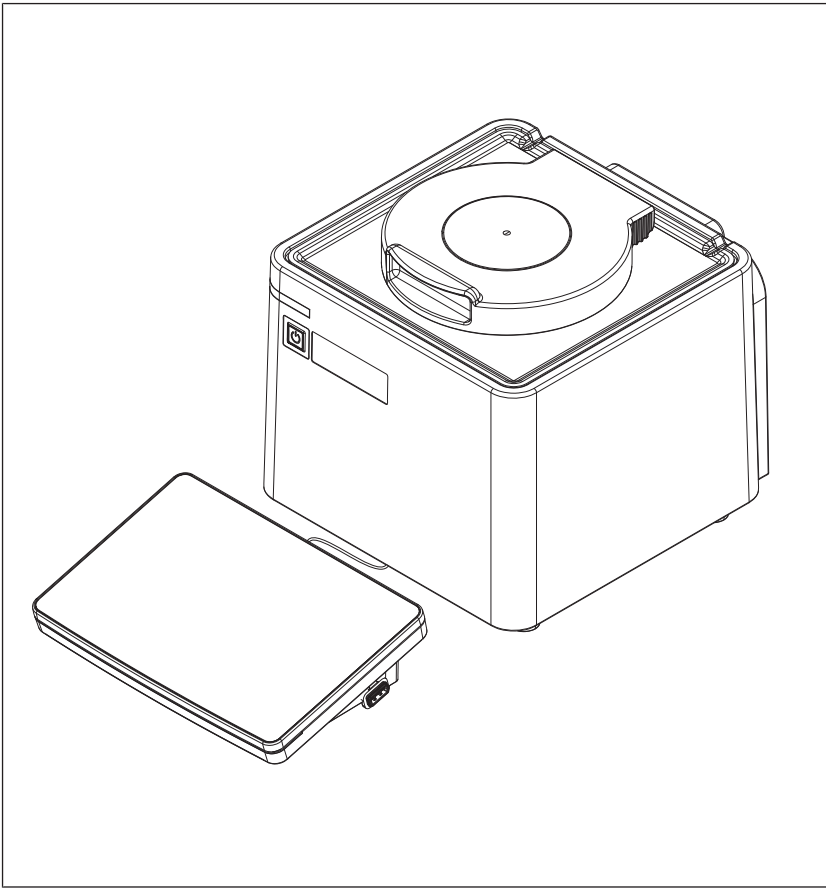
User Manual

Refractometer Excellence

R4/R5



METTLER TOLEDO

Table of Contents

1 Introduction

Thank you for choosing a METTLER TOLEDO refractometer. The refractometers R4 and R5 are easy-to-operate, high-performance instruments for measuring the refractive index of liquid samples.

About this document

This document provides you with the information you need to get started with your METTLER TOLEDO refractometer.

The instructions in this document refer to refractometers R4 and R5 running firmware version 1.0 or higher.

For a full description of the refractometer and its functions, refer to the Reference Manual supplied online.

▶ www.mt.com/library

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

Two documents named "User Manual" and "Reference Manual" are available for this instrument.

- The User Manual is printed and delivered with the instrument.
- The electronic Reference Manual contains a full description of the instrument and its use.
- Keep both documents for future reference.
- Include both documents if you transfer the instrument to other parties.

Only use the instrument according to the User Manual and the Reference Manual. If you do not use the instrument according to these documents or if the instrument is modified, the safety of the 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 refractometers R4 and R5 are designed to be used by trained staff. The refractometers 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 instrument and who uses the instrument or authorizes any person to use it, or the person who is deemed by law to be the operator of the instrument. The instrument owner is responsible for the safety of all users of the instrument and third parties.

METTLER TOLEDO assumes that the instrument owner trains users to safely use the 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 instrument.
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 instrument due to the use of unsuitable parts!

Using unsuitable parts with the instrument can damage the instrument or cause it to malfunction.

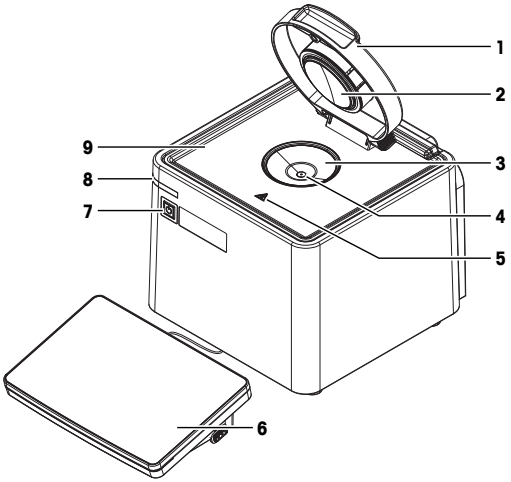
– Only use parts from METTLER TOLEDO that are intended to be used with your instrument.

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 refractometer

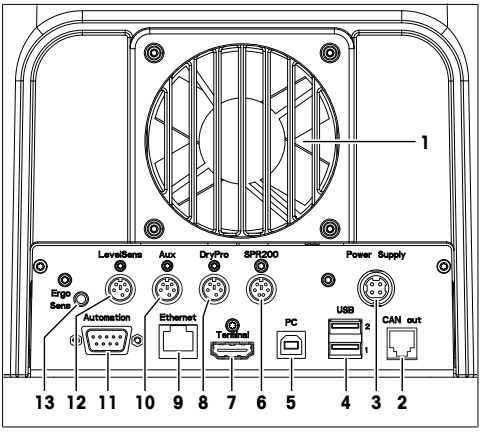


No.	Name	Function
1	Lid	Protects the measuring cell
2	Measuring-cell cover	Closes off the measuring cell and permits the formation of a stable vapour-liquid equilibrium
3	Measuring cell	Holds the sample
4	Prism	Refracts the light at its surface
5	Safety label	Warns that the measuring cell can be hot and cause slight burns if you touch it without protective gloves
6	Terminal	Displays information and is used to enter information
7	Power button	Starts up and shuts down the refractometer
8	Instrument status light (StatusLight™)	Provides information about the status of the refractometer.
9	Protection plate	Collects spilled sample or cleaning solution

Status light

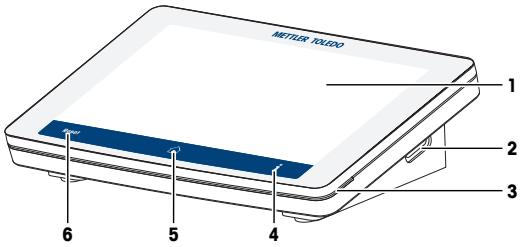
StatusLight	Refractometer status
Steady, green light	The refractometer is ready for operation.
Blinking, green light	The refractometer is performing a task.
Steady, orange light	The refractometer waits for the user to perform an action.
Blinking, orange light	The task has been interrupted, for example because a value lies outside of its limits.
Steady,red light	An error has occurred during task execution.

