DS2500 Solid Analyzer

Ω Metrohm

DS2500 Solid Analyzer

Manual

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1 Introduction

This manual gives you a comprehensive overview of the installation and maintenance of the DS2500 Solid Analyzer. The DS2500 Solid Analyzer is operated with the control software. You can find information on operating the instrument in the tutorial and in the manual for the control software.

> **i** **NOTICE**
> _____
>
> You can request application descriptions in the form of **Application Notes** and **Application Bulletins** from your Metrohm representative or download them from *http://www.metrohm.com*.

1.1 Instrument description

The DS2500 Solid Analyzer is a compact measuring instrument for reflection measurement in the near-infrared wavelength range. The polychromatic light is dispersed by the monochromator built into the DS2500 Solid Analyzer into monochromatic wavelengths before striking the sample. This reduces sample heating. The instrument operates in the range from 400 to 2500 nm.

The DS2500 Solid Analyzer is designed for quality monitoring in production processes and can be applied for the following purposes:

- Quick and non-destructive incoming goods inspection of raw materials
- Production process monitoring
- Final inspection of finished products

The DS2500 Solid Analyzer can be used to measure the following sample types:

- Solid samples: powders or granulated substances
- Liquid samples: liquids or suspensions

The DS2500 Solid Analyzer is a durable instrument that is resistant to moisture, dust, vibrations and temperature fluctuations. As a result, it can be operated in a variety of production facilities.

The DS2500 Solid Analyzer is designed for offline operation in the laboratory or atline operation in the production process.

The DS2500 Solid Analyzer is operated with the control software via an external computer.

1.2 Intended use

The DS2500 Solid Analyzer is designed for use in production facilities. The DS2500 Solid Analyzer can be used for incoming goods inspection or atline or offline for production process monitoring.

Usage requires the user to have basic knowledge and experience in handling chemicals. Knowledge with respect to the application of the fire prevention measures prescribed for laboratories is also required.

Adherence to this technical documentation and compliance with the maintenance specifications make up an important part of intended use.

Any utilization in excess of or deviating from the intended use is regarded as misuse.

Specifications regarding the operating values and limit values of individual products are covered in the "Technical specifications" section *(see chapter 6, page 36)*.

Exceeding and/or not observing the mentioned limit values during operation puts people and components at risk. The manufacturer assumes no liability for damage due to non-observance of these limit values.

The EU declaration of conformity loses its validity as soon as modifications are carried out on the products and/or the components.

1.3 About the documentation

> ### CAUTION
>
> Please read through this documentation carefully before putting the instrument into operation. The documentation contains information and warnings which the user must follow in order to ensure safe operation of the instrument.

1.3.1 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.
ℹ️	**CAUTION** This symbol draws attention to possible damage to instruments or instrument parts.
ℹ️	**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

Electrical safety when using the instrument is ensured in compliance with 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).

1.4.3   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.

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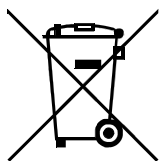
This product is covered by European Directive 2012/19/EU, WEEE – Waste Electrical and Electronic Equipment.

