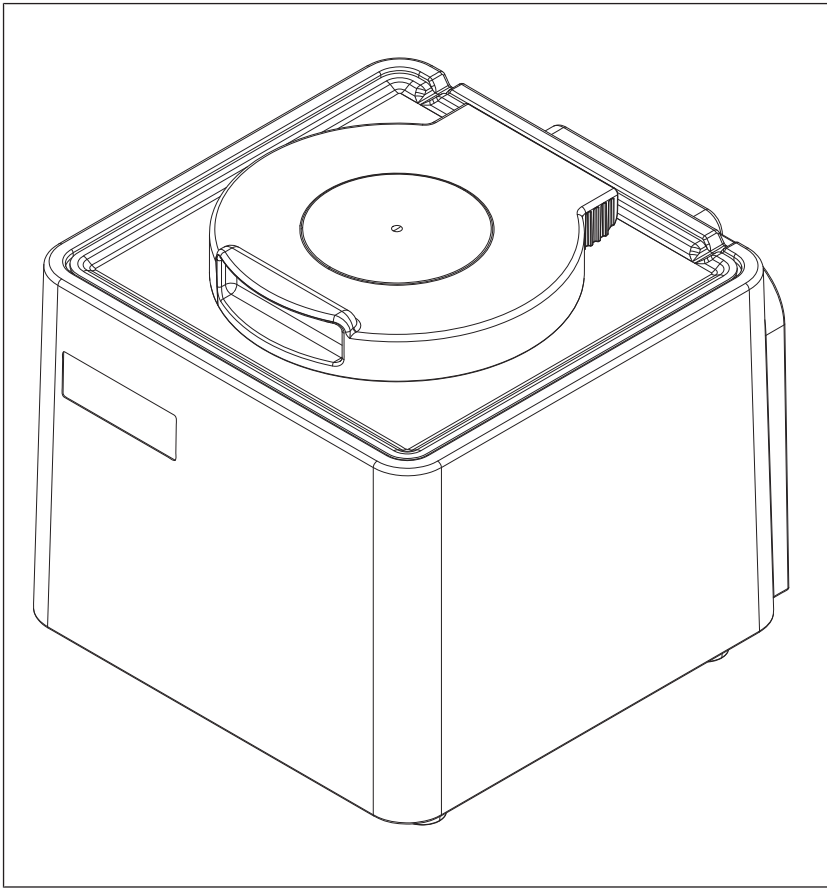
User Manual

Refractive Index Module

RX4/RX5



METTLER TOLEDO

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1 Introduction

Thank you for choosing a METTLER TOLEDO refractive index module. The refractive index modules RX4 and RX5 are easy-to-operate, high-performance accessories for measuring the refractive index of liquid samples.

The refractive index modules can be connected to either a R4/R5 refractometer for simultaneous measurement of refractive index at two different temperatures or to a D4/D5/D6 density meter for simultaneous measurement of refractive index and density.

About this document

The instructions in this document refer to refractive index modules RX4 and RX5 running firmware version 1.0.

The firmware license is subject to the End User License Agreement EULA version 3.0. See the following link for the license text:

▶ www.mt.com/legal

For third party licenses and open source attribution files, see the following link:

▶ www.mt.com/licenses

If you have any additional questions, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

Conventions and symbols

Refers to an external document.

Elements of instructions

▪ Prerequisites

1 Steps

2 ...

⇨ Intermediate results

⇨ Results

2 Safety information

The refractive index modules RX4 and RX5 are designed to be used as accessories and are compatible with the main instruments listed below.

- D4/D5/D6
- R4/R5

These instruments are referred to as main instruments in the following.

- This User Manual contains the information you need to set up the accessory, put it into operation and maintain it.
- Keep the User Manual for future reference.
- Include the User Manual if you transfer the accessory to other parties.
- The Reference Manual of the main instrument contains additional information on the interface between the accessory and the main instrument.

Only use the accessory according to this User Manual and the Reference Manual of the main instrument. If you do not use the accessory according to both documents or if it is modified, the safety of the main instrument may be impaired and Mettler-Toledo GmbH assumes no liability.

