OMNIS Sample Robot Oven

2.1030.0010/2.1030.10x0

Manual

8.1030.8001EN / v5 / 2026-01-31

Metrohm

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

Disclaimer

Deficiencies arising from circumstances that are not the responsibility of Metrohm, such as improper storage or improper use, etc., are expressly excluded from the warranty. Unauthorized modifications to the product (e.g., conversions or attachments) exclude any liability on the part of the manufacturer for resulting damage and its consequences. Instructions and notes in the Metrohm product documentation must be strictly followed. Otherwise, Metrohm's liability is excluded.

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1 Overview

1.1 OMNIS Sample Robot Oven – Product description

The OMNIS Sample Robot Oven is used for automated thermal sample preparation in Karl Fischer titration. The oven method is particularly suitable for samples that do not release their water until higher temperatures have been reached, for sparingly soluble samples or those that react with the Karl Fischer reagent.

When combined with an OMNIS Titrator or an OMNIS Coulometer, the OMNIS Sample Robot Oven creates the ideal analysis system for automatic coulometric or volumetric Karl Fischer moisture content determination with the oven technology.

The sample heated in the oven module releases its moisture in the form of water vapor, which is conveyed into a titration vessel with the aid of a gas flow. An air pump is installed to generate the gas flow. An inlet valve is available for nitrogen or other inert gases. The moisture can be determined in the titration vessel using Karl Fischer titration.

1.2 OMNIS Sample Robot Oven – Product versions

The product is available in the following version:

Table 1 Product versions

Article number	Designation	Version feature
2.1030.0010	OMNIS Sample Robot Oven	
2.1030.1010	OMNIS Sample Robot Oven	1x 6 mL oven module installed
2.1030.1020	OMNIS Sample Robot Oven	2x 6 mL oven module installed
2.1030.1030	OMNIS Sample Robot Oven	1x 8 mL oven module installed

1.3 Oven module – product versions

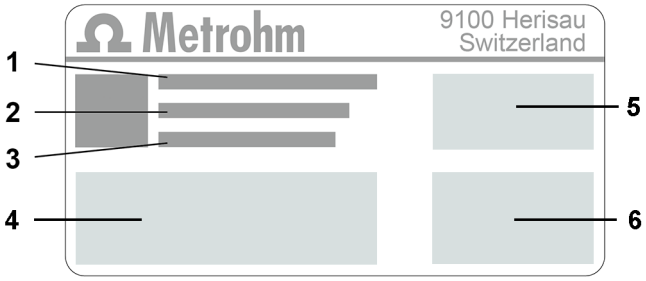
The product is available in the following versions:

Table 2 Product versions

Article number	Designation	Version feature
2.1017.0010	Oven Module	OMNIS Oven Module 2R
2.1017.1000	Oven Module	OMNIS Oven Module 6 mL
2.1017.1010	Oven Module	OMNIS Oven Module 8 mL

Information on function licenses is available on the *Metrohm website* or from the regional Metrohm representative.

The article number and serial number for identification of the product can be found on the type label:



1	**(01) = Article number in accordance with GS1 standard**	**2**	**(21) = Serial number**
3	**(240) = Metrohm article number**	**4**	**Certification**
5	**Certification**	**6**	**Technical specifications**

1.4 About the documentation

Possible depictions in the documentation:

Depiction	Meaning
*(5-**12**)*	Cross-reference to figure legend (Figure number - ***Element in the figure***)
1	Instruction step
Method	Parameters, menu items, tabs, and dialogs
File ▶ **New**	Menu path
[Continue]	Button or key
	Supplementary information to the descriptive text
	Note In graphics, orange arrows or frames indicate the reference to the descriptive text. The relevant elements may also be colored orange.
	Movement In graphics, blue arrows indicate the movement direction. The elements to be moved may also be colored blue.

1.5 Further information

Additional information on the product is available on the following pages:

- Metrohm website *https://www.metrohm.com* – Overview of product family, documents as PDF, details of accessories, and information on applications.
- Help for the OMNIS Software *https://guide.metrohm.com* – Thematically filtered information on OMNIS Software.

1.6 Displaying the accessories

Up-to-date information on the scope of delivery and on optional accessories can be found on the Metrohm website.

1 Searching for a product on the website

- Go to *https://www.metrohm.com*.
- Click on .
- Enter the article number of the product into the search field and press **[Enter]**.
  - Article number: *OMNIS Sample Robot Oven – Product versions, chapter 1.2, page 1*
- In the result list, click on the desired product.

Detailed information regarding the product is displayed.

2 Displaying the accessories

- Scroll down (accessories subject to availability):
  - Included parts
  - Optional parts

3 Downloading the accessories list (included and optional parts)

- Click on to download the accessories list as a PDF.

Metrohm recommends keeping the downloaded PDF for reference purposes.

2 Safety

2.1 Intended use

Metrohm products are used for the analysis and handling of chemicals.

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

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 contained in the "Technical specifications" section, if relevant.

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

2.2 Responsibility of the operator

The operator must ensure that basic regulations on occupational safety and accident prevention in chemical laboratories are observed. The operator has the following responsibilities:

- Instruct personnel in the safe handling of the product.
- Train personnel in the use of the product according to the user documentation (e.g. install, operate, clean, eliminate faults).
- Train staff on basic occupational safety and accident prevention regulations.
- Provide personal protective equipment (e.g. protective glasses, gloves).
- Provide suitable tools and equipment to carry out the work safely.

The product may be used only when it is in perfect condition. The following measures are required to ensure the safe operation of the product:

- Check the condition of the product before use.
- Remedy defects and malfunctions immediately.
- Maintain and clean the product regularly.

2.3 Requirements for operating personnel

Only qualified personnel may operate the product. Qualified personnel are persons who meet the following requirements:

- Basic regulations on occupational safety and accident prevention for chemical laboratories are known and complied with.
- Knowledge of handling hazardous chemicals is present. Personnel have the ability to recognize and avoid potential dangers.
- Knowledge regarding the application of fire prevention measures for laboratories is available.
- Safety-relevant information is communicated and understood. The personnel can operate the product safely.
- The user documentation has been read and understood. The personnel operate the product according to the instructions in the user documentation.

2.4 Safety instructions

2.4.1 Danger from electrical potential

Contact with electrical potential can cause serious injuries or death. To avoid danger from electrical potential, observe the following:

- Operate the product only if it is in perfect condition. The housing must also be intact.
- Only use the product with the covers fitted. If covers are damaged or missing, disconnect the product from the energy supply and contact the regional Metrohm service representative.
- Protect live components (e.g. power supply unit, power cord, connection sockets) against moisture.
- Always have maintenance work and repairs on electrical components carried out by a regional Metrohm service representative.
- Disconnect the product from the energy supply immediately if at least one of the following cases occurs:
  - The housing is damaged or open.
  - Live parts are damaged.
  - Moisture penetrates.

2.4.2 Danger from biological and chemical hazardous substances

Contact with biological hazardous substances may cause poisoning from toxins or infections from microorganisms. Contact with aggressive chemical substances may cause poisoning or chemical burns. To avoid danger from biological or chemical hazardous substances, observe the following:

- Label the product according to regulations if it is used for substances that have a potential for chemical hazards and are generally subject to the Hazardous Substances Ordinance.
- Wear personal protective equipment (e.g. protective glasses, gloves).
- Use exhaust equipment when working with vaporizing hazardous substances.
- Dispose of hazardous substances in accordance with regulations.
- Clean and disinfect contaminated surfaces.
- Only use detergents that do not cause any unwanted side reactions with the materials to be cleaned.
- Dispose of chemically contaminated materials (e.g. cleaning material) in accordance with regulations.
- Proceed as follows in case of a return shipment to Metrohm AG or a regional Metrohm representative:
  - Decontaminate the product or product component.
  - Remove the labeling for hazardous substances.
  - Create a declaration of decontamination and enclose it with the product.

2.4.3 Danger from highly flammable substances

Using highly flammable substances or gases may cause fires or explosions. To avoid danger from highly flammable substances, observe the following:

- Avoid ignition sources.
- Use protective grounding.
- Use exhaust equipment.

2.4.4 Danger from leaking liquids

Leaking liquids may cause injuries and may damage the product. To avoid danger from leaking liquids, observe the following:

- Check the product and its accessories for leakages and loose connections.
- Replace leaking components and connecting elements without delay.
- Tighten loose connecting elements.
- Do not loosen tubing connections under pressure.
- Do not remove aspiration tubing under pressure.
- Carefully pull the tubing ends out of the vessels.
- Carefully allow liquids from the tubing to drain into suitable vessels.
- Insert the tubing tips completely into the vessels.
- Remove and dispose of escaping liquids in accordance with regulations.
- If you suspect that liquid has penetrated the instrument, disconnect the instrument from the energy supply. Then have the instrument checked by a regional Metrohm service representative.

2.4.5 Danger during transport of the product

Chemical or biological substances may be spilled during the transport of the product. Parts of the product may fall down or may be damaged. There is a risk of injury from chemical or biological substances and pieces of broken glass. To ensure safe transport, observe the following:

- Remove loose parts (e.g. sample racks, sample vessels, bottles) before transport.
- Remove liquids.
- Lift and transport the product with both hands on the base plate.
- Lift and transport heavy products only according to instructions.

2.4.6 Dangers from hot surfaces and liquids

Contact with hot surfaces or hot liquids may cause burns. To avoid the risk of injury, observe the following:

- Install and use the protective devices enclosed with the product.
- Allow hot surfaces to cool down before working on the product.
- Wear heat-resistant protective gloves.
- Clean up spilled liquids and solids immediately.

2.4.7 Dangers due to automated motion sequences

Product parts that move automatically (e.g. robot arm) can cause injuries due to crushing or clamping. To avoid the risk of injury, observe the following:

- Do not reach into the working area while work processes are running.
- Install the protective devices enclosed with the product according to instructions and operate the product only with these protective devices.
- Do not bypass the installed protective devices.

2.5 Design of warning messages

The present documentation uses warning messages as follows.

Structure

1. Severity of the danger (signal word)
2. Type and source of danger
3. Consequences of disregarding the danger
4. Measures for averting the danger

Hazard levels

Signal color and signal word designate the hazard level.

DANGER

Indicates an immediate danger. It will result in serious injuries or death if not avoided.

WARNING

Indicates a potential danger. Failure to avoid the danger may result in death or serious injury.

CAUTION

Indicates a potential danger. If not avoided, it may result in light or minor injuries.

NOTICE

Indicates a potentially damaging situation. If not avoided, the product or something in the surrounding area could be damaged.

2.6 Meaning of warning signs

Warning signs on the product or in the documentation indicate potential dangers or draw attention to certain behaviors in order to avoid accidents or damage.

Depending on the application purpose, the operating company attaches additional warning signs to the product. The corresponding instructions of the operator must be followed.

Table 3 Warning signs according to ISO 7010 (examples)

Warning signs / meaning		Warning signs / meaning	
	General warning sign		Warning of hot surface
	Warning of sharp object (cut/ puncture)		Warning of hand injuries (crushing)
	Warning of electrical voltage		Warning of corrosive substances
	Warning of optical radiation		Warning of a laser beam
	Warning of flammable materials		Warning of biological hazard
	Warning of toxic materials		

3 Functional description

3.1 OMNIS Sample Robot Oven

The OMNIS Sample Robot Oven consists of the following components:

- OMNIS Main Module S – Oven
- A maximum of 2 oven modules

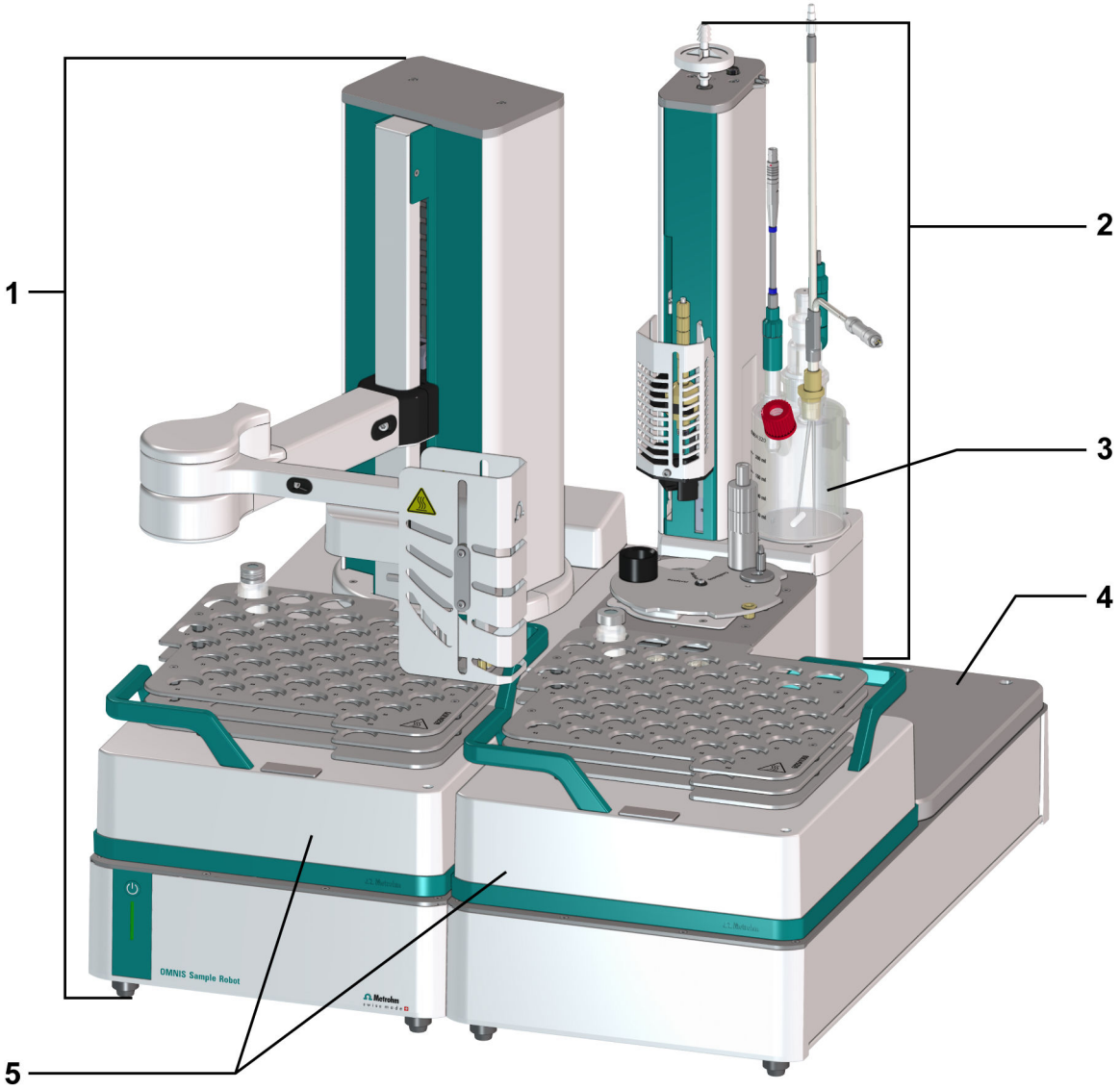


Figure 1 OMNIS Sample Robot Oven – Overview

1	**OMNIS Main Module S – Oven**	**2**	**Oven module**

3	**Titration cell**	**4**	**Dummy panel**
5	**OMNIS sample rack**		

3.1.1 OMNIS Main Module S – Oven

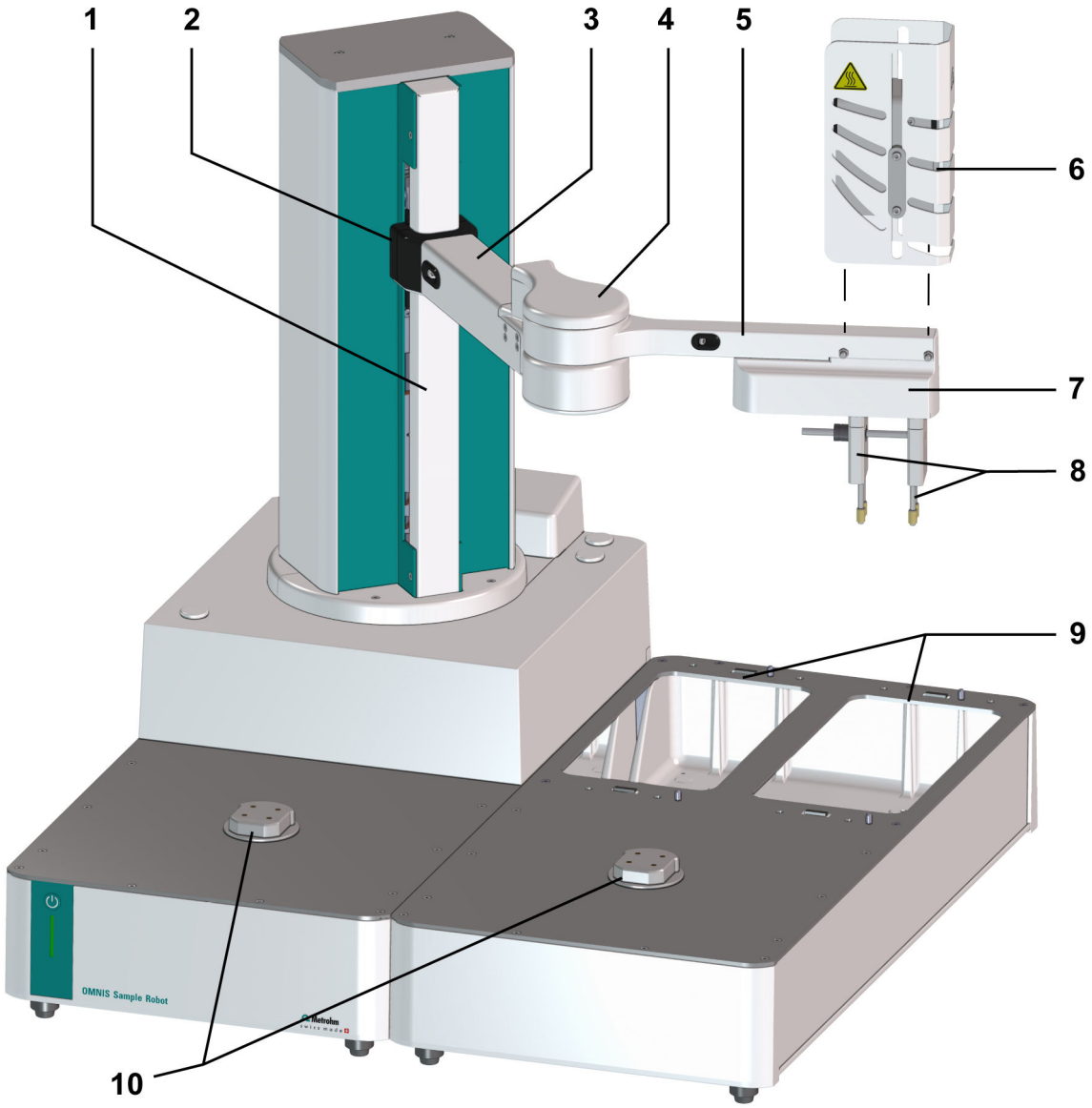


Figure 2 OMNIS Main Module S – Oven – Overview

1	**Main lift**	**2**	**Arm holder**
3	**Lift arm**	**4**	**Arm joint**
5	**Gripper arm**	**6**	**Safety shield (6.02700.010)** (optional)

7	**Gripper**	**8**	**Gripper fingers (6.02601.050)**
9	**Module slot**	**10**	**Rack holder**

The OMNIS Main Module S – Oven supplies all of the attached modules in the OMNIS sample robot system with electricity. The control hardware is integrated in the interior of the OMNIS Main Module S – Oven.

