Refractometer Excellence

R4/R5

METTLER TOLEDO

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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

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

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 service representative or dealer.

▶ www.mt.com/contact

Conventions and symbols

Note   For useful information about the product.

          Refers to an external document.

Elements of instructions

- Prerequisites
1 Steps
2 Steps
   ⇨ Intermediate results
3 Steps
⇨ 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
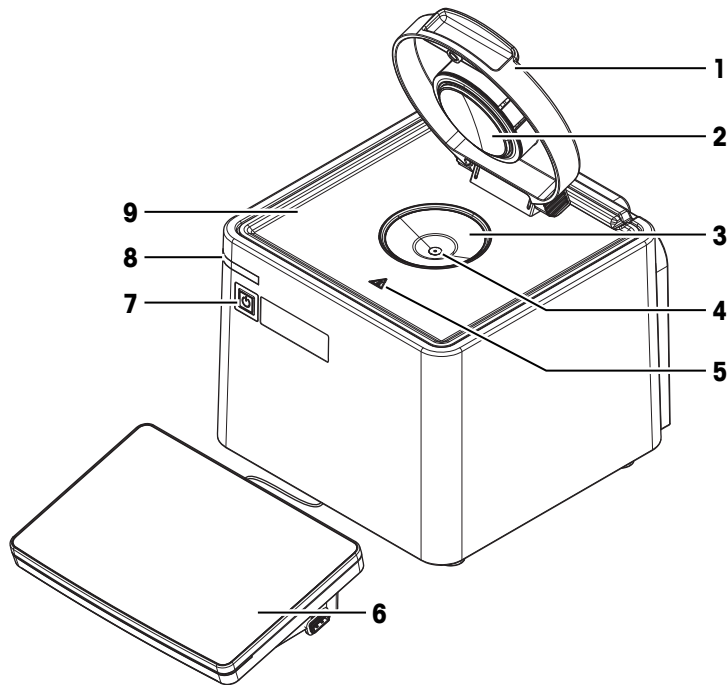
No.	Name	Function
1	Lid	Protects the measuring cell
2	Measuring-cell cover	Closes off the measuring cell and permits the formation of a stable vapour-liquid equilibrium
3	Measuring cell	Holds the sample
4	Prism	Refracts the light at its surface
5	Safety label	Warns that the measuring cell can be hot 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
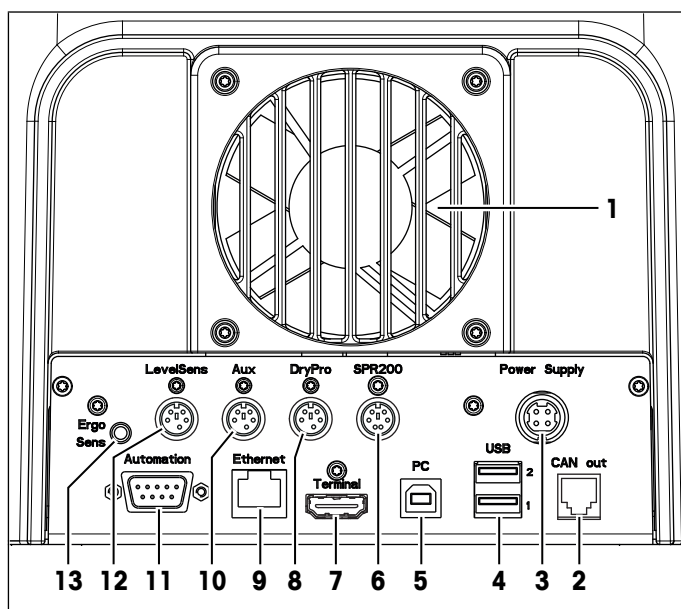
No.	Name	Function
1	Fan and ventilation openings	Move air over the heat sink of the Peltier element
2	**CAN out**	RJ12 socket to connect a LevelSens box
3	**Power Supply**	DC Socket to connect the AC adapter
4	**USB 1 / USB 2**	USB-A socket to connect USB devices, for example printers, barcode readers 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

See also
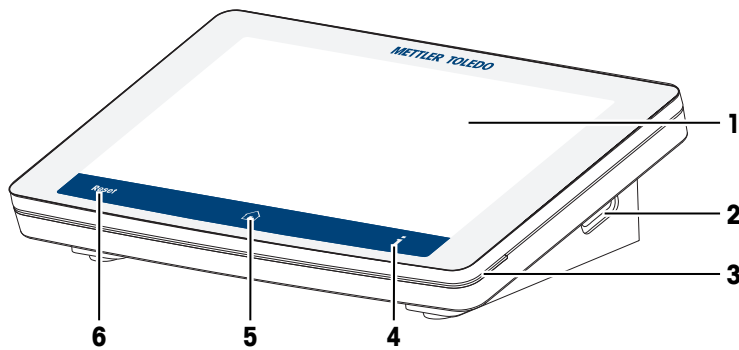
3.3 Terminal

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	![info icon]	Opens a window with general information about the refractometer
5	![home icon]	Opens the home screen
6	Reset	Ends all running tasks

3.4 The principle of measuring the refractive index

Definition of the refractive index

The refractive index of a substance is the ratio of the speed of a light beam in a vacuum to its speed in the substance (dimensionless).
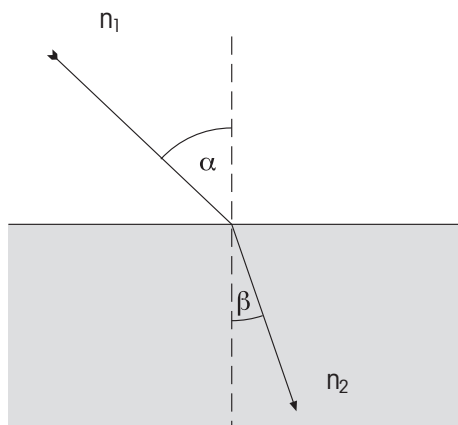
If a light beam crosses at a certain angle from an optically less dense to an optically denser medium (e.g. from air to water), it is deflected; when the beam crosses from one medium to another perpendicularly no directional change takes place. According to Snell's law, the ratio of the refractive index of the two media is proportional to the ratio of the incident and refractive angle of the light beam:

$$\frac{n_1}{n_2} = \frac{\sin \beta}{\sin \alpha}$$
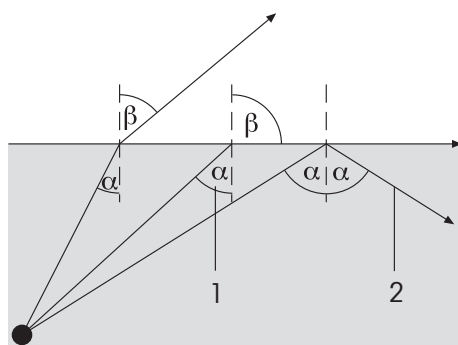
If a light beam passes from an optically denser to a less dense medium, it is also deflected. If the angle of incidence α is increased, then it reaches a critical value, at which the light beam no longer enters the less dense medium (refractive angle $\beta = 90°$). When this "critical angle" is exceeded, total internal reflection occurs. The refractive index is calculated from this critical angle α :

$$\beta = 90° \longrightarrow \sin \beta = 1$$

1: Critical angle
2: Total internal reflection

As refraction depends on the wavelength of the incident light, the refractive index n is measured as standard with the D line of sodium (wavelength 589.3 nm) and designated n_D.

The refractive index not only depends on the wavelength of the light but also on the temperature of the measured sample. For this reason the temperature must always be stated along with the result, e.g. n_D^{25}. The standard temperature is 20 °C.

Measuring the refractive index
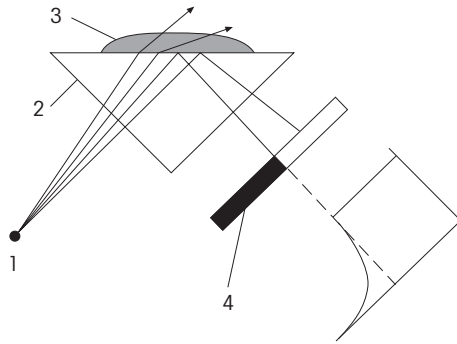
The light emitted from the light source passes through the prism and hits the sample. In the process it is partly refracted (angle of incidence < critical angle) and partly reflected (angle of incidence > critical angle).

The reflected light is measured by means of an optical sensor (CCD). The boundary between the dark and light area corresponds to the critical angle required for calculation of the refractive index.

1: Light source
2: Prism
3: Sample
4: Optical sensor (CCD)

3.5 Design of measuring cell
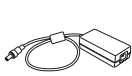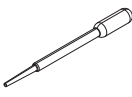
The light source is a light-emitting diode (LED), whose beam passes through a polarization filter, an interference filter (589.3 nm) and various lenses before it reaches the sample via the sapphire prism. The reflected light (angle of incidence > critical angle) is deflected via a lens to the optical sensor that determines the critical angle. The temperature in the prism/sample boundary is measured with a built-in sensor.
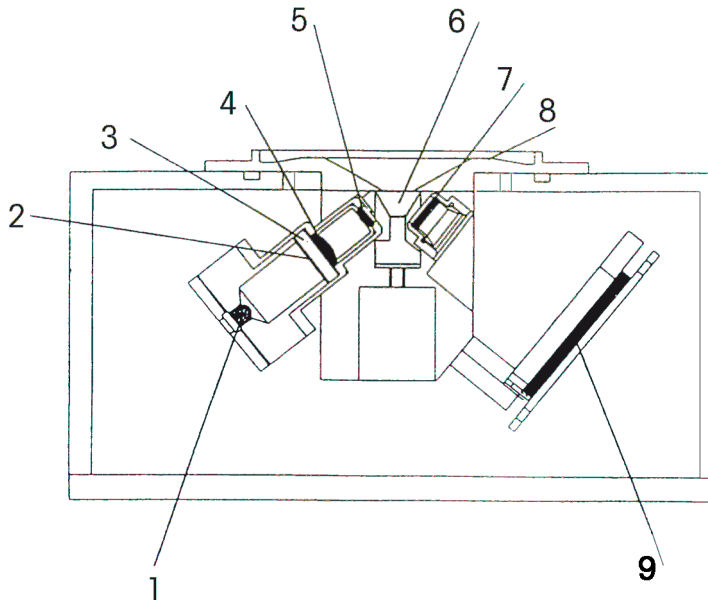
1: Light source
2: Polarization filter
3: Interference filter
4: Lens
5: Lens
6: Prism
7: Lens
8: Measuring cell
9: Optical sensor (CCD)

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)	–	●	●
	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 service representative or dealer.

▶ www.mt.com/contact

See also

▤ Introduction ▸ Page 5
▤ View the firmware version ▸ Page 90

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 service representative or dealer.

▶ www.mt.com/contact

See also

▤ Scope of delivery ▸ Page 12

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 93

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 into a grounded power outlet that is easily accessible.
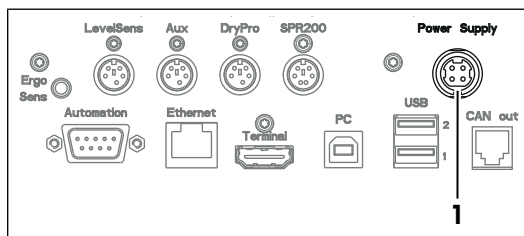
4.6 Disconnect the refractometer from the power supply

- 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.
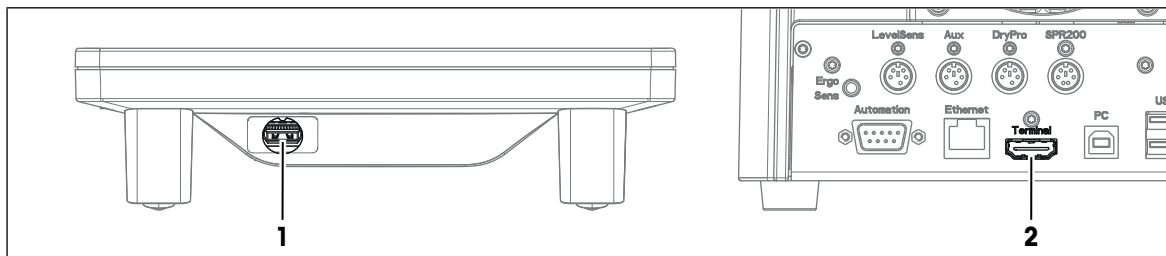
1 Insert one of the plugs of the supplied terminal cable in the socket (1) on the back of the terminal.

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.

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.
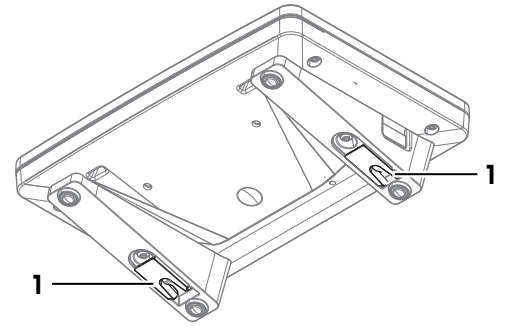
4.7.3 Disconnect the terminal

▪ 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.

4.8 Setup

This section tells you how to set up the refractometer acccordance with your requirements so that you can carry
out the measurements.

The following summary shows the buttons available in **Setup** for the various setting options:

Adjustments & Tests	Adjustment sets
	Test sets

Hardware	Cell
	Automation
	External instruments
	Peripherals
	Sensors
	Auxiliary instruments

User settings	Language
	Screen
	Beep
	Shortcuts
	Keyboards

Global settings	System
	User management
	Analysis and resources behavior
	Physical Properties

Tables & Values	Tables
	Auxiliary values

Maintenance & Service	MT service
	Import / Export
	Add external cell
	Reset to factory settings
	Firmware
	Update
	Hardware / Firmware summary
	Cell
	Touch screen adjustment
	Export of adjustments / Tests / Measurements

The "Expired Resources" button

The **Expired Resources** button is located on the setup overview screen. It provides you with a summary of all expired resources, stating the: type, name and expiration date of the respective resource.

Expired resources are entered if the setting "Monitoring adjustment set/test set/auxiliary value" is activated during setup.

Below you will find a detailed description of the setting options available in setup:

4.8.1 Adjustments & Tests

Navigation: `Home > Setup > Adjustments & Tests`

Adjustment and test sets can be administered as described below. You can create new sets and delete existing ones (when deleting you receive a prompt with the option to cancel). Before an adjustment or test can be performed, an adjustment or test set must be defined.

A maximum of six different adjustment sets or test sets respectively can be entered in the set list.

Before an adjustment or test can be performed, an adjustment or test set must be defined.

4.8.1.1 Adjustment Sets

Via the button **Adjustment sets** you will obtain a list of the defined sets. The default set "Air&Water20.00C" is always available and cannot be deleted. When you click the sets, you obtain more detailed information about the individual sets. The parameters "Adjustment mode", "Temperature" and "Set name" are displayed.

Creating adjustment sets

You can create your own adjustment sets via the button **New**. The **Adjustment set parameters** dialog opens.

Parameter	Description	Values
Adjustment mode	Defines the standard that is used for the adjustment procedure. **Standards** requires a valid adjustment with **Air&Water** at this temperature. (**Air&Standard** and **Water&Standard** are not available for refractometers).	Air&Water | Air&Standard | Water&Standard | Standards
Temperature	Defines the temperature at which the procedure is performed.	0.00…100.00 °C | 32.00…212.00 °F
Set name	Specify a descriptive name of your choice.	1…30 characters

Delete adjustment sets

1 To delete a created set, click the desired entry in the **Adjustment sets** dialog.

2 In the **Adjustment set parameters** dialog, click the button **Delete**.

⇨ When a set is deleted, the set history will also be deleted. Methods that refer to the deleted set are no longer executable.

4.8.1.2 Test Sets

Via the button **Test sets** you receive a list of the defined sets. The default set "Water20.00C" is always available and cannot be deleted. When you click the test sets, you obtain more detailed information about the individual sets. The parameters "Test mode", "Temperature", "Set name" and depending on the mode "Standard name" are displayed.

Creating test sets

You can create your own test sets via the button **New**. The **Test set parameters** dialog is opened.

Parameter	Description	Values
Test mode	Defines the standard that is used for the test procedure.	Air | Standard | Brix standard
Temperature	Defines at which temperature the test will be performed.	-
Standard name	Specify a descriptive name of your choice.	1…30 characters
Set name	Specify a descriptive name of your choice.	1…30 characters

Delete test sets

1 To delete a created set, click the desired entry in the **Test sets** dialog.

2 In the **Test set parameters** dialog click the button **Delete**.

⇨ When a set is deleted, the set history will also be deleted. Methods that relate to the deleted set are no longer executable.

4.8.2 Hardware

Navigation: `Setup>Hardware`

In this dialog window you can configure all the hardware components connected to the meter. These include:

- Cell
- Automation
- External instruments
- Peripherals
- Sensors
- Auxiliary instruments

4.8.2.1 Cell

Navigation: `Home > Setup > Hardware > Cell`

The measuring cell is connected via an internal interface in the compact device. The instrument can be extended to create a 2–cell instrument (see also "Setup: Maintenance & Service > [Add external cell ▶ Page 35]").

– Touch the button **Cell** in the **Hardware** dialog.

⇨ With single cell instruments you go directly to the list with the cell parameters

⇨ In the case of two cell instruments the connected cells are listed. You have to touch one of the displayed cells so that the **Cell parameters** dialog opens.

⇨ The **Cell parameters** dialog is opened.

Parameter	Description	Values
Cell	Name of the measuring cell	-
Type	Measuring cell type	-
Status	Shows whether the cell is connected.	-
Serial number	Serial number of the cell	-

If an adjustment has been performed, an entry in the adjustment set appears in the setup of the corresponding cell. If you touch the entry, the data of the most recent adjustment that was executed with the set will be displayed.

Parameter	Description	Values
Adjustment set	By touching the set entry, you obtain the values for the most recent adjustment of this set.	-
Monitoring adjustment set	Monitoring of the service life of the adjustment can be activated. The process, if the service life of a set has expired, is defined in the method function "Measure".	-
Adjustment interval	Validity of adjustment	"Monitoring adjustment set" activated
Reminder	Before the set expires, a message appears indicating that the adjustment or test has expired.	"Monitoring adjustment set / test set" activated
Days before expiration	Specifies the number of days after which a warning is triggered.	"Reminder" activated

If a test has been performed, an entry in the test set appears in the setup of the corresponding cell. If you touch the entry, the data of the most recent adjustment that were executed with the set will be displayed.

Parameter	Description	Values
Test set	By touching the set you go to the values for the most recent test for this set.	-
Monitoring test set	Monitoring of the service life of the test can be activated. The process, if the service life of a set has expired, is defined in the method function "Measure".	-
Test interval	Service life of test	"Monitoring test set" activated

Parameter	Description	Values
Reminder	Before the set expires, a message appears indicating that the adjustment or test has expired.	"Monitoring adjustment set / test set" activated
Days before expiration	Specifies the number of days after which a warning is triggered.	"Reminder" activated

Via the button **History** you go to a list that contains a maximum of ten adjustment or test entries for the selected set. In the process the measured refractive index values are displayed (in the adjustment mode air and water only the value for water). The history can be displayed in graphic form via the button **Graph**. You can view the history data by touching an entry.

4.8.2.2 Automation

Navigation: Home > Setup > Hardware > Automation

The automation units that can be installed are listed below:

- DryPro (drying pump)
- SPR200 (sample pump)
- SC1 (automation unit for a sample)
- SC30 (automation unit for 30 samples)

- InMotion (automation unit for up to 303 samples)

The peripheral devices have an automatic PnP (Plug and Play) – identification. They can also be manually created in the setup.

Via the button **Automation** in the **Hardware** dialog, you access a list with defined automation units. By touching a list entry, you obtain more detailed information about the corresponding automation unit.

Parameter	Description	Values
Type	Instrument Type	-
Power purge unit	The external diaphragm (Optional) has a much higher output than the diaphragm pump integrated in the SC1/SC30. The pump is actually adjusted at the SC1/SC30.	"Type" = "SC1" / "SC30"
Heating option	This is where the heating option is activated. The temperature is directly set on the heating unit.	"Type" = "SC1" / "SC30"
Limit sensor	Optical sensor that detects the sample and prevents it leaving the heated area of the heating option (info field).	"Type" = "SC1" / "SC30"
External drain valve	Located in the heating unit. Prevents the samples flowing back after filling process (info field).	"Type" = "SC1"/"SC30"
Solvent 1	Specifies the solvent at the connection Rinse 1	"Type" = "SC1" / "SC30"
Solvent 2	Specifies the solvent at the connection Rinse 2	"Type" = "SC1" / "SC30"
Speed "Low"	Value for speed level "Low" of the SPR200 or InMotion autosampler (in % of the maximum speed).	"Type" = "SPR200" / "InMotion"
Speed "Medium"	Value for speed level "Medium" of the SPR200 or InMotion autosampler (in % of the maximum speed).	"Type" = "SPR200" / "InMotion"
Speed "High"	Value for speed level "High" of the SPR200 or InMotion autosampler (in % of the maximum speed).	"Type" = "SPR200" / "InMotion"
Rate at 100%	Value for max. possible pump output (depending on the installed pump which is defined as sampling pump).	"Type" = "InMotion"
Stirrer output	Specifies the pump/stirrer port on the InMotion where your stirrer is connected.	"Type" = "InMotion"
Sampling pump output	Specifies the pump/stirrer port on the InMotion where your sampling pump is connected.	"Type" = "InMotion"
PowerShower output	Specifies the pump/stirrer port on the InMotion where your pump for PowerShower is connected.	"Type" = "InMotion"
Rate	Value for required pump output for PowerShower.	"Type" = "InMotion"
Beaker height	Specifies the height of the used beakers.	"Type" = "InMotion"

A distinction should be made between the following two cases in the installation of instruments:

1. There is still no setup entry available in the unit (delivery state).
   A new entry has been generated and the parameters automatically generated.

2. A setup entry was previously manually created in the instrument:
   The PnP parameters are automatically entered, the remaining parameters, previously edited by the user, remain unchanged.

When a PnP instrument is unplugged, the status changes to "not installed".

Below is described how you can administer the various devices in setup. This includes the creation of devices or changing the parameters in the setup.

