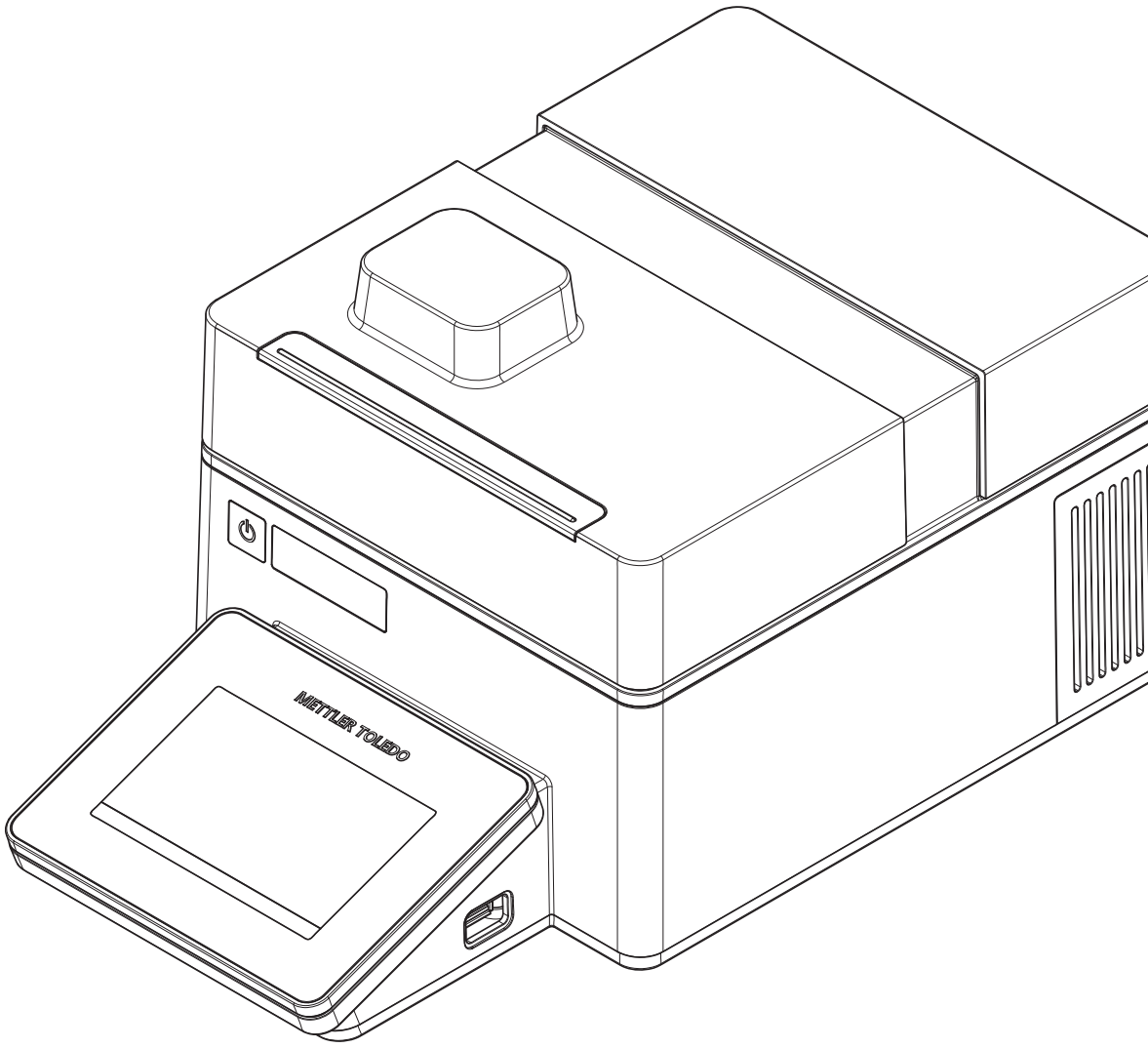
Reference Manual

EasyPlus UV/VIS

Easy UV/Easy VIS



METTLER TOLEDO

Table of Contents

1 Introduction

Thank you for choosing a METTLER TOLEDO EasyPlus UV/VIS spectrophotometer. The EasyPlus UV/VIS spectrophotometer is an easy-to-operate instrument for measuring molecular absorbance or molecular transmittance of analytical samples.

The wavelength range depends on the instrument type.

- Easy UV: ultraviolet (UV) range and visible (VIS) range
- Easy VIS: visible (VIS) range

The instructions in this document refer to EasyPlus UV/VIS spectrophotometers running firmware version 1.0 or higher. The screenshots show the user interface of an Easy UV spectrophotometer.

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

www.mt.com/EULA

See also

View the firmware version and other system information ▸ Page 119

1.1 Further documents and information

For application notes, see the following links:

www.mt.com/library

www.mt.com/analytical-application-library

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

1.2 Explanation of conventions and symbols

Refers to an external document.

Elements of instructions

Instructions always contain action steps and can contain prerequisites, intermediate results and results. If an instruction contains more than one action step, the action steps are numbered.

- Prerequisites that must be fulfilled before the individual action steps can be executed.

1 Action step 1

   ➡ Intermediate result

2 Action step 2

➡ Result

1.3 Compliance information

National approval documents, e.g., the FCC Supplier Declaration of Conformity, are available online and/or included in the packaging.

www.mt.com/ComplianceSearch

Application-relevant standards and norms are listed on the internet.

▶ http://www.mt.com/uvvis-water-test

▶ http://www.mt.com/uvvis-color

Contact METTLER TOLEDO for questions about the country-specific compliance of your instrument.

▶ www.mt.com/contact

European Union

The instrument complies with the directives and standards listed on the EU Declaration of Conformity.

United States of America

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Trademarks

Trademark	Trademark owner
LongClick™	Mettler-Toledo GmbH, Greifensee, Switzerland
SQKitReader™	Mettler-Toledo GmbH, Greifensee, Switzerland
XPathHolder™	Mettler-Toledo GmbH, Greifensee, Switzerland
Spectroquant®	Merck KGaA, Darmstadt, Germany

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. See [Download manuals ▸ Page 20].

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

General hazard: read the User Manual or the Reference Manual for information about the hazards and the resulting measures.

Hot surface

Notice

2.2 Product-specific safety notes

Intended use

The spectrophotometers Easy UV and Easy VIS are designed to be used by trained staff.

- The Easy UV spectrophotometer is suitable for measuring absorbance or transmittance in the ultraviolet (UV) range and the visible (VIS) range of analytical samples.
- The Easy VIS spectrophotometer is suitable for measuring absorbance or transmittance in the visible (VIS) range of analytical samples.

The spectrophotometers are suitable for samples with the following characteristics:

- Compatible with the materials they come into contact with
- Free of air bubbles
- In thermal equilibrium with the environment

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 GmbH assumes that the instrument owner trains users to safely use the instrument in their workplace and deal with potential hazards. Mettler-Toledo GmbH assumes that the instrument owner provides the necessary protective gear.

Safety notes

⚠ WARNING

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 cable and AC/DC 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 them if damaged.

NOTICE

Damage to the instrument or malfunction due to the use of unsuitable parts

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

See also

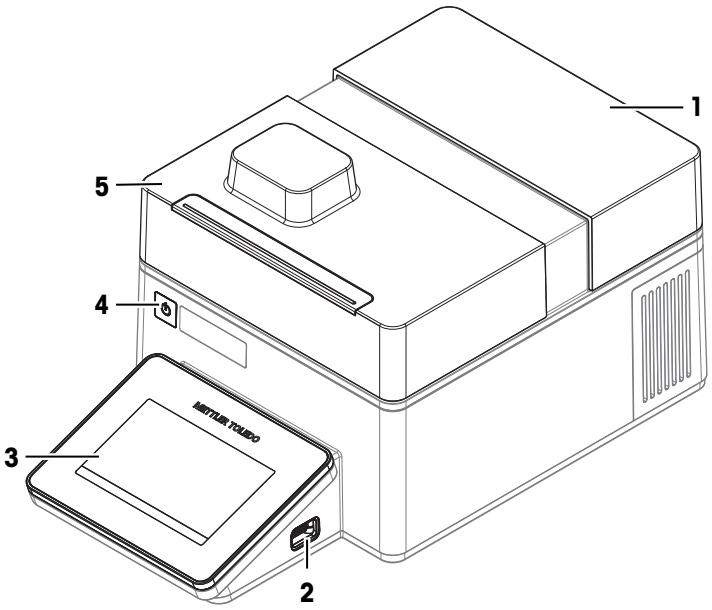
Technical data ▸ Page 121

3 Design and function

3.1 Overview of the spectrophotometer

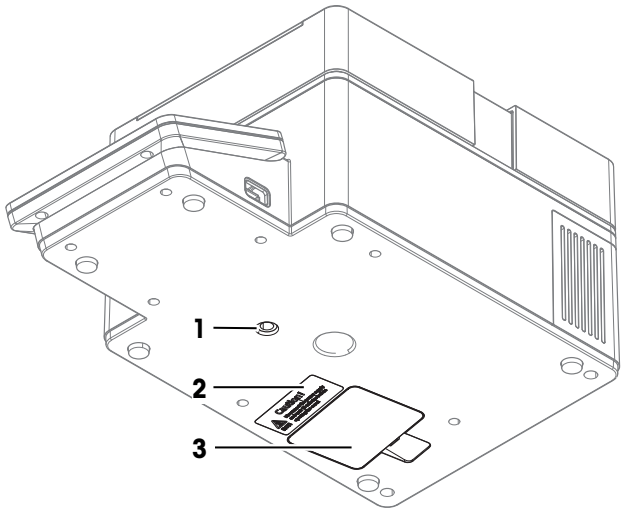
3.1.1 Top and bottom view

Top view



No.	Name	Function
1	Back cover	Protects storage compartment for the following accessories: • Allen wrench • Two cuvette carousels
2	Front USB socket	USB-A socket to connect USB devices, for example USB flash drives, printers or barcode readers
3	Touch screen	Displays information and is used to enter information
4	Power button	Starts up and shuts down the spectrophotometer
5	Lid	Protects the analysis compartment

Bottom view



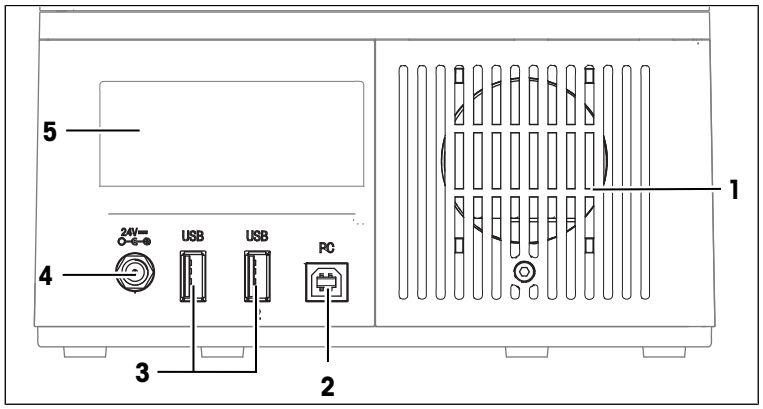
No.	Name	Function
1	Drain hole	Drainage hole for liquids spilled inside the spectrophotometer
2	Safety label (Easy VIS only)	Warns that the light bulb can be hot and cause burns
3	Lamp and battery compartment	Access point to replace the following parts: • Battery • Lamp (Easy VIS only)

See also

Maintenance ▸ Page 101

Technical data ▸ Page 121

3.1.2 Rear panel



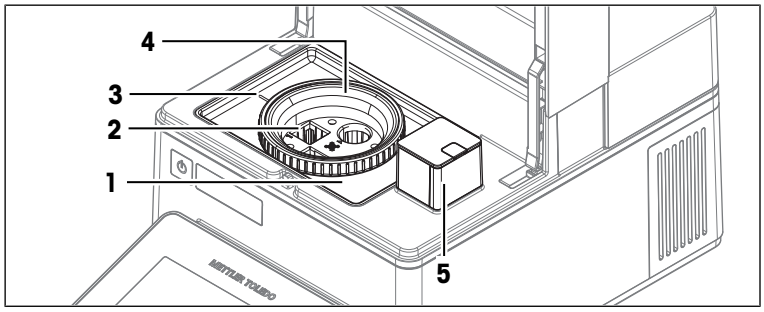
No.	Name	Function
1	Vent	Air outlet for cooling the spectrophotometer
2	**PC**	USB-B socket to connect a computer

No.	Name	Function
3	**USB 1/USB 2**	USB-A socket to connect USB devices, for example printers or barcode readers
4	**24V**	DC socket to connect the AC/DC adapter
5	Type label	Shows important information about the spectrophotometer

See also

- Maintenance ▸ Page 101
- Technical data ▸ Page 121

3.1.3 Analysis compartment



No.	Name	Function
1	Drip tray	Protects internal components from spillage
2	Measurement position	Position for cuvette during measurement
3	Mark	Mark for aligning cuvette carousel dot with the measurement position
4	Cuvette carousel	Cuvette carousel with cuvette holders for specific cuvette types
5	Internal barcode reader (optional accessory)	Reads 2D barcodes of water test kits, for example Spectroquant®

See also

- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Set up the SQKitReader internal barcode reader ▸ Page 26
- Maintenance ▸ Page 101
- Technical data ▸ Page 121

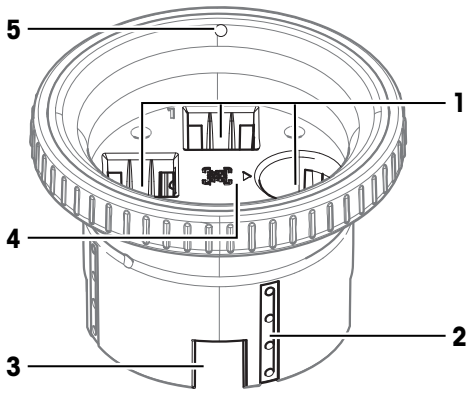
3.1.4 Cuvette carousels

There are three cuvette carousels that can be used with the spectrophotometer:

- Cuvette carousel 10/16
- Cuvette carousel 20/30
- Cuvette carousel 40/50/1

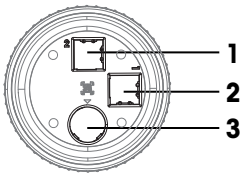
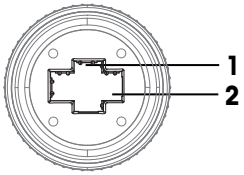
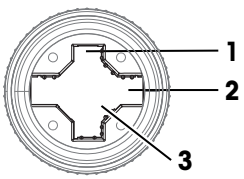
Each carousel has cuvette holders intended for use with specific cuvette types. Only one carousel can be installed in the analysis compartment at a time.

Cuvette carousel overview



No.	Name	Function
1	Cuvette holders	For placement of cuvettes in the cuvette carousel
2	Position magnet	Spectrophotometer detects magnets to determine which cuvette holder is in the measurement position
3	Light beam opening	Four cutouts in cuvette carousel allow the light beam to pass through sample
4	Barcode symbol and triangle	Symbols to align the 2D barcodes of water test kits
5	Dot	Dot for aligning the cuvette holder with the measurement position mark

Cuvette carousel specifications

Name	Top view	Cuvette holders
Cuvette carousel 10/16		**1**: 10 mm cuvette holder **2**: 10 mm cuvette holder **3**: Ø16 mm cuvette holder
Cuvette carousel 20/30		**1**: 20 mm cuvette holder **2**: 30 mm cuvette holder
Cuvette carousel 40/50/1		**1**: 40 mm cuvette holder **2**: 50 mm cuvette holder **3**: 1 inch cuvette holder

See also

- Cuvettes and cuvette holders ▸ Page 13
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Path length settings ▸ Page 37
- Loading cuvettes into holders ▸ Page 38
- Maintenance ▸ Page 101
- Technical data ▸ Page 121

3.1.5 Cuvettes and cuvette holders

Cuvettes must conform to the following guidelines:

- Only use macro cuvettes designed for use with spectrophotometers that have a Z height of 8.5 mm.
- Only use macro cuvettes because they have an optical window larger than the light beam.
- Only use flat-bottomed macro cuvettes.

The cuvette holders in each carousel accommodate specific cuvette types and path lengths. When analyzing samples, observe the following recommendations for cuvette use:

- Only use liquid blank solutions and samples for analysis.
- Use a cuvette cover when analyzing volatile or combustible samples.
- If present, only handle the frosted sides of cuvettes.
- Do not handle the clear sides of cuvettes.
- Only load cuvettes with the same width/diameter as the cuvette holder.

For questions regarding the use of micro cuvettes, contact your authorized METTLER TOLEDO service representative or dealer.

www.mt.com/contact

The following tables list the cuvette types that can be used with the cuvette holders in each cuvette carousel.

Cuvette carousel 10/16

Cuvette holder	Cuvette types
10 mm	0.1 mm optical path length macro cuvette
	0.2 mm optical path length macro cuvette
	0.5 mm optical path length macro cuvette
	1 mm optical path length macro cuvette
	2 mm optical path length macro cuvette
	5 mm optical path length macro cuvette
	10 mm optical path length macro cuvette
Ø16 mm	Glass tube: • 13.6 mm optical path length • 16 mm outer diameter • Flat bottom

Cuvette carousel 20/30

Cuvette holder	Cuvette type
20 mm	20 mm optical path length macro cuvette
30 mm	30 mm optical path length macro cuvette

Cuvette carousel 40/50/1

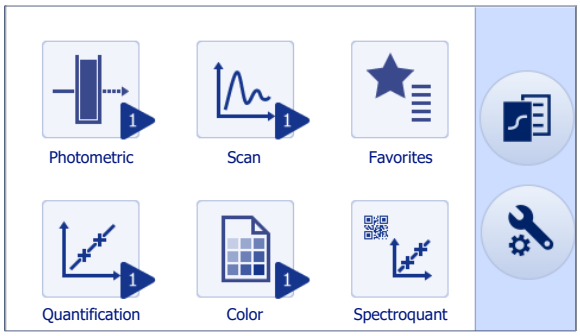
Cuvette holder	Cuvette type
40 mm	40 mm optical path length macro cuvette
50 mm	50 mm optical path length macro cuvette
1 inch	1 inch optical path length macro cuvette

See also

- Cuvette carousels ▸ Page 11
- Path length settings ▸ Page 37
- Loading cuvettes into holders ▸ Page 38
- Prepare the cuvettes ▸ Page 73
- Maintenance ▸ Page 101
- Technical data ▸ Page 121

3.2 Overview of home screen and functions

EasyPlus spectrophotometers perform optical spectroscopy and differ in their wavelength range. Measurements generate raw results that are provided as absorbance or percent transmittance. Depending on the method type, these raw results can be converted to other physical quantities like concentrations.



Icon	Name	Description
	Photometric	Configure and start a photometric method. Up to 20 methods can be configured. Absorbance, transmittance or both are measured at up to five specific wavelengths.
	Scan	Configure and start a scan method. Up to 20 methods can be configured. Absorbance or transmittance is measured as a function of wavelength. The results are provided as a spectrum.
	Favorites	Configure and start frequently used methods.
	Quantification	Configure and start a quantification method. Up to 20 methods can be configured. Absorbance or transmittance is measured at specific wavelengths. These raw results are converted to a desired result using either a formula or a calibration curve. • Formula: The spectrophotometer uses a mathematical formula that is defined by the user to calculate the desired result. • Calibration curve: The spectrophotometer creates a calibration curve based on the measurements of a range of standard solutions. Based on this calibration curve, the spectrophotometer calculates the concentrations of samples.

Icon	Name	Description
	**Color**	Configure and start a color method. Up to 20 methods can be configured. Absorbance or transmittance are measured. These raw results are converted to a color value according to the selected color scale.
	**Spectroquant** (with SQKitReader only)	Start Spectroquant® methods for water test kits. Absorbance is measured at specific wavelengths. These raw results are converted to the concentration of the analyte of the sample. The conversion is based on a mathematical formula, which is defined by the Spectroquant® test kit.
	**Results**	Access and manage the results of the last 100 analyses.
	**Setup & Tools**	Access the following functions: • **Settings**: change instrument settings. • **Language**: change the language of the user interface. • **Diagnostics**: run diagnostics. • **Toolbox**: update the firmware, restore factory settings, access tutorial and service information. • **Adjustment**: run adjustment methods to restore spectrophotometer performance: – Dark current correction of the two photosensors for accurate optical measurements (Easy VIS only). – System baseline correction for accurate optical measurements. • **Spectroquant** (with SQKitReader only): change settings that apply to all Spectroquant® methods.
	LongClick	Tap and hold the icon of one of the following apps to start the last performed method.  : The number in the triangle shows the method index of the last used method of the method type. • **Photometric** • **Scan** • **Quantification** • **Color**

See also

- Overview of the measurement technology ▸ Page 16
- Method configuration ▸ Page 29
- Example: Determine the spectrum of fruit juice ▸ Page 73
- Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
- Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93
- Accessories ▸ Page 123

3.3 Menu structure

	**Photometric**
	**Scan**
	**Favorites**

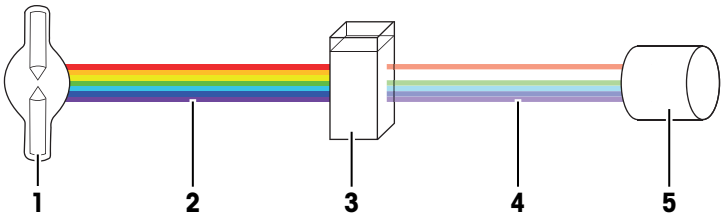
- **Quantification**
- **Color**
- **Spectroquant** (with SQKitReader only)
- **Results**
- **Setup & Tools**
  - **Settings**
  - **Language**
  - **Adjustment**
  - **Diagnostics**
    - **Peripheral check**
    - **Printer check**
    - **Performance test**
  - **Toolbox**
    - **Factory Reset**
    - **FW update**
    - **EasySetup Tutorial**
    - **MT-Service**
      - **Service history**
      - **Settings**
  - **Spectroquant** (with SQKitReader only)

See also

- Configure the spectrophotometer ▸ Page 22
- View parameter descriptions ▸ Page 72

3.4 Overview of the measurement technology

3.4.1 Measurement principle



The lamp (1) emits light (2) with a known spectrum and a defined intensity. This light passes through the sample and the cuvette (3). The sample and the cuvette absorb some of the light. The optical sensor (5) measures the intensity of remaining light (4).

This light intensity is not the final result. In addition to the sample, the solvent and the cuvette also absorb light. To correct for the absorption of the solvent and the cuvette, a blank solution needs to be measured. The blank solution is typically the solvent used to dissolve the sample.

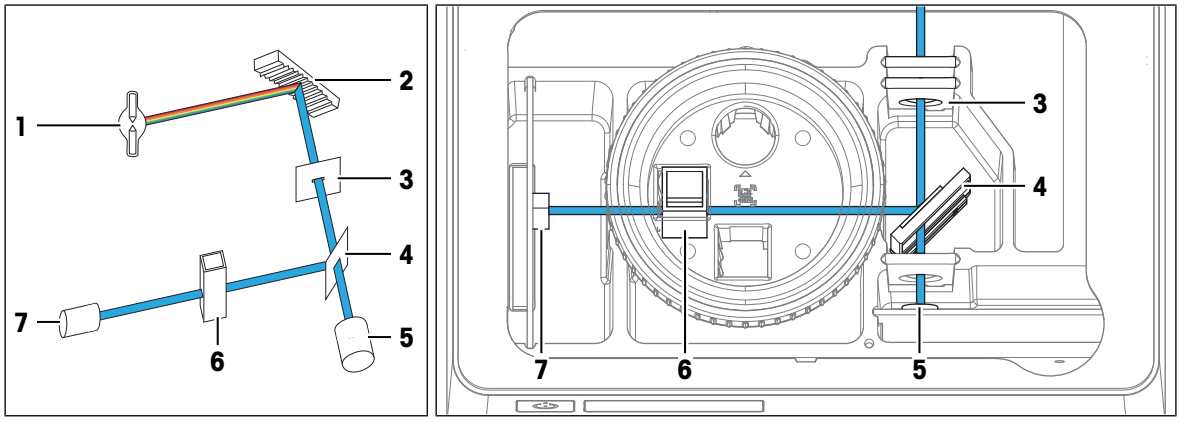
See also

Technical data ▸ Page 121

3.4.2 Scanning spectrophotometers

EasyPlus UV/VIS spectrophotometers are based on a scanning setup. In scanning spectrophotometers, consecutive measurements of the transmittance value at individual wavelengths are recorded.

A grating separates the light from the lamp into different wavelengths. Only one wavelength at a time can pass through the exit slit. The transmittance at this wavelength is recorded. Then the grating rotates and a different wavelength passes trough the exit slit. The whole spectrum is obtained by combining the measurements at the different wavelengths.



No.	Name	Function
1	Lamp	Emits light
2	Rotating grating	Separates the light beam into the different wavelengths and changes the exit angle of the light beam
3	Exit slit	Only lets one wavelength pass
4	Beam splitter	Splits the light beam into two beams, the reference light-beam and the sample light-beam
5	Optical sensor for reference light-beam	Records the transmittance of the reference light-beam
6	Sample	Absorbs light at specific wavelengths
7	Optical sensor for sample light-beam	Records the transmittance of the sample light-beam after it passed through the sample

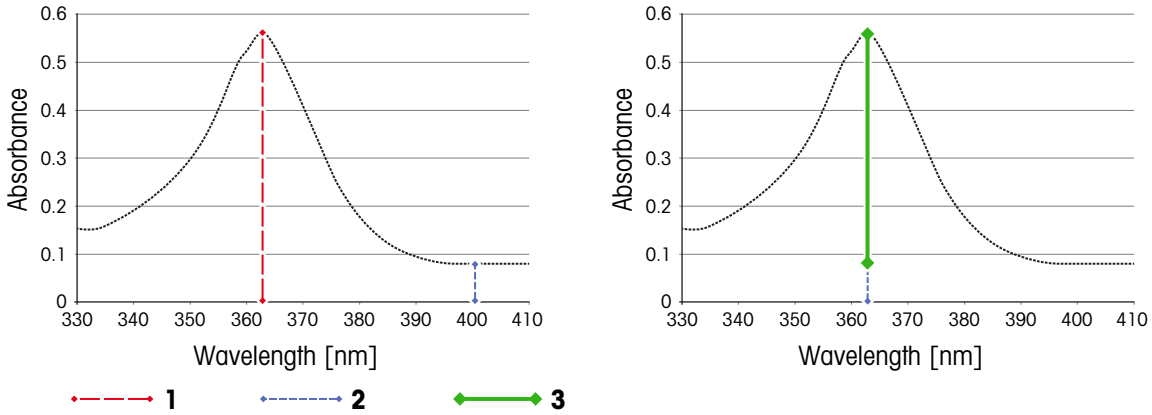
EasyPlus UV/VIS spectrophotometers use dual beam technology. When the light beam passes through the exit slit, a beam splitter separates the light beam into two light beams: a reference light-beam and a sample light-beam. The reference light-beam continues to an optical sensor that measures the reference value. The sample light-beam path continues through the sample cuvette, a lens and onto another optical sensor that records the spectrum.

See also

Analysis compartment ▸ Page 11
Cuvettes and cuvette holders ▸ Page 13
Install the cuvette carousel ▸ Page 23

3.4.3 1-point background correction

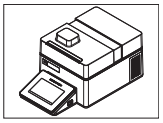
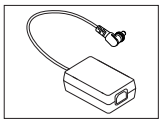
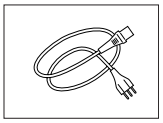
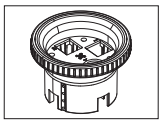
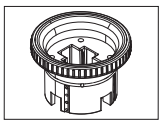
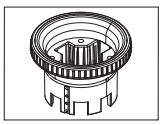
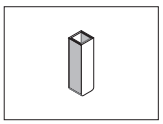
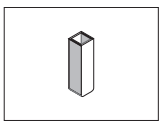
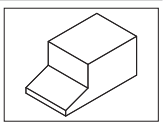
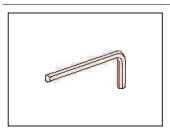
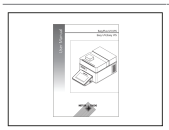
The absorbance at a reference wavelength is used to correct the result.