The main lift *(2-**1**)* with the robot arm of the sample robot is located on the OMNIS Main Module S – Oven. The arm holder (*(2-**2**)*) is used to move the robot arm on the main lift. The robot arm consists of the lift arm *(2-**3**)*, the arm joint *(2-**4**)*, and the gripper arm *(2-**5**)*. The gripper fingers *(2-**8**)* are mounted on the gripper *(2-**7**)*. The safety shield *(see "Mounting the safety shields", chapter 5.10, page 43)* protects you from contact with hot surfaces.

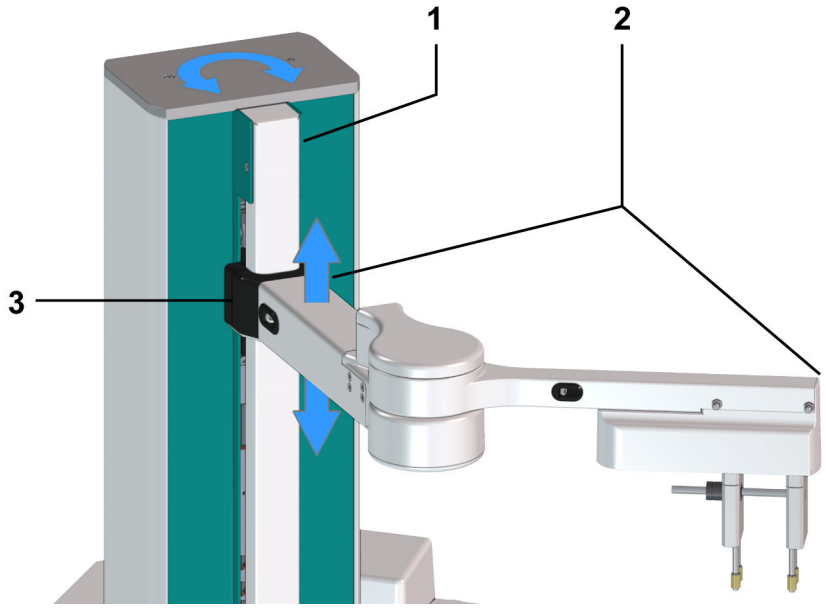


Figure 3 Main lift oven – Movement capacity

1	**Main lift**	**2**	**Robot arm**
3	**Arm holder**		

The main lift *(3-**1**)* can be rotated to the left and right. The arm holder *(3-**3**)* on the main lift moves the robot arm *(3-**2**)* up and down.

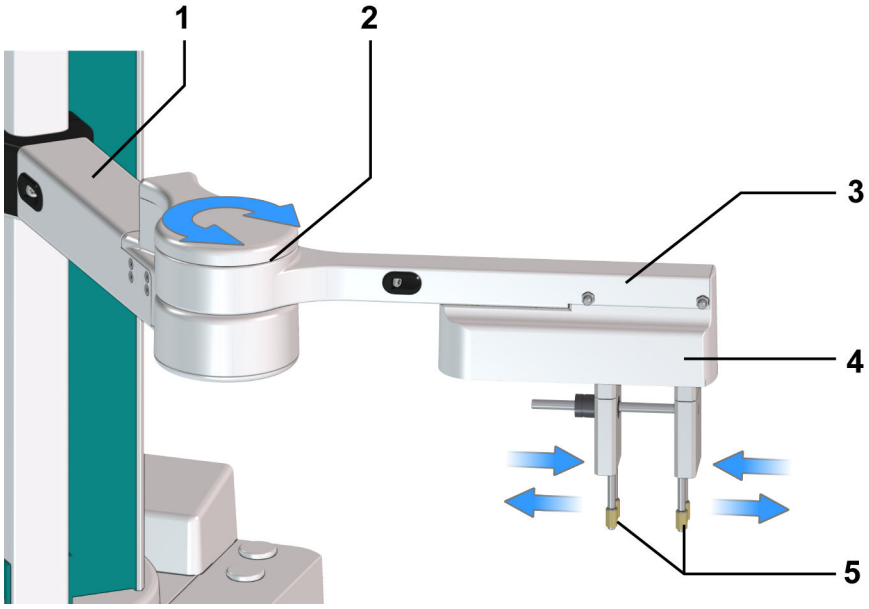


Figure 4 Robot arm – Movement capacity

1	**Lift arm**	**2**	**Arm joint**
3	**Gripper arm**	**4**	**Gripper**
5	**Gripper fingers**		

The arm joint *(4-**2**)* can be used to rotate the gripper arm *(4-**3**)* to the left and right. The gripper *(4-**4**)* can open and close the gripper fingers *(4-**5**)* in order to grasp and hold sample vials.

3.1.2 Oven module – Overview

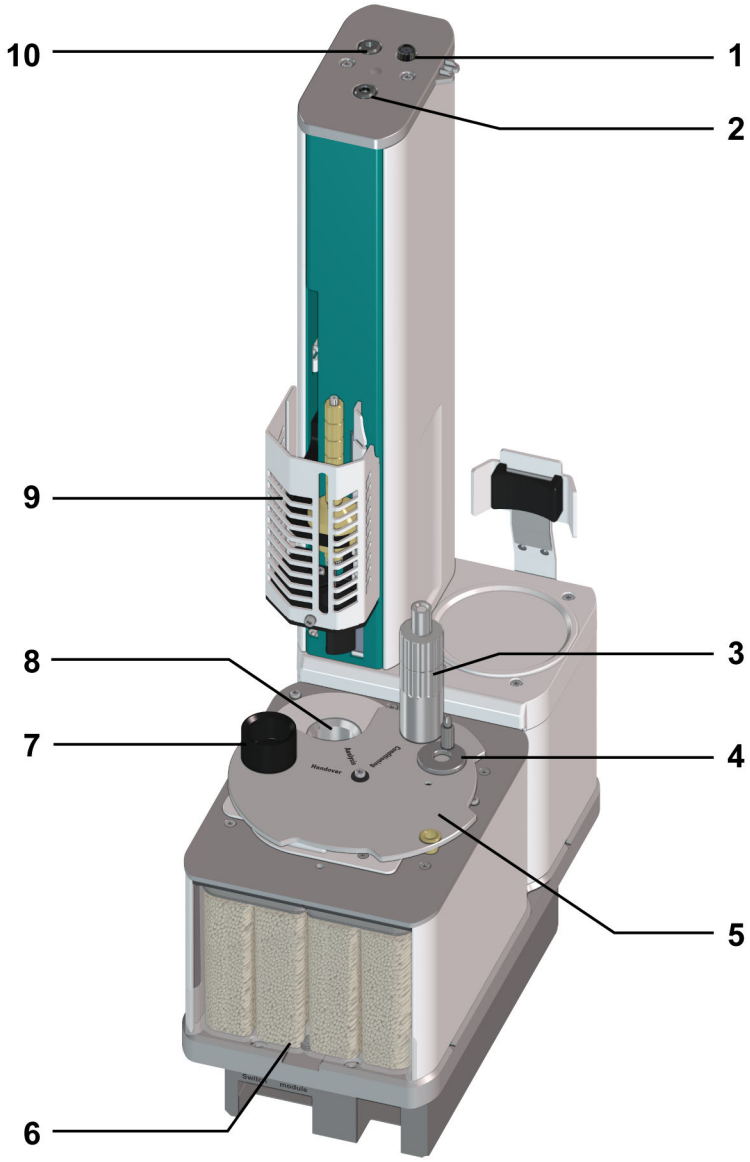


Figure 5 Oven module – Front

1	**Heating tube connection**	**2**	**Air pump inlet** with dust filter (6.2724.010)
3	**Conditioning tube** with screw cap and septum	**4**	**Adjustment tool** Adjustment pin and centering disk for adjustment of the needle system
5	**Turntable**	**6**	**Adsorber cartridge (6.01807.010)**

7	**Vial cradle**	**8**	**Oven**
9	**Needle system – with safety shield**	**10**	**Gas outlet** with M6 thread for FEP tubing (6.1805.470)

Three different positions can be actuated with the turntable *(5-**5**)*:

- Handover
- Analysis
- Conditioning

At the handover position, the vial cradle *(5-**7**)* is located under the needle system. At the analysis position, the recess in the turntable is located under the needle system so that the needle system can move into the oven. At the conditioning position, the conditioning tube *(5-**3**)* is located under the needle system.

1. The conditioning tube is located under the needle system during conditioning.
2. At the same time, the vial cradle is in the position that can be actuated from the OMNIS Main Module.
3. As soon as conditioning is completed, the sample vial needs to be transferred into the oven by the vial cradle. Transporting the sample vial from the vial holder into the oven (and vice versa) can be achieved by a selective combination of lift movements and turntable rotations.
4. Inlet and outlet needle piece the septum. A dry gas flow conducts the vaporized water into the Karl Fischer titration cell.

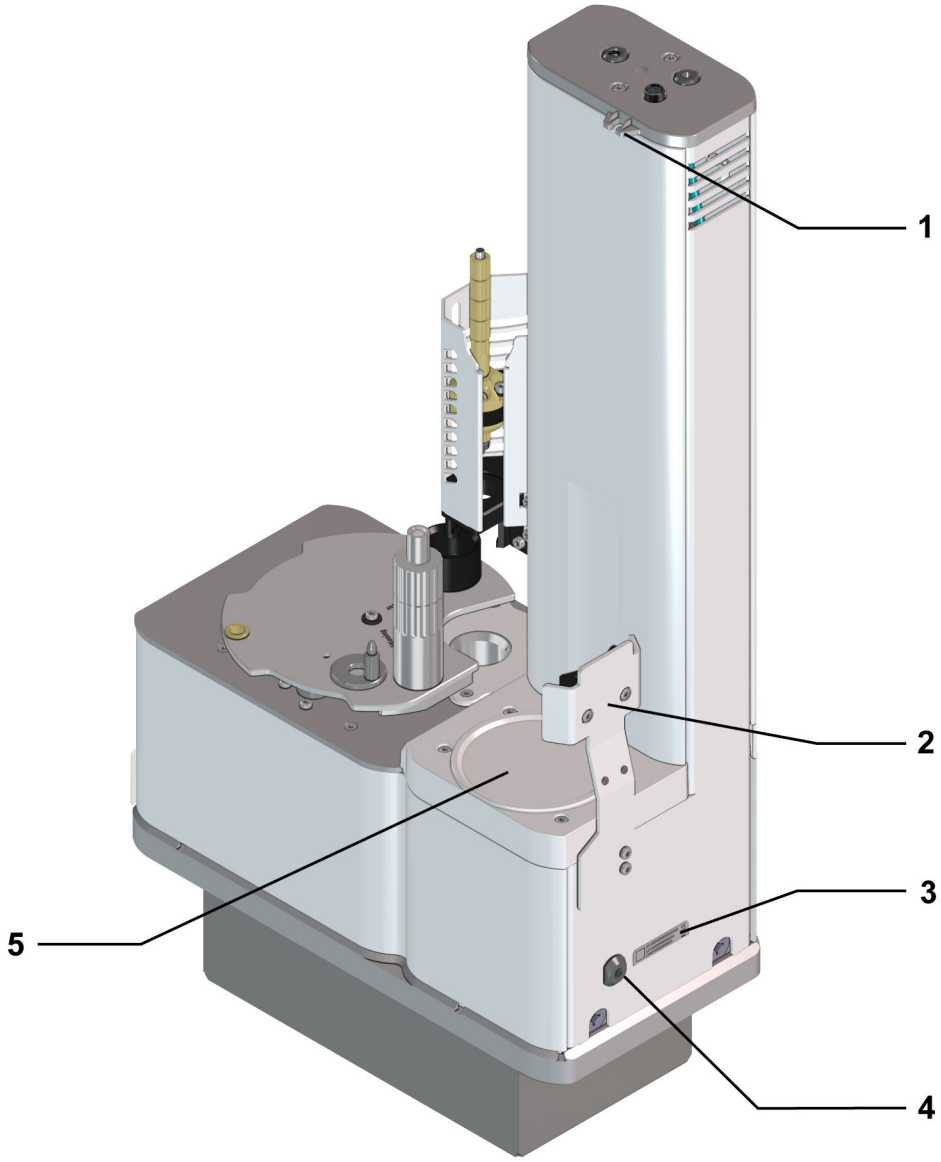


Figure 6 Oven module – rear

1	**Cable holder** for heating tubing cable	**2**	**Titration cell holder**
3	**Type label**	**4**	**Gas inlet** to connect a pressure line or a gas bottle
5	**Magnetic stirrer**		

At the gas inlet *(6-**4**)*, gas (e.g. nitrogen) can be fed in from a pressure line or gas bottle.

See also

Needle system (chapter 3.1.3, page 17)

3.1.3 Needle system

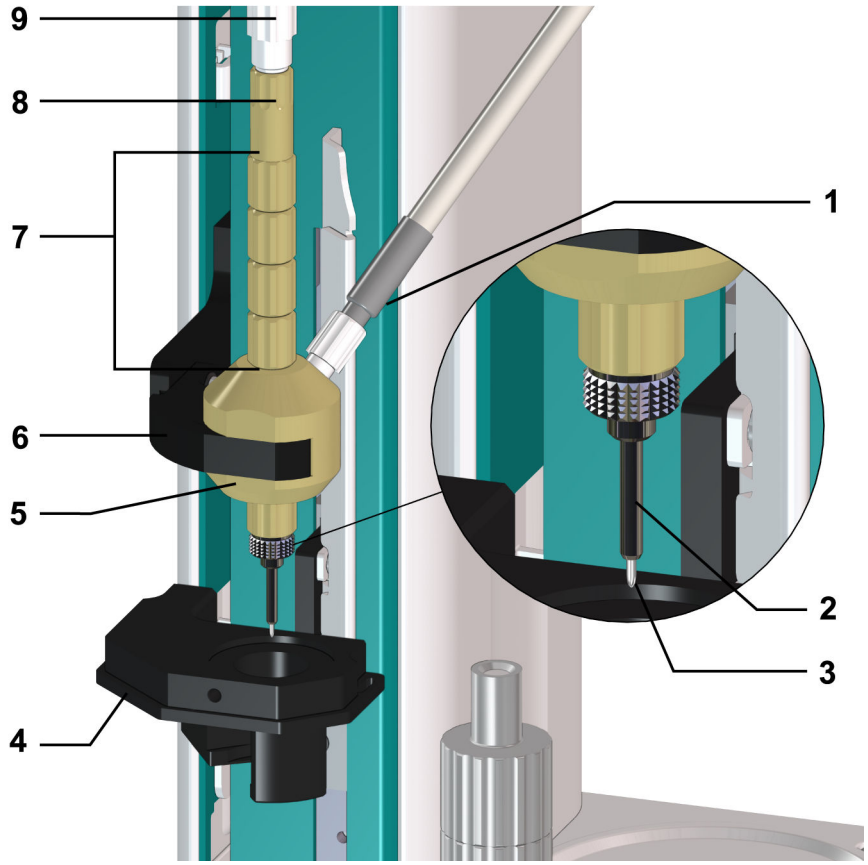


Figure 7 Needle system – Overview

1	**Heating tubing (6.1830.050)**	**2**	**Outlet needle (6.2816.080)**
3	**Septum piercing needle (6.2816.070)**	**4**	**Vial holder**
5	**Distributor**	**6**	**Distributor holder**
7	**Spacer (6.2049.060)**	**8**	**Needle holder**
9	**FEP tubing (6.1805.470)**		

The needle system is mounted on the oven module lift. The needle holder *(7-**8**)* and the spacer *(7-**7**)* ensure that the septum piercing needle *(7-**3**)* is directly above the sample (e.g. powder) or completely immersed in the sample (e.g. oil). If a sample vial is in the oven, then the needle system will move downwards. Septum piercing needle *(7-**3**)* and outlet needle *(7-**2**)* pierce the sample vial septum.

Dry air or another dry gas (e.g. nitrogen) enter the sample vial through the septum piercing needle via the FEP tubing *(7-**9**)*. The gas flows through the sample and efficiently removes the contained moisture. The moisture

enters the heating tubing *(7-**1**)* through the outlet needle and then into the Karl Fischer titration cell.