User Manual and Reference Manual are available online.

▶ www.mt.com/library

2.1 Definitions of signal words and warning symbols

Safety notes contain important information on safety issues. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results. Safety notes are marked with the following signal words and warning symbols:

Signal words

WARNING	A hazardous situation with medium risk, possibly resulting in death or severe injury if not avoided.
CAUTION	A hazardous situation with low risk, resulting in minor or moderate injury if not avoided.
NOTICE	A hazardous situation with low risk, resulting in damage to the instrument, other material damage, malfunctions and erroneous results, or loss of data.

Warning symbols

Electrical shock

Hot surface

2.2 Product specific safety notes

Intended use

The refractive index modules RX4 and RX5 are designed to be used by trained staff. The refractive index modules are intended for measuring the refractive index of liquid samples that are compatible with the materials with which they come into contact.

Any other type of use and operation beyond the limits of use stated by Mettler-Toledo GmbH without consent from Mettler-Toledo GmbH is considered as not intended.

Responsibilities of the instrument owner

The instrument owner is the person holding the legal title to the accessory and who uses the accessory and the main instrument or authorizes any person to use them, or the person who is deemed by law to be the operator of the accessory and the main instrument. The instrument owner is responsible for the safety of all users of the accessory and third parties.

METTLER TOLEDO assumes that the instrument owner trains users to safely use the accessory and the main instrument in their workplace and deal with potential hazards. METTLER TOLEDO assumes that the instrument owner provides the necessary protective gear.

Protective clothing

Gloves that protect your hands from contact with hot or cold surfaces.

Safety notes

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that carry a live current can lead to death or injury.

1 Only use the METTLER TOLEDO power supply cable and AC adapter designed for your accessory.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids and moisture.
4 Check the cables and the power plug for damage and replace damaged cables and power plugs.

⚠ CAUTION

Slight burns due to hot surface

The measuring cell can become hot enough to cause slight burns.

1 Do not touch the measuring cell without gloves before the measuring cell has cooled down.
2 Wear gloves that protect from contact heat if you need to touch the hot measuring cell.

NOTICE

Risk of damage to the accessory or the main instrument due to the use of unsuitable parts!

Using unsuitable parts with the accessory or the main instrument can damage the accessory or the main instrument or cause them to malfunction.

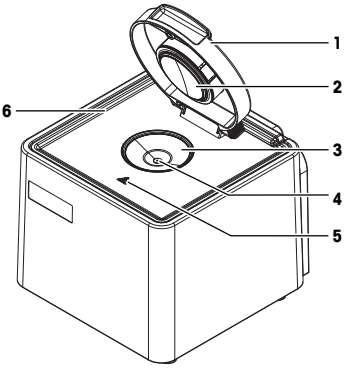
– Only use parts from METTLER TOLEDO that are intended to be used with your accessory.

FCC Rules

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

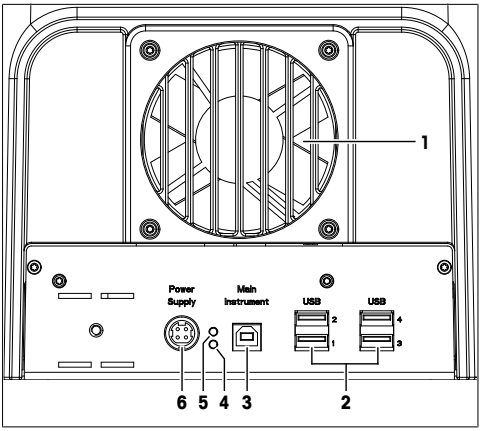
3 Design and function

3.1 Overview refractive index module



No.	Name	Function
1	Lid	Protects the measuring cell
2	Measuring-cell cover	Closes off the measuring cell and permits the formation of a stable vapour-liquid equilibrium
3	Measuring cell	Holds the sample
4	Prism	Refracts the light at its surface
5	Safety label	Warns that the measuring cell can be hot and cause slight burns if you touch it without protective gloves
6	Protection plate	Collects spilled sample or cleaning solution