Create automation units

So that methods for the application of automation units can be created and configured without the automation unit being connected, these units must be created in the setup via the button **New**.

Delete automation unit

It is not possible to delete the entry of a connected device.

Note

If you want to delete an entry for a unit that is not connected from the list, a message with the termination option appears indicating that after deletion the methods that use the external instruments will no longer be executable.

4.8.2.3 External Instruments

Navigation: `Home > Setup > Hardware > External instruments`

The external instruments that can be installed are listed below. They all have automatic PnP – identification:

- METTLER TOLEDO S20 – SevenEasy™ pH
- METTLER TOLEDO S30 – SevenEasy™ Conductivity
- METTLER TOLEDO S220 - SevenCompact™ pH/Ion
- METTLER TOLEDO S220 - SevenCompact™ Conductivity
- Lovibond colorimeters PFX880 / PFXi880, PFX950 / PFXi950 and PFX995 / PFXi995 series, Tintometer
- Minolta colorimeters CM-5 / CR-5

Note

- The Lovibond colorimeters can be connected to the USB interfaces. For this purpose the USB – RS232 adapter is required (contained in the connection kit).
- For each device type only one entry is possible.

Install devices

A distinction should be made between the following two cases in the installation of instruments:

1. There is still no setup entry available in the unit (delivery state).
   A new entry has been generated and the parameters automatically generated.
2. A setup entry was previously manually created in the instrument:
   The PnP parameters are automatically entered, the remaining parameters, previously edited by the user, remain unchanged.

When a PnP instrument is unplugged, the status changes to "not installed".

- Via the button **External instruments** in the **Hardware** dialog, you can obtain the list of instruments. By touching a list entry, you obtain more detailed information about the corresponding instrument.

Create device

So that methods can be created and configured with external instruments, without having to connect the instrument, the setup entries of the external instruments can be manually created via the button **New**.

Note

- The pH and conductivity meters can be assigned names individually using the "Instrument" parameter.

Delete devices

It is not possible to delete the entry of a connected device.

Note

If you want to delete an entry for a unit that is not connected from the list, a message with the termination option appears indicating that after deletion the methods that use the external instruments will no longer be executable.

SevenEasy™ / SevenCompact™ pH/ion and conductivity meters

1 Select the following for the SevenEasy™ and SevenCompact™ measuring instruments (also refer to the operating instructions for the measuring instrument concerned):
   ⇨ Manual end point measured value acquisition,
   ⇨ set the unit [pH]" ([mV] not supported).

2   For the SevenCompact pH and conductivity meters, the following must also be selected (also refer to the relevant operating instructions):
    ⇨ an interval time of 1 s (in menu>Interval measurements),
    ⇨ interface=printer (in menu>Data transmission),
    ⇨ "Send data to interface" (in "Type of data transmission").

3   For temperature compensation, set the unit [°C] at the measuring instruments. Two types of temperature compensation exist:
    - ATC (automatic temperature compensation) with a temperature sensor connected.
    - MTC (manual temperature compensation) with no temperature sensor connected.
    Note:
    The pH or conductivity meters switch automatically, depending on the arrangement.
    If the temperature unit at the pH meter or conductivity meter is set to [°C], the results "TpH" and "TCond" will be converted to the temperature unit set in the instrument, i.e. either [°C] or [°F] . By contrast, if [°F] is set at the pH or conductivity meter, no result will be calculated. "--" will be output in the results field.

Note

The conductivity units are [mS/cm] / [µS/cm] (depending on the range) or [mS/m] [µS/m] (depending on the range). However, the results are expressed in [µS/cm]. If you wish to have the result displayed in [mS/cm] or [mS/m] [µS/m], it will be necessary to recalculate the result using the "Calculation" method function.

Colorimeter

- Lovibond

The Lovibond colorimeter can be used for extinction or transmission measurements. The wavelengths are output in 5 nm (in the range 420 – 710 nm).

Note

A color measurement may take longer than 25 s.

- Minolta colorimeters CM-5 / CR-5

The Minolta colorimeters can be used for transmission measurements (liquids).
Transmission data are supplied in 10 nm increments within the spectral range 360 – 740 nm.
A color measurement takes approximately 1 s.
The measurements involve high-energy light flashes. For this reason, color scales are not offered for reflection measurements in the crude oil industry.

Note

- The CR-5 colorimeter does not supply any spectral data.
- Calibration is possible directly at the colorimeter only. The USB link must be disconnected.
- "Illuminant" and "Observer" can be set in the "Configuration" method function. For more information, see "[Methods and products: Method functions > Configuration ▶ Page 45]".

- Color scales

Navigation: `Home > Setup > Hardware > External instruments > Parameters`

– Click on "Colorimeter".
    ⇨ The "External instrument parameters" dialog appears.

If a device has been connected, a list of color scales is displayed via the **Color scales** button, that were available in the most recently connected device. If the device has been manually configured and no device has yet been connected, then the list is empty.

4.8.2.4 Peripherals

Navigation: `Home > Setup > Hardware > Peripherals`

In the dialog **Peripherals**, the following devices and settings can be configured:

- Barcode reader
- USB stick

- Fingerprint reader
- Printer
- Personal Computer (PC) – settings
- Network settings
- Network storage

Below is described how you can administer the various devices in setup. This includes the creation of devices or changing the parameters in the setup.

Barcode reader

Barcode readers have Plug&Play (PnP) recognition and can be installed via the USB interface.

The following barcode readers can be installed:

- Handheld readers
- Built-in readers

You can create the barcode readers via **New**. A maximum of one entry can be created for both types.

Parameter	Description	Values
Type	Instrument Type	-
Serial number	Serial number of the corresponding device	-
Barcode Information	Sample ID: on the barcode there is only the sample ID. Method ID: on the barcode there is the method ID (with this a saved method can be selected during scanning). Product ID: on the barcode there is the product ID (with this a saved product can be selected during scanning). Sample ID/Method ID: on the barcode there are the sample ID and method ID (with this a saved method can be selected during scanning). Sample ID/Product ID: on the barcode there are the sample ID and product ID (with this a saved product can be selected during scanning).	-
Start pos. sample ID	Start position of the sample ID on the barcode	"Barcode information" with sample ID
Number of characters	Length of the sample ID on the barcode	"Barcode information" with sample ID
Start pos. method ID	Start position of the method ID on the barcode	"Barcode information" with method ID
Number of characters	Length of the method ID on the barcode	"Barcode information" with method ID
Start pos. product ID	Start position of the product ID on the barcode	"Barcode information" with product ID
Number of characters	Length of the product ID on the barcode	"Barcode information" with product ID
Immediate start	If this parameter has been activated, when a task is started with the barcode reader, the **Start analysis** dialog is skipped and the task is started immediately.	"Type" = "Handheld reader", "Barcode information" with method ID, product ID or sample ID

Example of barcode with sample ID and method ID (161218522). (Sample ID=1612 and method ID 18522).

- Start pos. sample ID 1
- Number of characters 4
- Start pos. method ID 5
- Number of characters 5

USB stick

Commercially available USB sticks from USB Version 1.1 are supported.

Fingerprint reader

You can use a fingerprint reader to authenticate users on the titrator. In order to do this, the fingerprint reader must be activated on the titrator. The following parameters are available for this:

Parameter	Description	Values
Activate fingerprint reader	Activates the connected fingerprint reader.	-

Printer (and USB-RS232 data export)

- Date can be printed with the USB-P25 (strip printer) or with a network printer.
- Data can be exported using the USB data export box. The data are exported in the XML (UTF-8) formats.

Note

- For data export to an RS interface, you need the USB RS232 adapter (USB data export box).
- As desired, data can be printed either as a summary or in a user defined format (via "Print Mode" parameter "Report" method function; also see "Methods and products: Methods > Method functions > Report")

Note

For printing/USB data export, the following should be taken into consideration:

- In the "Report" method function, the "Print / USB-RS232 data export" parameter must be selected.

You can define the following parameters via the **Printer** button (Home > Setup > Hardware > Peripherals):

Parameter	Description	Values
Printer type	**USB compact printer** The USB compact printer does not support all languages. This printer can only print out a limited quantity of analysis data and results. **USB-RS232 data export** For the RS-232 data export, the data is transmitted regardless of the selected language. Only a limited quantity of data and results can be exported. **Network printer** Every connected printer in your local network that supports HP PLC 3 or Epson ESC/P 2 can be used.	-
Status	Indicates whether the selected printer type is installed (info field).	Only for printer type "USB compact printer" and "USB-RS232 data export"
Baud rate	The baud rate for data transmission via the USB-RS232 interface.	"Printer type" = "USB-RS232 data export"
Data bit	The number of data bits is displayed (info field).	"Printer type" = "USB-RS232 data export"
Stop bit	The number of stop bits is displayed (info field).	"Printer type" = "USB-RS232 data export"
Parity	Defines the parity protocol. ("Even", "Odd", "None") .	"Printer type" = "USB-RS232 data export"
Handshake	Data transmission via the RS-232 interface ("Xon-Xoff", "None").	"Printer type" = "USB-RS232 data export"
Type	Choose the printer protocol.	"Printer type" = "Network printer"

Network name	Define your local network name here.		"Printer type" = "Network printer"
Port number	Define your local port number here.		"Printer type" = "Network printer"
Paper size	Choose the print-format of the report (A4 / Letter).		"Printer type" = "Network printer"

PC settings

Only one PC connected per measuring instrument can be present at one time. You can select if you wish to set up a connection to the laboratory program "LabX".

Parameter	Description	Values
Set up connection to LabX at start up	If this parameter is activated, a connection to LabX will be established on startup.	-

Note

Changes to the PC settings are not implemented until after the measuring instrument is rebooted.

Network settings

You can define the following parameters for the network – settings:

Parameter	Description	Values
Type	Type of network connection	-
Obtain IP address automatically	If this device has been activated, the device automatically obtains an IP address.	"Type" = "Ethernet"
IP Address	IP address of the instrument	-
Subnet mask	Subnet mask of the device	-
Standard gateway	Standard gateway of the device	"Type" = "Ethernet"

Note

The device automatically reboots after any change to the network settings.

Network storage

You can define the following parameters for a network – storage:

Parameter	Description	Values
Transfer via	Method for transferring data (only **Network share**).	-
Server	PC or server name. Users should have read-write access. Maximum 60 alphanumeric characters.	-
Share name	Name of the share which is defined for the shared folder.	-
User name	Type in the user name for accessing the shared folder. The user name must be defined in the setup for the shared folder.	-
Domain	Domain name of the server where the shared folder is located.	-
Password	Password for the network share.	-
Target folder	Defines the name of the **Target folder** where the data is saved. The **Target folder** is a subfolder in the shared folder.	-
First folder level	If specified, the **First folder level** is a sub-folder in the **Target folder**. This folder can optionally be used to sort data. (**None** | **User name** | **Titrator ID** | **Date** | **Method ID**) Default: **None**	-

Second folder level	If specified, the **Second folder level** is a second sub-folder in the **Target folder**. This folder can optionally be used to sort data. (**None** | **User name** | **Titrator ID** | **Date** | **Method ID**) Default: **None** Only if **First folder level** = activated	-

4.8.2.5 Sensors

Navigation: `Home > Setup > Hardware > Sensors`

Sensors can be activated in the setup. The following sensors can be connected:

ErgoSens: Infrared sensor for contactless start of measurement (see "Analysis sequence: Start of analyses").

Before you can use ErgoSens, it has to be activated:

Parameter	Description	Values
Activate ErgoSens	Activates the ErgoSens	-

WasteSens or **LevelSens**: Level sensors for waste bottle.

It is determined whether the maximum filling level of the waste bottle is reached. If the maximum filling level has been reached, a message appears prompting the operator to empty the waste bottle. The task is then interrupted.

Before you can use WasteSens or LevelSens, it has to be activated:

Parameter	Description	Values
Activate WasteSens/ LevelSens	activates the WasteSens or LevelSens	-

If you connect the density - module, you can use an air pressure sensor:

AtmoSens: Atmospheric pressure sensor for measuring the absolute air pressure.

If an AtmoSens is connected, the atmospheric pressure (if required) is measured with the AtmoSens. If no AtmoSens is connected, the air pressure is read out from the current value from `Home > Setup > Global settings> Physical properties`.

Parameter	Description	Values
Verify AtmoSens availability	If this parameter is activated, the use of the AtmoSens is enforced for tasks which require the pressure.	-

4.8.2.6 Auxiliary instruments

Navigation: `Setup>Hardware>Auxiliary Instruments`

Auxiliary instruments can be any instruments that access the 24V output or USB-RS232 adapter of the measuring instrument and that are to be used in a method.

An auxiliary instrument that accesses the 24 V output is switched on for a predefined period and then switched off again via the corresponding command. The instruments are controlled via the "Auxiliary instrument" method function.

Auxiliary instruments form part of a method, while peripheral devices are classified as input/output devices (printers, barcode readers etc.), which do not have direct access to methods.

Starting from the auxiliary instrument list, you can add new auxiliary instruments or select existing ones or modify their parameters. In addition, the selected auxiliary instruments can be deleted.

Note

A maximum of 30 auxiliary instruments can be entered.

- Choose the **New** button in the **Auxiliary Instruments** dialog window to open the **Auxiliary Instrument Parameters** dialog.

1 Before a new auxiliary instrument can be added, you must first use the "Control type" parameter to select the manner in which the auxiliary instrument is to be controlled:. The following values are available for "Control type":

⇨ 24V output

⇨ USB-RS-232

2 You can assign a name of your choice to the auxiliary instrument.

The parameters for the control types are listed below:

24V output

Parameter	Description	Values
Control type	The control type of the auxiliary instrument.	USB-RS232 | Output 24 V
Name	Defines the name of the auxiliary instrument.	-

USB-RS-232 interface

Parameter	Description	Values
Control type	The control type of the auxiliary instrument.	USB-RS232 | Output 24 V
Name	Defines the name of the auxiliary instrument.	-
Adapter	Defines which adapter is used. Maximum 2 auxiliary instruments of type USB-RS-232 can be used in the same method (by using adapter 1 and 2)	"Control type" = "USB-RS232"

Parameter	Description	Values
Baud rate	The baud rate for data transmission via the RS-232 interface of the adapter.	"Control type" = "USB-RS232"
Data bit	Defines the number of data bits.	"Control type" = "USB-RS232"
Stop bit	Defines the number of stop bits. (2 stop bits can only be selected if 7 data bits are also selected at the same time.)	"Control type" = "USB-RS232"
Parity	Defines the parity protocol.	"Control type" = "USB-RS232"
Handshake	Data transmission via the RS-232 interface of the adapter.	"Control type" = "USB-RS232"

Note

A suitable adapter (USB data export box) is required for the USB-RS-232 connection.

4.8.3 Language

Navigation: `Home > Setup > User settings > Language`
The following languages are available:

- German
- English
- French
- Italian
- Polish
- Portuguese
- Spanish

- Chinese
- Russian

The language can be defined both for the operation of the terminal as well as for the protocols that are to be printed out from a printer.

Parameter	Description	Values
Touchscreen	Language of the user interface	-
Report	Language of the printout*	-

Note

*Chinese can not be selected as language for reports

4.8.4 Screen

Navigation: `Home > Setup > User – settings > Screen`

The following parameters can be set in the screen settings:

Parameter	Description	Values
Primary color	Color of the user interface	-
Brightness	Brightness of the display	-
Button shape	Shape of buttons on the touchscreen	-
Screen saver	Activates screen saver	-
Wait time	Time for the display of the screen saver	Activates screen saver

4.8.5 Beep

Navigation: `Home > Setup > User settings> Beep`

The audio signal is set specifically for each user. You can activate the audio signal in the **Audio-Signal settings** dialog.

4.8.6 Shortcuts

Navigation: `Home > Setup > User – settings > Shortcuts`

In this dialog, every user has the opportunity to administer his or her own selected shortcuts.
The list of all shortcuts for the logged in user can be viewed. Individual shortcuts can be selected and deleted.
You can determine the following parameters:

Parameter	Description	Values
Description	This text is the name of the shortcut that is displayed in the Homescreen.	-
Immediate start	When the shortcut is pressed, the display switches directly over to the online screen without opening the **Start analysis** dialog.	-
Homescreen Position	Selection of the position on the Homescreen	-

4.8.7 Keyboards

Navigation: `Home > Setup > User – settings > Keyboards`

In the **Keyboard settings** dialog, you can define the layout for the alphanumeric and the numeric input fields.
The following settings are available:

Parameter	Description	Values
ABC keyboard	Defines the layout of the alphanumeric input field.	-

| 123 keyboard | Defines the arrangement of the keys for the numeric input field. | - |

4.8.8 Global Settings

Navigation: `Home > Setup > Global setting`

In the **Global Settings**, you can make general settings to the measuring instrument that apply to all users of the instrument. The settings in this dialog can only be changed by users with the appropriate authorizations.

Global settings include:

- The **system settings**
- **User management** for creating user accounts and assigning rights.
- The settings for **Analysis and resources behavior**.
- **Physical properties** for defining the "Temperature unit" and the air pressure.

4.8.8.1 System

Navigation: `Home > Setup > Global settings > System`

In the **System settings** dialog the following buttons are available:

- **Identification**:In this menu you can give the measuring instrument a freely definable ID consisting of at least four characters.

  In addition the following information is displayed: Device, serial number and firmware version.
- **Date / time:**You can define the format used to display the date and time and set the device date and time.
- **Data storage**: If this parameter is activated, all results that are saved under Home > Results are deleted (only when device is shut down).

4.8.8.2 User Management

Navigation: `Home > Setup > Global settings > User management`

By means of the **User management** dialog you can administer users and account policies for the instrument. A maximum of 30 different users can be defined, from which only maximum one may be logged in with the instrument (1 user operation).

User accounts can be deleted and edited.

There is a default user with the user name "Administrator" (user group: Administrators). This cannot be deleted.

4.8.8.2.1 Users

Navigation: `Home > Setup > Global settings > User management > User`

Via the button **New** in the **User** dialog you can open the **User parameters** of the dialog. It is possible to define new users here.

Note

"User management" is the only area in which users with administrator rights are able to edit settings and, therefore, create or make changes to users.

Create a new user in the **User parameters** dialog as follows:

1 Define a user name.

2 Assign the user to a group. The following user groups are available:
  Administrator
  Expert
  Technician
  Operator

Note

For information on the rights of these user groups, see "[Setup (Setup: Global settings > User management > User groups ▶ Page 29]".

The following parameters are available in the **User parameters** dialog:

Parameter	Description	Values
User name	The user is uniquely identified in the system via the name.	-
Full Name	Complete name of the user.	-
User Group	Selection of the user group for the user. Depending on the user group the user has various rights.	-
Reset password	Resets the password for the user to "123456".	Activates "Enforce password/fingerprint"
Lock user	Locks the user.	Activates "Enforce password/fingerprint"
Enforce password change	With the next login the entry of a new password will be enforced.	Activates "Enforce password/fingerprint"
Created by	The administrator logged in at time of creation	-
Created on	Date of creation and time (info field)	-
Modified by	The administrator logged in at time of creation	-
Modified at	Change date and time (info field)	-

4.8.8.2.2 Account Policy

Navigation: `Home > Setup > Global setting > User management > Account policies`

The following parameters can be edited in the dialog:

Parameter	Description	Values
Enforce password / finger print	If this parameter has been activated, you can only log in by entering the password (or via the fingerprint reader, if the parameter "Activate fingerprint reader" is activated, in `Home > Setup > Hardware > Peripherals > Fingerprint reader`).	-
Min. password length	The minimum length of the user passwords	Activates "Enforce password/fingerprint"

If the parameter "Enforce password" is deactivated, then the instrument starts directly, i.e. not via the login screen (only if one user is defined – corresponds to the factory settings). If several users are defined, the user name can be selected in the login screen from a list.

4.8.8.2.3 User Groups

Each user is assigned to a user group. The following four user groups (with decreasing rights going downward) should be distinguished:

- Administrator
- Expert
- Technician
- Operator

The following table presents the user rights that are assigned to the corresponding user group:

List of user rights

Right	Minimum required user group
Start analysis via Shortcuts.	Operator
Start analysis via **Start** button in the Homescreen	Operator
Start analysis with ErgoSens	Operator
Start analysis from method editor (for method type: measurement, cleaning and test), product and series editor (for method type: measurement, cleaning, test and adjustment)	Technician

Right	Minimum required user group
Adding/deleting items for series in the **Start analysis** dialog (does not apply for adjustment-type methods)	Technician
Executing manual operations	Technician
Editing shortcuts (Setup>User settings)	Technician
Including and excluding results	Technician
Deleting results	Expert
Adding/deleting items for series in the **Start analysis** dialog (also applies for adjustment-type methods)	Expert
Setting the language for touchscreen and reports	Expert
Start analysis from method editor (for method type: measurement, cleaning, test and adjustment)	Expert
Editing methods, products, series	Expert
Editing "Adjustments & Tests" (`Home > Setup`)	Expert
Editing "Hardware" (`Home > Setup`)	Expert
Editing "Analysis and resources behavior" (`Home > Setup > Global setting`)	Expert
Editing "Tables & Values" (`Home > Setup`)	Expert
Setting the language for reports	Expert
Editing "Physical properties" (`Home > Setup > Global setting`)	Expert
Running "Maintenance & Service" in `Home > Setup`, **except**: • Importing/exporting user management and memory copy	Expert
Running "Maintenance & Service" (`Home > Setup`), **including**: • Importing/exporting user management and memory copy	Administrator
Editing "User management" (`Home > Setup > Global setting`)	Administrator

4.8.8.3 Analysis and Resources Behavior

Navigation: `Home > Setup > Global settings > Analysis and resources behavior`.