See also

Oven module – Overview (chapter 3.1.2, page 14)

3.1.4 Coulometric Karl Fischer titration cell

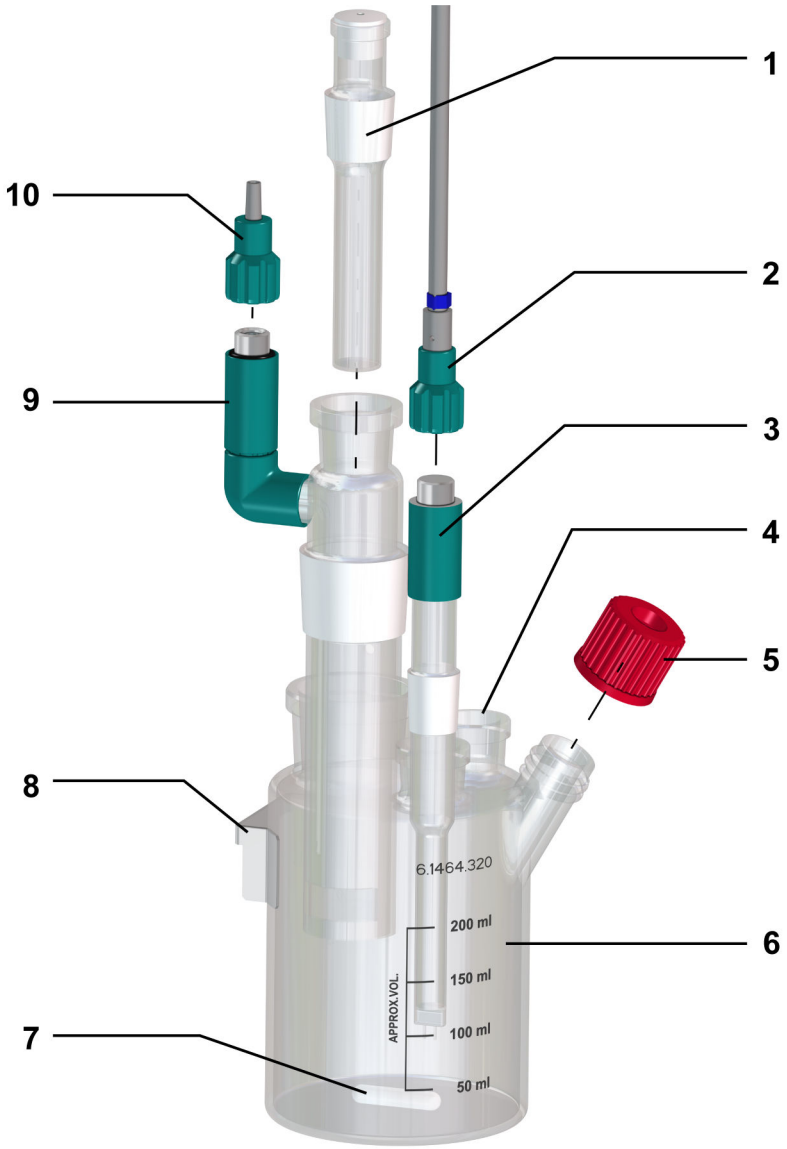


Figure 8 Coulometric Karl Fischer titration cell (equipped) – Overview

1 Adsorber tube (6.1403.030)
With ground-joint sleeve NS19 (6.2713.020)

2 Indicator electrode cable (6.02104.0X0)
With blue coding for polarizable metal electrodes

3	**Indicator electrode** With ground-joint sleeve NS14 (6.2713.000) e.g. double Pt wire electrode for coulometry (6.0341.100)
4	**Opening for application versions** Ground-joint stopper NS14 (6.1437.000) with ground-joint sleeve (6.2713.000) *(see "Accessories for use with oven technology", page 21)*
5	**Screw cap (6.2701.040)** with septum inserted (6.1448.020) for manual sample addition
6	**Karl Fischer titration cell / 80–250 mL / coulometric (6.1464.320) or Karl Fischer titration cell made of amber glass / 80–250 mL / coulometric (6.1464.323)**
7	**Stirring bar** 25 mm (6.1903.030)
8	**Metal clip for titration cell holder**
9	**Generator electrode** With ground-joint sleeve (6.2713.010) Without diaphragm (6.00349.100) or with diaphragm (6.00348.100)
10	**Generator electrode cable (6.2104.6X0)** With gray coding for generator electrodes

3.1.5 Volumetric Karl Fischer titration cell

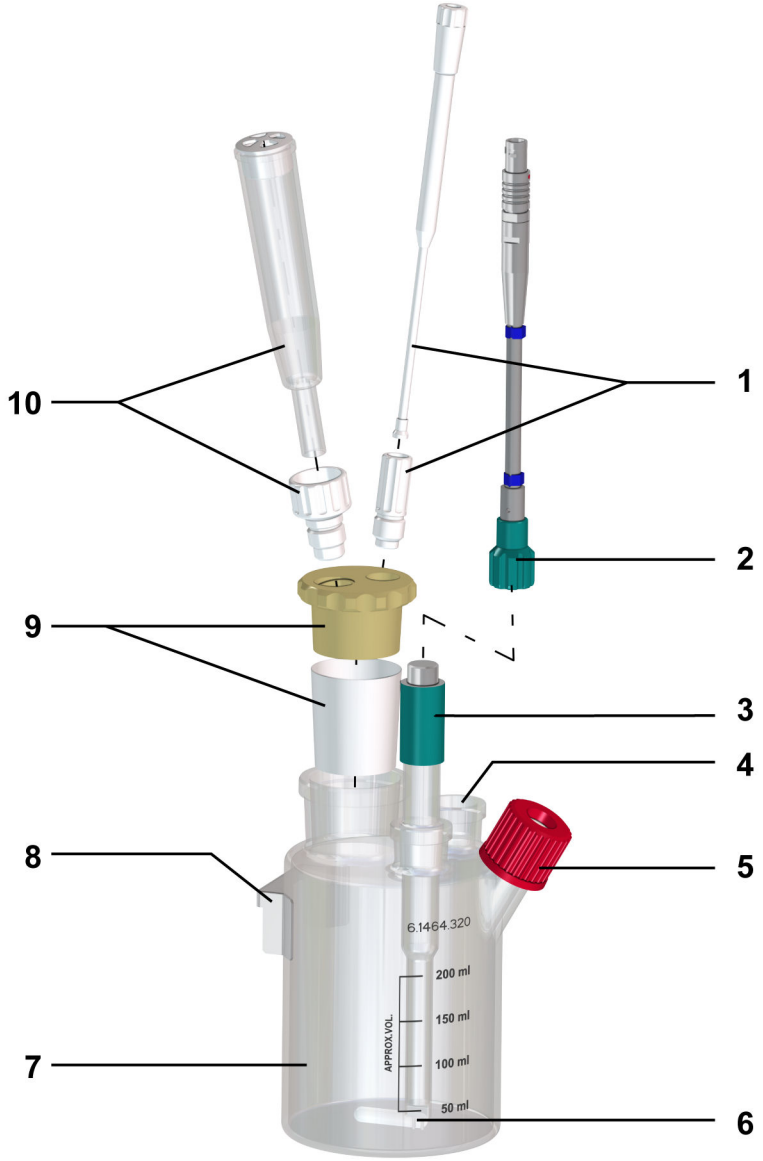


Figure 9 Volumetric Karl Fischer titration cell (equipped) – Overview

1	**Antidiffusion tip (6.01543.120) or titration tip (6.1543.200)** with screw nipple (6.02709.010)	**2**	**Indicator electrode cable (6.02104.0X0)** with blue coding for polarizable metal electrodes
3	**Indicator electrode** with ground-joint sleeve NS14 (6.2713.000), e.g. double Pt wire electrode for coulometry (6.0341.100)	**4**	**Opening for application versions** Ground-joint stopper (6.1437.000) with ground-joint sleeve NS14 (6.2713.000)

5	**Septum cap** with septum (6.1448.020) and screw cap (6.2701.040) inserted for manual sample addition	**6**	**Stirring bar** 25 mm (6.1903.030)
7	**Titration cell (6.1464.320) or Karl Fischer titration cell made of amber glass / 80–250 mL / coulometric (6.1464.323)**	**8**	**Metal clip for titration cell holder**
9	**Stopper (6.1446.240)** with ground-joint sleeve NS29 (6.2713.010)	**10**	**Adsorber tube (6.01406.010)** with screw nipple (6.02709.030)

3.1.6 Accessories for application versions

Different accessories are used in the opening for application versions of the Karl Fischer titration cell, depending on the type of application.

Accessories for use with oven technology

Table 4 Accessories supplied

Accessories	Article number	Figure
Adapter for OMNIS heating tubing	6.1446.230	

Table 5 Optional accessories

Accessories	Article number	Figure
Adapter for heating tubing and reagent replacement with OMNIS Solvent Module	6.1446.200	

Accessories	Article number	Figure
Adapter for heating tubing and reagent replacement with OMNIS Dosing Module	6.1446.210	

3.1.7 Adsorber cartridge and adsorber tube

An adsorber cartridge is present in the oven module. The following adsorber tubes are used, depending on the use of the Karl Fischer titration cell and the type of reagent addition.

Table 6 Adsorber cartridge / adsorber tube

Adsorber cartridge / adsorber tube	Article number	Figure
Adsorber cartridge for the oven module	6.01807.010	
Adsorber tube for coulometric Karl Fischer titration cell (for use in the generator electrode)	6.1403.030	
Adsorber tube for volumetric Karl Fischer titration cell	6.01406.010	

Adsorber cartridge / adsorber tube	Article number	Figure
Adsorber tube for cylinder unit	6.1619.020	

3.1.8 OMNIS sample rack

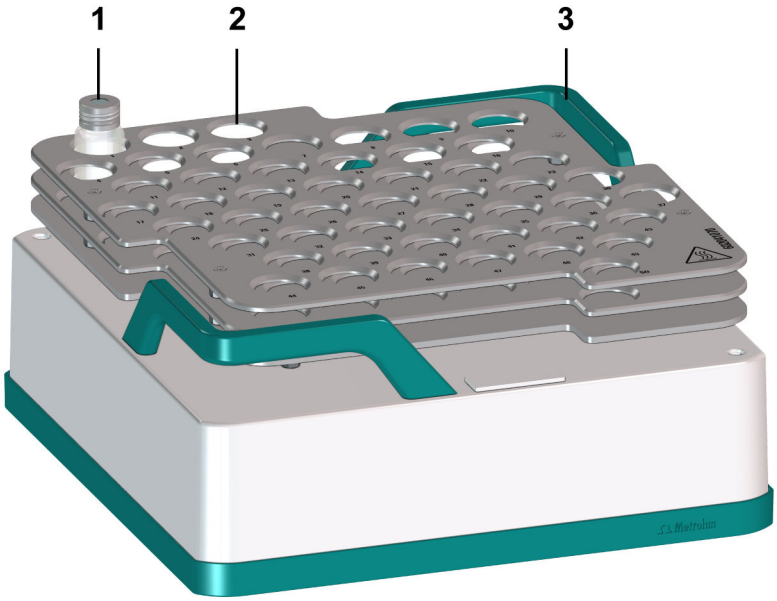


Figure 10 OMNIS sample rack – Overview

1	**Sample vial**	**2**	**Sample position**
3	**Transport handle**		

In the OMNIS sample rack, sample vials *(10-**1**)* are placed in sample positions *(10-**2**)*.

The transport handles *(10-**3**)* allow the OMNIS sample rack to be transported by hand so that it can be set down on or removed from the rack holder of the rack base.

Sensors in the rack holders let the system know if and what OMNIS sample racks are in place. If a OMNIS sample rack is removed, then the system will register the missing OMNIS sample rack. Consequently, this OMNIS sample rack can no longer be approached and it is displayed as absent in the OMNIS Software.

The OMNIS sample rack is not dishwasher-safe.

CAUTION

Use of different sample vials

If different sample vials are used on the same rack, then correct positioning of the sample vials is not ensured. Lost or incorrectly positioned sample vials could damage the OMNIS Sample Robot Oven.

- Use only the correct sample vial version in the OMNIS sample rack.

The following OMNIS sample rack are available:

Table 7 Sample rack variants

Sample rack variant	Article number
OMNIS sample rack 50 x 6 mL	6.02041.060
OMNIS sample rack 50 x 8 mL	6.02041.070
OMNIS sample rack 77 x 2R	6.02041.140

3.1.9 Sample vial

The hermetically sealed sample vessels allow the samples to be filled directly on site. The PTFE-coated septa guarantee a constant, unaltered water content, even after prolonged downtimes. There are different versions of sample vials in different sizes and with different volumes and types of cap.

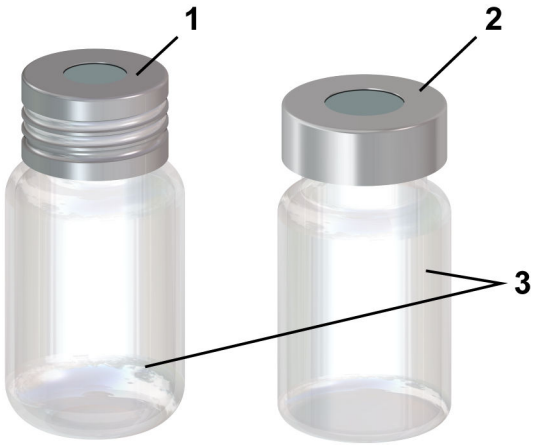


Figure 11 Sample vials – Overview

1	**Screw cap with septum**	**2**	**Aluminum septum cap**
3	**Sample vial**		

The following sample vials are available:

Table 8 Sample vial versions

Volume	Article number sample vial	Article number cap	Remark
6 mL	6.2419.000	6.1448.050	1000 pieces, aluminum septum cap
6 mL	6.2419.007	6.1448.057	100 pieces, aluminum septum cap
8 mL	6.2420.007	6.1448.067	100 pieces, screw cap with septum

3.2 Indicators and controls

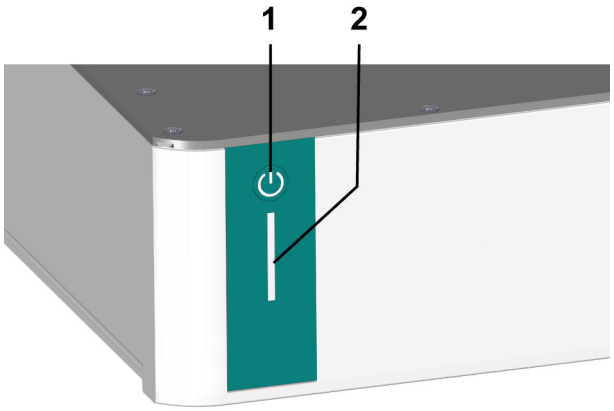


Figure 12 Indicators and controls

1 **On/off switch**

2 **Status display**
multi-colored

Table 9 Behavior of the on/off switch

Pressure duration	Function	Type of beep
Press briefly (1 s)	Switching on the device	A beep sounds as soon as the LED flashes yellow (instrument can be reserved by an OMNIS system)
Press briefly (2 s)	Shut down the instrument	Beep after 2 s
Press and hold (approx. 5 s)	Gripper opens	Dual beeps

See also

Switching on and off (chapter 6.1, page 51)

System – Signals (chapter 3.3, page 26)

3.3 System – Signals

System components with status indicators show their operating status with colors and/or flashing patterns. The meaning of the colors and flashing patterns is explained in the following table.

Visual signal		Meaning
	LED lights up yellow.	System start or initialization
	LED flashes yellow (slowly).	Ready for connection setup or locking
	LED flashes yellow (fast).	Connection setup started or locking underway
	LED lights up green.	Ready for operation
	LED flashes green (slowly).	In operation
	LED flashes red (fast).	Malfunction or error

Some system components only use part of the explained flashing patterns.

3.4 Connectors

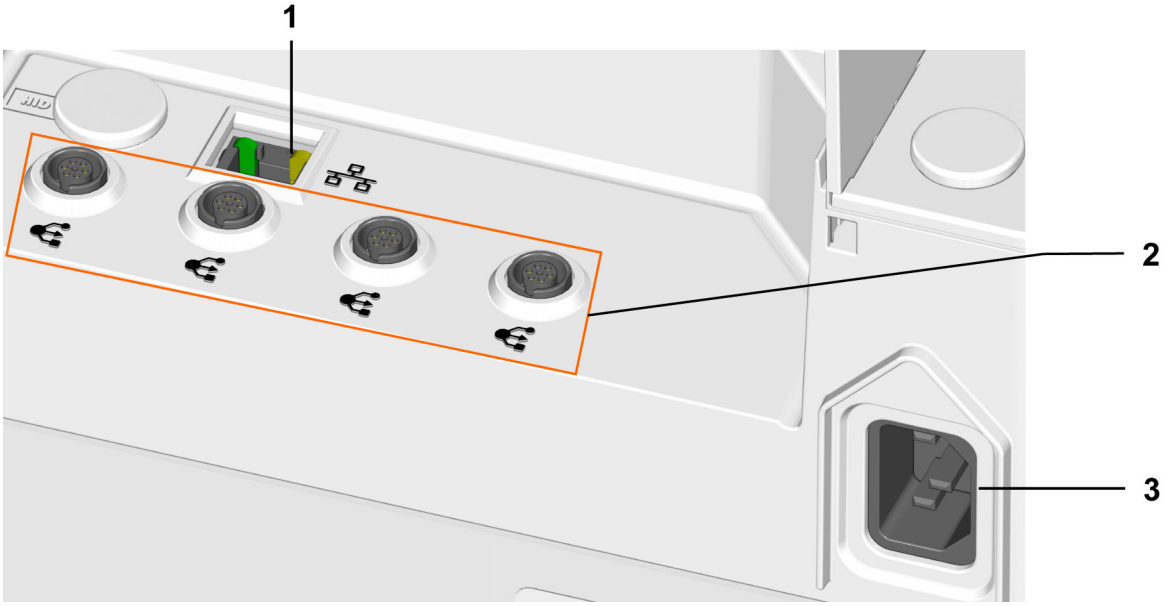


Figure 13 Connections on the rear

1 Ethernet network connection or LAN connector

LAN = Local Area Network.

Connection socket for a connecting cable to the local network

2 MDL connectors

MDL = Metrohm Device Link

Connection socket for connecting cables between OMNIS products

3 Power socket

Connection socket for the energy supply

4 Delivery and transport

4.1 Delivery

Inspect the delivery immediately upon receipt:

- Check the delivery against the delivery note to ensure completeness.
- Check the product for damage.
- If the delivery is incomplete or damaged, contact your regional Metrohm representative.

4.2 Packaging

The product and accessories are supplied in protective special packaging. Keep this packaging to ensure safe transportation of the product. If a transport locking device is present, keep this as well for future reuse.

5 Installation

5.1 Installation by Metrohm

Installation and start-up of the system is always carried out by the regional Metrohm service representative.

5.2 Setup location

The product is only suitable for operation indoors and may not be used in explosive environments.

The following requirements apply to the setup location:

- The room is well-ventilated and protected against both direct sunlight and excessive temperature fluctuations.
- The setup space is stable and free of vibrations. The setup space must be suitable for the dimensions and weight of the components (see technical specifications).
- All cables and connectors are accessible during operation. The cables are safely installed (no tripping hazards).
- The workplace is ergonomically designed and ensures trouble-free operation of the product.

5.3 Lifting the OMNIS Sample Robot Oven

Try to avoid lifting the Sample robot after initial installation. However, if a transport is necessary, then observe the following:

- Lift the Sample robot on all 4 sides or transport it on a continuous plate to avoid sagging.
- Check the positioning accuracy of the sample robot after placing the sample robot down.
- If inaccuracies occur, contact the regional Metrohm service representative for a readjustment.

5.4 Filling the adsorber cartridge

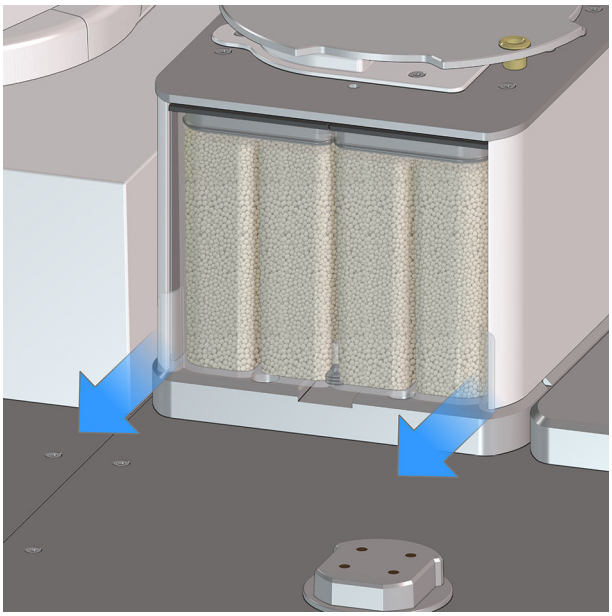
Prerequisite:

- The right-hand sample rack is removed *(see "Attaching and removing the OMNIS sample rack", chapter 6.2, page 52)*.
- Filters are inserted into the adsorber cartridge *(see "Replacing filters in the adsorber cartridge", chapter 7.1, page 60)*.

Required accessories:

- Adsorber material (e.g. 6.2811.000 / 6.2811.010 molecular sieve)

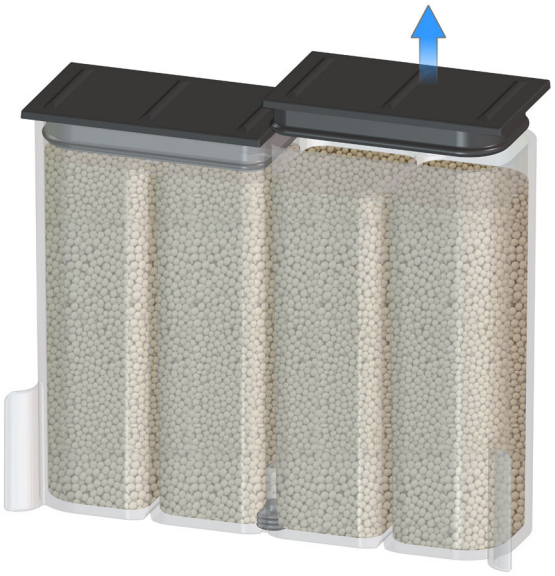
1 Removing the adsorber cartridge



- Pull out and remove the adsorber cartridge.

