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>

**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.

**WARNING**

Warning of optical radiation

**CAUTION**

This symbol draws attention to possible damage to instruments or instrument parts.

**NOTICE**

This symbol highlights additional information and tips.

## 1.5 Safety instructions

### 1.5.1 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.



### 1.5.3 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.

### 1.5.4 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.

### 1.5.5 Optical radiation



#### WARNING



#### Health hazards due to optical radiation

Risk group 3

Damage to eyes and skin.

- Avoid eye and skin exposure to unshielded product.
- Do not look at operating lamp.
- Switch off the device before removing the lamp.
- Wear personal protective equipment (e.g. protective glasses, gloves).



### 1.5.6 Recycling and disposal



This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

The correct disposal of your old instrument will help to prevent negative effects on the environment and public health.

More details about the disposal of your old instrument can be obtained from your local authorities, from waste disposal companies or from your local dealer.

## 2 Overview of the device

### 2.1 Front

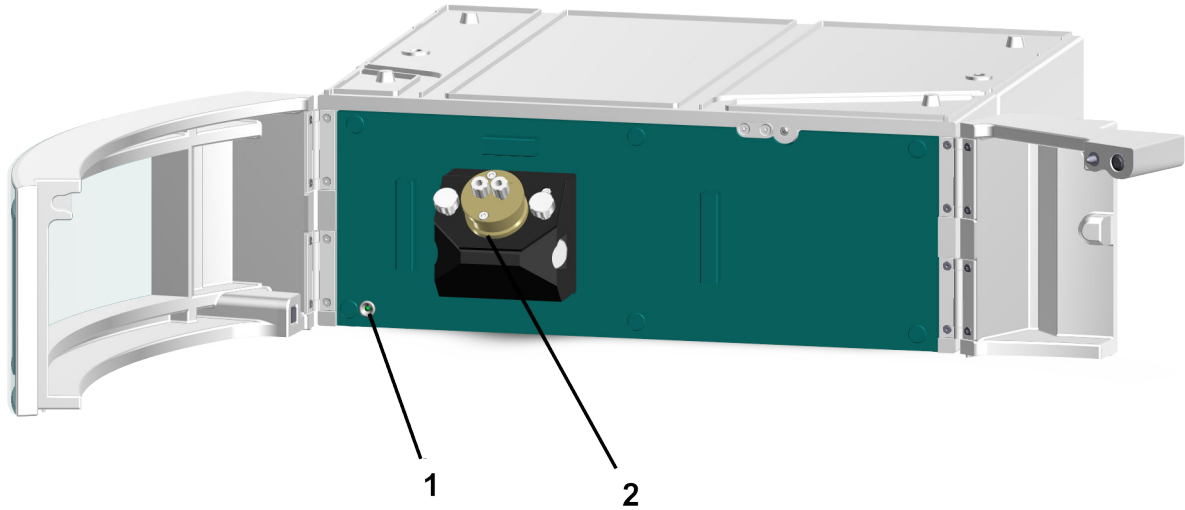


Figure 2 Front – Overview

**1** Standby indicator

**2** Flow-through cell

## 2.2 Rear

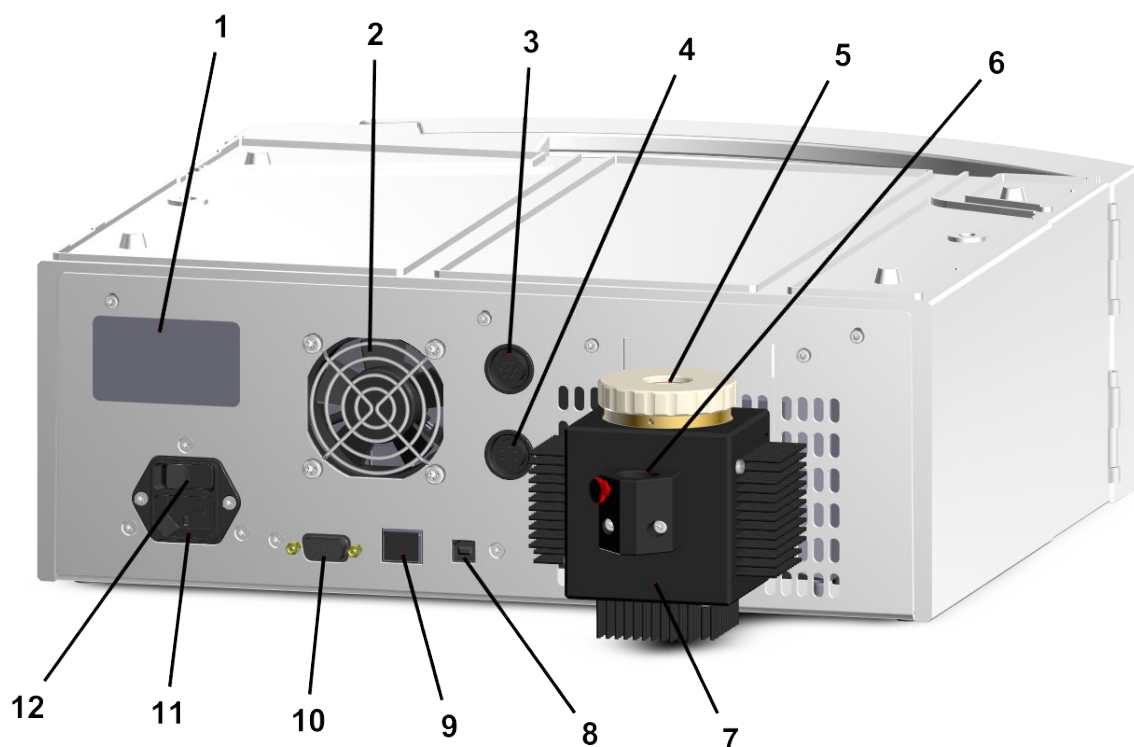


Figure 3 Rear – Overview

<b>1</b>	<b>Type plate</b>	<b>2</b>	<b>Vent</b>
<b>3</b>	<b>UV connection socket</b> For connecting the cable of the UV lamp.	<b>4</b>	<b>VIS connection socket</b> For connecting the cable of the VIS lamp.
<b>5</b>	<b>UV lamp opening</b> When the instrument is delivered, the opening with the socket cap for the UV lamp is closed.	<b>6</b>	<b>VIS lamp opening</b> When the instrument is delivered, the opening with the socket cap for the VIS lamp is closed.
<b>7</b>	<b>Lamp cooling element</b>	<b>8</b>	<b>PC connection socket</b> For connecting the USB cable to the PC.

9 **LAN connection socket**

For connecting the LAN cable.

The LAN connection socket is closed with a blind cover. The connector is not functional.

10 **Analog connection socket**

Output for analog signals.

11 **Power socket**

For connecting the power cord.

12 **Power switch**

For switching the instrument on and off.

I = On

O = Off



such a system, you will need a 947 Professional UV/VIS Detector Vario and, for example, the following devices:

- Any 940 Professional IC Vario or any 930 Compact IC Flex
- 943 Professional Thermostat / Reactor Vario
- Optionally: 942 Extension Module Vario for sample preparation
- Optionally if the reagent is pumped with a high-pressure pump: Metrosep BP 1 Guard/2.0 backpressure column (6.1015.100)

An IC system with photometric detection and post-column derivatization can be set up in various configurations.

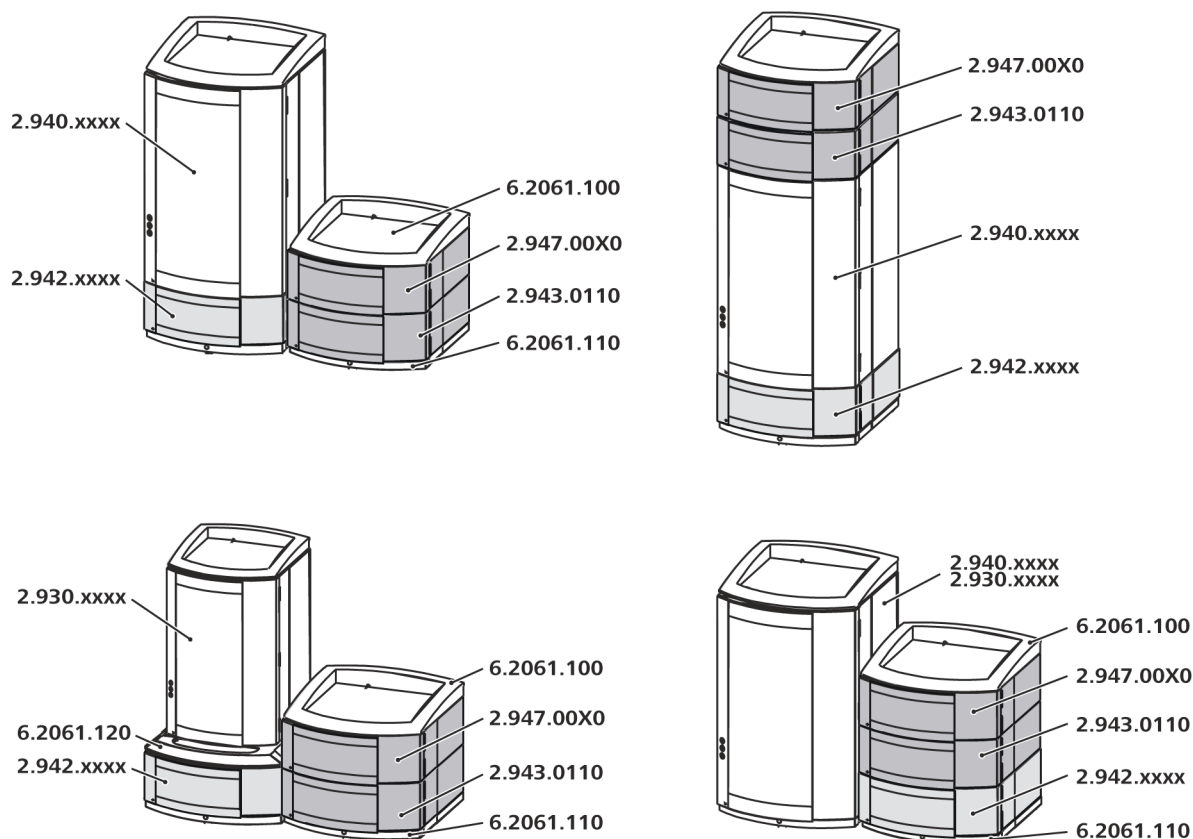


Figure 4 Setup configurations

### Notes on the setup configurations

If you want to set up the devices in 2 stacks, we recommend you order the following accessories to protect the devices of the second stack:

- Bottle holder (ProfIC) (6.2061.100)
- Base tray with sensor for Professional IC devices (6.2061.110)

If you stack a 930 Compact IC Flex on a 947 Professional UV/VIS Detector Vario, a 943 Professional Thermostat / Reactor Vario and/or a 942 Extension Module Vario, use the System Connector (6.2061.120) to accommodate the different base sizes.