The following settings can be defined:

Parameter	Description	Values
Show required resources at start	If this parameter is activated, all resources are shown during startup that are required for performance of the analysis. **Note**: If a required resource is not available, the "Needed resources" dialog is also shown without this parameter having being activated.	-

Confirm end of the analysis	If this parameter is activated, the **OK** button is shown at the end of the task. The task is not ended until you confirm with **OK**. This parameter is especially used if the result should remain on the online screen at the end of the measurement so that, for example, it can be copied.	-
Reset statistics if sample ID changes	If this parameter is activated, the rolling statistics will be interrupted, if the sample ID differs from the previous analysis. If it is not activated, the rolling statistics will only be interrupted if the method ID (or product ID) differs from the previous analysis.	-
Verify USB stick availability	If this parameter is activated and a USB stick is used in the method, the task will be checked when the start is started to see if the USB stick is available. If none is available the task cannot be started.	-

Parameter	Description	Values
Verify printer availability	If this parameter is activated and a printer is used in the method, the task will be checked when the task is started to see if the printer is available. If the printer is not available the task cannot be started (does not work for network printers).	-
Information on identification of PnP resources	If this parameter is activated, a message is shown when a PnP resource is detected.	-
Verify network storage avail-ability	If this parameter is activated and network storage is used in the method, the task will be checked when the task is started to see if a network storage is available. If no network storage is available, the task cannot be started.	-

4.8.8.4 Physical Properties

Navigation: Home > Setup > Global setting > Physical properties

In the **Physical properties** dialog you can defined the parameters "Temperature unit" [°C] or [°F] and "Atmospheric pressure" in [hPa].

Parameter	Description	Values
Temperature unit	Temperature unit applicable for all ranges of the instrument (global setting). Either Celsius or Fahrenheit can be selected. All inputs or outputs are in the temperature unit selected here. The setting is saved after a restart.	-
Atmospheric pressure	Input of atmospheric pressure that is used for calculating the nominal value of the air density. The atmospheric pressure is required for an adjustment or a test with air or a cell test. If the AtmoSens is connected, the reading will be displayed here.	-

Note

The atmospheric pressure is only required when using the density - module.

4.8.9 Tables & Values

Navigation: Home > Setup > Tables & values

The instrument has tables and auxiliary values that can be used for the calculation of results (see also "Results").

With measurements the raw data (e.g. temperature value and refractive index) are delivered. These results are fed into the relevant tables so that corresponding results can be displayed in the respective units.

Tables are always assigned to an application. The list can be sorted according to application.

There are two types of tables:

- METTLER TOLEDO tables:
  These tables are included in the factory settings, they are only listed and can be neither edited, viewed nor deleted.
- User-defined tables:
  Tables are laid out in the form of a value table (X-Y). They can be created, edited and deleted.

Below is a description of how to create your own tables.

In addition to the tables, you can also administer the auxiliary values in setup. The auxiliary values can thereby be used in formulas. By means of the method function "Auxiliary value", an auxiliary value from any desired formula can be assigned raw data or calculated results.

4.8.9.1 Tables

Navigation: `Home > Setup > Tables & values > Tables`

By opening the **Tables** dialog you can see a list of available tables (METTLER TOLEDO and user-defined).

How to create tables in the setup is described below.

You can create a table with the **New** button.

Parameter	Description	Values
Name	Table name: The name uniquely identifies the table in the system. The name is entered into the formula in the method function "Calculation".	-
Application	Application area of table. Facilitates the sorting of the table list.	-
Input value	Table heading for the input value.	-
Output value	Table heading for the output value.	-
Fit type	Definition of the curve type for the calculation. • Linear interpolation: Corresponds to a segmented curve. • Lagrange interpolation: Lagrange fit via four points • 1 order polynom • 2 order polynom • 3 order polynom	-

1 Save the new table.

⇨ A dialog opens with the name of the new table.

2 Enter value pairs via **New**.

Parameter	Description	Values
"Input value"	Input value of the value pair (corresponding to the measuring cell used, e.g. density or refractive index)	-
"Output value"	Output value of the value pair (e.g. Brix)	-

At least four value pairs must be entered and then saved via the **Save** button.

– Touch the button **Graph**. The fit function is graphically presented (the button **Graph** is only displayed if the table has been saved).
  Note: The axis labeling corresponds to the specified "Input" – (x-axis) and "Output" parameters (y-axis).

⇨ The table has been successfully entered. The coefficients are calculated according to the selected function. There is a "delta" column that shows the deviation from the calculated value at the effective table point (only for the "Fit type" = "Polynomial"). This column is not shown when the table is being edited.

Note

- In the **Table – parameters** dialog, you can again remove the table via the **Delete** button.
- A table must contain at least 4 and contain a maximum of 200 value pairs.
- A maximum of 30 user-defined tables may be defined.
- Tables cannot be deleted or modified when they are currently in use.

- The table name must be unique.

4.8.9.2 Auxiliary Values

Navigation: `Home > Setup > Tables & Values> Auxiliary values`

Via the **New** button, you open the **Auxiliary values parameters** dialog. In it you can use the following parameters to define the auxiliary value:

Parameter	Description	Values
Name	Unique designation of the auxiliary value: The name is entered into the formula in the method function "Calculation".	-
Comment	Short comment on the auxiliary value (e.g. about the unit)	-
Value	Numerical value	-
Determination method	Type of determination method (info field)	-
Determination date	Date on which determination was performed (info field)	-
Performed by	Person who performed determination	-
Monitoring auxiliary value	Specifies whether the auxiliary value is to be monitored.	-
Interval	Specifies the time period for monitoring of the auxiliary value.	"Monitoring auxiliary value" activated
Expiry date	Expiry date of auxiliary value (info field)	"Monitoring auxiliary value" activated
Reminder	Defines whether a reminder should be issued before expiry of the auxiliary value.	"Monitoring auxiliary value" activated
Days before expiration	Specifies the number of days after which a warning is triggered.	"Reminder" activated

Note

- A maximum of 100 auxiliary values can be saved in the instrument.
- Auxiliary values cannot be deleted or modified when they are currently in use.
- When an auxiliary value is assigned with the "Auxiliary value" method function, this is updated in the setup immediately after completion of the method function.

4.8.10 Maintenance & Service

Navigation: `Home > Setup > Maintenance & Service`

The following functions are available to you:

- MT service
- Import / Export
- Add external cell
- Reset to factory settings
- Firmware
- Update
- Hardware / Firmware summary
- Cell
  - One-point temperature alignment (only for density - module)
  - Whole-range temperature alignment
  - Fan check

– Add manual adjustment
- Export of adjustments / tests / measurements

4.8.10.1 MT Service

Navigation: `Home > Setup > Maintenance & Service> MT Service`

Via the button **MT Service** you can open the **Last MT services** dialog window.

In this dialog, you can view and print out a list of the most recent (max. 10) METTLER TOLEDO services. Under each date, the user name of the METTLER TOLEDO service technicians and the date and time of the service appointment are displayed. The most recently performed service always appears at the top of the list.

Via the **Settings** button in the **Last MT services** dialog window you can open the **Service data** dialog window, via which you can edit the service life of the last service due date. You can define whether a warning should be issued before the service life expires (requires administrator rights). You can define the following parameters:

- "Service life" (in days) of the most recently performed service.
- "Reminder": Defines whether a reminder should be issued before expiry of the service life of the service.
- "Days before expiration" Number of days before expiration of the service life on which the instrument should issue a warning.
  The entered value must be smaller than the value for the service life (only appears if "Reminder" has been activated).

4.8.10.2 Import / Export

Navigation: `Home > Setup > Maintenance & Service> Import / Export`

With the aid of this feature you can save the data on a UBS stick (export) or import data from a stick.
The following can be imported or exported:

- Single method
- All methods
- Single product
- All products
- Single series
- All series
- Single table (only affects user-specific tables)
- All tables (only affects user-specific tables)
- User management
- Memory copy

The following rules apply for Import / Export:

1. Import/Export is only possible when a USB stick is connected.
2. Import/Export is only possible when no task is running.
3. Products can only be imported if referenced methods are already available on the device required for the import.
4. Series can only be imported if referenced methods or products of the series are already available on the device required for the import.

– In the **Maintenance & Service** dialog, open the **Import / Export** dialog window. In this dialog, you can define the following parameters:

⇨ "Action": Data can be exported to a USB stick or imported back from a USB stick.

⇨ "Data": Data that is to be exported or imported can be selected.

Memory copy

You can create a memory copy from your data. This includes adjustment and test data, auxiliary values, shortcuts and fingerprints, data relating to automation, peripherals and external instruments. When a firmware upgrade of the instrument has to be done, the instrument can be restored from the memory copy. The memory copy can also be imported to another instrument. In this case, the Test and Adjustment history are not imported and an adjustment of the instrument is required.

Uploading data from a backup copy results in the existing data being overwritten by the data in the memory copy. In this way you can restore the initial status.

Note

- **Not** contained in a memory copy are
  any saved results, default parameters for manual operations, internal tables, hardware for cell creation or parameters for added external cells.
- When you import / export user management settings the entire user management settings with all users and their properties are exported or imported.
- If the import is canceled, all previously imported users are deleted and only a default user (administrator) is created.
- You must have administrator rights before you can create and reimport a backup copy.

4.8.10.3 Add External Cell

Navigation: `Home > Setup > Mainten. & Service > Add external cell`

Perform the action "Add external cell". In the **Cell** dialog box, the cell type must be selected (`Home > Setup > Hardware > Cell`).

When you connect the external cell (module), the status changes to "installed" and the effective serial number is entered.

If the external cell is removed, the entry in the cell list is retained. The status changes to "not installed". The serial number and the cell type however continue to be displayed.

4.8.10.4 Reset to Factory Settings

Navigation: `Home > Setup > Maintenance & Service > Reset to factory settings`

With the button **Reset to factory settings** you can reset your settings.

⚠ If you do this all created data, amendments, settings, setup entries or results are lost.
Before you activate "Reset to factory settings" you should create a memory copy.

4.8.10.5 Firmware

Navigation: `Home > Setup > Maintenance & Service > Firmware`

With the aid of this feature you can display a list showing the most recent firmware updates. The first entry in the list corresponds to initial operation.
All list entries are saved with a date and FW version.

4.8.10.6 Update

Navigation: `Home > Setup > Maintenance & Service > Update`

With the aid of this feature a firmware update of the instrument, device board and cells can be performed via a USB stick. After the button **update** is touched, all available and associated components that contain firmware are presented in a list (Instrument FW, cell FW, Device Board FW).

- You must have administrator access rights.
  - The instrument is in idle mode (no task is active).
  - To update a cell, the cell must be connected. In the process each update must be performed separately for each connected cell that is to be updated.

1 Via the button **update** you can open the **Firmware – List** dialog. Select the relevant components from this list.

2 Plug in the USB stick with the firmware update files into the instrument.

  ⇨ The instrument recognizes the USB stick and enables the update.

3 Start the update.

  ⇨ The instrument reboots and starts the update program via the USB stick. The update can be performed in the update program.

4 When the update program is terminated, the instrument reboots with the normal application.

Instrument update:

All results, settings, setup entries, methods, products and individual modifications are lost during the instrument firmware update. On the other hand, the service history, the instrument firmware history and serial number are all retained.

Cell update:

- Only updates from connected and recognized cells are offered, whose update file is on the USB stick.
- With the cell update, no changes are made to the application program and to the individual settings and methods.

Device board update:

With the device board update, no changes are made to the application program and to the individual settings and methods.

4.8.10.7 Hardware / Firmware summary

Navigation: `Home > Setup > Maintenance & Service > Hardware / Firmware summary`

You can view a list with all connected components along with the corresponding information on hardware or firmware. The list can be saved as a file on a USB stick. The file name contains the serial number of the device and the current date and time. Example:
HW_SW_Info_5124560983_23_03_2010_08_23.cvs

4.8.10.8 Board Tests

Navigation: `Home > Setup > Maintenance & Service > Board tests`

With this function, the interfaces of various boards can be tested:

- Main board
- Device board
- External cell board, if an external cell is connected

The sequence for testing the boards is described below:

1 Via the button **Board tests** you can open the **Boards** dialog. In this dialog, buttons are provided, which guide you to the corresponding board information for the connections.

2 Touch the button for the desired board and you will receive an information list with the connections on the board and the required resources that must be plugged into the corresponding connection.

3 Touch the **Start** button, to go to the list of test functions.
  - By touching a test, you change over to the corresponding test and this can then be started. Pop-ups guide you through the test process and show you any errors identified.
  - The test result is also displayed in the interface list.

4 You can select another interface and proceed as described above or you can cancel the test with the **Stop** button.

  ⇨ When all interfaces for the selected board have been tested and all have the status "successfully passed", the results can be written onto the USB stick.

4.8.10.9 Cell

Navigation: `Home > Setup > Maintenance & Service > Cell`

Via the **Cell** you get to the service function of the cells.

This dialog window contains the following buttons:

Button	Parameters
One-point temperature alignment	Adjustment of the cell temperature to the set temperature. The block thermistor is adjusted to the certified cell thermistor at the current set temperature.
	The **One-point temperature alignment** dialog shows the selected cell, the set (Tset), the cell (Tcell) and the cell block temperature (Tblock).
Whole-range temperature alignment	Adjustment of the cell temperature to the set temperature across the entire temperature range.
	Note: The alignment takes about two hours.

The **Whole range temperature alignment** dialog shows the selected cell, the current values of the set (Tset), cell (Tcell), cell block- (Tblock) and the ambient temperature (Tambient).

The alignment can be started when the temperature in the cell is stable and the cell is dry and clean.

Note:

- If there is an error message, the current values are saved on the display so that it can be seen at which temperature the error occurred.
- With **Stop** the alignment can be interrupted at any time.
- During alignment, the temperature per interval is saved in a file. This file can be saved on the USB stick.

Fan check	The functional efficiency of the fans is tested. The display is periodically updated. **Note**: The instrument is not switched off when there is an error display.
Add manual adjustment	This function simulates an adjustment. It is used in order to perform a measurement without previously adjusting the instrument.
	Note: **Only use for demonstration or method development processes!**

4.8.10.10 Export Adjustments / Tests / Measurements

Navigation: `Home > Setup > Maintenance & Service > Export of adjustments / Tests / Measurements`

With the aid of this function, the adjustment, test and measurement history can be saved on the USB stick so that it can then be imported into an EXCEL file.

- The histories can be viewed and exported.
- The measurement history is only exported if the measured data agree with the current cell configuration (if the external cell type is changed, the measured data cannot be exported from the previous cell).

5 Configuration of measurement methods

A method basically consists of the configuration, sample feed, the actual measurement, cleaning, result calculation and the creation of a report. These steps are defined as functions. The individual functions in turn consist of parameters, whose values or names can be changed.

Method types

The instrument distinguishes between the following method types with different objectives:

- MS (Measurement), for the performance of a measurement
- ADJ (Adjustment), for an adjustment of the measuring cell(s)
- TE (Test), for testing the measuring cell(s)
- CL (Cleaning), for cleaning the measuring cell(s)

5.1 Establishing Methods

When creating methods (max. number of methods: 30) you can make use of method templates with predefined method types and hence structures. The corresponding parameters thereby contain suitable default values.

Select: `Home > Methods / Products > Methods`

1 Choose **New** to create a new method on the basis of a template.

2 Select the desired method type from the available templates. Now you can adjust this method to your own specifications by adding or deleting method functions, or by adjusting the settings.

⇨ After a template has been chosen, the **Configuration** dialog opens. Here, according to the defined setup, you can select the cell mode, the cell, automation unit and the external devices (pH, conductivity and colorimeter) with which you wish to carry out the method.

Parameter	Description	Values
Cell mode	Defines the type of cells (Density/Refractometry).	D ǀ R ǀ D+R ǀ D+D ǀ R+R
Automation	Defines the automation unit used by the method. The choice available depends on the automation units defined in `Home > Setup > Hardware > Automation`. **Note** • If the filling and rinsing is performed with "SPR200" and drying with "DryPro", then "SPR200+DryPro" must be selected. • If the InMotion autosampler is used together with a DryPro in method type "Clean", both (InMotion and DryPro) must be selected.	-
Lid handling	Defines whether CoverUp (optional lid handling system on InMotion) is used in the method.	Automation unit" = "InMotion"

Parameter	Description	Values
pH	Defines whether the pH meter is used in the method.	"Method type" = "Measurement" pH meter is defined in "`Home > Setup > Hardware > External instruments`".

Conductivity	Defines whether the conductivity meter is used in the method.	"Method type" = "Measurement" Conductivity meter is defined in "`Home > Setup > Hardware > External instruments`"
Color	Defines whether the colorimeter is used in the method.	"Method type" = "Measurement" Colorimeter is defined in "`Home > Setup > Hardware > External instruments`".

Note

Up to the automation unit, these settings cannot be retrospectively modified.

Parameter	Description	Values
Color settings (Minolta only)	Activates "Illuminant" so that the illuminant type can be defined and "Observer" so that the angle can be entered.	Active	Inactive
Illuminant	Defines the illuminant to be used.	A	C	65	D50	ID65	ID50	F2	F12
Observer	Defines the viewing angle. Default 2°.	2°	10°

Note

The parameters "Color settings" (Minolta only), "Illuminant" and "Observer" are used only with Minolta colorimeters.

1 Confirm with **OK**.

2 In the "Title" method function, enter a new method ID. Afterwards, the new method will be stored under this method ID.

3 Save the method.

   ⇨ You have now created a new method with its own ID. This method already has predefined method functions. To change the method functions proceed as follows:

4 Select available method functions to modify their parameters in line with your requirements.

5 Choose **Insert** to add additional method functions to the method.

6 Now use the arrow-shaped "Insert" button to select the required position for the new method function in the method. (You will only be able to insert the method functions that are allowed in the corresponding location based on the method syntax.)
   Note: It is a good idea to save at regular intervals.

7 From the list, select the method function that you want to insert.

8 Modify the individual parameters of the method function.

   ⇨ The new method function will be displayed in the method.

9 To delete a method function, select the function in question and then choose **Delete**.

   ⇨ The method function will disappear from the method.
      Note: Some essential method functions cannot be deleted.
      (The "Delete" button is not available in these cases.)

10 After inserting all desired method functions, you can store the new method in the device by choosing **Save**.

Note

When creating a new method, follow the rules specified by the device. These are described in Chapter "Method Syntax – Rules for Establishing methods".

5.2 Creating a Method Copy

You can copy an existing method by changing the ID of the method in the method function "Title". When the method is saved a new method is created.

5.3 Modifying or Deleting Methods

Modifying a method

To modify a method, select: `Home > Methods / Products > Methods`

1 From the displayed list of methods, select the method that you want to modify.
2 As soon as the methods functions of the selected method appear on the screen, you can edit and save the method.

Delete Method

It is simple to delete newly created methods. Select: `Home > Methods.`

1 Select the method that you want to delete.
2 Choose Delete method to delete the method from the memory.

Note

Shortcuts, products and series that refer to the method will also be deleted.

5.4 Method Syntax

The following rules describe in which point method functions can be inserted or deleted. Only the available method functions are displayed for insertion.

Rules for method type "Measurement" (MS)

- The following method functions cannot be deleted: Title, configuration, sample, filling, measure and online display.
- The method functions "Calculation" (R1, R2,....Rx) and "Temperature compensation" (TC1, TC2,...TCx) are indexed.
- A maximum of 20 method functions "Calculation" can be inserted.
  The method function "Temperature compensation" can be inserted a maximum of five times, in each case immediately after the method function "Measure".
  Insertion of the "Report" method function is limited for the following method types:
  - twice for "Measurement" and "Test"
  - once for "Adjustment" and
  - "Report" cannot be inserted for "Cleaning".

Method functions can be inserted in the method as follows:

Template	Method function
Title	
	⌐ Instruction, Auxiliary instrument
Configuration	
	⌐ Instruction, Auxiliary instrument
Sample	
	⌐ Calculation, Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, Stir, Line rinse
Fill	

<table>
<tr><td></td><td>⬱ Calculation, Instruction, Auxiliary value, Wait, Auxiliary instrument, Stir</td></tr>
<tr><td>Measure</td><td></td></tr>
<tr><td></td><td>⬱ Calculation, Report, Clean, Instruction, Auxiliary value, Temperature compensation, Wait, Auxiliary instrument PowerShower, Line rinse</td></tr>
<tr><td>Calculation R1</td><td></td></tr>
<tr><td></td><td>⬱ Calculation, Report, Clean, Instruction, Auxiliary value, Temperature compensation, Wait, Auxiliary instrument, PowerShower, Line rinse</td></tr>
<tr><td>Clean</td><td></td></tr>
<tr><td></td><td>⬱ Calculation, Report, Clean, Instruction, Auxiliary value, Temperature compensation, Wait, Auxiliary instrument, PowerShower, Line rinse</td></tr>
<tr><td>Online Display</td><td></td></tr>
<tr><td></td><td>⬱ Report</td></tr>
<tr><td>Report</td><td></td></tr>
</table>

Rules for method type "Adjustment" (ADJ)

- The following method functions cannot be deleted: Title, Configuration, sample, Filling, Measuring and adjustment.
- The method functions are executed twice between "Sample" and "Adjustment".

The following method functions can be inserted in the method template:
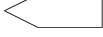
Template	Method function
Title	
	Instruction, Auxiliary instrument
Configuration	
	Instruction, Auxiliary instrument
Sample	
	Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, Line rinse
Fill	
	Instruction, Auxiliary value, Instruction, Wait, Auxiliary instrument
Measure	

	Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, Line rinse
Clean	
	Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, Line rinse
Adjustment	
	Instruction, Auxiliary instrument
Report	

Rules for method type "Test" (TE)

The following method functions cannot be deleted: Title, Configuration, Sample, Filling, Measure and Test.

The following method functions can be inserted in the method template:

Template	**Method function**
Title	
	Instruction, Auxiliary instrument
Configuration	
	Instruction, Auxiliary instrument
Sample	
	Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, Line rinse
Fill	
	Instruction, Auxiliary value, Wait, Auxiliary instrument
Measure	
	Report, Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, PowerShower, Line rinse
Clean	
	Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument
Test	
	Report, Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, PowerShower, Line rinse
Clean	
	Report, Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, PowerShower, Line rinse
Report	
	Report, Clean, Instruction, Auxiliary value, Wait, Auxiliary instrument, PowerShower, Line rinse

Note

The "Report" method function can be inserted a maximum of two times. There is no limit on the other method functions.

Rules for method type "Clean" (CL)

The following method functions cannot be deleted: Title and Configuration.

For the method type "Clean" at least a method function "Clean" or "Cell test" must be available.