2 Removing the adsorber material

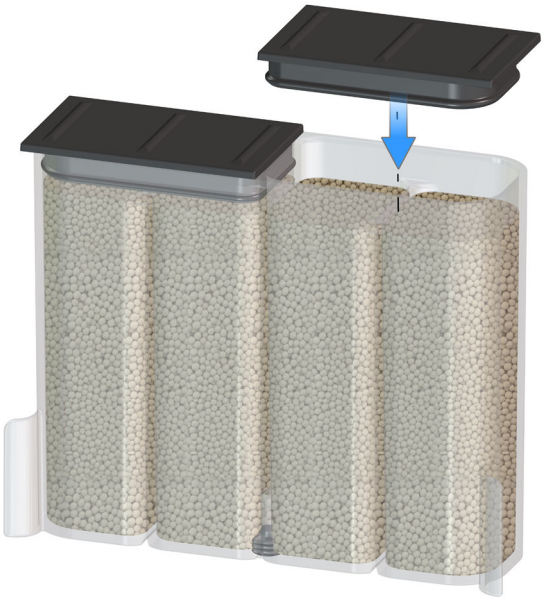
The adsorber cartridge chambers can be emptied individually. Always replace the adsorber material in both chambers.



- Remove only 1 lid of the adsorber cartridge to make it easier to empty out the adsorber material.
- Remove the adsorber material.

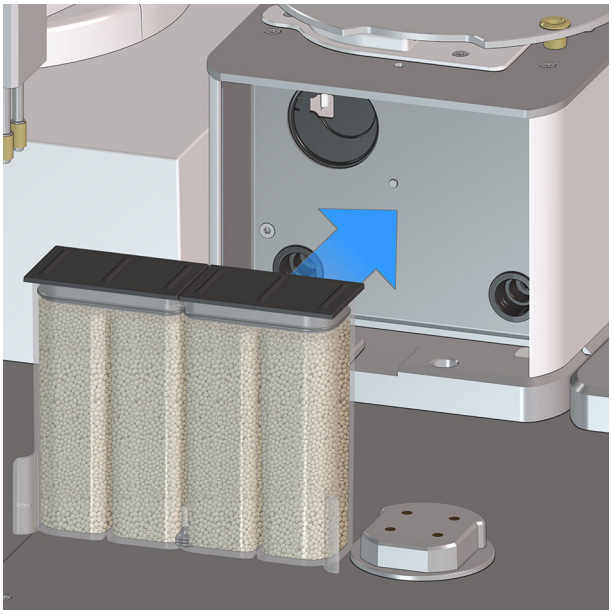
Regenerate the molecular sieve for at least 24 hours in the drying oven at 300 °C. Transfer to a desiccator to cool down and then seal airtight in a glass bottle, see also *Metrohm website*.

3 Filling with adsorber material



- Fill the adsorber cartridge with adsorber material up to the ridge height. A wad of cotton is not required as there are filters in the suction stoppers.
- Attach the lid. The lid is designed to be safe to install; rotate the lid 180° if necessary.
- Make sure that the sealing surface between the housing and the lid is clean and dry, and without any residual filling material present.

4 Inserting the adsorber cartridge



- Place the adsorber cartridge in the oven module and check that it is positioned correctly.

An increase in the drift value of the Karl Fischer titration cell may be an indication that the absorber material has reached its capacity limit. In this case, Metrohm recommends replacing the adsorber material.

At average humidity, replace the adsorber material approx. every 4 weeks.

See also

Adsorber cartridge and adsorber tube (chapter 3.1.7, page 22)

5.5 Filling the adsorber tubes

Required accessories:

- Adsorber material (e.g. 6.2811.000 / 6.2811.010 molecular sieve)
- A wad of cotton or glass wool

1 Removing the lid

Remove the lid by pulling it out of the housing.

2 Removing adsorber material (if present)

Remove the adsorber material, including a wad of cotton or glass wool.

Regenerate the molecular sieve for at least 24 hours in the drying oven at 300 °C. Place in a desiccator to cool down and then seal airtight in a glass bottle, see also *Metrohm website*.

3 Filling with adsorber material

- Place a small cotton plug in the adsorber tube.
- Fill the adsorber tube with molecular sieve.
- Place a small cotton plug on the molecular sieve. Do not pack the wad of cotton too tightly as sufficient gas flow must be possible.

4 Attaching the lid

Make sure that the sealing surface between the housing and the lid is clean and dry, and that there no residual filling material whatsoever is present.

Seal the housing with the lid.

At average humidity, replace the adsorber material approx. every 4 weeks.

An increase in the drift value in the Karl Fischer titration cell is an indication that the adsorber material is saturated and that the humidity is therefore entering the coulometric Karl Fischer titration cell.

Hint:

After replacing the molecular sieve, write the date on the adsorber housing.

See also

Adsorber cartridge and adsorber tube (chapter 3.1.7, page 22)

5.6 Equipping and filling the coulometric Karl Fischer titration cell

CAUTION

Risk of cuts from sharp edges

Cut injuries due to damaged glass parts and pieces of broken glass.

- Handle glass parts (e.g. electrodes, bottles) with care.
- Only use undamaged glass parts.
- Dispose of damaged glass parts immediately.

Preparing the coulometric Karl Fischer titration cell

Prerequisite:

- The adsorber tube of the generator electrode (6.1403.030) is filled with a wad of cotton and molecular sieve *(see "Filling the adsorber tubes", chapter 5.5, page 33)*.
- When using a dosing module: The adsorber tube for the cylinder unit (6.1619.020) is filled with a wad of cotton and molecular sieve.

Required accessories:

- Indicator electrode, generator electrode, adsorber tube, etc. *(see "Accessories for application versions", chapter 3.1.6, page 21)*

1. Place a stirring bar in the Karl Fischer titration cell.
2. Cut the ground-joint sleeve to the correct length. Ensure that there are no fringes left over.
3. Slide the ground-joint sleeves over the ground joints of the electrodes and the adsorber tube. In addition, slide a ground-joint sleeve onto the adapter for application versions.

Equipping the coulometric Karl Fischer titration cell

Prerequisite:

- The Karl Fischer titration cell is prepared.

1. Insert the adsorber tube filled with molecular sieve into the generator electrode.
2. Insert the generator electrode into the large ground-joint opening at the rear.

3 Insert the indicator electrode into the left ground-joint opening.

4 Screw an electrode cable with blue coding tightly on the indicator electrode.

5 Screw an electrode cable with gray coding tightly on the generator electrode.

6 Place the septum on the front opening of the titration cell and screw it shut with the screw cap.

Tighten the screw cap only enough so that everything seals. The septum must not bend.

7 Fill the Karl Fischer titration cell. *(see "Equipping and filling the coulometric Karl Fischer titration cell", chapter 5.6, page 34)*, *(see "Equipping and filling the coulometric Karl Fischer titration cell", chapter 5.6, page 34)*

8 Depending on the application, insert the required adapter into the opening for application versions *(see "Accessories for application versions", chapter 3.1.6, page 21)*.

NOTICE

Inward seepage of liquid

Material damage to the instrument or functional disruptions due to inward seepage of liquids when refilling the titration cell.

- Take down the titration cell from the oven module to refill reagent.
- If the titration cell is filled with a solvent module or a dosing module, ensure that the solution does not overflow.

WARNING

Contact with chemicals

Chemicals may cause chemical burns.

- Wear personal protective equipment (e.g. protective glasses, gloves).
- Use exhaust equipment when working with vaporizing hazardous substances.

Using a generator electrode with diaphragm

Prerequisite:

- The Karl Fischer titration cell is completely equipped with a generator electrode with diaphragm. Pre-dry the components in the oven at 50 °C.

1. Remove the adsorber tube from the generator electrode.
2. Fill approximately 7 mL of catholyte into the generator electrode.
3. Insert the adsorber tube into the generator electrode.
4. Remove the right-hand adapter from the Karl Fischer titration cell.
5. Using a funnel, fill as much anolyte as needed into the Karl Fischer titration cell until the 150 mL marking on the titration cell is reached.

   The level of the anolyte should be roughly 1 to 2 mm above the level of the catholyte.
6. Close the ground-joint opening on the right with the adapter (with the ground-joint sleeve attached).

Using a generator electrode without diaphragm

Prerequisite:

- The Karl Fischer titration cell is completely equipped with a generator electrode without diaphragm. Pre-dry the components in the oven at 50 °C.

1. Remove the right-hand adapter from the Karl Fischer titration cell.
2. Use a funnel to fill approximately 150 mL of reagent into the Karl Fischer titration cell.
3. Close the ground-joint opening on the right with the adapter (with the ground-joint sleeve attached).

5.7 Equipping and filling the volumetric Karl Fischer titration cell

Preparing the volumetric Karl Fischer titration cell

Prerequisite:

- The adsorber tube for the volumetric Karl Fischer titration cell (6.01406.010) is filled with a wad of cotton and molecular sieve. *(see "Filling the adsorber tubes", chapter 5.5, page 33)*. When using a dosing module: The adsorber tube for the cylinder unit (6.1619.020) is filled with a wad of cotton and molecular sieve.

Required accessories:

- Indicator electrode, antidiffusion tip, adsorber tube, etc. *(see "Volumetric Karl Fischer titration cell", chapter 3.1.5, page 20)*
- Accessories for application version

1. Place a stirring bar in the Karl Fischer titration cell.
2. Cut the ground-joint sleeve to the correct length. Ensure that there are no fringes left over.
3. Slide the ground-joint sleeves over the ground joint of the indicator electrode and onto the stoppers.

Equipping the volumetric Karl Fischer titration cell

Prerequisite:

- The Karl Fischer titration cell is prepared.

1. Insert a stopper (6.1446.240) with an antidiffusion tip (6.01543.120) or a titration tip (6.1543.200) and an adsorber tube (6.01406.010) into the large ground-joint opening at the rear.
2. Insert the indicator electrode into the left ground-joint opening.
3. Screw an electrode cable with blue coding tightly on the indicator electrode.
4. Place the septum on the front opening of the titration cell and screw it on with the screw cap.

Tighten the screw cap only enough so that everything seals. The septum must not bend.

5 Fill the Karl Fischer titration cell.

6 Depending on the application, insert the required stopper into the opening for application versions .

NOTICE

Inward seepage of liquid

Material damage to the instrument or functional disruptions due to inward seepage of liquids when refilling the titration cell.

- Take down the titration cell from the oven module to refill reagent.
- If the titration cell is filled with a solvent module or a dosing module, ensure that the solution does not overflow.

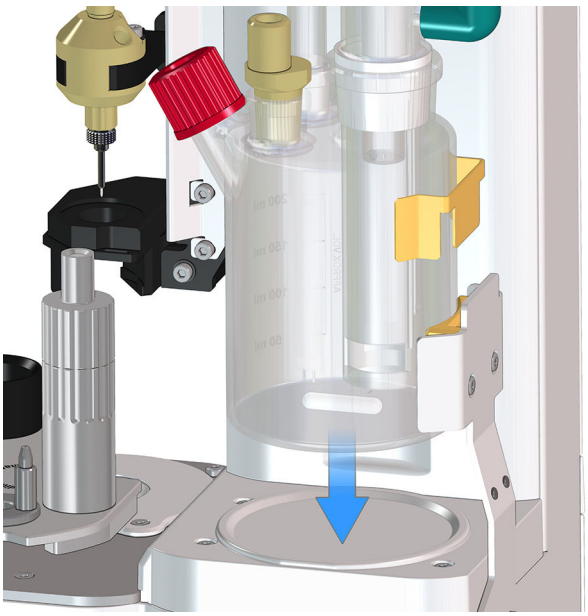
1 Use a funnel to fill approx. 150 mL KF solvent into the opening for application versions of the Karl Fischer titration cell.

See also

Volumetric Karl Fischer titration cell (chapter 3.1.5, page 20)

5.8 Mounting the Karl Fischer titration cell

1



Insert the metal clip on the Karl Fischer titration cell into the titration vessel holder.

The Karl Fischer titration cell is fixed in place.

To remove any condensation there may be on the wall of the Karl Fischer titration cell, swing the Karl Fischer titration cell forwards and backwards in the titration cell holder.

5.9 Adjusting the position of the septum piercing needle

A spacer can be used to set the position of the septum piercing needle in the sample vial.

Prerequisite:

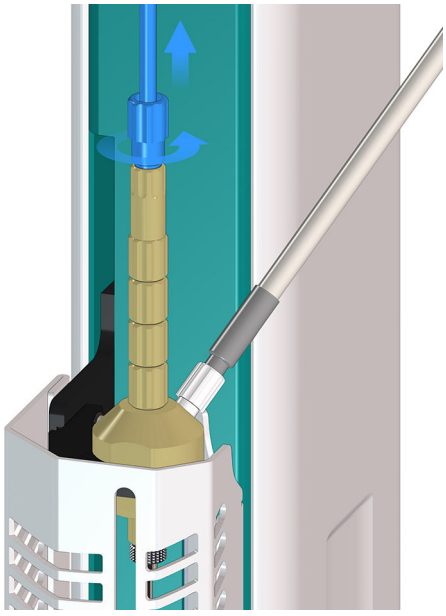
- The OMNIS Sample Robot Oven is switched off.
- Hot surfaces have cooled down.
- The needle system is in the top position.

Required accessories:

- Needle holder set (6.2049.060)

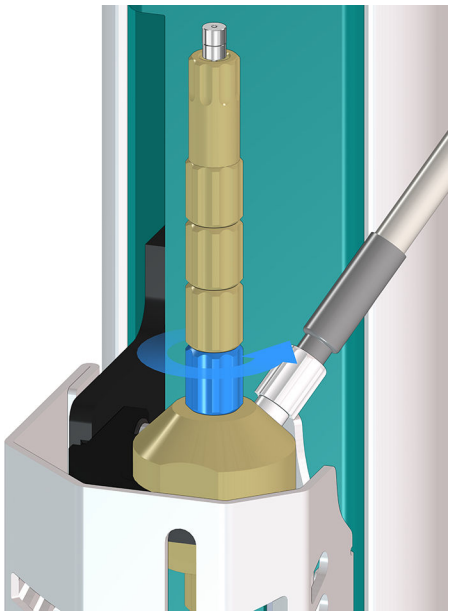
1 Removing the gas inlet tubing

- Unscrew the FEP tubing *(7-**9**)* from the needle holder *(7-**8**)*.

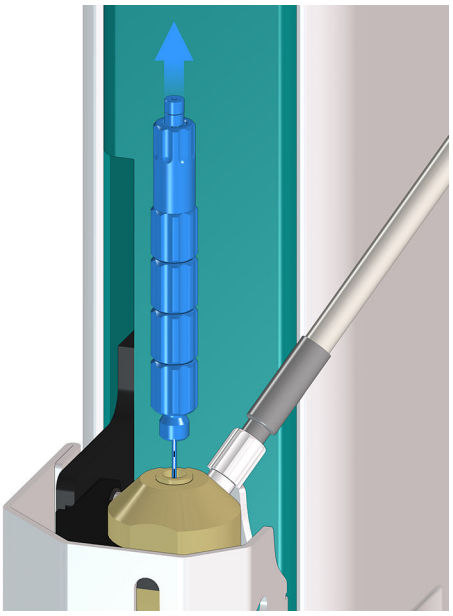


2 Removing the needle and the needle holder

- Unscrew the bottom spacer *(7-**7**)* from the distributor.



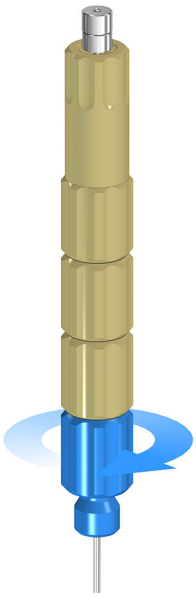
- Pull out all spacers and the needle holder *(7-**8**)* upwards with the septum piercing needle *(7-**3**)*.



3 **Adjusting the height of the needle holder**

Remove or add spacers as required.

Remove



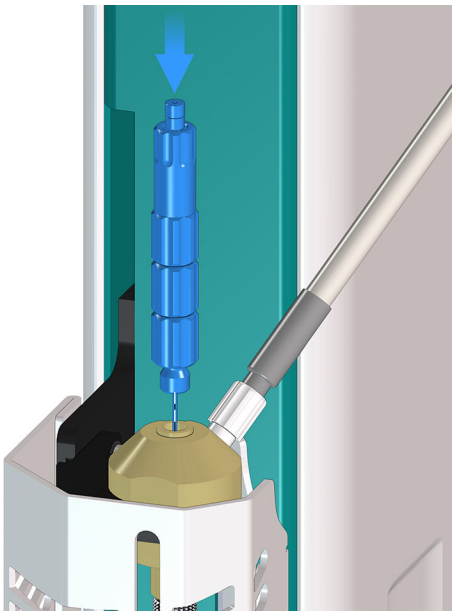
- Unscrew the bottom spacer and remove it.
- If required, remove one or more spacers at the same time.

Add

- If required, add one or more spacers at the same time.
- Slide the spacer over the septum piercing needle from below and screw it tight.

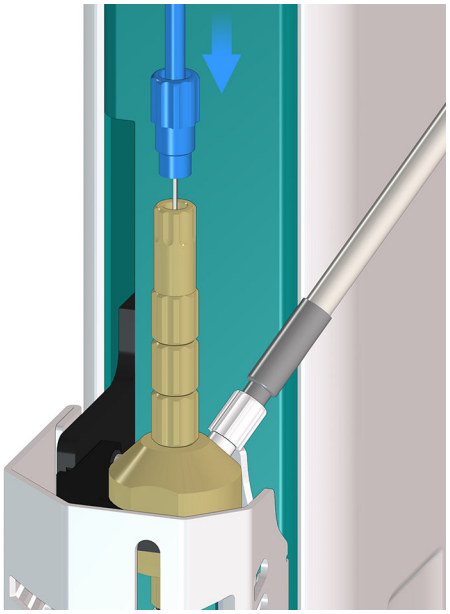
4 Mounting the needles and needle holders

- Insert the needle holder *(7-**8**)* with the septum piercing needle and spacers into the distributor and tighten it.



5 Mounting the gas inlet tubing

Fasten the FEP tubing to the needle holder *(see "Number of spacers, depending on type of sample", page 43)*.



Configure and adjust the needle holder in such a way that both the septum piercing needle and the outlet needle are immersed in the sample vial. The septum piercing needle must not touch the base of the sample vial. Loosen and clean the outlet needle only if it is blocked.