## 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)

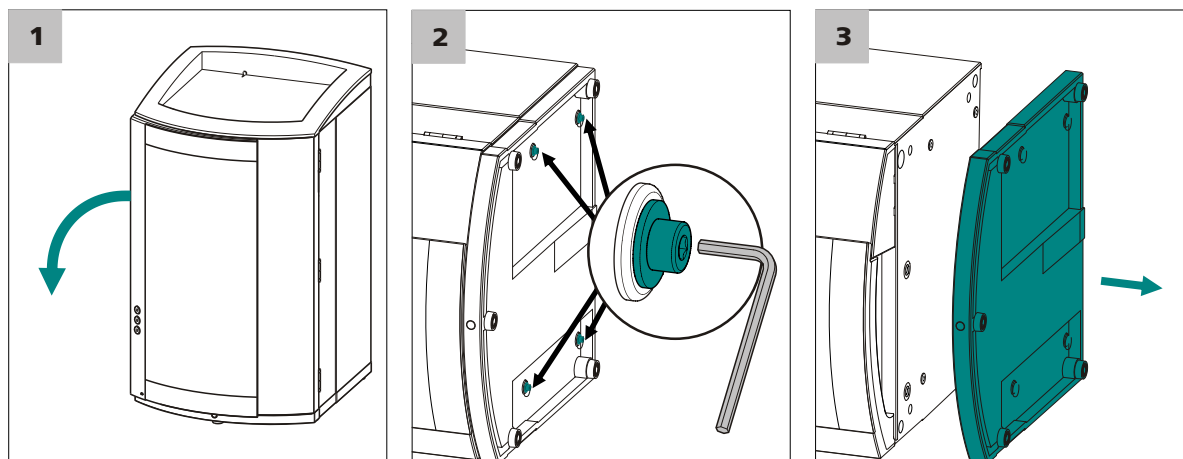


Figure 5 Removing the base tray

- 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)

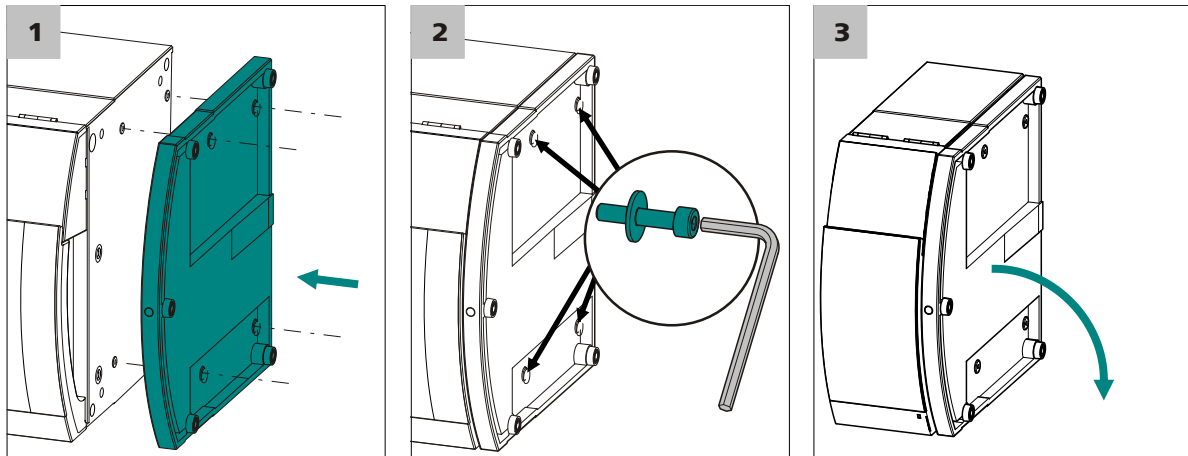


Figure 6 Mounting the base tray

- 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 15).

### 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)

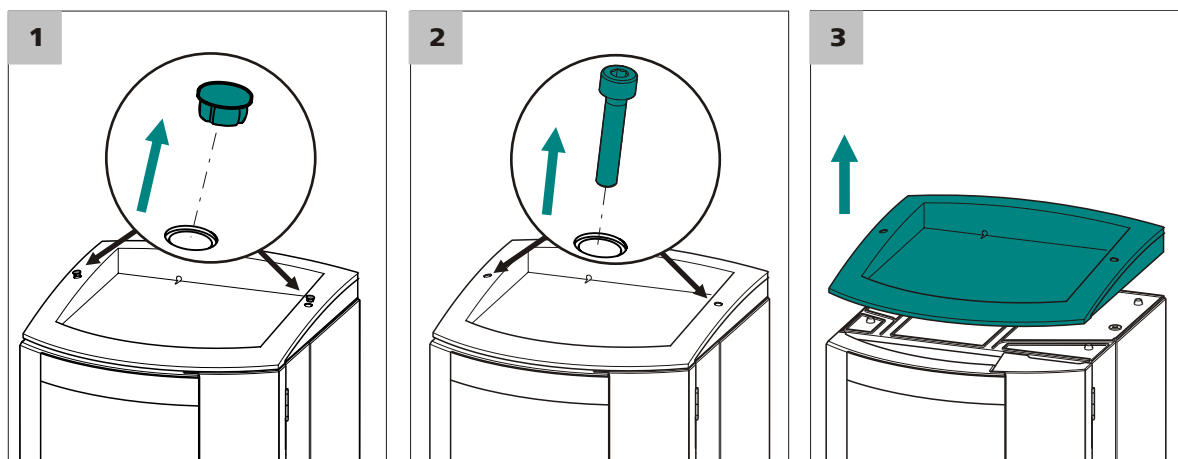


Figure 7 Removing the bottle holder

- 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)

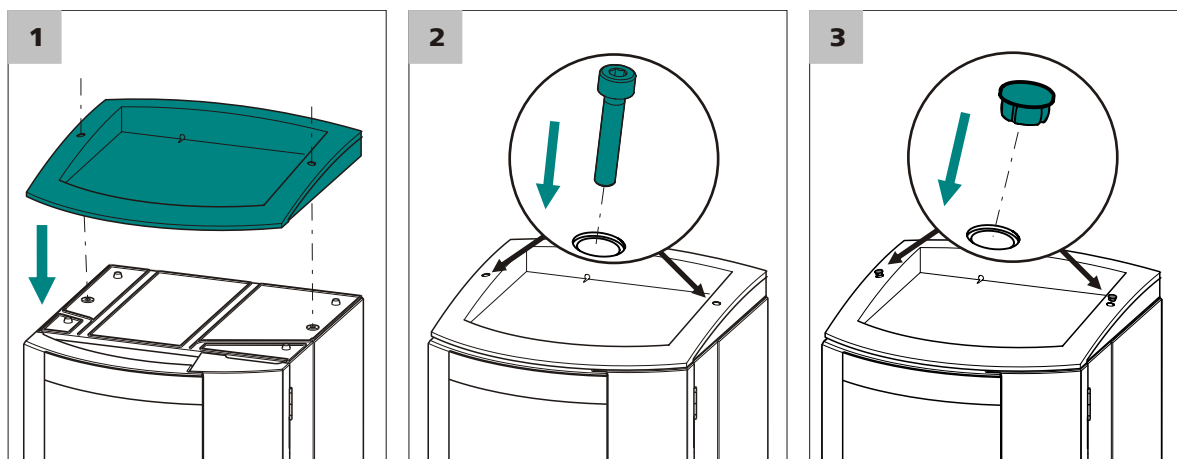


Figure 8 Mounting the bottle holder

- 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 flow-through cell



### WARNING

#### Leakage

Risk of injury in connection with escaping liquids.

- Wear work clothes suitable for laboratory work.
- Lower the backpressure in the system.
- Replace leaking parts and connection elements without delay.
- Tighten loose connecting elements.
- Regularly check the leak-tightness of the tubings. If the instrument is used mainly in unattended operation, carry out weekly inspections.
- Use environmentally-friendly methods to dispose of escaping liquids.

To connect the capillaries to the flow-through cell, proceed as follows:

#### Connecting the capillaries

#### Accessories

- PEEK capillaries (6.1831.100)

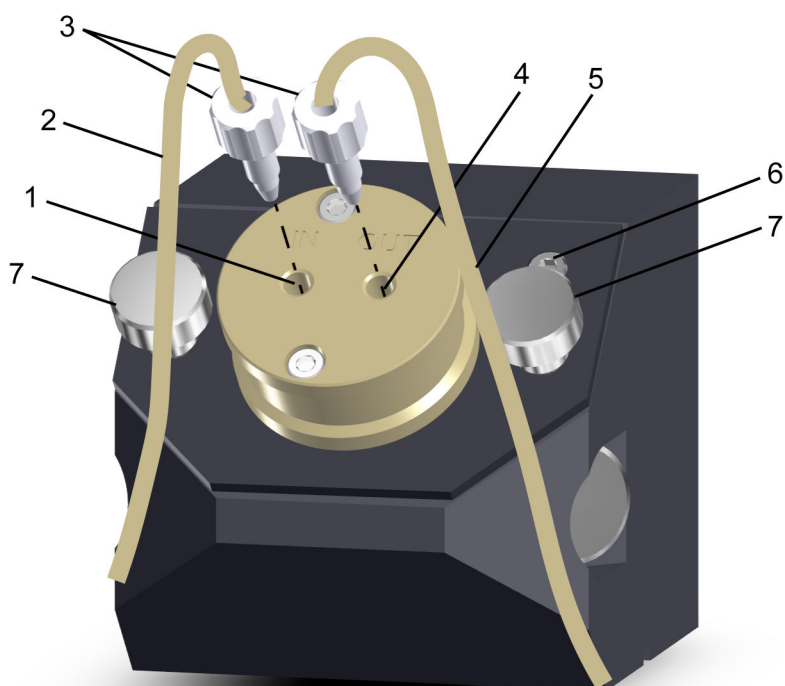


Figure 9 Connecting the capillaries

<b>1</b>	<b>Detector inlet capillary</b> PEEK capillary	<b>2</b>	<b>Detector inlet</b> Labeled <i>IN</i>
<b>3</b>	<b>Pressure screws</b>	<b>4</b>	<b>Detector outlet</b> Labeled <i>OUT</i>
<b>5</b>	<b>Detector outlet capillary</b> PEEK capillary	<b>6</b>	<b>Cylinder screw</b> For the correct alignment of the flow-through cell
<b>7</b>	<b>Knurled screws</b>		

### 1 Connecting the detector inlet

Unscrew the pressure screw from the *IN* detector inlet.

Slide the pressure screw over the detector inlet capillary such that a small part of the capillary is visible at the top.

Tighten the capillary in the detector inlet using the pressure screw.

### 2 Connecting the detector outlet

Unscrew the pressure screw from the *OUT* detector outlet.

Slide the pressure screw over the detector outlet capillary such that a small part of the capillary is visible at the top.

Tighten the capillary in the detector outlet using the pressure screw.

**NOTE**

The detector outlet capillary (6.1831.100) is 1 m long and may not be shortened.

## 3.5 Installing the lamps

**CAUTION****Damage to the lamp**

Reduced light transmission due to residues on the lamp surface. Damage to the lamp due to burnt-on residues on the lamp surface.

- Do not touch the lamp surface with your fingers!
- If the lamp surface is contaminated, clean the lamp with alcohol and a lint-free cloth.
- Make sure the lamp surface is dry before using the device.