3.2 Rear panel

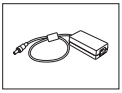
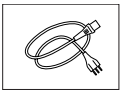
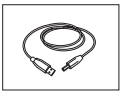
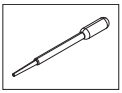
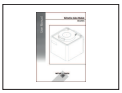


No.	Name	Function
1	Fan and ventilation openings	Move air over the heat sink of the Peltier element
2	**USB 1** / **USB 2** / **USB 3** / **USB 4**	USB-A socket to connect USB devices, for example printers, barcode readers or an InMotion™ Autosampler

No.	Name	Function
3	**Main Instrument**	USB-B socket to connect the main instrument
4	Green pilot light	Voltage on connection to main instrument and AC adapter
5	Red pilot light	Voltage on connection to main instrument but no voltage on the connection to AC adapter
6	**Power Supply**	DC Socket to connect the AC adapter

4 Installation and commissioning

4.1 Scope of delivery

Part		Order number	R4X	R5X
	Refractive index module	–	•	•
	Extern. Power Supply 120W	30298362	•	•
	Power cable (country-specific)	–	•	•
	USB cable A-B 180 cm	51191926	•	•
	Plastic pipettes (3 pcs) PP (polypropene)	51191092	•	•
	User Manual	–	•	•
	Declaration of conformity	–	•	•
	Test report	–	•	•

4.2 Download the Reference Manual

1 Go to the website www.mt.com/library.
2 Select the **Technical Documentation** tab.
3 Enter the product type in the search field and start the search.
4 Select the Reference Manual from the result list.

5 Select the link.

⇨ The Reference Manual is either opened or downloaded depending on the browser settings.

6 Check which firmware version is installed on your main instrument.

7 If the Reference Manual is not written for the installed firmware version, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

4.3 Unpack the refractive index module

1 Remove the refractive Index module from the protective packaging.

2 Store the packing material for later transport over long distances.

3 Check if you received all parts listed in the scope of delivery.

4 Inspect the parts visually for flaws or damage.

5 If parts are missing or damaged, report it to your authorized METTLER TOLEDO dealer or service representative.

See also

🗎 Scope of delivery ▸ Page 7

4.4 Install and connect the refractive index module

How to install the refractive index module and connect it to the main instrument is described in the Reference Manual of the main instrument.

▶ www.mt.com/library

4.5 Connect the refractive index module to the power supply

The AC adapter is suitable for all supply line voltages ranging from 100...240 V AC and 50/60 Hz.

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that carry a live current can lead to death or injury.

1 Only use the METTLER TOLEDO power supply cable and AC adapter designed for your accessory.

2 Connect the power cable to a grounded power outlet.

3 Keep all electrical cables and connections away from liquids and moisture.

4 Check the cables and the power plug for damage and replace damaged cables and power plugs.

NOTICE

Danger of damage to the AC adapter due to overheating!

If the AC adapter is covered or in a container, it is not sufficiently cooled and overheats.

1 Do not cover the AC adapter.

2 Do not put the AC adapter in a container.

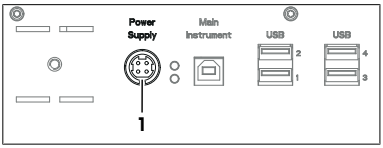
- The refractive index module is installed and connected to the main instrument.

1 Install the cables in such a way that they cannot be damaged or interfere with operation.

2 Insert the plug of the power cable in the socket of the AC adapter.

3 Insert the plug of the AC adapter in the **Power Supply** (1) socket on the rear panel.

4 Insert the plug of the power cable in a grounded power outlet that is easily accessible.



4.6 Disconnect the refractive index module from the power supply

- The main instrument is shut down.

1 Pull the plug of the power cable out of the power outlet.

2 Pull the plug of the AC adapter out of the **Power Supply** socket on the rear panel.

5 Operation

How to operate the refractive index module is described in the Reference Manual of the main instrument.

▶ www.mt.com/library

6 Maintenance

In this chapter you find descriptions of the maintenance tasks you should perform on your refractive index module. Any other maintenance tasks need to be performed by a service technician that has been qualified by METTLER TOLEDO.