Number of spacers, depending on type of sample

The needle depth must be set differently, depending on the aggregate state of the sample. The following applies to sample vials with a volumes of 6 mL and 8 mL:

- Liquid samples = 3 spacers
- Lyophilized samples = 4 spacers
- Solid samples = 5 spacers

Check the needle adjustment. *(see "Adjusting the needle system", chapter 7.3, page 64)*

5.10 Mounting the safety shields

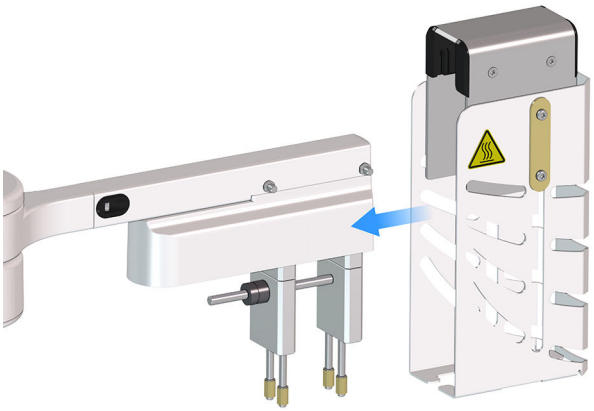
Mounting the optional safety shield on the gripper

Prerequisite:

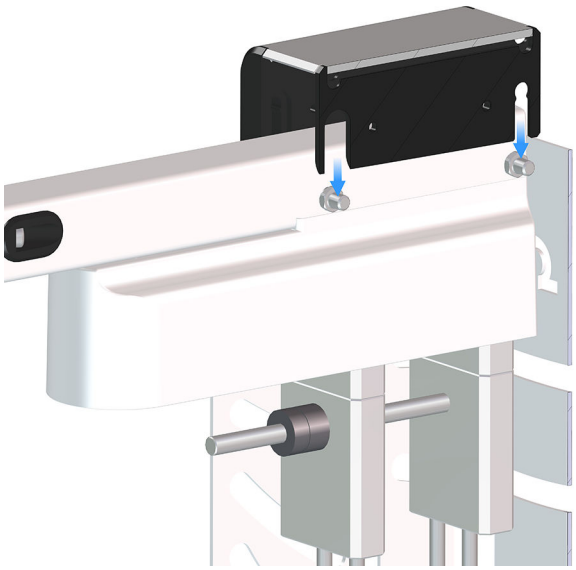
- The OMNIS Sample Robot Oven is switched off.

1 Putting the safety shield in position

- Place the safety shield on the gripper arm:

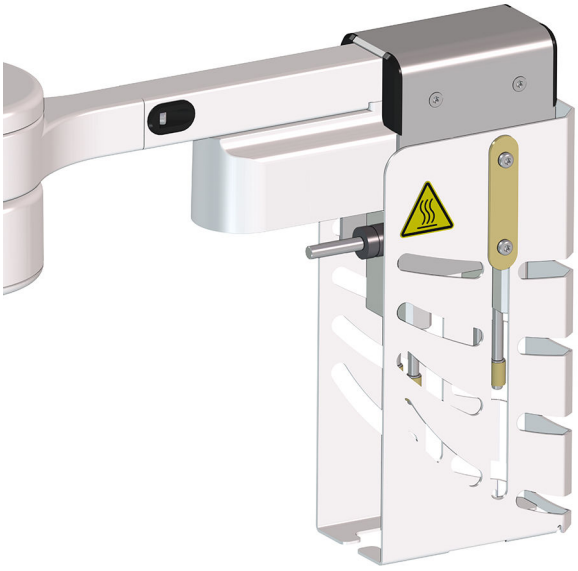


- Align the groove in the holder of the safety shield into the bolts in the gripper arm:



- Hold the gripper arm from below and slide the safety shield downwards until the stop. The safety shield must snap into place.
- Press the safety shield upwards and check that it is firmly in place. The safety shield must not come off the gripper arm.

The safety shield is mounted.



Mounting the safety shield on the needle system

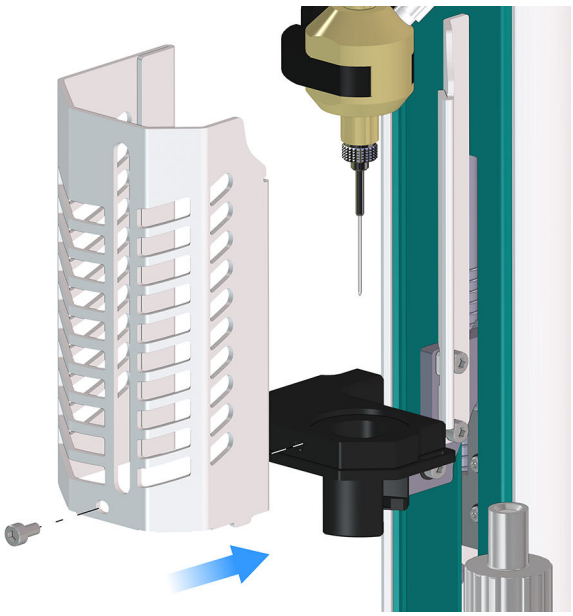
Prerequisite:

- The OMNIS Sample Robot Oven is switched off.

Required accessories:

- Hex key (6.2621.140)

1 Attach the safety shield and use the hex key to tighten the screw.



5.11 Connecting the heating tubing

Prerequisite:

- The OMNIS Sample Robot Oven is switched off.
- Hot surfaces have cooled down.
- The Karl Fischer titration cell is positioned correctly on the oven module and is completely equipped.

Required accessories:

- Accessories for application version

1 Checking the tubing flare

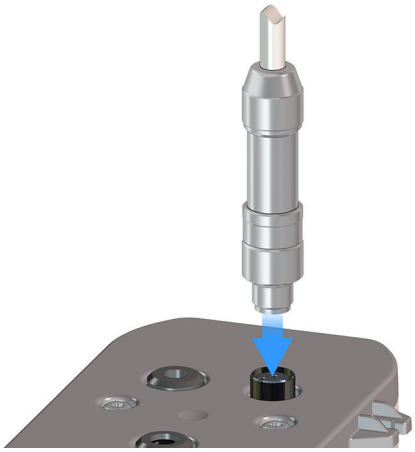
Check the tubing flare of the heating tubing for damage. Use only heating tubing that has an undamaged tubing flare.

2 Fastening the heating tubing to the distributor

Screw the heating tubing adapter to the distributor. Make sure that the heating tubing is fastened correctly so that no moisture can get in which would falsify the measurement result.

3 Plugging the heating tube cable into heating tube connection

- Rotate the plug on the heating tubing cable in such a way that the 3 contact pins correspond to the sequence of the corresponding socket openings on the oven module.
- Attach the plug, press lightly and tighten the knurled nut.



- Fasten the heating tubing cable in the side cable holder.

4 Mounting the heating tubing in the Karl Fischer titration cell

- Depending on the application, insert the required stopper into the opening for application versions.
- Insert the heating tubing from the gas outlet through the largest opening of the selected plug.

The heating tubing reaches deep into the Karl Fischer titration cell, but stops just above the stirring bar. The heating tubing must not get in the way of the stirring bar.

As soon as the OMNIS Sample Robot Oven is switched on and the heating tubing is connected to the oven module, the heating jacket of the heating tubing is heated up to approx. 40 to 50 °C. This prevents condensation of moisture in the tubing when it is removed from the sample and transferred to a Karl Fischer titration cell with a carrier gas.

5.12 Mounting the compressed air / nitrogen connection

Prerequisite:

- The OMNIS Sample Robot Oven is switched off.
- Hot surfaces have cooled down.

1 Checking the accessories

Check the accessories for damage. Use only undamaged accessories.

2 Fastening the tubing using a thread adapter or tubing adapter

Use a thread adapter or a tubing adapter to screw the tubing to the rear of the device. Tubing olive / M8 outside (6.1808.050) and adapter M6 outside / M8 inside (6.1808.040). Ensure it is fastened correctly so as not to falsify the measurement result.

If gas is fed from a pressure line or a pressure vessel, then an upstream pressure reduction valve must be installed. The input pressure must be set with the valve closed and must not exceed 1.5 bar of overpressure. The nominal operating pressure is 1.0 bar.

5.13 Connecting the electrodes

CAUTION

Damage to the indicator electrode

The indicator electrode will be damaged if it is connected to the connector for the generator electrode. The two electrodes have the same plug-in head and can be connected incorrectly. The connectors on the instrument are different.

- Observe the color coding of the electrode cables and the name of the connection sockets:
  - Plug the electrode cable with **gray coding** in the **GENERATOR** connector and mount the generator electrode.
  - Plug the electrode cable with **blue coding** in the **INPUT 1** measuring input and mount the indicator electrode.

If the plug cannot be inserted easily, rotate the plug slightly to the right or left using light pressure until it latches in the socket.

- Align the red dot on the plug with the groove on the measuring input.
- Plug in the plug until you can feel it snap in.

Connecting the generator electrode and indicator electrode

Prerequisite:

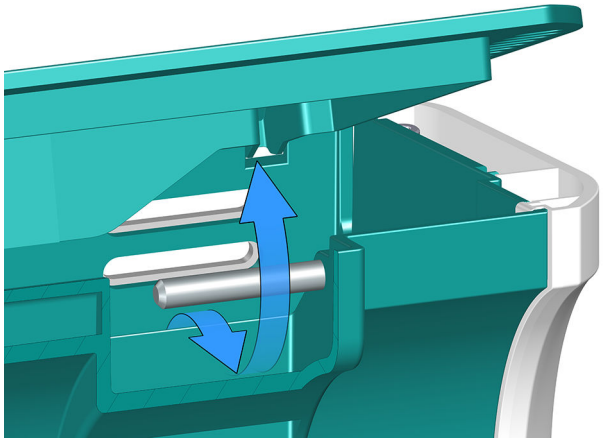
- The electrode cable with gray coding is screwed tightly on the generator electrode.
- The electrode cable with blue coding is screwed tightly on the indicator electrode.

1 Open the lid on the OMNIS Coulometer or OMNIS Coulometer Module.

2 Plug the electrode cable with **gray coding** in the **GENERATOR** connector.

3 Plug the electrode cable with **blue coding** in the **INPUT 1** measuring input.

4 **Guiding out the cable**



Guide the cables out going under the bar.

5 Close the lid.

5.14 Plugging in the power cord

WARNING

Health hazards from electrical potential.

Severe injuries with possibly fatal consequences.

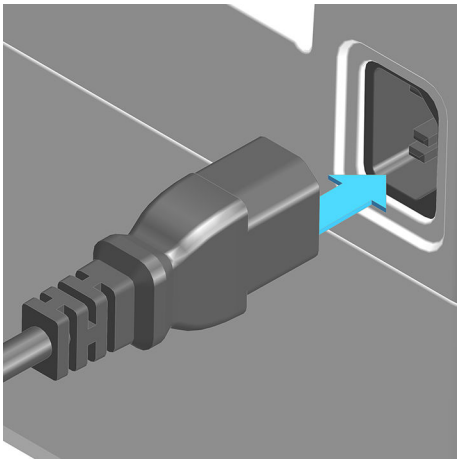
- Operate the product only if it is in perfect condition. The housing must also be intact.
- Only use the product with the covers fitted.
- Protect live components (e.g. power supply unit, power cord, connection sockets) against moisture.
- Always have maintenance work and repairs on electrical components carried out by a regional Metrohm service representative.

Required accessories:

- Power cord:
  - Length: max. 2 m
  - Number of conductors: 3, with protective ground
  - Conductor cross-section: 3x min. 1.0 mm^2 / 18 AWG
- Instrument plug:
  - IEC 60320, type C13, 10 A

- Power plug:
  - 6.2122.XX0 (according to customer requirement), min. 10 A

1



- Plug the power cord into the product's power socket. Use only permitted power cords.
- Connect the power cord to the energy supply.

6 Operation

The product is operated via the OMNIS Software. Additional information under *https://guide.metrohm.com/#/welcome*.

6.1 Switching on and off

NOTICE

Data loss

Disconnecting OMNIS instruments from the power grid (e.g. with a connector strip) may lead to irreversible data loss. If the instrument can no longer be used, contact your regional Metrohm service representative.

- Press the on/off switch for 2 seconds to safely shut down the instrument.
- Wait until the status display goes out and only then disconnect the electricity.

1 Switching on the Sample robot

Press the on/off switch for 1 second.

- The status display lights up in yellow. A single beep sound will then be heard. There will be a further beep sound for each attached rack.
- The status display flashes yellow as soon the sample robot is ready to connect to the OMNIS Software.
- The status display flashes green as soon as the sample robot is connected to the OMNIS Software and is ready for operation.

2 Switching off the Sample robot

Press the on/off switch for 2 seconds until the single beep sound is heard.

- The status display goes out and the Sample robot is switched off.

See also

Indicators and controls (chapter 3.2, page 25)

6.2 Attaching and removing the OMNIS sample rack

WARNING

Chemical hazardous substances

Contact with aggressive chemical substances may cause poisoning or chemical burns.

- Do not remove the sample rack while work processes are running.
- Wear personal protective equipment (e.g. protective glasses, gloves).
- Use exhaust equipment when working with vaporizing hazardous substances.
- Clean contaminated surfaces.
- Only use detergents that do not cause any unwanted side reactions with the materials to be cleaned.
- Dispose of chemically contaminated materials (e.g. cleaning material) in accordance with regulations.

WARNING

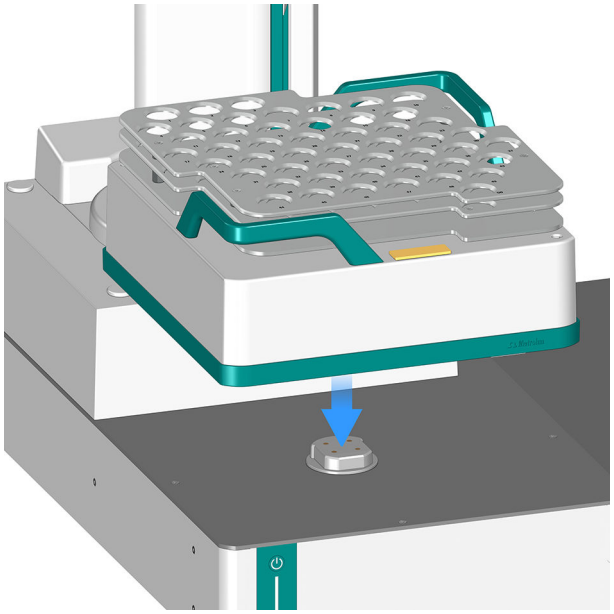
Risk of injury from careless transport

Injuries from spilled chemical and/or biological substances, falling parts and pieces of broken glass.

- Remove loose parts (e.g. sample racks, sample beaker, bottles) before transport.
- Wear protective clothing.
- Remove liquids.
- Lift and transport the instrument with both hands on the base plate.
- Lift and transport heavy instruments only according to instructions.

Attaching the OMNIS sample rack

1



Grip the OMNIS sample rack by the transport handles with both hands and set it down on the rack base.

The OMNIS sample rack is designed for safe installation and, because of the shape of the rack holder, it can be placed on the rack base in only one position.

Removing the OMNIS sample rack

1 Grip the OMNIS sample rack by the transport handles with both hands and remove it towards the top.

A brief signal will sound as soon as the OMNIS sample rack has been removed.

6.3 Reagent replacement

The electrolyte solutions must be replaced in the following cases:

- The titration cell is too full.
- The KF reagent has reached its capacity limit.
- The drift is too high and cannot be reduced by shaking the titration cell.

Exhausted electrolyte solution is best disposed of by aspiration. An advantage is that the titration cell does not have to be disassembled. In addition, no humidity gets into the titration cell as it is not opened.

In the event of severe contamination, the titration cell can be rinsed with a suitable solvent which is also aspirated.

In the case of a generator electrode with diaphragm, the catholyte should be replaced once per week. Longer use can cause blackening and yellow precipitates in the cathode chamber. An unpleasant smell is also a sign of having used the catholyte for too long.

6.3.1 Reagent replacement with OMNIS Solvent Module

When replacing reagents with the OMNIS Solvent Module, the used reagent is aspirated through the PTFE tubing from the Karl Fischer titration cell and pumped into the waste bottle.

If necessary, clean the titration cell with multiple rinsing cycles.

The fresh reagent is pumped into the titration cell via the OMNIS Solvent Module.

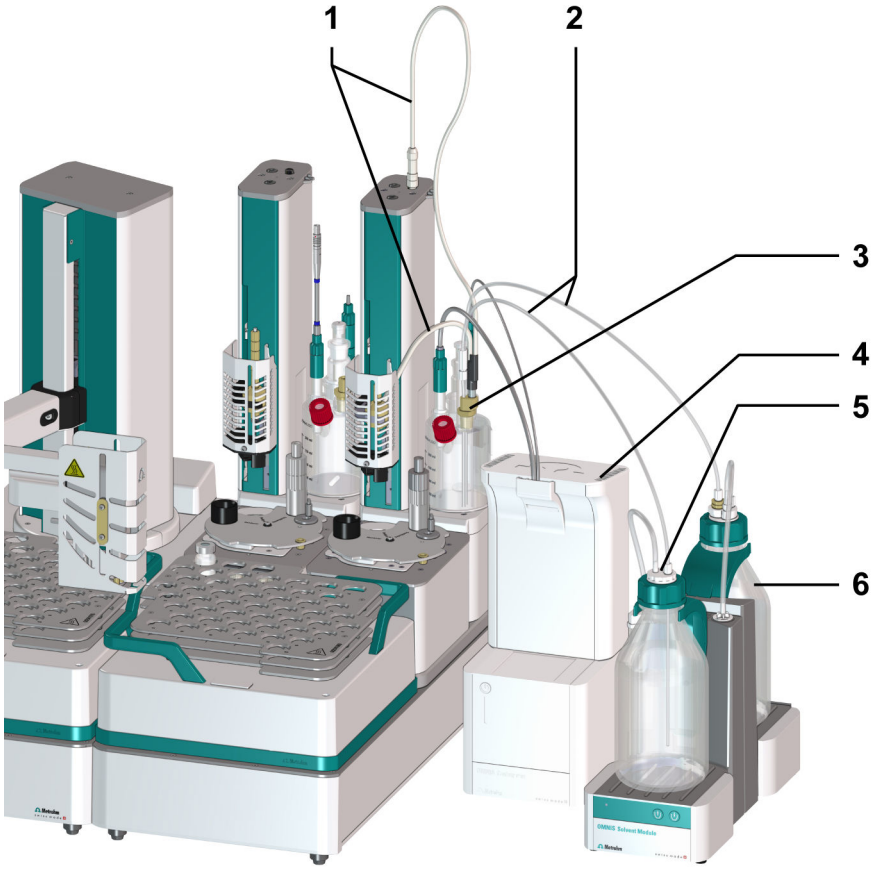


Figure 14 Reagent replacement with OMNIS Solvent Module – Example

1	**Heating tubing**	**2**	**PTFE tubing (6.1805.200)**
3	**Stoppers for reagent replacement (6.1446.200)**	**4**	**Measuring instrument** OMNIS Coulometer or OMNIS Titrator
5	**Siphon Breaker (6.01600.200)** on bottle with KF reagent	**6**	**Waste bottle (6.1608.030)**

For a reagent replacement with the OMNIS Solvent Module, a tubing setup such as that shown in the figure is required. Proceed as follows:

Preparing the reagent replacement

Required accessories:

- Adapter (6.1446.200)
- Solvent Module

1 Inserting the adapter

- Place the ground-joint sleeve over the stopper.