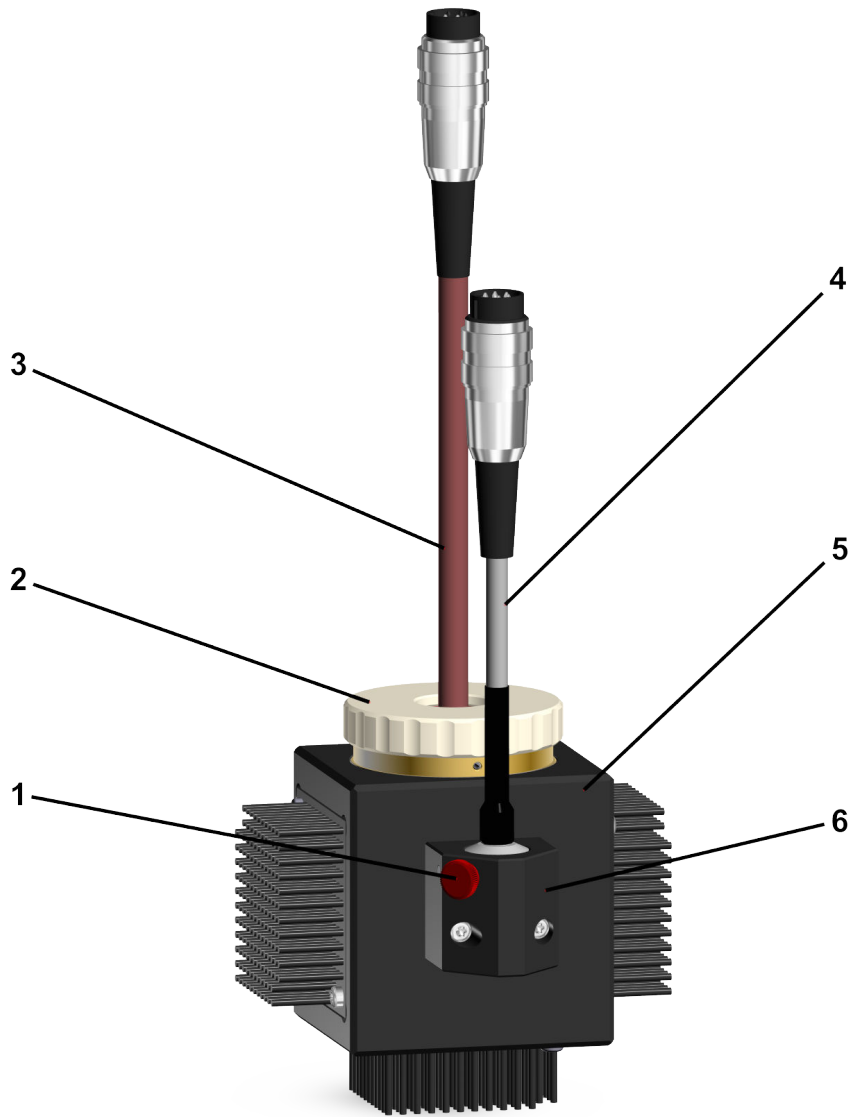


Figure 10 Lamp module – Overview

<b>1</b>	<b>Knurled screw</b>	<b>2</b>	<b>Adjustment ring</b>
<b>3</b>	<b>UV lamp</b> Deuterium lamp (6.2804.110)	<b>4</b>	<b>VIS lamp</b> Halogen lamp (6.2804.100)
<b>5</b>	<b>Lamp cooling element</b>	<b>6</b>	<b>VIS lamp holder</b>

### 3.5.1 Installing the VIS lamp



#### WARNING



#### Health hazards due to optical radiation

Risk group 3

Damage to eyes.

- Do not look at operating lamp.
- Switch off the device before removing the lamp.
- Wear personal protective equipment (e.g. protective glasses, gloves).

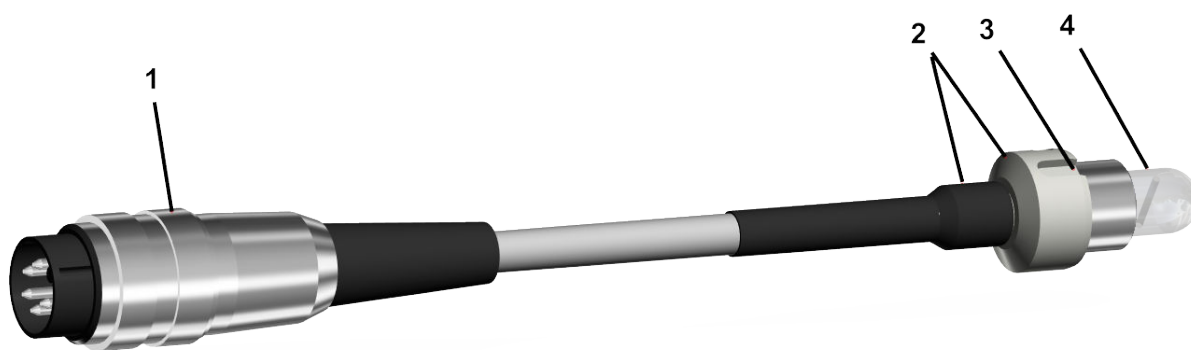


Figure 11 VIS lamp (6.2804.100) – Overview

**1 Plug**

**2 Lamp socket**

**3 Groove for the alignment of the lamp**

**4 Lamp surface**

#### Inserting the VIS lamp

##### Prerequisite

- The device is switched off.

##### Accessories

- VIS lamp (6.2804.100)  
The VIS lamp is not part of the products 2.947.0010 and 2.947.0020.  
The VIS lamp must be purchased separately.

#### 1 Removing the socket cap for the VIS lamp

Unscrew the knurled screw (10-1) by hand.

Remove the socket cap.

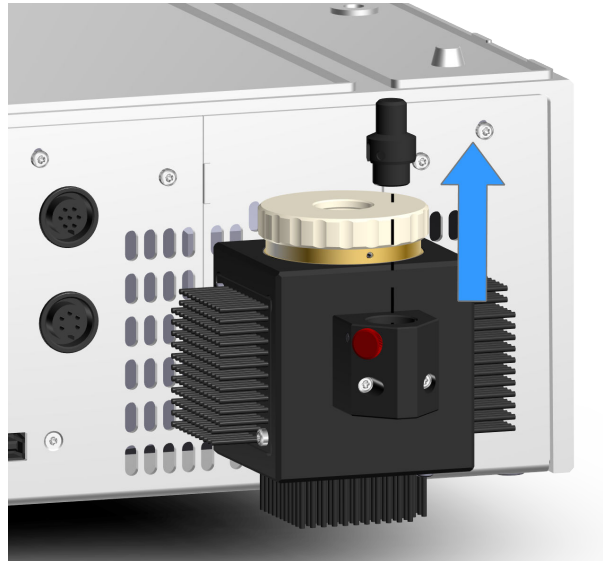


Figure 12 Removing the socket cap for the VIS lamp

## 2 Inserting the VIS lamp

Hold the VIS lamp on the lamp socket (11-2). Insert the lamp into the opening for the VIS lamp (3-6) on the lamp cooling element. Align the groove on the lamp socket (11-3) with the positioning pin in the lamp cooling element.

Push the VIS lamp into the opening for the VIS lamp until it stops.

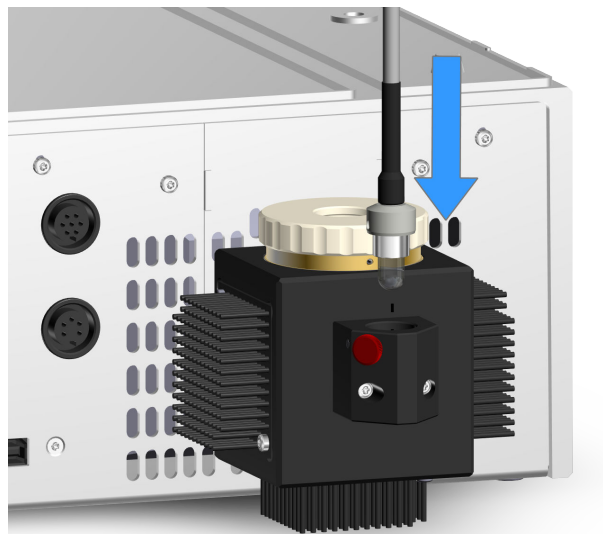


Figure 13 Inserting the VIS lamp

## 3 Fastening the VIS lamp

Screw the knurled screw (10-1) tight by hand until the lamp is firmly fixed in the lamp module.

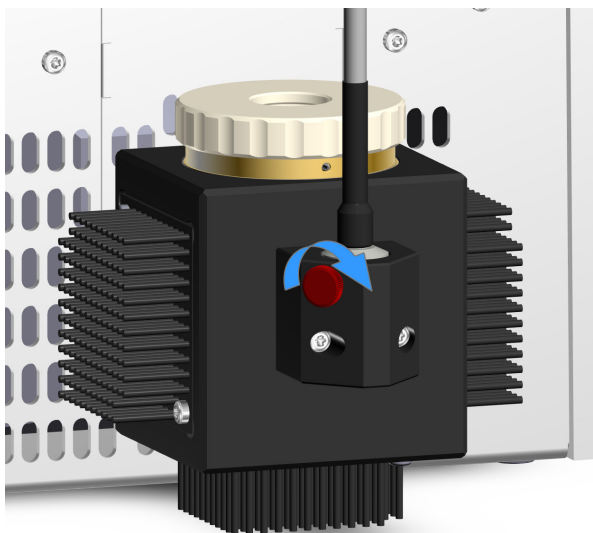


Figure 14 Fastening the VIS lamp

#### 4 Connecting the VIS lamp

Plug the plug of the VIS lamp (11-1) into the connection socket VIS (3-4) of the UV/VIS detector. Tighten the retaining ring of the plug.



Figure 15 Connecting the VIS lamp

**NOTE**

To operate the device without a VIS lamp, insert the socket cap for the VIS lamp into the opening for the VIS lamp (3-6). Align the groove on the socket cap with the positioning pin in the lamp cooling element. Screw the knurled screw (10-1) tight by hand until the socket cap is firmly fixed in the lamp module.

**NOTE**

Remove the VIS lamp (see chapter 6.4.1, page 47) and insert the socket cap if the VIS lamp is not used for a longer period.

**3.5.2 Installing the UV lamp****WARNING****Health hazards due to optical radiation**

Risk group 3

Damage to eyes and skin.

- Avoid eye and skin exposure to unshielded product.
- Switch off the device before removing the lamp.
- Wear personal protective equipment (e.g. protective glasses, gloves).

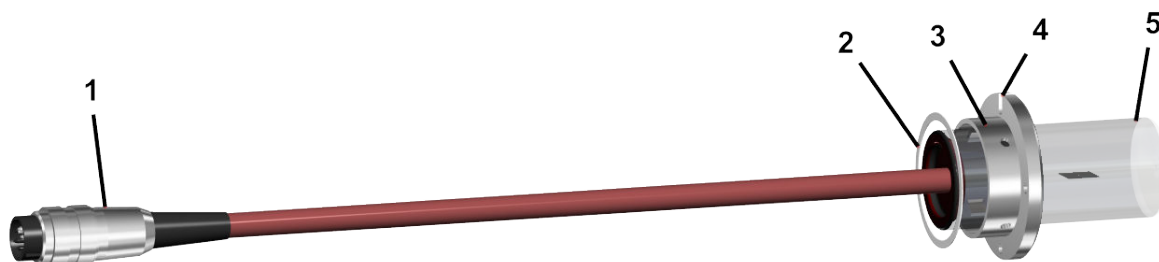


Figure 16 UV lamp (6.2804.110) – Overview

**1 Plug**

**2 Teflon ring**

The Teflon ring allows for easier tightening and loosening of the adjustment ring.