The following method functions can be inserted in the method template:

Template	**Method function**
Title	

	Instruction, Auxiliary instrument

Configuration

	Clean, Instruction, Wait, Auxiliary instrument, Stir, Park, PowerShower, Line rinse

Clean

	Clean, Instruction, Wait, Auxiliary instrument, Stir, Park, PowerShower, Line rinse
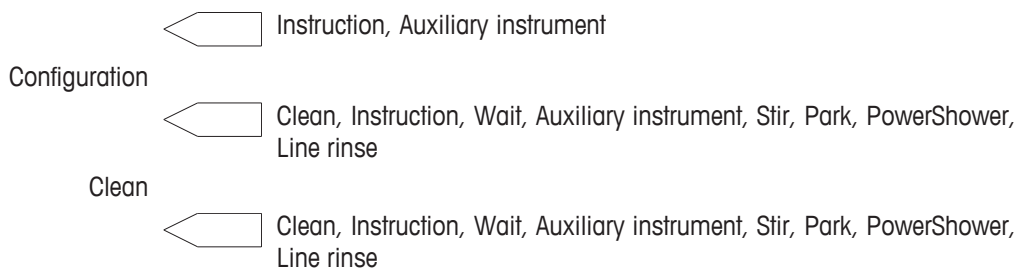
5.5 Standard Data

The standard data are editable according to mode and standard.

Parameter	Description	Values
Standard name	Specify a descriptive name of your choice.	0…30 characters
Lot number	The lot or batch number of the standard.	0…30 characters
Date of certification	The certification date of the standard.	Date
Expiry date Std	The expiry date of the standard.	Date
nD nominal	Defines the nominal refractive index value of the standard.	1.32…1.7
d nominal	Defines the nominal density value of the standard.	0.00000…3.00000
Uncertainty d [g/cm3]	Limits of error of the standard (with reference to the nominal value).	0…0.001

5.6 Condition

A logical condition can be defined to determine whether a particular method function should be executed based on a result (true or false). The condition is in the format of a formula. An empty condition is interpreted as true.

Formulas can be used in various method functions. In formulas you can enter the calculated results Rx, temperature-compensated values (TCx), tables, auxiliary values and raw data.

Formula Editor

Navigation: `Home > Methods / Products > Methods > Method > Calculation`

With the formula editor both numerical values and symbols can be entered. The symbols **H**, **T** and **C** are made available when you select the **1** button in the formula editor.
If you touch **H**, the list of auxiliary values opens; **T** opens the table list; **C** opens the list of color scales for the colorimeters. For colorimeters, it is possible to define whether measurements should be carried out in extinction or transmission mode.
You can enter raw data manually or via insert via the button "Proposal". You will find the raw data in the "Annex: Raw data".

Mathematical Functions and Operators

The following mathematical functions and operators can be used in formulas:

Functions		Comparison operators	
Logarithm to the base 10	lg(x)	equal to	=
Logarithm to the base e	ln(x)	larger than	>
Exponential to base 10	pw(x) or scientific notation	larger than or equal to	> =
Exponential to base e	ex(x)	smaller than	<
Square	sq(x)	smaller than or equal to	<=
Square root	sr(x)	x in the range of	… < x < …
		not equal to	< >
		approximately	~

Mathematical operators		Logical operators	
Addition	+	and	AND
Subtraction	-	or	OR
Multiplication	*		
Division	/		

Note

- Logical operators are only permitted within formulas of the subfunction "Condition".
- The use of mathematical operators (+, -, * and /) within a parenthetical expression is not possible.

Formula Syntax

- Brackets

There are three types of brackets that can be used in formulas:

- Round brackets "( )":
  e.g. T[Table_name(d)] and mathematical operators ln(d)
- Square brackets "[ ]"
  - Table name T[Table_name()] , e.g. T[Brix_d_NBS(d)];
  - Auxiliary value H[Auxiliary_value], e.g. H[Auxiliary_Value_1]
- Curly brackets "{ }": Relation to the cell, e.g. d{DX}. if the cell is not specified, then the internal cell is used as default.

- Fixed abbreviations

The following abbreviations are defined:

R	Internal refractive index cell
RX	Refractive index module
R1 … Rx	Results from the method function "Calculation"
TC1 … TCx	Results from the method function "temperature compensation"
A, B, C, D, x, y	Coefficients (A-D) and variables (x,y) can be used in formulas, e.g. Ax + B.

- Syntax examples

- Simple raw result: R1 = nD
- Temperature compensation: R1 = TC1
- Tables: R1 = T[Brix_nD_20C (nD)]

The following values can be entered for tables:
- Internal tables: d, dRaw, TC
- User-defined tables: All generated analysis data
- Density modules: d, dRaw, TC
- Internal refractive index cell: nD, TC

5.7 Method functions

5.7.1 Title

The method function "Title" contains general method data.

Parameter	Description	Values
Type	Method type (measurement, adjustment, test, cleaning): Defined by the selection of the method template during creation of the method (info field).	-
Method ID	The method is uniquely identified in the system via the method ID. Once the method has been saved, the method ID can no longer be changed. A change of the method ID results in the creation of a copy of the method.	-

Title	Title of the method.	-
Author	Name of creator (info field)	-
Created on	Date of creation and time (info field)	-
Modified at	Change date and time (info field)	-
Modified by	User who made change (info field)	-
Protect	When this is activated, only the author or an administrator can edit or delete the method.	-
SOP	On activation a text is displayed before the start.	-
SOP-Text	Displayed SOP text	"SOP" activated

5.7.2 Configuration

Used for making settings for cells, automation and external instruments.

The settings in the method function "Configuration" affect the parameters of the following method functions.

Parameter	Description	Values
Cell mode	Display of cells to be used in the method (info field)	-
Automation	Defines the automation unit used by the method. The choice available depends on the automation units defined in `Home > Setup > Hardware > Automation`. **Note** • If the filling and rinsing is performed with "SPR200" and drying with "DryPro", then "SPR200+DryPro" must be selected. • If the InMotion autosampler is used together with a DryPro in method type "Clean", both (InMotion and DryPro) must be selected.	-
Lid handling	Defines whether CoverUp (optional lid handling system on InMotion) is used in the method.	Active | Inactive
External instruments	Display of external instruments (pH, conductivity, color) to be used in the method is to be measured (info field)	-
Color settings (Minolta only)	Activates "Illuminant" so that the illuminant type can be defined and "Observer" so that the angle can be entered.	Active | Inactive
Illuminant	Defines the illuminant to be used.	A | C | 65 | D50 | ID65 | ID50 | F2 | F12
Observer	Defines the viewing angle. Default 2°.	2° | 10°

Note

The parameters "Color settings" (Minolta only), "Illuminant" and "Observer" are used only with Minolta colorimeters.

5.7.3 Sample

By means of the method function "Sample", sample data for the following method types are defined:

Method type: Measurement

Parameter	Description	Values
Viscosity correction	Activation of the viscosity correction	Density - Module defined

Viscosity	≤2000: For samples with viscosity less than 2000 mPa*s >2000: For samples with viscosity greater than 2000 mPa*s - Set value: With this selection, a known viscosity can be entered	Density - Module connected Viscosity correction activated
Viscosity value [mPa*s]	Defines the viscosity value of the sample.	1…99999
Sample ID	Sample ID can be entered; you can still change this ID at the analysis start.	"Method type" = "Measurement"
Correction factor	This factor (f) can be included in the calculations. It can be changed before performance of the analysis in the **Start analysis** dialog.	-
Comment	A comment was entered before performance of the analysis in the **Start analysis** dialog. Method type "Adjustment" / "Test" = The standards will be shown additionally.	-

Method type: Adjustment

Parameter	Description	Values
Viscosity correction	Activation of the viscosity correction	Density - Module defined
Viscosity	≤2000 (info field)	Density - Module defined Viscosity correction activated
Adjustment mode	Controls the selection of the adjustment sets and the standard specific data. The selection is filtered according to the modes of the available sets in the `Method > Setup > Adjustment sets`. The following adjustment modes are available: - Air&Water (recommend settings) - Air&Standard (only for density - module) - Water&Standard (only for density - module) - Standards	-
Adjustment set	The adjustment set defines the standards and the temperature at which the adjustment is performed. The selection of sets is filtered according to the selection in **Cell mode**. **Air&Water**: The instrument accesses its internally saved nominal value tables. **Standards**: The nominal value must be entered.	Air&Water | Air&Standard | Water&Standard | Standards
Adj. temperature	The adjustment temperature is displayed (info field).	15 °C | 20 °C | 25 °C
Standard 1 … 2	Shows the parameters of the standard	-
Comment	A comment was entered before performance of the analysis in the **Start analysis** dialog. Method type "Adjustment" / "Test" = The standards will be shown additionally.	-

Note

Please note: For using an **adjustment set** "Standards" in an R/RX, a valid adjustment based on Air&Water must be stored in the instrument for the same temperature.

Method type: Test

Parameter	Description	Values
Viscosity correction	Activation of the viscosity correction	Density - Module defined
Viscosity	≤2000: For samples with viscosity less than 2000 mPa*s >2000: For samples with viscosity higher than 2000 mPa*s.	Density module specified and viscosity correction activated
Test mode	Controls the selection of the test sets and the standard specific data. The selection is filtered according to the modes of the available sets in the `Home > Setup > Test sets`. The following test modes are available: - Air (Internal standard value table) (only for density - module) - Water (internal standard value table) - Default - Brix standard	-
Test set	The test set defines the standards and the temperature at which the test is performed. The selection of sets is filtered according to the selection in **Cell mode**. **Air&Water**: The instrument accesses its internally saved nominal value tables. **Standards**: The nominal value must be entered.	Air&Water | Air&Standard | Water&Standard | Standards
Test temperature	The test temperature is displayed (info field).	15 °C | 20 °C | 5 °C
Standard	Shows the parameters of the standard	-
Comment	A comment was entered before performance of the analysis in the **Start analysis** dialog. Method type "Adjustment" / "Test" = The standards will be shown additionally.	-

You can find detailed information on the standards in "[Methods and products: Methods > Standard data ▶ Page 43]".

5.7.4 Fill

Sample feed via the automation unit specified in the method function "Configuration".

Parameter	Description	Values
Prompt for sample	When activated, a confirmation appears on completion of the method function **Fill**, stating that the task is paused until confirmed.	Active | Inactive
Speed	**Pump speed** "SC1" / "SC30": • "Maximum": Sample feed with maximum pump speed • "Reduced": Sample feed with speed set at the automation unit • "Automatic": The pump speed changes according to the defined time period from "Reduced" to "Maximum". "SPR200" / "InMotion": • "High" • "Medium" • "Low" The corresponding pump speed can be set under `Home > Setup > Hardware > Automation`.	"Automation" = "SPR200" / "SC1" / "SC30" / "InMotion"
Max. filling speed after	Defines the period of time [s] after which the pump speed changes to maximum speed.	1…10000

Filling mode	Defines the way in which the sample feed is to be stopped.	Fixed duration | Automatic
	Fixed duration: The sample feed is stopped after a certain time.	
	Automatic: The measuring signal is used to detect when the sample has reached the measuring cell. (Not possible with InMotion sample changer).	
Filling duration	Defines the fixed duration [s] for the filling.	0…10000
Fill ratio	Defines the percentage by which the cell is "overfilled" for automatic filling. For example: After 10 s pumping, the sample is recognized in the cell, the fill ratio is 150%, i.e. the pump switches off after 15 s.	100…1000
	(**Filling duration** + **Filling duration** x (**Fill ratio** -100) / 100).	
Sample detection at	Selection of the cell in which the sample detection is carried out.	D | R
Max. fill duration	After this time at the latest, the sample feed for automatic filling is stopped if no new sample is detected in the cell.	1…10000
Pressure release	Determines whether the pressure should be released after filling the cells for SC1 and SC30 sample changer.	Active | Inactive

5.7.5 Measure

Via the method function "Measure", the measurement, data capture and error detection can be configured. It contains the following subfunctions that are described below:
"Cell"
"Measured value acquisition"
"Error detection"

Subfunction Cell – method type: Measurement

Parameter	Description	Values
Meas. temperature	Defines the measuring temperature.	0.00…91.00 | 0.00…95.00
Adjustment set	Defines the adjustment set applicable for the measurement.	List of available adjustment sets
Action when expired	This parameter defines the behavior if an adjustment set expired. In `Home > Setup > Cell` the monitoring of the adjustment set can be set. Action: • "Block": The method is no longer executable. • "Warn: A message is shown at the method start. In spite of this, the method is performed. The analysis is labeled with the status "OK*". • "None": No action	-
Adj. temperature	The adjustment temperature is displayed (info field).	15 °C | 20 °C | 25 °C
Verify test set	Defines that a method can be executed for the valid test set (the last test was passed with the corresponding test set).	-
Test set	Selection of test set to be verified	"Verify test set" activated
Action	This parameter defines the behavior with an expired test set and whether the last test was valid or not. (in `Home > Setup > Cell` it is possible to configure monitoring of the test set): • "Block": The method can no longer be run. • "Warn": A notification is displayed when the method is started. The method is still executed despite this notification. The analysis is tagged with the status "OK*".	"Verify test set" is enabled

Subfunction cell – method type: Adjustment

Parameter	Description	Values
Adj. temperature	The adjustment temperature is displayed (info field).	15 °C | 20 °C | 25 °C

Subfunction cell – method type: Test

Parameter	Description	Values
Test temperature	The test temperature is displayed (info field).	15 °C | 20 °C | 5 °C
Adjustment set	Defines the adjustment set applicable for the measurement.	List of available adjustment sets
Action when expired	This parameter defines the behavior if an adjustment set expired. In `Home > Setup > Cell` the monitoring of the adjustment set can be set. Action: • "Block": The method is no longer executable. • "Warn: A message is shown at the method start. In spite of this, the method is performed. The analysis is labeled with the status "OK*". • "None": No action	-
Adj. temperature	The adjustment temperature is displayed (info field).	15 °C | 20 °C | 25 °C

Subfunction measurement acquisition – method types: Measurement, adjustment and test

Parameter	Description	Values
Wait time R	The refraction index measurement begins after this time has elapsed. This wait time ensures that the prism is completely wetted with liquid. In the case of multiple measurements, each measurement is started after this wait time has elapsed.	0…9999
Wait time Col	The colorimetric measurement begins after this time has elapsed. In the case of multiple measurements, only the first measurement is started after this wait time has elapsed. All other measurements begin with no wait time.	0…9999
Endpoint	**Automatic**: The measurement is ended if the defined stability criteria have been achieved. This is fixed for the method types **Adjustment** and **Test**. **Fixed duration**: The measurement is stopped after a certain time. This function is used to shorten the measurement time if high precision is not required. The measurement is stopped on achievement of the maximum measurement reliability at the latest.	Automatic | Fixed duration
Meas. duration	Defines the duration of measurement in [s].	1…9999
Meas. reliability	Setting of stability criteria for measurement value acquisition.	Medium | High | Maximum
Max. meas. duration	Maximum duration of measurement. If the measured value has not stabilized by this time, the measurement will be canceled with the status **Error**. This depends on the stability criteria of the parameter **Meas. reliability**.	1…9999

You record the following measuring errors with the bubble check or a multiple measurement:

- air bubbles in the measuring cell (Bubble Check)
- Solvent residues in the measuring cell
- Solid particles in the sample

With the **Bubble Check** variations in the measuring signal are analyzed.

With **Multiple measurement**, n measurements are performed. Between measurements, the sample is subject to continual movement. The standard deviation of the n measurements is added, and checked to see whether it is smaller than the maximum standard deviation (Max. SD) defined in the method.

Parameter	Description	Values
Bubble check	If activated, the system verifies whether bubbles are present in the density cell.	Active | Inactive
Multiple measurement	If activated, several measurements are performed with the same sample.	Active | Inactive
No. of measurements	Defines the number of measurements.	2...10
Refill ratio	Used for the calculation of the further movement of the sample between two measurements. The refill rate [%] is calculated over the duration of the sample addition. **Example**: The fill duration is 10 s and the refill ratio 50%, i.e. pumping is activated for 5 seconds.	10...100
Max. SD	Maximum permitted absolute standard deviation of the measurements for density, refractive index or color. When the deviation is exceeded the measurement is interrupted with the status **Error**. The maximum standard deviation must be entered in the function of the measuring cell type.	4 | 5 | 6 decimal places

Note

For the calculation of the standard deviation SD of the color results, the first color result in the formula of the "Calculation" method function with the smallest Rx index is used.
If no color result is included in the calculation, "−" will be displayed for the standard deviation, i.e. SD is within Max. SD.

Single values (d1 to d10) are available as raw results and can be used in a calculation (i.e. for a 3-fold measurement all 3 single values can be reported).

Parameter	Description	Values
Repeat if failed	If activated, the measurement is repeated if bubble check has failed or if **Max. SD** or **Max. deviation** are exceeded. **Note**: If **Multiple measurement** is activated, all measurements are repeated.	Active | Inactive

Note

For "Repeat if failed", no wait time is included.

Parameter	Description	Values
No. of meas. points	Defines the number of measured points used for determining the mean value. Preferably use a high number of 10 measuring points. **Note**: If multiple measurement is activated, only the measured values from the last measurement repetition are used.	1...10
Max. deviation	The maximum permissible absolute deviation [pH] of the measured values for pH or conductivity meters. If this is exceeded, the results are marked accordingly.	0.01...7.00

Subfunction Error detection – method type: Adjustment / Test

If you are using a density - module, the following additional functions are available:

Parameter	Description	Values
Bubble check	If activated, the system verifies whether bubbles are present in the density cell.	Active | Inactive

5.7.6 Calculation

A result can be defined by means of the method function "Calculation". For this purpose any desired formula with raw data, tables or other calculated results can be entered (see also "Formula syntax and tables" and "Results"). Results are displayed on the online screen. They are saved after the final "Calculation" method function has completed.

Results receive an index Rx, by which they can be referenced in formulas of other method functions. The calculation number (Rx) is increased (from R1 to R20) when the "Calculation" method function is inserted, independently of the sequence of the method functions. By means of the button "Results proposals" you can select the predefined results with unit, coefficients and formulas. You will find the list of predefined results in the Annex.

Parameter	Description	Values
Name	Defines the name of the result generated in the calculation.	1…30 characters
Unit	Specifies the unit used for the result.	0…18 characters
Formula	Specifies the formula for calculating the result.	Mathematical calculation
Coefficients	Activates the coefficients that can be used in the formula. For powers to the base 10 the "e"-convention may be used (e.g. 1.2e-4 --> 0.00012).	Active | Inactive
Variable x / Variable y	Defines the variables that can be used in the formula.	-
A / B / C / D	Defines the coefficients that can be used in the formula.	-
Decimal places	Defines the number of decimal places in the calculated result.	0…6
Result limits	Limit values for going above and below a result	-
Lower limit	Lower limit of the result	"Result limits" activated
Upper limit	Upper limit of the result	"Result limits" activated
Interrupt if limits exceeded	Defines that the measurement will be interrupted if the result is outside the limits. It then receives the status "Error". If this parameter is not activated, the measurement continues even if the limit value is exceeded. The analysis then receives the status "Limit exceeded"	"Result limits" activated
Statistics	For the calculation, rolling statistics are activated.	-
Print statistics	Defines whether the statistics should be printed out for each sample.	"Statistics" activated
Formula (Condition)	Define a specific condition for calculation.	"Condition" activated

See also

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5.7.7 Clean

Cleaning the measuring cell by means of the automation unit specified in the method function "Configuration".

Parameter	Description	Values
Drain	Defines whether the contents of the measuring cell should be drained.	Active | Inactive
Drain direction	Defines the pumping direction. **Waste**: The liquid is pumped through the cell and into the waste container. **Vial**: The liquid is pumped back into the sample vial (SC1/SC30). **Beaker**: The liquid is pumped back into the sample beaker (InMotion).	Waste | Vial | Beaker

Drain mode	**Fixed duration**: Draining is stopped after a defined time.	Fixed duration | Automatic
	Automatic: The drain duration depends on the sample feed (total duration equals the time for which the pump was in operation during filling).	
Drain duration	Defines the fixed pumping time [s] for draining.	1…1000
Drain ratio	Duration of draining in percentage of filling duration.	10…1000
Rinse cycle 1	Activates a first rinse cycle.	Active | Inactive
Solvent	Automation unit SC1 / SC30: Selecting the solvent. The selection depends on the solvents entered in `Home > Setup > Hardware > Automation` The solvents are listed in the list field along with the connection. The name of the solvent is displayed during method execution in the notification that prompts the rinse process.	"Rinse cycle" activated
Rinse mode 1	**Fixed duration**: Rinsing is stopped after a defined time.	Fixed duration | Automatic
	Automatic: The rinse duration depends on the sample feed (total duration equals the time for which the pump was in operation during filling).	
Rinse duration 1	Defines the fixed rinse time in [s].	1…1000
Rinse ratio 1	Duration of rinsing as percentage of filling duration.	10…1000
Air addition	To increase the efficiency of rinsing, air is mixed with the solvent. A higher air ratio causes a more turbulent flow, meaning more intensive cleaning and lower consumption of fluid.	Normal | Low | Very low
Rinse cycle 2	Activates a second rinse cycle.	Active | Inactive
Dry	Activates drying the cell.	Active | Inactive
Dry mode	Fixed duration: Drying is stopped after a defined time For the density - the "dry mode" can also be set to "Automatic": Automatic: Drying is interrupted, when the oscillation value becomes stable.	Drying activated
Dry duration	Defines the fixed drying time in [s].	1…1000
Max. dry duration	Maximum drying time: If the oscillation value has not stabilized by the end of this period, drying is terminated.	Density - Module defined Dry mode = Automatic
Interrupt if failed	If this parameter is activated, the measurement is given the status "Error", if with dry mode "automatic" the oscillation value has not stabilized within the defined "Max. dry duration". The task list is then interrupted. If the parameter has not been activated, the measurement proceeds as normal, even if drying failed. This parameter is necessary, for example, for when execution of the "Drying" method function is associated with a condition.	"Dry mode" = "Automatic"
Prompt for DryPro	Select if you want a prompt on the homescreen for connecting the DryPro to the aspiration tube for drying.	"Automation" = "InMotion" "Dry" activated
Suppress prompts	Choose if you want to suppress prompts on the homescreen for the cleaning process.	"Automation" = "SPR200" / "SPR200&DryPro"
Formula (Condition)	Define a specific condition for cleaning.	"Automation" = "InMotion" Only if "Condition" activated

5.7.8 Online Display

You can define the number of displayed results for the online screen (two or four). You can also specify where the results should be placed.