No.	Symbol	Explanation
1	A(λ)	Absorbance of the sample without background correction
2	A(λRef1)	Absorbance at the wavelength used for the background correction
3	A(λ, λRef1)	Corrected absorbance: A(λ, λRef1) = A(λ) - A(λRef1)

4 Installation

4.1 Scope of delivery

Part		Order number	Easy UV	Easy VIS
	Spectrophotometer	–	•	•
	AC adapter with power cable	30472916	•	•
	Power cable Country specific	–	•	•
	XPathHolder cuvette carousel 10/16	30705122	•	•
	XPathHolder cuvette carousel 20/30	30705123	•	•
	XPathHolder cuvette carousel 40/50/1	30705124	•	•
	Cuvette Standard Q Quartz Glass 10 mm (2 pcs)	30675051	•	–
	Cuvette Standard O Optical Glass 10 mm (2 pcs)	30675053	–	•
	Dust cover	–	•	•
	Allen wrench	–	•	•
	User Manual	–	•	•
	Declaration of conformity	–	•	•

Part		Order number	Easy UV	Easy VIS
	Test report	–	•	•

See also

Accessories ▸ Page 123

4.2 Download manuals

1 Go to the website www.mt.com/library.
2 Select the **Technical Documentation** tab.
3 Find the product type on the housing of the spectrophotometer and enter it into the search field.
4 Start the search.
5 Select the manual from the result list.
6 Select the link.
➡ The manual is either opened or downloaded depending on the browser settings.
7 Check which firmware version is installed on your spectrophotometer.
8 If the manual is not written for the installed firmware version, contact your authorized METTLER TOLEDO service representative or dealer.

▸ www.mt.com/contact

See also

Update the firmware ▸ Page 111
View the firmware version and other system information ▸ Page 119

4.3 Unpack the spectrophotometer

1 Remove the spectrophotometer from the protective packaging.
2 Store the protective packaging for later transport over long distances.
3 Check that you have 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 19

4.4 Position the spectrophotometer

The spectrophotometer has been developed for indoor operation in a well-ventilated area.
The following site requirements apply:

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

See also

Technical data ▸ Page 121

4.5 Connect and disconnect the power supply

4.5.1 Connect the power supply

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

⚠ WARNING

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 cable and AC/DC 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 them if damaged.

NOTICE

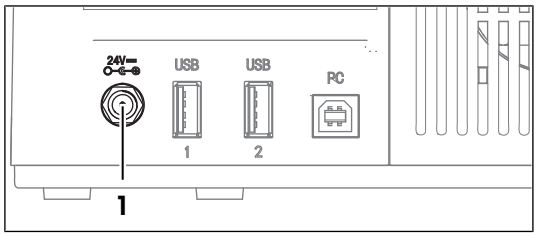
Damage to the AC/DC adapter due to overheating

An AC/DC adapter that does not have adequate air circulation around it, cannot cool sufficiently and overheats.

– Do not cover the AC/DC adapter.

Procedure

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 into the socket of the AC/DC adapter.
3 Insert the plug of the AC/DC adapter into the **24V** socket (1) on the rear panel.
4 Tighten the knurled nut to secure the plug.
5 Insert the plug of the power cable into a grounded power outlet that is easily accessible.



See also

Rear panel ▸ Page 10
Start up the spectrophotometer ▸ Page 68

4.5.2 Disconnect the power supply

■ The spectrophotometer is shut down.
1 Pull the plug of the power cable out of the power outlet.
2 Loosen the knurled nut.

3 Pull the plug of the AC/DC adapter out of the **24V** socket on the rear panel.

See also

- Rear panel ▸ Page 10
- Shut down the spectrophotometer ▸ Page 71

4.6 Configure the spectrophotometer

4.6.1 Change the language

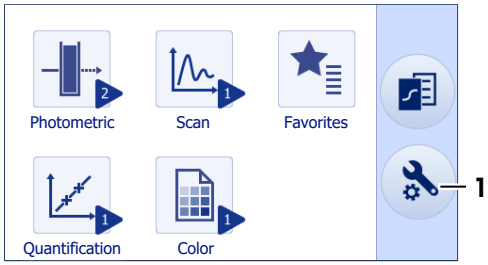
1 Go to (1) > .

2 Tap **Language** and select the language from the list.

➡ The selected language is used on the touch screen and printouts.

3 To return to **Setup & Tools**, tap .

4 To return to the home screen, tap .



See also

- Overview of home screen and functions ▸ Page 14
- View parameter descriptions ▸ Page 72

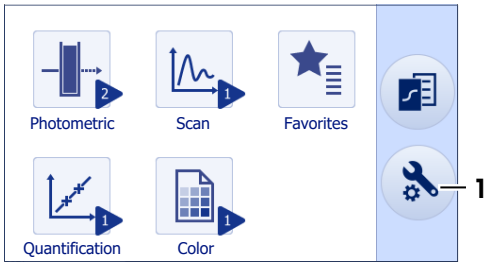
4.6.2 Configure date and time

This chapter shows you how to access and change the following settings:

- Date and time formats
- Date/time

Procedure

1 Go to (1) > .



2 Select **Settings** (1).

3 Change the parameters as needed.

4 To display parameter descriptions, tap (2).

5 To return to the home screen, go to (3) > .

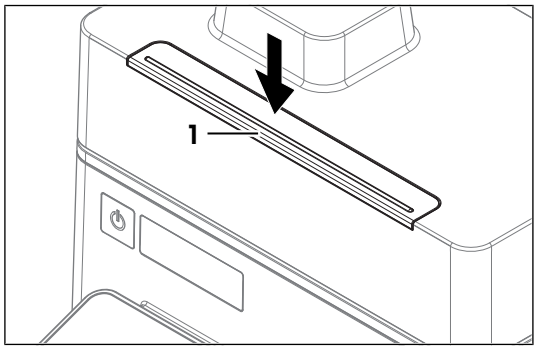
See also

- Overview of home screen and functions ▸ Page 14
- View parameter descriptions ▸ Page 72

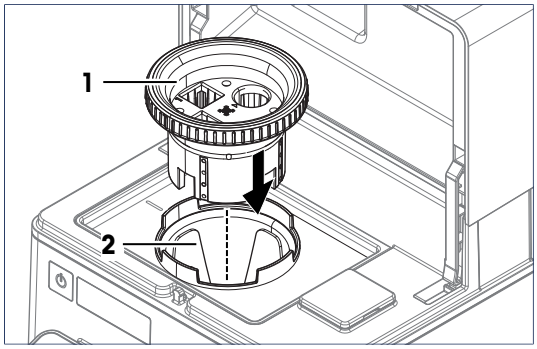
4.7 Install the cuvette carousel

To perform measurements, a cuvette carousel must be properly installed in the drip tray in the analysis compartment. Each carousel has a dot above each cuvette holder. When installing a cuvette carousel, the dot must be aligned with the mark on the drip tray for proper positioning of the desired cuvette holder in the measurement position.

1 Press down on the lid (1) to open the analysis compartment.

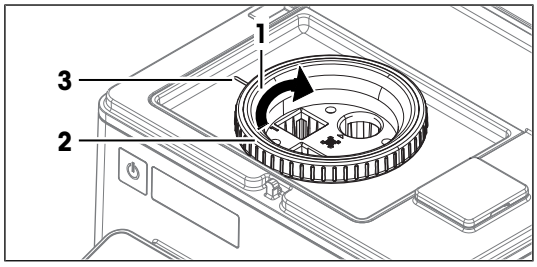


2 Insert the cuvette carousel (1) into the drip tray (2).



3 Rotate the cuvette carousel (2) to align the cuvette holder dot (1) with the measurement position mark (3).

➡ The positioning pin snaps into the positioning groove when the cuvette holder is properly aligned.

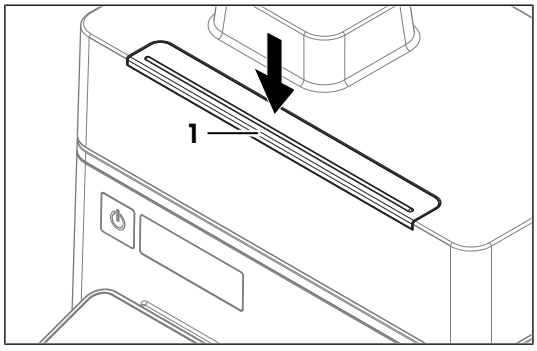


See also

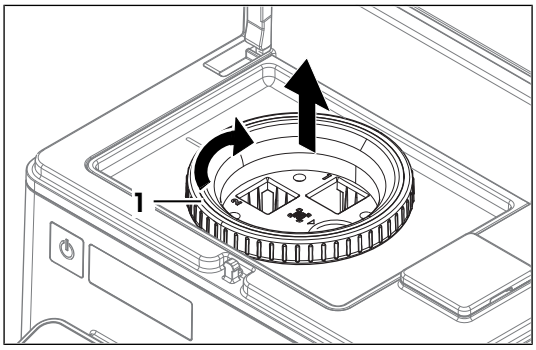
- Analysis compartment ▸ Page 11
- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13

4.8 Change the cuvette carousel

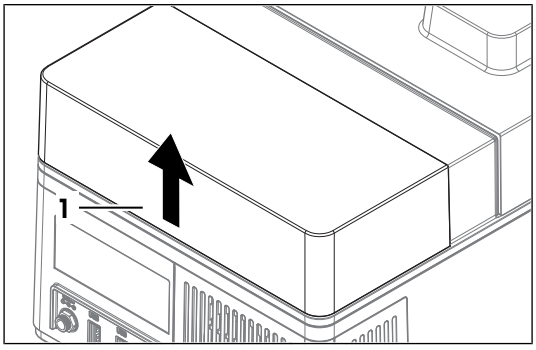
1 Press down on the lid (1) to open the analysis compartment.



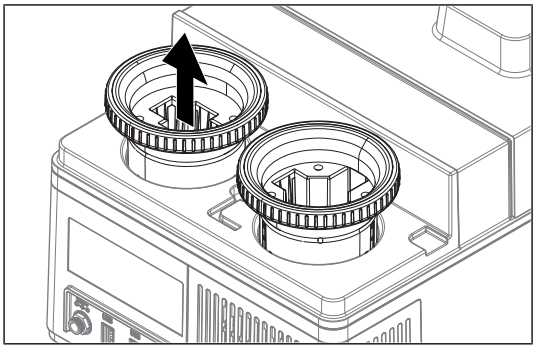
2 Slightly turn the cuvette carousel (1) and lift it out of the drip tray.



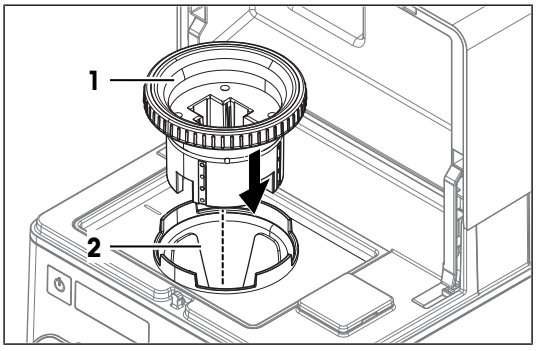
3 Lift the back cover (1) of the storage compartment.



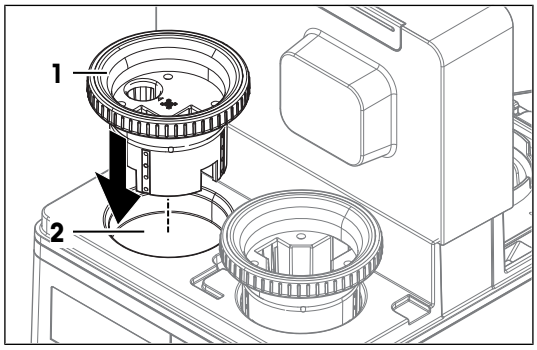
4 Lift the cuvette carousel out of the cuvette carousel bay.



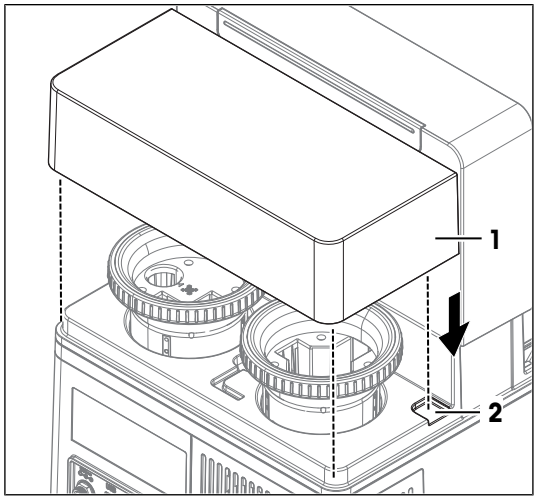
5 Insert the cuvette carousel (1) into the drip tray (2).



6 Insert the previously installed cuvette carousel (1) into the empty cuvette carousel bay (2).



7 Align the back cover (1) with the magnet notches (2).
8 Lower the back cover (1) onto the storage compartment.



See also

- Cuvette carousels ▸ Page 11
- Analysis compartment ▸ Page 11
- Install the cuvette carousel ▸ Page 23

4.9 Install accessories

4.9.1 Connect and test a USB printer

If a printer is connected, you can use the following functions:

- Print results as soon as they are saved.
- Print individual results from the result list.
- Print configuration data of methods with the exception of Spectroquant® methods.

Read the user documentation of the USB printer for more information on how to set up and operate the USB printer.

See also

- Accessories ▸ Page 123

4.9.1.1 Connect the USB printer

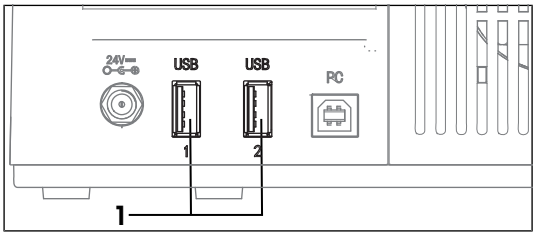
- The USB printer is set up.
- A USB-A-B cable is available.

1 Insert the USB-B plug of the printer cable into the USB-B socket on the rear panel of the printer.

2 Insert the USB-A plug of the printer cable into one of the **USB 1**/**USB 2** sockets (1) on the rear panel of the spectrophotometer, or the front USB socket.

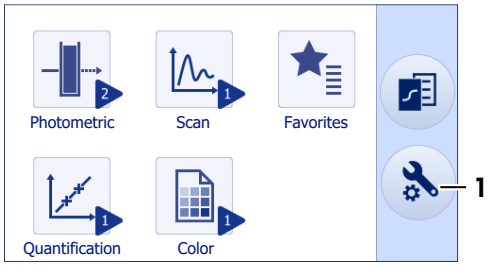
3 Switch on the USB printer.

➡ The spectrophotometer automatically detects the USB printer.



4 To check the connection, go to (1)> > .

➡ **Printer** is set to **Connected**.



See also

Rear panel ▸ Page 10

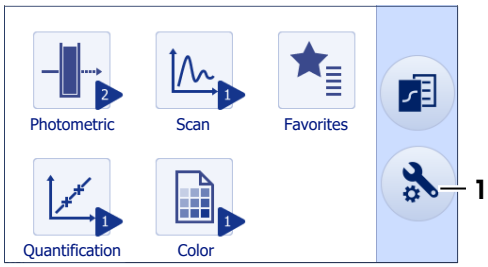
Accessories ▸ Page 123

4.9.1.2 Test the USB printer

■ The USB printer is connected and switched on.

– Go to > (1) > > .

➡ The spectrophotometer sends a test page to the printer.



4.9.2 Set up the SQKitReader internal barcode reader

If an internal barcode reader is connected, you can use the following functions:

- Run Spectroquant® methods to analyze samples with Spectroquant® water tests.
- Scan 2D barcodes of Spectroquant® water tests to open the appropriate Spectroquant® method.

See also

Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82

Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93

Accessories ▸ Page 123

4.9.2.1 Install the internal barcode reader

Material

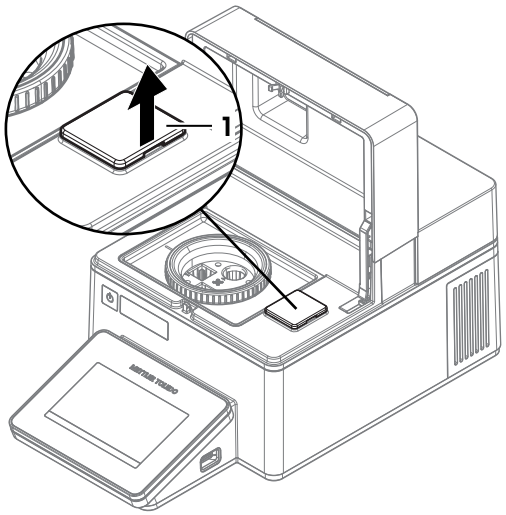
- Allen wrench
- SQKitReader

Procedure

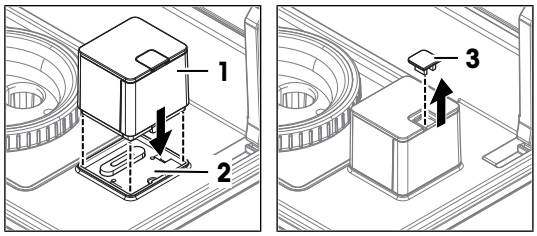
1 Shut down the spectrophotometer.

2 Disconnect the spectrophotometer from the power supply.

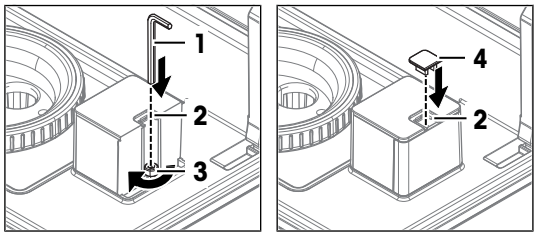
3 Lift off the cover (1) and store it in a safe place.



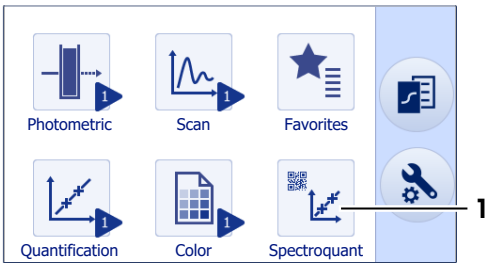
4 Lower the internal barcode reader (1) onto the socket (2).
   ➡ Magnets pull the internal barcode reader down and hold it in place.
5 Gently push the internal barcode reader into the socket.
6 Lift off the cover (3).



7 Insert the Allen wrench (1) into the opening (2) and down into the screw (4).
8 Tighten the screw clockwise.
9 Insert the cover (4) into the opening (2).
10 Connect the spectrophotometer to the power supply.
11 Restart the spectrophotometer.



   ➡ The Spectroquant® app (1) is visible on the home screen.

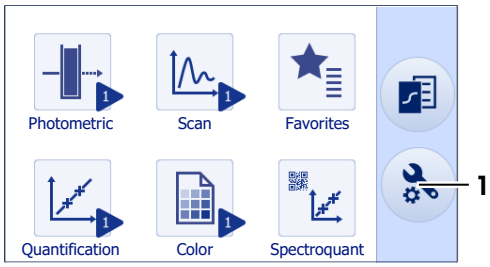


See also

- Analysis compartment ▸ Page 11
- Connect and disconnect the power supply ▸ Page 21
- Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
- Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93
- Accessories ▸ Page 123

4.9.2.2 Check the version of the Spectroquant® methods

1 Go to (1) > .

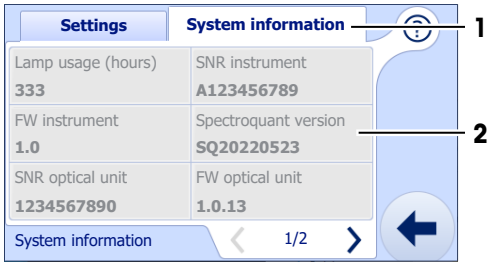


2 Select **System information** (1).

3 In **Spectroquant version** (2) look up the installed version of the Spectroquant® methods.

4 Check on mt.com/easyplus-uvvis, whether the latest version of the Spectroquant® methods is installed.

5 If needed, update the Spectroquant® methods.



See also

- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15

5 Method configuration

The spectrophotometer uses five types of methods to perform the different types of analyses. Choose the method that suits your analysis:

- **Photometric**: Photometric methods are used to measure absorbance and/or transmittance for up to five specific wavelengths.
- **Scan**: Scan methods are used to measure the spectrum.
- **Quantification**: Quantification methods are used to calculate a concentration or user-defined result based on a photometric measurement.
- **Color**: Color methods are used to measure the color of a substance based on predefined color scales.
- **Spectroquant**: Spectroquant® methods are used for water testing applications.

See also

- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15
- Configure the spectrophotometer ▸ Page 22
- View parameter descriptions ▸ Page 72
- Example: Determine the spectrum of fruit juice ▸ Page 73
- Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
- Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93

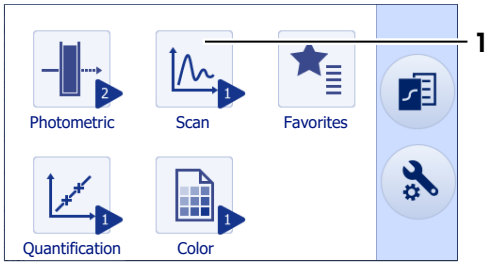
5.1 Access the method editor

The photometric, scan, quantification and color methods require configuration of the measurement parameter settings. Each method has measurement parameters that can be configured for a specific analysis. The example below shows how to access the scan method editor to configure the measurement parameters. The method editor for each method can be accessed following these steps after selecting the desired method.

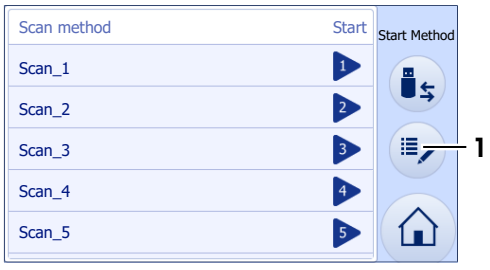
Procedure

1 Select (1).

➡ The scan method list opens.

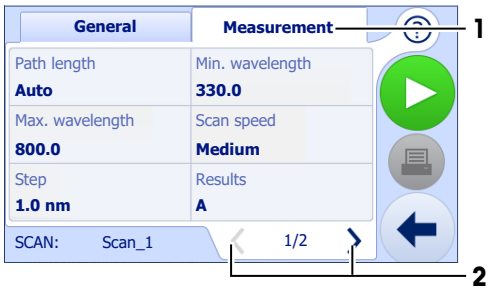


2 Select (1).



3 Select (1) to open the method editor.
➡ The **General** and **Measurement** tabs open.

4 Select **Measurement** (1)
5 Use the arrows (2) to move between windows.
➡ The measurement parameters can be configured.



See also

- Overview of home screen and functions ▸ Page 14
- Scan method ▸ Page 38
- Quantification method ▸ Page 47
- Example: Determine the spectrum of fruit juice ▸ Page 73
- Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
- Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93

5.2 Working with blank values

Overview

Sample result determination is dependent upon the measurement of a sample in solvent and a corresponding blank solution. Typically, the blank solution is only the solvent and it is used to measure the intensity of light transmitted through the solvent in the absence of sample. The light intensity change at different wavelengths is calculated by dividing the transmitted intensity of a measured sample by the corresponding values of the blank solution. The blank measurement is necessary for correcting any absorption that is not caused by the sample.

The following table provides an overview of the types of blank measurements for each method type:

Method type	Blank measurement	Description
Photometric	Blank solution	Solvent in absence of sample is measured prior to sample measurement.
Scan	Blank solution	Solvent in absence of sample is measured prior to sample measurement.
Quantification	Standard blank solution	Solvent in absence of standard is measured prior to standard measurement.
	Sample blank solution	Solvent in absence of sample is measured prior to sample measurement.
Color	Blank solution	Solvent in absence of sample is measured prior to sample measurement.

Method type	Blank measurement	Description
Spectroquant	Zero adjustment	Solvent in absence of sample is measured prior to sample measurement.
	Reagent blank	• Default reagent blank: No measurement required because the blank value is stored in the method based on the kit catalog number. • Custom reagent blank: Solvent and reagent(s) are combined in the absence of sample and measured prior to sample measurement.
	Sample blank	Solvent and sample are combined in the absence of reagent(s) and measured prior to sample measurement.

5.2.1 When to measure a blank solution

All EasyPlus UV/VIS methods require blank solution measurements prior to sample measurements if valid blank values are not previously stored. Spectoquant® methods require a zero adjustment and may also require reagent blank and/or sample blank solution measurements depending on the analysis being performed. The spectrophotometer always uses the values of the last measured blank solution for a configured method to calculate a result.

New blank solutions must be measured for a variety of different method-specific reasons. Universal reasons, common for all methods, to measure new blank solutions are provided in the following table:

Action	Description
Lamp counter reset	When the lamp counter is reset, all stored blank values, except default reagent blank values for Spectroquant® methods, are deleted and new blank measurements are required.
Changes in path length	The spectrophotometer detects the path length in the measurement position prior to sample measurement. If there is no stored blank value for the path length in the measurement position detected by the instrument, you will be prompted to measure a new blank solution, provided the detected path length is valid for the method. After a successful measurement of the blank solution, the previously stored blank value will be deleted, but this does not apply to Spectroquant® methods.

See also

- Cuvettes and cuvette holders ▸ Page 13
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Path length settings ▸ Page 37
- Start up the spectrophotometer ▸ Page 68
- Replace the lamp (Easy VIS only) ▸ Page 107
- Reset the lamp usage time (Easy VIS only) ▸ Page 109
- Check lamp usage (Easy VIS only) ▸ Page 109

5.2.1.1 Blank measurement for all method types except Spectroquant®

When a blank solution is measured for the first time, the blank value is stored for seven days for that specific method. After seven days, a new blank solution must be measured. A stored blank value is only valid for the specific method. If certain parameter settings in the measurement tab for a configured method are changed, the blank value is no longer valid. The parameters that require a new blank measurement after changing the settings are listed in the following table:

Method	Parameters
Photometric	• **Wavelength** • Wavelength values for **Wavelength 1** through **Wavelength 5** • **Background corr.** • Wavelength value for **Background corr.** • **Results**
Scan	• **Min. wavelength** • **Max. wavelength** • **Scan speed** • **Step**
Quantification	Formula and calibration curve: • **Calculation type** • **Unit** Formula: • **Abs./Transm.** (adding or deleting) • Wavelength **Value** • **Background corr.** • Wavelength value for **Background corr.** Calibration curve: • **Background corr.** • Wavelength value for **Background corr.** • **λ meas.**
Color	• **Color scale** • **Wavelength range** • **Step**

Blank measurement for photometric, scan and color methods

After a photometric, scan or color method is configured, you are prompted to measure the blank solution when the first sample measurement is performed.

Blank measurement for quantification methods

Blank solution measurement for quantification methods depends on the type of quantification method being performed. For a calibration curve, two blank solution measurements may be necessary: a standard blank solution and a sample blank solution. Standard blank solution measurement is performed during configuration of the standards. Sample blank solution measurement for a calibration curve is only necessary when background correction is active. For both calibration curve and formula methods, you are prompted to measure the sample blank solution when the first sample measurement is performed.

See also

- Remeasure a blank solution or zero cell ▸ Page 33
- Scan method ▸ Page 38
- Quantification method ▸ Page 47
- Quantification with a calibration curve ▸ Page 53
- Blank measurements for a calibration curve ▸ Page 61
- Quantification with a formula ▸ Page 62
- Example: Determine the spectrum of fruit juice ▸ Page 73

5.2.1.2 Blank measurement for Spectroquant® methods

Blank solution measurements for Spectroquant® methods depend on the Spectroquant® analysis being performed. All methods require zero adjustment and some may also require reagent blank and/or sample blank measurement. Zero adjustment, reagent blank and sample blank values are stored for different lengths of time and can be dependent upon method, kit catalog number, kit lot ID number, path length value and wavelength value.

Zero adjustment

When a zero adjustment is performed, the value is stored for seven days. The stored value is valid for the wavelength and path length configurations, and is applicable for all Spectroquant® methods based on these wavelength and path length configurations. After seven days, you will be prompted to perform a new zero adjustment.

Reagent blank

There are two options for using a reagent blank: default and custom.

When using the default setting, no physical measurement is required because the blank value is programmed into the method based on the kit catalog number. When using the custom setting, a custom reagent blank is measured to obtain a blank value.

To measure a custom reagent blank, a valid zero adjustment value must be stored. The reagent blank parameter is set to **Custom**. When a custom reagent blank is measured, the blank value is stored for the configured path length setting and kit lot ID number. The custom reagent blank value remains valid for the kit catalog number, kit lot ID number and path length configuration until the lamp counter is reset. The stored value is applicable for all Spectroquant® methods based on the kit catalog number, kit lot ID number and path length. New custom reagent blank measurement is required if any changes are made regarding the kit catalog number, kit lot ID number or path length while the Spectroquant® method is open.

A custom reagent blank can be measured to calculate a mean blank value or overwrite an existing value. Tap either R▶ or ▶R for custom reagent blank measurement options. Up to five custom reagent blank values can be stored for each kit lot number for calculating a mean reagent blank value.

Sample blank

To measure a sample blank, a valid zero adjustment value must be stored. The sample blank parameter is set to **Yes**. When a sample blank is measured, the sample blank value is only stored for the next single sample measurement. New sample blank measurements are required if you exit the method (i.e., return to the home screen) after performing a sample measurement or if a different Spectroquant® kit catalog number is entered.