On receipt of the lamp, the Teflon ring is already attached to the lamp.

**3 Lamp socket**

**4 Groove for the alignment of the lamp**

**5 Lamp surface**

### Inserting the UV lamp

#### Prerequisite

- The device is switched off.

#### Accessories

- UV lamp (6.2804.110)  
The UV lamp is not part of the products 2.947.0010 and 2.947.0020.  
The UV lamp must be purchased separately.

#### 1 Removing the socket cap for the UV lamp

Loosen the adjustment ring (10-2).

Remove the adjustment ring and the socket cap.



Figure 17 Removing the socket cap for the UV lamp

## 2 Inserting the UV lamp

Hold the UV lamp on the lamp socket (16-3). Insert the lamp into the opening for the UV lamp (3-5) on the lamp cooling element.

Align the groove on the lamp socket (16-4) with the positioning pin in the lamp cooling element. The positioning pin is located on that side in the lamp cooling element that is closer to the rear of the device.

Push the UV lamp into the opening for the UV lamp until it stops.

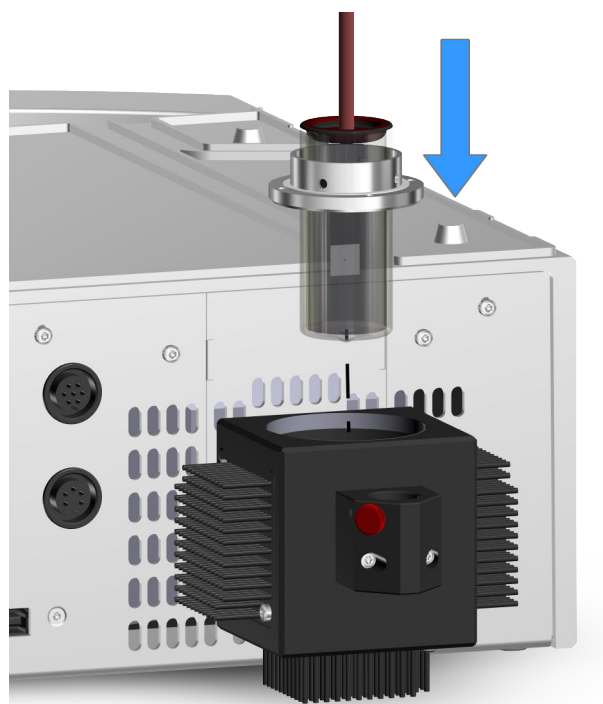


Figure 18 Inserting the UV lamp

### 3 Inserting the adjustment ring

Slide the adjustment ring (10-2) over the cable of the UV lamp.

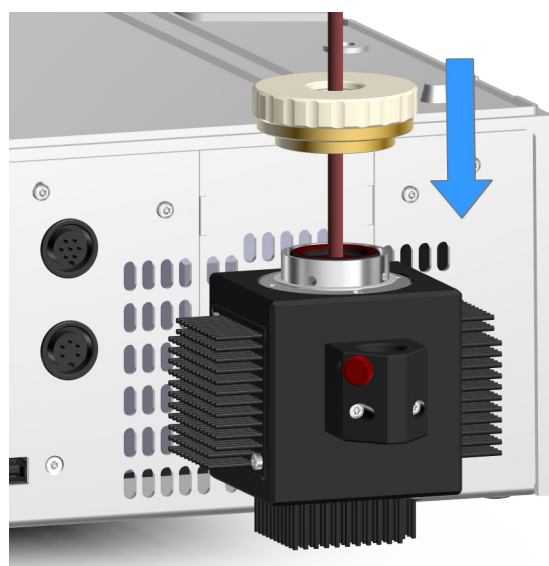


Figure 19 Inserting the adjustment ring

### 4 Tightening the adjustment ring

Tighten the adjustment ring (10-2).

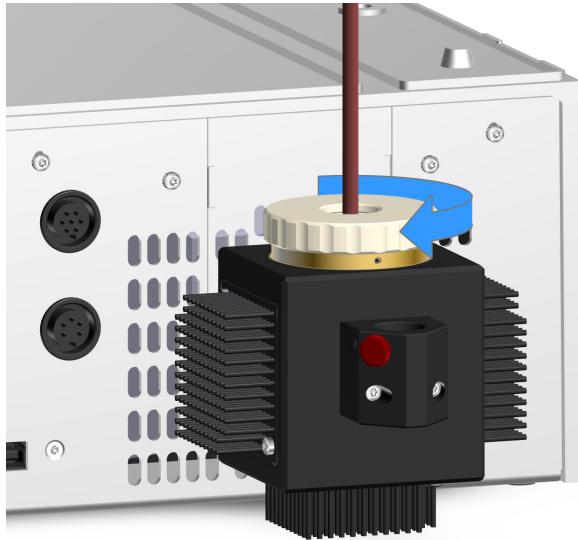


Figure 20 Tightening the adjustment ring

**5 Connecting the UV lamp**

Plug the plug of the UV lamp (16-1) into the connection socket UV (3-3) of the UV/VIS detector. Tighten the retaining ring of the plug.

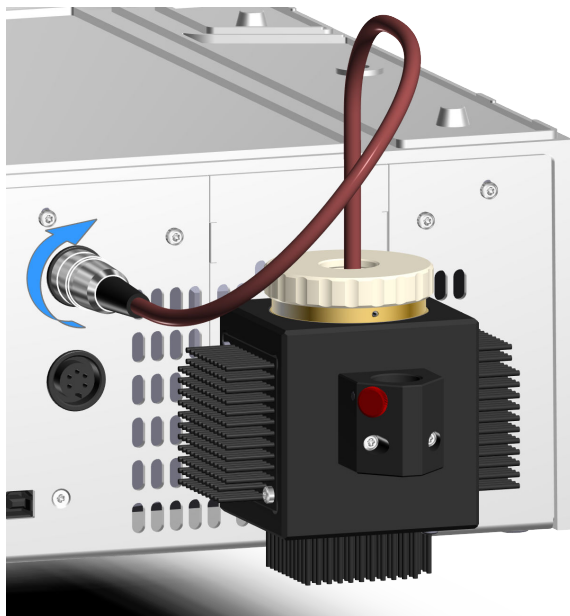


Figure 21 Connecting the UV lamp

**NOTE**

To operate the device without a UV lamp, insert the socket cap for the UV lamp into the opening for the UV lamp (3-5) until it stops.

Align the groove and the circular opening of the socket cap with the positioning pins in the lamp cooling element.



Tighten the adjustment ring (10-2) by hand until the socket cap is firmly fixed in the lamp module.

**NOTE**

If the 947 Professional UV/VIS Detector Vario is operated with the UV lamp and the VIS lamp, adjust the UV lamp after start-up (see chapter 4.1, page 32).

**NOTE**

Remove the UV lamp (see chapter 6.4.2, page 49) and insert the socket cap if the UV lamp is not used for a longer period.

## 3.6 Connecting the instrument

### 3.6.1 Connecting the instrument to a computer



#### NOTE

The instrument must be switched off before being connected to a computer.

#### Accessories

- USB connecting cable (6.2151.020)

**1** Insert the USB cable into the connection socket on the rear of the instrument labeled *PC*.

**2** Insert the other end into a USB port on the computer.

### 3.6.2 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.



### 4.1.1 Operation with UV lamp and VIS lamp



#### NOTE

Only follow the following steps if the instrument is in operation with the UV lamp and the VIS lamp.

The lamp settings must be adjusted if the lamp was replaced or if checking the intensity spectrum after first start-up displays a cut-off (see chapter 4.2, page 41).

#### Adjusting the UV lamp and the lamp settings

##### Prerequisites

- The UV lamp and the VIS lamp are installed.
- The instrument is switched on.
- The instrument was configured in MagIC Net (see 8.102.8004EN Manual MagIC Net 3.3).
- The UV lamp and the VIS lamp have been burning for 30 minutes.
- The flow-through cell is clean.
- The flow-through cell is rinsed with ultrapure water.
- The flow-through cell is free of air bubbles.

**1** Open the **Configuration** program part in MagIC Net.

Double-click on **947 UV/VIS Detector** in the device table.

The **Properties...** window opens.

**2** On the **Detector** tab, click on **[Properties...]** to open the detector settings.

**3** Set the integration duration manually to 20.0 ms. Set the VIS intensity level manually to 7.0. Confirm with **[Apply]**.

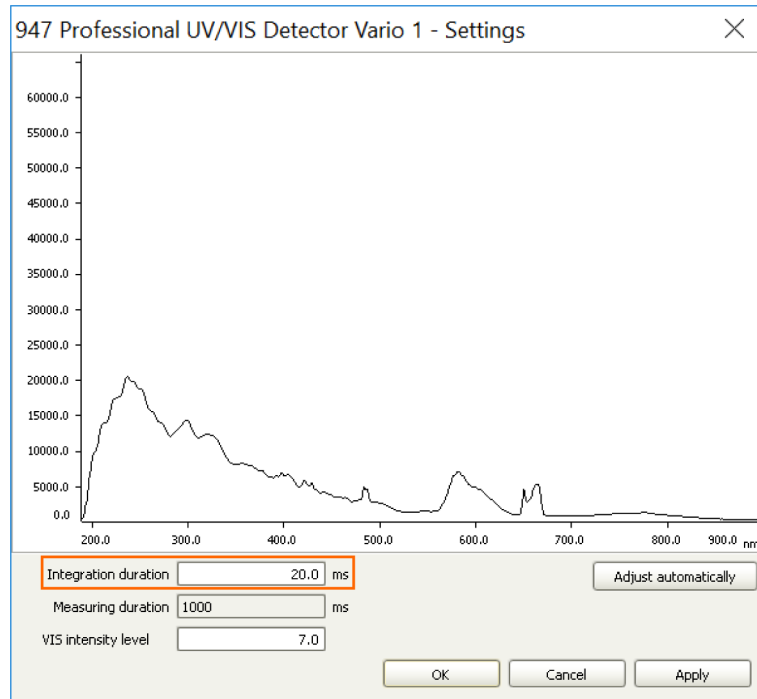


Figure 22 Setting the integration duration

- 4 Slowly** turn the adjustment ring to move the UV lamp in its vertical axis. This allows for adjusting the intensity in the range of 400 - 900 nm. Turn the adjustment ring until the maximum intensity is reached. Place the cursor on a peak to see better in which direction the intensity spectrum changes.