Parameter	Description	Values
Displayed results	The number of results on the online screen can be selected.	-
Top / bottom	Place at which the calculated results can be displayed on the screen.	"Displayed results" = "2"
Top left / Top right / Bottom left / Bottom right	Place at which the calculated results can be displayed on the screen.	"Displayed results" = "4"

5.7.9 Report

This method function defines the type and scope of the data to be output for a report sent to network, a USB stick, printer (stripe printer or network printer) or via a USB-RS232 interface. The "Report" method function refers to all previous method functions. "Report" contains the following parameters:

Parameter	Description	Values
Export to USB stick	Analysis data can be exported to a USB stick in a CSV or/and PDF format. Multiple measurements are arranged in succession in the same file. Data export to the USB stick is only possible when the USB stick is available. This can be checked using the option "Verify USB stick availability" (Home>Setup>Global settings>Analysis and resources behavior).	-
Export to network	Analysis data can be exported to a network folder in a XML, CSV or/and PDF format. Multiple measurements are arranged in succession in the same file. Data export to the network is only possible when the network connectivity is available. This can be checked using the option "Verify network storage availability" (Home>Setup>Global settings>Analysis and resources behavior).	-

Parameter	Description	Values
Print / USB-RS232 data export	Data are either sent to a USB compact printer, to a network printer or exported via the USB-RS232 interface. You can define the type of data transfer using the "Printer type" parameter in the Setup menu (Home>Setup>Hardware>Peripherals>Printer).	-
Print Mode	The following values are available: "Summary" or "User defined". If "Summary" has been selected, a brief summary of the most important data is printed. If "User defined" has been selected, you are presented with additional parameters enabling you to define which data should be printed.	-

Note

"Print Mode" applies only to printing on the printer. For USB-RS232 data export, a fixed data record is exported. For information on the scope and syntax of the data export, see "RS232 Interface Description"

The following parameters are displayed for "Print Mode"="User defined":

Parameter	Description	Values
Method/Product information	Method information is printed or exported, e.g. method ID or product ID, method type. A complete method is not printed.	"Print Mode" = "User defined"

Calculated results	The results from the "Calculation" method functions can be printed or exported.	"Print Mode" = "User defined"
Data	The raw results produced during the determination and used in the calculations are printed or exported.	"Print Mode" = "User defined"
Sample information	Information on the sample (e.g. sample ID, viscosity, standard name) can be printed or exported.	"Print Mode" = "User defined"
Resource information	Information on the resource used (e.g. auxiliary value, adjustment set, cell type) can be printed or exported.	"Print Mode" = "User defined"

The "Condition" and "Formula" parameters can be found in "Methods and products: Methods: Conditions and formulas".

The "Report" method function can be inserted a maximum of two times per method for the method types "Measurement" and "Test" and only once for "Adjustment". See also the flow chart in "Methods and products: Methods: Method Syntax".

5.7.10 Cell Test

The cell test can only be performed for the density - module.

Use this method function to verify the cleanliness and dryness of a cell, either before or after performing a measurement, test, or adjustment.

A measurement of the empty (clean and dry) cell is performed, and compares the measured density to the nominal air density under the current pressure conditions. A warning is shown if the difference exceeds the defined tolerance.

Parameter	Description	Values
Tolerance	Maximum permissible deviation of the measured air density from the theoretical value [g/cm^3].	0.0001…0.001
Max. test duration	Defines the maximum duration of the cell test in [s]. If the measured value has not stabilized by this time, the cell test is interrupted and is treated as failed.	1…9999
Interrupt if failed	**Active**: the measurement receives the status **Error** if the cell test fails. The task list is interrupted. **Inactive**: the measurement proceeds, even if the cell test has failed.	Active l Inactive

5.7.11 Temperature Compensation

Temperature compensation allows you to measure a sample at a temperature and then to output the measured value at another temperature. This temperature compensation is used in the following cases:

- The measured value must for example be stated at 15 °C, however the sample is too viscous at this temperature. Therefore these samples must be measured at correspondingly higher temperatures so that they can be pumped to the measuring cell and remain fluid there.

- For accelerated measurements. If the sample is delivered at 35 °C for example and the measured value is required at 15 °C, the sample can be measured at 35 °C and the measured value can be compensated to 15 °C.

- If the required reference temperature is outside the range of the measuring instrument (e.g. 120 °C), the sample can be measured at 75 °C and the result compensated to 120 °C.

To use the temperature compensation, the temperature dependence of the sample must be known.

If you have connected a density - module, you can also use the API table (ASTM-D 1250). The following tables are used (for crude oils, refined products, lubricants):

- 53A, 53B and 53D for **15 °C**

- 5A, 5B and 5D for **60 °F**

- 59A, 59B and 59D, for **20 °C**

The aforementioned ASTM or API tables take as input values the readings taken from a hydrometer, which do not however make allowance for the coefficient of expansion of the glass hydrometer. Therefore the measured density cannot be directly used as the input value for these tables.

The measured values are converted to the desired temperature. The output value (TC) of this method function can be used in the method function "Calculation".

Parameter	Description	Values
Compensation type	API (only for external density measuring cell): Temperature compensation with API tables Formula: Temperature compensation by entering any desired formula	-
API table	Selection of the relevant API table: Crude oil, refined products, lubricants	Density - Module defined Compensation type = API
Compensation - temp.	**Compensation type = API** (only for density - module) You can choose from among three reference temperatures (15 °C, 60 °F, 20 °C). The temperature is entered as the input value in the algorithm for calculating the API compensation. **Compensation type = Formula** The defined value is for information purposes only and is not included in the calculation.	-
Output	Defines the unit in which the temperature compensated value is to be expressed.	°API I d I SG4 I SG
Formula	Specifies the formula for the temperature compensation.	Mathematical calculation
Coefficients	Activates the coefficients that can be used in the formula. For powers to the base 10 the "e"-convention may be used (e.g. 1.2e-4 --> 0.00012).	Active I Inactive
A / B / C / D	Defines the coefficients that can be used in the formula.	-

5.7.12 Adjustment

You can use the "Adjustment" method function to store the adjustment data in the setup for the corresponding cell(s). Here you can also perform an adjustment analysis that should be used to verify the accuracy of the determined adjustment data. In this process, the system checks the deviation from the last adjustment. If the maximum deviation is exceeded, you can decide at the end of the adjustment whether the data is transferred.

Parameter	Description	Values
Adjustment analysis	Defines whether the adjustment should be used to verify the accuracy of the determined adjustment data. The system checks the deviation from the last adjustment. If the maximum deviation is exceeded, you can decide at the end of the adjustment whether the data is transferred.	Active I Inactive
Standard 1	Information of the used standard.	-
Max. deviation	Input of the maximum permissible deviation.	"Adjustment analysis" activated

5.7.13 Test

This method compares the measured with the theoretical test value. The data from the test is saved in the setup of the corresponding cell(s).

Parameter	Description	Values
Tolerance d/nD	Allowed tolerance for the test	-

5.7.14 Instruction

You can determine the output of a message to be displayed during the analysis process. The analysis is interrupted while the message is displayed.

Parameter	Description	Values
Instruction	Freely definable text. Via the input %x% reference can be made to results or raw data, e.g. %R1%.	-
Continue after	**Confirmation**: The analysis will continue as soon as the user confirms the instructions. **Time interval**: The analysis is continued after the defined time period has elapsed.	Confirmation | Time interval
Time interval	The time period, in [sec], during which the analysis is paused and the instructions are displayed on the screen.	$0...10^6$
Print	The specified text is printed out from the printer.	-

5.7.15 Auxiliary Value

By means of the method function "Auxiliary value" a result can be assigned an auxiliary value. These auxiliary values can be accessed in a formula (also in other methods).

Parameter	Description	Values
Name	Selection of auxiliary value The selection relations to the list in the setup (`Home > Setup > Tables & Values > Auxiliary values`)	-
Formula H=	Formula for the calculation of the auxiliary value.	-
Limits	By means of limits, the checking of the calculated value can be defined. If the value is outside the limits, it will not be saved as an auxiliary value.	-
Lower limit	Lower limit for the calculated value.	"Limits" activated
Upper limit	Upper limit for the calculated values	"Limits" activated

5.7.16 Wait

By means of the method function "Wait" a method can be interrupted.

Parameter	Description	Values
Wait time	Defines a waiting time, in [sec].	1...3600

5.7.17 Auxiliary instrument

This method function activates auxiliary instruments and enables the instrument to communicate with these auxiliary instruments. Auxiliary instruments can be connected either to the "Aux" (24 Volt) socket on the instrument board or to a USB interface, using a USB-RS232 adapter. The parameters described in the following apply to all control types.

These are followed by parameters that can be defined explicitly for the relevant control type:

Parameter	Description	Values
Control type	The control type of the auxiliary instrument.	USB-RS232 | Output 24 V
Name	Defines the name of the auxiliary instrument.	-
Condition	Logical condition that determines whether or not a method function is executed based on a result (true or false). A method function can be executed using a specified calculation formula (see the parameter **Formula**).	Active | Inactive

| Formula | Specifies the formula for calculating the result. | Mathematical calcu-lation |

Note

A method function can be executed using a specified calculation formula (see also "Methods and products: Methods > Calculations and formulas").

Control type: 24V output

Parameter	Description	Values
Mode	Defines the mode for controlling the control output.	On | Off | Fixed duration
	Fixed duration: The control output is switched on for the defined time interval.	
	On | **Off**: The control outlet is switched on or off. After a sample series the control outlet is automatically switched off.	
Duration	A time span in [sec] can be defined here for which the control outlet should be switched on.	$0…10^6$

Control type: USB-RS232

Parameter	Description	Values
Send output sequence	Defines whether the instrument sends an output sequence to the auxiliary instrument.	Active | Inactive
Output sequence	Defines the output sequence the instrument sends to the auxiliary instrument.	1…120 characters
	The control sequence for the signal receiver - can also contain a formula or result enclosed in characters % or control characters in format \xxx where xxx is the decimal number of the ASCII control character.	
	\013 for Carriage Return	
	\010 for line feed.	
Wait for input sequence	Defines whether the instrument waits for a defined input sequence before continuing the method.	Active | Inactive
Maximum time	Defines the maximum time the method function waits for the input sequence. When the maximum time has passed, the method continues even if no input sequence was detected.	0…1000000 s | ∞ s
Input sequence	Defines the input sequence the spectrophotometer expects from the auxiliary instrument.	1…20 characters
Input sequence with results	Defines whether the input sequence contains data that is used in calculations.	Active | Inactive
	Inactive: The instrument waits for the input sequence defined in **Input sequence**.	
	Active: The instrument waits for the input sequence with results as defined by the various parameters.	
	Start sequence, **Total length**, **Number of results**, **Start position 1…Start position 10**, **Max. length 1…Max. length 10**	
Start sequence	Defines the start sequence that the instrument expects from the auxiliary instrument.	0…20 characters
	The start sequence can contain ASCII control characters in the format \xxx. Here, xxx is the decimal code of the control character.	
Total length	Defines the total length of the input sequence.	1…1000 characters

Number of results	Defines the number of relevant values that are included in the input sequence.	1…10
Start position 1… Start position 10	Defines the absolute position of first character of the relevant value. Leading space characters before the result will be ignored.	1…1000
Max. length 1Max. length 10…	Defines the maximum length of the relevant value.	1…1000 characters

Note

- The ASCII control characters can be found at: http://www.asciitable.com/
- Results are stored under the variables "AuxInst x[y]" (x: result number; y: number of the "Auxiliary instrument" method function). For example: AuxInst 3[2]; where "3" represents the third result in the input sequence, which was received in the second auxiliary instrument method function in the method.

5.7.18 PowerShower

The PowerShower rinsing offers an automated and effective cleaning mechanism, eliminating carryover thanks to strong solvent stream that cleans the tubes from top to bottom with the defined number of rinse cycles.

Parameter	Description	Values
Beaker position	Define the position of the rinse beaker. Current position: Rinsing is performed in the same beaker. Next beaker: Rinsing is performed in the beaker next to the tower (current position + 1). Absolute position: Rinsing is performed in a fix defined beaker on the sample rack.	"Automation" = "InMotion"
Position	Define the position of your rinse beaker on the sample rack.	"Automation" = "InMotion" Only if "Absolute position" is selected
Drain beaker	Drains the beaker before rinsing with the complete beaker volume. The maximum pumping speed is used for draining.	Active | Inactive
PowerShower rinse	Rinse using the PowerShower pump. During rinsing, the sampling pump is always active with maximum speed to prevent overfilling of the beaker.	Active | Inactive
Rinse cycles	Defines the number of rinse cycles that are performed.	1…100
Volume per cycle	Defines the volume of rinsing liquid that the PowerShower pump moves to the sample vessel during each cycle.	0…1000 mL
Fill beaker	Defines whether the PowerShower pump moves the volume defined in **Volume** to the sample vessel.	Active | Inactive
Volume	Defines the volume of rinse liquid, pumped into the beaker, per cycle. The lift will go to position **Sample** for that.	0…1000 mL
Fill cell and tubes	Fills the cell and tubes with the defined volume using the sampling pump.	Active | Inactive
Volume	Defines the volume of rinse liquid, pumped towards the cell. The lift will go to position **Sample** for that.	0…1000 mL
Fill beaker	Defines whether the PowerShower pump moves the volume defined in **Volume** to the sample vessel.	Active | Inactive
Volume	Defines the volume of rinse liquid, pumped into the beaker, per cycle. The lift will go to position **Sample** for that.	0…1000 mL

| Formula (Condition) | Define a specific condition for rinsing with PowerShower. | "Automation" = "InMotion" |
| | | Only if "Condition" is activated |

5.7.19 Stir

With this method function you can define a fixed pre-stirring duration and also, if the stirrer shall be activated after the defined pre-stirring duration.

Parameter	Description	Values
Speed 1	Define the stirrer speed in percent depending on the maximum speed of the stirrer (pre-stirring).	1…100
Stir duration	Define the stirring time [s] for the pre-stirring. You can define two stirring sections (e.g. 10 s higher speeded for pre-stirring followed lower speeded until the end of measurement).	0…10000
Continue stirring	Continued stirring after the defined stirring time in **Stir duration**.	Active | Inactive
Speed 2	Define the stirrer speed after pre-stirring in percent depending on the maximum speed of the stirrer.	1…100
Formula (Condition)	Define a specific condition for stirring.	"Automation" = "InMotion"
		Only if "Condition" is activated

5.7.20 Line rinse

This function for InMotion sample changer, starts at Position **Rinse** (or when using higher beakers at a higher position) and moves down at a variable speed (**Descent rate**). Air bubbles are introduced with the rinsing liquid in the beaker for mechanical cleaning of the system.

Parameter	Description	Values
Beaker position	**Absolute position**: Defines the absolute position that is approached by the sample changer.	Absolute position | Current position | Next beaker
	Current position: The beaker at the current position is used.	
	Next beaker: The sample changer will move to the beaker which is next to the tower (home position + 1). If no beaker can be detected, the sample changer moves to the next position (home position + 2) and repeats until a beaker is detected.	
Duration	Defines the cleaning time, which depends on the installed tubes and the desired degree of cleanliness.	Short | Medium | Long
Descent rate	Defines the speed at which the lift of the autosampler is lowered. This parameter affects the ratio of intake air and liquid. The suction of air improves the cleaning effect.	Very low | Low | Medium | High | Very high
Formula (Condition)	Define a specific condition for line rinse.	"Automation" = "InMotion"
		"Condition" is activated

5.7.21 Park

With this method function you can park the InMotion head in a beaker, e.g. parking the pH electrode in a beaker with buffer.

Parameter	Description	Values
Park position	**Absolute position**: Defines the absolute position that is approached by the sample changer.	Absolute position I Current position I Next beaker
	Current position: The beaker at the current position is used.	
	Next beaker: The sample changer will move to the beaker which is next to the tower (home position + 1). If no beaker can be detected, the sample changer moves to the next position (home position + 2) and repeats until a beaker is detected.	
Position	Define the position of the park beaker on the sample rack.	"Automation" = "InMotion"
		"Park position" = "Absolute position"
Formula (Condition)	Define a specific condition for method function "park".	"Automation" = "InMotion"
		"Condition" is activated

6 Configuration of products

By means of products, product-specific adjustments to methods can be made. Each product is respectively associated with one method. and several products can be association with the same method. The product parameters are a subset of the method parameters. Products are created and managed in the product editor.

When a method is saved, the products that access this method are updated.

6.1 Create Products

Select: `Home > Methods / products > Products`

You create a new product if you either select and configure defined products from the list and save them under a new ID or generate a completely new product. The following description shows how you can generate a new product:

- Open the method selection window via the button **New** in the **Products** dialog. Here all the methods of the type Measurement are listed that can be assigned to a product.

1 Touch the corresponding method in the list that should be assigned to the product.

   ⇨ The **Product** dialog is opened. The parameter "Linked method" shows the ID of the selected methods.
   Note: You can retrospectively assign another method to the product (same configuration).

2 You can edit and configure product parameters, assign the product an ID and a title.

You can start the product immediately or return to the product editor.

6.2 Linking Methods with Products

A distinction is made between two cases:

1. A product is created and linked with a method.

    On linking of a product to a method (before saving the first time) the values are taken over from the linked method.

2. A product has been previously created, the linked method is changed (relinking).

    In this case only the methods for the relinking are suggested that agree with the currently linked method in the configuration. After initial saving, the product parameters are not overwritten by the parameters of the method.
    For the measurement the product parameters are: such as e.g. Multiple measurements, Calculations (Coefficients and result limits) are used and not the parameters of the corresponding method. The entries in the method however remain unchanged.

Note

- When you start a product measurement, the parameters defined in the method are "overwritten" by the product parameters.
- A maximum of 100 products can be defined.
- If no measurement methods have been defined on the device, no product can be created.
- Product ID's can be used for barcode recognition.
- Several products can be linked to the same method.
- A product is always assigned to exactly one method.
- When a method is deleted, all linked products are also deleted.
- If a product is saved under a new ID, the values are retained in the product and are not overwritten by standard values from the method.

6.3 Parameters for Products

The following parameters can be defined:

Parameter	Description	Values
Product ID	The product is uniquely identified in the system via the product ID.	-
Product title	Name of the product	-

Linked method	Selection of methods used in the product. With a new link, only methods with the same configuration (cell mode and external instruments) are shown.	-
Cell mode	Display of cells to be used in the method (info field)	-
External instruments	Display of external instruments (pH, conductivity, color) to be used in the method is to be measured (info field)	-
Color settings (Minolta only)	Activates "Illuminant" so that the illuminant type can be defined and "Observer" so that the angle can be entered.	Active | Inactive
Illuminant	Defines the illuminant to be used.	A | C | 65 | D50 | ID65 | ID50 | F2 | F12
Observer	Defines the viewing angle. Default 2°.	2° | 10°
Speed	**Pump speed** "SC1" / "SC30": • "Maximum": Sample feed with maximum pump speed • "Reduced": Sample feed with speed set at the automation unit • "Automatic": The pump speed changes according to the defined time period from "Reduced" to "Maximum". "SPR200" / "InMotion": • "High" • "Medium" • "Low" The corresponding pump speed can be set under `Home > Setup > Hardware > Automation`.	"Automation" = "SPR200" / "SC1" / "SC30" / "InMotion"
Max. filling speed after	Defines the period of time [s] after which the pump speed changes to maximum speed.	1…10000
Multiple measurement	If activated, several measurements are performed with the same sample.	Active | Inactive
No. of measurements	Defines the number of measurements.	2…10
Refill ratio	Used for the calculation of the further movement of the sample between two measurements. The refill rate [%] is calculated over the duration of the sample addition. **Example**: The fill duration is 10 s and the refill ratio 50%, i.e. pumping is activated for 5 seconds.	10…100
Max. SD	Maximum permitted absolute standard deviation of the measurements for density, refractive index or color. When the deviation is exceeded the measurement is interrupted with the status **Error**. The maximum standard deviation must be entered in the function of the measuring cell type.	4 | 5 | 6 decimal places
No. of meas. points	Defines the number of measured points used for determining the mean value. Preferably use a high number of 10 measuring points. **Note**: If multiple measurement is activated, only the measured values from the last measurement repetition are used.	1…10
Max. deviation	The maximum permissible absolute deviation [pH] of the measured values for pH or conductivity meters. If this is exceeded, the results are marked accordingly.	0.01…7.00

Repeat if failed	If this is activated, the measurement is repeated if "Max. SD" or "Max. Deviation" are exceeded. **Note**: If "Multiple measurement" is activated, all measurements are repeated.	"Multiple measurement" activated, or External instrument defined (pH meter, conductivity meter, colorimeter)
Author	Name of creator (info field)	-
Created on	Date of creation and time (info field)	-
Modified at	Change date and time (info field)	-
Modified by	User who made change (info field)	-
Protect	When this is activated, only the author or an administrator can edit or delete the method.	-

For the density module the following parameters are available:

Parameter	Description	Values
Bubble check	If activated, the system verifies whether bubbles are present in the density cell.	Active l Inactive
Viscosity correction	Activation of the viscosity correction	Density - Module defined
Viscosity	≤2000: For samples with viscosity less than 2000 mPa*s >2000: For samples with viscosity greater than 2000 mPa*s - Set value: With this selection, a known viscosity can be entered	Density - Module connected Viscosity correction activated
Viscosity value [mPa*s]	Defines the viscosity value of the sample.	1…99999

6.4 Calculations in Products

The calculations defined in the method (Rx) are listed in the product. Press the button **Calculations** in the product dialog (Navigation: `Home > Methods / products > Products`). For a description of the parameters also see "[Methods and products: Methods > Method functions > Calculation ▸ Page 51]".

The following rules apply for calculations in products:

1. When the methods are saved calculations in methods and products are compared on the basis of calculation indexes (R1 – R1, R2 – R2 etc.). If these indices from product and linked method do not coincide, they will be automatically aligned, i.e. product calculations that do not occur in the method will be automatically deleted and method calculations that do not occur in the product will be automatically inserted.