3.2 Rear panel



No.	Name	Function
1	Fan and ventilation openings	Move air over the heat sink of the Peltier element
2	**CAN out**	RJ12 socket to connect a LevelSens box
3	**Power Supply**	DC Socket to connect the AC adapter
4	**USB 1 / USB 2**	USB-A socket to connect USB devices, for example printers, barcode readers or an InMotion™ Autosampler
5	**PC**	USB-B socket to connect a computer
6	**SPR200**	6-pin Mini-DIN socket to connect the filling pump SPR200
7	**Terminal**	19-pin Mettler-HDMI socket with non-standard pin assignment, reserved to connect the terminal and no other display device
8	**DryPro**	5-pin Mini-DIN socket to connect the drying pump DryPro
9	**Ethernet**	RJ45 socket to connect a network
10	**Aux**	5-pin Mini-DIN socket to connect an auxiliary instrument
11	**Automation**	9-pin male D-sub socket to connect a sample delivery and cleaning unit
12	**LevelSens**	5-pin Mini-DIN socket to connect the fluid-level sensor LevelSens
13	**ErgoSens**	3.5 mm jack socket to connect the infrared motion-sensor ErgoSens

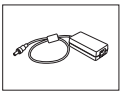
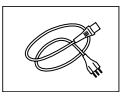
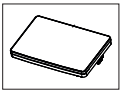
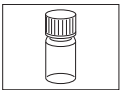
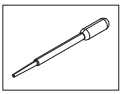
3.3 Terminal

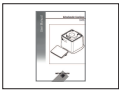


No.	Name	Function
1	Touch screen	Displays information and can be used to enter information
2	USB-A socket	Is used to transfer data to and from a USB flash drive
3	Terminal status light (StatusLight™)	Provides information about the status of the refractometer
4		Opens a window with general information about the refractometer
5		Opens the home screen
6	Reset	Ends all running tasks

4 Installation and commissioning

4.1 Scope of delivery

Part		Order number	R4	R5
	Refractometer	–	•	•
	Extern. Power Supply 120W	30298362	•	•
	Power cable (country-specific)	–	•	•
	Terminal WVGA 7 inch AnaChem • Terminal • HDMI cable	–	•	•
	Combined water standard 9 mL, density/refractive index	51338010	•	•
	Plastic pipettes (3 pcs) PP (polypropene)	–	•	•

Part		Order number	R4	R5
	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 refractometer.
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

See also

Introduction ▸ Page 3
View the firmware version ▸ Page 30

4.3 Unpack the refractometer

1 Remove the refractometer 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.

▶ www.mt.com/contact

See also

Scope of delivery ▸ Page 7

4.4 Position the refractometer

The refractometer has been developed for indoor operation in a room with stable temperature and ventilation as needed by the chemicals that are used.

The following site requirements apply:

- Dew point below the measurement temperature
- Ambient conditions within the limits specified in the technical data
- No powerful vibrations
- No direct sunlight

- No corrosive gas atmosphere
- No explosive atmosphere
- No powerful electric or magnetic fields

Procedure

1 Place the refractometer on a level surface.
2 Make sure that there are at least 15 cm clearance behind the refractometer.
3 Make sure that nothing blocks the ventilation openings at back of the refractometer.

See also

Technical data ▸ Page 31

4.5 Connect the refractometer 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 instrument.
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.

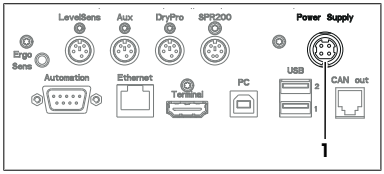
NOTICE

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.

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 refractometer from the power supply

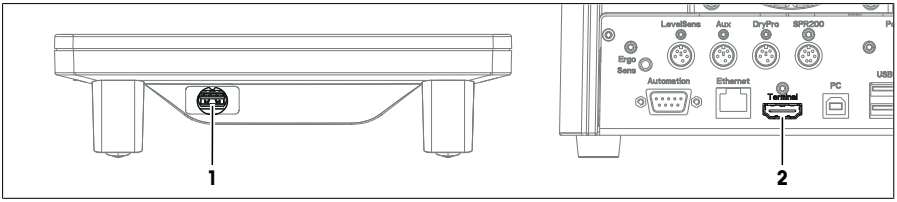
- The refractometer is shut down.

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.

4.7 Connect, adjust and disconnect the terminal

4.7.1 Connect the terminal

- The refractometer is shut down.



1 Insert one of the plugs of the supplied terminal cable in the socket (1) on the back of the terminal.
2 Insert the other plug of the terminal cable into the **Terminal** socket (2) on the rear panel.
3 Start up the refractometer.
⇨ The refractometer automatically detects the terminal and activates it.

See also

Start up the refractometer ▸ Page 11

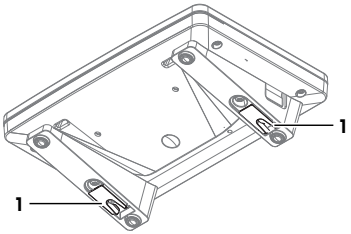
4.7.2 Adjust the angle of the terminal

The angle of the terminal has two positions.

Procedure

- No task is running.