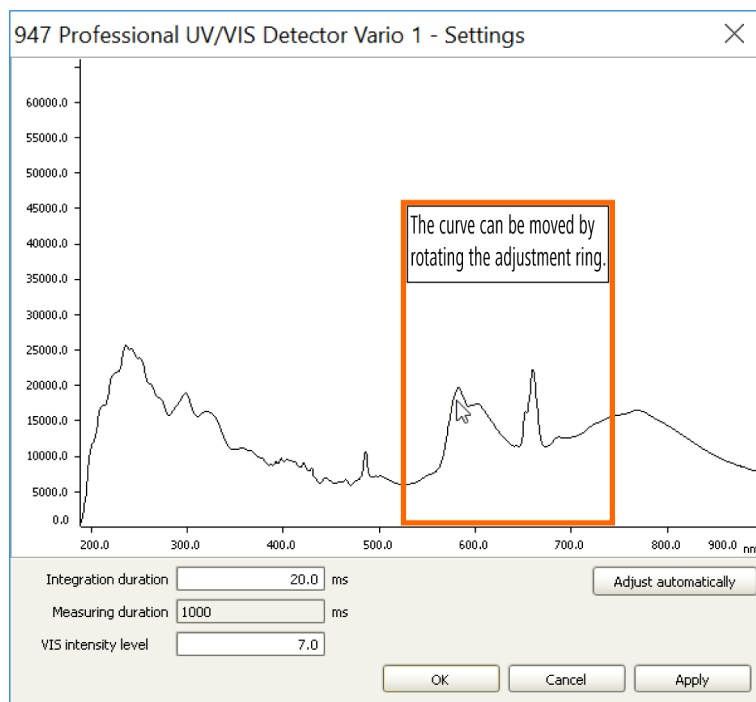


Figure 23 Adjusting the UV lamp

**5** Click on **[Adjust automatically]**.

Optimized values for the integration duration and the VIS intensity level are calculated and set.

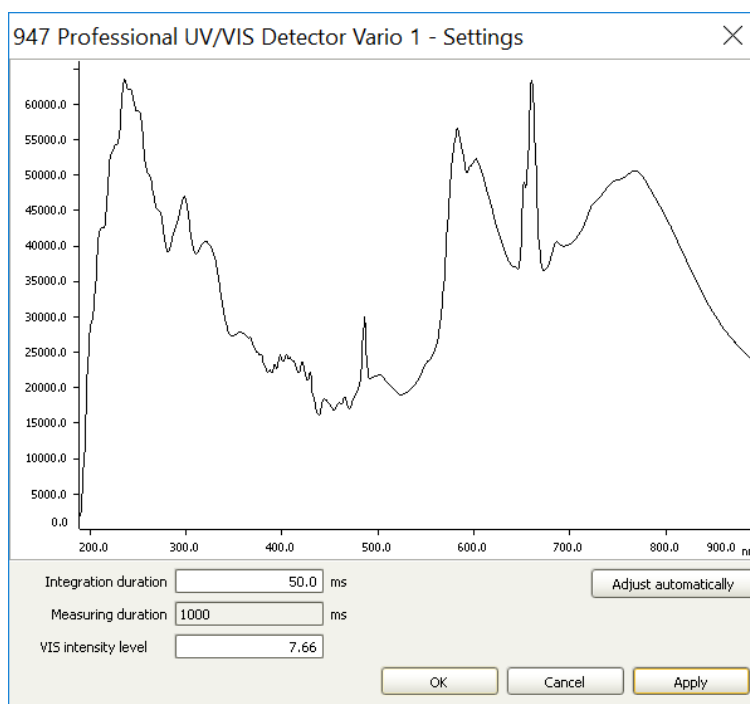


Figure 24 Optimized intensity spectrum with UV lamp and VIS lamp

**6** Click on **[OK]**.

The lamp values are transferred to the instrument. The window is closed. The adjustment is complete.

### 4.1.2 Operation with UV lamp



#### NOTE

Only follow the following steps if the instrument is in operation exclusively with the UV lamp.

The lamp settings must be adjusted if the lamp was replaced or if checking the intensity spectrum after first start-up displays a cut-off (see chapter 4.2, page 41).

Remove the VIS lamp completely (see chapter 6.4.1, page 47). Close the opening of the lamp with the socket cap. Otherwise the lamp is automatically switched on as soon as the detector settings are opened.

#### Adjusting the UV lamp and the lamp settings

##### Prerequisites

- The UV lamp is installed.

- The instrument is switched on.
- The instrument was configured in MagIC Net (*see 8.102.8004EN Manual MagIC Net 3.3*).
- The UV lamp has been burning for at least 30 minutes.
- The flow-through cell is clean.
- The flow-through cell is rinsed with ultrapure water.
- The flow-through cell is free of air bubbles.

**1** Open the **Configuration** program part in MagIC Net.

Double-click on **947 UV/VIS Detector** in the device table.

The **Properties...** window opens.

**2** On the **Detector** tab, click on **[Properties...]** to open the detector settings.

**3** Set the integration duration manually to 20.0 ms. Confirm with **[Apply]**.

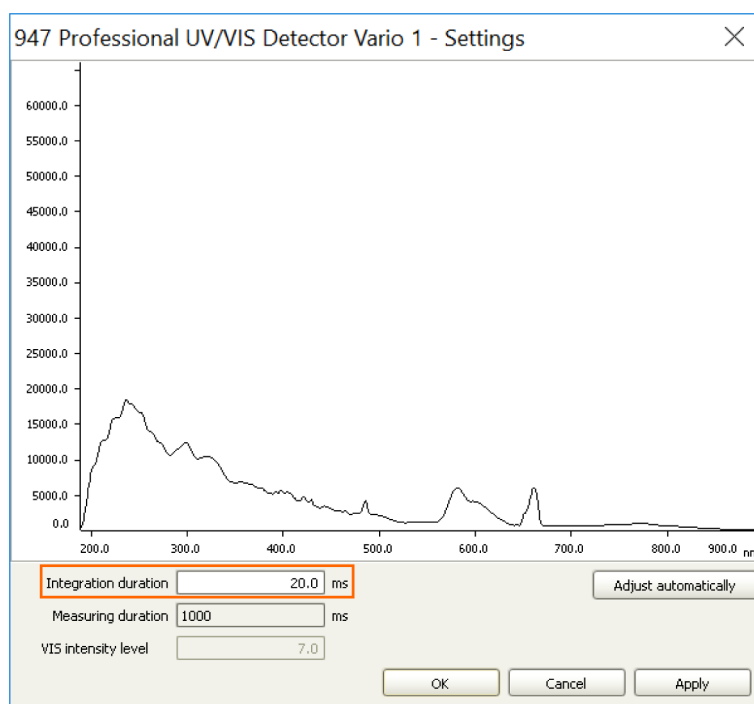


Figure 25 Setting the integration duration

**4** **Slowly** turn the adjustment ring to move the UV lamp in its vertical axis. This allows for adjusting the intensity in the range of 200 - 400 nm. Turn the adjustment ring until the maximum intensity is reached. Place the cursor on a peak to see better in which direction the intensity spectrum changes.

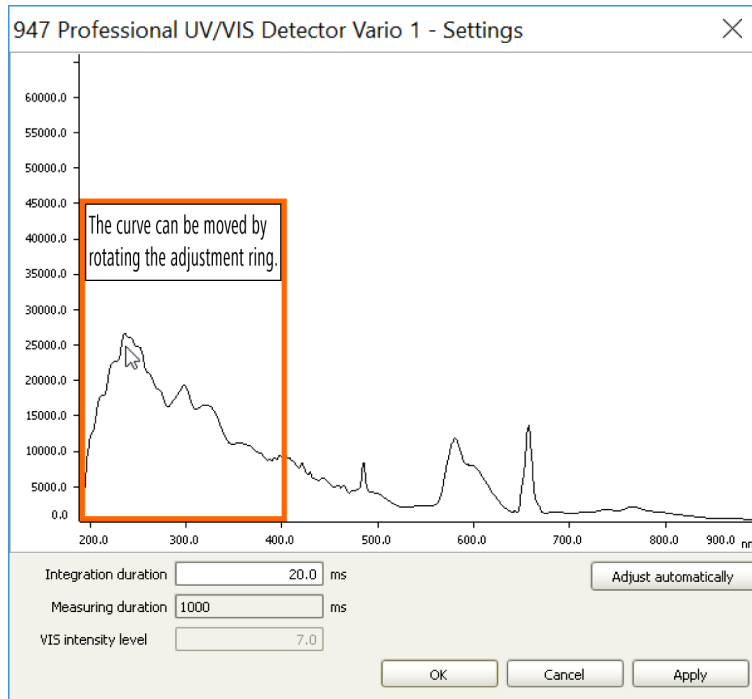


Figure 26 Adjusting the UV lamp

**5** Click on **[Adjust automatically]**.

Optimized values for the integration duration and the VIS intensity level are calculated and set.

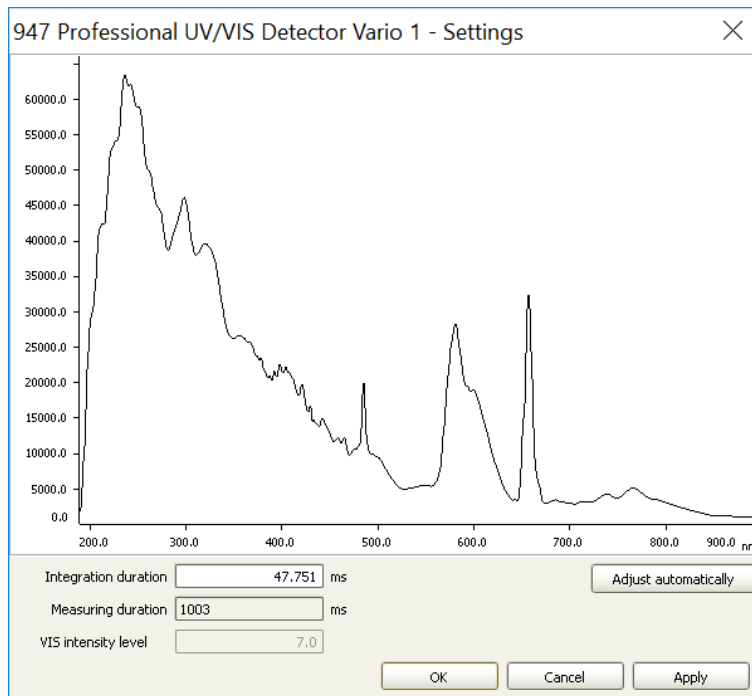


Figure 27 Optimized intensity spectrum with UV lamp

**6** Click on **[OK]**.

The lamp values are transferred to the instrument. The window is closed. The adjustment is complete.

### 4.1.3 Operation with VIS lamp



#### NOTE

Only follow the following steps if the instrument is in operation exclusively with the VIS lamp.

The lamp settings must be adjusted if the VIS lamp was replaced or if checking the intensity spectrum after first start-up displays a cut-off (see chapter 4.2, page 41).

Remove the UV lamp completely (see chapter 6.4.2, page 49). Close the opening of the lamp with the socket cap. Otherwise the lamp is automatically switched on as soon as the detector settings are opened.

#### Adjusting the lamp settings

##### Prerequisites

- The instrument is operated exclusively with the VIS lamp.
- The VIS lamp is installed.
- The instrument is switched on.
- The VIS lamp has been burning for at least 30 minutes.
- The flow-through cell is clean.
- The flow-through cell is rinsed with ultrapure water.
- The flow-through cell is free of air bubbles.
- The intensity spectrum has been checked and shows a cut-off (see chapter 4.2, page 41).

**1** Open the **Configuration** program part in MagIC Net.

Double-click on **947 UV/VIS Detector** in the device table.

The **Properties...** window opens.