If you experience problems with your refractive index module, contact your authorized METTLER TOLEDO dealer or service representative.

METTLER TOLEDO recommends that a preventive maintenance and calibration certification is done at least once a year through your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

6.1 Maintenance schedule

If the standard operating procedures of your company require other maintenance intervals, use the intervals listed in the standard operating procedures.

Frequency	Task	Reference
Daily	Clean the measuring cell at the end of the work day.	Reference Manual of the main instrument
	Perform a test with deionized water.	Reference Manual of the main instrument

See also

Download the Reference Manual ▸ Page 7

6.2 Clean the refractive index module

NOTICE

Danger of damage to the refractive index module due to inappropriate cleaning methods!

Inappropriate cleaning agents can damage the housing or other parts of the refractive index module. If liquids enter the housing they can damage the refractive index module.

1 Make sure the cleaning agent is compatible with the material of the part you want to clean.

2 Make sure that no liquid enters the interior of the refractive index module.

If you have questions about the compatibility of cleaning agents, contact your authorized METTLER TOLEDO dealer or service representative.

See also

Technical data ▸ Page 16

6.2.1 Clean the housing and the lid

METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Procedure

- The main instrument is shut down.
- The measuring cell has cooled down to room temperature.

1 Wipe the housing with a cloth moistened with the cleaning agent.
2 Wipe the inside and the outside of the lid with a cloth moistened with the cleaning agent.
3 Wait until the lid and the space between the lid and the measuring-cell cover are dry.
4 Close the lid.

6.3 Clean the measuring cell

How to clean the measuring cell is described in the Reference Manual of the main instrument.

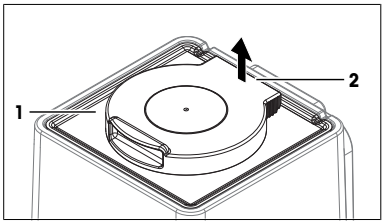
▶ www.mt.com/library

6.4 Replace the protection plate

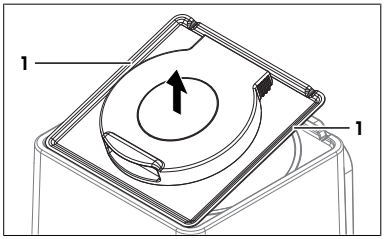
6.4.1 Remove the protection plate

- The refractive index module is not vertically mounted on the density meter.
- The measuring cell is clean and dry.

1 Hold the protection plate (1) by the back of the lid (2) with one hand.
2 Pull the back of the lid up to overcome the force of the magnets that hold the protection plate in place.

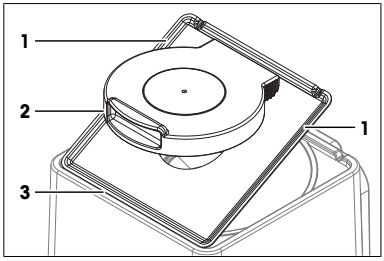


3 Hold one of the edges (1) of the protection plate with your free hand, let go of the lid and hold the protection plate with both hands.
4 Remove the protection plate with both hands.

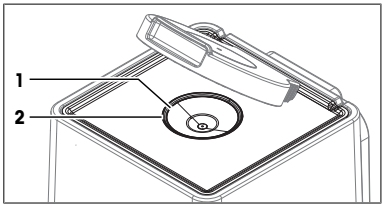


6.4.2 Install the protection plate

1 Open the lid (2).
2 Hold the protection plate by its edges (1) with both hands.
3 Align the front edge of protection plate with the front edge (3) of the refractive index module.
4 Let go with one hand and use it to hold the protection cover by the open lid.
5 **CAUTION Bruising of fingers due to strong magnet.** Hold the protection plate by the open lid and not by its edge when you lower it.