– To increase the angle of the terminal, fold out the two feet (1) at the underside of the terminal.



4.7.3 Disconnect the terminal

- The refractometer is shut down.

1 Pull the plug of the terminal cable out of the socket on the back of the terminal.
2 Pull the plug of the terminal cable out of the **Terminal** socket on the rear panel.

See also

Shut down the refractometer ▸ Page 11

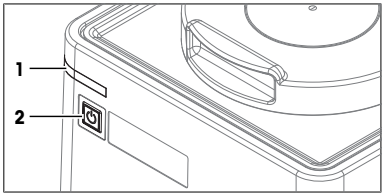
4.8 Install accessories

The installation of accessories is described in the Reference Manuals.

▶ www.mt.com/library

5 Operation

5.1 Start up the refractometer

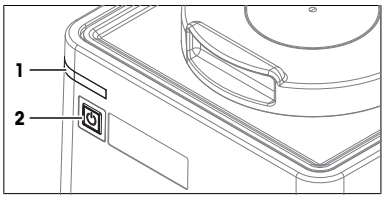


– Press the power button (2).
  ⇨ The StatusLight (1) turns green.
  ⇨ The refractometer starts up and detects connected devices.
  ⇨ The welcome screen on the terminal opens.
  ⇨ The refractometer is ready for use when the StatusLight of the terminal turns green.

5.2 Shut down the refractometer

Shut down the refractometer using the power button

- No task is running.
- The measuring cell is clean and dry.



– Press the power button (2).
  ⇨ METTLER TOLEDO is displayed and the StatusLight (1) starts blinking.
  ⇨ When the StatusLight and the screen are dark, the refractometer is shutdown.

⇨ The control circuit for the power button is energized. The rest of the refractometer is no longer energized.

Shut down the refractometer in emergency situations

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

5.3 Typical phases of refractive-index determinations

Refractive-index determinations usually include three phases.

- Fill the measuring cell and measure the refractive index.
- Rinse the measuring cell to remove residue of the sample.
- Dry the measuring cell.

5.3.1 Fill the measuring cell

This chapter describes how to fill the measuring cell using a plastic pipette. How to work with automation is described in the Reference Manual.

▶ www.mt.com/library

If you work without automation, METTLER TOLEDO recommends to use small sample volumes. For small volumes, the temperatures of the sample and the measuring cell equalize faster and the analysis therefore takes less time.

- Samples with high surface tension: 0.5 mL
- Samples with low surface tension: 1 mL

If you have samples that contain particles, it is important, that you always use the same sample volume.

5.3.2 Rinse the measuring cell

At the end of this phase, the residue in the measuring cell must have the following properties.

- Evaporate without leaving incrustations.
- Evaporate easily.

To clean the measuring cell, it has to be rinsed with one or two different cleaning solutions.

- Purpose of the cleaning solution 1: Dissolve and remove the sample, so that the residue in the measuring cell is pure cleaning solution 1. If the cleaning solution 1 does not easily evaporate, a second cleaning solution must be used.
- Purpose of the cleaning solution 2: Dissolves the cleaning solution 1 and evaporates easily without leaving any residue.

METTLER TOLEDO recommends the following cleaning solutions if you work without a flow cell.

Sample	Cleaning solution 1	Cleaning solution 2
Water, water based	Deionized water	Measuring temperature <20 °C: acetone, ethanol (100%) Measuring temperature >20 °C: none
Acids (concentrated)	Water (flush the measuring cell with plenty of water to remove the heat from the reaction of water and acid)	Measuring temperature <20 °C: acetone, ethanol (100%) Measuring temperature >20 °C: none
Alkaline solutions (concentrated)	0.3…0.5 % deconex solution	Measuring temperature <20 °C: acetone, ethanol (100%) Measuring temperature >20 °C: water
Samples with fats or oily components	0.3…0.5 % deconex solution	Measuring temperature <20 °C: acetone, ethanol (100%) Measuring temperature >20 °C: water
Petrochemical samples, edible oils and fats	Toluene, xylene or petrol ether mixtures	Room temperature: low-boiling petrol ether mixture or acetone Temperature > 30 °C: hexane or similar organic solvents

5.3.3 Dry the measuring cell

At the end of this phase, the measuring cell contains no residue and is ready for a new analysis or storage.

5.4 Example: refractive-index determination without automation

The following chapters show you how to configure a measurement method and determine the refractive index of tap water at 20 °C.

You can find more information about the configuration of methods and working with other types of samples in the Reference Manual.

▶ www.mt.com/library

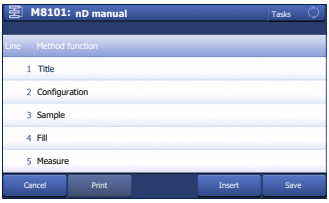
5.4.1 Create the measurement method

- The home screen is open.

1 Go to **Methods / Products** (1) > **Methods**.
⇨ The **Methods** window opens.

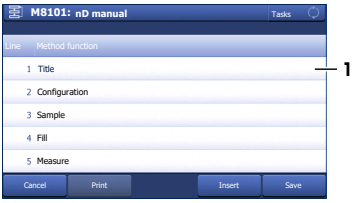
2 Select the method **M8501 nD manual** (1).

⇨ The method window with the list of the method functions opens.



5.4.2 Configure the measurement method

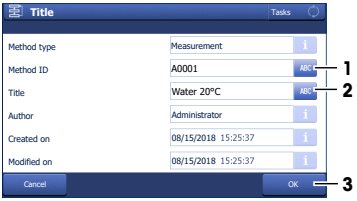
1 Select the **Title** (1) method function.



2 Change **Method ID** (1) as needed. The following format is reserved for METTLER TOLEDO predefined methods: "M" followed by a number.

3 Change **Title** (2) as needed and tap **OK** (3).

⇨ The method window with the list of the method functions opens.