A sample blank can be measured to calculate a mean blank value or overwrite an existing value. Tap either S▶ or ▶S for sample blank measurement options. Up to five sample blank values can be stored for each kit lot number for calculating a mean sample blank value.

See also

- Remeasure a blank solution or zero cell ▸ Page 33
- Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
- Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93

5.2.2 Remeasure a blank solution or zero cell

All methods provide an option to remeasure a blank solution to obtain a new blank value. Users can tap to measure a blank solution even if a stored blank value is still valid.

For photometric, scan, quantification and color methods, blank solution measurement can be performed manually to overwrite an existing value. Tap and you will be prompted to insert the cuvette containing blank solution for a new measurement.

For Spectroquant® methods, zero adjustment can be performed manually to overwrite an existing value. Tap and you will be prompted to insert the zero cell for a new measurement.

To remeasure a blank solution or zero cell for a new value while rapid measure is active, see [Recommended procedures for using rapid measure ▸ Page 34].

See also

- Using rapid measure with all methods except Spectroquant® ▸ Page 35
- Using rapid measure with Spectroquant® methods ▸ Page 36

5.3 Rapid measure

EasyPlus UV/VIS spectrophotometers have a **Rapid measure** feature. When active, the instrument will initiate measurements without sample insert prompts if a valid blank value is stored for the method being performed.

See also

- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15
- Using rapid measure with all methods except Spectroquant® ▸ Page 35
- Using rapid measure with Spectroquant® methods ▸ Page 36

5.3.1 Activate or deactivate rapid measure

The setting for rapid measure determines how the spectrophotometer prompts for samples and blank solutions for each method:

- Rapid measure = No: You are prompted to insert samples for measurement.
- Rapid measure = Yes: If a valid blank value is stored, sample measurement starts without an insert sample prompt.
- Rapid measure = Yes: If a valid blank value is not stored, you are prompted to measure a blank solution followed by an insert sample prompt.

For all methods except Spectroquant®, the rapid measure feature is located in the system settings. For Spectroquant® methods, the rapid measure feature is located in the Spectroquant® settings.

All methods except Spectroquant®

Procedure

1 Go to > .
2 Tap **Rapid measure** to select **Yes** or **No**.
3 To return to the home screen, go to > .
➡ Rapid measure is configured for all methods except Spectroquant® methods.

Spectroquant® methods

Procedure

1 Go to > .
2 Tap **Rapid measure** to select **Yes** or **No**.
3 To return to the home screen, go to > .
➡ Rapid measure is configured for Spectroquant® methods.

See also

- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15

5.3.2 Recommended procedures for using rapid measure

When rapid measure is active, it is important to open the lid prior to starting a method. If the lid is closed and a valid blank value is stored, the spectrophotometer will immediately begin measuring, without a sample prompt, when a method is started from the method list. If a valid blank value is not stored, you will be prompted to insert a blank. It is recommended to keep rapid measure inactive and only activate the feature when planning to repeatedly measure a single sample or measure multiple samples consecutively.

5.3.2.1 Using rapid measure with all methods except Spectroquant®

Measuring samples

Procedure

- Rapid measure is active.
- The method is configured.
- A valid blank value for the configured method is stored.
- The spectrophotometer is running.

1 Open the lid.
2 Select the method type (**Photometric**, **Scan**, **Quantification** or **Color**).
3 Select the configured method from the method list.
   ➡ You are prompted to insert the cuvette containing sample.
4 Insert the first sample.
5 Close the lid.
   ➡ The measurement starts.
   ➡ When the measurement is complete, the revolving circle is replaced by ▶.
6 Open the lid and remove the first sample.
7 Insert the second sample.
8 Close the lid.
9 Tap ▶ to start the analysis.
   ➡ The measurement starts.
10 When complete, repeat the process of opening the lid and measuring samples.

➡ All samples have been measured.

Remeasure a blank solution while rapid measure is active

To remeasure a blank solution for a new blank value before performing a sample measurement, the lid must be open before starting a method.

Procedure

- Rapid measure is active.
- The method is configured.
- A valid blank value for the configured method is stored.
- The spectrophotometer is running.

1 Open the lid.
2 Select the method type (**Photometric**, **Scan**, **Quantification** or **Color**).
3 Select the configured method from the method list.
   ➡ You are prompted to insert the cuvette containing sample.
4 Tap 0.0.
5 Insert the cuvette containing blank solution.
6 Close the lid.
   ➡ The measurement starts.
   ➡ When the measurement is complete, the revolving circle is replaced by ▶.
   ➡ You are prompted to insert the cuvette containing sample.

➡ The blank solution has been remeasured.

To remeasure a blank solution for a new blank value after performing a sample measurement, open the lid, tap ▶, tap 0.0 and you will be prompted to insert the blank solution for a new measurement.

See also

Blank measurement for all method types except Spectroquant® ▸ Page 31

5.3.2.2 Using rapid measure with Spectroquant® methods

Measuring samples

Procedure

- Rapid measure is active.
- The method is configured.
- Valid blank values for the configured method are stored.
- The spectrophotometer is running.

1 Open the lid.
2 Select .
   ➡ You are prompted to scan the 2D barcode.
3 Scan the 2D barcode.
   ➡ You are prompted to insert the cuvette containing sample.
4 Insert the first sample.
5 Close the lid.
   ➡ The measurement starts.
   ➡ When the measurement is complete, the revolving circle is replaced by .
6 Open the lid and remove the first sample.
7 Insert the second sample.
8 Close the lid.
9 Tap to start the analysis.
   ➡ The measurement starts.
10 When complete, repeat the process of opening the lid and measuring samples.

➡ All samples have been measured.

Remeasure a zero cell while rapid measure is active

To remeasure a zero cell for a new zero adjustment value before performing a sample measurement, the lid must be open before selecting the Spectroquant® method.

Procedure

- Rapid measure is active.
- The method is configured.
- Valid blank values for the configured method are stored.
- The spectrophotometer is running.

1 Open the lid.
2 Select .
   ➡ You are prompted to scan the 2D barcode.
3 Scan the 2D barcode.
4 Tap .
   ➡ You are prompted to insert the zero cell.
5 Insert the zero cell.
6 Close the lid.
   ➡ The measurement starts.
   ➡ When the measurement is complete, the revolving circle is replaced by .

➡ You are prompted to insert the cuvette containing sample.

➡ The zero cell has been remeasured.

To remeasure a zero cell for a new zero adjustment value after performing a sample measurement, open the lid, tap ▶, tap 0,0 and you will be prompted to insert the zero cell for a new measurement.

See also

🔗 Blank measurement for Spectroquant® methods ▸ Page 33

5.4 Path length settings

Path length

EasyPlus UV/VIS spectrophotometers have two settings for cuvette path length:

- Auto: cuvette path length is automatically detected.
- Fixed: cuvette path length is manually entered.

Cuvette path length selection is entered during method configuration when setting **Measurement** parameters. For quantification methods, the path length parameter can be set to auto or fixed when a formula calculation type is used. When a calibration curve is used, this parameter defaults to fixed and is not available for configuration. For information on path length configuration for quantification methods see [Configure the path length ▸ Page 49].

Auto path length detection

When set to auto, the spectrophotometer automatically uses the detected path length for method implementation (i.e., it checks if there is a stored blank value for the path length) and post-measurement calculation. For example, if a 10 mm cuvette holder is in the measurement position, the measurement results will be calculated based on a 10 mm optical path length.

Macro cuvettes with 0.1 mm, 0.2 mm, 0.5 mm, 1 mm, 2 mm and 5 mm path lengths can be used in the 10 mm cuvette holder but auto path length detection cannot be used. The spectrophotometer only detects the dimensions of the cuvette holder (i.e., 10 mm) but it does not detect the path length of the inserted cuvette. For 0.1 mm to 5 mm path length cuvettes, the fixed path length setting must be used. If cuvettes with 0.1 mm to 5 mm path lengths are not loaded correctly into the measurement position, incorrect measurements may result.

Fixed path length detection

When set to fixed, the path length must be manually selected from the pulldown list. If the instrument detects that the cuvette holder in the measuring position is not consistent with the selected fixed setting, you will be prompted to position the cuvette holder correctly.

Procedure

1 Select the method type (**Photometric**, **Scan**, **Quantification** or **Color**).

2 Open the method editor.

3 Select **Measurement**.

4 Tap **Path length** to select **Auto** or **Fixed**.

➡ If **Auto** is selected, the path length will be automatically detected by the spectrophotometer.

5 If **Fixed** is selected, tap **Path length (fixed)** and select the desired setting from the list.

➡ Path length is configured.

See also

🔗 Cuvettes and cuvette holders ▸ Page 13

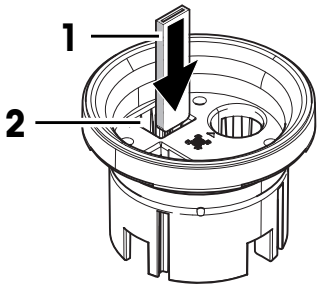
🔗 Install the cuvette carousel ▸ Page 23

🔗 Access the method editor ▸ Page 29

🔗 Loading cuvettes into holders ▸ Page 38

5.5 Loading cuvettes into holders

Cuvette carousel 10/16 cuvette loading



Load flat cuvettes with 0.1–0.5 mm and 1–5 mm path lengths straight down into the 10 mm cuvette holder (2) with the optical window (1) positioned perpendicular to the light beam. Position the cuvette against the inner wall of the holder closest to the center of the carousel and ensure it is not slanted. Gently press down on the cuvette to confirm it is at the bottom of the cuvette holder.

Load rectangular cuvettes with 10 mm path lengths straight down into the center of the 10 mm cuvette holder with the clear sides positioned perpendicular to the light beam.

Load 16 mm flat-bottomed, glass tube cuvettes into the Ø16 mm cuvette holder by holding the top half of the tube. Do not handle the cuvette in the lower half aligned with the light beam. When measuring samples in the Ø16 mm cuvette holder, ensure there is no cuvette in the 10 mm cuvette holder aligned with the light beam.

Cuvette carousel 20/30 cuvette loading

Load cuvettes with 20 mm and 30 mm path lengths straight down into the center of the respective cuvette holder with the clear sides positioned perpendicular to the light beam read path.

Cuvette carousel 40/50/1 cuvette loading

Load cuvettes with 40 mm and 50 mm path lengths straight down into the center of the respective cuvette holder with the clear sides positioned perpendicular to the light beam read path.

Load cuvettes with 1 inch path lengths straight down into the center of the 1 inch cuvette holder in any orientation.

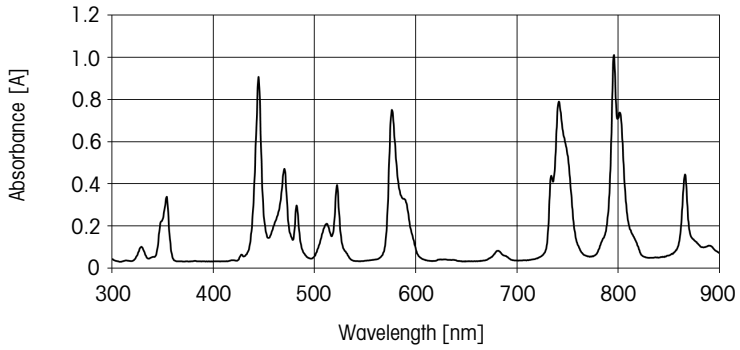
See also

- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Path length settings ▸ Page 37

5.6 Scan method

5.6.1 Overview

Spectral scanning measurements determine the absorbance (A) or transmittance (T) of a sample over a specified wavelength range or over the full spectrum range. The full spectrum range for Easy UV is 190 to 1000 nm and for Easy VIS the range is 330 to 1000 nm. Scanning measurement provides much more detailed results than when measuring a fixed wavelength.



In this example spectrum scan, the absorbance is measured starting at minimum wavelength 300 nm and ending at maximum wavelength 900 nm.

A common analysis is the detection of peaks in the spectrum. The heights and locations of peaks provide an indication of sample composition and purity. For example, from the location of peaks and combination of peaks, it can be concluded whether a compound is saturated or unsaturated. The identification of a compound can also be managed by comparing the spectrum to a known compound spectrum from a database. Scanning UV/VIS methods can be used for characterizing aromatic compounds and aromatic olefins.

Structure of the measurement tab

The following table shows the parameters available in the **Measurement** tab. After a scan method has been configured, any changes to any parameter will overwrite the existing configuration for the method.

Parameter	Subparameters			
Path length	**Auto**			
	Fixed	**Path length (fixed)**		
Min. wavelength				
Max. wavelength				
Scan speed	**Low**			
	Medium			
	High			
Step	**0.5 nm**			
	1.0 nm			
	2.0 nm			
	5.0 nm			
Results	**A**			
	%T			
Peaks/Valleys	**No**			
	Peaks	**Sensitivity**	**Low**	
	Valleys		**High**	
	Both		**Own**	**Prominence**
				Threshold
		Detect λ min.		
		Detect λ max.		

See also

- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15
- Path length settings ▸ Page 37
- Configure the wavelength range ▸ Page 40
- Configure the detection of peaks and valleys ▸ Page 41
- Configure scan speed and step ▸ Page 44
- Configure the results ▸ Page 46
- Example: Determine the spectrum of fruit juice ▸ Page 73

5.6.2 Configure the wavelength range

The wavelength range defines the starting and stopping wavelengths for the scan. Wavelengths are measured in nm. EasyPlus UV/VIS spectrophotometers perform scan measurements from short to long wavelengths, so the minimum wavelength value must be less than the maximum wavelength value.

Measurement settings

Before starting a scan, the minimum and maximum wavelengths must be defined. The minimum wavelength value must be less than the maximum wavelength value and within the range of 190 nm (Easy UV) or 330 nm (Easy VIS) to 1000 nm.

- Minimum wavelength: Defines the start wavelength for scanning.
- Maximum wavelength: Defines the end wavelength for scanning.

The minimum measurement increment is 0.5 nm, so the values for minimum and maximum wavelength settings will round to the closest reasonable wavelength. For example:

- A setting of 400.1 will round to 400.0
- A setting of 400.3 will round to 400.5
- A setting of 400.7 will round to 400.5
- A setting of 400.8 will round to 401.0

Procedure

1 Open the **Scan** method editor.

2 Select **Measurement**.

3 Select **Min. wavelength** and **Max. wavelength** to edit the parameters.

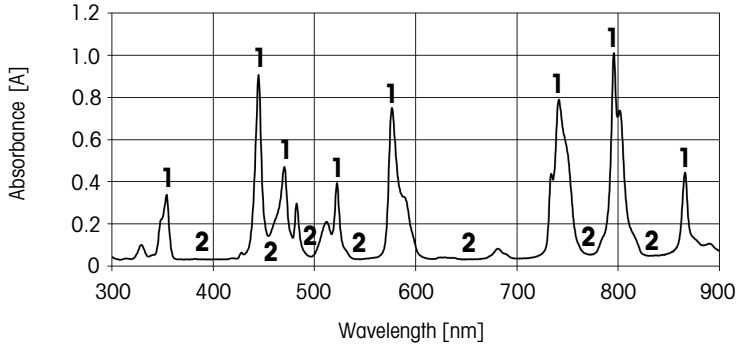
➡ The wavelength range is configured.

See also

- Access the method editor ▸ Page 29

5.6.3 Configure the detection of peaks and valleys

When scanning absorbance measurements over a defined wavelength range, peaks are points of absorbance maxima and valleys are points of absorbance minima. The detection of peaks and valleys is dependent upon sensitivity and wavelength range settings.



In this example spectrum scan, peaks (1) and valleys (2) are identified within a scanning range of 300 to 900 nm.

5.6.3.1 Peaks/valleys settings

Before starting a scan, the peaks/valleys setting must be defined:

- No: Neither peaks nor valleys will be detected.
- Peaks: Only peaks will be detected.
- Valleys: Only valleys will be detected.
- Both: Peaks and valleys will both be detected.

If peaks, valleys or both is selected, sensitivity and peak/valley detection wavelength range must be defined.

Procedure

1 Open the **Scan** method editor.
2 Select **Measurement**.
3 Tap **Peaks/Valleys** to select the desired setting from the list.
➡ The detection of peaks and valleys is configured.

See also

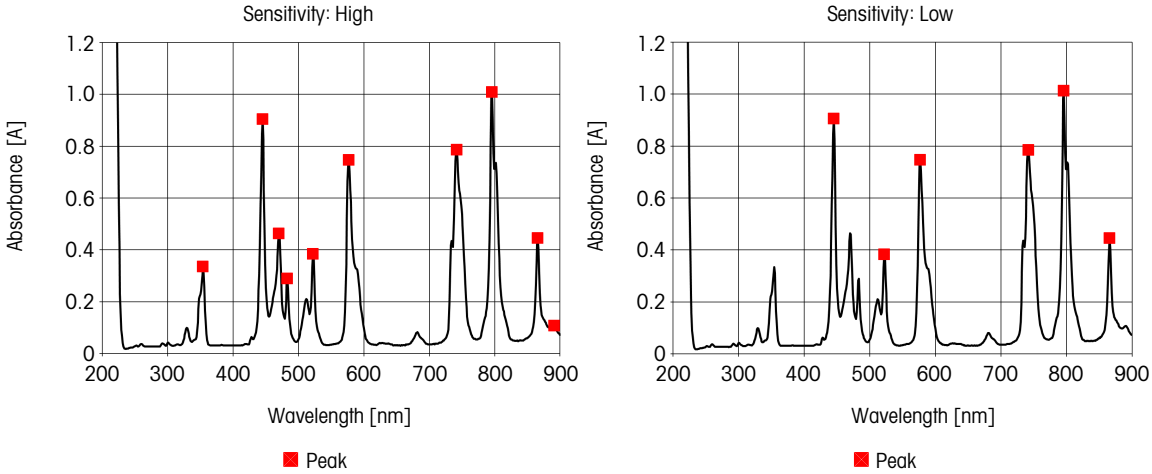
🔗 Access the method editor ▸ Page 29

5.6.3.2 Sensitivity settings

Sensitivity settings are based on threshold and prominence settings. A low sensitivity consists of a higher threshold value and a higher prominence value to define a peak, resulting in the identification of only the most prominent peaks. A high sensitivity consists of lower threshold and prominence values, resulting in more peaks being identified relative to adjacent data points. The level of sensitivity for detecting peaks can be selected from the following options:

- **Low** (threshold 20 %, prominence 3): Only the most prominent peaks are identified.
- **High** (threshold 5 %, prominence 2): Typically, more peaks are identified.
- **Own**: User-defined values for threshold and prominence determine peak identification.

If own is selected, threshold and prominence must be defined.



In the example spectrum scans above, the absorbance is measured starting at minimum wavelength 200 nm and ending at maximum wavelength 900 nm. In the scan on the left, the sensitivity is set to high and in the scan on the right it is set to low. Although the scan traces are nearly identical, the higher sensitivity setting results in more peaks being identified compared to the low sensitivity setting.

Procedure

1 Open the **Scan** method editor.
2 Select **Measurement**.
3 Tap **Sensitivity** to select the desired setting from the list.
➡ Sensitivity is configured.

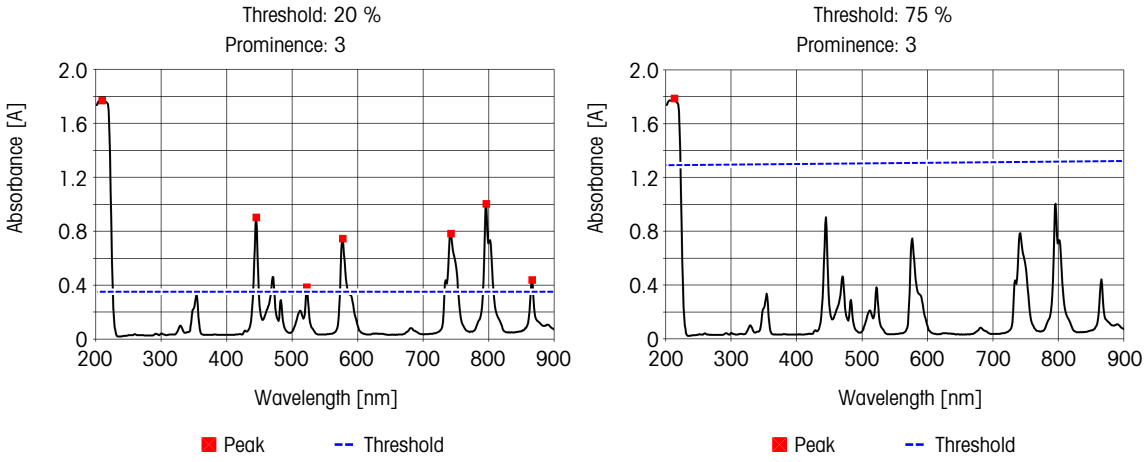
See also

Access the method editor ▸ Page 29

5.6.3.3 Threshold and prominence settings

Threshold

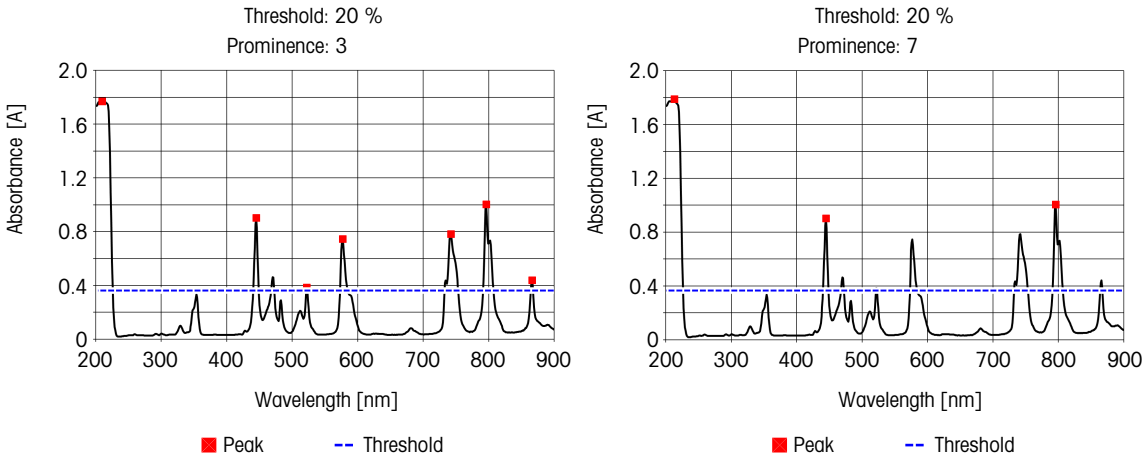
Threshold is defined as a simple cutoff boundary based on a percentage of absorbance measurements over the scanned spectrum range. For example, if the scanned spectrum absorbance values range from 0.2 to 1.8, and the threshold is set to 20 %, the absorbance value boundary for peak identification is 0.32. Measurement data points at 0.32 and greater may qualify as peaks. As such, a low threshold value will result in more peaks being identified in the scanned spectrum, while a high threshold value will result in fewer peaks being identified. However, peak identification is also dependent upon prominence, so the threshold setting does not guarantee that all data points greater than or equal to the threshold value will be identified as peaks.



In the example spectrum scans above, the absorbance is measured starting at minimum wavelength 200 nm and ending at maximum wavelength 900 nm. In both scans, the prominence is set to three. In the scan on the left, the threshold is set to 20 %, the maximum absorbance measurement is 1.771 at 210 nm and the minimum absorbance measurement is 0.018 at 235 nm. In the scan on the right, threshold it is set to 75 %, the maximum absorbance measurement is 1.789 at 213 nm and the minimum absorbance measurement is 0.023 at 234 nm. The 20 % threshold is approximately 0.35, so only absorbance measurements 0.35 and greater could potentially be defined as peaks. The 75 % threshold is approximately 1.31, so only absorbance measurements 1.31 and greater could potentially be defined as peaks. Although the scan traces are nearly identical, the lower 20 % threshold setting results in more peaks being identified compared to the higher 75 % threshold setting scan. In the 20 % threshold setting scan, the absorbance value of 0.46 at 470 nm is not identified as a peak, likely because of its proximity to the peak at 445 nm combined with the prominence setting of three.

Prominence

Prominence is defined as the minimum distance of a peak compared to surrounding peak data points combined with how much higher the peak is compared to other peak data points in the spectrum. A lower prominence setting increases the likelihood of a peak being identified relative to surrounding data points. A low prominence setting identifies more peaks by also selecting less prominent peaks relative to surrounding data points, while a high prominence setting only identifies the most dominant peaks, which could also include a small peak with no near or distant adjacent peak data points.



In the example spectrum scans above, the absorbance is measured starting at minimum wavelength 200 nm and ending at maximum wavelength 900 nm. In both scans, the threshold is set to 20 %. In the scan on the left, the prominence is set to three and in the scan on the right it is set to seven. Although the scan traces are nearly identical, the lower prominence setting results in the definition of more peaks compared to the scan with

the higher prominence setting. In the prominence three setting scan, the absorbance value of 0.46 at 470 nm is not identified as a peak, likely because of its proximity to the peak at 445 nm. A lower prominence setting, such as one or two results in the 445 nm data point being identified as a peak.

Threshold and prominence settings for detecting peaks can be configured within the following ranges:

- Threshold: Range 1 to 100 %.
- Prominence: Range 1 to 10.

Procedure

1 Open the **Scan** method editor.
2 Select **Measurement**.
3 Select **Threshold** to enter the desired setting.
4 Select **Prominence** to enter the desired setting.
➡ Threshold and prominence are configured.

See also

Access the method editor ▸ Page 29

5.6.3.4 Peak/valley detection wavelength range settings

The peak/valley detection wavelength range can help reduce the number of peaks and valleys that are detected. Peak/valley detection wavelength minimum and maximum values can be defined separately from the scanning wavelength range, but they must be within the defined scanning wavelength range. If the scanning wavelength range is changed after setting the peak/valley detection wavelength range, the peak/valley detection wavelength minimum and maximum values will automatically change to match the minimum and maximum scanning wavelength values.

Procedure

1 Open the **Scan** method editor.
2 Select **Measurement**.
3 Select **Detect λ min.** and **Detect λ max.** to edit the parameters.
➡ The peak/valley detection wavelength range is configured.

See also

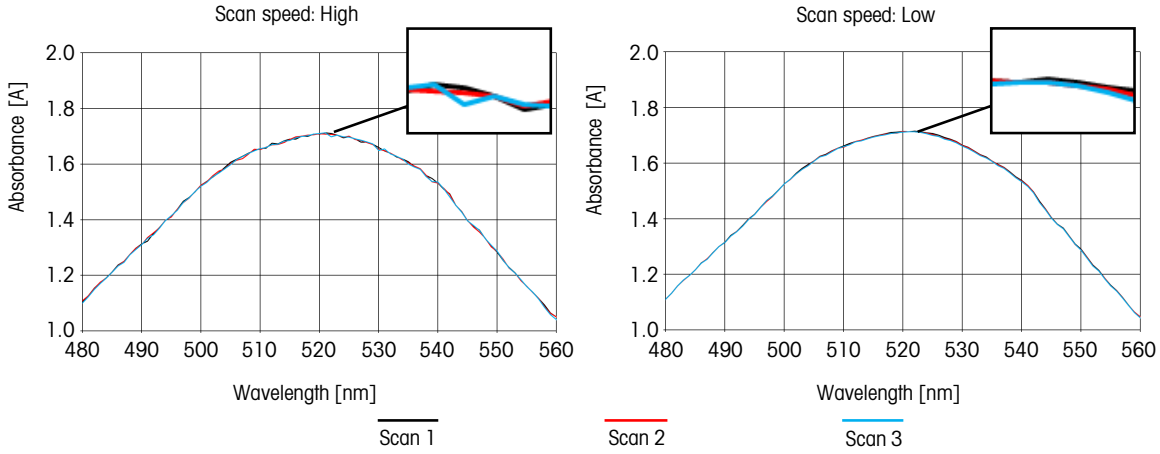
Access the method editor ▸ Page 29

5.6.4 Configure scan speed and step

Scan speed and step configurations are based on the desired measurement accuracy, reproducibility and amount of time you have to perform the analysis. Both parameters directly affect the resolution of data in spectral analysis. A low scan speed will provide the best accuracy in measurement, while a smaller step will provide the most defined peak detection. When configuring scan speed and step, the combination of settings will have varying effects on scan time and the resolution of measurement results.

5.6.4.1 Scan speed settings

Scan speed defines how frequently the spectrophotometer records measurements for absorbance/transmittance at specified wavelengths. The spectrophotometer collects data points for absorbance/transmittance for each wavelength based on distance (nm) per minute. Scan speed can be set to low, medium or high and directly affects the accuracy and reproducibility of the spectral data resolution.