**2** On the **Detector** tab, click on **[Properties...]** to open the detector settings.**3** In the detector settings, click on **[Adjust automatically]** to start the automatic lamp adjustment.



The lamp settings are made based on a built-in algorithm. This algorithm calculates and sets the optimized values for **Integration duration** and **VIS intensity level**. After the automatic adjustment, a new intensity spectrum is displayed.

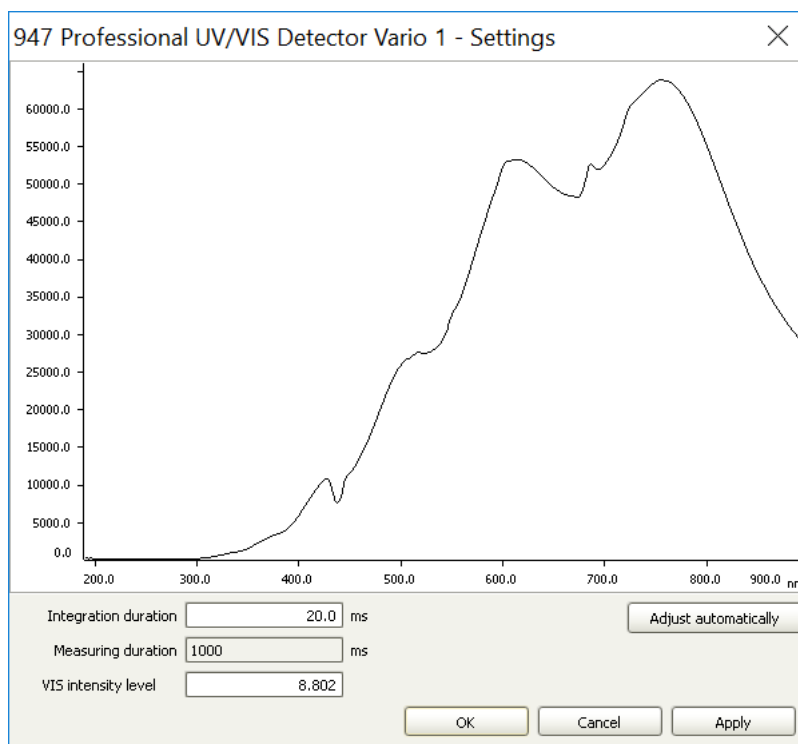


Figure 28 Optimized intensity spectrum with VIS lamp

- 4 Check the new intensity spectrum that is displayed.

Click on **[OK]**.

The adjusted lamp values are transferred to the instrument. The window is closed. The lamp optimization is complete.

## 4.2 Checking the intensity spectrum

Check the intensity spectrum in the following cases:

- After initial start-up
- After replacing a lamp
- If increased noise or measurement inaccuracies occur after prolonged use

### Checking the intensity spectrum

#### Prerequisite

- The lenses and the flow path of the flow-through cell must be clean.


#### 1 Rinsing the flow-through cell with ultrapure water

Rinse the flow-through cell with ultrapure water at a flow rate of 0.5 mL/min.

Ensure that no air bubbles remain in the flow-through cell.

#### 2 Checking the intensity of the lamps

In MagIC Net, adjust the following settings:

- Load and start a method with UV/VIS detection in the **Workplace** program part.
- Go to the **Manual** program part.
- Click on the  icon for the **947 UV/VIS Detector**.
- On the **UV lamp** tab, switch on the UV lamp.
- On the **VIS lamp** tab, switch on the VIS lamp.
- On the **Detector** tab, select the **Intensity spectrum**.  
First click on **[Reset baseline]** and then click on **[View]**.

The lamp's intensity range is monitored and the spectrum is recorded.

If the intensity spectrum looks similar to the spectrum in figure *Intensity spectrum OK*, then the lamp is correctly adjusted.

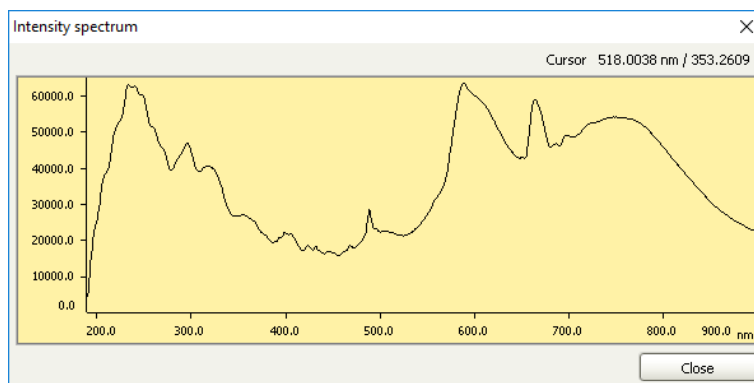


Figure 29 Intensity spectrum OK

If the intensity spectrum is cut off at the top like the one in figure *Lamp intensity too high*, then the lamp settings must be adjusted (see chapter 4.1, page 32).

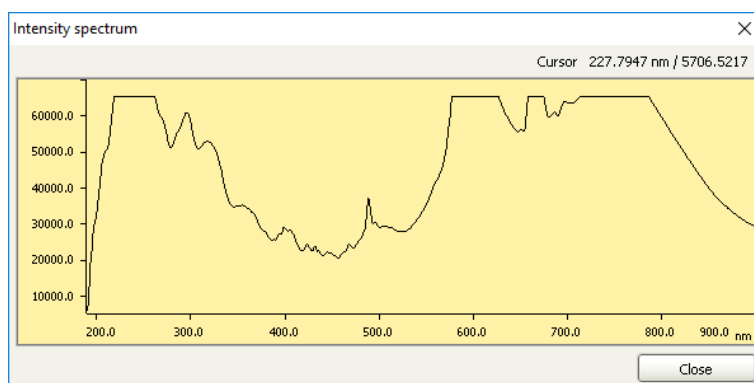


Figure 30 Lamp intensity too high

If the intensity spectrum shows an intensity that is too low like the one in figure *Lamp intensity too low*, then the lamp settings must be adjusted (see chapter 4.1, page 32).

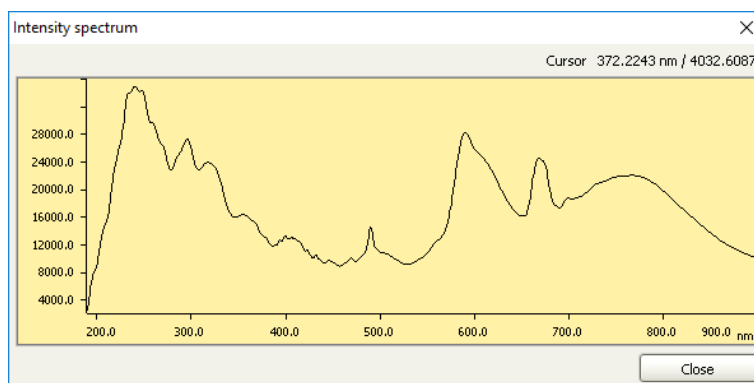
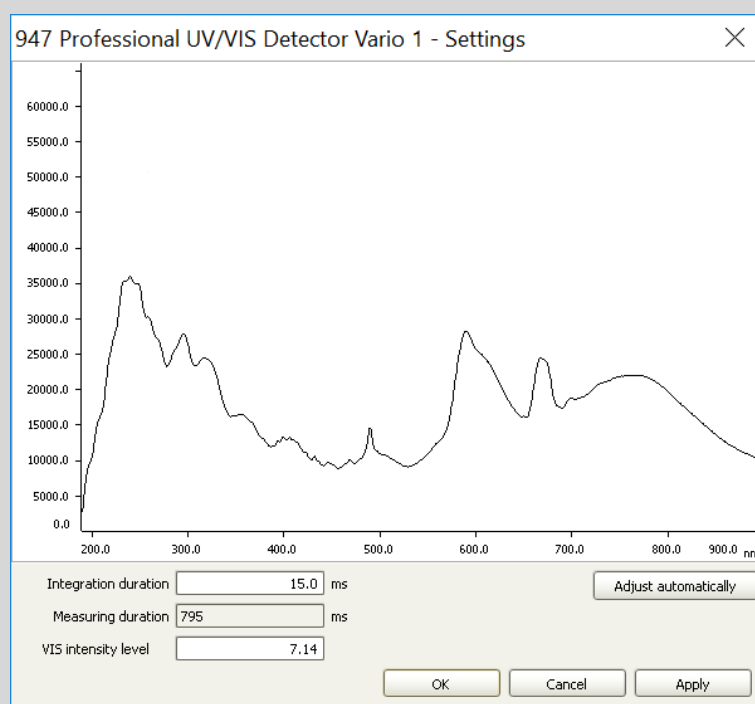


Figure 31 Lamp intensity too low

**NOTE**

In the intensity spectrum, the scale for the intensity automatically adjusts to the current lamp intensity. If the lamp intensity is OK like the one in figure *Lamp intensity OK*, the scale for the intensity has a range up to 60,000. To see whether the lamp intensity is too low, check if the scale for the intensity has a range up to 60,000. In figure *Lamp intensity too low*, for example, the scale of the intensity only has a range up to 28,000.

A lamp intensity that is too low is easier to see in the detector settings, as the scale for the intensity here is fixed and does not adjust to the current lamp intensity.



## 5 Operation

The device is operated via the MagIC Net software and the driver software Metrohm IC Driver for OpenLab.

Additional information on operating MagIC Net can be found in the document *MagIC Net Tutorial* or in the software's online help.

Additional information on operating the Metrohm IC Driver for OpenLab can be found in the document *Tutorial – Metrohm IC Driver 1.0 for OpenLab* or in the online help of the driver.

## 6 Operation and maintenance

### 6.1 Care

The instrument requires appropriate care. Excess contamination of the instrument may result in functional disruptions and a reduction in the service life of the sturdy mechanics and electronics.

Clean the instrument immediately if chemicals or solvents are spilled on it. The plug connections (particularly the power plug) absolutely must be protected against contamination.



#### CAUTION

##### **Inward seepage of liquid**

Instrument damage through inward seepage of liquid!

- The instrument has been designed so that liquid is largely prevented from being able to get inside the instrument. However, unplug the power plug immediately if you suspect that corrosive media have gotten inside the instrument. This is the only way to prevent extreme damage to the instrument electronics. Contact Metrohm Service immediately.



#### WARNING

Only trained personnel may open the instrument's housing.

### 6.2 Maintenance by Metrohm Service

Maintenance of the instrument is best carried out as part of annual service, which is performed by specialist personnel from Metrohm. A shorter maintenance interval is recommended if you frequently work with caustic and corrosive chemicals. Metrohm Service offers every form of technical advice for maintenance and service of all Metrohm instruments.

## 6.3 Door



### CAUTION

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#### Incorrect detergents

The door is made of PMMA (poly(methyl methacrylate)). Property damage to the door by using incorrect detergents.

- Never clean the door with abrasive agents or solvents.



### CAUTION

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#### Instrument damage due to incorrect lifting

Property damage to the instrument due to incorrect lifting or moving.

- Never hold the instrument by the door when lifting or moving it.

## 6.4 Replacing the lamps



### CAUTION

---

#### Damage to the lamp

Reduced light transmission due to residues on the lamp surface. Damage to the lamp due to burnt-on residues on the lamp surface.