4 Select the **Sample** method function.

5 Enter for **Sample ID** (1) the default value for the sample identification and tap **OK** (2).

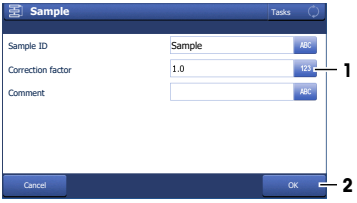
⇨ The default value is used in the **Start analysis** window.

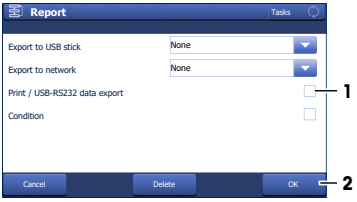
⇨ The method window with the list of the method functions opens.

6 Move your finger upward on the touch screen to scroll down.

7 Select the **Report** method function.

8 Deactivate **Print / USB-RS232 data export** (1) and tap **OK** (2).





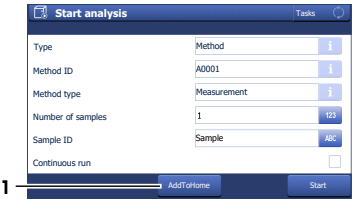
9 Tap **Save** (1).

⇨ The method is listed with **Method ID** and **Title** in the **Methods** window.

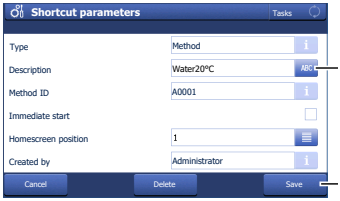
5.4.3 Create a shortcut on the home screen

1 Tap **Start** (1).

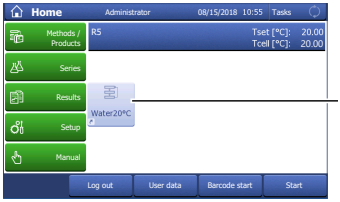
2 Tap **AddToHome** (1).



3 For **Description** (1), enter a name to identify the shortcut on the home screen and tap **Save** (2).



⇨ The home screen with the shortcut (1) opens.



5.4.4 Determine the refractive index

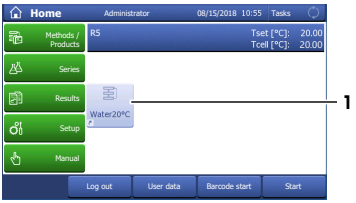
Material

- Tap water
- Deionized water
- Plastic pipettes
- Waste container
- Lint free tissues

Start the method

- The lid is closed.

1 Tap the shortcut (1) of the method you configured.

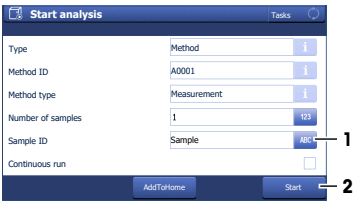


2 If needed, change the entry in **Sample ID** (1).

3 Tap **Start** (2).

⇨ The temperature of the measuring cell is brought to the temperature defined in the method.

⇨ A message prompts you to add the sample.



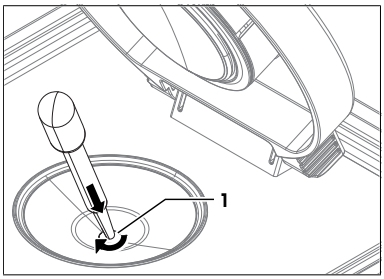
Fill the measuring cell

1 Fill a clean plastic pipette with 0.5 mL of tap water.

2 Open the lid.

3 Place the pipette tip on the prism (1) and move it in circles over the prism while you empty it into the measuring cell.

4 Close the lid.



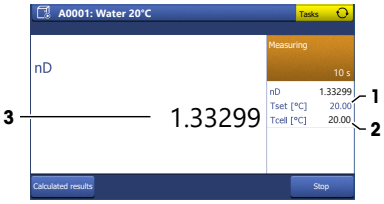
5 Tap **OK** (1).

⇨ The temperature of the measuring cell (2) is brought to the temperature defined in the method (1).

⇨ The currently measured value is displayed (3).

⇨ The measured value is saved as result when the criteria for measurement reliability are met.

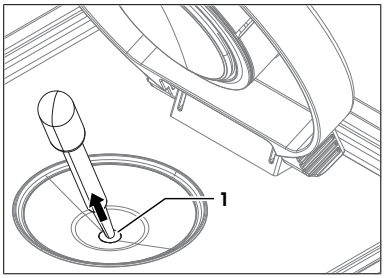
⇨ A message prompts you to drain the measuring cell.



Drain the measuring cell

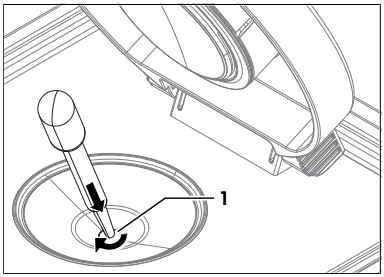
1 Open the lid.

2 Place the pipette tip on the prism (1) and aspirate the content of the measuring cell.
3 Empty the pipette into a suitable waste container.
4 Tap **OK**.
⇨ A message prompts you to rinse the measuring cell with deionized water.

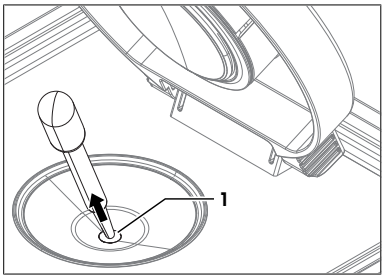


Rinse the measuring cell with deionized water

1 Fill a clean plastic pipette with deionized water.
2 Place the pipette tip on the prism (1) and move it in circles over the prism while you empty it into the measuring cell.



3 Place the pipette tip on the prism (1) and aspirate the content of the measuring cell.
4 Empty the pipette into a suitable waste container.
5 Repeat the steps above two or three times.
6 Tap **OK**.
⇨ A message prompts you to dry the measuring cell.



Dry the measuring cell

1 Wipe the measuring cell with a dry, clean and lint-free tissue.
2 Tap **OK**.
⇨ The home screen opens.
3 Wait a few seconds until any remaining residue of the deionized water has evaporated.
4 Close the lid.
⇨ The measuring cell is clean and dry.