In the example spectrum scans above, one sample was analyzed in triplicate using both high and low scan speeds. The absorbance is measured starting at minimum wavelength 480 nm and ending at maximum wavelength 560 nm. In both scans, the scan step is set to one. In the scan on the left the speed is set to high and slight deviations in measurements are indicated by variations in the colored traces. For comparison, the scan on the right is set to low speed. The low speed scan shows colored traces that are more closely aligned, with the consistent overlap indicating greater consistency in measurements. A low scan speed collects more data points and provides greater reproducibility, but requires more time. A high scan speed collects fewer data points and provides lower reproducibility, but requires less time.

Approximate scan speeds, using a scan step setting of 1.0 nm and an absorbance value of zero (i.e., air was measured), are defined in the following tables for each spectrophotometer:

Easy VIS (range 330–1000 nm)

Scan speed setting	Total time	Speed
Low	201 s	200 nm/min
Medium	63 s	640 nm/min
High	20 s	2010 nm/min

Easy UV (range 190–1000 nm)

Scan speed setting	Total time	Speed
Low	221 s	220 nm/min
Medium	145 s	335 nm/min
High	45 s	1080 nm/min

The low scan speed will provide the best accuracy and reproducibility in measurement, but has the longest measurement duration. The medium scan speed is designed to balance accuracy and measurement duration. The high scan speed has the shortest measurement duration, but provides the least accurate and reproducible measurement.

Procedure

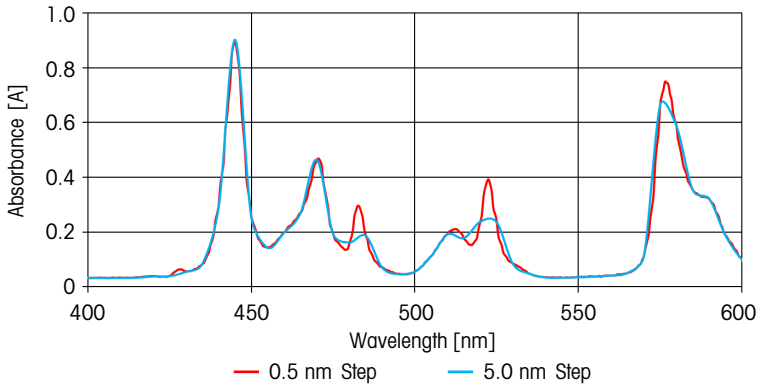
1 Open the **Scan** method editor.
2 Select **Measurement**.
3 Tap **Scan speed** to select the desired setting from the list.
➡ Scan speed is configured.

See also

Access the method editor ▸ Page 29

5.6.4.2 Scan step settings

The step defines the wavelength interval between two measurement points in a spectral scan. A smaller step increment will result in more data points and higher resolution of the spectral analysis. Conversely, a larger step increment will result in fewer data points and reduced resolution.



The magnitude of the scan step may affect the prominence of peaks. In this example spectrum scan ranging from 400 to 600 nm, the smaller step increment, 0.5 nm, results in more prominent peaks compared to the larger 5.0 nm increment.

There are four options for step size:

- 0.5 nm
- 1.0 nm
- 2.0 nm
- 5.0 nm

Procedure

1 Open the **Scan** method editor.

2 Select **Measurement**.

3 Tap **Step** to select the desired setting from the list.

➡ Scan step is configured.

See also

Access the method editor ▸ Page 29

5.6.5 Configure the results

The results configuration defines which physical quality of the material being analyzed will be measured and displayed on the vertical axis of the spectrum chart. Transmittance (%T) is the main value determined by UV/VIS spectroscopy. Absorbance (A) represents an additional result and is defined as the negative logarithm of the transmittance. The display of peaks and valleys is dependent upon the results configuration.

In general, a UV/VIS spectrum is graphically represented as absorbance as a function of wavelength. The advantage of this representation is that the heights of the absorption peaks are directly proportional to the concentration of the species. The degree of light absorption is indicated by higher absorbance values and appear as peaks while lower absorbance values appear as valleys. Conversely, results reported as % transmittance will display peaks at points of maximal transmittance and valleys at points of minimal transmittance.

Procedure

1 Open the **Scan** method editor.

2 Select **Measurement**.

3 Tap **Results** to select the desired setting from the list.

➡ The results are configured.

See also

Access the method editor ▸ Page 29

5.7 Quantification method

5.7.1 Overview

With a quantification method you can automate the calculation of a physical quantity using the raw results absorbance and transmittance. You do not have to use another software to convert absorbance or transmittance values to the physical quantity you need. The physical quantity is called a calculated result.

Raw results

Raw results are derived from measured values and cannot be changed by the user.

EasyPlus UV/VIS spectrophotometers generate raw results by measuring absorbance and transmittance as defined by pre-configured parameters.

Calculated results

Calculated results are derived from raw results based on formulas or curves.

EasyPlus UV/VIS spectrophotometers generate calculated results from raw results using a pre-configured formula or calibration curve.

Calculation

Quantification can be performed with EasyPlus UV/VIS spectrophotometers using either a formula or calibration curve for calculation of results (i.e., sample concentration). Quantification methods must first be configured to define if a calibration curve or formula is used as the calculation type. Up to 20 quantification methods can be configured and stored.

Calculation type	Description
Formula	Calculated results based on measured absorbance or transmittance are determined using up to four pre-defined formulas.
Calibration curve	Calculated results based on measured absorbance are determined using a calibration curve derived from standards of known concentrations.

The selected calculation type determines which parameters are available for configuration. The following table provides an overview of the parameters that can be configured for measurement of raw results, calculation and presentation of calculated results for each calculation type.

Calculation type	Raw result parameters	Calculation parameters	Calculated result parameters
Calibration curve	• Path length • Background correction • Wavelength	• Curve fit type • Standards for generating the calibration curve used to calculate the result	• Name of the result • Number of decimal places • Unit • Result limits for the range of acceptable values
Formula	• Path length • Background correction • Wavelength	• Formula used to calculate the result • Constants used as coefficients in the formula • Sample factors for defining sample-specific values used to calculate the result	• Name of the result • Number of decimal places • Unit • Result limits for the range of acceptable values

See also

- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15
- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51
- Quantification with a calibration curve ▸ Page 53
- Quantification with a formula ▸ Page 62

5.7.1.1 Structure of the Measurement tab

Calibration curve

The following table shows the parameters available in the **Measurement** tab for calculations using a calibration curve. This means that **Calculation type** is set to **Calibration curve**.

Parameter	Subparameters	
Path length	**Fixed**	
Path length (fixed)		
Background corr.	**λ corr.**	
Calculation type	**Calibration curve**	
Name		
Unit		
Decimal places		
λ meas.		
Result limits	**Lower limit**	
	Upper limit	
Curve	**Linear**	**Force through 0**
	Quadratic	
	Cubic	
Standards	**Concentration**	

Formula

The following table shows the parameters available in the **Measurement** tab for calculations using a formula. This means that **Calculation type** is set to **Formula**.

Parameter	Subparameters	
Path length	**Fixed**	**Path length (fixed)**
	Auto	**Norm. path length**
Background corr.	**λ corr.**	
Calculation type	**Formula**	
Abs./Transm.	**Value**	
Constants	**Constant a** through **Constant j**	
Sample factors	**Name**	
	Value	

Parameter	Subparameters	
Results	**Name**	
	Unit	
	Formula	
	Result limits	**Lower limit**
		Upper limit
	Decimal places	

See also

- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51
- Quantification with a calibration curve ▸ Page 53
- Quantification with a formula ▸ Page 62

5.7.2 Configure the calculation type

To configure a quantification method, the calculation type must be defined first. After a calculation type is selected, all subsequent parameter configurations are stored for the method. If the calculation type is changed, specific parameter configurations will be deleted. For a calibration curve, the configured parameters will be stored but the standards data points and calibration curve will be deleted. For a formula, all calculated result settings will be deleted.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Calculation type**.
4 Select **Calibration curve** or **Formula**.
➡ The calculation type is configured.

See also

- Access the method editor ▸ Page 29

5.7.3 Configure the measurement of raw results

5.7.3.1 Configure the path length

When configuring a formula calculation type, the path length setting can be set to auto or fixed.

- Auto: The spectrophotometer detects which path length is in the measurement position.
- Fixed: The path length in the measurement position is manually defined.

When a calibration curve is used, this parameter defaults to fixed and is not available for configuration.

Fixed path length configuration requires manually selecting the cuvette path length used for the procedure. For information on path length configuration see [Path length settings ▸ Page 37].

See also

- Access the method editor ▸ Page 29

5.7.3.2 Configure the path length normalization

Configure path length normalization to define if measured absorbance and transmittance values will be normalized to a 10 mm path length. If **Norm. path length** is activated, the measurements can be performed with a cuvette of any path length and the measured absorbances/transmittances are automatically converted to a path length of 10 mm.

This parameter is not available for configuration when a calibration curve is used. Path length normalization can only be configured when using a formula and the path length parameter is set to auto.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Calculation type** and select **Formula**.
4 Tap **Path length** and select **Auto**.
5 Tap **Norm. path length** to select **Yes** or **No**.
➡ Path length normalization is configured.

See also

- Access the method editor ▸ Page 29
- Path length settings ▸ Page 37
- Configure the calculation type ▸ Page 49

5.7.3.3 Configure the background correction

Background correction can be activated to correct absorbance/transmittance at the measured wavelength. Background correction accounts for a non-specific signal, such as spectral background, at the measured wavelength and excludes it to achieve a more accurate analyte-specific measurement.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Background corr.** to activate or deactivate.
4 If active, tap **λ corr.** to enter the wavelength for background correction.
➡ Background correction is configured.

See also

- Access the method editor ▸ Page 29

5.7.3.4 Configure the wavelength

A fixed wavelength setting is used for calibration curve and formula quantification methods. This requires manually entering the specific wavelength for photometric measurements. Fixed wavelengths for measurement can be selected within a range of 190 to 1000 nm for Easy UV or 330 to 1000 nm for Easy VIS.

Configure the wavelength for a calibration curve

The absorbance of standards and samples will be measured at the defined wavelength.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **λ meas.** to enter the wavelength.
➡ The wavelength measurement is configured.

Configure the wavelength for quantification with formula

The absorbance and transmittance for up to five wavelengths can be used in a formula quantification method. Configure absorbance/transmittance to define the specific wavelength values used in calculated results for each variable.

Procedure

1 Open the **Quantification** method editor.

2 Select **Measurement**.
3 Tap **Abs./Transm.**.
➡ A table with the wavelengths opens.
4 To create a new wavelength, tap +.
5 To change or delete an existing wavelength, select a wavelength.
➡ The wavelength editor opens.
6 Enter wavelength.
7 Tap ← to return to the wavelength table.
➡ The wavelength is configured.

See also

Access the method editor ▸ Page 29

5.7.4 Configure the presentation of the calculated result

5.7.4.1 Configure the name

The name of the calculated result must be defined. Typically, this is the name of the analyte.

Configure the name for a calibration curve result

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Name** to enter the name of the calculated result.
➡ The name is configured.

Configure the name for a formula result

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Result**.
➡ The results list opens.
4 To create a new result, tap +.
5 To change or delete an existing result, select the result.
➡ The result editor opens.
6 Tap **Name** to enter the name of the calculated result.
7 Tap ← to return to the results list.
➡ The name is configured.

See also

Access the method editor ▸ Page 29

5.7.4.2 Configure the unit

The unit of concentration for the result of the quantification method must be defined. Common units of concentration include, but are not limited to:

- Mass per unit volume (e.g., mg/L)
- Percent by mass (m/m %)
- Percent by volume (v/v %)
- Molarity (M)

- Normality (N)
- Molality (mol/kg)
- Parts per million (ppm)
- Parts per billion (ppb)

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Unit** to enter the concentration unit.
➡ The unit is configured.

See also

Access the method editor ▸ Page 29

5.7.4.3 Configure the decimal places

Calculated results can be configured to display zero to four decimal places. Values are rounded either to the nearest integer if zero decimal places are used or to the nearest 1st, 2nd, 3rd or 4th decimal places based on the configuration.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Decimal places** to select the desired setting from the list.
➡ Decimal places is configured.

See also

Access the method editor ▸ Page 29

5.7.4.4 Configure the result limits

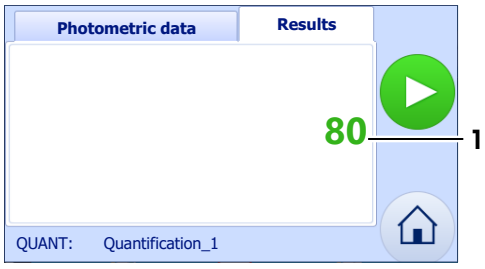
Result limits can be activated to perform a check to determine if calculated results are within a defined range. To identify outliers, you can manually set limits that define the acceptable value range for your result. Result limits must be within the range of 0 to 100,000. This function is suitable for use in a quality control setting:

- Quickly identify results that lie outside the defined acceptance criteria.
- Quickly identify unexpected results. Unexpected results can be an indication that the analysis was not performed correctly.

Results within the defined limits

Results within the defined limits are displayed in green (1).

All results are saved and can be viewed in the results list.

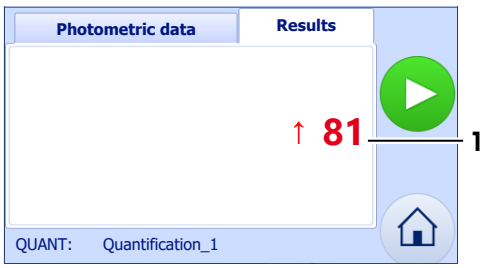


Results outside the defined limits

Results outside the defined limits are displayed in red (1).

- ↑ : indicates outliers above the upper limit.
- ↓ : indicates outliers below the lower limit.

All results are saved and can be viewed in the results list.



Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Result limits** to activate or deactivate.
4 If active, use the parameters **Lower limit** and **Upper limit** to define the range.
➡ Result limits is configured.

See also

Access the method editor ▸ Page 29

5.7.5 Quantification with a calibration curve

Quantification based on a calibration curve can be divided into the following steps:

- Selection of a suitable wavelength
- Determination of the calibration curve
- Measurement of the sample
- Determination of the sample concentration

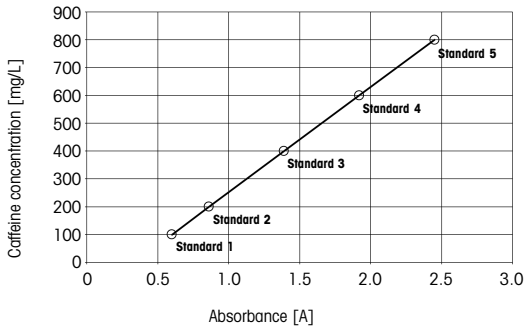
Selection of a suitable wavelength

The selected wavelength is normally a peak maximum, i.e., at an absorption peak. At a peak, the change in absorbance for a given concentration change is maximal, leading to greater sensitivity and accuracy in the measurements.

Determination of the calibration curve

For the calibration curve, the absorbance of known standards is measured at the selected wavelength and plotted against the concentration. The absorbance is proportional to the concentration and a first order regression curve can be fitted to the data points. The example below shows the calibration curve for caffeine dissolved in deionized water.

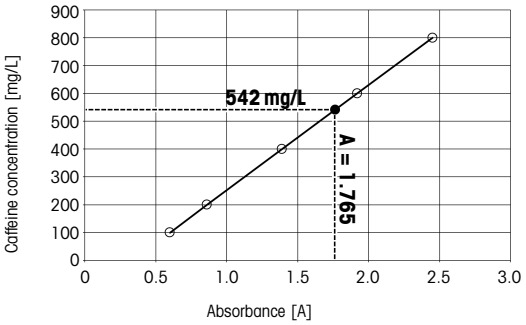
- Standard 1 (100 [mg/L] caffeine)
- Standard 2 (200 [mg/L] caffeine)
- Standard 3 (400 [mg/L] caffeine)
- Standard 4 (600 [mg/L] caffeine)
- Standard 5 (800 [mg/L] caffeine)



Measurement of the sample and determination of the sample concentration

As shown in the example below, the sample concentration for the measured absorbance can be read from the curve.

- Measured absorbance of the sample: 1.765
- Concentration of the sample: 542 mg/L



See also

- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51
- Configure the calibration curve ▸ Page 55

5.7.5.1 Overview of calibration curve configuration

To perform quantification using a calibration curve, the **Calculation type** must first be set to **Calibration curve**. All parameter configurations are stored for the method. If the **Calculation type** is changed to **Formula**, the configured parameters will be stored but the calibration curve and configured standards will be deleted.

The following components need to be configured:

Component	Description	Parameters	Additional information
Measurement of the raw results	Path length (fixed)	**Path length (fixed)**	[Configure the path length ▸ Page 49]
	Background correction	**Background corr.**	[Configure the background correction ▸ Page 50]
	Wavelength measurement	**λ meas.**	[Configure the wavelength ▸ Page 50]
Configuration of the curve	Curve fit type	**Curve**	[Configure the curve ▸ Page 55]
	Standard values	**Standards**	[Configure the standards ▸ Page 56]
Presentation of the calculated result	Name of the calculated result	**Name**	[Configure the name ▸ Page 51]
	Number of decimal places displayed for the calculated result	**Decimal places**	[Configure the decimal places ▸ Page 52]
	Unit of the calculated result	**Unit**	[Configure the unit ▸ Page 51]
	Range of acceptable values for the calculated result	**Result limits**	[Configure the result limits ▸ Page 52]

See also

- Structure of the Measurement tab ▸ Page 48
- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51
- Create a calibration curve ▸ Page 57

5.7.5.2 Configure the calibration curve

5.7.5.2.1 Configure the curve

The calibration curve is automatically determined from the measured absorbances of standards of varying concentrations. Curve settings are configured to define which curve fitting model is used for fitting data points. There are three models of curve fitting, based on linear and non-linear functions, that can be selected:

- **Linear**: Linear regression of the standard measurement data is used to determine a linear calibration function based on at least two measurements.
- **Quadratic**: A second-order polynomial (a parabola) is fitted to the standard measurement data based on at least three measurements.
- **Cubic**: A third-order polynomial is fitted to the standard measurement data based on at least four measurements.

In general, model selection should be based on achieving the highest accuracy with the provided variable data. While higher-order polynomials may provide greater flexibility to accommodate variable data, overfitting may occur and result in greater variance.

Once configured, any changes to the **Curve** parameter will result in an updated calibration curve based on the new selection.

Linear calibration curve

The linear calibration curve is the most common and simple model for curve fitting. The absorbance measurements of standards are plotted on the x-axis vs the known concentrations on the y-axis, resulting in a linear fit. The linear model requires a minimum of at least two configured standards. The linear equation is:

- C = (slope x A) + y-intercept, where A is absorbance and C is concentration

A is the measured absorbance of a sample, and slope and intercept are derived from the calibration curve based on the fit of the measured standards.

When using the linear method, the data can be forced to include the data point 0,0 (the origin of the coordinate system) in the curve fit. The **Force through 0** parameter must be activated or deactivated during configuration.

Quadratic calibration curve

The quadratic calibration curve is a non-linear method for curve fitting. The absorbance measurements of standards are plotted on the x-axis vs the known concentrations on the y-axis. The quadratic model requires a minimum of at least three configured standards. The quadratic equation is:

- $C = (a \times A^2) + (b \times A) + c$, where A is absorbance, C is concentration, and a, b and c are coefficients.

A is the measured absorbance of a sample and the coefficients are derived from the calibration curve based on the quadratic fit of the measured standards.

Cubic calibration curve

The cubic calibration curve is a non-linear method for curve fitting. The known concentrations of standards are plotted on the y-axis vs absorbance measurements on the x-axis. The cubic model requires a minimum of at least four configured standards. The cubic equation is:

- $C = (a \times A^3) + (b \times A^2) + (c \times A) + d$, where A is absorbance, C is concentration, and a, b, c and d are coefficients.

A is the measured absorbance of a sample and the coefficients are derived from the calibration curve based on the cubic fit of the measured standards. The concentration of the sample is solved directly using the cubic equation.

Procedure

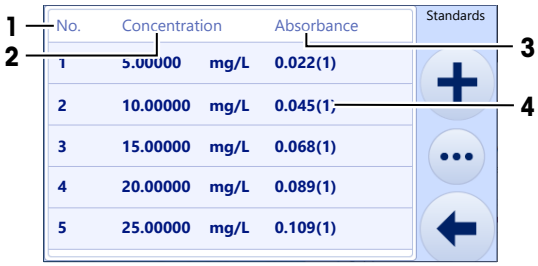
1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Curve** to select the curve model from the list.
4 If **Linear** is selected, activate or deactivate **Force through 0**.
➡ The curve is configured.

See also

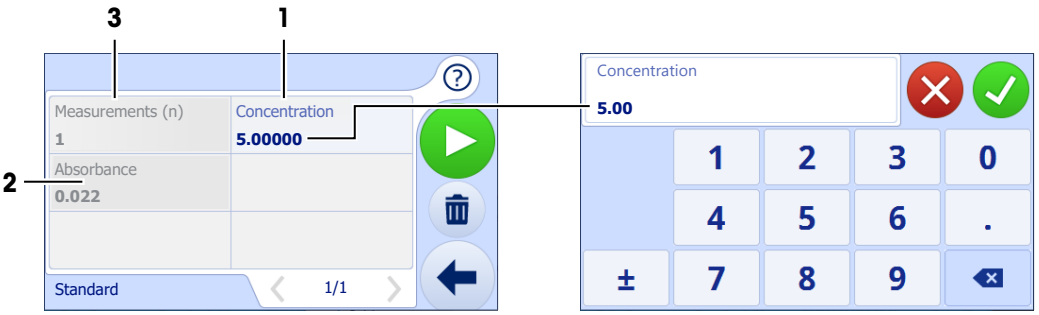
Access the method editor ▸ Page 29

5.7.5.2.2 Configure the standards

Standards are configured and measured to generate the calibration curve that will be used to determine calculated results.



The standards list is displayed in a table format for each calibration curve. The standard number (1), concentration (2) and absorbance (3) are displayed for each configured standard. The value in parenthesis (4) after each absorbance value is the number of times the standard has been measured. Up to 25 standards can be configured and stored for each calibration curve. The list above displays five configured standards. Configured standards are stored until they are edited or manually deleted from the list.



After measuring a standard, the standard editor displays the concentration (1), absorbance (2) and number of times (3) the standard has been measured.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Standards**.
➡ The standards table opens.
4 Tap +.
➡ The standard editor opens.
5 Tap **Concentration** to enter the concentration of the first standard.
6 Tap ▶.
➡ You are prompted to insert the blank solution.

7 Press down on the lid to open the analysis compartment.
8 Insert the cuvette containing blank solution vertically into the cuvette holder located in the measurement position.
9 Close the lid.
➡ The spectrophotometer measures the blank solution.
➡ You are prompted to insert the standard.
10 Press down on the lid to open the analysis compartment.
11 Remove the cuvette containing blank solution.
12 Insert the cuvette containing the first standard vertically into the cuvette holder located in the measurement position.
13 Close the lid.
➡ The spectrophotometer measures the standard.
14 Tap ✓ to return to the standard editor.
15 Tap ← to return to the standards table.
16 To create another standard, tap +.
➡ The standard editor opens.
17 Tap **Concentration** to enter the concentration of the second standard.
18 Tap ▶.
➡ You are prompted to insert the second standard.
19 Press down on the lid to open the analysis compartment.
20 Remove the cuvette containing the first standard.
21 Insert the cuvette containing the second standard vertically into the cuvette holder located in the measurement position.
22 Close the lid.
➡ The spectrophotometer measures the standard.
23 Tap ✓ to return to the standard editor.
24 Tap ← to return to the standards table.
25 To create additional standards, repeat the process until all standards are configured.
26 Tap ← to return to **Measurement**.
➡ The standards are configured for the method.

See also

Access the method editor ▸ Page 29
Blank measurements for a calibration curve ▸ Page 61

5.7.5.3 Create a calibration curve

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Calculation type** and select **Calibration curve**.
4 Configure **Path length (fixed)**.
5 Configure **Background corr.**.
6 Configure **Name**.
7 Configure **Unit**.
8 Configure **Decimal places**.
9 Configure **λ meas.**.
10 Configure **Result limits**.

11 Configure **Curve**.

12 Configure **Standards**.

13 Tap ← to return to **Measurement**.

➡ The calibration curve is configured and ready for sample analysis.

See also

- Access the method editor ▸ Page 29
- Structure of the Measurement tab ▸ Page 48
- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51
- Configure the calibration curve ▸ Page 55

5.7.5.4 View, edit and delete a calibration curve

The equation and values for a configured calibration curve method can be viewed using the method editor. Existing standards for a calibration curve can be edited by changing concentrations, overwriting absorbances with new measurements or remeasuring standards to calculate mean absorbance values. Standards for a configured calibration curve method can be deleted, but the existing calibration curve will change.

5.7.5.4.1 View a calibration curve

Procedure

1 Open the **Quantification** method editor.

2 Select **Measurement**.

3 Tap **Standards**.

➡ The standards table opens.

4 Tap ⋯.

➡ The options list opens.

5 Select **Show calibration curve**.

➡ The equation and R^2 value for the calibration curve are displayed.

6 Tap ← to return to **Measurement**.

See also

- Access the method editor ▸ Page 29
- Configure the standards ▸ Page 56

5.7.5.4.2 Edit the concentration

The concentration value of an existing standard can be edited but changing the concentration deletes the previous absorbance measurement and changes the existing calibration curve. When changing concentrations of existing standards, new standards must be measured to generate new absorbance values.

Procedure

1 Open the **Quantification** method editor.

2 Select **Measurement**.

3 Tap **Standards**.

➡ The standards table opens.

4 Tap the standard that requires editing.

➡ The standard editor opens.

5 Tap **Concentration** to edit the concentration value.

6 Tap ▶.

➡ You are prompted to insert the standard.

7 Press down on the lid to open the analysis compartment.

8 Insert the cuvette containing the standard vertically into the cuvette holder located in the measurement position.

9 Close the lid.

➡ The spectrophotometer measures the standard.

10 Tap ✅ to return to the standard editor.

11 Tap ⬅ to return to the standards table.

➡ The concentration is edited and the new values are stored for the standard.

See also

🔗 Access the method editor ▸ Page 29

🔗 Configure the standards ▸ Page 56

5.7.5.4.3 Remeasure and overwrite the absorbance

A standard can be measured again to overwrite the existing absorbance value.

Procedure

1 Open the **Quantification** method editor.

2 Select **Measurement**.

3 Tap **Standards**.

➡ The standards table opens.

4 Tap the standard that requires overwriting.

➡ The standard editor opens.

5 Tap ▶.

6 Tap **Measure and overwrite**.

➡ You are prompted to insert the standard.

7 Press down on the lid to open the analysis compartment.

8 Insert the cuvette containing the standard vertically into the cuvette holder located in the measurement position.

9 Close the lid.

➡ The spectrophotometer measures the standard.

10 Tap ✅ to accept the new measurement or ❌ to reject.

➡ You return to the standard editor.

11 Tap ⬅ to return to the standards table.

➡ The absorbance is overwritten and the new value is stored for the standard.

See also

🔗 Access the method editor ▸ Page 29

🔗 Configure the standards ▸ Page 56

5.7.5.4.4 Remeasure and calculate the mean absorbance

A standard can be measured multiple times to calculate a mean absorbance value.

Procedure

1 Open the **Quantification** method editor.

2 Select **Measurement**.

3 Tap **Standards**.

➡ The standards table opens.

4 Tap the standard that requires remeasuring.
➡ The standard editor opens.
5 Tap ▶.
6 Tap **Measure and calculate mean**.
➡ You are prompted to insert the standard.
7 Press down on the lid to open the analysis compartment.
8 Insert the cuvette containing the standard vertically into the cuvette holder located in the measurement position.
9 Close the lid.
➡ The spectrophotometer measures the standard.
10 Tap ✅ to accept the remeasurement or ❌ to reject.
➡ You return to the standard editor.
11 Tap ← to return to the standards table.
➡ The absorbance is measured and the mean value is stored for the standard.

See also

Access the method editor ▸ Page 29
Configure the standards ▸ Page 56

5.7.5.4.5 Deleting standards

There are two ways to delete standards from a calibration curve:

- Delete individual standards
- Delete all standards

Regardless of which option is used, stored blank values will not be deleted. When new standards are created for a calibration curve, it is recommended to measure a new blank solution.

Deleting individual standards

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Standards**.
➡ The standards table opens.
4 Tap the standard you want to delete.
➡ The standard editor opens.
5 Tap 🗑.
6 Confirm the deletion.
➡ The standards table opens.
7 Tap ← to return to **Measurement**.
➡ The individual standard is deleted from the calibration curve.

Deleting all standards

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Standards**.
➡ The standards table opens.
4 Tap ⋯.
➡ The options list opens.

5 Select **Delete all data points**.

6 Confirm the deletion.

➡ The cleared standards table opens.

7 Tap ← to return to **Measurement**.

➡ All standards are deleted from the calibration curve.

See also

- Access the method editor ▸ Page 29
- Configure the standards ▸ Page 56

5.7.5.5 Blank measurements for a calibration curve

Blank measurements are required when performing quantification using a calibration curve:

- Blank value for zeroing the spectrophotometer for measurement of standards.
- Blank value for zeroing the spectrophotometer for measurement of samples when background correction is active.