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 instrument

2.1   Front

Figure 1   Front DS2500 Solid Analyzer

1	Lid	2	Sampling window
3	LED display	4	Feet (shock-absorbing)
5	Lamp compartment		

2.2 Rear
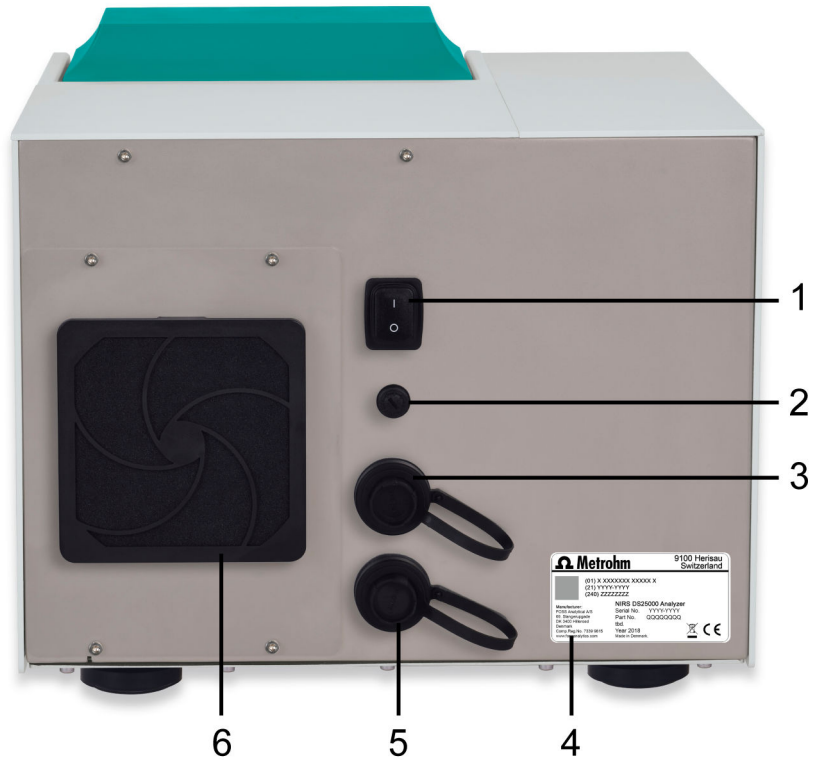
Figure 2   Rear DS2500 Solid Analyzer

1	**On/off switch**	**2**	**Fuse holder**
	For switching the instrument on and off.		

3	**Power socket**	**4**	**Type plate**
	Sealed with protective cap.		

5	**LAN connection socket**	**6**	**Fan**
	Sealed with protective cap.		With filter.

3   Installation

3.1   Unpacking and inspecting the instrument

3.1.1   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.

3.1.2   Checks

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

3.2   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   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. 0.75 mm^2 / 18 AWG
- Power plug:
    - according to customer requirement (6.2122.XX0)
    - min. 10 A

> **i**   **NOTICE**
>
> Do not use a not permitted power cord!

1 **Plugging in the power cord**

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

3.4   Connecting the data cable

In order to control the DS2500 Solid Analyzer, connect it to a computer either directly or via a local network (LAN).

For direct connection to the network card of a computer, use the supplied data cable.

Additional steps might be required for connecting via your local network. As network configurations vary considerably across different companies, exact details are not provided in this manual. Have your network specialist establish the connection between the instrument and the company network.

Connecting the computer directly

Accessories   - DS2500 data cable
- Computer with installed control software

1 Remove the protective cap from the LAN connection socket *(2-**5**)*.

2 Plug the cable into the LAN connection socket *(2-**5**)* and tighten it.

3 Connect the other end of the data cable to the computer's network cable connector.

3.5 Switching on the instrument

Switching on the instrument

1 Turn the on/off switch *(2-1)* to position **I**.

- The LED display on the front of the DS2500 Solid Analyzer *(1-3)* lights up.
- The instrument performs a self-test.
- The sample compartment lid opens.

2 Wait until the control software has recognized the instrument.

3.6 Initial start-up

The initial start-up of the instrument is always carried out with the control software.

You can find detailed information on the procedure in the tutorial for the control software.

3 Installation

3.7 Setting up accessories

Metrohm supplies various sample cups for your DS2500 Solid Analyzer:

Samples	Sample vessels	Order number
Nonhomogenous, solid samples in large quantities	DS2500 large sample cup	6.7402.050
Nonhomogenous, solid samples in small quantities	Mini sample cup, 10 pieces incl. 100 disposable backs	6.7402.030
	DS2500 holder for sample cup	6.7430.040
Solid sample in sample vial	DS2500 Iris	6.7425.100
	DS2500 holder for sample cup	6.7430.040
Several sample vials with solid samples	MultiSample Cup 15 mm	6.7490.440
	MultiSample Cup 19 mm	6.7490.450
	MultiSample Cup 22 mm	6.7490.460
	MultiSample Cup 28 mm	6.7490.470
Liquid samples and suspensions	Transflection kit for liquid samples	6.7400.010
	DS2500 holder for sample cup	6.7430.040
Creams and pastes	DS2500 Slurry Cup	6.7490.430

3.7.1 Analyzing nonhomogenous, solid samples in large quantities

Inserting the DS2500 large sample cup

Required accessories
- DS2500 large sample cup (6.7402.050)

1 Clean the sample cup and the sampling window with a lens cleaner cloth.

2 Fill the sample cup with the sample.

Make sure that the glass bottom of the sample cup is completely covered and that the layer of sample is at least 1 cm thick.