- Do not touch the lamp surface with your fingers!
- If the lamp surface is contaminated, clean the lamp with alcohol and a lint-free cloth.
- Make sure the lamp surface is dry before using the device.



### WARNING

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#### Hot surface

Hot UV lamps and VIS lamps can lead to a risk of burns and fire.

- Switch off the instrument and allow the lamp to cool before you start working.
- Do not place the hot lamp on flammable surfaces.

## 6.4.1 Replacing the VIS lamp



### WARNING



#### Health hazards due to optical radiation

Risk group 3

Damage to eyes.

- Do not look at operating lamp.
- Switch off the device before removing the lamp.
- Wear personal protective equipment (e.g. protective glasses, gloves).

### Removing the VIS lamp

#### Prerequisites

- The device is switched off.
- The lamp has cooled down.

#### 1 Disconnecting the VIS lamp

Loosen the retaining ring on the plug of the VIS lamp. Unplug the plug (1-1) from the power socket VIS (3-4) of the UV/VIS detector.



Figure 32 Disconnecting the VIS lamp



**2 Loosening the knurled screw**

Unscrew the knurled screw (10-1) by hand.

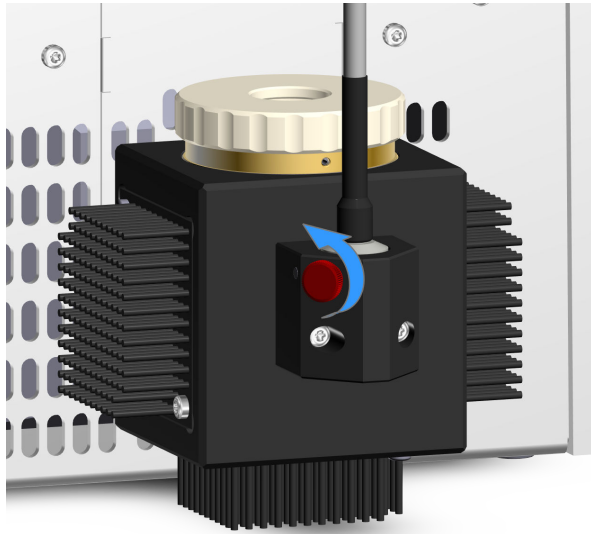


Figure 33 Loosening the knurled screw

**3 Removing the VIS lamp**

Remove the lamp by pulling the lamp socket (11-2) from the housing.



Figure 34 Removing the VIS lamp

**NOTE**

Inserting the VIS lamp is described in the chapter about the installation (see chapter 3.5.1, page 21).

If the device is operated with the VIS lamp and the UV lamp, adjust the UV lamp and the lamp settings after inserting the VIS lamp. This is described in the chapter about the installation (see chapter 4.1, page 32).

## 6.4.2 Replacing the UV lamp

**WARNING****Health hazards due to optical radiation**

Risk group 3

Damage to eyes and skin.

- Avoid eye and skin exposure to unshielded product.
- Switch off the device before removing the lamp.
- Wear personal protective equipment (e.g. protective glasses, gloves).

After a prolonged burning time, the radiation of the UV lamp starts to decrease. This can be noticed by an increased noise on the baseline. The service life of the lamp is approximately 2,000 operating hours. This means that after 2,000 operating hours at a wavelength of 250 nm the intensity decreases by 50% at the most. Replace the UV lamp if the noise on the baseline becomes too strong and the burning time of the lamp is more than 2,000 hours. Replace the UV lamp if the lamp does not light up anymore when it has cooled down.

### Removing the UV lamp

**Prerequisites**

- The device is switched off.
- The lamp has cooled down.

#### 1 Disconnecting the UV lamp

Loosen the retaining ring on the plug of the UV lamp (16-1). Remove the plug from the connection socket UV (3-3).

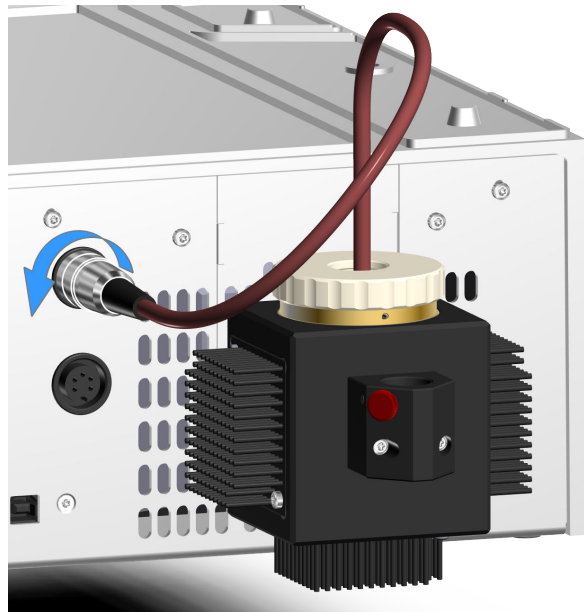


Figure 35 Disconnecting the UV lamp

**2 Loosening the adjustment ring**

Loosen the adjustment ring (10-2) of the UV lamp.

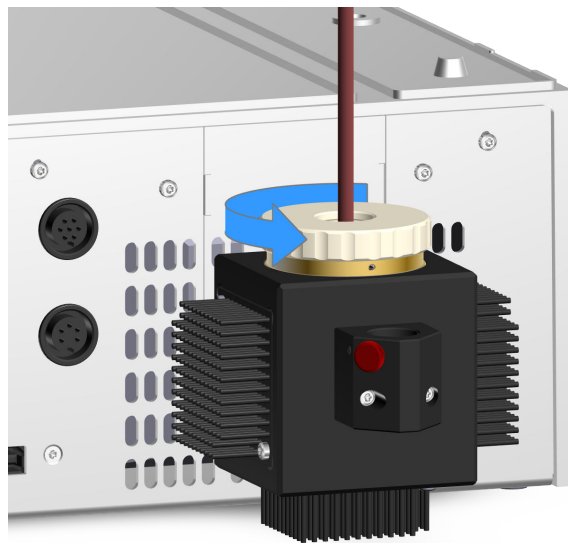


Figure 36 Loosening the adjustment ring

**3 Removing the adjustment ring**

Remove the adjustment ring (10-2) of the UV lamp.

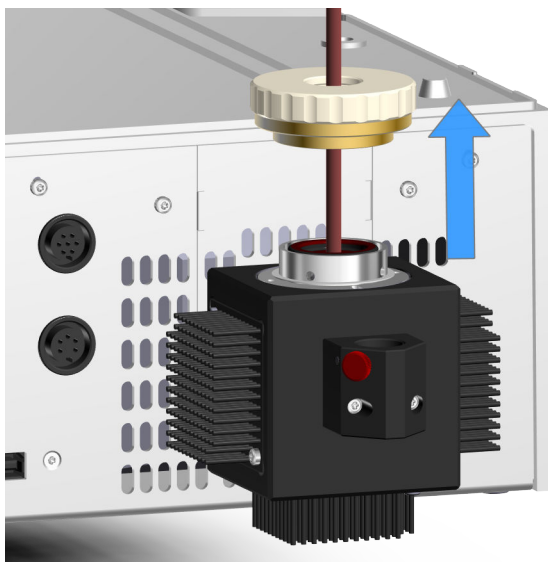


Figure 37 Removing the adjustment ring

#### 4 Removing the UV lamp

Remove the lamp by pulling the lamp socket (16-3) from the housing.

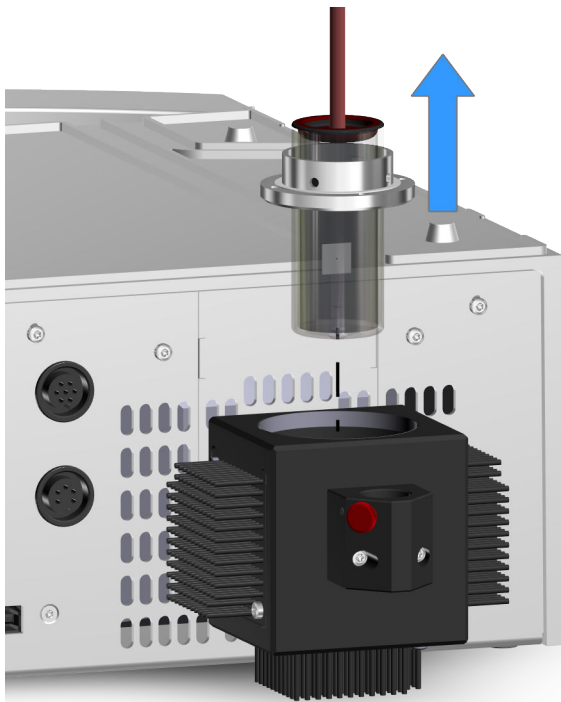


Figure 38 Removing the UV lamp

**NOTE**

Inserting the UV lamp is described in the chapter about the installation (see chapter 3.5.2, page 24).

Adjust the UV lamp and the lamp settings after inserting the UV lamp. This is described in the chapter about the installation (see chapter 4.1, page 32).

## 6.5 Cleaning the flow-through cell

**WARNING****Leakage**

Risk of injury in connection with escaping liquids.

- Wear work clothes suitable for laboratory work.
- Lower the backpressure in the system.
- Replace leaking parts and connection elements without delay.
- Tighten loose connecting elements.
- Regularly check the leak-tightness of the tubings. If the instrument is used mainly in unattended operation, carry out weekly inspections.
- Use environmentally-friendly methods to dispose of escaping liquids.

Depending on the application, hardly visible deposits may form on the lenses with time. This may lead to higher absorption and can increase noise on the baseline.

If the baseline is very noisy and the problem is not caused by other parts of the system, the flow-through cell must be cleaned.

For the cleaning of the flow-through cell, we recommend a 3-step process:

1. Rinse the flow-through cell with methanol.
2. Rinse the flow-through cell with a different solvent.
3. Dismantle the flow-through cell and clean it manually.

Always start the cleaning process with step 1. If this does not solve the problem, perform step 2. Only perform step 3 if the deposits are persistent.

### Rinsing the flow-through cell with methanol

- 1 Disconnect the inlet capillary from the IC system.

**2** Connect the inlet capillary to a high-pressure pump or a peristaltic pump and rinse the flow-through cell as described below. Ensure that the maximum pressure of 5 MPa is not exceeded:

- Rinse the flow-through cell with ultrapure water to avoid precipitates.
- Rinse the flow-through cell with methanol for several minutes to dissolve the deposits.
- Rinse the flow-through cell again with ultrapure water for at least 15 minutes to wash away the dissolved deposits.

**3** Observe the baseline during the last rinsing with ultrapure water.

If the baseline is only slightly noisy, then the flow-through cell is clean.

If the noise on the baseline persists, rinse the flow-through cell once again with another solvent (*see "Rinsing the flow-through cell with another solvent", page 53*).

### Rinsing the flow-through cell with another solvent

A solvent made up of a 1:2 mixture of acetate and isopropanol has shown good results. Depending on the application, other solvents also prove efficient.

#### Prerequisites

- Rinsing with methanol was ineffective.
- The inlet capillary is connected to a high-pressure pump or a peristaltic pump.

**1** Rinse the flow-through cell as follows. Ensure that the maximum pressure of 5 MPa is not exceeded:

- Rinse the flow-through cell with ultrapure water to avoid precipitates.
- Rinse the flow-through cell for several minutes with the selected solvent to dissolve the deposits.
- Rinse the flow-through cell again with ultrapure water for at least 15 minutes to wash away the dissolved deposits.