When background correction is inactive, the blank solution measured for standards provides the blank value for sample measurements.

Once a blank solution has been measured, either for samples or standards, the blank value is stored for seven days. After seven days, you are prompted for a new blank solution measurement for the calibration curve.

Options for measuring a blank solution include the following:

- Measure blank solution for standards during standard creation.
- Measure blank solution for samples prior to running the first sample when background correction is active.
- Measure blank solution to overwrite an existing value.

See also

- Working with blank values ▸ Page 30
- Blank measurement for all method types except Spectroquant® ▸ Page 31
- Configure the background correction ▸ Page 50
- Configure the standards ▸ Page 56

5.7.5.5.1 Measuring the blank solution for standards

When a list of standards is created for a calibration curve, the blank solution is measured when the first standard is created. To measure a blank solution to overwrite an existing value, the options menu is used. When background correction is inactive, the stored blank value for the standards is used as the blank value for sample measurements.

Measure a blank solution using the options menu

Procedure

1 Open the **Quantification** method editor.

2 Select **Measurement**.

3 Tap **Standards**.

➡ The standards table opens.

4 Tap ⋯.

➡ The options menu opens.

5 Select **Measure blank** to measure the blank solution.

➡ You are prompted to insert the blank solution.

6 Press down on the lid to open the analysis compartment.

7 Insert the cuvette containing blank solution vertically into the cuvette holder located in the measurement position.

8 Close the lid.
   ➡ The spectrophotometer measures the blank solution.
9 Tap ✅ to return to the standards table.
➡ The blank solution is measured and the value is stored for the method.

See also

- Access the method editor ▸ Page 29
- Working with blank values ▸ Page 30
- Blank measurement for all method types except Spectroquant® ▸ Page 31
- Configure the background correction ▸ Page 50
- Configure the standards ▸ Page 56

5.7.5.5.2 Measuring the blank solution for samples

After a quantification calibration curve method is configured with background correction active, the blank solution for samples is measured prior to measurement of the first sample. To measure a blank solution to overwrite an existing value, the re-zero button is used.

Measure a blank solution using the re-zero button

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap ▶.
4 Tap .
   ➡ You are prompted to insert the blank solution.
5 Press down on the lid to open the analysis compartment.
6 Insert the cuvette containing blank solution vertically into the cuvette holder located in the measurement position.
7 Close the lid.
   ➡ The spectrophotometer measures the blank solution.
➡ The blank solution is measured and the value is stored for the method.

See also

- Access the method editor ▸ Page 29
- Working with blank values ▸ Page 30
- Blank measurement for all method types except Spectroquant® ▸ Page 31
- Configure the background correction ▸ Page 50

5.7.6 Quantification with a formula

Overview

Quantification with formula allows to define a function that the spectrophotometer uses to calculate a physical quantity using the raw results absorbance and transmittance.

For each quantification method you can define up to four different calculated results.

To configure a calculated result using a formula, the parameter **Calculation type** needs to be set to **Formula**. The following settings need to be configured:

Settings	Description	Parameters	Additional information
Measurement of the raw results	Path length	**Path length**	[Configure the path length ▸ Page 49]
	Path length normalization	**Norm. path length**	[Configure the path length normalization ▸ Page 49]
	Background correction	**Background corr.**	[Configure the background correction ▸ Page 50]
	Wavelengths	**Abs./Transm.**	[Configure the wavelength ▸ Page 50]
Coefficients used in the formula and the formula	Constant values	**Constants**	[Configure the constant coefficients ▸ Page 64]
	Sample-specific values that users enter at the beginning of the analysis	**Sample factors**	[Configure the sample factors ▸ Page 64]
	Formula used to calculate the result	**Formula**	[Configure the formula ▸ Page 65]
Presentation of the calculated result	Name	**Name**	[Configure the name ▸ Page 51]
	Number of decimal places	**Decimal places**	[Configure the decimal places ▸ Page 52]
	Unit	**Unit**	[Configure the unit ▸ Page 51]
	Range of acceptable values	**Result limits**	[Configure the result limits ▸ Page 52]

Example

As a result of an analysis you want a value that describes the total polyphenol content of beer.

The following formula is used:

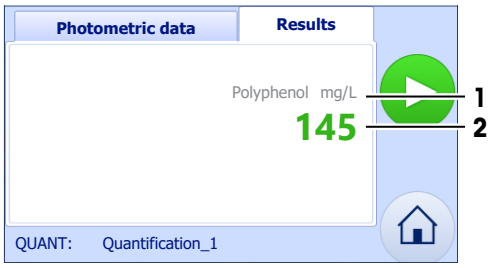
Total polyphenol = A*820*x

Where:

- A is the absorbance of pretreated beer at 600 nm
- 820 is the constant
- x is the dilution factor that is specific for each sample

You want the result to be shown with the label "**Polyphenol**" (1), the unit [**mg/L**] (1) and zero decimal places (2). If the result was outside the result limit range of 140–150 it would be colored red.

The following table displays the settings for the example:



Settings	Parameters	Option	Value
Measurement of the raw results	**Path length**	**Fixed**	**Path length (fixed)**: 10 mm
	Background corr.	No	
	Abs./Transm.	1	**Name**: λ A1/T1 **Value**: 600 nm

Settings	Parameters	Option	Value
Coefficients used in the formula and the formula	**Constants**	Constant a	820
	Sample factors	x	**Name**: Dilution factor **Default value**: 1
	Formula		A1*a*x
Presentation of the calculated result	**Name**		**Polyphenol**
	Decimal places		0
	Unit		mg/L
	Result limits	**Lower limit**	140
		Upper limit	150

See also

- Structure of the Measurement tab ▸ Page 48
- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51

5.7.6.1 Configure the constant coefficients

Constants are fixed values that can be used as coefficients in a formula. Up to 10 constants (a–j) can be configured for each quantification method. The name of a constant cannot be changed. You can only change the value of a constant.

Procedure

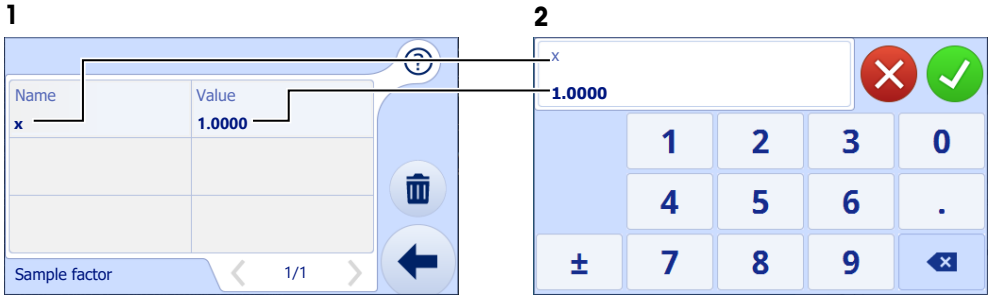
1. Open the **Quantification** method editor.
2. Select **Measurement**.
3. Tap **Constants** to open the table of constants.
4. Select a **Constant** and enter the desired value.
5. Tap ← to return to **Measurement**.

See also

- Menu structure ▸ Page 15
- Access the method editor ▸ Page 29

5.7.6.2 Configure the sample factors

You can configure up to three sample factors with the parameter **Sample factors**. If you configure sample factors, you are prompted to enter a value for each configured sample factor before a measurement starts.



For each sample factor you can configure a name and a default value in the sample-factor editor (1). The name and the default value are shown in the prompt (2) at the start of the analysis. Users can replace the default value with a sample-specific value before a measurement starts.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Sample factors**.
   ➡ The sample factors table opens.
4 To create a new sample factor, tap +.
5 To change or delete an existing sample factor, select a sample factor.
   ➡ The sample-factor editor opens.
6 Enter a name and a default value.
7 Tap ← to return to the sample-factor table.

See also

Access the method editor ▸ Page 29

5.7.6.3 Add or edit a calculated result

Before you can configure the formula and the presentation of a calculated result, you have to create a result or open the results editor.

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Results**.
   ➡ A table with the results opens.
4 To create a new result, tap +.
5 To change or delete an existing result, select a result.
   ➡ The results editor opens.
6 Configure the presentation of the calculated result and enter the formula.
7 Tap ← to return to the results table.

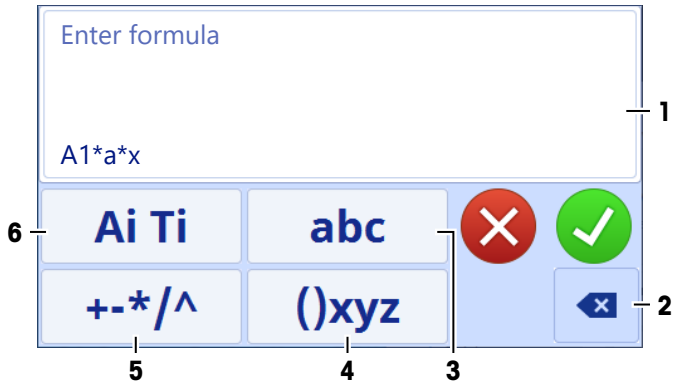
See also

Access the method editor ▸ Page 29
Configure the presentation of the calculated result ▸ Page 51
Configure the formula ▸ Page 65

5.7.6.4 Configure the formula

One formula can be configured for each quantification method. Each formula can include raw result wavelength, constant and sample factor values.

Overview of the formula editor



No.	Name	Function
1	Preview	Shows the formula
2	Backspace button	Deletes the previous character
3	Constants button	Opens a window with the defined constants
4	Sample-factor and parenthesis button	Opens a window with the defined sample factors, opening parenthesis and closing parenthesis
5	Operator button	Opens a window with mathematical operators and functions
6	Raw result absorbance/ transmittance button	Opens a window with available raw result absorbance/transmittance values at defined wavelengths

Mathematical operators and functions

Symbol	Description
+	Addition
-	Subtraction
*	Multiplication
/	Division
^2	Exponent 2
^3	Exponent 3
^4	Exponent 4
^5	Exponent 5

Open the formula editor

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Results**.
➡ A table with the results opens.
4 To create a new result, tap **+**.
5 To change or delete an existing result, select a result.
➡ The results editor opens.
6 Tap **Formula**.
➡ The formula editor opens.

See also

Access the method editor ▸ Page 29

5.7.6.5 Create a formula

Procedure

1 Open the **Quantification** method editor.
2 Select **Measurement**.
3 Tap **Calculation type** and select **Formula**.
4 Configure **Path length**.
5 Configure **Path length (fixed)** or **Norm. path length** as needed.
6 Configure **Background corr.**.
7 Configure **Abs./Transm.**.
8 Configure **Constants**.
9 Configure **Sample factors**.
10 Tap **Results**.
➡ The results table opens.
11 Configure **Name**.
12 Configure **Unit**.
13 Configure **Formula**.
14 Configure **Result limits**.
15 Configure **Decimal places**.
16 Tap ← to return to the results table.
17 Tap ← to return to **Measurement**.
➡ The formula is configured and ready for sample analysis.

See also

- Access the method editor ▸ Page 29
- Structure of the Measurement tab ▸ Page 48
- Configure the calculation type ▸ Page 49
- Configure the measurement of raw results ▸ Page 49
- Configure the presentation of the calculated result ▸ Page 51
- Configure the formula ▸ Page 65

6 Operation

6.1 Start up the spectrophotometer

Initial adjustment

The first time the spectrophotometer is started up, adjustment is required to ensure measurement accuracy. If adjustment is not performed upon first-time startup, measurement results may be unreliable.

The spectrophotometer must be running and warmed up for at least one hour prior to performing adjustment.

Available adjustment methods for each instrument are:

- Easy UV: system baseline
- Easy VIS: system baseline and dark current

See also

- Connect the power supply ▸ Page 21
- Perform adjustments ▸ Page 105

6.1.1 Start up the Easy VIS spectrophotometer

First-time startup

When the spectrophotometer is started up for the first time, you will need to select the language from the menu. After initialization, the EasySetup Tutorial dialog will open. The EasySetup Tutorial dialog only opens during first-time startup, but can be accessed later from the toolbox.

Initialization

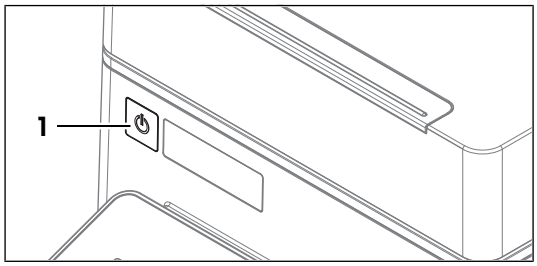
Upon start up, the spectrophotometer will perform a series of initialization and calibration self-tests that require approximately two minutes. Do not open the lid during this process.

Warm-up phase

When initialization is complete, a 20-minute warm-up phase is necessary to ensure measurement accuracy. A pop-up timer opens for monitoring the warm-up phase. The pop-up timer can be closed, but do not take measurements until the 20-minute warm-up phase is complete.

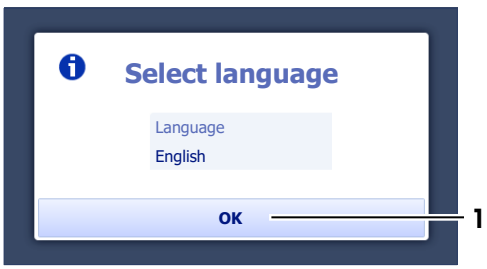
Procedure

1 Press the power button (1).



➡ First-time startup: You are prompted to select the language.

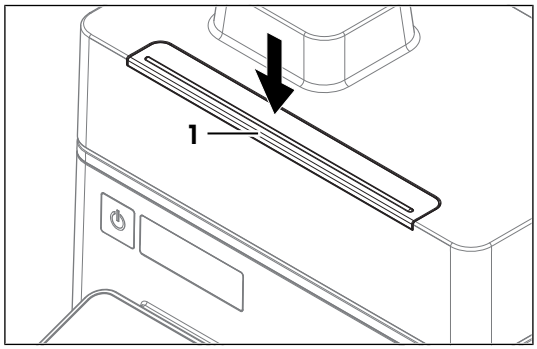
2 If prompted, select the language and tap **OK** (1).



➡ You are prompted to confirm that the light beam is not blocked and the lid is closed.

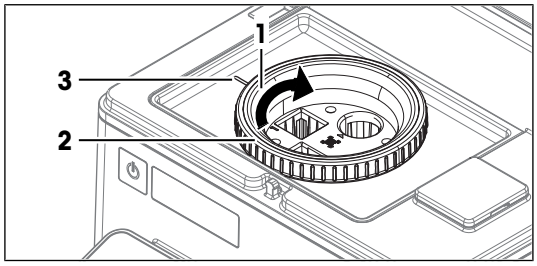
3 Tap **Continue** (1).

4 Press down on the lid (1) to open the analysis compartment.



5 Rotate the cuvette carousel (2) to align the cuvette holder dot (1) with the measurement position mark (3).

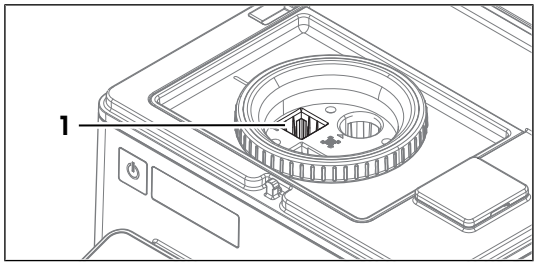
➡ The positioning pin snaps into the positioning groove when the cuvette holder is properly aligned.



6 Make sure the cuvette holder in the measurement position (1) is empty.

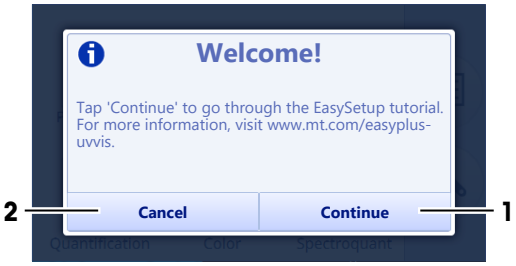
7 Close the lid.

➡ The spectrophotometer performs self-tests and detects connected devices.



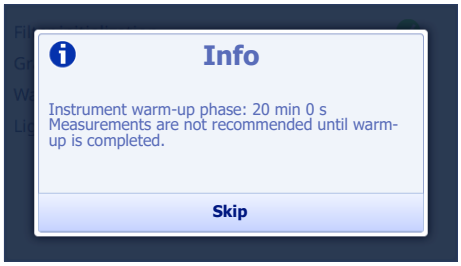
➡ First-time startup: You can choose to run the tutorial.

8 If prompted, select **Continue** (1) to open the tutorial or **Cancel** (2) to close it.



➡ The pop-up timer opens.

➡ The spectrophotometer is ready for use after 20 minutes when the home screen opens.



See also

- Connect the power supply ▸ Page 21
- Change the language ▸ Page 22
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Start and end the tutorial ▸ Page 72
- Perform adjustments ▸ Page 105

6.1.2 Start up the Easy UV spectrophotometer

First-time startup

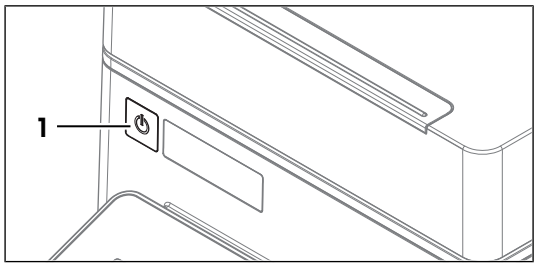
When the spectrophotometer is started up for the first time, you will need to select the language from the menu. After initialization, the EasySetup Tutorial dialog will open. The EasySetup Tutorial dialog only opens during first-time startup, but can be accessed later from the toolbox.

Initialization

Upon start up, the spectrophotometer will perform a series of initialization and calibration self-tests that require approximately two minutes. Do not open the lid during this process.

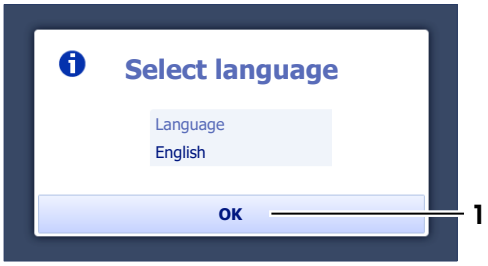
Procedure

1 Press the power button (1).



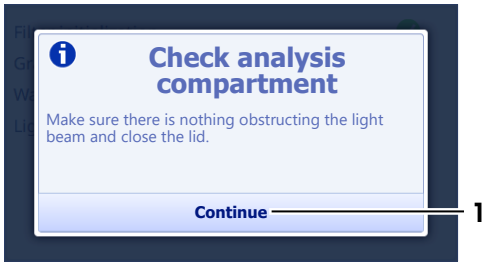
➡ First-time startup: You are prompted to select the language.

2 If prompted, select the language and tap **OK** (1).

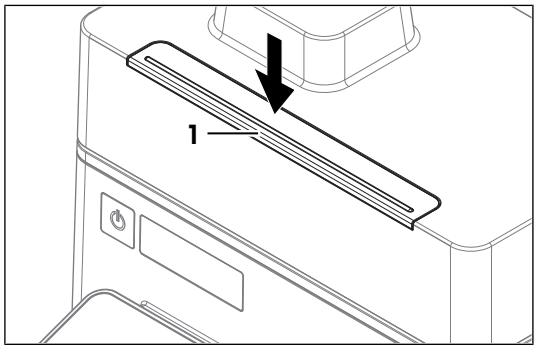


➡ You are prompted to confirm that the light beam is not blocked and the lid is closed.

3 Tap **Continue** (1).

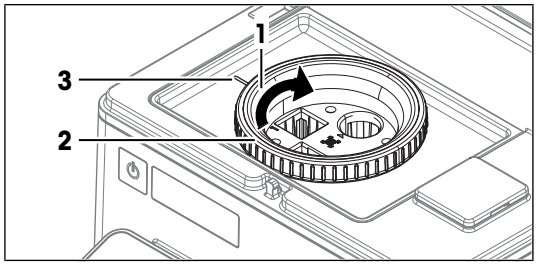


4 Press down on the lid (1) to open the analysis compartment.



5 Rotate the cuvette carousel (2) to align the cuvette holder dot (1) with the measurement position mark (3).

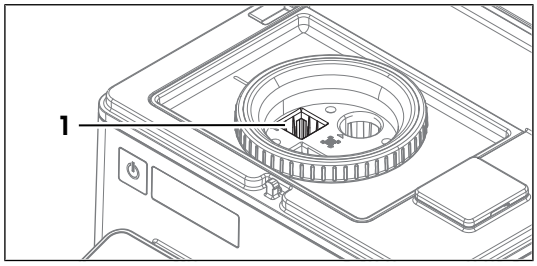
➡ The positioning pin snaps into the positioning groove when the cuvette holder is properly aligned.



6 Make sure the cuvette holder in the measurement position (1) is empty.

7 Close the lid.

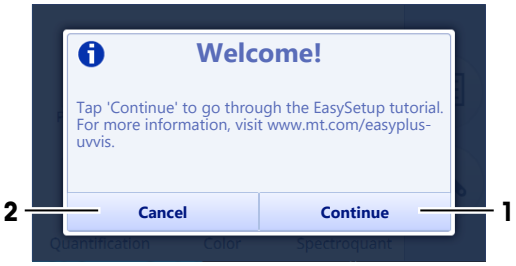
➡ The spectrophotometer performs self-tests and detects connected devices.



➡ First-time startup: You can choose to run the tutorial.

8 If prompted, select **Continue** (1) to open the tutorial or **Cancel** (2) to close it.

➡ The spectrophotometer is ready for use when the home screen opens.



See also

- Connect the power supply ▸ Page 21
- Change the language ▸ Page 22
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Start and end the tutorial ▸ Page 72
- Perform adjustments ▸ Page 105

6.2 Shut down the spectrophotometer

– Press the power button for 3 s.

➡ The spectrophotometer stops running tasks.

➡ The shut down screen will be displayed while history and data are saved.

➡ The touch screen turns off and the power shuts down.

➡ The AC/DC adapter and the control circuit for the power button are energized. The rest of the spectrophotometer is no longer energized.

Shutdown of the spectrophotometer in emergency situations

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

See also

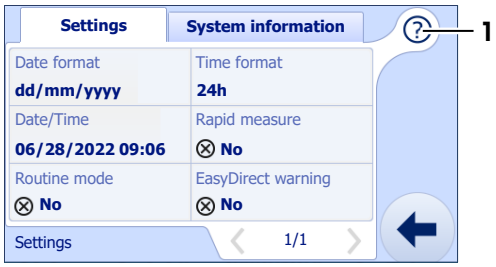
Disconnect the power supply ▸ Page 21

6.3 View parameter descriptions and tutorial

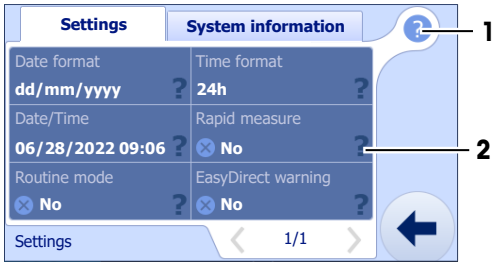
6.3.1 View parameter descriptions

1 Go to (1) > .

2 Tap (1).



3 Tap the parameter (2) that interests you.
➡ A window with the help text opens.
4 Close the window.
5 Tap (1) to close the help text.
6 To return to the home screen, tap and then .



See also

Overview of home screen and functions ▸ Page 14
Configure the spectrophotometer ▸ Page 22
Method configuration ▸ Page 29
Example: Determine the spectrum of fruit juice ▸ Page 73
Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93

6.3.2 Start and end the tutorial

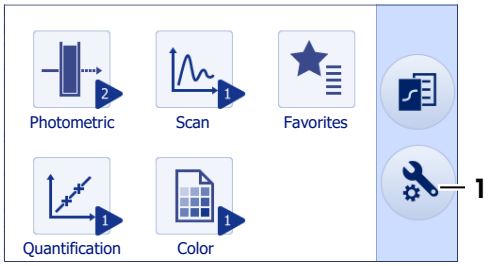
The EasySetup Tutorial consists of seven sections:

1. Define settings
2. Install cuvette carousel and position cuvette holder
3. Change cuvette carousel
4. Measurement methods
5. Options for starting a method
6. Online help and perform photometric measurement

7. Tips for using the spectrophotometer

Procedure

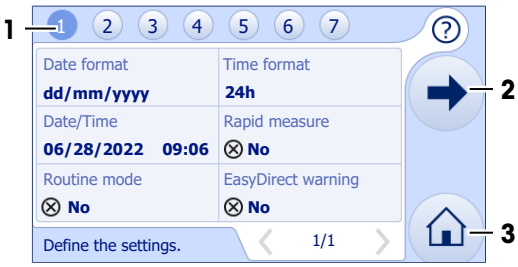
1 To start the tutorial, tap (1) > > .



2 To proceed through the tutorial windows, tap (2).

3 To open a specific tutorial window, select a number (1).

4 To exit the tutorial at any point, tap (3).



See also

- Overview of home screen and functions ▸ Page 14
- Start up the spectrophotometer ▸ Page 68

6.4 Example: Determine the spectrum of fruit juice

The example shows how to use the scan method to determine the spectrum of fruit juice in the range of 330 nm to 800 nm.

Overview of the analysis

- Disposable macro cuvettes with 10 mm path length are used.
- The blank solution is only measured once at the beginning of the analysis.
- Users can enter a unique identifier for each sample.
- The results for each sample are exported as a CSV file to a USB flash drive.
- The configuration of the scan method is saved.

Overview of the actions

1 [Prepare the cuvettes ▸ Page 73].

2 [Prepare the spectrophotometer ▸ Page 74].

3 [Configure the scan method ▸ Page 75].

4 [Perform the analysis ▸ Page 77].

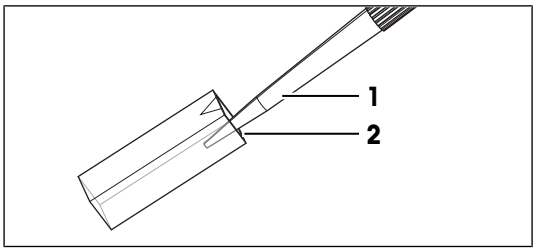
6.4.1 Prepare the cuvettes

Material

- Blank solution: 3 mL deionized water
- First sample: 3 mL 1:10 dilution of clear or transparent fruit juice (e.g., grape, apple, cranberry)
- Second sample: 3 mL 1:5 dilution of fruit juice
- Three disposable macro-cuvettes with a path length of 10 mm
- Plastic pipettes
- Lint-free optical tissues
- Waste container

Procedure

1 Hold the cuvette on its frosted sides and check that the clear sides of the cuvette are clean and free of scratches.
2 If necessary, clean the clear sides with a lint-free tissue or replace the cuvette.
3 Fill a pipette with 2 mL of blank solution.
4 Insert the pipette tip (1) into the cuvette so that it touches the lower, inner side (2) of the cuvette.
5 Slowly pipette the blank solution into the cuvette.
6 If air is trapped in the blank solution, empty the cuvette and start again.
7 Place the cuvette in a rack.
8 Repeat the previous steps to fill two cuvettes with fruit juice dilutions.



See also

Cuvettes and cuvette holders ▸ Page 13
Clean glass or quartz cuvettes ▸ Page 102

6.4.2 Prepare the spectrophotometer

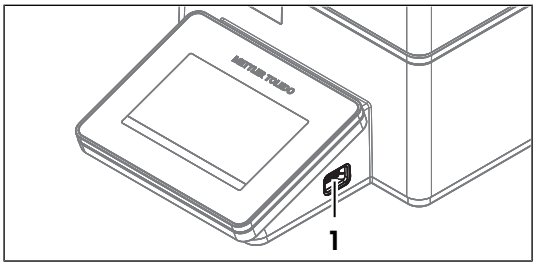
Material

- USB flash drive

Set up the spectrophotometer

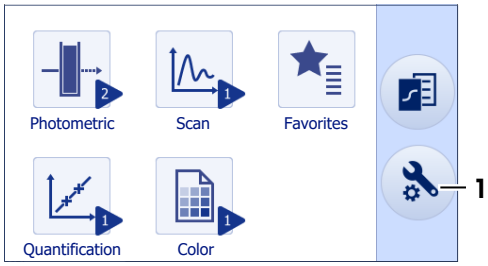
- Spectrophotometer is running.
- Spectrophotometer is warmed up (Easy VIS only).

– Insert a USB flash drive into the front USB socket (1).



Configure the instrument settings

1 Go to (1) > .



2 Select **Settings** (1).

3 Change the parameters to the settings listed in the following table.

4 To return to the home screen, go to ← (2) > ⌂.

Parameter	Setting	Explanation
Routine mode	**No**	You can change the parameters of a method in the method editor.
Rapid measure	**No**	During analysis, you will be prompted to insert the samples.
EasyDirect warning[1)]	**No**	There is no warning if EasyDirect is disconnected.