3 Place the sample cup onto the sampling window.

3.7.2 Analyzing nonhomogenous, solid samples in small quantities

Inserting the mini sample cup

Required accessories
- Mini sample cup (6.7402.030)
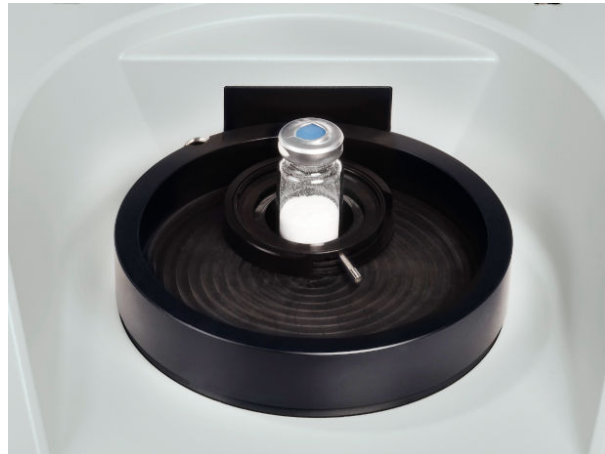- DS2500 holder for sample cup (6.7430.040)

1 Clean the sample cup and the sampling window with a lens cleaner cloth.

2 Fill the powder into the sample cup.

Make sure that the glass bottom of the sample cup is completely covered and that the layer of sample is at least 1 cm thick.

Seal the sample cup with the disposable back.

3 Place the sample cup holder onto the sampling window.

Place the sample cup into the round opening of the holder.

3.7.3   Analyzing solid samples in sample vials

Inserting the DS2500 Iris

Required accessories
- DS2500 Iris (6.7425.100)
- DS2500 holder for sample cup (6.7430.040)

1 Clean the sample cup and the sampling window with a lens cleaner cloth.

2 Fill the sample vial with the sample.

Make sure that the glass bottom of the sample vial is completely covered and that the layer of sample is at least 1 cm thick.

3 Place the sample cup holder onto the sampling window.

Place the DS2500 Iris into the round opening of the holder.

4 Place the sample vial into the opened DS2500 Iris.

Close the iris around the sample vial.

3.7.4 Analyzing samples in several sample vials

Inserting the MultiSample Cup

Required accessories   ■ MultiSample Cup (6.7490.4x0)

| 1 | Clean the sample cup and the sampling window with a lens cleaner cloth. |

| 2 | Fill sample vials with the samples. |

Make sure that the glass bottom of the sample vials is completely covered and that the layer of sample is at least 1 cm thick.

| 3 | Place the sample cup onto the sampling window. |

| 4 | Place the sample vials into the positions of the sample cup. |

3.7.5 Analyzing samples and suspensions

Inserting the mini sample cup and the Transflection kit for liquid samples

Required accessories
- Transflection kit for liquid samples (6.7400.010)
- DS2500 holder for sample cup (6.7430.040)

1 Clean the sample cup and the sampling window with a lens cleaner cloth.

2 Fill liquid sample to a height of approx. 1 cm into the sample cup.

Place the gold diffuse reflector into the liquid. Avoid air pockets while doing so.

3 Place the sample cup holder onto the sampling window.

Place the transflection vessel into the round opening of the holder.

3.7.6 Analyzing creams and pastes

Inserting the DS2500 Slurry Cup and the transflection kit for liquid samples

Required accessories
- DS2500 Slurry Cup (6.7490.430)
- Transflection kit for liquid samples (6.7400.010)

1   Clean the sample cup and the sampling window with a lens cleaner cloth.

2   Fill the sample cup with the sample to about 5 mm.

Place the gold diffuse reflector into the sample. Avoid air pockets while doing so.

3   Place the sample cup holder onto the sampling window.

Place the transflection vessel into the round opening of the holder.

4 Operation

The DS2500 Solid Analyzer is operated with the control software.

You can find more information on working with the control software in the tutorial for the control software.

5 Maintenance

The DS2500 Solid Analyzer requires appropriate care. Excessive soiling of the instrument leads to functional disruptions and shortens the service life of the durable mechanical and electronic components.

5.1 Maintenance by Metrohm Service

Maintenance of the DS2500 Solid Analyzer is best carried out as part of an annual service appointment by Metrohm specialist personnel. If you work with caustic and corrosive chemicals, a shorter maintenance interval is required.

Metrohm Service offers every form of technical advice for maintenance and servicing of all Metrohm instruments.