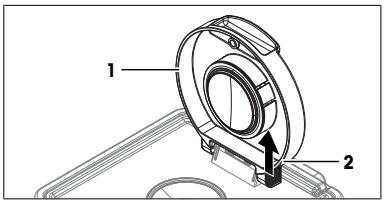
6 Lower the protection plate and make sure that the opening (2) in the protection plate is aligned with the rim (1) of the measuring cell.
   ⇨ When the protection plate is close to the top of the refractive index module, strong magnets pull it down and hold it in place.



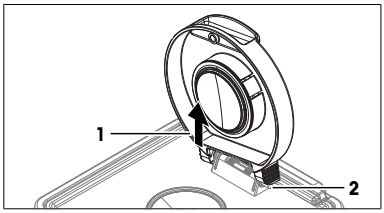
6.5 Replace the lid

6.5.1 Remove the lid

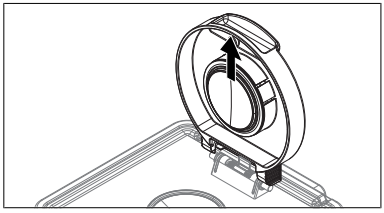
1 Open the lid (1) completely.
2 Pull one side of the lid (2) up until it slides off its axle.



3 Pull the other side of the lid (1) off the axle (2).

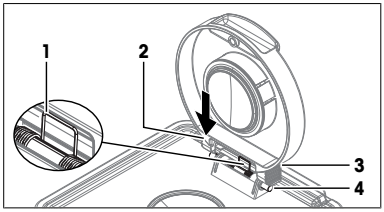


4 Remove the lid.

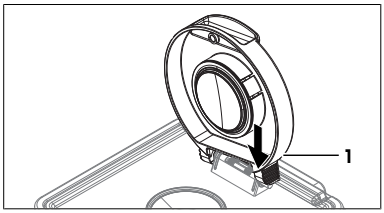


6.5.2 Install the lid

1 Align the back of the upright lid (3) with the axle (4).
2 Make sure that the spring (1) is in front of the lid.
3 Push one side of the lid (2) down until it clicks into place.



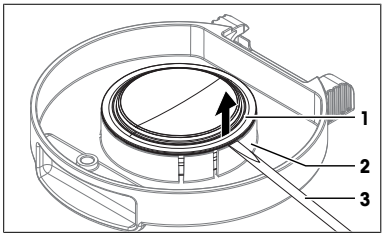
4 Push the other side of the lid down until it clicks into place.



6.6 Replace the measuring-cell cover

6.6.1 Remove the measuring-cell cover

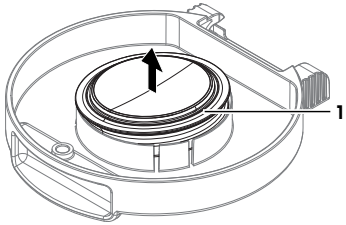
1 Remove the lid.
2 Insert the tip of a flat screwdriver (3) in the slit between the measuring-cell cover (1) and the lid (2).
3 Use the screwdriver to lift the measuring-cell cover partially out of the lid.