2. If a parameter is changed in the method function "Calculation" that is only visible in the product (non-editable, e.g. formula), then the entire product calculation will be overwritten in the associated product.

7 Series

Series act as a starting aid for several tasks. The tasks are individually lined up in the task list after the series start.

Series can be created, edited saved and deleted.

- You can create shortcuts for series.
- A maximum of 5 series can be saved.
- The maximum number of series entries is 60.
- Series can consist of products and / or methods.
- Series can consist of the same or different entries (i.e. several entries (from the type method or product).
  All entries can be deleted.
- Series can also be saved without entries.
- If you are in the **Start analysis** dialog of the series, series entries can be deleted, inserted or selected.
  Via the **Insert** button, you open the **Series item** dialog to define parameters; see also "Create series".

  If a change of series is made in the **Start analysis** dialog and a shortcut is created, this shortcut does not point to the changed series but to the series created in the series editor.
- If no methods are defined in the instrument, no new series can be created.

Create series

Navigation: `Home > Series`

- Via the button **Series** in the Homescreen you open the **Series list** dialog.
  The available series are displayed.

1 Touch the button **New**.
  ⇨ A new series is generated. You can enter a series ID or use the default ID.

2 Save the series.
  ⇨ A dialog with the title of the newly created series opens. You can add new entries or edit existing ones. To edit an existing entry, touch the relevant entry.
  The **Series item** dialog opens.

3 For a new series entry, press the button **Insert** in the dialog of the selected series.
  ⇨ The **Series item** dialog is opened.

4 Enter the parameters and confirm with **OK**.
  ⇨ In the case of multiple entries, "Insert" markers appear behind the series entries.

5 Press the **Insert** marking area at the desired point.
  ⇨ The **Series item** dialog is opened.

6 Enter the parameters and confirm with **OK**.

7 Save the series.

The parameters for the **Series item** dialog are listed below:

Parameter	Description	Values
Item type	The series item can either be a product or a method (only if at least one product is defined in the system).	-
Product ID	Selection of product	"Item type" = "Product"
Method ID	For "Item type"="Method", it is possible to select the relevant method here. For "Item type"="Product", the associated method is displayed here (Info Field).	-
Method type	Displays the type of method, e.g. measurement	-
Sample ID	Input of the sample ID	"Method type" = "Measurement"
Number of entries	To define the quantity of series entries.	-

For the entry type "Method" of the type "Adjustment" and "Test", you can change the associated standard data using the parameter "Standard". For this, see also "[Methods and products: Methods > Standard data ▶ Page 43]".

Parameter	Description	Values
Standard	For "Method type"="Adjustment", it is possible to modify the standard data. For "Method type"="Test", the standard used is displayed (Info Field).	"Method type" = "Adjustment" "Method type" = "Test"

A series can also be saved without entries.
All entries can be deleted.

In the dialog of the corresponding series the **Start** button is found with which you can open the **Start analysis** dialog. In this you have the option to change your items again before the actual analysis start. To do this press the button **Items**.

In addition to the parameters described above, the following parameters are displayed:

Parameter	Description	Values
Correction factor	Defines a correction factor that can be used in calculations.	0.000001…1000000

For more information on the parameters in the **Start analysis** dialog, see also "Analysis sequence: Starting an analysis".

7.1 Delete Series

1 Touch the series to be deleted in the **Series list** dialog.
   ⇨ A list with the corresponding items for the series appears.
2 In the dialog press the **Parameters** button.
   ⇨ In the dialog there is a **Delete** button with which you can delete the series.

Note

A prompt with the interruption criterion appears before you finally delete the series.

7.2 Creating a series copy

Using the **Parameters** button, you can then copy an existing series by changing the "Series ID". When the series is saved a new series is created.

8 Operation

8.1 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.
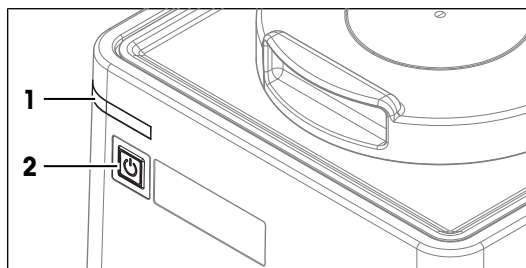
8.2 Shut down the refractometer

Shut down the refractometer using the touch screen

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

1 Tap **Log out**.
  - ⇨ The **Login** window opens.
2 Tap **Shut down**.
  - ⇨ 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 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.
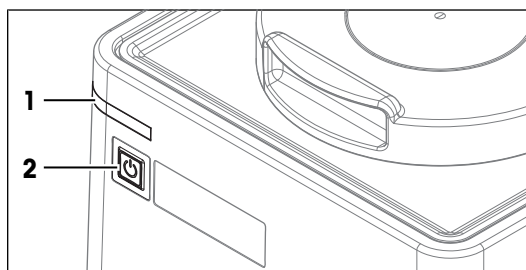
Forced shutdown

The refractometer should only be shut down in this way if it is absolutely necessary.

– Press and hold the power button (2) for more than 10 s.
  - ⇨ If an analysis is running, it is terminated prematurely and any data produced during this time is lost.
  - ⇨ The StatusLight (1) turns red.
  - ⇨ 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.
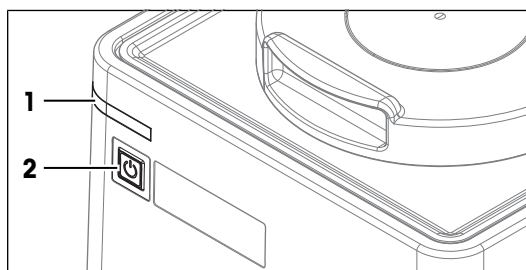
Shut down the refractometer in emergency situations

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

8.3 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.

8.3.1 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.

8.3.2 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

Sample	Cleaning solution 1	Cleaning solution 2
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

8.3.3 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.

8.4 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 in the chapter .

8.4.1 Create the measurement method

- The home screen is open.
1 Go to **Methods / Products** (1) > **Methods**.
   ⇨ The **Methods** window opens.
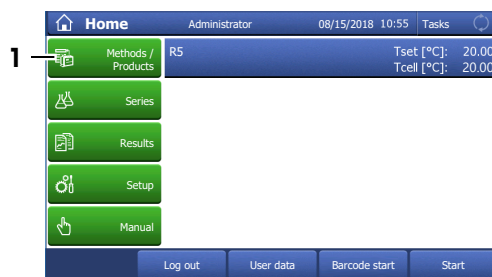
2 Select the method **M8501 nD manual** (1).

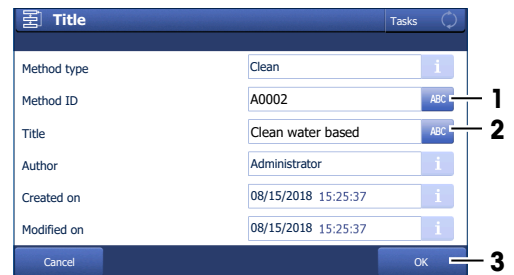   ⇨ The method window with the list of the method functions opens.
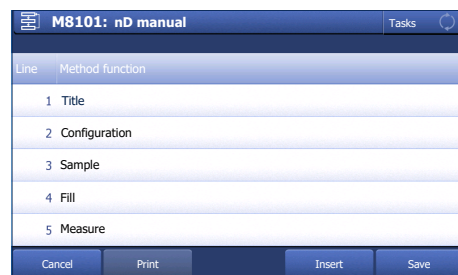
8.4.2 Configure the measurement method
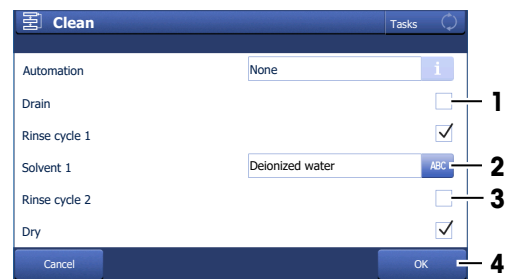
1 Select the **Title** (1) method function.
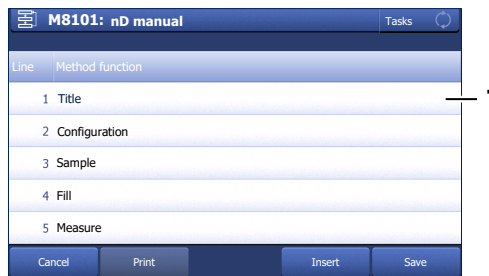
2 Change **Method ID** (1) as needed. The following format is reserved for METTLER TOLEDO predefined methods: "M" followed by a number.

3 Change **Title** (2) as needed and tap **OK** (3).
   ⇨ The method window with the list of the method functions opens.
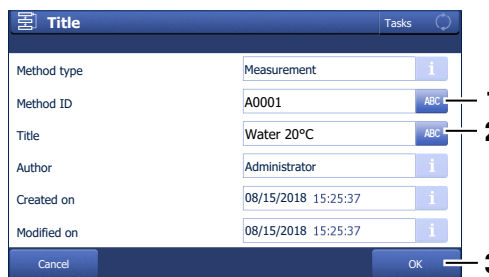
4 Select the **Sample** method function.

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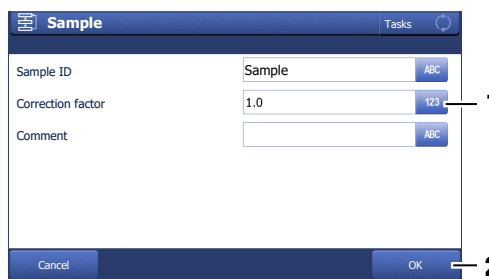
6 Move your finger upward on the touch screen to scroll down.

7 Select the **Report** method function.

8 Deactivate **Print / USB-RS232 data export** (1) and tap **OK** (2).
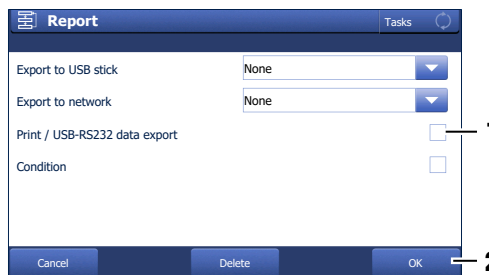
9 Tap **Save** (1).
   ⇨ The method is listed with **Method ID** and **Title** in the **Methods** window.
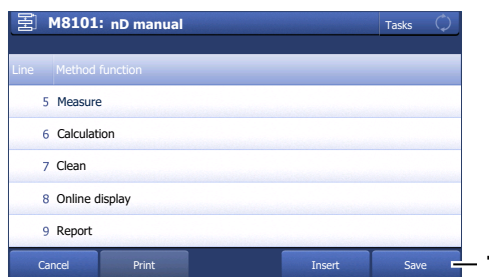
### 8.4.3 Create a shortcut on the home screen

1 Tap **Start** (1).

2 Tap **AddToHome** (1).
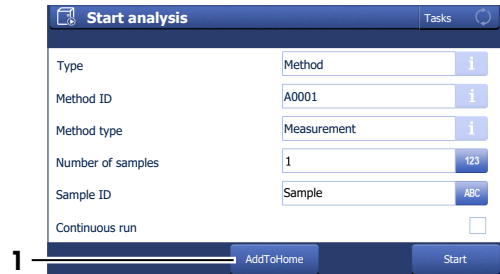
3 For **Description** (1), enter a name to identify the shortcut on the home screen and tap **Save** (2).
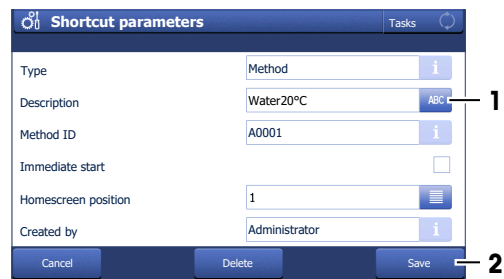
⇨ The home screen with the shortcut (1) opens.
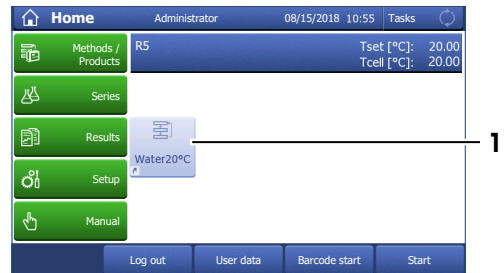
8.4.4 Determine the refractive index

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.
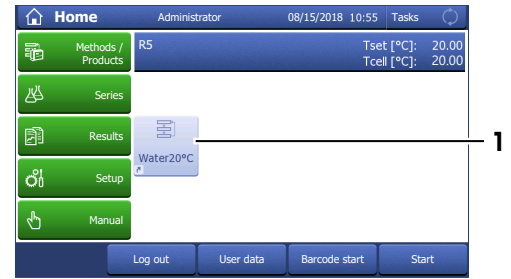
2 If needed, change the entry in **Sample ID** (1).
3 Tap **Start** (2).
   - ⇨ The temperature of the measuring cell is brought to the temperature defined in the method.
- ⇨ A message prompts you to add the sample.
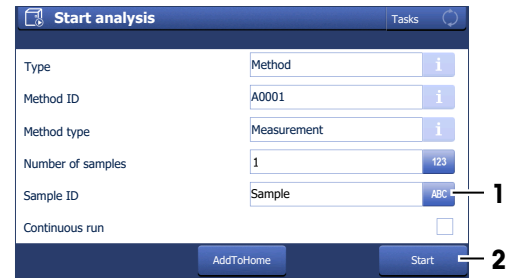
Fill the measuring cell

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.
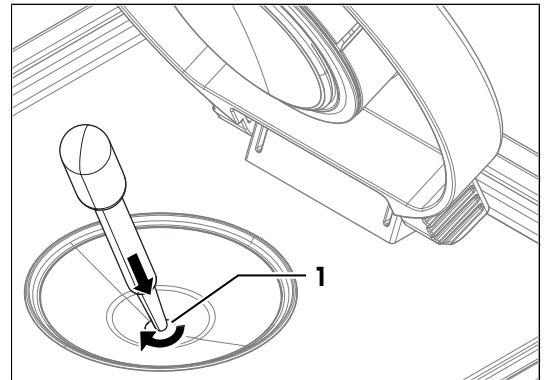
5 Tap **OK** (1).
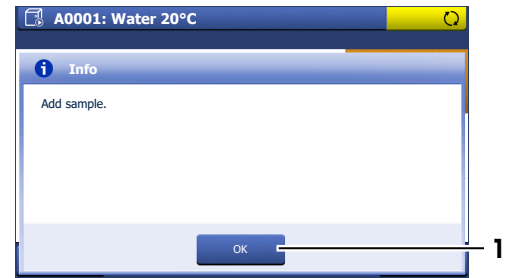
   - ⇨ The temperature of the measuring cell (2) is brought to the temperature defined in the method (1).
   - ⇨ The currently measured value is displayed (3).
   - ⇨ The measured value is saved as result when the criteria for measurement reliability are met.
- ⇨ A message prompts you to drain the measuring cell.
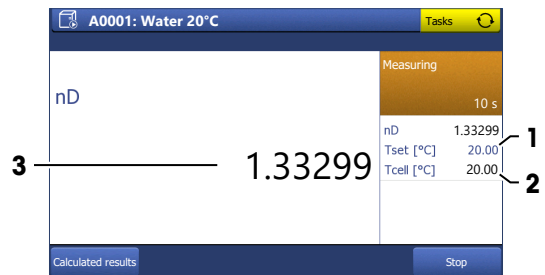
Drain the measuring cell

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.
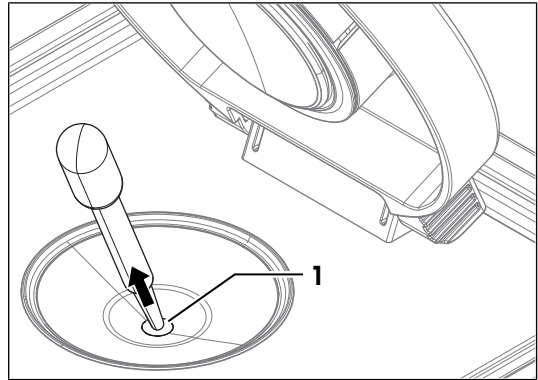
Rinse the measuring cell with deionized water

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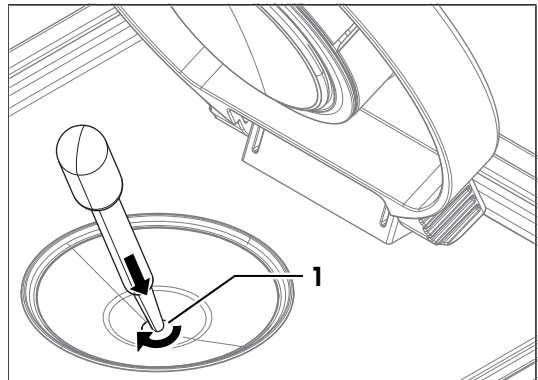
3 Place the pipette tip on the prism (1) and aspirate the content of the measuring cell.

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.
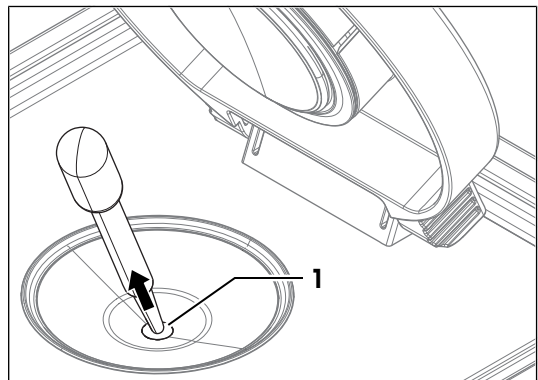
Dry the measuring cell

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.

8.5 Viewing the results

– Tap **Home** > **Results**.

 ⇨ The **Analysis list** dialog screen appears.

1 Select a measurement from the **Analysis list**.

 ⇨ The **MS** dialog screen appears.

2 Tap the **Calculated results** button.

 ⇨ The **Calculated results** dialog screen with the
desired result appears.

Type	Meth./Prod.	Date/Time	Status		
MS	M8501	09/28/2018 16:39	OK		
ADJ	M8500	09/28/2018 16:35	OK		

Back · Export · Delete all · Sample · Rx

– Tap on a desired **Value**.

⇨ A dialog screen with detailed information to the result is
shown.

Name	Value	Limits
nD	1.33898	

Back

8.6 Automation

Navigation: `Home > Manual operations > Automation`

You can perform the following manual operations with the automation units:

Action	DryPro	SPR200	SC1	SC30	InMotion
Dry	X		X	X	
Rinse		X	X	X	X
Drain					X
Pump sample		X	X	X	X
PowerShower					X
Stir					X
Move to position				X	X
Move lift					X

If no automation is defined in the setup, the manual operation "Automation" does not appear.

– Open the **Automation** dialog window via the button **Automation** in **Manual operations**.

In it you can define the following parameters to perform a manual operation with an automation unit:

Parameter	Description	Values
Cell mode	Defines the type of cells (Density/Refractometry).	D | R | D+R | D+D | R+R
Automation	Defines the automation unit for manual operation.	List of available automation units
Action	Defines the action to be executed on the automation unit.	List of actions

Below the parameters are listed that are to be entered for the selected action:

8.6.1 Action: Dry

Parameter	Description	Values
Dry mode	**Fixed duration**: Drying is stopped after a defined time. **Automatic**: The oscillation is measured. Drying is stopped, when the oscillation value becomes stable.	Fixed duration | Automatic
Dry duration	Defines the fixed drying time in [s].	1…1000
Max. dry duration	If the oscillation value has not stabilized by the end of this period [s], drying is stopped.	1…10000

8.6.2 Action: Rinse

Parameter	Description	Values
Solvent	Definition of the solvent at the connections Rinse 1 and Rinse 2.	List of solvents
Rinse duration	Defines the fixed rinse time in [s].	1…10000 | ∞
Rinse position	**Absolute position**: Defines the absolute position that is approached by the sample changer. **Current position**: The beaker at the current position is used. **Next beaker**: The sample changer will move to the beaker which is next to the tower (home position + 1). If no beaker can be detected, the sample changer moves to the next position (home position + 2) and repeats until a beaker is detected.	Absolute position | Current position | Next beaker

8.6.3 Action: Drain

Drain

Parameter	Description	Values
Drain duration	Defines the fixed drain duration in [s].	1…10000 | ∞

8.6.4 Action: Pump sample

Parameter	Description	Values
Direction	Defines the pumping direction. **Waste**: The liquid is pumped through the cell and into the waste container. **Vial**: The liquid is pumped back into the sample vial. **Beaker**: The liquid is pumped back into the sample beaker.	Waste | Vial | Beaker
Speed	Pump speed "SC1" / "SC30": • "Maximum": Filling with maximum pump speed • "Reduced": Filling with speed set at the automation unit "SPR200" / "InMotion": • "High" • "Medium" • "Low" The appropriate pump speed can be set in `Home > Setup > Hardware > Automation`.	Automation = "SPR200" / "SC1" / "SC30" / "InMotion"
Duration	Defines the fixed pumping duration in [s].	1…10000 | ∞

8.6.5 Action: PowerShower

Parameter	Description	Values
Rinse cycles	Number of rinse cycles that should be performed.	1…100
Volume per cycle	Defines the rinse volume in [mL] per cycle.	10…1000

8.6.6 Action: Stir

Parameter	Description	Values
Speed	Defines the speed of the stirrer in percent of the maximum speed. 0 %: The stirrer is off. 100 %: The stirrer moves at maximum speed.	0…100 %
Stir duration	Defines the fixed stir time in [s].	1…10000 | ∞

8.6.7 Action: Move to position

Parameter	Description	Values
Go to	**Home**: To move the sample rack to the home position. **Relative position**: To move the sample rack a definable number of steps. **Absolute position**: To move the sample rack to a defined position. **Next vial** / **Next beaker**: To move the sample rack to the next vial or beaker.	Home | Relative position | Absolute position | Next vial | Next beaker
Position	Defines the absolute position on the sample rack.	1…303 | 1…30
Direction	Defines the moving direction of the sample rack.	Forward | Backward
Lift position	Defines the position of the lift to approach.	Sample | Rinse | Rotate

8.6.8 Action: Move lift

Parameter	Description	Values
Lift position	Defines the position of the lift to approach.	Sample | Rinse | Rotate

9 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.