5.2 Maintenance by the user

Table 1   Maintenance tasks and intervals

Maintenance task	Maintenance interval
Performance test in the regulated area *(see 8.105.8032 Tutorial Vision Air Local and 8.105.8036 Tutorial Vision Air Network and Server)*	weekly
Performance test in the non-regulated area *(see 8.105.8032 Tutorial Vision Air Local and 8.105.8036 Tutorial Vision Air Network and Server)*	monthly
Clean the instrument *(see chapter 5.2, page 19)*	when necessary
Clean the sampling window	before every measurement
Replace the lamp *(see chapter 5.2, page 19)*	After a burning time of 3,500 hours or if the *Performance Test* or the *Instrument diagnostic Test* yields unsatisfactory results
Check the fan filter and replace it if necessary *(see chapter 5.2, page 19)*	monthly

Maintenance task	Maintenance interval
Replace the fuse	if blown

(see chapter 5.2, page 19)

5.2.1   Cleaning the instrument

The instrument requires appropriate care. Excess soiling of the instrument may result in functional disruptions and a reduction in the service life of the durable mechanical and electronic components.

Clean the instrument using a lint-free cloth and ethanol.

> **NOTICE**
>
> Do not use aggressive solvents such as acetone. Aggressive solvents can damage the surfaces of the instrument.

> **CAUTION**
>
> **Spillage of chemicals or solvents**
>
> Damage to the instrument due to spillage of chemicals or solvents!
>
> - 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.

5.2.2   Replacing the lamp

Replace the lamp once it is blown or when its performance is insufficient. Signs of insufficient lamp performance include:

- Noise impairs the measurements.
- The repeatability of the wavelengths deteriorates.
- The performance test is no longer completed successfully.

Removing the lamp

Accessories
- Screwdriver

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.

WARNING

Hot surface

Danger of burning due to hot lamp. The lamp is extremely hot immediately after operation.

- Allow the lamp to cool down for approx. 10 to 15 minutes.
- Remove the lamp carefully.

NOTICE

Clean the instrument before replacing the lamp. This prevents dust from damaging the lamp's reflector.

> **NOTICE**
>
> **Spare part**
>
> A new spare lamp is available from your Metrohm representative under the article number 6.7430.050.
>
> - We recommend keeping spare lamps in stock.
> - Only use original lamps in the instrument.

1 Switching off the instrument

- Turn the on/off switch *(2-1)* to the position **O**.

2 Disconnecting the instrument from the energy supply

- Disconnect the power cord.
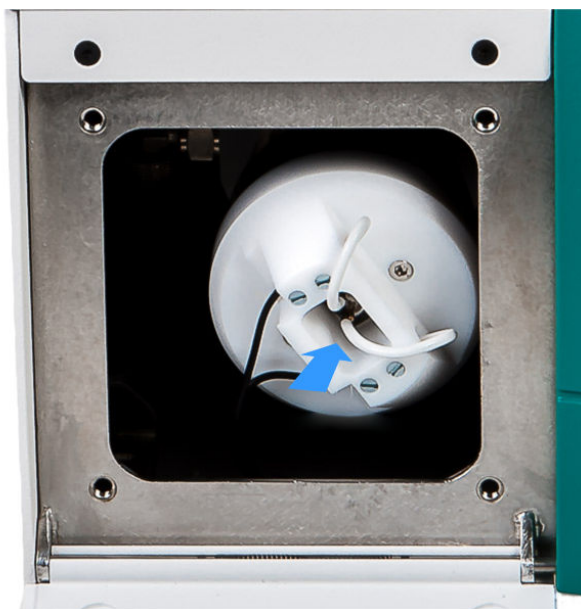- Wait 10 to 15 minutes until the lamp has cooled down.

3 Opening the lamp compartment

- Open the lid of the lamp compartment *(1-5)*.
- Take the hex key out of the guide rail.
- Unscrew the four sealing plate screws using the hex key and put them aside.
- Remove the sealing plate and put it aside.
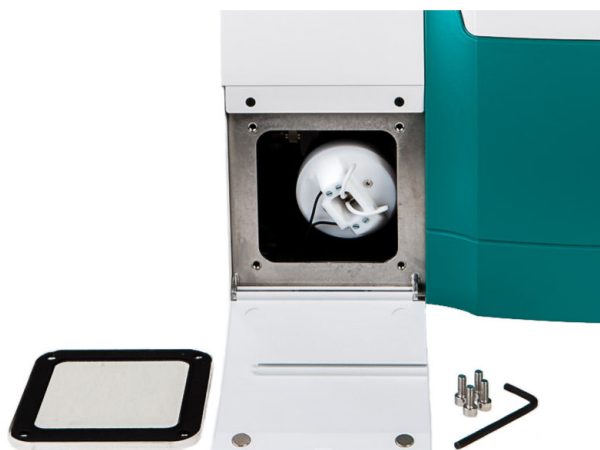
4 **Removing the lamp holder**

- Push the 2 mm white lamp holder inwards.