- Insert the stopper together with the ground-joint sleeve into the right-hand ground-joint opening of the titration cell.

2 Connecting the titration cell with the waste bottle

- Screw the first PTFE tubing onto the aspiration tip.
- Screw the other end of the PTFE tubing onto the waste bottle to pump the used reagent into the waste bottle.

3 Connecting the titration cell with the Siphon Breaker

- Screw the second PTFE tubing onto the dosing tip.
- Screw the other end of the PTFE tubing onto the Siphon Breaker on the fresh reagent to pump the fresh reagent into the titration cell.

6.3.2 Manual reagent replacement

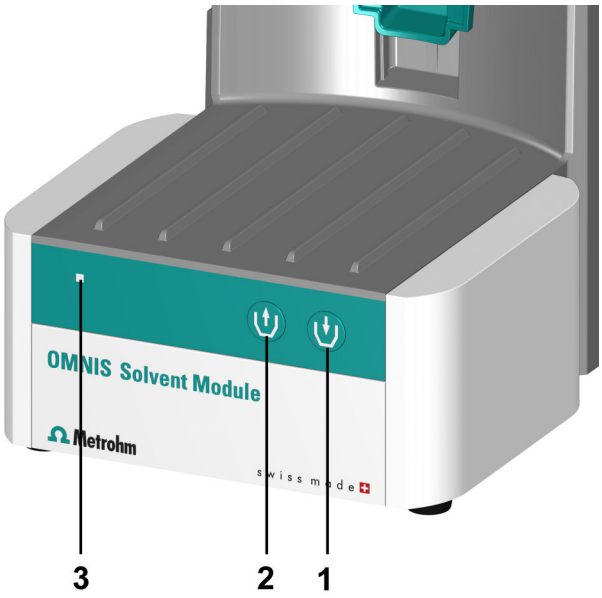


Figure 15 OMNIS Solvent Module – Indicators and controls

1 **Add key** Deliver liquid (Solvent) into the titration cell	**2** **Aspirate key** Aspirate waste from the titration cell
3 **Status display** Multi-colored	

Prerequisite:

- OMNIS Solvent Module is connected.

- The solvent bottle, waste bottle and Karl Fischer titration cell are fully mounted and connected with the corresponding tubings.

1 Manually emptying the KF titration cell

Press the key on the OMNIS Solvent Module:

The OMNIS Solvent Module starts aspirating waste out of the Karl Fischer titration cell into the waste bottle.

Different versions are possible:

- Press and hold (> 1 s): Aspirating takes place until the key is released. The pumping duration is saved.
- Press briefly (≤ 1 s): The aspiration takes place during the saved pumping duration. Press the key again to stop the procedure prematurely.

2 Manually filling the KF titration cell

Press the key on the OMNIS Solvent Module:

The OMNIS Solvent Module starts aspirating waste out of the Karl Fischer titration cell into the waste bottle.

Different versions are possible:

- Press and hold (> 1 s): Aspirating takes place until the key is released. The pumping duration is saved.
- Press briefly (≤ 1 s): The aspiration takes place during the saved pumping duration. Press the key again to stop the procedure prematurely.

The reagent replacement can also be carried out automatically via the OMNIS Software. Additional information under *https://www.metrohm.com*.

6.3.3 Reagent replacement with dosing device

When replacing reagent with a dosing device, the used reagent is aspirated through the FEP tubing from the Karl Fischer titration cell and into the cylinder unit. The used reagent is ejected from the cylinder unit into the waste bottle through the FEP tubing connected to the waste port.

If necessary, clean the titration cell with multiple rinsing cycles.

The fresh reagent is dosed from the liquid adapter through the FEP tubing into the cylinder unit. The fresh reagent is dosed from the cylinder element through the FEP tubing into the titration cell.

The aspiration/dosing tip is filled with fresh reagent after dosing. Dry air is drawn into the cylinder element through the adsorber tube so that no liquid flows from the aspiration/dosing tip into the titration cell during the measurement. The dry air is ejected into the titration cell together with the residual liquids from the aspiration/dosing tip. This allows the titration cell to be completely dried before the measurement.

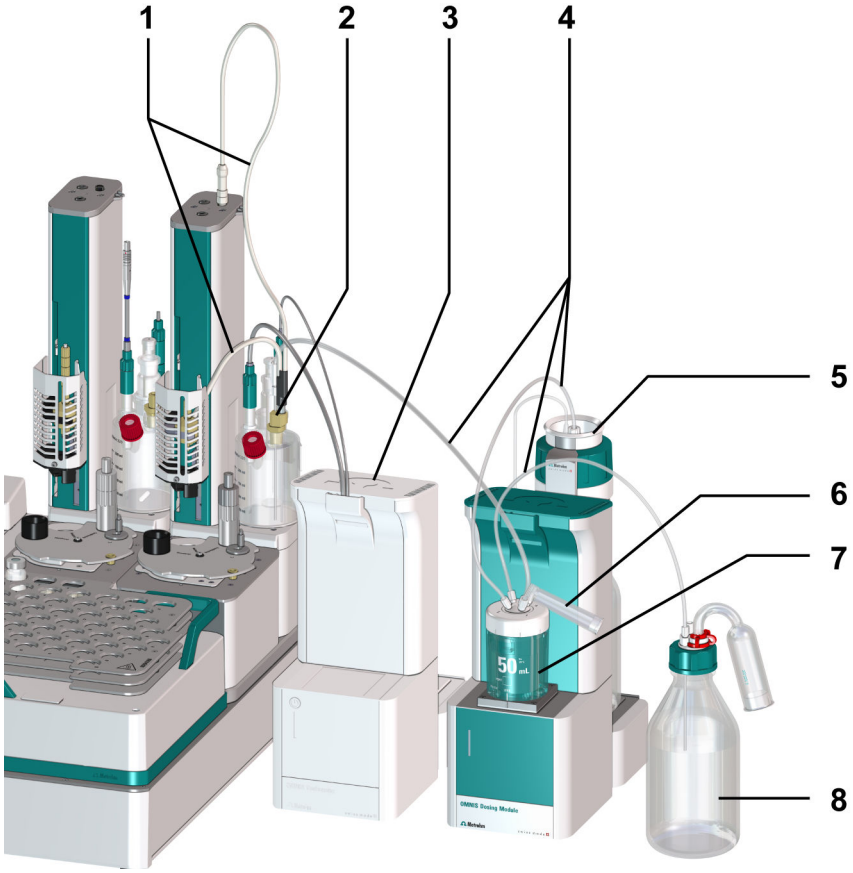


Figure 16 Reagent replacement with OMNIS Dosing Module – Example

1	**Heating tubing**	**2**	**Adapter (6.1446.210)**
3	**Measuring instrument** OMNIS Coulometer or OMNIS Titrator	**4**	**FEP tubing (6.1805.1X0)**
5	**OMNIS Liquid Adapter (6.01600.010)** on a bottle with KF reagent	**6**	**Adsorber tube for cylinder unit (6.1619.020)**
7	**Cylinder unit OMNIS 50 mL (6.01503.250) on the OMNIS Dosing Module**	**8**	**Waste bottle (6.1608.030)**

A tubing setup as shown in the figure is required for a reagent replacement with a dosing device. Proceed as follows:

Preparing the reagent replacement

Required accessories:

- *(see "Reagent replacement with dosing device", chapter 6.3.3, page 57)*

1 Assembling stoppers

- Place the ground-joint sleeve over the stopper.
- Insert the stopper together with the ground-joint sleeve into the right-hand ground-joint opening of the titration cell.

2 Connecting the titration cell with the cylinder unit

- Screw the first FEP tubing onto the aspiration tip.
- Screw the other end of the FEP tubing onto the dosing port of the cylinder unit.

3 Connecting the cylinder unit with the waste bottle

- Screw the second FEP tubing onto the waste port of the cylinder unit.
- Screw the other end of the FEP tubing onto the waste bottle to aspirate the used reagent from the titration cell and dose it through the cylinder unit into the waste bottle.

4 Connecting the cylinder unit with the Liquid Adapter

- Screw the third FEP tubing onto the fill port of the cylinder unit.
- Screw the other end of the FEP tubing onto the Liquid Adapter to dose the fresh reagent through the cylinder unit into the titration cell.

5 Mounting the adsorber tube

Screw the adsorber tube onto the free port.

7 Maintenance

- Regularly check all tubing connections for leak-tightness.
- Replace the adsorber material in the adsorber cartridge approx. every 4 weeks or when the drift value increases *(see "Filling the adsorber cartridge", chapter 5.4, page 30)*.
- Replace the adsorber material in the adsorber tube approx. every 4 weeks or when the drift value increases *(see "Filling the adsorber tubes", chapter 5.5, page 33)*.
- Replace the filters in the adsorber cartridge at regular intervals *(see "Replacing filters in the adsorber cartridge", chapter 7.1, page 60)*.
- Replace the dust filter in the oven module once a year *(see "Replacing the dust filter", chapter 7.2, page 63)*.
- Replace the septum for the conditioning tube at regular intervals *(see "Replacing the septum in the conditioning tube", chapter 7.4, page 78)*.

7.1 Replacing filters in the adsorber cartridge

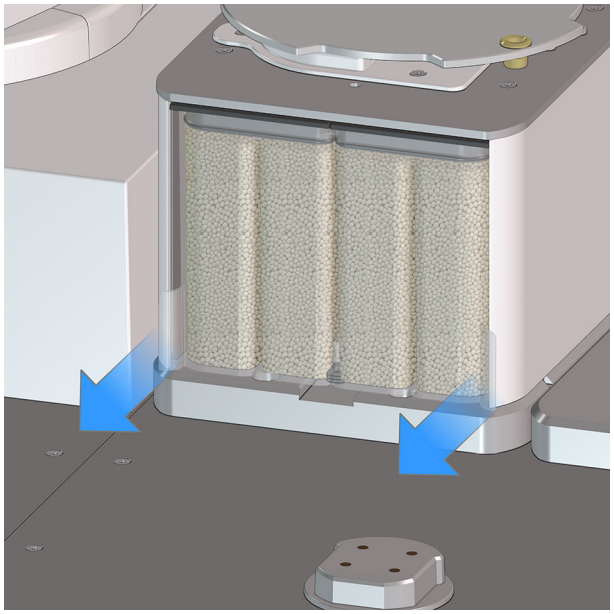
There are 2 filters used in the adsorber cartridge to keep dust and molecular sieve particles out of the titration cell. These filters must be replaced regularly.

Required accessories:

- Filter (6.2821.090)

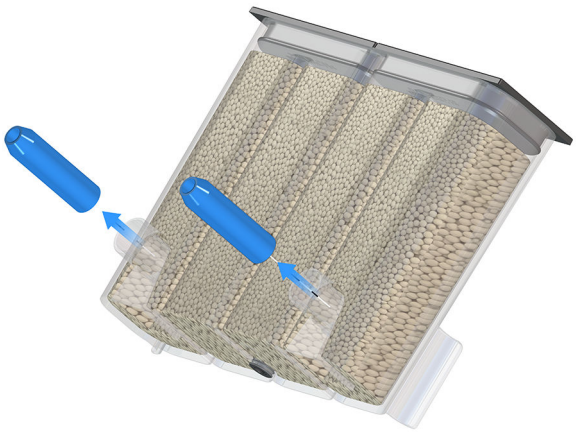
1 Remove the right-hand OMNIS sample rack.

2



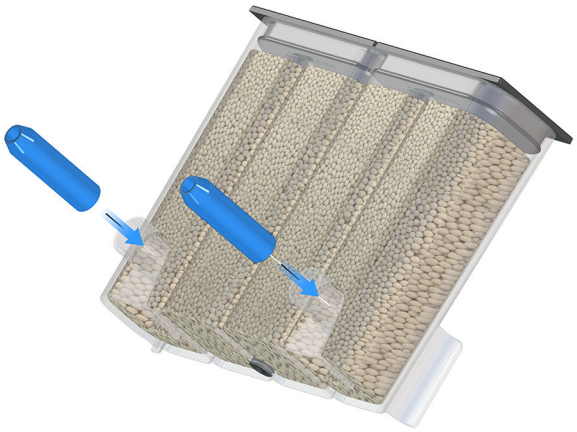
Pull out and remove the adsorber cartridge.

3



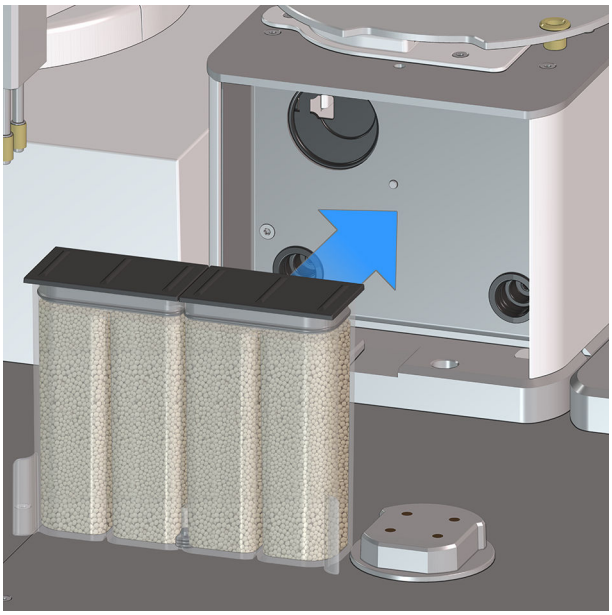
Remove the filter.

4



Insert new filters with the opening pointing outwards.

5



Insert the adsorber cartridge and attach the OMNIS sample rack.

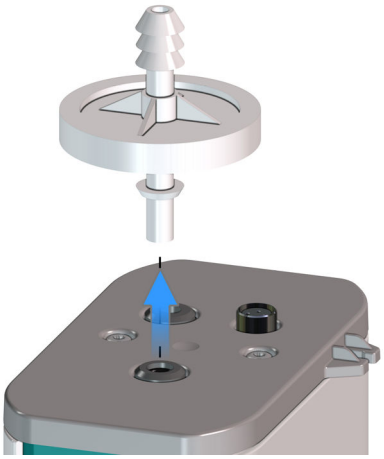
7.2 Replacing the dust filter

A dust filter must be attached to the air pump inlet of the oven module to protect the built-in air pump from dust.

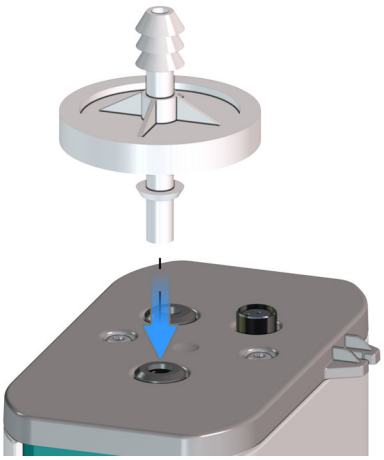
Required accessories:

- Dust filter (6.2724.010)

1 Pull out the used dust filter upwards and dispose of it.



2 Attach the new dust filter.



7.3 Adjusting the needle system

Preparing the adjustment

Prerequisite:

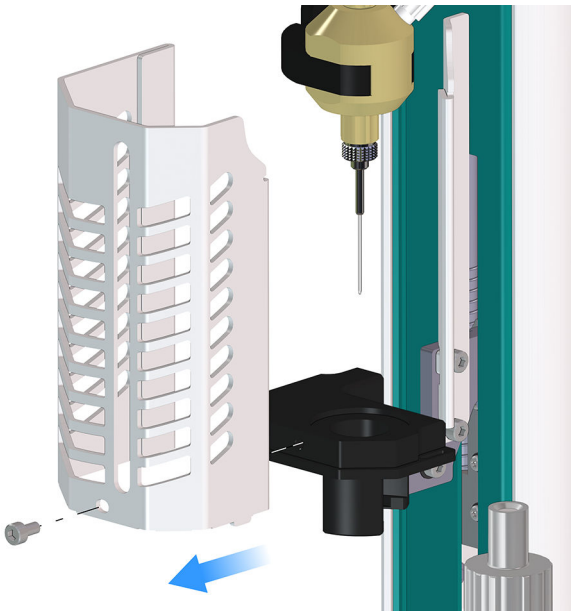
- The OMNIS Sample Robot Oven is switched off.
- Hot surfaces have cooled down.
- The sample rack has been removed.
- The adsorber cartridge has been removed.

Required accessories:

- Hex key (6.2621.140)
- Wrench (6.2739.000)

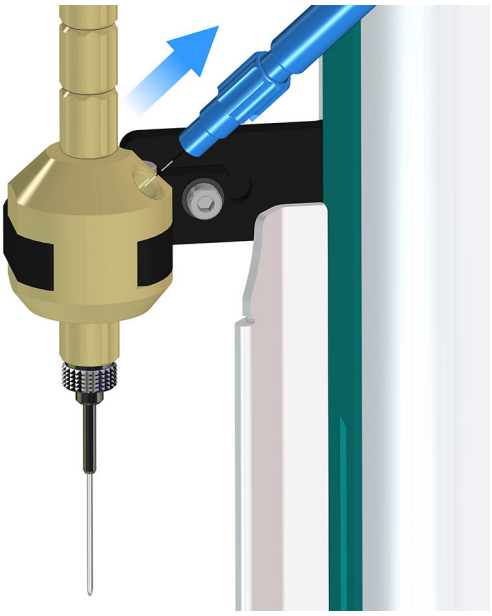
1 Removing the safety shield

- Use the hex key to loosen and remove the fastening screw.
- Remove the safety shield *(5-**9**)*.

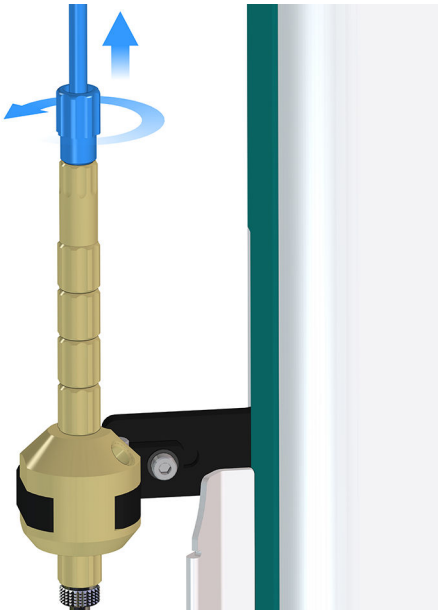


2 Removing the tubing

- Loosen and remove the heating tubing *(7-**1**)*.

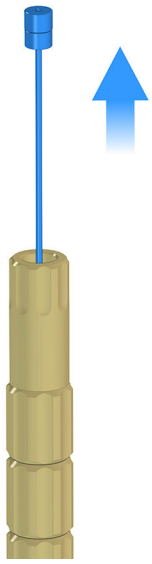


- Loosen and remove the FEP tubing *(7-**9**)*.