4 Remove the measuring-cell cover (1).

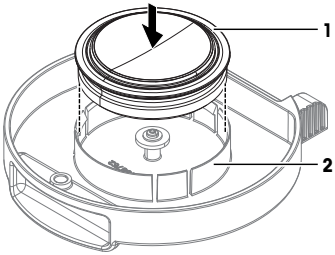
See also

Remove the lid ▸ Page 11

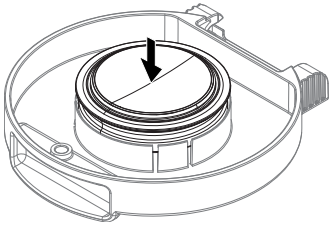


6.6.2 Install the measuring-cell cover

1 Lower the measuring-cell cover (1) into its support on the lid (2).



2 Push the measuring-cell cover into its support until it clicks into place.
3 Install the lid.



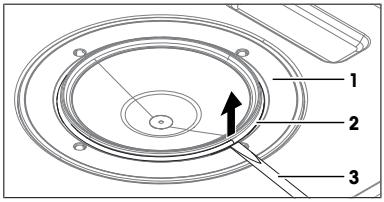
See also

Install the lid ▸ Page 12

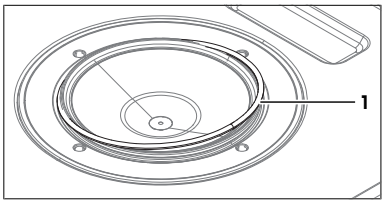
6.7 Replace the measuring-cell O-ring

6.7.1 Remove the measuring-cell O-ring

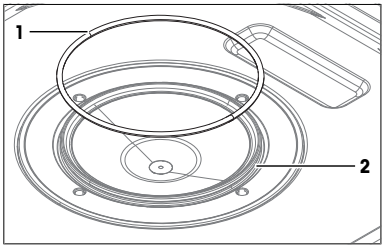
1 Remove the protection plate.
2 Insert the tip of a flat screwdriver (3) in the slit between the O-ring (2) and the measuring cell (1).



3 Use the screwdriver to lift the O-ring (1) over the rim of the groove.



4 Lift the O-ring (1) completely out of the groove (2).

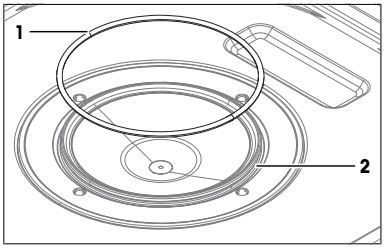


See also

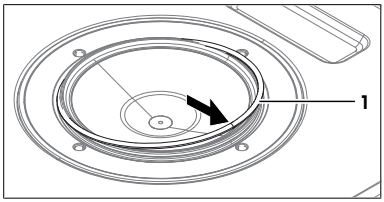
Remove the protection plate ▸ Page 10

6.7.2 Install the measuring-cell O-ring

1 Place the one side of the O-ring (1) in the groove (2) on the measuring cell.



2 Push the other side of the O-ring (1) over the rim into the groove.
3 Install the protection plate.



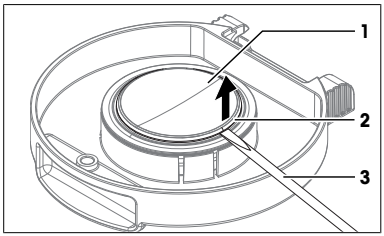
See also

Install the protection plate ▸ Page 11

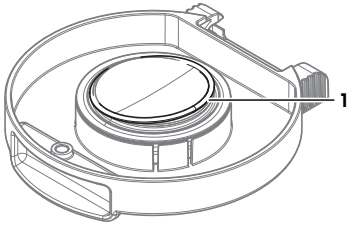
6.8 Replace the O-ring of the measuring-cell cover

6.8.1 Remove the O-ring of the measuring-cell cover

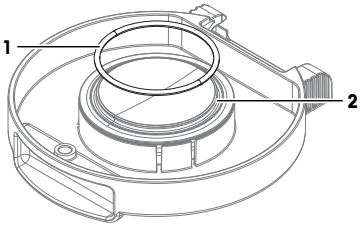
1 Remove the lid.
2 Insert the tip of a flat screwdriver (3) in the slit between the O-ring (2) and the measuring-cell cover (1).



3 Use the screwdriver to lift the O-ring (1) over the rim of the groove.



4 Lift the O-ring (1) completely out of the groove (2).

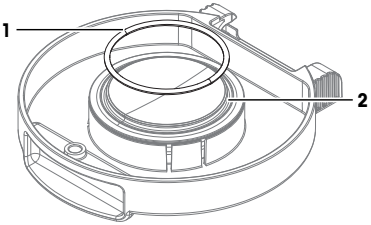


See also

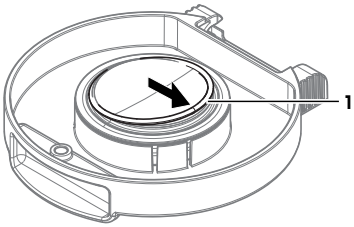
Remove the lid ▸ Page 11

6.8.2 Install the O-ring of the measuring-cell cover

1 Place the one side of the O-ring (1) in the groove (2) on the measuring-cell cover.



2 Push the other side of the O-ring (1) over the rim into the groove.
3 Install the lid.



See also

Install the lid ▸ Page 12

6.9 Prepare the refractive index module for storage

How to remove the refractive index module from the main instrument is described in the Reference Manual of the main instrument.