**2** Observe the baseline during the last rinsing.

If the baseline is only slightly noisy, then the flow-through cell is clean.



If the noise on the baseline persists, the flow-through cell must be disassembled and cleaned manually (see "Dismantling and cleaning the flow-through cell manually", page 54).

### Dismantling and cleaning the flow-through cell manually



#### NOTE

Ex works, the retaining screws are tightened with a torque wrench. This guarantees a pressure stability up to 5 MPa (50 bar).

Once the flow-through cell has been opened and closed again manually, this maximum pressure stability is no longer guaranteed.

#### Prerequisites

- Rinsing the flow-through cell with solvent was ineffective.

#### Accessories

- Slotted screwdriver, size 5
- Seals (6.2764.000)

#### 1 Removing the flow-through cell

- Disconnect the inlet capillary and the outlet capillary.
- Loosen and remove the knurled screws.
- Remove the flow-through cell from the optical block.

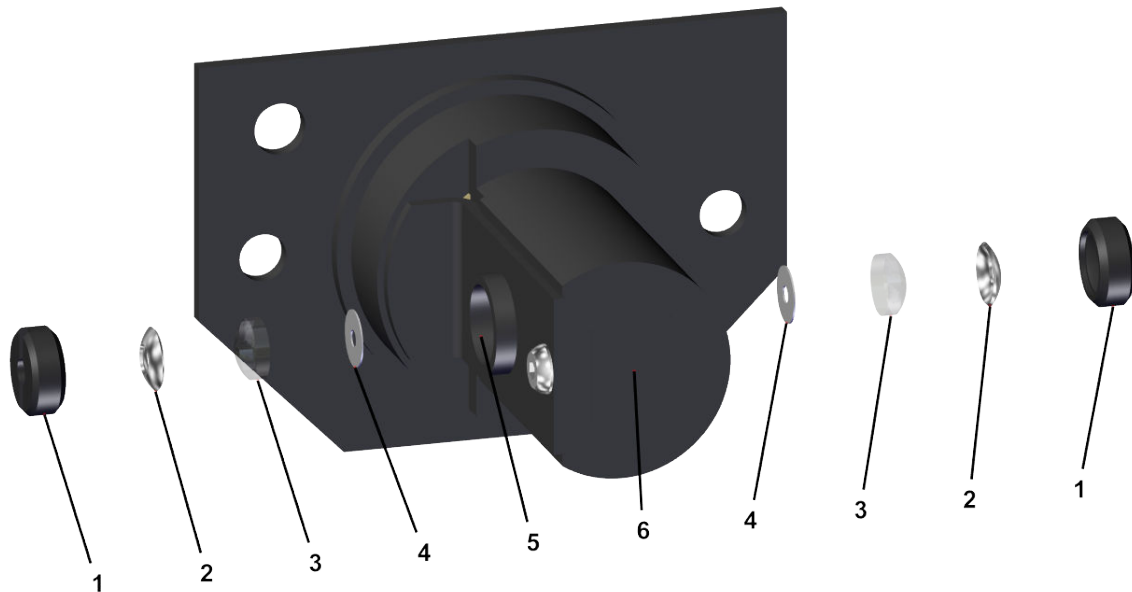


Figure 39 Flow-through cell – parts

<b>1 Retaining screw</b>	<b>2 Outer seal</b> The outer seal is attached to the retaining screw. When removing the flow-through cell, the outer seal does not have to be removed from the retaining screw.
<b>3 Lens</b>	<b>4 Inner seal</b>
<b>5 Measuring cell – opening</b>	<b>6 Cell holder</b>

## 2 Removing the lens

Loosen the retaining screw (39-1) with a slotted screwdriver, size 5, and remove it.

The outer seal is attached to the inside of the retaining screw (39-2). Remove the outer seal.

Carefully remove the lens (39-3) and the inner seal (39-4) from the measuring cell.

Put the lens onto a white paper. This allows you to see possible deposits. There are deposits that only absorb in the UV range. These deposits are not visible.

## 3 Cleaning the lens

Clean the lens with ultrapure water, methanol or another suitable solvent (depending on the application) and wipe with a lint-free cloth.



Rinse again with ultrapure water and dry with a lint-free cloth.

#### 4 Reinserting the lens

Insert a new inner seal (39-4) into the measuring cell. Make sure that the inner seal lies flat and centered in the recess of the measuring cell.

Reinsert the lens (39-3) with its flat side facing inwards. Make sure that the lens lies flat and centered in the recess of the measuring cell.

Insert a new outer seal (39-2) into the retaining screw (39-1).

Reinsert the retaining screw (39-1) and tighten it with a slotted screwdriver, size 5.

#### 5 Cleaning the second lens

Repeat steps 2 to 4 on the opposite side of the cell holder.

#### 6 Inserting the flow-through cell

Insert the flow-through cell such that the opening in the top right corner is aligned with the cylinder screw on the cell block.

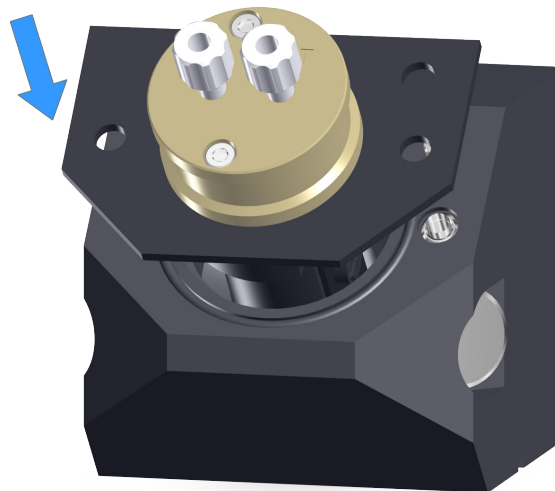


Figure 40 Inserting the flow-through cell

#### 7 Screwing in the knurled screws

Screw in the knurled screws again.

**NOTE**

In order to fix the flow-through cell in the correct position, tighten the two knurled screws symmetrically and with constant force.

Any tilting, twisting or canting of the flow-through cell influences the light incidence and thus the measuring results.

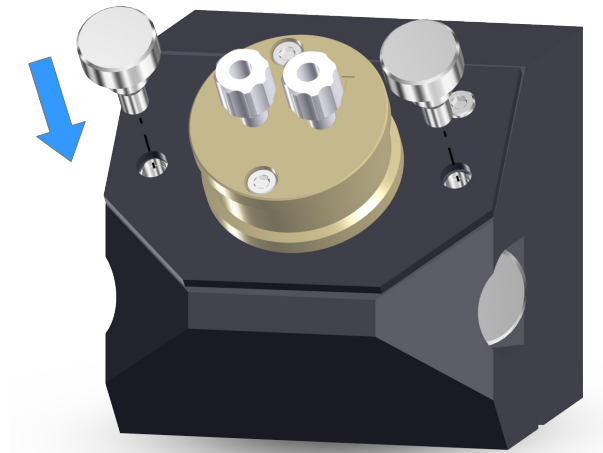


Figure 41 Screwing in the knurled screws



## 8 Technical specifications

### 8.1 Reference conditions

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

<i>Ambient temperature</i>	+25 °C (±3 °C)
<i>Instrument status</i>	> 60 min in operation with both lamps switched on.
<i>Wavelength</i>	
<i>UV range</i>	254 nm
<i>VIS range</i>	550 nm
<i>Data rate</i>	1000 ms
<i>Bandwidth</i>	10 nm
<i>Flow-through cell</i>	Flow-through cell PEEK (6.2839.130) installed
<i>Measurement duration</i>	1000 ms
<i>Eluent</i>	Ultrapure water
<i>Flow rate</i>	1 mL/min

### 8.2 UV/VIS detector

<i>Detector type</i>	
<i>Diode array detector</i>	1024 diodes
<i>Measuring range</i>	
<i>Absorption</i>	-2.0 - +2.0 AU
<i>Number of channels</i>	1 measuring channel, readable in analog mode
2.947.0010	
<i>Number of channels</i>	8 measuring channels, 1 of them readable in analog mode
2.947.0020	
<i>Resolution</i>	$4 \times 10^{-7}$ AU
<i>Noise UV range</i>	< 10 µAU at 254 nm and with the VIS lamp uninstalled or switched off
<i>Noise VIS range</i>	< 15 µAU at 550 nm and with the UV lamp uninstalled

*Drift*

*at reference conditions* < 0.3 mAU/h

*Wavelength range*

*Wavelength range  $\lambda$*  190 - 900 nm

*Bandwidth*  $\pm 1$  - 50 nm

*Accuracy, absolute*  $\pm 1$  nm at 360 nm  
 $\pm 3$  nm at 536 nm

*Stability*  $\pm 1$  nm (across temperature range)

*Optical resolution* 2.5 nm (at 254 nm)

*Measuring interval*

*Data rate for each channel* 0.5 - 10 samples/sec

*Integration duration* 15 - 247 ms

*Measurement duration* 100 - 2,000 ms

*Analog output*

*Voltage range* -1.0 - +1.0 V

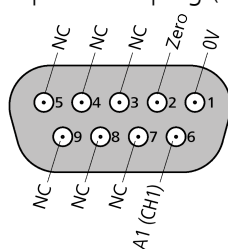
*Resolution* 0.5 mV

*Noise* < 0.5 mV

*Output impedance* 50  $\Omega$  (sustained short circuit-proof)

*Offset error*  $\pm 1.5$  mV

*Plug* 9-pin DSUB plug (female)

*Control input*

*Input voltage range* 0–5 V (5 V logic or switching contact control possible.)

*Impedance* 22 k $\Omega$  (permanent resistance up to 50 V. Secured against ESD.)

*Function* Zero on the channel of the analog output

### 8.3 Lamps

#### UV lamp

Type	D <sub>2</sub> (deuterium)
Power consumption	20 - 30 W
Service life	approx. 2,000 h

#### VIS lamp

Type	Halogen
Power consumption	5 - 15 W
Service life	approx. 5,000 h

### 8.4 Ambient conditions

#### Operation

Ambient temperature	+5 to +45 °C
Humidity	20–80% relative humidity
Altitude / Pressure range	max. 4,000 m.a.s.l. / min. 610 mbar Overvoltage category: II Pollution degree: 2

#### Storage and transport

Ambient temperature	–20 to +70 °C
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## 8.5 Dimensions

### Measurements

<i>Width</i>	370 mm
<i>Height</i>	131 mm
<i>Depth</i>	495 mm
<i>Weight</i>	10.7 kg

## 8.6 Housing

*Base tray, housing and bottle holder material* Polyurethane hard foam (PUR) with flame retardation for fire class UL94V0, CFC-free, coated

*IP degree of protection* IP 20

## 8.7 Controls

*Status display* LED

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

## 8.8 Power connection

*Required supply voltage* 100–240 V  $\pm$  10%

*Required frequency* 50–60 Hz  $\pm$  3 %

*Power consumption* 60 VA

## 8.9 Interfaces

### *USB*

*Input* 1 plug, type B (for connecting to a computer)

### *Further connections*

*Analog output/  
control input* 9-pin DSUB (female)

## 9 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**

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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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