▶ www.mt.com/contact

9.1 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 77]
	Perform a test with deionized water.	[Check the measurement accuracy ▶ Page 80]

9.2 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 93

9.2.1 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.

9.3 Clean the measuring cell

9.3.1 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 67
- 📄 Dry the measuring cell ▶ Page 68

9.3.2 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 in the chapter .

9.3.2.1 Create the cleaning method

- ▪ The home screen is open.
1 Go to **Methods / Products** (1) > **Methods**.
    - ⇨ The **Methods** window opens.
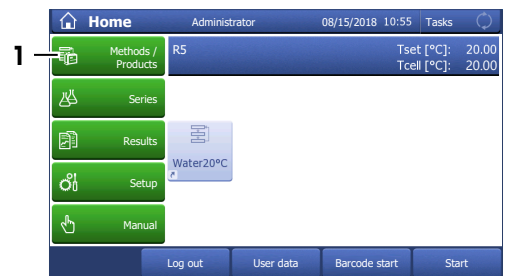
2 Tap **New** (1).

3 Select the template **CLEAN** (1).
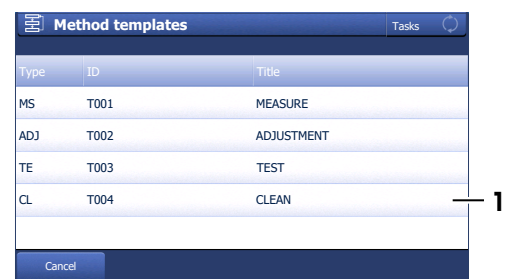
4   For **Automation** select **None** (1) and tap **OK** (2).

Configuration	Tasks
Cell mode	R
Automation	None 1

Cancel   OK — 2

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

U8001: CLEAN   Tasks

Line	Method function
1	Title
2	Configuration
3	Clean

Cancel   Print   Insert   Save

9.3.2.2   Configure the cleaning method

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

U8001: CLEAN   Tasks

Line	Method function
1	Title — 1
2	Configuration
3	Clean

Cancel   Print   Insert   Save

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.

Title   Tasks

Method type	Clean	i
Method ID	A0002	ABC — 1
Title	Clean water based	ABC — 2
Author	Administrator	i
Created on	08/15/2018 15:25:37	i
Modified on	08/15/2018 15:25:37	i

Cancel   OK — 3

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)

Clean   Tasks

Automation	None	i
Drain		☐ — 1
Rinse cycle 1		✓
Solvent 1	Deionized water	ABC — 2
Rinse cycle 2		☐ — 3
Dry		✓

Cancel   OK — 4

8 Tap **Save** (1).

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

9.3.2.3 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.
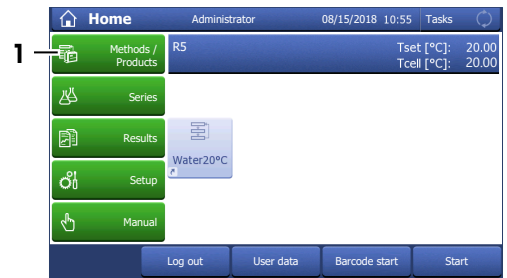
2 Select the cleaning method that you configured (1).

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.
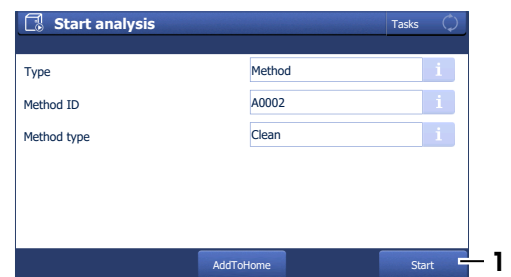
Rinse the measuring cell with deionized water

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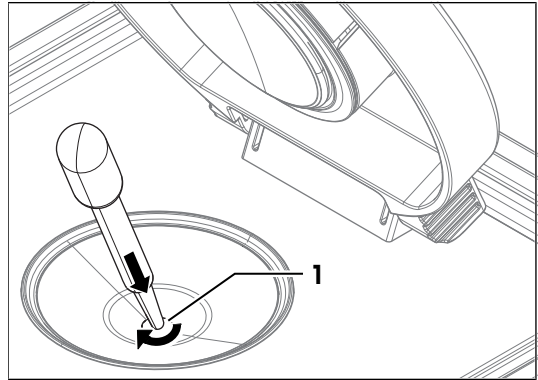
4 Place the pipette tip on the prism (1) and aspirate the content of the measuring cell.
5 Repeat the steps above two or three times.
6 Tap **OK**.
⇨ A message prompts you to dry the measuring cell.
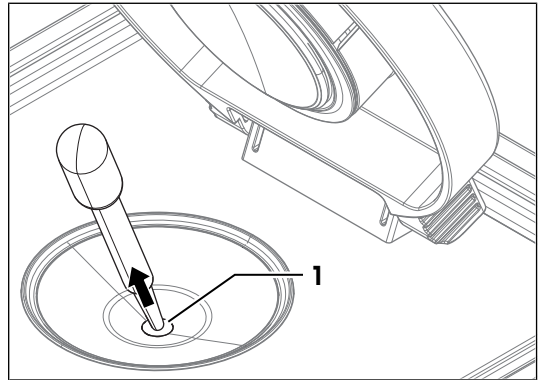
Dry the measuring cell

⚠ **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.

9.4 Check the measurement accuracy

9.4.1 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 67
- ▤ Rinse the measuring cell ▸ Page 67
- ▤ Dry the measuring cell ▸ Page 68

9.4.2 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 in the chapter .

9.4.2.1 Create the test method

- ▪ The home screen is open.

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

   ⇨ The **Methods** window opens.
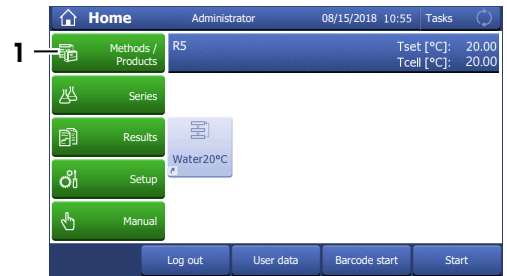
2 Tap **New** (1).

3 Select the template **TEST** (1).
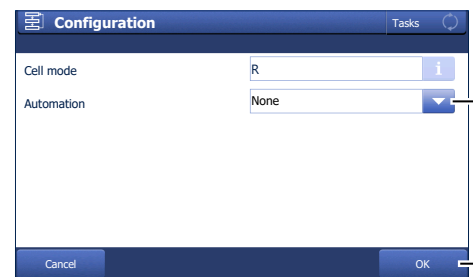
4   For **Automation** select **None** (1) and tap **OK** (2).

⇨   The method window with the list of the method functions opens.
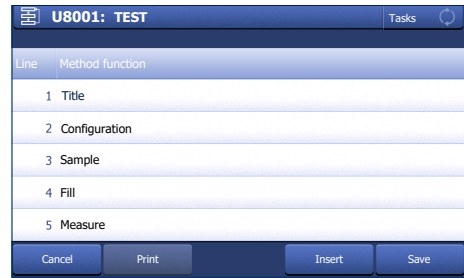
9.4.2.2 Configure the test method

▪   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).
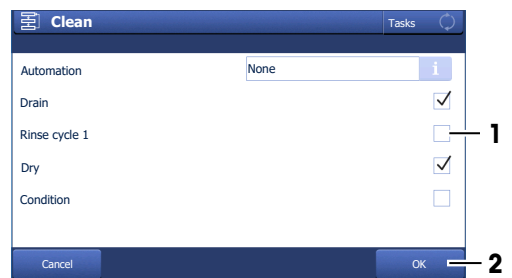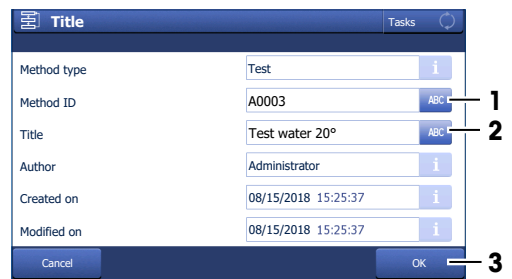
9 Select the **Report** method function.

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

Report	Tasks
Export to USB stick	None
Export to network	None
Print / USB-RS232 data export	☐ — **1**
Condition	☐
Cancel	Delete	OK — **2**

11 Tap **Save** (1).
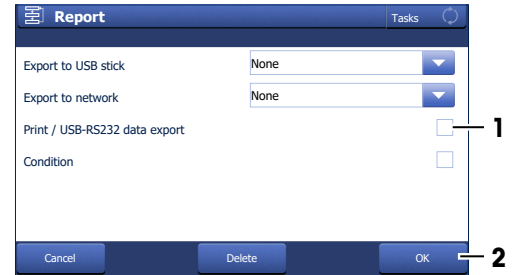
U8001: TEST	Tasks
Line	Method function
5	Measure
6	Calculation
7	Clean
8	Online display
9	Report
Cancel	Print	Insert	Save — **1**

9.4.2.3 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.

1 —

⌂ Home	Administrator	08/15/2018 10:55	Tasks
Methods / Products	R5		Tset [°C]: 20.00
			Tcell [°C]: 20.00
Series			
Results	Water20°C		
Setup			
Manual			
Log out	User data	Barcode start	Start
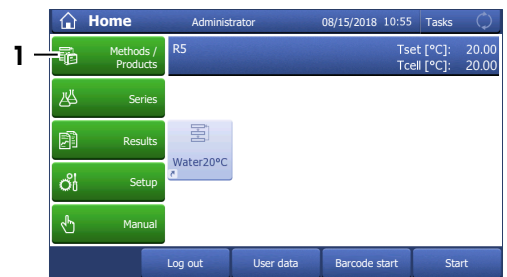
2 Select the test method that you configured (1).

Methods			Tasks
Type	ID	Title	°C
MS	A0001	Water 20°C	20.00
CL	A0002	Clean water based	20.00
TE	A0003	Test water 20°C	20.00 — **1**
MS	M8501	nD manual	20.00
MS	M8502	Brix manual	20.00
Back		New	

3 Tap **Start** (1).

A0003: Test water 20°C	Tasks
Line	Method function
1	Title
2	Configuration
3	Sample
4	Fill
5	Measure
Back	Print	Delete method	Insert	Start — **1**

4 Tap **Standard** (1).

Start analysis		Tasks	↻
Type	Method		i
Method ID	A0003		i
Method type	Test		i
Standard	Water		▤ — 1
Comment			ABC
	AddToHome		Start

5 Enter the information **Lot number** (1), **Date of certifi-cation** (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.

Standard data		Tasks	↻
Standard name	Water		i
Lot number	171118		ABC — 1
Date of certification	08/15/2018		▤ — 2
Expiry date Std	08/15/2020		▤ — 3
nD nominal	1.33299		i
Uncertainty nD	0.00002		123 — 4
Cancel			OK — 5
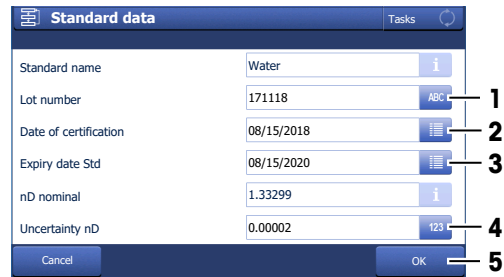
Fill the measuring cell

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).

A0003: Test water20°C	↻
i Info	
Add sample.	
	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.

A0003: Test water 20°C		Tasks	↻
nD	Nom. 1.33299	Measuring	
			10 s
3 — 1.33298		nD 1.33298	1
		Tset [°C] 20.00	
		Tcell [°C] 20.00	2
Dev	Tol. 0.00002		
		Stop	

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.

9.5 Replace the protection plate

9.5.1 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.
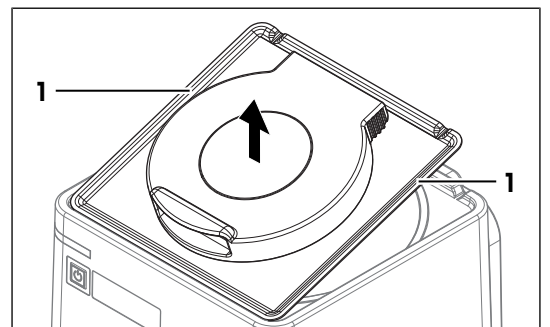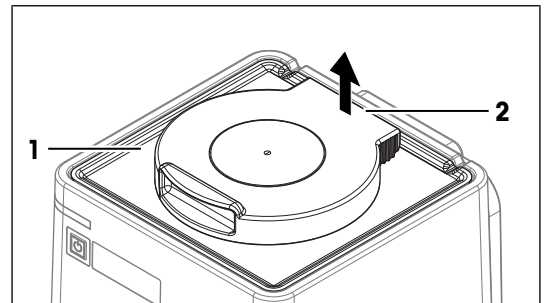
9.5.2 Install the protection plate

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.

See also

▤ Accessories ▶ Page 96
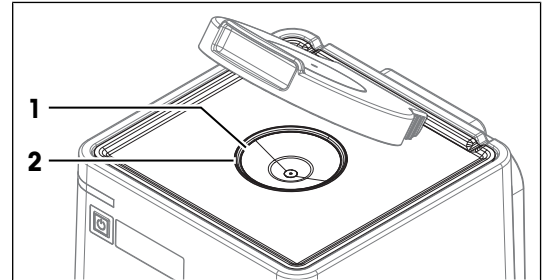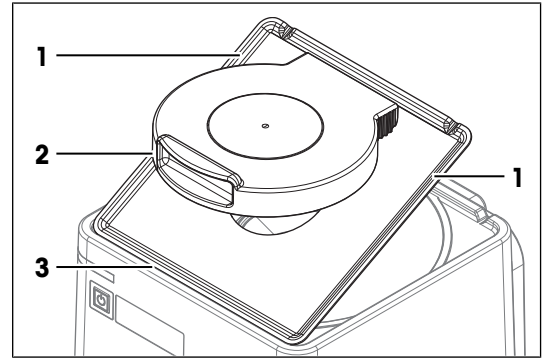
9.6 Replace the lid

9.6.1 Remove the lid

1. Open the lid (1) completely.
2. Pull one side of the lid (2) up until it slides off its axle.
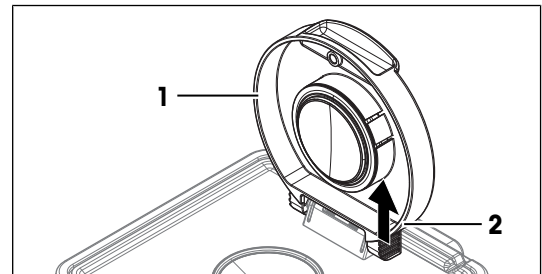
3. Pull the other side of the lid (1) off the axle (2).
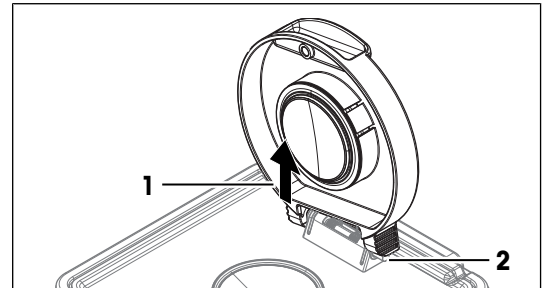
4. Remove the lid.
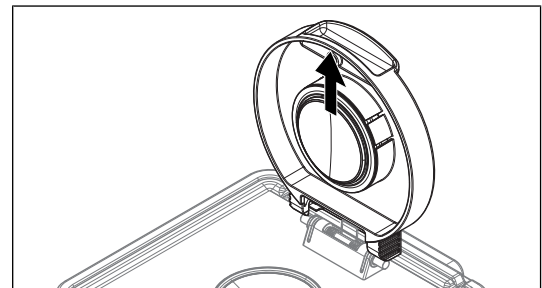
9.6.2 Install the lid

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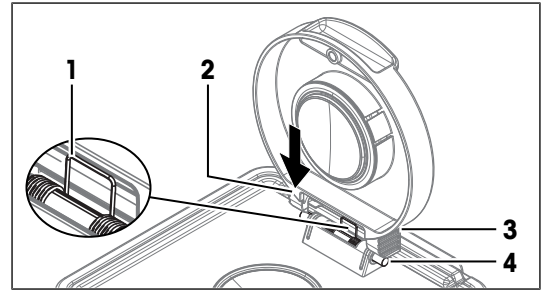
4 Push the other side of the lid down until it clicks into place.

See also

▤ Accessories ▸ Page 96
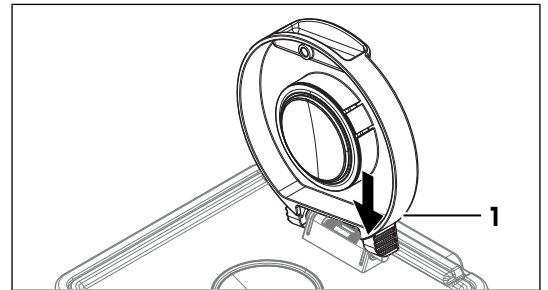
9.7 Replace the measuring-cell cover

9.7.1 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.
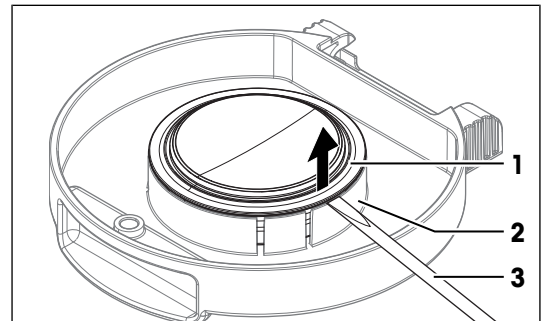
4 Remove the measuring-cell cover (1).

See also

▤ Remove the lid ▸ Page 86
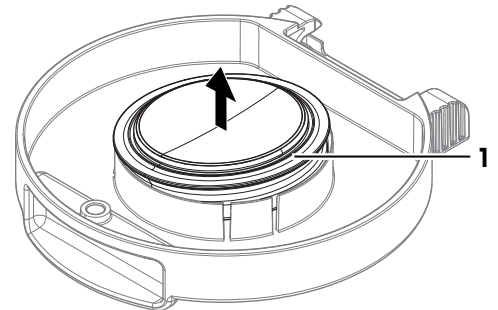
9.7.2 Install the measuring-cell cover

1 Lower the measuring-cell cover (1) into its support on the lid (2).
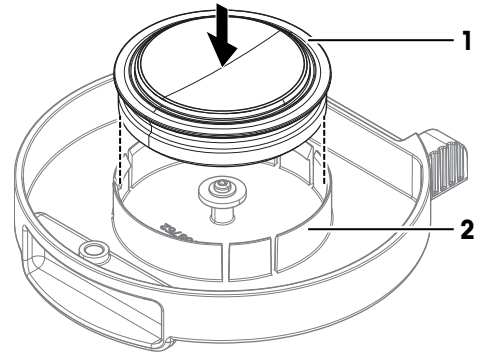
2 Push the measuring-cell cover into its support until it clicks into place.
3 Install the lid.

See also

- 📄 Install the lid ▶ Page 87
- 📄 Accessories ▶ Page 96
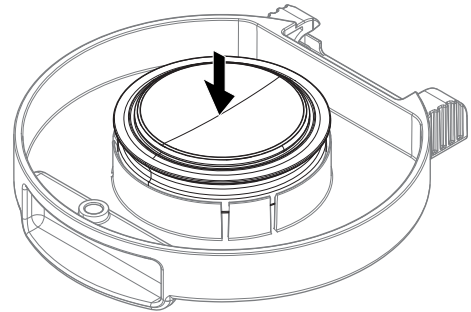
9.8 Replace the measuring-cell O-ring

9.8.1 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).
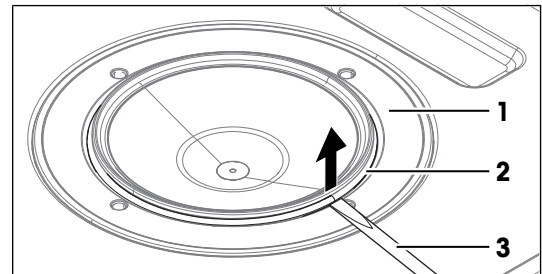
3 Use the screwdriver to lift the O-ring (1) over the rim of the groove.
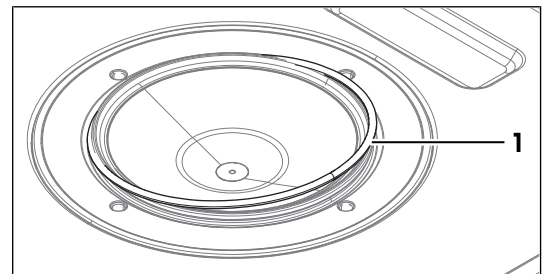
4   Lift the O-ring (1) completely out of the groove (2).