[1)] The EasyDirect software is only supported in firmware version 1.1.0 or higher.

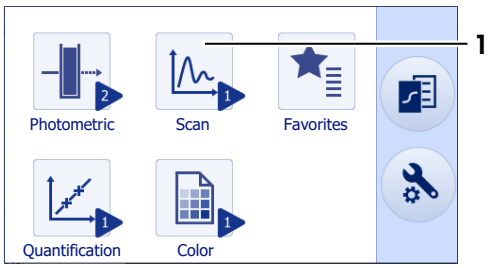
See also

- Analysis compartment ▸ Page 11
- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Overview of home screen and functions ▸ Page 14
- Menu structure ▸ Page 15
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Start up the spectrophotometer ▸ Page 68
- View parameter descriptions ▸ Page 72

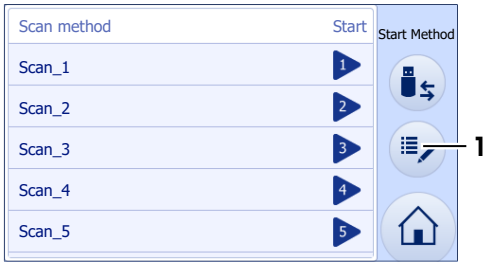
6.4.3 Configure the scan method

Open the method editor

1 Select (1).



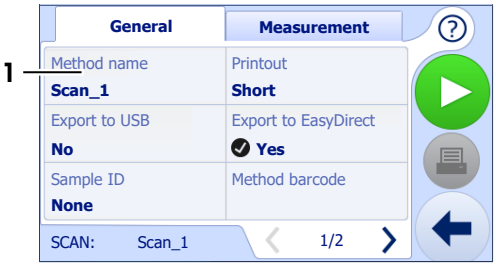
2 Select (1).



3 Select ✎ (1).

Configure the general parameters

1 Select **Method name** (1).



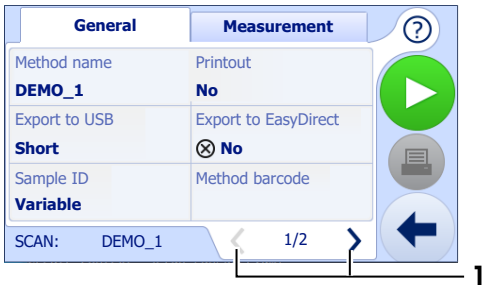
2 Use abc (4) to cycle through keyboard layouts for capital and lower case letters, numbers, and symbols.

3 Enter DEMO_1 for the **Method name** (1).

4 Tap ✅ (2) to save changes or ❌ (3) to close without saving changes.

5 Change the parameters to the settings listed in the following table.

6 Use the arrows (1) to move between windows.



Parameter	Setting	Explanation
Method name	DEMO_1	Defines the name of the method.
Printout	**No**	No results are printed after measurement.
Export to USB	**Short**	A short format result is exported to the USB flash drive as a CSV file.
Export to EasyDirect[1)]	**No**	Results are not exported to EasyDirect.
Sample ID	**Variable**	The spectrophotometer prompts users to enter a sample identifier before each measurement.
Method barcode	–	Method cannot be started with a barcode reader.
Favorites Nr.	**None**	Method cannot be started from the favorites list.

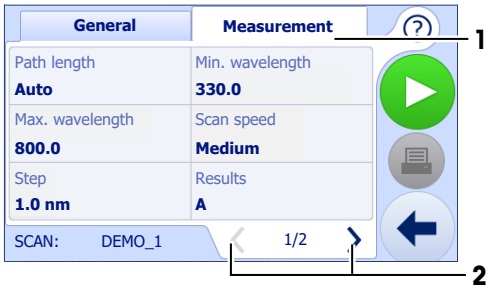
[1)] The EasyDirect software is only supported in firmware version 1.1.0 or higher.

Configure the measurement parameters

1 Select **Measurement** (1).

2 Change the parameters to the settings listed in the following table.

3 Use the arrows (2) to move between windows.



Parameter	Setting	Explanation
Path length	**Auto**	The spectrophotometer detects which cuvette holder is in the measurement position. The path length of this cuvette holder is used in calculations.
Min. wavelength	330.0 nm	The scanning range is 330 nm to 800 nm.
Max. wavelength	800.0 nm	
Scan speed	**Medium**	The full scan takes less than 1.5 minutes. A balance is maintained between accuracy and measurement duration.
Step	1.0 nm	The wavelength interval between two points is set to 1.0 nm.
Results	**A**	Results are reported as absorbance for each wavelength.
Peaks/Valleys	**Both**	Peaks and valleys in the spectrum will both be listed in the results.
Sensitivity	**Low**	Only the most prominent peaks and valleys are marked in the spectrum and listed in the values table.
Detect λ min.	330.0 nm	The detection range for peak/valley determination is 330 nm to 800 nm.
Detect λ max.	800.0 nm	

See also

- Overview of home screen and functions ▸ Page 14
- View parameter descriptions ▸ Page 72
- Scan method ▸ Page 38

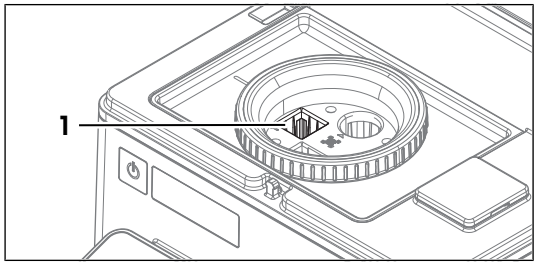
6.4.4 Perform the analysis

Material

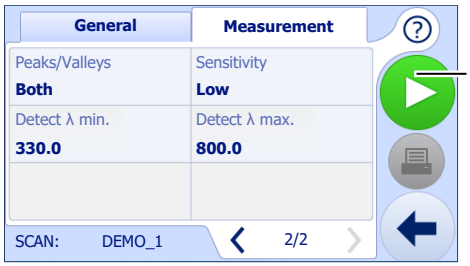
- Waste container
- Cuvette with blank solution
- Cuvette with first sample
- Cuvette with second sample

Measure the blank solution

- Example scan method DEMO_1 is configured.
- A 10 mm cuvette holder is in the measurement position (1).
- The lid is closed.

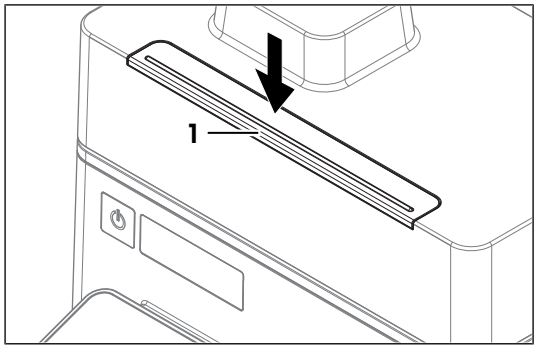


1 Tap ▶ (1) to start the analysis.

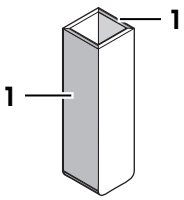


➡ You are prompted to insert the cuvette containing blank solution.

2 Press down on the lid (1) to open the analysis compartment.



3 Hold the top of the cuvette containing blank solution by the frosted sides (1) and lift it out of the rack.
4 Check that the clear sides of the cuvette are clean.
5 If necessary, clean the clear sides with a lint-free tissue.

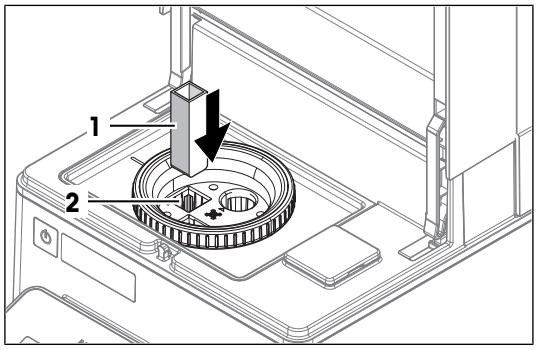


6 Orient the cuvette (1) so that the frosted sides are directed towards the front and back of the spectrophotometer.

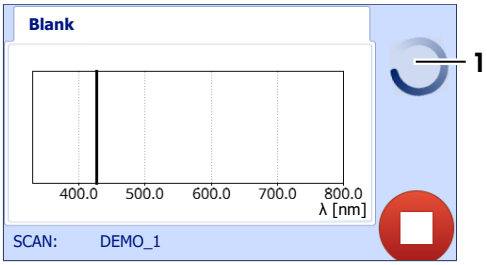
7 To avoid scratching the cuvette's surface, insert the cuvette vertically into the cuvette holder (2).

8 Close the lid.

➡ The measurement starts.

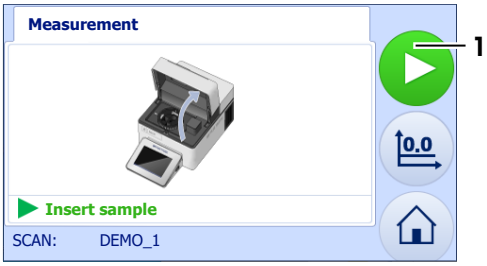


➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

➡ You are prompted to insert the cuvette containing sample.

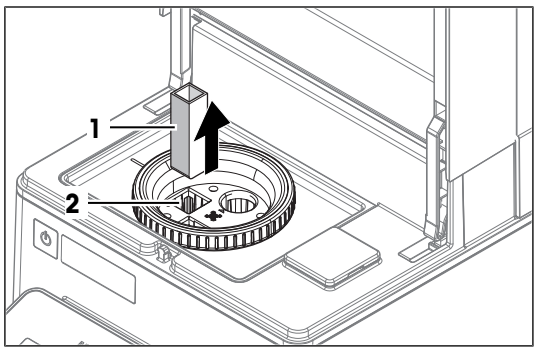


Scan the first sample

1 Open the lid to remove the cuvette (1) from the measurement position (2).

2 Lift the cuvette out, being careful to hold it vertically.

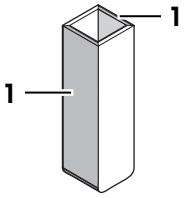
3 Place the cuvette in a rack.



4 Hold the top of the cuvette containing first sample by the frosted sides (1) and lift it out of the rack.

5 Check that the clear sides of the cuvette are clean.

6 If necessary, clean the clear sides with a lint-free tissue.

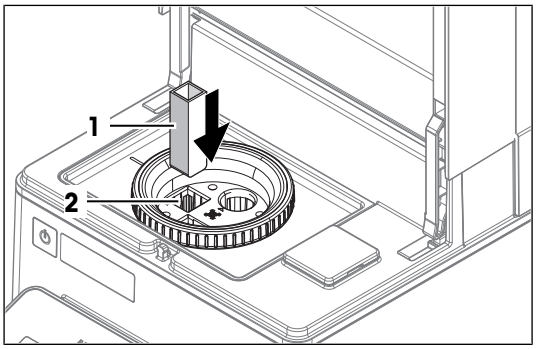


7 Orient the cuvette (1) so that the frosted sides are directed towards the front and back of the spectrophotometer.

8 To avoid scratching the cuvette's surface, insert the cuvette vertically into the cuvette holder (2).

9 Close the lid.

➡ You are prompted to enter a sample identifier.

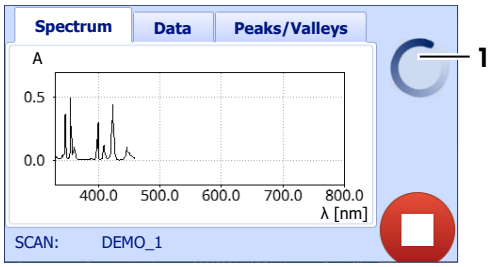


10 For **Sample ID** (1), enter an identifier.

11 Tap ✅ (2).

➡ The measurement starts.

➡ The revolving circle (1) shows that the measurement is in progress.

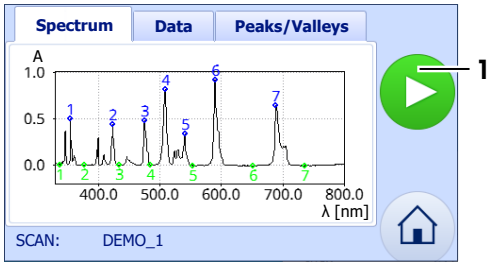


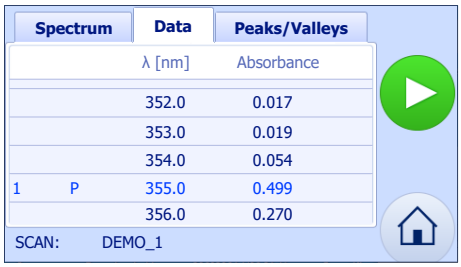
➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

➡ Results are displayed on the touch screen.

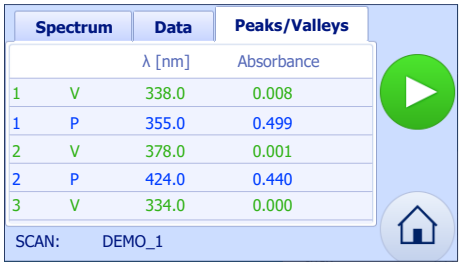
➡ Results are exported to the USB flash drive as a CSV file.

➡ Results can be viewed on the touch screen by navigating the **Spectrum**, **Data** and **Peaks/Valleys** tabs.



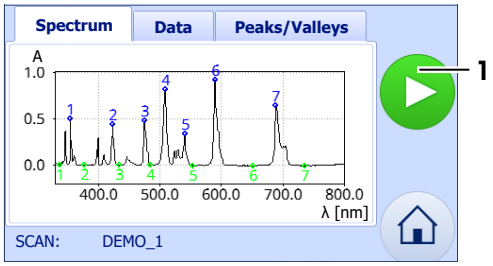


➡ The analysis of the first sample is complete.

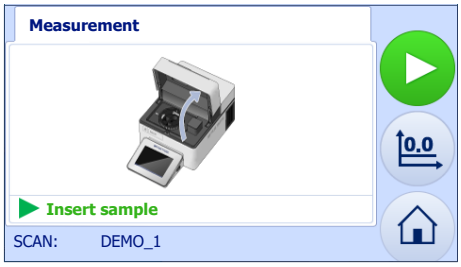


Scan the second sample

1 Tap ▶ (1).



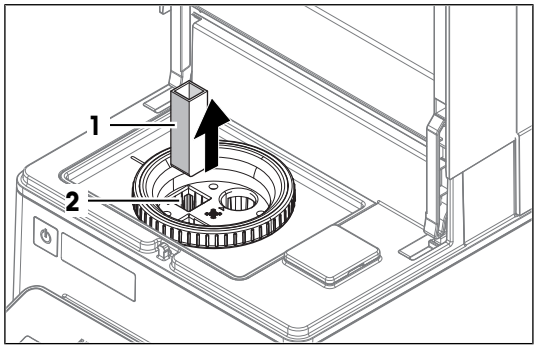
➡ You are prompted to insert the cuvette containing sample.



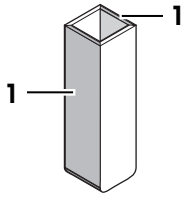
2 Open the lid to remove the cuvette (1) from the measurement position (2).

3 Lift the cuvette out, being careful to hold it vertically.

4 Place the cuvette in a rack.



5 Hold the top of the cuvette containing second sample by the frosted sides (1) and lift it out of the rack.

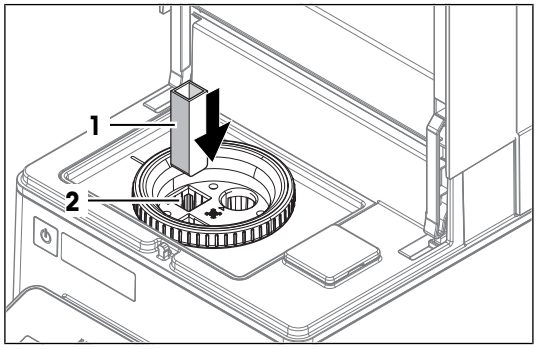


6 Orient the cuvette (1) so that the frosted sides are directed towards the front and back of the spectrophotometer.

7 To avoid scratching the cuvette's surface, insert the cuvette vertically into the cuvette holder (2).

8 Close the lid.

➡ You are prompted to enter a sample identifier.

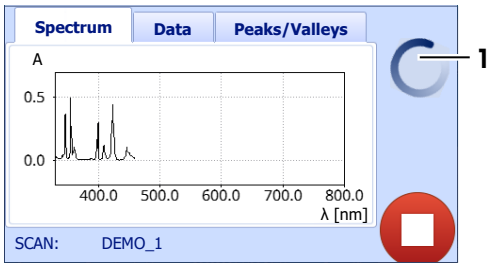


9 For **Sample ID** (1), enter an identifier.

10 Tap ✅ (2).

➡ The measurement starts.

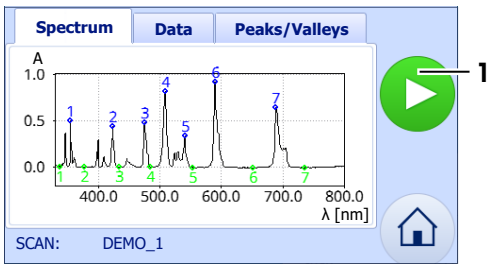
➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

➡ Results are displayed on the touch screen.

➡ Results are exported to the USB flash drive as a CSV file.

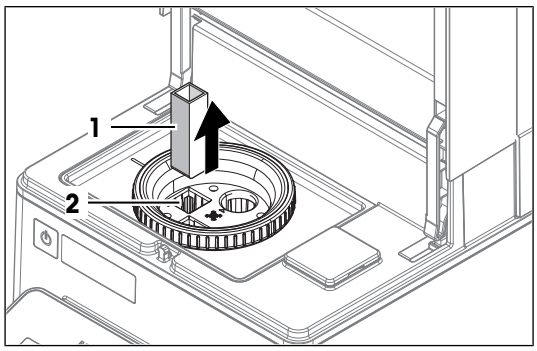


11 Open the lid to remove the cuvette (1) from the measurement position (2).

12 Close the lid.

13 To return to the home screen, tap 🏠.

➡ Spectrum determination of fruit juice is complete.



6.5 Example: Analyze water samples with a Spectroquant® COD Cell Test

The example shows how to use the Spectroquant® method and the Spectroquant® COD Cell Test kit to determine COD (chemical oxygen demand) in water samples.

Overview of the analysis

- Two samples and a reagent blank are prepared with the Spectroquant® COD Cell Test kit (catalog number 114541).
- Zero adjustment is performed.
- The Spectroquant® method settings are configured.
- The reagent blank is measured twice and the mean result is determined.
- Users can enter a unique identifier for each sample.
- Results for each sample are exported as a CSV file to a USB flash drive.

Overview of the actions

[Prepare the samples and reagent blank ▸ Page 83]

[Prepare the spectrophotometer ▸ Page 83]

[Perform the analysis ▸ Page 84]

See also

Set up the SQKitReader internal barcode reader ▸ Page 26

6.5.1 Prepare the samples and reagent blank

Before starting the analysis, the samples and reagent blank must be prepared according to the Spectroquant® COD Cell Test kit (catalog number 114541) Instructions for Use:

- Reagent blank: Reaction cell and COD-free water
- Sample 1: Reaction cell and tap water
- Sample 2: Reaction cell and tap water

In this analysis, the reagent blank will be measured twice to calculate a mean value.

See also

Working with blank values ▸ Page 30

Blank measurement for Spectroquant® methods ▸ Page 33

Prepare the cuvettes ▸ Page 73

Clean glass or quartz cuvettes ▸ Page 102

6.5.2 Prepare the spectrophotometer

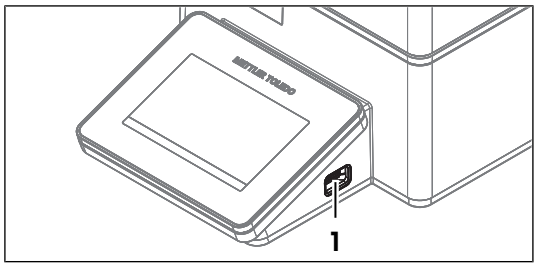
Set up the spectrophotometer for Spectroquant® analysis

Material

- USB flash drive
- Cuvette carousel 10/16

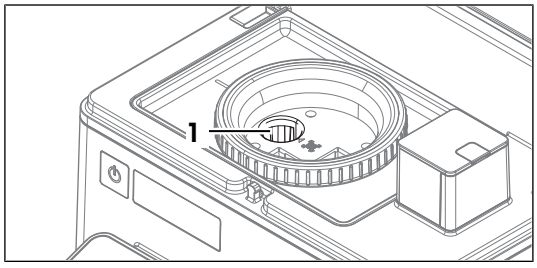
- Spectrophotometer is running.
- Spectrophotometer is warmed up (Easy VIS only).
- SQKitReader internal barcode reader is installed in the analysis compartment.

1 Insert a USB flash drive into the front USB socket (1).



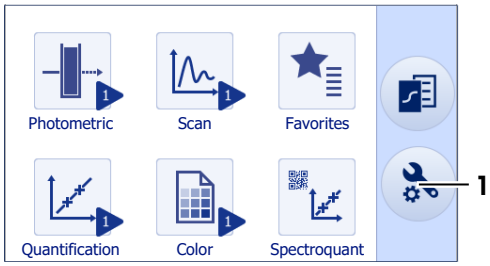
2 Install cuvette carousel 10/16 in the analysis compartment with the Ø16 mm cuvette holder in the measurement position (1).

3 Close the lid.



Configure the instrument settings for Spectroquant®

1 Go to (1) > .



2 Change the parameters to the settings listed in the following table.

3 To return to the home screen, go to (1) > .

Parameter	Setting	Explanation
Rapid measure	**No**	During analysis, you will be prompted to insert the samples.
Export to EasyDirect	**No**	Results are not exported to EasyDirect.
Sample ID	**Yes**	The spectrophotometer prompts users to enter a sample identifier before each measurement.

See also

- Analysis compartment ▸ Page 11
- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Overview of home screen and functions ▸ Page 14
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Start up the spectrophotometer ▸ Page 68
- View parameter descriptions ▸ Page 72

6.5.3 Perform the analysis

The Spectroquant® method is configured during the first sample measurement procedure.

To begin the analysis, the 2D barcode on a sample reaction cell is scanned to open the Spectroquant® method. Next, a zero adjustment is performed using the zero cell. Afterwards, the method is configured and then the reagent blank is measured twice to calculate a mean value. Finally, samples 1 and 2 are measured.

Material

- Prepared samples 1 and 2
- Prepared reagent blank
- Zero cell
- Lint-free optical tissues
- Waste container

See also

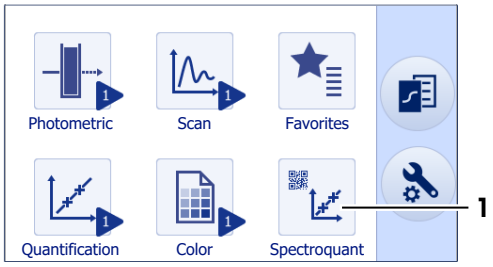
- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Overview of home screen and functions ▸ Page 14
- Loading cuvettes into holders ▸ Page 38

6.5.3.1 Perform the zero adjustment

The zero adjustment is performed using the zero cell.

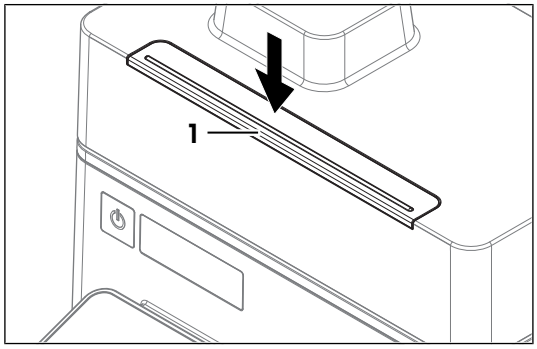
- Cuvette carousel 10/16 is installed in the analysis compartment.
- The Ø16 mm cuvette holder is in the measurement position.

1 Select (1).



➡ You are prompted to scan the 2D barcode on a sample reaction cell.

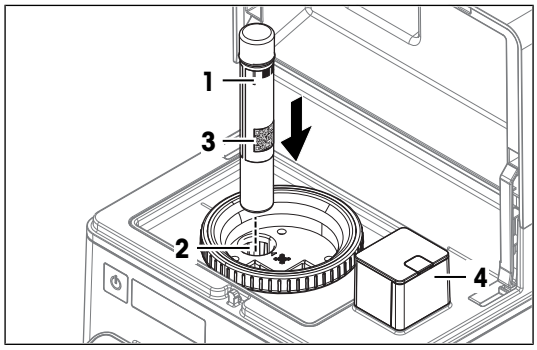
2 Press down on the lid (1) to open the analysis compartment.



3 Hold the top (1) of the first sample reaction cell.

4 Lift the sample reaction cell out of the rack.

5 To avoid scratching the surface of the sample reaction cell, insert the sample reaction cell (1) vertically into the Ø16 mm cuvette holder (2) with the 2D barcode (3) positioned toward the internal barcode reader (4).

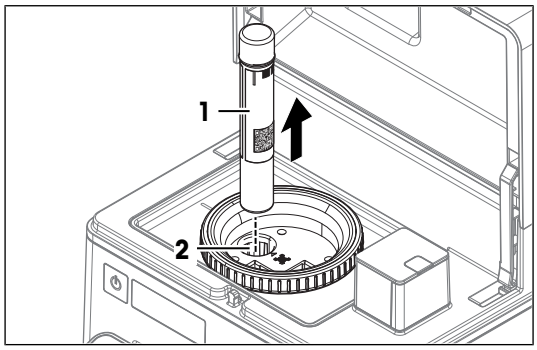


➡ The spectrophotometer reads the barcode and opens the method.

➡ You are prompted to insert the zero cell.

6 Lift the sample reaction cell (1) out of the measurement position (2), being careful to hold it vertically.

7 Place the sample reaction cell in a rack.



8 Hold the top (1) of the zero cell.

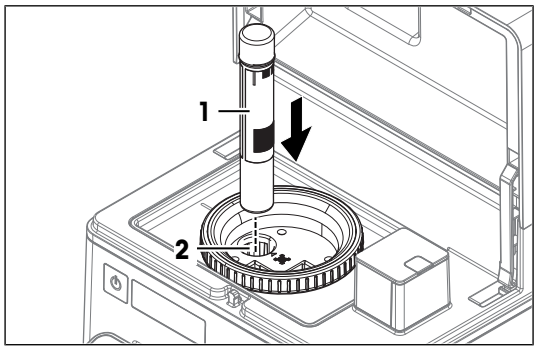
9 Lift the zero cell out of the rack.

10 Check that the clear surface below the label on the zero cell is clean.

11 If necessary, clean the clear surface with a lint-free tissue.

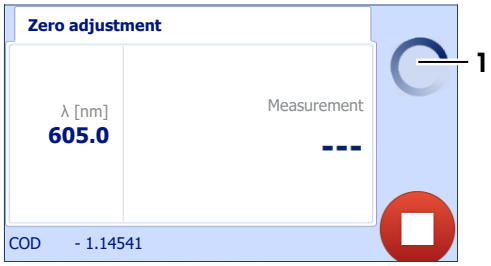
12 To avoid scratching the surface of the zero cell, insert the zero cell (1) vertically into the Ø16 mm cuvette holder (2).

13 Close the lid.



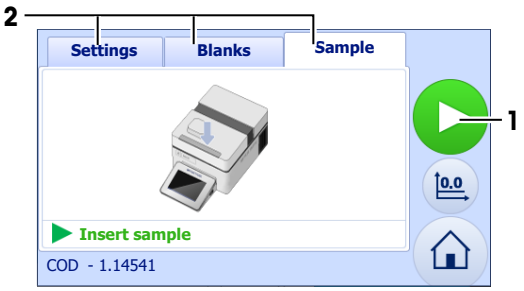
➡ The spectrophotometer performs the zero adjustment.

➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

➡ The **Settings**, **Blanks** and **Sample** tabs (2) activate.



See also

- Working with blank values ▸ Page 30
- Blank measurement for Spectroquant® methods ▸ Page 33

6.5.3.2 Configure the Spectroquant® method settings

1 Select **Settings** (1).

2 Change the parameters to the settings listed in the following table.

Parameter	Setting	Explanation
Citation	**COD**	COD is measured.
Unit	**mg/L**	Measurement result is provided in mg/L.
Turbidity corr. (T)	**No**	Automatic turbidity correction is turned off.
Dilution (D)	**No**	Dilution is not taken into account for calculating sample concentration.
Printout	**No**	No results are printed after measurement.
Export to USB	**Short**	A short format result is exported to the USB flash drive as a CSV file.