6 Maintenance

In this chapter you find descriptions of the maintenance tasks you should perform on your refractometer. 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 refractometer, 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.

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	Link
Daily	Clean the measuring cell at the end of the work day.	[Clean the measuring cell ▸ Page 17]
	Perform a test with deionized water.	[Check the measurement accuracy ▸ Page 21]

6.2 Clean the refractometer

NOTICE

Danger of damage to the refractometer due to inappropriate cleaning methods!

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

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 refractometer.

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

▶ www.mt.com/contact

See also

Technical data ▸ Page 31

6.2.1 Clean the housing and the lid

METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Procedure

- The refractometer 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

6.3.1 Typical phases of cleaning the measuring cell

Cleaning the measuring cell usually includes two phases:

- Rinse the measuring cell to remove residue of the sample.
- Dry the measuring cell.

See also

Rinse the measuring cell ▸ Page 11

Dry the measuring cell ▸ Page 12

6.3.2 Example: clean with deionized water

The following chapters show you how to configure a cleaning method and clean the measuring cell with deionized water.

You can find more information about the configuration of methods and working with other types of samples in the Reference Manual.

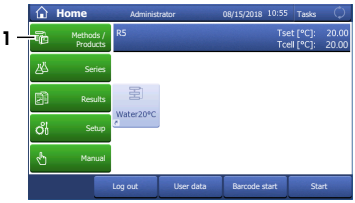
▶ www.mt.com/library

6.3.2.1 Create the cleaning method

- The home screen is open.

1 Go to **Methods / Products** (1) > **Methods**.

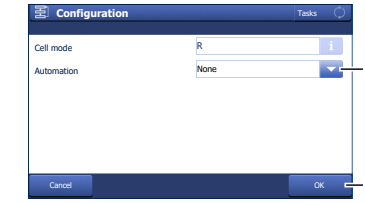
⇨ The **Methods** window opens.



2 Tap **New** (1).

3 Select the template **CLEAN** (1).

4 For **Automation** select **None** (1) and tap **OK** (2).



⇨ The method window with the list of the method functions opens.

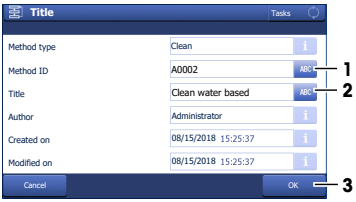
6.3.2.2 Configure the cleaning method

1 Select the **Title** (1) method function.

2 Change **Method ID** (1) as needed. The following format is reserved for METTLER TOLEDO predefined methods: "M" followed by a number.

3 Change **Title** (2) as needed and tap **OK** (3).

⇨ The method window with the list of the method functions opens.

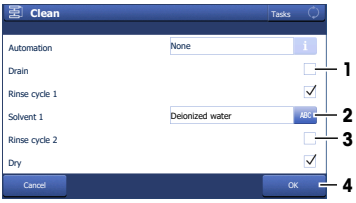


4 Select the **Clean** method function.

5 Deactivate **Drain** (1).

6 Enter for **Solvent 1** (2) "Deionized water".

7 Deactivate **Rinse cycle 2** (3) and tap **OK** (4)



8 Tap **Save** (1).

⇨ The method is listed with **Method ID** and **Title** in the **Methods** window.

6.3.2.3 Clean using deionized water

Material

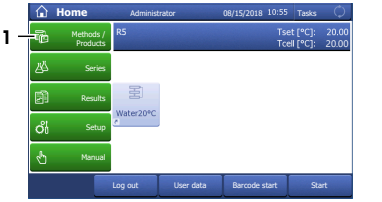
- Deionized water
- Plastic pipettes
- Waste container
- Lint-free tissues

Start the method

- The home screen is open.
- The measuring cell is drained.

1 Go to **Methods / Products** (1) > **Methods**.

⇨ The **Methods** window opens.



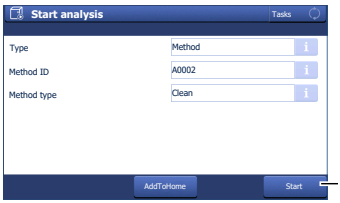
2 Select the cleaning method that you configured (1).

3 Tap **Start** (1).

4 Tap **Start** (1).

⇨ The method window with the list of the method functions opens.

⇨ A message prompts you to rinse the measuring cell with deionized water.

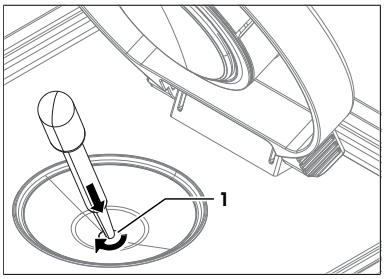


Rinse the measuring cell with deionized water

1 Fill a clean plastic pipette with deionized water.

2 Open the lid.

3 Place the pipette tip on the prism (1) and move it in circles over the prism while you empty it into the measuring cell.

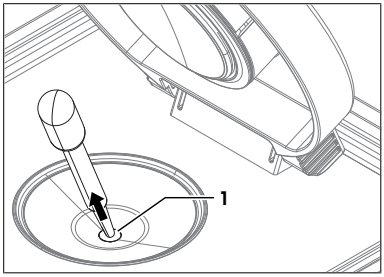


4 Place the pipette tip on the prism (1) and aspirate the content of the measuring cell.

5 Repeat the steps above two or three times.

6 Tap **OK**.

⇨ A message prompts you to dry the measuring cell.



Dry the measuring cell

⚠ 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.

1 Wipe the measuring cell with a dry, clean and lint-free tissue.

2 Tap **OK**.

⇨ The home screen opens.

3 Wait a few seconds until any remaining residue of the deionized water has evaporated.

4 Close the lid.

⇨ The measuring cell is clean and dry.

6.4 Check the measurement accuracy

6.4.1 Typical phases of checking the measurement accuracy

Checking the measurement accuracy usually includes three phases:

- Fill the measuring cell and measure the refractive index.
- Rinse the measuring cell to remove residue of the sample.
- Dry the measuring cell.