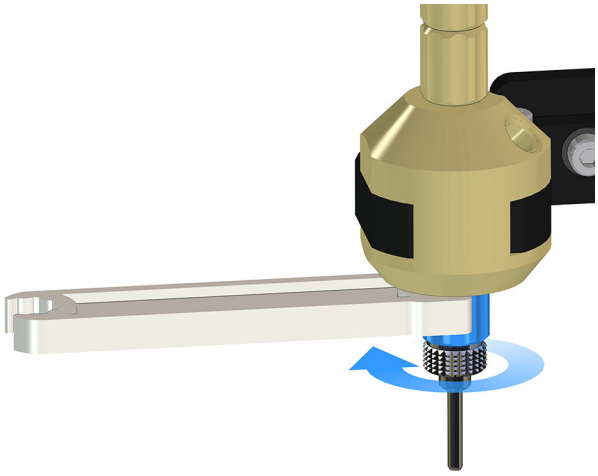


3 Removing the needles

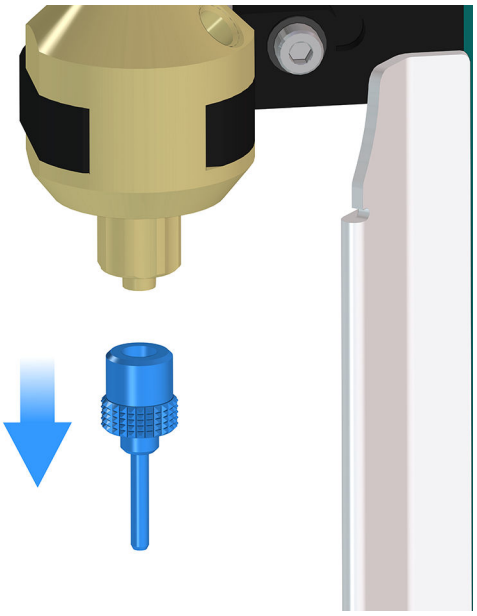
- Pull out the septum piercing needle *(7-**3**)* upwards.



- Use a wrench to loosen the outlet needle holder *(7-**2**)*.

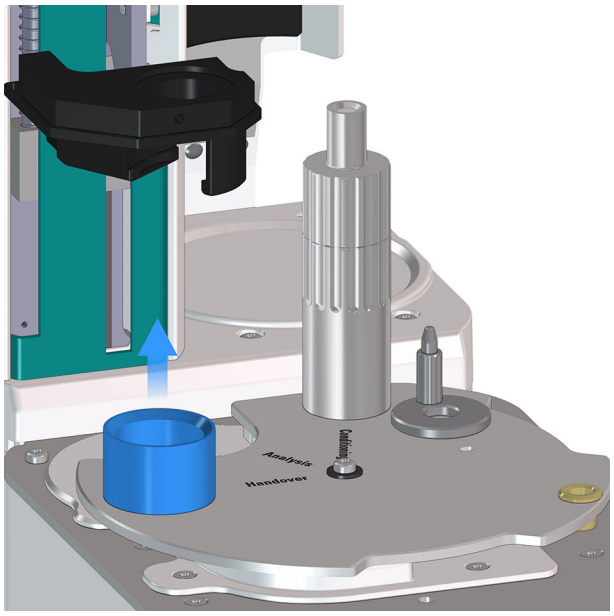


- Remove the outlet needle *(7-**2**)* downwards.

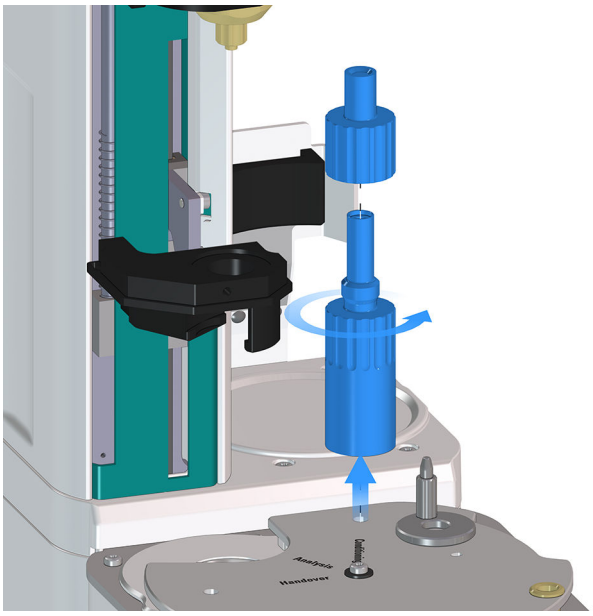


4 Preparing the turntable

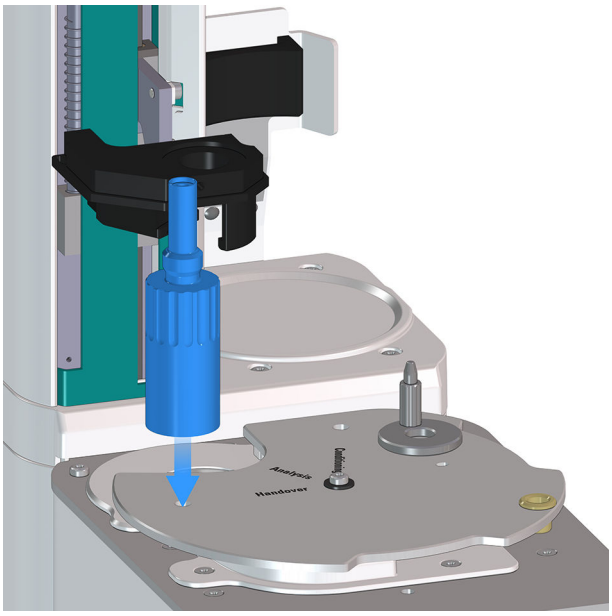
- Loosen and remove the vial cradle *(5-**7**)* from the turntable *(5-**5**)*.



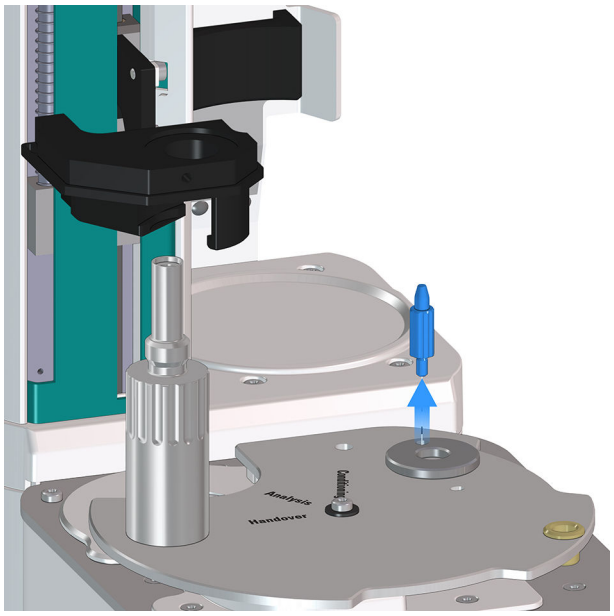
- Loosen the conditioning tube *(5-**3**)* from the turntable *(5-**5**)*, then loosen the screw cap and septum from the conditioning tube *(5-**3**)*.



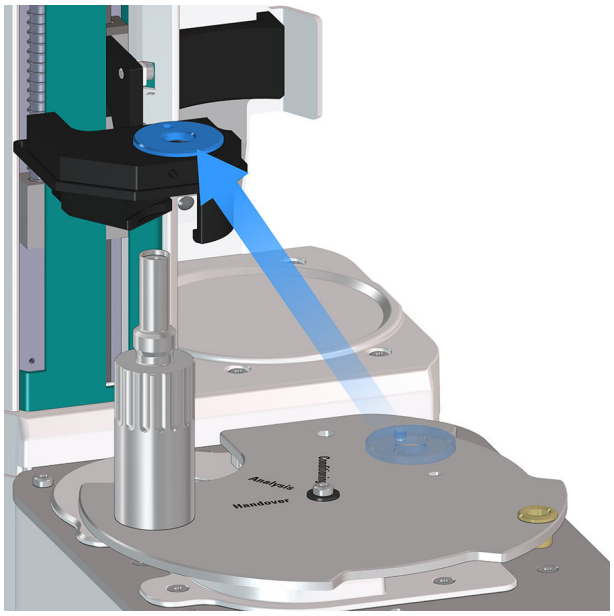
- Position the bottom part of the conditioning tube *(5-**3**)* instead of the vial cradle *(5-**7**)*.



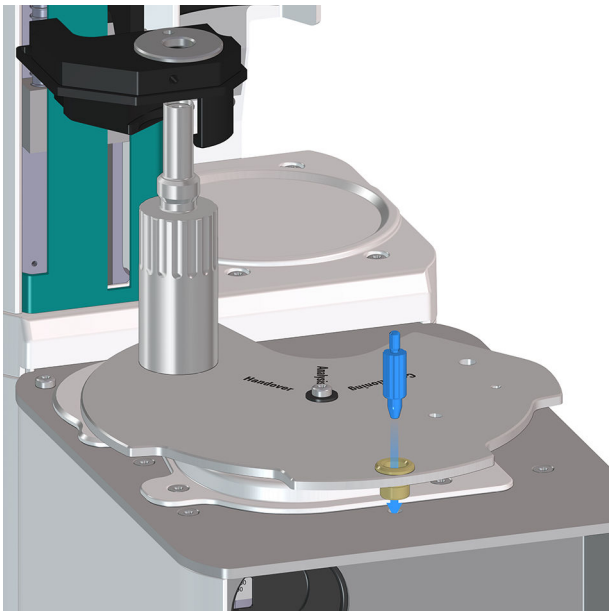
- Loosen the adjustment pin *(5-**4**)* and the centering disk.



- Place the centering disk *(5-**4**)* into the opening in the vial holder *(7-**4**)*.



- Use the adjustment pin *(5-**4**)* to fix the turntable *(5-**5**)* in place in handover position.

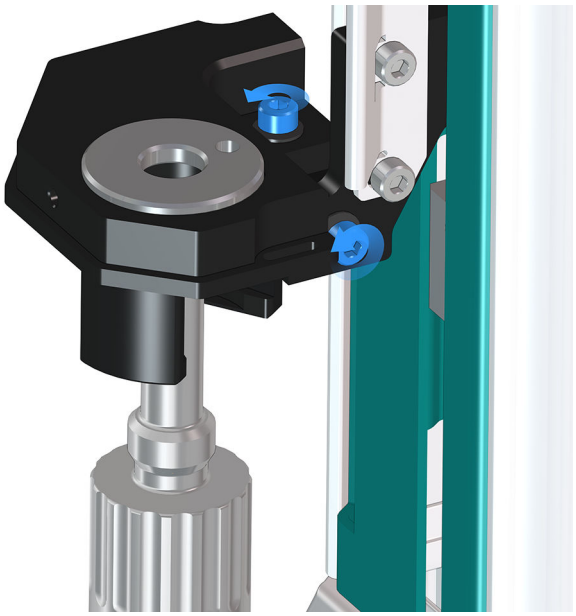


The adjustment pin *(5-**4**)* is in the designated bore at the end stop.

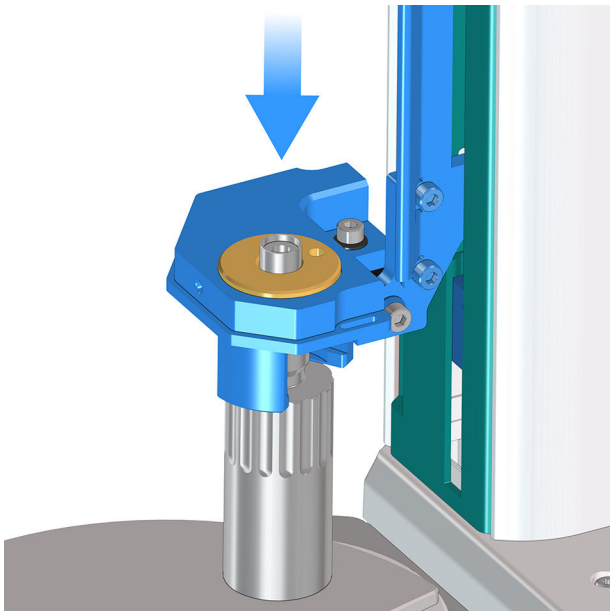
Adjusting

1 Aligning the vial holder

- Use the hex key to loosen both of the screws on the vial holder *(7-**4**)*.
  Do not remove screws completely.



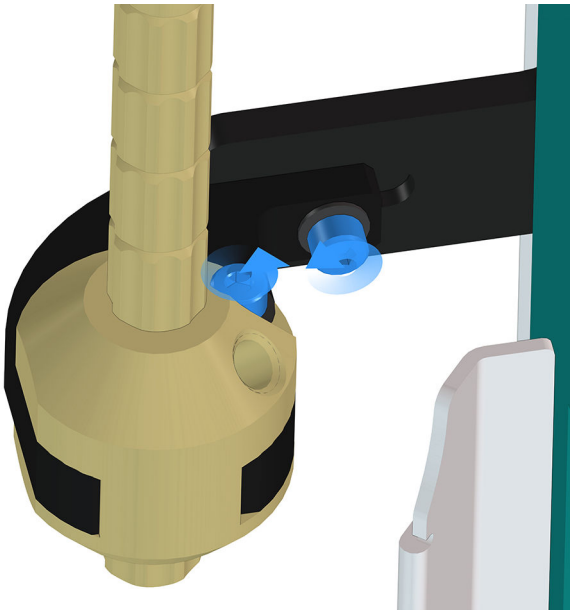
- Lower the vial holder *(7-**4**)* and align it to the centering disk *(5-**4**)* by moving the needle holder *(7-**8**)* along the x- and y-axes.



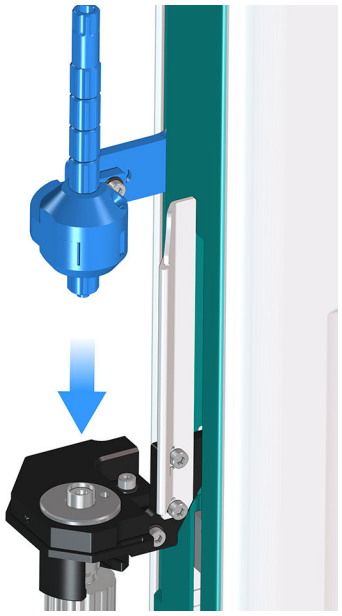
- Use the hex key to retighten both of the screws that were previously loosened.

2 Aligning the needle system

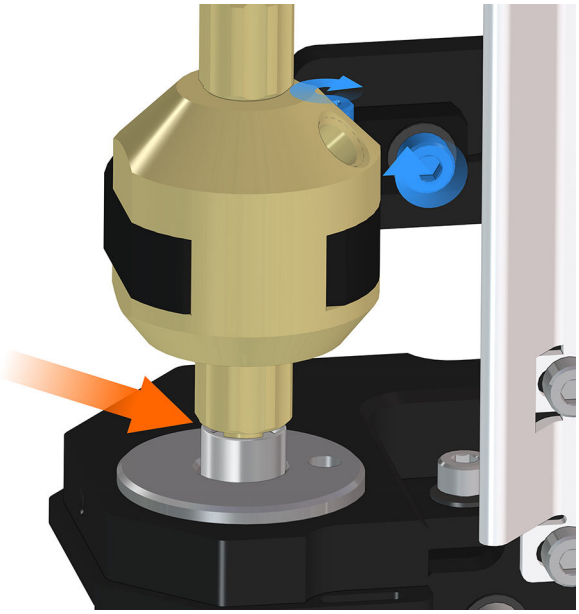
- Use the hex key to loosen both of the screws on the distributor holder *(7-**9**)*.
  Do not remove screws completely.



- Move the needle system *(5-**9**)* downwards and position it so that the distributor *(7-**5**)* is aligned with the conditioning tube *(5-**3**)* by moving the needle system along the x- and y-axes.



- Do not press the needle system *(5-**9**)* all the way down while doing so; there should still be a small gap present (see arrow). Use the hex key to retighten both of the screws that were previously loosened.



3 Checking the alignment

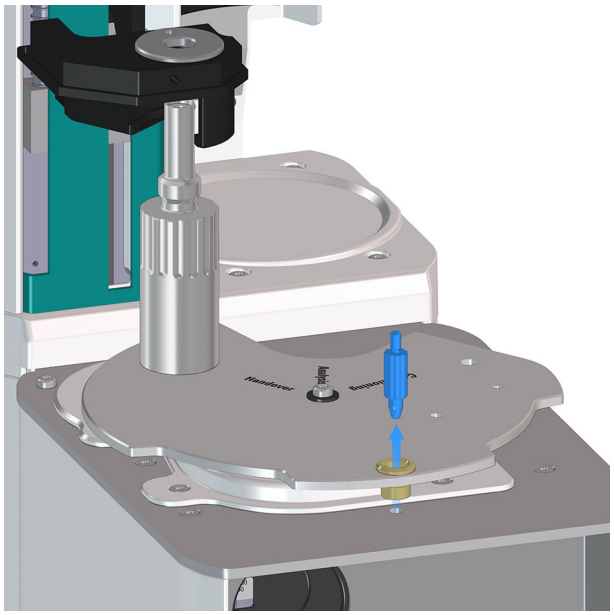
- Move the vial holder *(7-**4**)* and the needle system upwards.
- Move the vial holder *(7-**4**)* and needle system down once again and check the alignment.

You can continue once the alignment is correct. Otherwise repeat the entire sequence again.

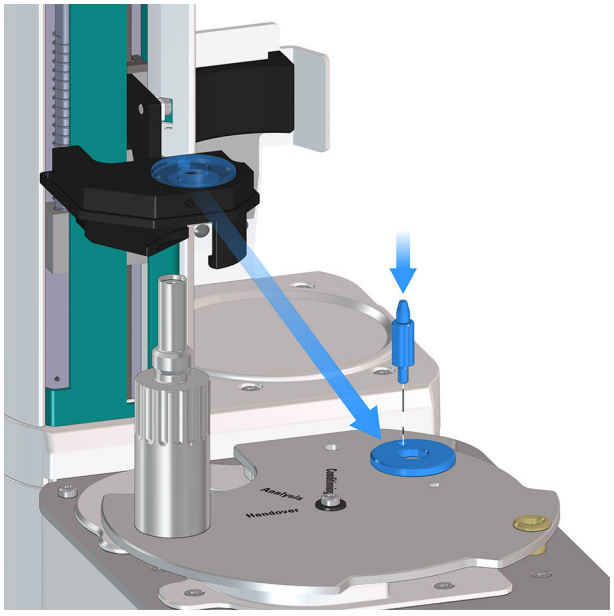
Finishing the adjustment

1 Dismantling the turntable

- Pull out the adjustment pin *(5-**4**)*.

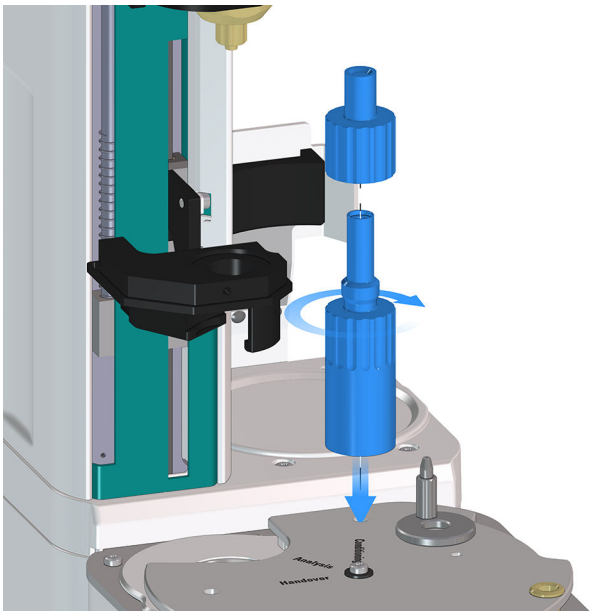


- Place the centering disk *(5-**4**)* on the turntable.
- Fix the centering disk *(5-**4**)* in place with the centering pin *(5-**4**)*.