See also

- Overview of home screen and functions ▸ Page 14
- View parameter descriptions ▸ Page 72

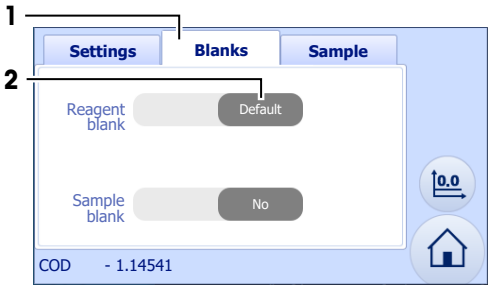
6.5.3.3 Measure the reagent blank

The reagent blank reference measurement accounts for the contribution of the reagent absorbance in result calculation.

The reagent blank is measured twice in this procedure to calculate a mean value.

1 Select **Blanks** (1).

2 Tap **Default** (2) to the activate the **Reagent blank** and change it to **Custom**.



➡ You are prompted to measure the reagent blank.

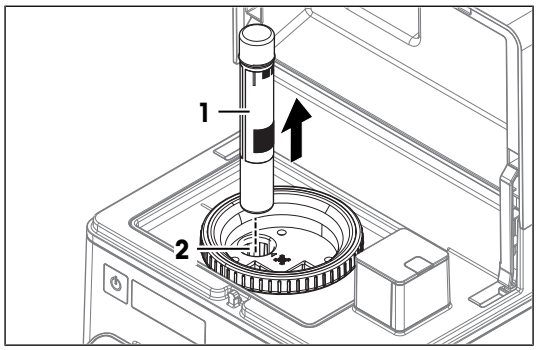
3 Select **OK** (1).

➡ You are prompted to insert the reagent blank.

4 Open the lid to remove the zero cell (1) from the measurement position (2).

5 Lift the zero cell out, being careful to hold it vertically.

6 Place the zero cell in a rack.



7 Hold the top (1) of the reagent blank.

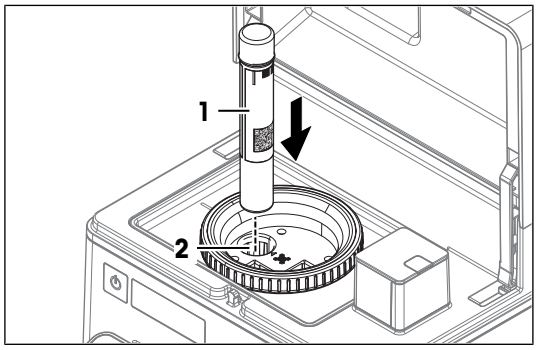
8 Lift the reagent blank out of the rack.

9 Check that the clear surface below the label on the reagent blank is clean.

10 If necessary, clean the clear surface with a lint-free tissue.

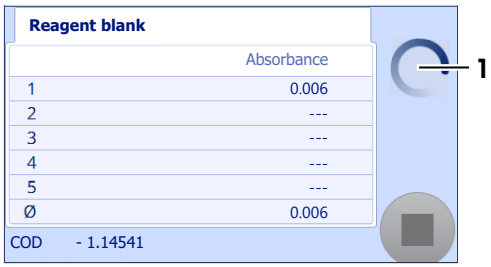
11 To avoid scratching the surface of the reagent blank, insert the reagent blank (1) vertically into the Ø16 mm cuvette holder (2).

12 Close the lid.



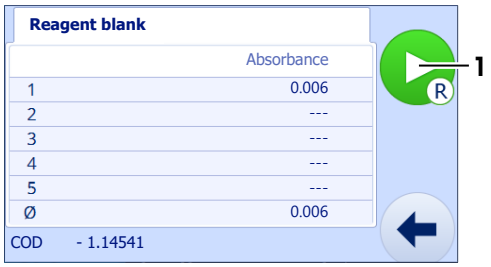
➡ The spectrophotometer measures the reagent blank.

➡ The revolving circle (1) shows that the measurement is in progress.

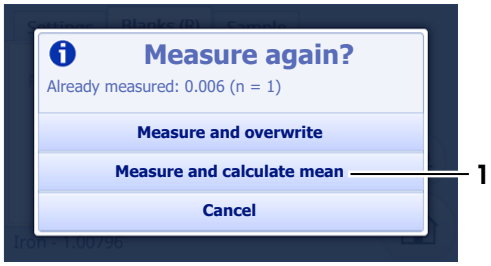


➡ When measurement is complete, the revolving circle is replaced by (1).

13 Tap (1).



14 Select **Measure and calculate mean** (1).



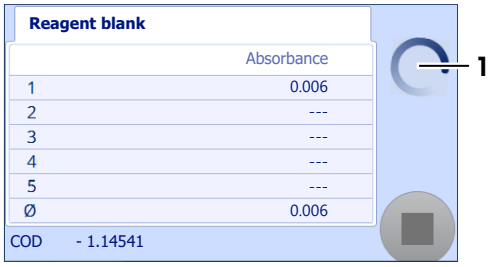
➡ You are prompted to insert the reagent blank.

15 Open the lid but DO NOT remove the reagent blank.

16 Close the lid.

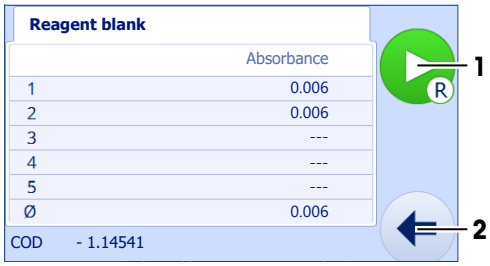
➡ The spectrophotometer measures the reagent blank a second time.

➡ The revolving circle (1) shows that the measurement is in progress.



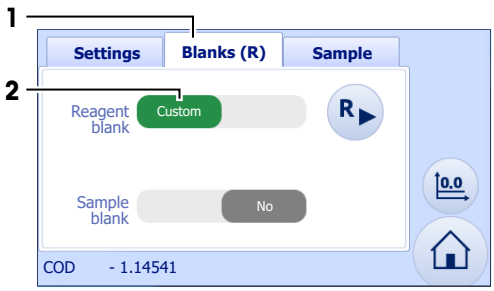
➡ When measurement is complete, the revolving circle is replaced by (1).

17 Select (2).



➡ The **Reagent blank** setting displays **Custom** (2).

➡ The **Blanks** tab displays **Blanks (R)** (1), indicating the reagent blank is active.

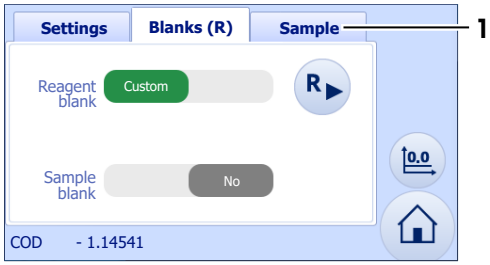


See also

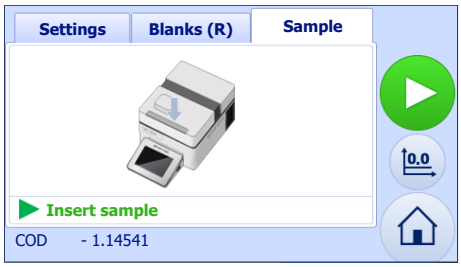
Blank measurement for Spectroquant® methods ▸ Page 33

6.5.3.4 Measure the first sample

1 Select **Sample** (1).



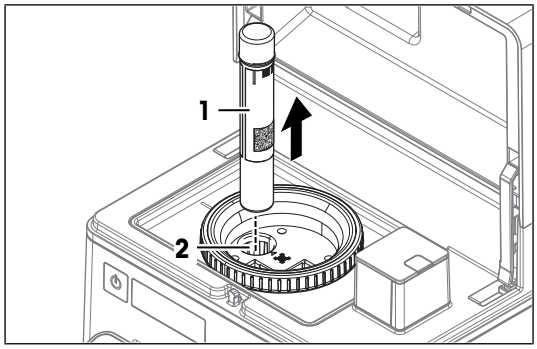
➡ You are prompted to insert the sample.



2 Open the lid to remove the reagent blank (1) from the measurement position (2).

3 Lift the reagent blank out, being careful to hold it vertically.

4 Place the reagent blank in a rack.



5 Hold the top (1) of the first sample reaction cell.

6 Lift the sample reaction cell out of the rack.

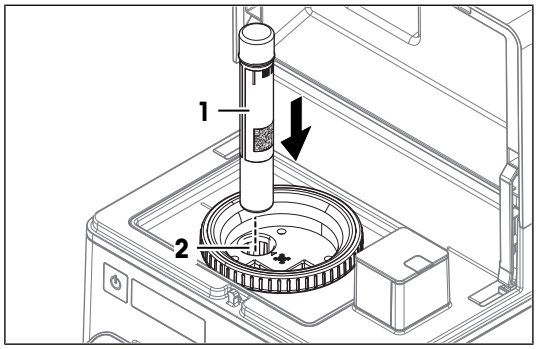
7 Check that the clear surface below the label on the sample reaction cell is clean.

8 If necessary, clean the clear surface with a lint-free tissue.

9 To avoid scratching the surface of the sample reaction cell, insert the sample reaction cell (1) vertically into the Ø16 mm cuvette holder (2).

10 Close the lid.

➡ You are prompted to enter a sample identifier.

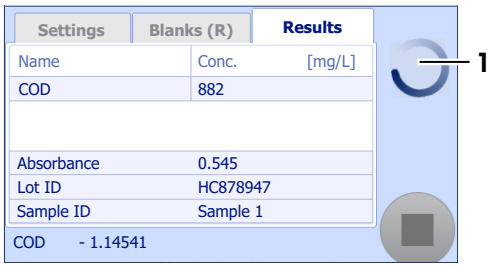


11 For **Sample ID** (1), enter an identifier.

12 Tap ✅ (2).

➡ The spectrophotometer measures the sample.

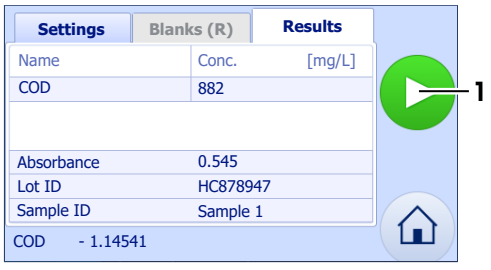
➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

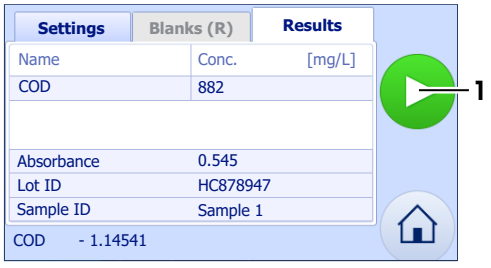
➡ Results are displayed on the touch screen.

➡ Results are exported to the USB flash drive as a CSV file.

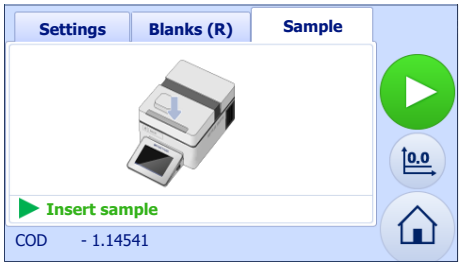


6.5.3.5 Measure the second sample

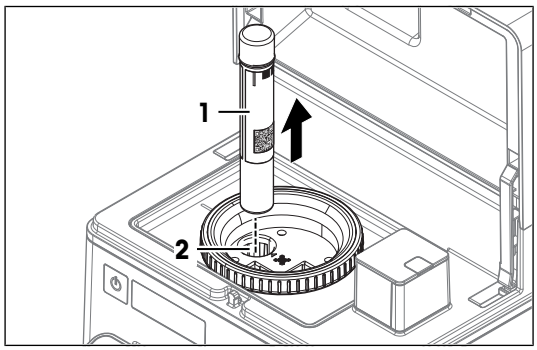
1 Tap ▶ (1).



➡ You are prompted to insert the sample.

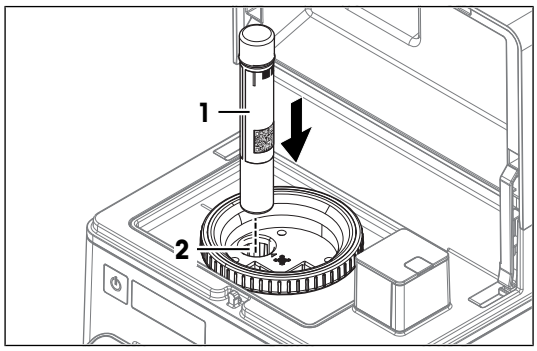


2 Open the lid to remove the first sample reaction cell (1) from the measurement position (2).
3 Lift the first sample reaction cell out, being careful to hold it vertically.
4 Place the first sample reaction cell in a rack.



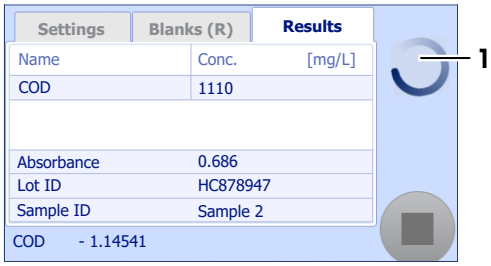
5 Hold the top (1) of the second sample reaction cell.
6 Lift the sample reaction cell out of the rack.
7 Check that the clear surface below the label on the sample reaction cell is clean.
8 If necessary, clean the clear surface with a lint-free tissue.

9 To avoid scratching the surface of the sample reaction cell, insert the sample reaction cell (1) vertically into the Ø16 mm cuvette holder (2).
10 Close the lid.
➡ You are prompted to enter a sample identifier.



11 For **Sample ID** (1), enter an identifier.
12 Tap ✅ (2).
➡ The spectrophotometer measures the second sample.

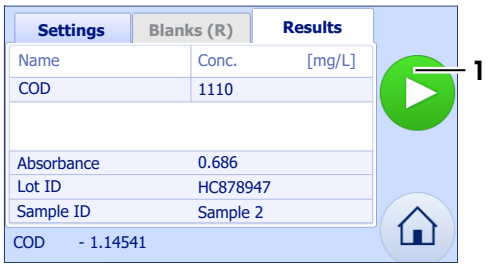
➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

➡ Results are displayed on the touch screen.

➡ Results are exported to the USB flash drive as a CSV file.



13 Open the lid and remove the sample from the measurement position.

14 Close the lid.

15 To return to the home screen, tap ⌂.

➡ Spectroquant® water analysis is complete.

6.6 Example: Analyze water samples with a Spectroquant® Iron Test

The example shows how to use the Spectroquant® method and the Spectroquant® Iron Test kit to determine iron concentration in water samples.

Overview of the analysis

The example Spectroquant® analysis requires preparation of one water sample according to the Spectroquant® Iron Test Instructions for use. During the procedure, the water sample (sample 1) will be split into two samples (sample A and sample B) for analysis with the spectrophotometer.

For this example analysis, the method will be performed using the extended parameter differentiation. When this parameter is active, the analysis differentiates between different iron ions when interpreting measurement results. In this example, when determining iron concentration, iron(II) can be distinguished from iron(III), and the total iron concentration (iron[II] + iron[III]) can also be automatically calculated and displayed.

- Sample is prepared with the Spectroquant® Iron Test kit (catalog number 100796).
- Zero adjustment is performed.
- The Spectroquant® method settings are configured.
- Users can enter a unique identifier for each sample.
- Results are exported as a CSV file to a USB flash drive.

Overview of the actions

[Prepare the samples and zero cell ▸ Page 93]

[Prepare the spectrophotometer ▸ Page 94]

[Perform the analysis ▸ Page 95]

See also

🔗 Set up the SQKitReader internal barcode reader ▸ Page 26

6.6.1 Prepare the samples and zero cell

Before starting the analysis, the samples must be prepared according to the Spectroquant® Iron Test kit (catalog number 100796) Instructions for Use.

- Sample 1: tap water (divided into sample A and sample B during preparation):
  - Sample A: 10 mm cell containing prepared sample
  - Sample B: 10 mm cell containing prepared sample

- Zero cell: 10 mm cell containing 2 mL distilled water

See also

- Working with blank values ▸ Page 30
- Blank measurement for Spectroquant® methods ▸ Page 33
- Prepare the cuvettes ▸ Page 73
- Clean glass or quartz cuvettes ▸ Page 102

6.6.2 Prepare the spectrophotometer

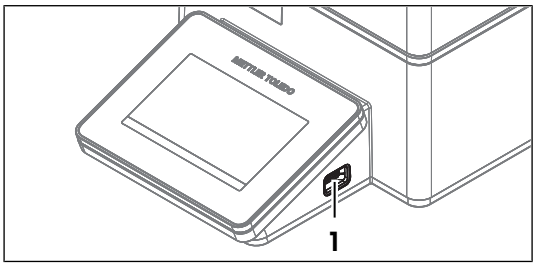
Set up the spectrophotometer for Spectroquant® analysis

Material

- USB flash drive
- Cuvette carousel 10/16

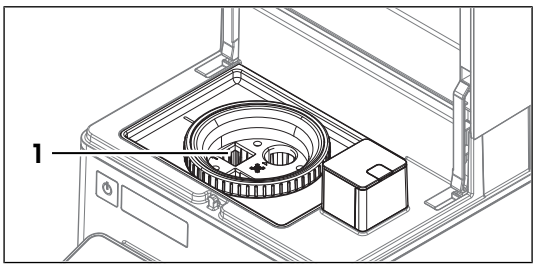
- Spectrophotometer is running.
- Spectrophotometer is warmed up (Easy VIS only).
- SQKitReader internal barcode reader is installed in the analysis compartment.

1 Insert a USB flash drive into the front USB socket (1).



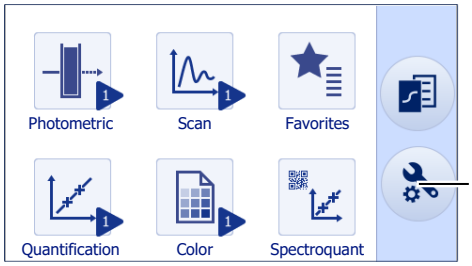
2 Install cuvette carousel 10/16 in the analysis compartment with the 10 mm cuvette holder in the measurement position (1).

3 Close the lid.



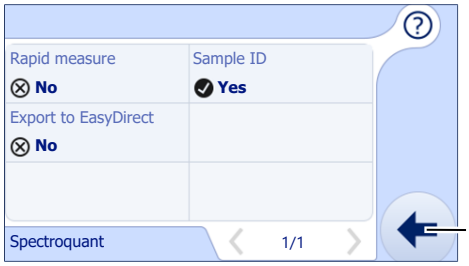
Configure the instrument settings for Spectroquant®

1 Go to (1) > .



2 Change the parameters to the settings listed in the following table.

3 To return to the home screen, go to (1) > .



Parameter	Setting	Explanation
Rapid measure	**No**	During analysis, you will be prompted to insert the samples.
Export to EasyDirect	**No**	Results are not exported to EasyDirect.
Sample ID	**Yes**	The spectrophotometer prompts users to enter a sample identifier before each measurement.

See also

- Analysis compartment ▸ Page 11
- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Overview of home screen and functions ▸ Page 14
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Start up the spectrophotometer ▸ Page 68
- View parameter descriptions ▸ Page 72

6.6.3 Perform the analysis

The Spectroquant® method is configured after zero cell measurement.

To begin the analysis, the 2D barcode on the AutoSelector is scanned to open the Spectroquant® method. Next, a zero adjustment is performed using the zero cell. Afterwards, the method is configured and then prepared samples A and B are measured.

Material

- AutoSelector
- Prepared sample A
- Prepared sample B
- Zero cell
- Lint-free optical tissues
- Waste container

See also

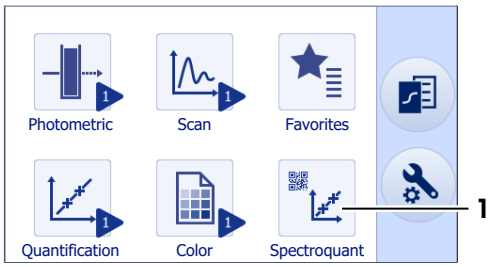
- Cuvette carousels ▸ Page 11
- Cuvettes and cuvette holders ▸ Page 13
- Overview of home screen and functions ▸ Page 14
- Loading cuvettes into holders ▸ Page 38

6.6.3.1 Perform the zero adjustment

The zero adjustment is performed using the zero cell.

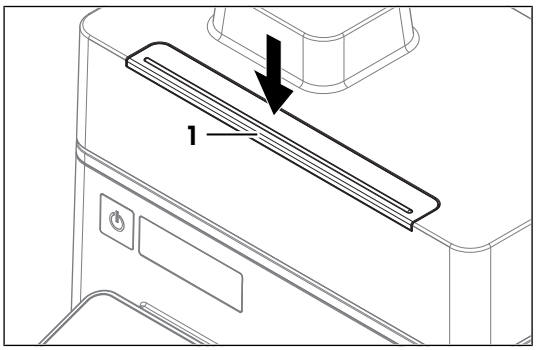
- Cuvette carousel 10/16 is installed in the analysis compartment.
- A 10 mm cuvette holder is in the measurement position.

1 Select (1).

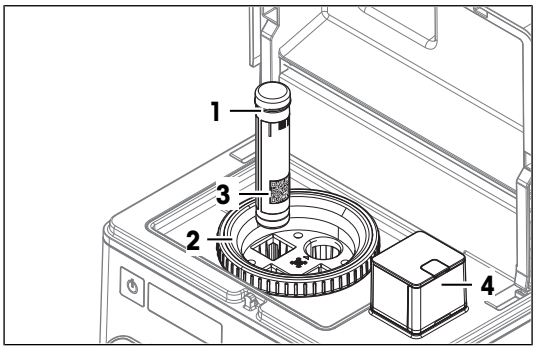


➡ You are prompted to scan the 2D barcode on the AutoSelector.

2 Press down on the lid (1) to open the analysis compartment.

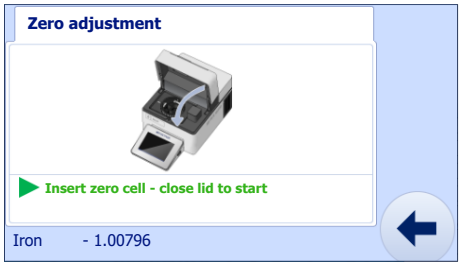


3 Holding the top of the AutoSelector (1), position it over the cuvette carousel (2) with the 2D barcode (3) situated toward the internal barcode reader (4).



➡ The spectrophotometer reads the barcode and opens the method.

➡ You are prompted to insert the zero cell.

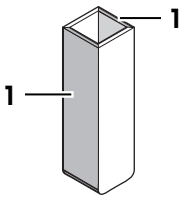


4 Hold the top of the zero cell by the frosted sides (1).

5 Lift the zero cell out of the rack.

6 Check that the clear sides of the zero cell are clean.

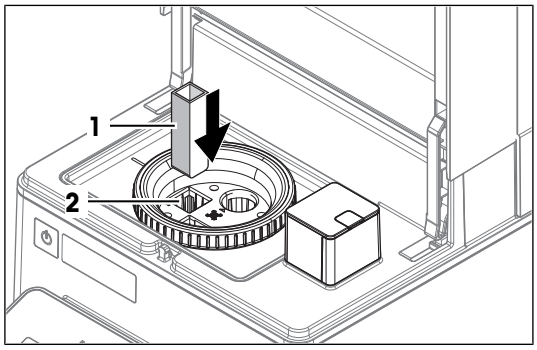
7 If necessary, clean the clear sides with a lint-free tissue.



8 Orient the zero cell (1) so that the frosted sides are directed towards the front and back of the spectrophotometer.

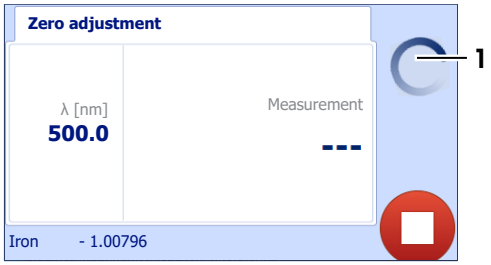
9 To avoid scratching the surface of the zero cell, insert the zero cell vertically into the 10 mm cuvette holder (2) in the measurement position.

10 Close the lid.



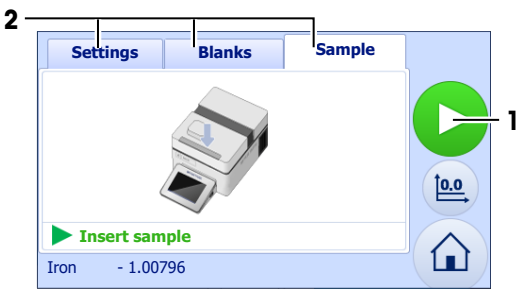
➡ The spectrophotometer performs the zero adjustment.

➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).

➡ The **Settings**, **Blanks** and **Sample** tabs (2) activate.



See also

Working with blank values ▸ Page 30

Blank measurement for Spectroquant® methods ▸ Page 33

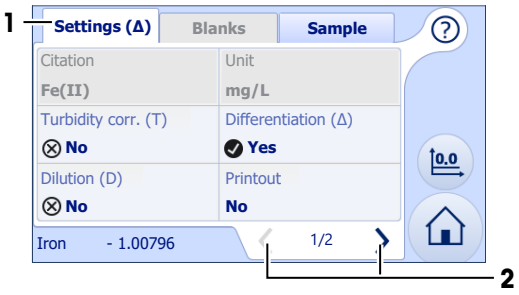
6.6.3.2 Configure the Spectroquant® method settings

1 Select **Settings** (1).

2 Change the parameters to the settings listed in the following table.

➡ The **Settings** tab will change to **Settings (Δ)** when **Differentiation (Δ)** is set to **Yes**.

3 Use the arrows (2) to move between windows.



Parameter	Setting	Explanation
Turbidity corr. (T)	**No**	Automatic turbidity correction is turned off.
Differentiation (Δ)	**Yes**	Calculations of measurement results will differentiate between distinct chemical formulas for iron. The following parameters are automatically set: • **Citation**: **Fe(II)** is displayed and concentration is measured. • **Unit**: Measurement result is provided in **mg/L**

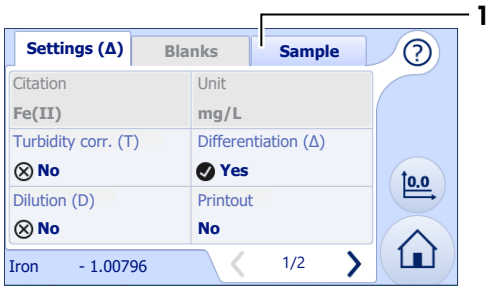
Parameter	Setting	Explanation
Dilution (D)	**No**	Dilution is not taken into account for calculating sample concentration.
Printout	**No**	No results are printed after measurement.
Export to USB	**Short**	A short format result is exported to the USB flash drive as a CSV file.

See also

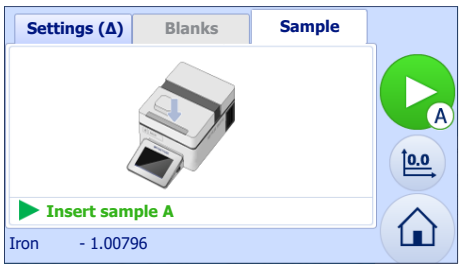
- Overview of home screen and functions ▸ Page 14
- View parameter descriptions ▸ Page 72

6.6.3.3 Measure sample A

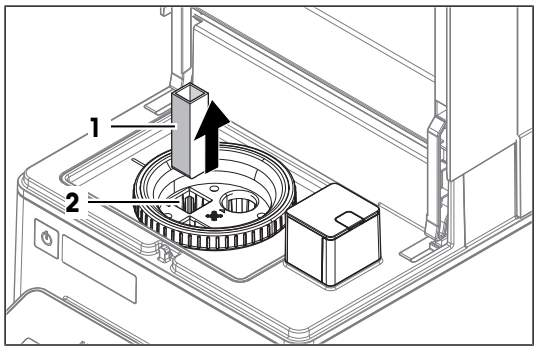
1 Select **Sample** (1).



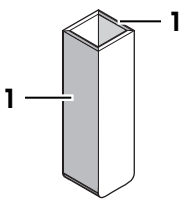
➡ You are prompted to insert sample A.



2 Open the lid to remove the zero cell (1) from the measurement position (2).
3 Lift the zero cell out, being careful to hold it vertically.
4 Place the zero cell in a rack.



5 Hold the top of sample A by the frosted sides (1).
6 Lift sample A out of the rack.
7 Check that the clear sides of sample A are clean.
8 If necessary, clean the clear sides with a lint-free tissue.