See also

Fill the measuring cell ▸ Page 11

Rinse the measuring cell ▸ Page 11

Dry the measuring cell ▸ Page 12

6.4.2 Example: test with a water standard

The following chapters show you how to configure and perform a refractive-index determination for a water standard at 20 °C.

You can find more information about the configuration of methods and working with other types of samples in the Reference Manual.

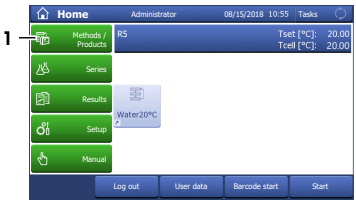
▶ www.mt.com/library

6.4.2.1 Create the test method

- The home screen is open.

1 Go to **Methods / Products** (1) > **Methods**.

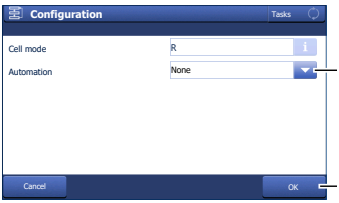
⇨ The **Methods** window opens.



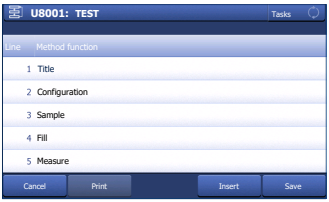
2 Tap **New** (1).

3 Select the template **TEST** (1).

4 For **Automation** select **None** (1) and tap **OK** (2).



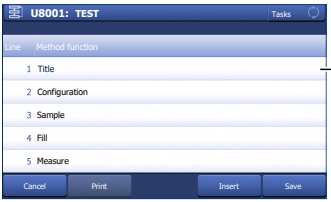
⇨ The method window with the list of the method functions opens.



6.4.2.2 Configure the test method

- A test set for water at 20°C is configured.

1 Select the **Title** (1) method function.

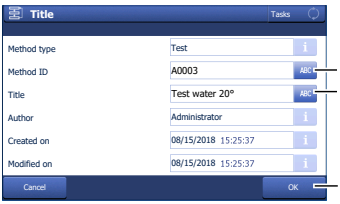


2 Change **Method ID** (1) as needed. The following format is reserved for METTLER TOLEDO predefined methods: "M" followed by a number.

3 Change **Title** (2) as needed and tap **OK** (3).

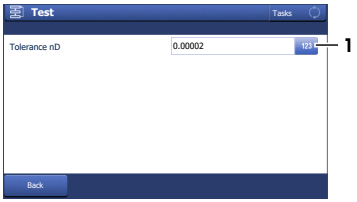
⇨ The method window with the list of the method functions opens.

4 Move your finger upward on the touch screen to scroll down.



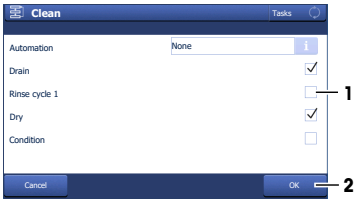
5 Select the **Test** method function.

6 Set **Tolerance nD** to a value in the range listed for your instrument type.
- R4: 0.0002
- R5: 0.00002…0.00008



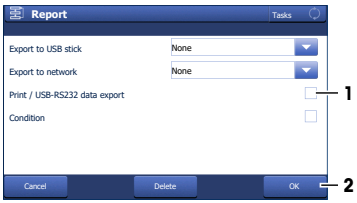
7 Select the **Clean** method function.

8 Deactivate **Rinse cycle 1** (1) and tap **OK** (2).



9 Select the **Report** method function.

10 Deactivate **Print / USB-RS232 data export** (1) and tap **OK** (2).



11 Tap **Save** (1).

6.4.2.3 Perform the test

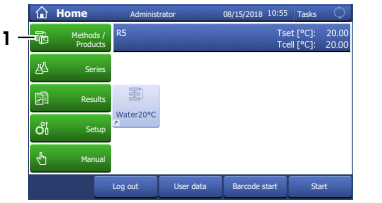
Material

- METTLER TOLEDO water standard
- Plastic pipettes
- Waste container
- Lint-free tissues

Start the method and configure the standard

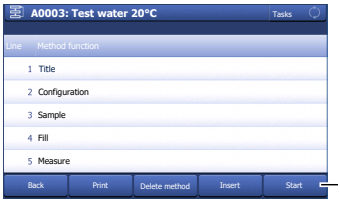
- The home screen is open.
- The lid is closed.
- The measuring cell is clean and dry.

1 Go to **Methods / Products** (1) > **Methods**.
⇨ The **Methods** window opens.

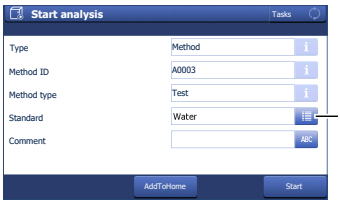


2 Select the test method that you configured (1).

3 Tap **Start** (1).



4 Tap **Standard** (1).

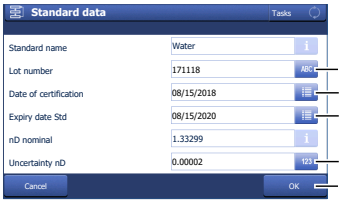


5 Enter the information **Lot number** (1), **Date of certification** (2), **Expiry date Std** (3) and **Uncertainty nD** (4) as printed on the certificate and tap **OK** (5).

6 Tap **Start** (2).

⇨ The temperature of the measuring cell is brought to the temperature defined in the method.

⇨ A message prompts you to add the sample.



Fill the measuring cell

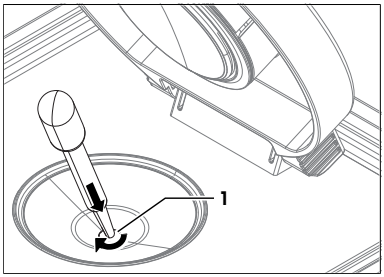
1 Open the standard bottle.