- Rotate the white lamp holder 45° counterclockwise.
- Carefully pull the white lamp holder out straight.
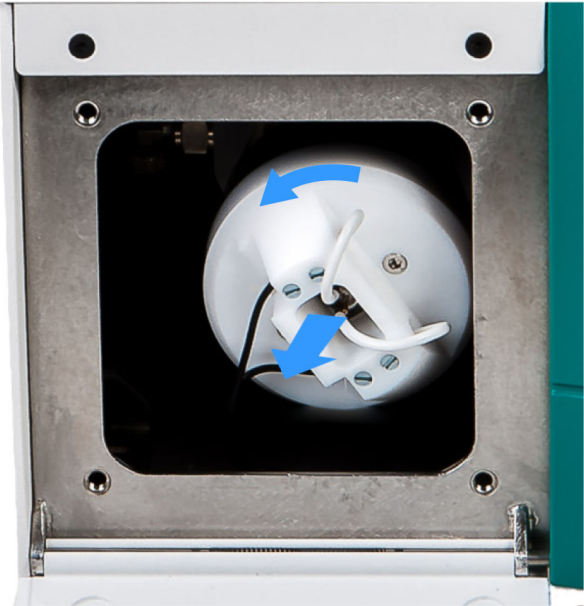
- Place the lamp on the lid with the reflector facing down.
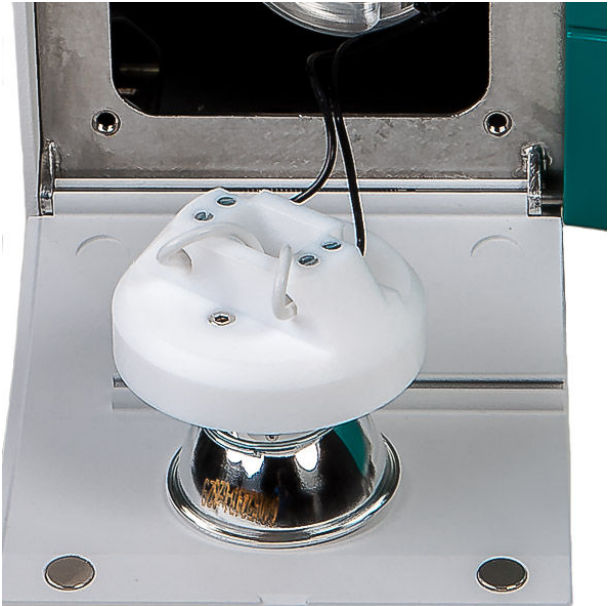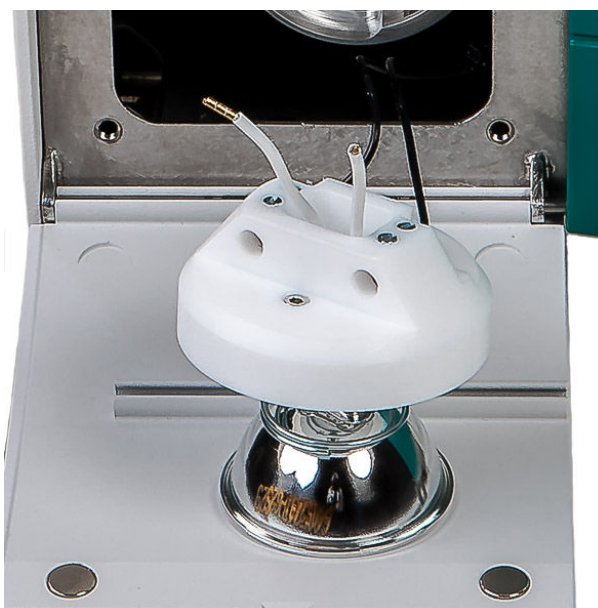

5 **Disconnecting the cables**

> ⓘ **CAUTION**
>
> **Functional disruption**
>
> Do **not** unscrew the screw terminals of the black cables.
>
> Only unscrew the screw terminals of the white cables.