See also

▤ Remove the protection plate ▸ Page 85
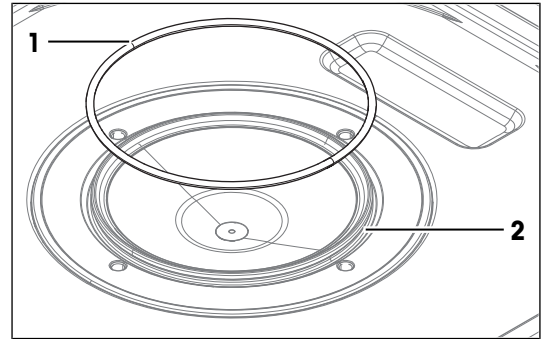
9.8.2 Install the measuring-cell O-ring

1   Place the one side of the O-ring (1) in the groove (2)
     on the measuring cell.
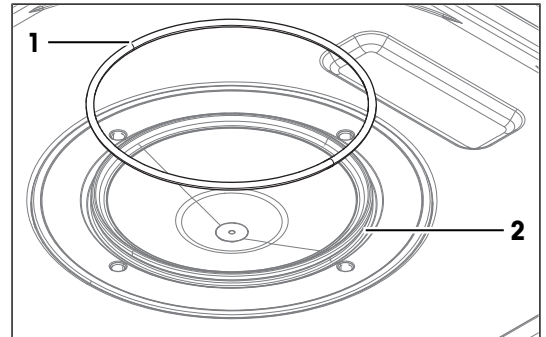
2   Push the other side of the O-ring (1) over the rim into
     the groove.
3   Install the protection plate.
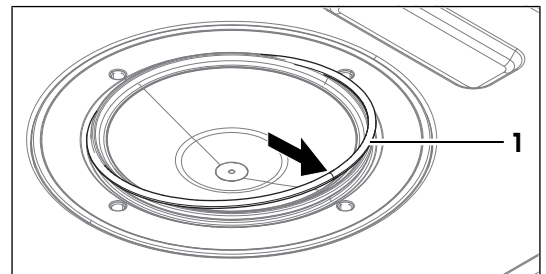
See also

▤ Install the protection plate ▸ Page 86
▤ Accessories ▸ Page 96

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

9.9.1 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).
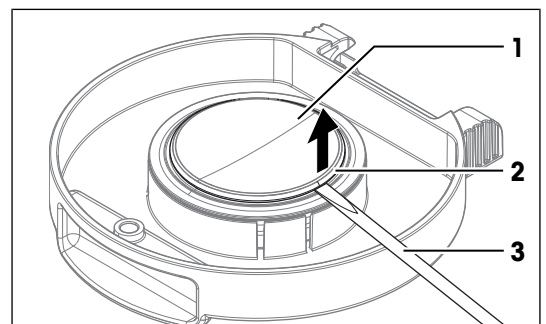
3   Use the screwdriver to lift the O-ring (1) over the rim of
    the groove.
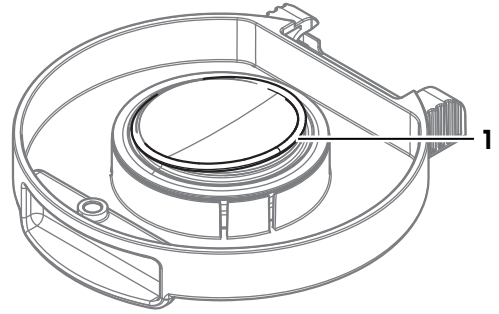
4   Lift the O-ring (1) completely out of the groove (2).

See also

▤ Remove the lid ▶ Page 86
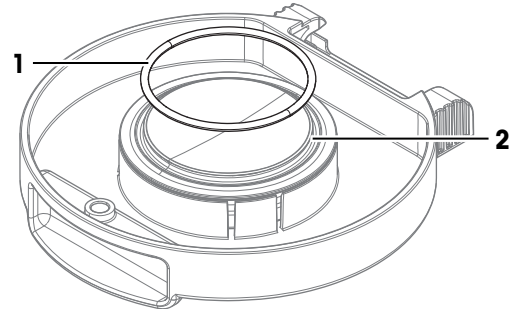
9.9.2 Install the O-ring of the measuring-cell cover

1   Place the one side of the O-ring (1) in the groove (2)
    on the measuring-cell cover.
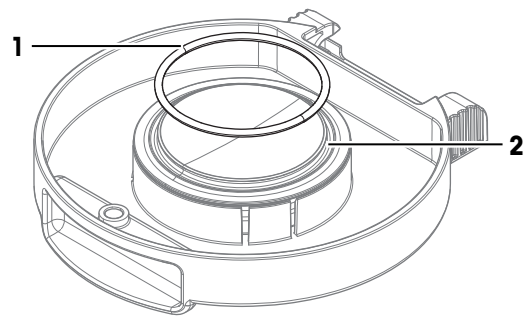
2   Push the other side of the O-ring (1) over the rim into
    the groove.
3   Install the lid.

See also

▤ Accessories ▶ Page 96
▤ Install the lid ▶ Page 87
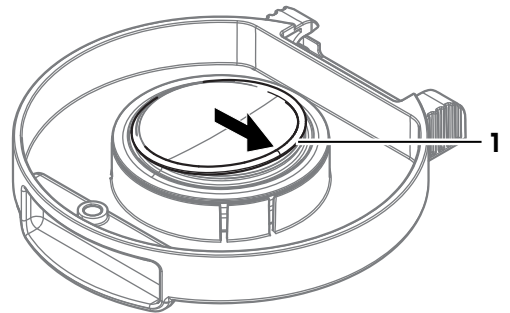
9.10 View the firmware version

1   Press the **Info** key.
2   The firmware version and other system information is displayed.

9.11 Update the firmware

It is possible to update the firmware of your refractometer. If you want to update the firmware of your refractometer, contact your authorized METTLER TOLEDO dealer or service representative.

▶ www.mt.com/contact

9.12 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.

9.13 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.

9.14 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.

10 Troubleshooting

10.1 View and export system information

10.1.1 View system information of the refractometer

Info key: System information and current firmware

Home > Setup > maintenance & service > Firmware: Firmware history

10.1.2 View system information of connected accessories

Info key: System information and current firmware

Home > Setup > maintenance & service > Firmware: Firmware history

11 Technical data

11.1 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 %

Connections

The power consumption of all connected and active devices must be ≤2.4 A.

Characteristic		Value
ErgoSens	Socket	3.5 mm jack socket
	Voltage	12 V DC pulsed ±5 % (max. 100 mA)
LevelSens	Socket	5-pin mini-DIN
	Voltage	24 V DC ±5 % (max. 100 mA)
Aux	Socket	5-pin mini-DIN
	Voltage	24 V DC ±5 % (max. 500 mA)
DryPro	Socket	5-pin mini-DIN
	Voltage	24 V DC ±5 % (max. 500 mA)
SPR200	Socket	6-pin mini-DIN
	Voltage	24 V DC ±5 % (max. 500 mA)

Characteristic		Value
Automation	Socket	9-pin male D-sub
	Configuration	Full-duplex
	Baud rate	4800
	Handshake	X-On / X-Off
	Galvanic isolation	No
	ESD stability	Min. 1000 V
	Short-circuit protection	Yes
Ethernet	Socket	RJ45
	Speed	10/100 MBit/s
	Cable length	Max. 10 m
Terminal	Socket	19-pin Mettler-HDMI with non-standard pin assignment
PC	Socket	Device, USB B 2.0, full speed
	Cable length	Max. 3 m
USB 1 / **USB 2** / USB terminal	Socket	Host, USB A 2.0 , full speed
	Current	Max. 500 mA
	Cable length	Max. 3 m
CAN out	Socket	RJ12
	Speed	500 kBit/s
	Voltage	24 V DC ±5 % (max. 1 A)

Directives, standards and REACH regulation

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

SVHC candidate substances according to REACH (Article 33)

Material	CAS No.
1,2-dimethoxyethane	110-71-4

11.2 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 Zl-0410)
	Lower housing	Crastin SO653
	Cover glass	Gorilla glass
Display	Technology	Color TFT
	Size	7"
	Resolution	WVGA 800 x 480 pixels
	Backlighting	LED backlight
	Brightness control	Per software 50–100%
Input	Technology	Full-coverage capacitive touchscreen

Characteristic		Value
Connections	Cables	1m (standard)
	Connector	19-pin Mettler-HDMI with non-standard pin assignment
	USB	2.0
Angle adjustment	Mechanical	2-stage

11.3 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
Min. sample volume	Syringe	1 mL	1 mL
Application	Max. number of methods	120	120
	Max. number of products	100	100
	Stored results	200	200

[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

12 Accessories

The following accessories and parts are available for the refractometers R4 and R5.

All parts and accessories are specified with their ordering number and quantity in cases where more than one part is included. When ordering, some parts are only available in a minimum order quantity. In such cases, the corresponding minimum order quantity is quoted.

If you have any questions, contact your authorized METTLER TOLEDO dealer.

12.1 Standards

Combined density / refractive index standard water
9mL, 0.99… g/cm^3, nD 1.33…
51338010
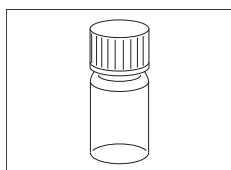
Combined density / refractive index standard dodecane
9 mL, 0.75... g/cm^3, nD 1.42…
51338012
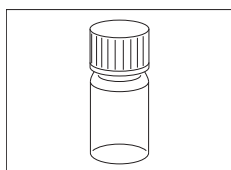
Combined density / refractive index standard 2,4-dichloro-toluene
9 mL, 1.25... g/cm^3, nD 1.55…
51338013
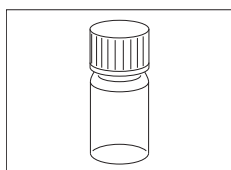
Combined density / refractive index standard 1-bromonaph-thalene
9 mL, 1.48... g/cm^3, nD 1.66…
51338014

12.2 Sensors
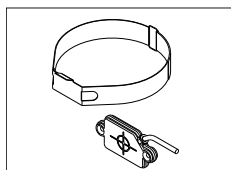
LevelSens
- Fluid level sensor
- Attachment strap
- Cable (2 m)
51109863

Extension cable for LevelSens
1 m
51108308

Motion sensor ErgoSens
11132601

12.3 Sample changers and pumps

DryPro drying pump
- Desiccator
- Silicon tube (500 mm)
- Silica gel
30474899
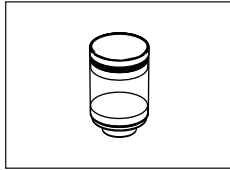
	Desiccator tower	**51337180**
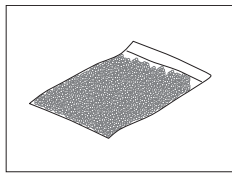
	Silica gel bag 170 g	**51337241**
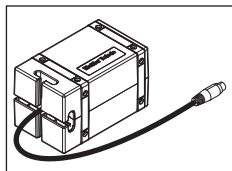
	3-way valve SV3	**30474898**
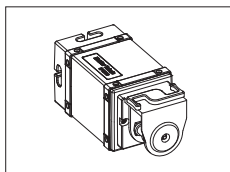
	Pump SPR200 Peristaltic Reversible • Silicone tubing • Connectors	**30094285**

Connecting Kit SPR200 DxRx **30474908**
- Adapter M8 M / M8x1 F
- Sampling Tube DM/DX
- Tube (connectors M8/M8, length 280) mm

SV3 SPR200 Bundle **30474907**
- 3 Way Valve SV3
- Connecting Kit SPR200 DxRx
- Pump SPR200 Peristaltic Reversible
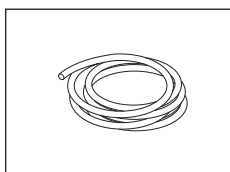
	Silicon tube 500 mm	**51337228**
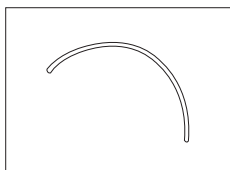
	ChemSure tube for SPR 200 120 mm	**30094297**
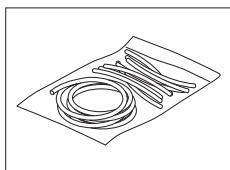
	Novoprene tubes (1x1 m + 10x118 mm)	**51190969**
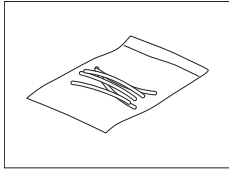
	Silicone tubes (5x118 mm)	**51108149**
	SC1 Sample changer and cleaning unit	**51326000**
	SC30 Sample delivery and cleaning unit	**51327000**
	SC1H Sample Delivery and Cleaning Unit with Heating Option including 1 control box	**51326400**
	SC30H (heated version of SC30)	**51327500**
	Stand SC1H SC30H	**30474896**
	Autosampler InMotion Flex 100mL • Base InMotion Flex • Rack Kit InMotion Flex 100mL	**30094290**
	Base InMotion Flex	**30094291**
	Rack Kit InMotion Flex 25 mL 50 samples	**30094124**
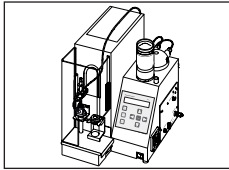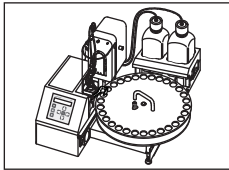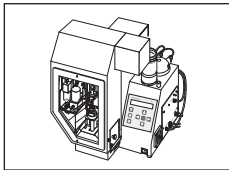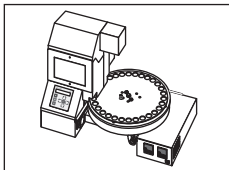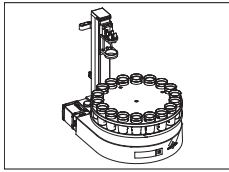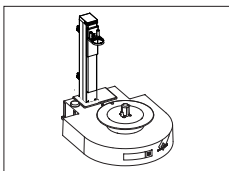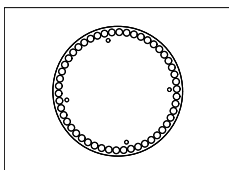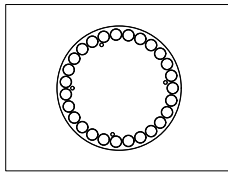
	Rack Kit InMotion Flex 80 mL 27 samples	**30094125**
	Rack Kit InMotion Flex 100 mL 18 samples	**30094126**
	Base InMotion Pro	**30094292**
	Rack Kit InMotion Pro 25 mL 182 samples	**30094129**
	Rack Kit InMotion Pro 80 mL 69 samples	**30094130**
	Rack Kit InMotion Pro 100 mL 34 samples	**30094131**
	Base InMotion Max	**30094293**
	Rack Kit InMotion Max 25 mL 303 samples	**30094134**
	Rack Kit InMotion Max 80 mL 113 samples	**30094135**
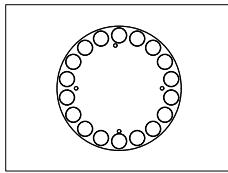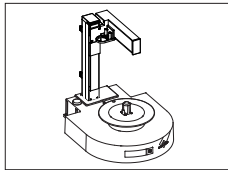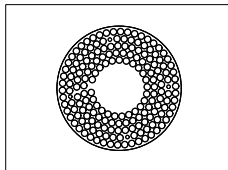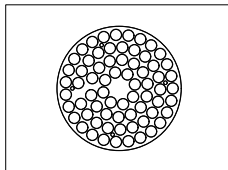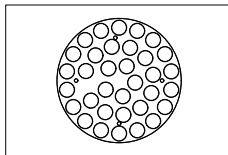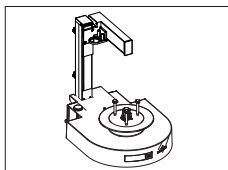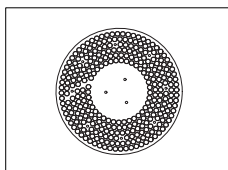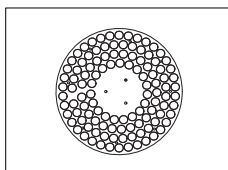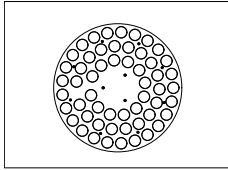
	Rack Kit InMotion Max 100 mL 55 samples	**30094136**

12.4 External measuring cells
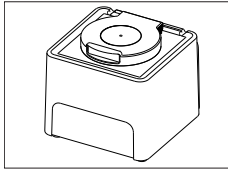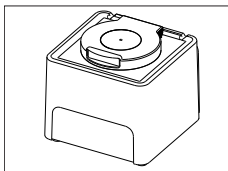
	RX5	**30474906**
	RX4	**30474905**
	Connecting kit - Refractive Index Cell SC1/SC30/InMotion automation or multiparameter system • Tube (connectors M8/M8, length 400 mm) • Tube (connectors M8/M8, length 800 mm) • Waste tube (connector M8, length 600 mm) • O-ring for flow cell • Protection plate	**51337024**
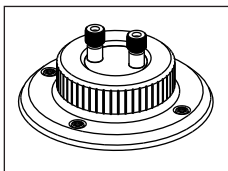
12.5 External instruments

SevenCompact S220 pH/Ion	**30019028**
pH connecting kit complete with • Tube (connectors M8/M8, length 400 mm) • Tube (connectors M8/M8, length 550 mm) • Cable for pH electrode • USB/RS adaptor for SevenEasy™ / SevenCompact™ pH meter • RS-232C cable • pH electrode • External flow cell • Holding plate for pH / Conductivity flow cell	**51337023**
pH electrode InLab Flow	**59902917**
InLab cable S7-BNC 1.2 m	**30281915**
SevenCompact S230 Conductivity	**30019033**

Conductivity connecting kit complete with	**51337022**

- Tube (connectors M8/M8, length 400 mm)
- Tube (connectors M8/M8, length 550 mm)
- USB/RS adaptor for SevenEasy™ / SevenCompact™ pH meter
- RS-232C cable
- Conductivity sensor
- External flow cell
- Holding plate for pH / Conductivity flow cell

Conductivity sensor InLab 715	**51302885**
External Flow Cell Complete	**51337190**
Holding plate for pH / conductivity flow cell	**51337197**
USB-RS Adapter Conduct. Meter SevenEasy	**51105852**
RS-232C cable RS9-RS9	**51190589**
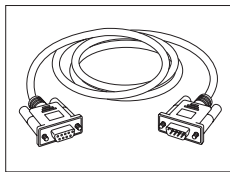
Coupling piece for M8 screws (2 pcs)	**51337179**

Colorimeter

Color connecting kit UV5	**30474868**

- Flow cell (quarz, 10 mm)
- Tubing set polarimeter/colorimeter
- Syringe adapter
- USB A-B cable (1.8 m)

Color connecting kit Konica Minolta	**30025477**

- Flow cell
- USB A-B cable

Connecting kit - Color Lovibond PFXi-195	**30395922**

Color connecting kit Lovibond	**51337021**

- Connection kit for colorimeter
- USB-RS adaptor for Lovibond colorimeter
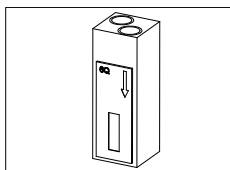
Flow cell Quartz glass, 10 mm	**30258741**

Tubing set polarimetrie/colorimeter	**30251100**
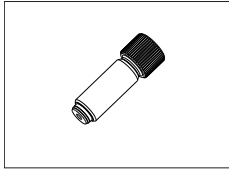
	DM tube / syringe adaptor	**51337154**
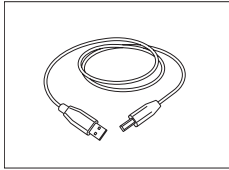
	USB cable A-B (for PC or printer) 180 cm	**51191926**

	Adapter Auxiliary Instruments (USB-RS232 convertor) If you want to use two auxiliary instrument RS232-USB adapters, contact METTLER TOLEDO for a customized solution.	**51105856**

12.6 Peripheral instruments
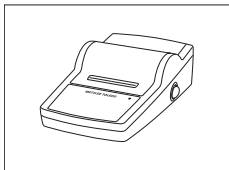
	Lab equip acc data writer USB-P25/01	**11124301**
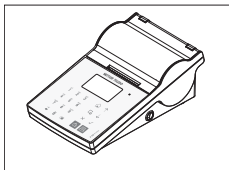
	Lab equip access. data writer P-58RUE	**30094674**
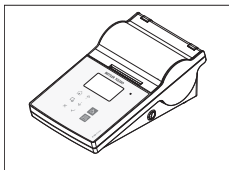
	Lab equip access. data writer P-56RUE	**30094673**
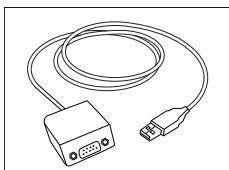
	USB data export box	**51105855**
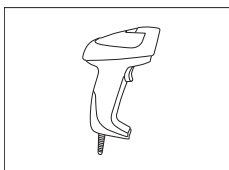
	Handheld barcode reader with USB interface	**21901297**
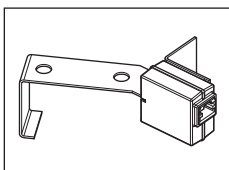
	Barcode Reader ScanStraight for SC30	**51337185**
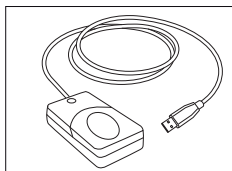
| Fingerprint reader with USB interface | **51192107** |

12.7 Software
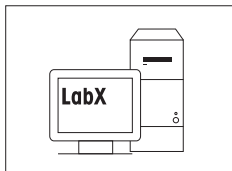
| Starter Pack LabX Server for Density Refractometry | **11153131** |

- 1 instrument license for Density Refractometry
- Network installation for up to 30 total instrument licenses
- User Management and Auot Import/Export
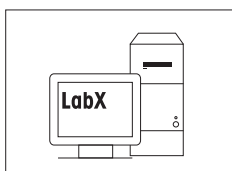
| Starter Pack LabX Express for Density Refractometry | **11153130** |

- 1 instrument license for Density Refractometry
- Single PC installation for up to 3 total instrument licenses
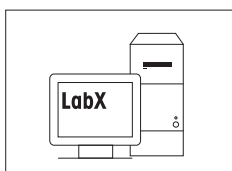
| 1 instrument license for Density Refractometry | **11153250** |

12.8 Miscellaneous accessories

Press for paste-like products	**51337155**
RM / Rx foil stamp	**30097047**
Terminal protection cover	**30125377**
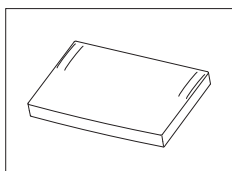
USB Keyboard	**51192111**
O-Ring Lid Flow Cell RM/RX Size 63.22 mm x 1.78 mm	**51192079**
O-Ring DI 53.25x2.62 inserted in lid	**51192051**
Insert for lid of measuring cell	**51337159**
RM / RX protection plate incl. lid	**51337166**
Lid incl. magnets Rx	**30474909**
Extern. Power Supply 120W	**30298362**

Index

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.

Please request full details about our attractive terms of service.

For more information

30471974