2 Fill a clean plastic pipette with 0.5 mL of the water standard.

3 Open the lid.

4 Place the pipette tip on the prism (1) and move it in circles over the prism while you empty it into the measuring cell.

5 Close the lid.



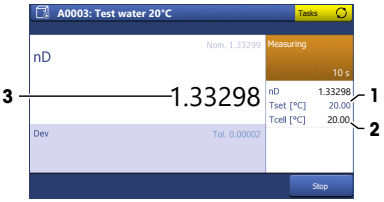
6 Tap **OK** (1).

⇨ The temperature of the measuring cell (2) is brought to the temperature defined in the method (1).

⇨ The currently measured value is displayed (3).

⇨ The measured value is saved as result when the criteria for measurement reliability are met.

⇨ A message prompts you to drain the measuring cell.



Drain the measuring cell

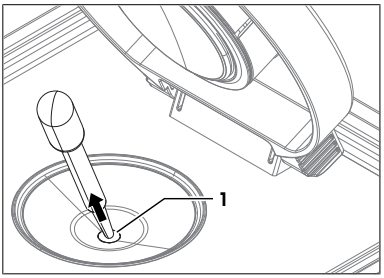
1 Open the lid.

2 Place the pipette tip on the prism (1) and aspirate the content of the measuring cell.

3 Empty the pipette into a suitable waste container.

4 Tap **OK**.

⇨ A message prompts you to dry the measuring cell.



Dry the measuring cell

1 Wipe the measuring cell with a dry, clean and lint-free tissue.

2 Tap **OK**.

⇨ The home screen opens.

3 Wait a few seconds until any remaining residue of the deionized water has evaporated.

4 Close the lid.

⇨ The measuring cell is clean and dry.

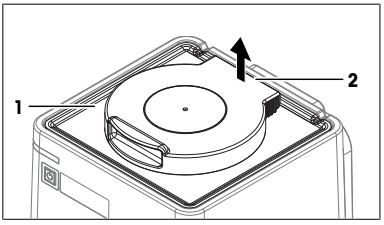
6.5 Replace the protection plate

6.5.1 Remove the protection plate

- The measuring cell is clean and dry.

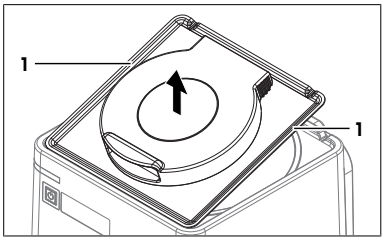
1 Hold the protection plate (1) by the back of the lid (2) with one hand.

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.



6.5.2 Install the protection plate

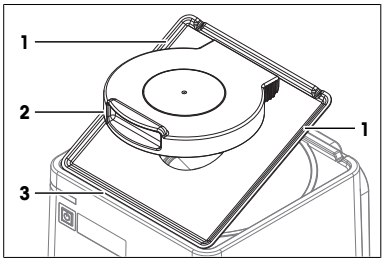
1 Open the lid (2).

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 refractometer.

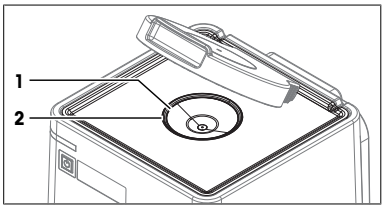
4 Let go with one hand and use it to hold the protection cover by the open lid.

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 refractometer, strong magnets pull it down and hold it in place.

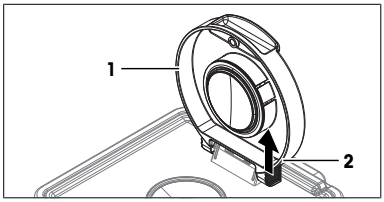


6.6 Replace the lid

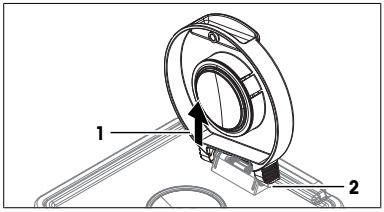
6.6.1 Remove the lid

1 Open the lid (1) completely.

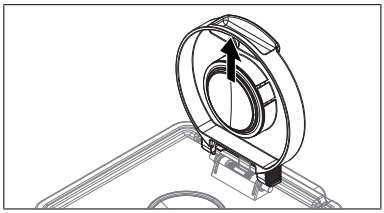
2 Pull one side of the lid (2) up until it slides off its axle.



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

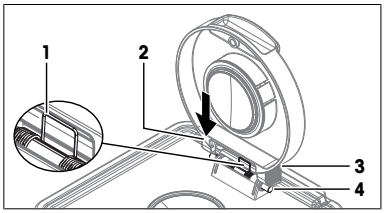


4 Remove the lid.

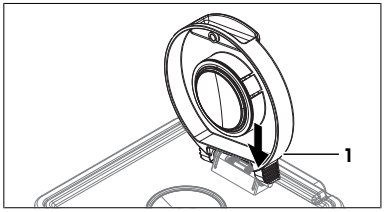


6.6.2 Install the lid

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.



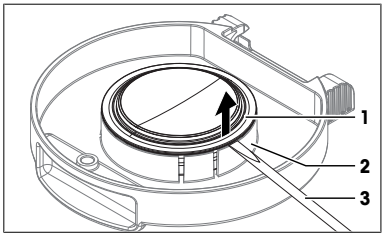
4 Push the other side of the lid down until it clicks into place.



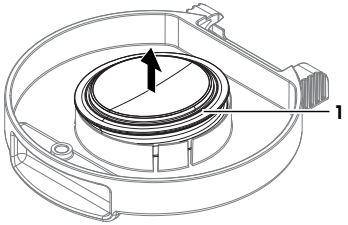
6.7 Replace the measuring-cell cover

6.7.1 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).