▶ www.mt.com/library

1 Shut down the main instrument.
2 Disconnect the refractive index module from the power supply.
3 Remove the refractive index module from the main instrument.
4 Disconnect and remove any accessories from the refractive index module.
5 Clean the refractive index module.
6 Protect the refractive index module from dust.
7 Store the refractive index module in a dry and clean place.

6.10 Transport the refractive index module

If you have questions about transporting your refractive index module, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

How to remove the refractive index module from the main instrument is described in the Reference Manual of the main instrument.

▶ www.mt.com/library

1 Shut down the main instrument.
2 Disconnect the refractive index module from the power supply.
3 Remove the refractive index module from the main instrument.
4 Disconnect and remove any accessories from the refractive index module.
5 Clean the refractive index module.
6 If you transport the refractive index module over long distances, use the original packaging.
7 Move the refractive index module to the new location.

6.11 Dispose of the refractive index module

In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment. If you have any questions, please contact the responsible authority or the distributor from which you purchased this device. Should this device be passed on to other parties, the content of this regulation must also be related.

7 Technical data

7.1 Refractive index module

Characteristic		Value
Power rating instrument	Input values	24 V DC, 4 A
	Connector type	4-pin, power Mini-DIN female
Power rating AC adapter	Input values	100...240 V AC ±10%, 1.8 A
	Input frequency	50 - 60 Hz
	Output values	24 V DC, 5 A
Dimensions	Width	208 mm
	Depth	226 mm
	Height	193 mm
	Weight	4.8 kg
Materials	Housing	PP HCT540
	Lid	PBT-CRASTIN SO653
	Measuring-cell cover	PTFE C25
	O-ring of measuring-cell cover	EPDM
	Measuring cell	Sapphire prism, stainless steel SUS316, perfluo-roelastomer
Ambient conditions	Ambient temperature	+5 °C…+40 °C
	Relative humidity	20…80 % (not condensing)
	Altitude	≤5000 m above sea level
	Pressure range	Atmospheric pressure
	Use	In interior spaces
	Overvoltage category	II
	Pollution degree	2
Storage	Temperature range	-20…70 °C
	Relative humitidy	10…90 %

Connections

Characteristic		Value
Main Instrument	Client	USB B 2.0, full speed
	Cable length	Max. 3 m
USB 1 / **USB 2** / **USB 3** / **USB 4**	Host	USB A 2.0 , full speed
	Max. power load	500 mA
	Cable length	Max. 3 m

Directives and standards

The refractive index module complies with the directives and standards that are listed on the declaration of conformity.

7.2 Measurement

Characteristic		RX4	RX5
Refractive index	Measuring range	1.32…1.70	1.32…1.58
	Accuracy[1)]	±0.0001	±0.00002[2)]
	Repeatability[1)]	±0.00005	±0.00001
	Resolution[1)]	0.0001	0.00001
	Wavelength	589 nm	589 nm
Measuring temperature	Range[3)]	5…100 °C	5…75 °C
	Accuracy (5…15 °C)	±0.1 °C	±0.05 °C
	Accuracy (15…50 °C)	±0.1 °C	±0.03 °C
	Accuracy (50…75 °C)	±0.1 °C	±0.05 °C
	Accuracy (75…100 °C)	±0.1 °C	–
	Resolution[1)]	0.01 °C	0.01 °C

[1)] RX4: for temperature range 15…70 °C, RX5: for temperature range 15…50 °C

[2)] RX5: 0.00002 (around the adjustment point), 0.00004 (entire range)

[3)] Minimal temperature not more than 12 °C below ambient temperature

International standards and norms

International standards and norms complied with are listed on the internet.

▶ www.mt.com/dere-norms

To protect your product's future:
METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of this product for years to come.

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www.mt.com/Refractometry-Excellence

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