- Loosen the screw terminals of the white cables using a small screwdriver.

- Carefully remove the cables from the terminals.
- Bend the cables upwards so that they stand vertically.

6 **Removing the lamp from the holder**
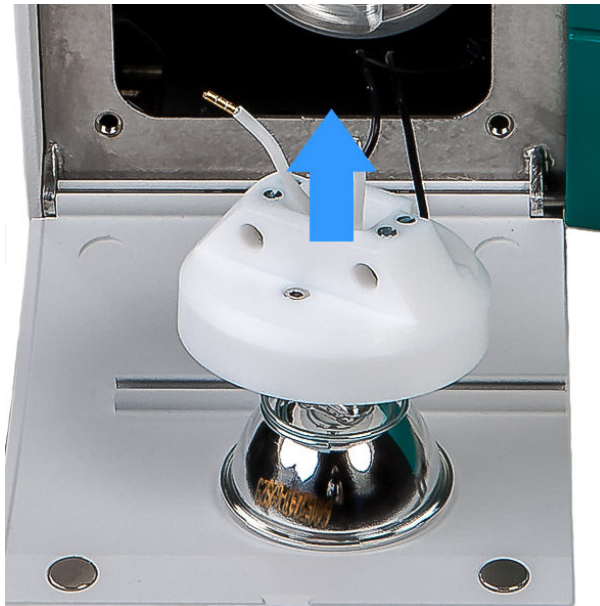
- Hold the lamp by the reflector.
- Lift the lamp holder off the lamp and the cables.

TIP: Bend the cables to mark the lamp as used.

Installing a new lamp

Accessories
- Spare lamp (6.7430.050)
- Screwdriver

> **CAUTION**
>
> **Damage to the lamp**
>
> Fingerprints and greasy deposits damage the lamp.
>
> Do not touch either the glass part of the lamp or the inside of the reflector.

1 Keeping the new lamp ready

- Take the new lamp out of the packaging.
- Position the lamp cables upright so that the cables will fit through the rectangular opening of the lamp holder.
- Place the lamp on the lamp compartment lid with the reflector facing down.
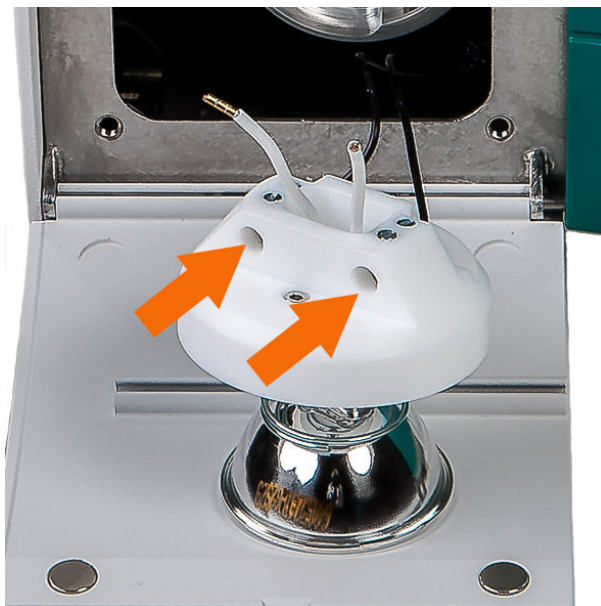