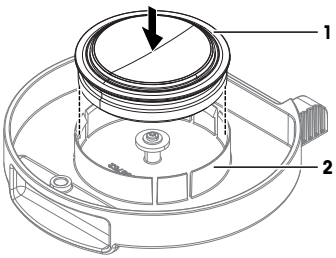


See also

Remove the lid ▸ Page 26

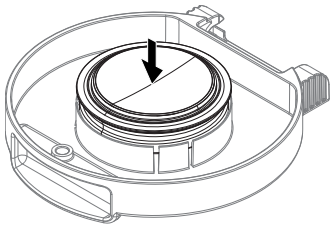
6.7.2 Install the measuring-cell cover

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

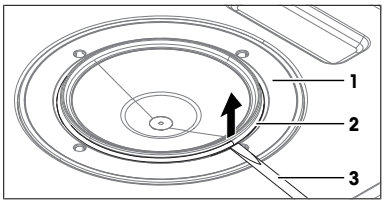
Install the lid ▸ Page 27

6.8 Replace the measuring-cell O-ring

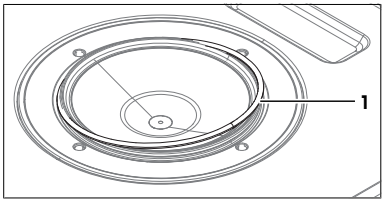
6.8.1 Remove the measuring-cell O-ring

1 Remove the protection plate.

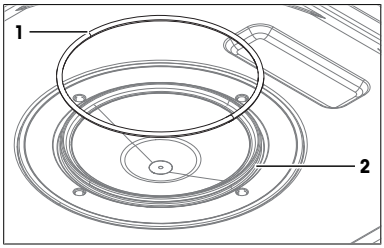
2 Insert the tip of a flat screwdriver (3) in the slit between the O-ring (2) and the measuring cell (1).



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).

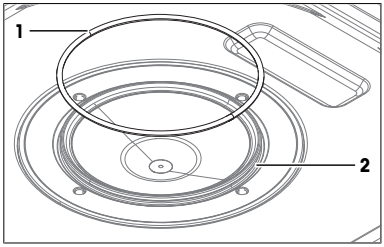


See also

Remove the protection plate ▸ Page 25

6.8.2 Install the measuring-cell O-ring

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

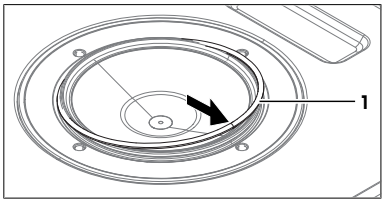


2 Push the other side of the O-ring (1) over the rim into the groove.

3 Install the protection plate.

See also

Install the protection plate ▸ Page 26

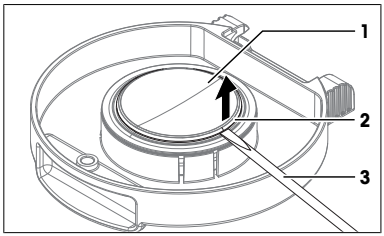


6.9 Replace the O-ring of the measuring-cell cover

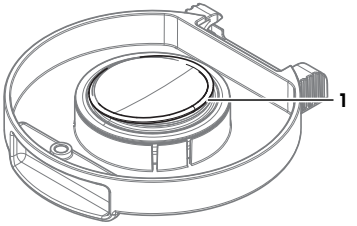
6.9.1 Remove the O-ring of the measuring-cell cover

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).



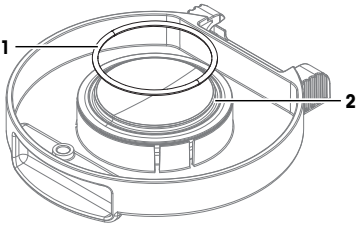
3 Use the screwdriver to lift the O-ring (1) over the rim of the groove.



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

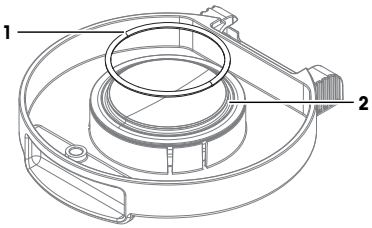
See also

Remove the lid ▸ Page 26



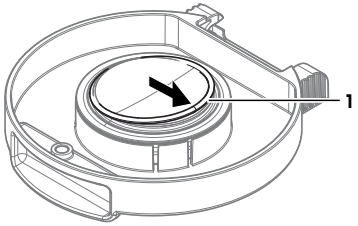
6.9.2 Install the O-ring of the measuring-cell cover

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 27

6.10 View the firmware version

1 Press the **Info** key.

2 The firmware version and other system information is displayed.

6.11 Prepare the refractometer for storage

1 Shut down the refractometer.

2 Disconnect the refractometer from the power supply.

3 Disconnect and remove any accessories from the refractometer.

4 Disconnect the terminal.

5 Clean the refractometer.

6 Protect the refractometer from dust.

7 Store the refractometer and the terminal in a dry and clean place.

6.12 Transport the refractometer

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

▶ www.mt.com/contact

1 Shut down the refractometer.

2 Disconnect the refractometer from the power supply.

3 Disconnect any accessories from the refractometer.

4 Disconnect the terminal.

5 Clean the refractometer.

6 If you transport the refractometer and the terminal over long distances, use the original packaging.

7 Move the refractometer and the terminal to the new location.

6.13 Dispose of the refractometer

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

Additional technical data are listed in the Reference Manuals.

▶ www.mt.com/library

7.1 Refractometer

Characteristic		Value
Power rating instrument	Input values	24 V DC, 5 A
	Socket	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, perfluoroelastomer
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 %

Directives and standards

The instrument complies with the directives and standards that are listed on the declaration of conformity.

7.2 Terminal

Characteristic		Value
Dimensions	Width	194 mm
	Depth	129.5 mm
	Height	56.7 mm
	Weight	638.4 g
Materials	Top housing	EN ZL-ZnAl4Cu1 (EN ZI-0410)
	Lower housing	Crastin SO653
	Cover glas	Gorilla glas

7.3 Measurement

Characteristic		R4	R5
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)] R4: for temperature range 15…70 °C, R5: for temperature range 15…50 °C

[2)] R5: 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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