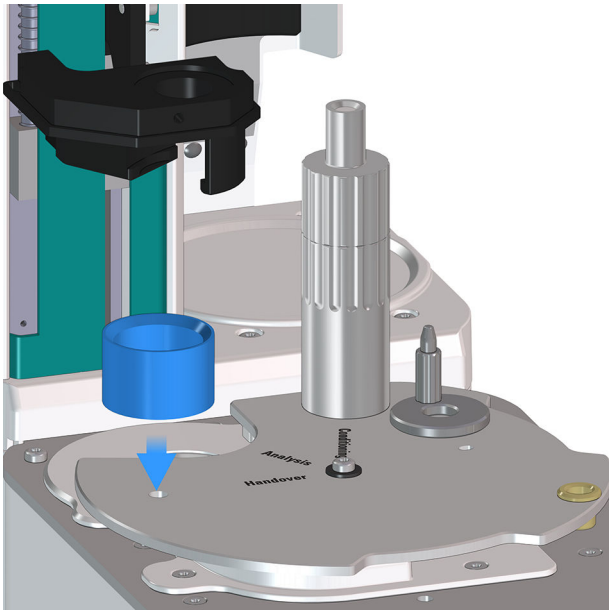


- Loosen the lower part of the conditioning tube *(5-**3**)* from the turntable *(5-**5**)*.

- Install the conditioning tube *(5-**3**)* at its original place on the turntable *(5-**5**)*, then mount the screw cap and septum on the conditioning tube *(5-**3**)*.

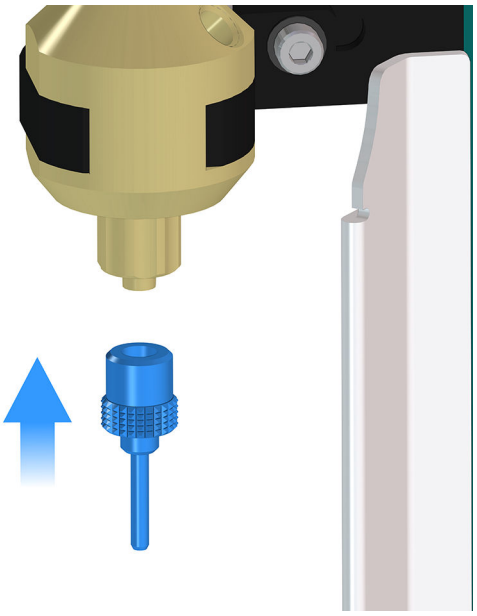


- Mount the vial cradle *(5-**7**)* on the turntable *(5-**5**)*.

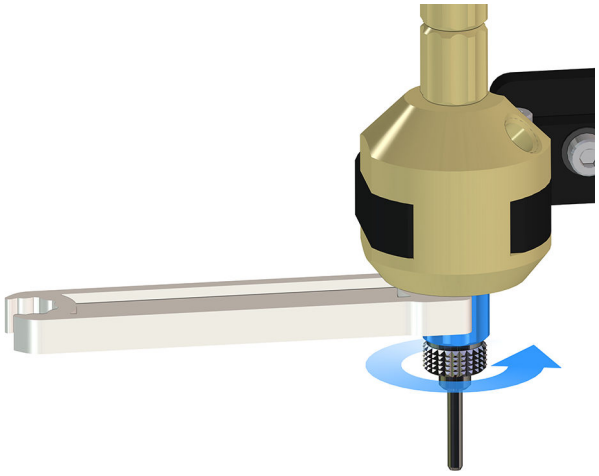


2 Mounting the needles

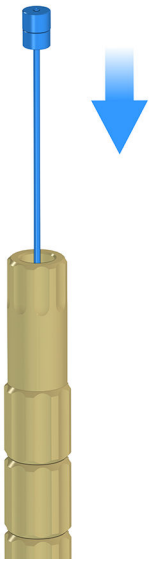
- Position the outlet needle *(7-**2**)* on the needle holder *(7-**8**)*.



- Fasten the outlet needle *(7-**2**)* with the wrench.

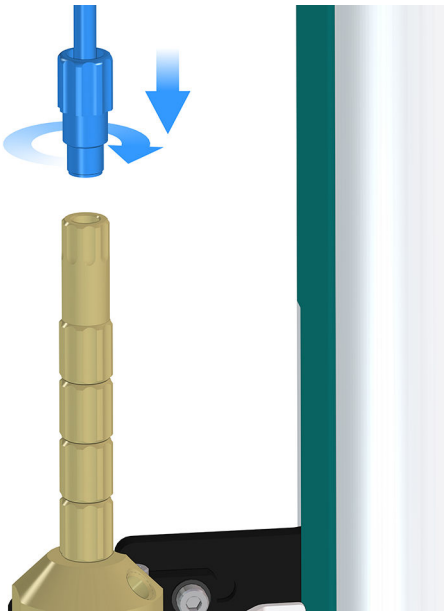


- Feed the septum piercing needle *(7-**3**)* into the needle holder *(7-**8**)*.

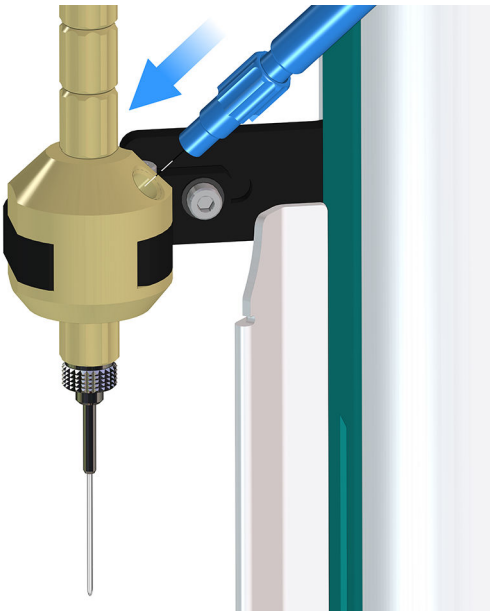


3 Mounting the tubing

- Connect the FEP tubing *(7-**9**)* to the needle holder *(7-**8**)*.

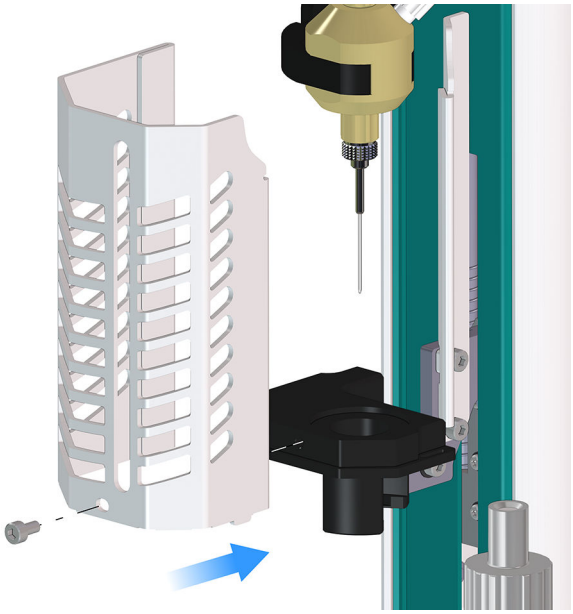


- Connect the heating tubing *(7-**1**)*.



4 Fastening the safety shield

- Attach the safety shield *(5-**9**)*.
- Use the hex key to tighten the fastening screw.



The oven module is now read to use again.

7.4 Replacing the septum in the conditioning tube

Prerequisite:

- The OMNIS Sample Robot Oven is switched off.
- Hot surfaces have cooled down.

Required accessories:

- Septum for the conditioning tube (6.1448.080)

1. Remove the screw cap of the conditioning tube.
2. Remove the existing septum from the conditioning tube and replace it with a new septum.
3. Tighten the screw cap.

7.5 Cleaning the product surface

Regularly clean the product to prevent malfunctions and to ensure a long service life.

- Remove spilled chemicals immediately.
- Protect plug connections against contamination.

WARNING

Chemical hazardous substances

Contact with aggressive chemical substances may cause poisoning or chemical burns.

- Wear personal protective equipment (e.g. protective glasses, gloves).
- Use exhaust equipment when working with vaporizing hazardous substances.
- Clean contaminated surfaces.
- Only use detergents that do not cause any unwanted side reactions with the materials to be cleaned.
- Dispose of chemically contaminated materials (e.g. cleaning material) in accordance with regulations.

WARNING

Health hazards from electrical potential.

Severe injuries with possibly fatal consequences.

- Operate the product only if it is in perfect condition. The housing must also be intact.
- Only use the product with the covers fitted.
- Protect live components (e.g. power supply unit, power cord, connection sockets) against moisture.
- Always have maintenance work and repairs on electrical components carried out by a regional Metrohm service representative.

Prerequisite:

- The product is switched off and disconnected from the energy supply.

Required accessories:

- Cleaning cloth (soft, lint-free)
- Water or ethanol

1. Clean the surface with a damp cloth. Remove persistent contamination with ethanol.
2. Wipe the surface with a dry cloth.
3. Clean the connectors with a dry cloth.

8 Troubleshooting

Messages on malfunctions and errors are displayed in the control software or in the embedded software (e.g. on the display of an instrument) and contain the following information:

- Descriptions of causes of malfunctions (e.g. jammed drive)
- Descriptions of problems with the control (e.g. missing or invalid parameter)
- Information on how to solve the problem

System components with status display elements also indicate malfunctions and errors with a red flashing LED.

Troubleshooting on the product is often only possible with the control software or the embedded software (e.g. initializing, moving to a defined position).

See also

System – Signals (chapter 3.3, page 26)

8.1 OMNIS Sample Robot Oven – Troubleshooting

⚠ CAUTION

Jammed drive and components

Risk of injury in the event of jammed, moving, and hot components. Contact with hot surfaces can cause burns. Contact with aggressive chemical substances may cause poisoning or chemical burns. To avoid danger, observe the following:

- Wear personal protective equipment (e.g. protective glasses, gloves).
- Loosen jamming only after switching off the instrument and allowing the components to cool down.

Problem	Cause	Remedy
The drift is very high during conditioning.	The molecular sieve of the cartridge and/or the titration cell has reached its capacity limit.	Replace the molecular sieve.
	The titration cell is leaking.	Check the seals and the septum and replace them if necessary.
	The conditioning tube is contaminated.	Clean the conditioning tube with methanol and then blow it out with nitrogen.
The titration time is too long.	The sample is not homogenous.	Pulverize the sample or homogenize it before weighing in.
	The tubing connections are leaking.	Inspect the tubing and replace it as necessary.
The results are widely scattered.	The molecular sieve of the cartridge and/or the titration cell has reached its capacity limit.	Replace the molecular sieve.
	There is condensate in the heating tubing.	Dry the tubing.
		Reduce the gas flow.
		Lower the oven temperature.
	The gas flow is too high.	Reduce the gas flow.
	The sample is not homogenous.	Pulverize the sample or homogenize it before weighing in.

Problem	Cause	Remedy
Unable to achieve selected gas flow.	The system is leaking.	Check all tubing connections for leaks.
		Check the molecular sieve for leaks.
	Pressure from external gas supply either too low or too high.	Set the input pressure with the valve closed to 1 bar (max. 1.5 bar) of overpressure.
	A blockage in the gas system.	Clean the needle (blow it out).
		Clean the heating tubing (blow it out).
		Replace the air filter.
	The pump or the valve is defective.	If this occurs frequently, contact your regional Metrohm representative.
Needle lift collides with the vial or the conditioning tube.	Vial not picked up correctly during transport from the turntable to the oven.	Clean the vial holder.
		Check the septum crimping tongs and readjust them as required.
		Check the adjustment of the needle system and readjust it as required.
		Check the adjustment of the turntable and readjust as required.
		If this occurs frequently, contact your regional Metrohm representative.
	The position of the conditioning tube and the needle system is not correct.	Check the adjustment of the needle system and readjust it as required.
		Check the adjustment of the turntable and readjust as required.
		If this occurs frequently, contact your regional Metrohm representative.

Problem	Cause	Remedy
The oven does not heat up.	Restart protection is active after triggering the excess temperature switch.	Switch the instrument off and on again.
		If this occurs frequently, contact your regional Metrohm representative.
	The temperature measurement is defective.	Contact your regional Metrohm representative.
	The heating tubing is not inserted correctly.	Check the plug connection of the heating tubing on the lid of the lift.
	The oven is defective.	Contact your regional Metrohm representative.
The heating tubing does not heat up.	The heating tubing is not inserted correctly.	Check the plug connection of the heating tubing on the lid of the lift.
	The heating tubing is defective.	Replace the heating tubing.
It is not possible to initialize the sample robot.	There is a sample vial in the gripper.	Press and hold the on/off switch for approx. 5 seconds until a dual beep is heard.
There is liquid in the sample vial.	Liquid is drawn into the sample vial after an emergency stop.	After an emergency stop, ramp up the lift manually until the needle is outside the sample vial.

8.2 Opening the gripper manually

Prerequisite:

- The OMNIS Sample Robot Oven is at a standstill.
- The sample vial in the gripper has cooled down.

WARNING

Hot sample vials

The hot sample vial might fall out and break if the gripper is opened manually. Hot sample vials can cause burns. Leaking samples can damage the instrument.

- Allow the sample vial to cool down for approx. 5 minutes before removing it.
- Wear personal protective equipment and heat-resistant protective gloves.

1 Hold the sample vial in one hand.

2 Press and hold the on/off switch for 5 seconds until a dual beep is heard.

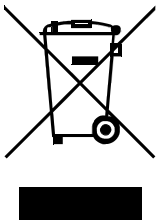
The gripper opens and the sample vial can be removed.

In the event of a malfunction, sample vials must always be removed manually, as the gripper is jammed. Sample processing is not possible. An error message appears in the OMNIS Software.

See also

Indicators and controls (chapter 3.2, page 25)

9 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.

10 Technical specifications

10.1 OMNIS Main Module S – Oven

Robot arm

Typical load	3.7 N
Speed	adjustable, 15–75 mm/s

Gripper

Grip diameter	9–38 mm

Rack positions

1–2

10.2 Oven module

10.2.1 Lift

Stroke path	193 mm
Speed	adjustable, 10–100 mm/s

10.2.2 Turntable

Turntable angle	110°
Angular speed	adjustable, 10–180 °/s

10.2.3 Oven

Temperature range	50–300 °C	
Stability	±0.5 °C	
Accuracy	±4.0 °C	
Heating power	85 W	
Heating current	3.0–4.0 A	depending on the heating coil tolerance

Heating rate	70 °C/min when heating from 50 to 300 °C	depending on ambient temperature, sample amount, and vessel dimensions
Cooling rate	15 °C/min when cooling from 300 to 50 °C	depending on ambient temperature, sample amount, and vessel dimensions
Temperature gradient	15 °C/min when cooling from 300 to 50 °C	adjustable 0.01–15 °C/min

10.2.4 Heating tubing

Typical temperature	50 °C
Power	50 °C
Voltage	17 V
Current	150 mA

10.2.5 Gas flow

Gas flow range	10–150 mL/min	under normal conditions, calibrated with air at 0 °C and 1013.25 mbar
Stability	±3 mL/min	
Accuracy	±5%	min. 1.5 mL/min, max. 5 mL/min
External gas inlet	1.0 bar (±0.5 bar)	

10.2.6 Magnetic stirrer

Adjustment range for rotational speed	+1 to +15	Rotation in counter-clockwise direction (seen from above)
	–1 to –15	Rotation in clockwise direction (seen from above)

Rotational speed change per step	120 rpm	
Maximum rotational speed	1,800 rpm	

10.3 Ambient conditions

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
Altitude / Pressure range	max. 3,000 m. above sea level / min. 700 mbar	
Overvoltage category	II	
Pollution degree	2	
Calibration:	Air (at 20 °C, 101.325 kPa)	

10.4 Energy supply

10.4.1 OMNIS Main Module S – Oven

Nominal voltage range	100–240 V AC	±10 %
Nominal frequency range	50–60 Hz	±3 %
Power consumption	max. 200 W	
Protection		
Internal fuse	4 ATH	cannot be replaced by the user

10.4.2 Oven module – Energy supply

Nominal voltage	24 VDC	internal
Power consumption	max. 100 W	
Protection		
Control node protection	1.5 ATH	
Oven actuation protection	4.0 ATH	cannot be replaced by the user

10.4.3 OMNIS sample rack – Energy supply

Nominal voltage	5 VDC	internal
Power consumption	max. 0.5 W	

10.5 Measurements and weight

10.5.1 OMNIS Main Module S – Oven

Measurements	
Width	558 mm
Height	585 mm
Depth	564 mm
Weight	21.0 kg

10.5.2 Oven module – Measurements and weight

Measurements	
Width	92 mm
Height	585 mm
Depth	289 mm
Weight	
	4.4 kg

10.5.3 OMNIS sample rack – Measurements and weight

Measurements

Width	277 mm
Height	125 mm
Depth	277 mm

Weight

Versions	
9 x 250 mL	1,038 g
9 x 200 mL	1,086 g
9 x 150 mL	1,620 g
16 x 120 mL	1,051 g
25 x 75 mL	1,071 g

10.6 Housing

10.6.1 OMNIS Main Module S – Oven

Materials

Lid	AlSi12Cu1	Aluminum, coated
Back panel	AW-5754 H12 / H22	Aluminum, coated
Base	AlSi12Cu1	Aluminum, coated
Enclosure	PP	Polypropylene
Front foils	PET	Poly(ethylene terephthalate), mat

IP degree of protection IP 20

10.6.2 Oven module – Housing

Materials

Lid	PBT	Poly(butylene terephthalate)
Back panel	1.4301	Stainless steel, coated
Base	PBT	Poly(butylene terephthalate)

Enclosure	PP	Polypropylene
IP degree of protection	IP 20	

10.6.3 OMNIS sample rack – Housing

Materials	PP	polypropylene
IP degree of protection	IP 40	

10.7 Connectors

10.7.1 OMNIS Main Module S – Oven

Energy supply		via power connection
Socket		IEC 60320, type C14, 10 A
Power cord		
Length	max. 2 m	
Number of conductors	3	with protective ground
Conductor cross-section	min. 1.0 mm^2 / 18 AWG	
Plug		
Instrument side		IEC 60320, type C13, 10 A
Building side		country-specific
MDL	Metrohm Device Link	4 connectors
LAN	Local Area Network	
Type	Ethernet CAT 6	
Socket	RJ45	shielded
Cable type	(min. FFTP)	shielded
Cable length	max. 10 m	from Metrohm accessories
Contacts	4	Contact surfaces for OMNIS sample rack

10.7.2 OMNIS sample rack – Connectors specifications

Contacts	4	Spring contacts