2 Inserting the lamp into the lamp holder

- Guide the lamp cables through the rectangular opening of the lamp holder.
- Attach the lamp holder to the cable side of the lamp. The spring on the lamp holder keeps the lamp in the correct position.
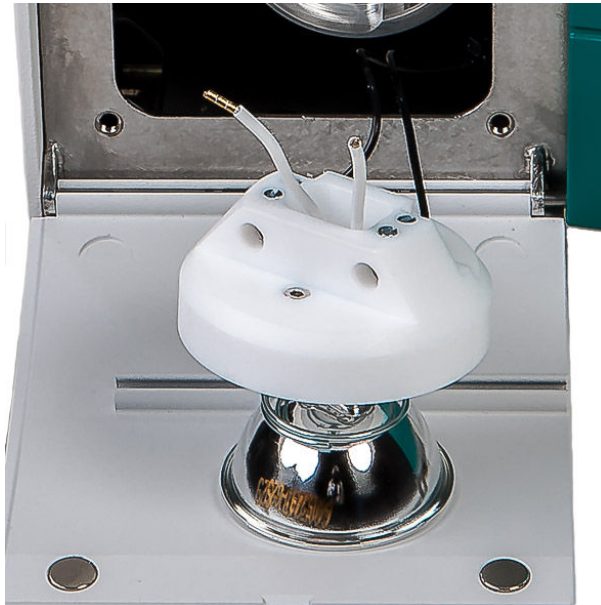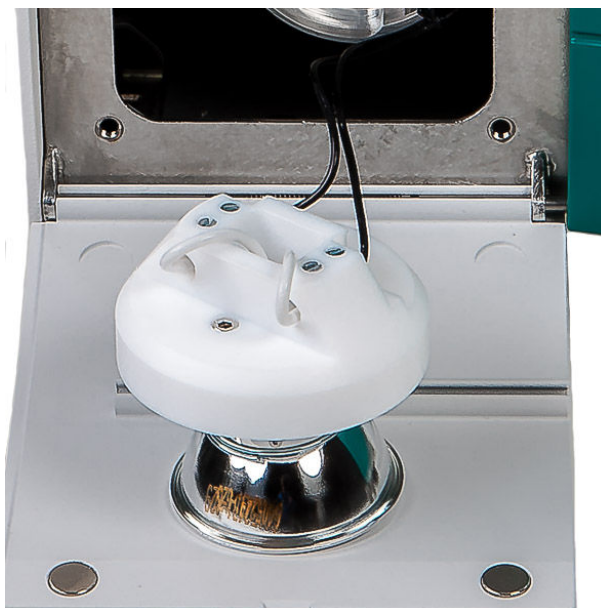
3 **Connecting the lamp cables**

- Push the two white cables all the way into the corresponding screw terminal by hand or using tweezers.
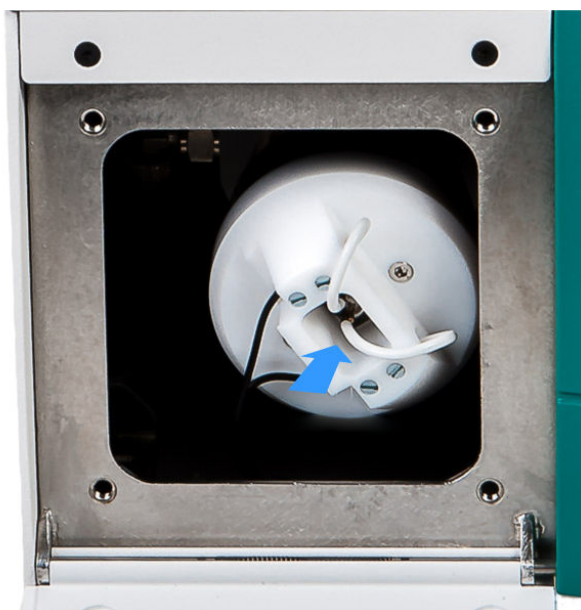

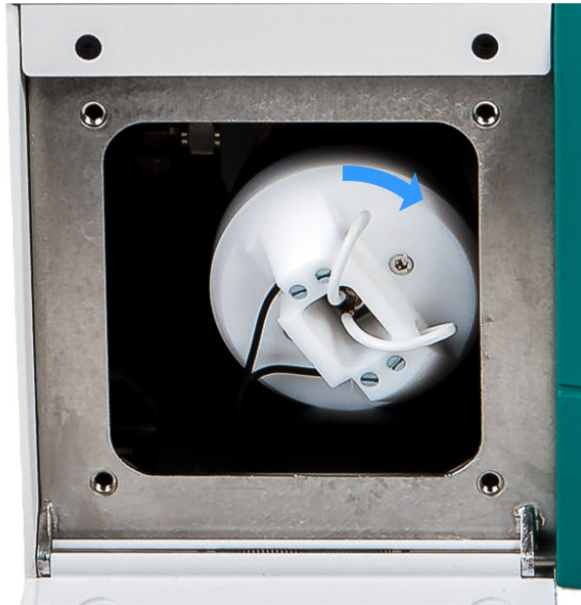- Tighten the screw terminals using the small screwdriver.

4 **Inserting the lamp holder**

- Push the white lamp holder carefully all the way into the opening.

- Rotate the white lamp holder 45° clockwise.

- Let go of the white lamp holder.

5 | **Closing the lamp compartment**

- Place the sealing plate onto the opening. Make sure that no cables are being pinched.
- Insert the four screws and tighten them in crosswise sequence using the hex key.
- Push the hex key into the guide rail on the lid.
- Close the lid.

6 | **Calibrating the instrument**

Recalibrate the instrument every time a lamp is replaced.

- Switch on the instrument.
- Wait for at least 2 hours while the instrument warms up.
- Recalibrating the instrument *(see 8.105.8032 Tutorial Vision Air Local and 8.105.8036 Tutorial Vision Air Network and Server).*

5.2.3 Replacing the fan filter

Clean the fan filter at least once a month. If the instrument is operated in a dusty or otherwise dirty environment, check the fan filter weekly or twice a week as necessary.

The fan is on the rear of the instrument. The filter cover is attached to the fan filter by means of four plastic latches.

Replacing the fan filter

Accessories
- Fan filter, if replacement is required.

1 Switching off the instrument
- Turn the on/off switch *(2-1)* to the position **O**.
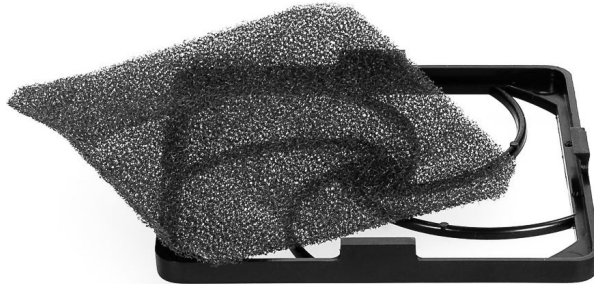

2 Removing the filter cover

Grab the filter cover with both hands and take it off starting from the top and then proceeding to the sides.

3 Checking the state of the filter

Take out the filter and inspect it carefully.

- If you cannot see any small tears in the filter, clean the filter and reinstall it.
- If the filter is damaged, install a new filter.

4 | **Cleaning the filter**

- Blow out the dirty filter with a compressed air duster spray.
- Alternative: Rinse the dirty filter with clean water and allow to dry.

5 | **Mounting the filter**

Place the new or cleaned filter symmetrically into the filter cover.

Do not crumple or fold the filter. The edges must form a good seal.

6 **Mounting the filter cover**

Mount the filter cover to the frame starting on the bottom and push it in place until all latches snap in.

7 **Switching on the instrument**

Turn the on/off switch *(2-1)* to the position **I**.

5.2.4   Replacing a fuse

The fuse is located in the fuse holder *(2-2)* on the rear of the instrument, directly underneath the on/off switch *(2-1)*.

Replacing the fuse

Accessories
- Spare fuse type: 250 V, 5 A, slow-acting fuse, 20 mm

1 Switching off the instrument
- Turn the on/off switch *(2-**1**)* to the position **O**.

  NOTICE

Unplug the power cord as well. This prevents the instrument from being switched on accidentally while you insert the fuse.

2 Removing the faulty fuse
- Unscrew the fuse holder *(2-**2**)* by hand or, if necessary, unscrew the holder using a size 5 flat-head screwdriver.
- Take the faulty fuse out of the holder.

3 Inserting the new fuse
- Insert a new fuse of the same type into the holder.

- Place the fuse holder back into the opening on the rear of the instrument and tighten by hand.

4 Switching on the instrument

- Plug the power cord back in.
- Turn the on/off switch *(2-1)* to the position **I**.

6 Technical specifications

6.1 Interfaces

Ethernet connection socket	Ethernet connector for data transmission to a PC

6.2 Power connection

Nominal voltage range	100–240 V (±10%, autosensing)
Frequency	50 and 60 Hz (autosensing)
Power consumption	max. 90 W
Protection	5 AT

6.3 Ambient conditions

Nominal function range	5 - 40 °C At max. 60% humidity, non-condensing
Storage	−20 - 70 °C At max. 93% humidity, non-condensing

6.4 Dimensions

Measurements	
Length	490 mm
Width	375 mm
Height	300 mm (closed) 534 mm (opened)
Weight	27 kg
Additional free space	at least 200 mm (on the sides and rear)

6.5   Housing

Material	Steel sheet
	Aluminum
	ABS - Acrylonitrile butadiene styrene
IP degree of protection	65

7 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. **2.922.0010**) 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.

ℹ	**NOTICE**

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.

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