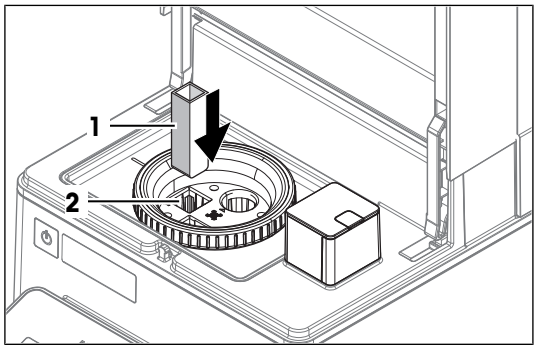


9 Orient sample A (1) so that the frosted sides are directed towards the front and back of the spectrophotometer.

10 To avoid scratching the surface of sample A, insert sample A vertically into the 10 mm cuvette holder (2) in the measurement position.

11 Close the lid.

➡ You are prompted to enter a sample identifier.

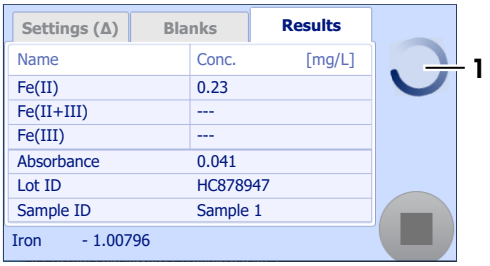


12 For **Sample ID** (1), enter an identifier.

13 Tap ✅ (2).

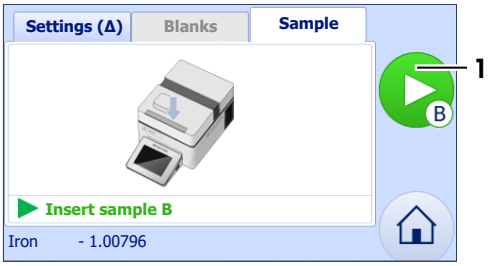
➡ The spectrophotometer measures sample A.

➡ The revolving circle (1) shows that the measurement is in progress.



➡ When measurement is complete, the revolving circle is replaced by ▶ (1).

➡ You are prompted to insert sample B.

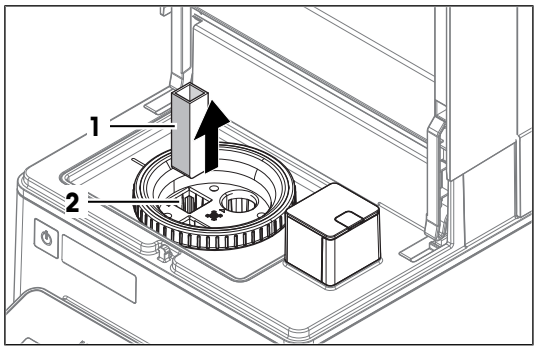


6.6.3.4 Measure sample B

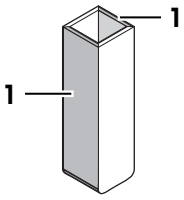
1 Open the lid to remove sample A (1) from the measurement position (2).

2 Lift sample A out, being careful to hold it vertically.

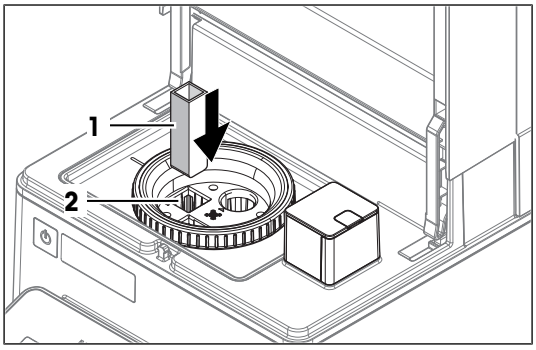
3 Place sample A in a rack.



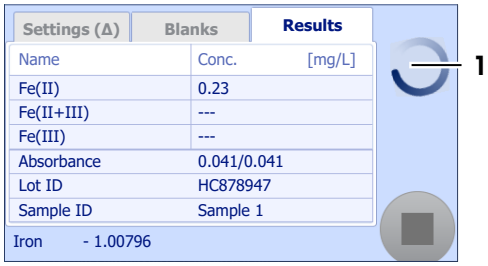
4 Hold the top of sample B by the frosted sides (1).
5 Lift sample B out of the rack.
6 Check that the clear sides of sample B are clean.
7 If necessary, clean the clear sides with a lint-free tissue.



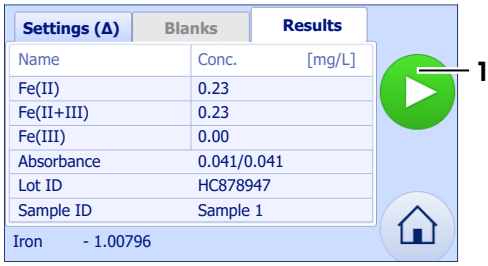
8 Orient sample B (1) so that the frosted sides are directed towards the front and back of the spectrophotometer.
9 To avoid scratching the surface of sample B, insert sample B vertically into the 10 mm cuvette holder (2) in the measurement position.
10 Close the lid.
➡ The spectrophotometer measures the sample B.



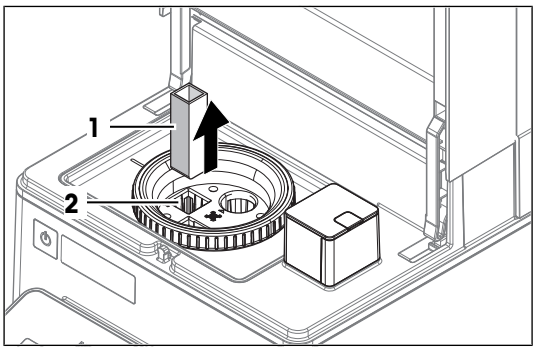
➡ The revolving circle (1) shows that the measurement is in progress.



➡ When the measurement is complete, the revolving circle is replaced by ▶ (1).
➡ Results are displayed on the touch screen.
➡ Results are exported to the USB flash drive as a CSV file.



11 Open the lid and remove sample B (1) from the measurement position (2).
12 Close the lid.
13 To return to the home screen, tap ⌂.
➡ Spectroquant® water analysis is complete.



7 Maintenance

In this chapter you find descriptions of the maintenance tasks you should perform on your spectrophotometer. 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 spectrophotometer, contact your authorized METTLER TOLEDO service representative or dealer.

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

www.mt.com/contact

7.1 Maintenance schedule

After each measurement series

Task	Link
Clean the cuvettes	**See** [Clean glass or quartz cuvettes ▸ Page 102]

Every day

Task	Link
Clean the cuvettes	**See** [Clean glass or quartz cuvettes ▸ Page 102]

Every month

Task	Link
Clean the housing	**See** [Clean the housing ▸ Page 102]
Clean the analysis compartment	**See** [Clean the analysis compartment ▸ Page 103]
Clean the storage compartment	**See** [Clean the storage compartment ▸ Page 104]

Every three months

Task	Link
Perform system baseline adjustment (Easy VIS only)	**See** [Perform adjustments ▸ Page 105]

Every six month

Task	Link
Perform system baseline adjustment (Easy UV only)	**See** [Perform adjustments ▸ Page 105]

Before periods of inactivity

Task	Link
Clean the cuvettes	**See** [Clean glass or quartz cuvettes ▸ Page 102]
Clean cuvette carousels	**See** [Clean the cuvette carousels ▸ Page 103]
Clean the housing	**See** [Clean the housing ▸ Page 102]
Clean the analysis compartment	**See** [Clean the analysis compartment ▸ Page 103]
Clean the storage compartment	**See** [Clean the storage compartment ▸ Page 104]

7.2 Clean the spectrophotometer

NOTICE

Damage to the spectrophotometer due to inappropriate cleaning methods

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

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 spectrophotometer.

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

www.mt.com/contact

See also

Technical data ▸ Page 121

7.2.1 Clean glass or quartz cuvettes

METTLER TOLEDO recommends the following cleaning agents:

- Water
- Deionized water
- Spectroscopy grade isopropanol
- Spectroscopy grade acetone

Some of the recommended cleaning agents are hazardous materials. Wear protective gear as required by the safety-data sheets of the cleaning agents you use and the safety rules of your workplace.

Clean the inside of the cuvette

1 Hold the top of the cuvette by the frosted sides.

2 Rinse the cuvette under warm, running water.

3 Rinse the inside of the cuvette with deionized water.

4 Rinse the inside of the cuvette with acetone.

5 If the cuvette is still dirty, clean it with an appropriate optical cell cleaning solution. Take care to follow the instructions of the supplier.

Clean the outside of the cuvette

1 Hold the top of the cuvette by the frosted sides.

2 Wipe the outside of the cuvette with a lint-free optical tissue moistened with spectroscopy grade isopropanol.

3 To dry the outside of the cuvette, wipe it with a dry, lint-free optical tissue.

4 Make sure that the clear sides are free of lint.

5 Store the cuvette in its original packaging or in an appropriate cuvette holder.

7.2.2 Clean the housing

METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Procedure

- The spectrophotometer is shut down.

1 Wipe the housing with a cloth moistened with the cleaning agent.

2 Wipe the housing with a cloth moistened with water.

See also

Technical data ▸ Page 121

7.2.3 Clean the cuvette carousels

METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Procedure

1 Remove the cuvette carousel.

2 Rinse the cuvette carousel with the cleaning agent.

3 Air-dry the cuvette carousel or dry it with a soft tissue.

4 Install the cuvette carousel.

See also

Install the cuvette carousel ▸ Page 23

Change the cuvette carousel ▸ Page 23

Technical data ▸ Page 121

7.2.4 Clean the analysis compartment

METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Procedure

- The spectrophotometer is shut down.

1 Press down on the lid to open the analysis compartment.

2 Remove the cuvette carousel.

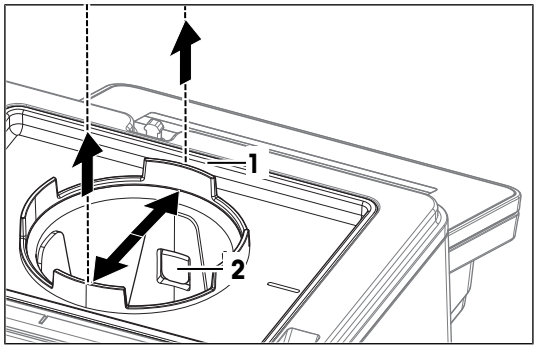
3 Wipe the surface of the analysis compartment with a cloth moistened with the cleaning agent.

4 Press the release latch (2) on the inside of the drip tray.

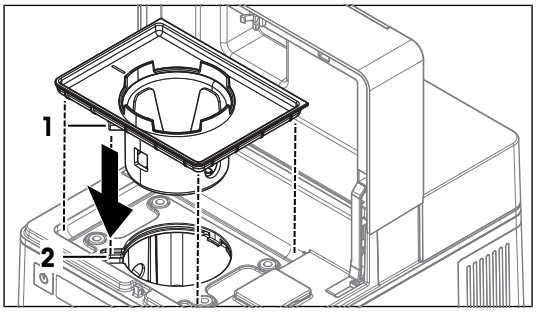
5 Slightly move the drip tray (1) back and forth while lifting it out.

6 Wipe the drip tray with a cloth moistened with the cleaning agent.

7 Air-dry the drip tray or dry it with a soft tissue.



8 Align the guide (1) with the guide notch (2) and insert the drip tray into the measurement chamber.
9 Push the drip tray down until it clicks into place.
10 Install the cuvette carousel.



See also

- Analysis compartment ▸ Page 11
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Technical data ▸ Page 121

7.2.5 Clean the storage compartment

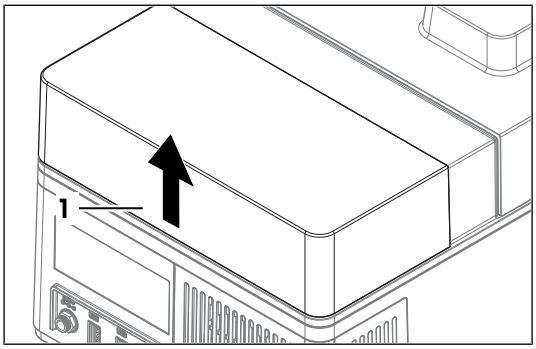
METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Procedure

- The spectrophotometer is shut down.

1 Lift the back cover (1) of the storage compartment.
2 Wipe the back cover with a cloth moistened with the cleaning agent.
3 Lift the cuvette carousels out of the cuvette carousel bay.
4 Lift the Allen wrench out of the allen wrench tray.
5 Wipe the surface of the storage compartment with a cloth moistened with the cleaning agent.
6 Reinstall cuvette carousels and Allen wrench.



See also

- Change the cuvette carousel ▸ Page 23
- Technical data ▸ Page 121

7.2.6 Clean up spills

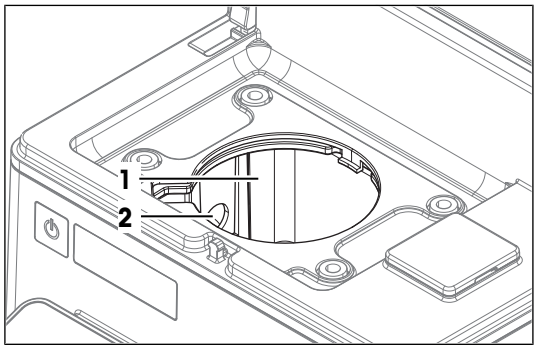
METTLER TOLEDO recommends the following cleaning agents:

- Water
- Water with a mild detergent

Clean the inside

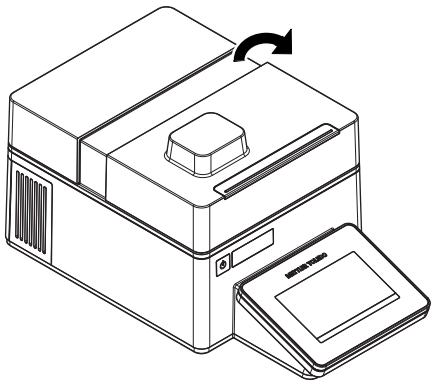
1 Shut down the spectrophotometer.
2 Pull the plug of the power cable out of the power outlet.
3 Remove all cuvettes.
4 Remove and clean the cuvette carousel.
5 Wipe the surface of the analysis compartment with a cloth moistened with the cleaning agent.
6 Remove and clean the drip tray.

7 Without touching the lenses (2), wipe the measurement chamber (1) with a soft dry cloth.
8 Install the drip tray and the cuvette carousel.
9 Close the lid.

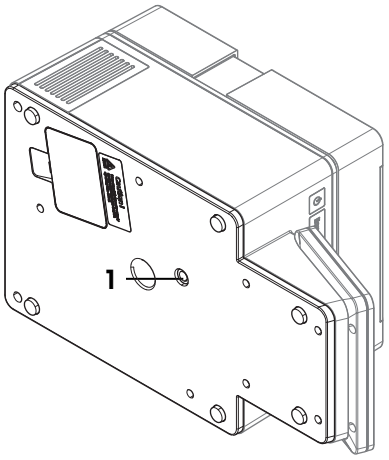


Clean the outside

1 Tilt the spectrophotometer and carefully lower it onto its right side.



2 Wipe the drain hole (1) and the bottom of the spectrophotometer with a cloth moistened with the cleaning agent.
3 Wipe the work surface with a cloth moistened with the cleaning agent.
4 Return the spectrophotometer to its upright position.
5 Connect the spectrophotometer to the power supply.



See also

- Connect and disconnect the power supply ▸ Page 21
- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Clean the cuvette carousels ▸ Page 103
- Clean the analysis compartment ▸ Page 103
- Technical data ▸ Page 121

7.3 Perform adjustments

Adjustments are performed to ensure measurement accuracy. If adjustments are not performed when required, measurement results may be unreliable.

Once an adjustment has been started, there is no way to stop the procedure. Do not turn off or unplug the spectrophotometer during an adjustment. Do not restart the spectrophotometer until a successful adjustment has been completed. Do not open the lid or interfere with an adjustment that is in progress. Any interruption to an adjustment in progress may result in unreliable measurement results. If an adjustment is interrupted, it needs to be rerun until successful completion.

There are two methods of adjustment:

- System baseline
- Dark current

Adjustments are required during first-time startup.

Adjustments are required for maintenance as described below:

System baseline

After the spectrophotometer has warmed up for at least one hour, system baseline adjustment takes approximately five minutes.

- After instrument firmware update
- After optical firmware update
- After lamp replacement (Easy VIS only)
- Every 3 months (Easy VIS only)
- Every 6 months (Easy UV only)

Dark current (Easy VIS only)

After the spectrophotometer has warmed up for at least one hour, dark current adjustment takes approximately 20 minutes.

- After instrument firmware update
- After optical firmware update
- After the operational environment has changed (e.g., the spectrophotometer is moved to a different location)

Procedure

- Spectrophotometer has been warmed up for at least one hour. For example, after lamp sleep or start up.
- There is nothing blocking the light path. For example, no cuvette in measurement position.
- The lid is closed.

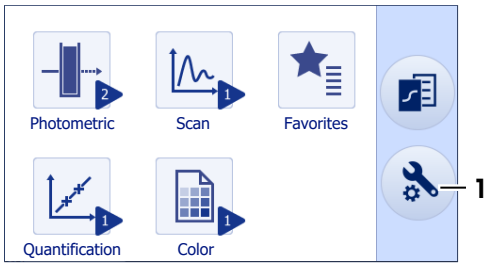
1 Go to (1) > .

2 Select either **System baseline** or **Dark current**.

3 Tap .

➡ The selected adjustment is performed.

➡ A window opens confirming successful adjustment.



See also

- Analysis compartment ▸ Page 11
- Overview of home screen and functions ▸ Page 14
- Overview of the measurement technology ▸ Page 16
- Start up the spectrophotometer ▸ Page 68
- When to measure a blank solution ▸ Page 31
- Replace the lamp (Easy VIS only) ▸ Page 107
- Update the firmware ▸ Page 111

7.4 Replace parts

7.4.1 Replace the lamp (Easy VIS only)

The lamp lifetime varies and depends on factors such as the switching frequency. The lamp needs to be replaced after a burn time of about 2000 h. The spectrophotometer monitors the light emitted by the lamp. When changes in the light intensity indicate that the lamp is near the end of its life, users are notified to prepare its replacement.

When you replace the lamp, you need to perform adjustments and reset the lamp usage.

- Perform adjustments: System baseline adjustment and dark current adjustment
- Reset lamp usage: This is important because blank values that have been measured with the old lamp are no longer valid. When you reset the lamp usage time, the blank values are deleted and users are prompted to measure them again.

See also

- When to measure a blank solution ▸ Page 31
- Perform adjustments ▸ Page 105
- Reset the lamp usage time (Easy VIS only) ▸ Page 109

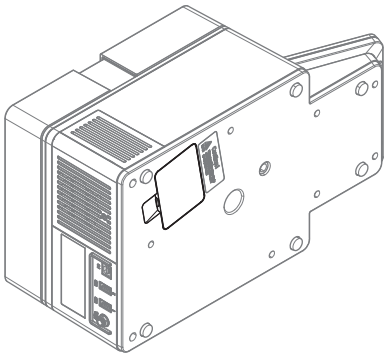
7.4.1.1 Remove the lamp (Easy VIS only)

Material

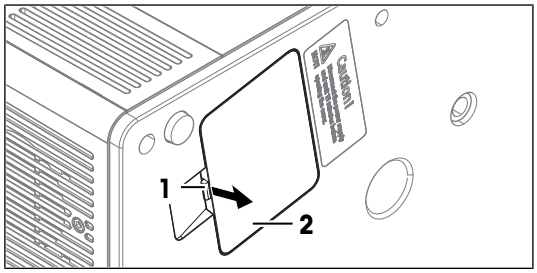
- Allen wrench

Procedure

1 Shut down the spectrophotometer.
2 Pull the plug of the power cable out of the power outlet.
3 Remove all cuvettes.
4 Tilt the spectrophotometer and carefully lower it onto its right side.

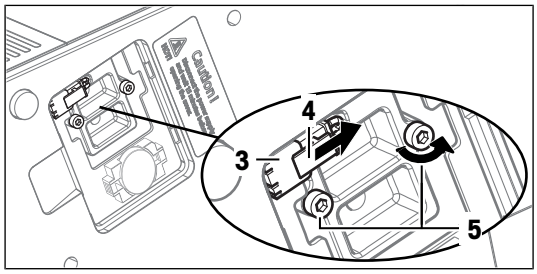


5 ⚠ **CAUTION: Burns due to hot surfaces. The light bulb heats up the surfaces of the lamp and battery compartment. Let the spectrophotometer cool down for 15 minutes.**
6 Pull the latch (1) and remove the cover (2).

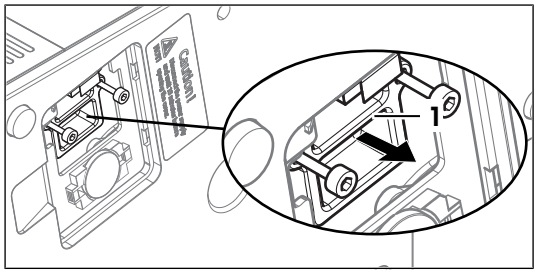


7 Press down the latch (4) and pull the lamp plug out of the lamp socket (3).

8 Turn the two screws (5) anticlockwise with the Allen wrench.



9 Grab the grip (1) and carefully pull out the lamp.



See also

- Top and bottom view ▸ Page 9
- Connect and disconnect the power supply ▸ Page 21

7.4.1.2 Reinstall the lamp (Easy VIS only)

NOTICE

Damage to the light bulb due to oily residue

If you touch the light bulb with your bare hand, your skin leaves oily residue on the light bulb.

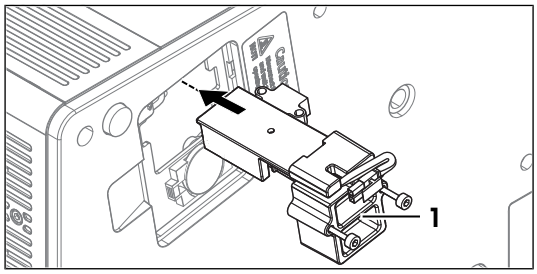
– Do not touch the light bulb.

Material

- Allen wrench
- New lamp

Procedure

1 Hold the new lamp by the grip (1) and carefully insert it as shown.



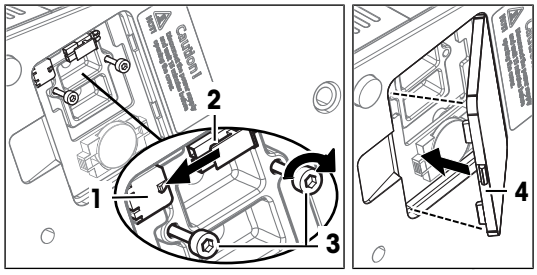
2 Use the Allen wrench to tighten the two screws (3) clockwise.

3 Insert the lamp plug (2) into the lamp socket (1).

4 Install the cover (4).

5 Return the spectrophotometer to its upright position.

6 Connect the spectrophotometer to the power supply.

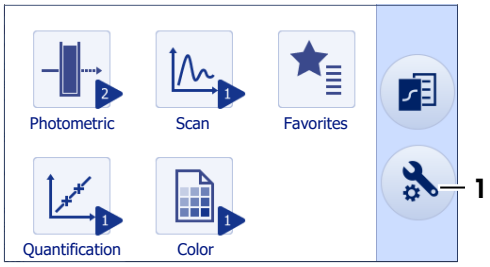


See also

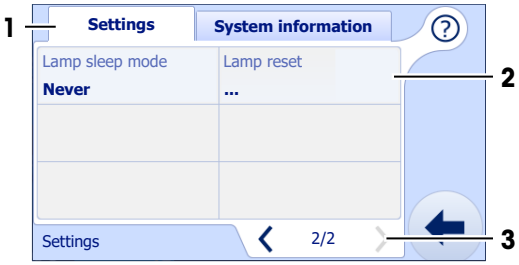
- Top and bottom view ▸ Page 9
- Connect and disconnect the power supply ▸ Page 21

7.4.1.3 Reset the lamp usage time (Easy VIS only)

1 Go to (1) > .



2 Select **Settings** (1).
3 Tap the arrow (3) to switch to the next page.
4 Tap **Lamp reset** (2).
5 Perform adjustments.

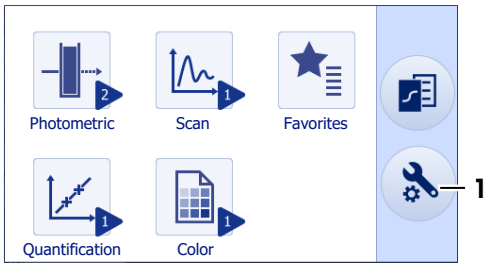


See also

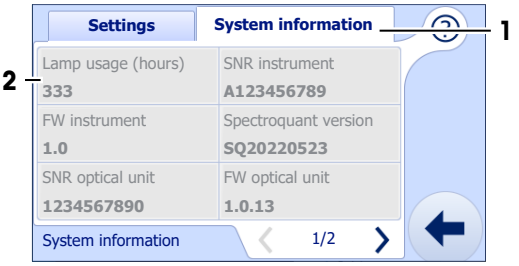
- When to measure a blank solution ▸ Page 31
- Perform adjustments ▸ Page 105

7.4.1.4 Check lamp usage (Easy VIS only)

1 Go to (1) > .



2 Select **System information** (1).
➡ In **Lamp usage (hours)** (2) the burn time is shown in hours.



See also

- When to measure a blank solution ▸ Page 31
- Update the firmware ▸ Page 111
- Update the instrument firmware ▸ Page 112
- Update the optical unit firmware ▸ Page 113

7.4.2 Replace the SQKitReader internal barcode reader

When you remove the internal barcode reader, you can no longer access the Spectroquant® methods or the Spectroquant® settings. You can still access the results of analyses performed with a Spectroquant® method.

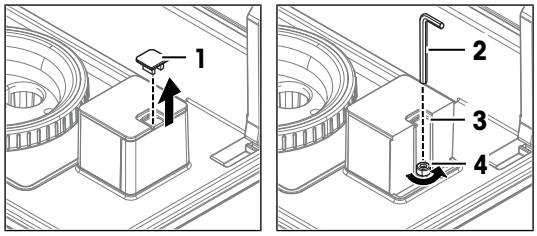
The Spectroquant® settings remain unchanged and access is restored as soon as the new internal barcode reader is installed.

Material

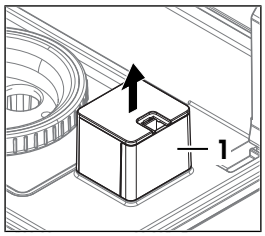
- Allen wrench
- SQKitReader

Remove the internal barcode reader

1 Shut down the spectrophotometer.
2 Disconnect the spectrophotometer from the power supply.
3 Lift off the cover (1).
4 Insert the Allen wrench (2) into the opening (3) and down into the screw (4).
5 Loosen the screw (4) anticlockwise.

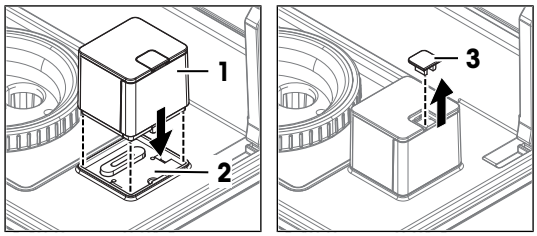


6 Pull up the internal barcode reader (1) against the small resistance of the magnets that hold it in place.

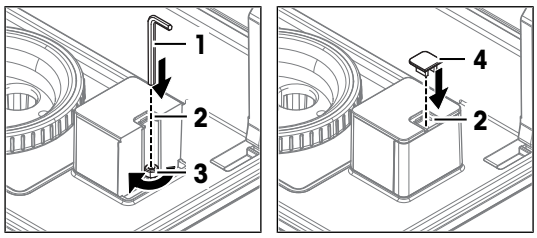


Install the new internal barcode reader

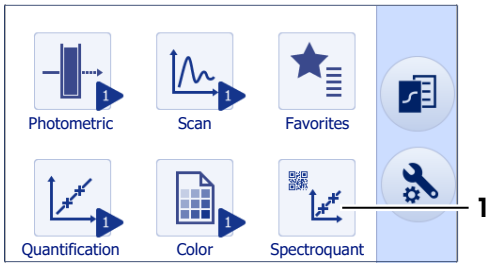
1 Lower the internal barcode reader (1) onto the socket (2).
   ➡ Magnets pull the internal barcode reader down and hold it in place.
2 Gently push the internal barcode reader into the socket.
3 Lift off the cover (3).



4 Insert the Allen wrench (1) into the opening (2) and down into the screw (4).
5 Tighten the screw clockwise.
6 Insert the cover (4) into the opening (2).
7 Connect the spectrophotometer to the power supply.
8 Restart the spectrophotometer.



➡ The Spectroquant® app (1) is visible on the home screen.



See also

- Connect and disconnect the power supply ▸ Page 21
- Install the internal barcode reader ▸ Page 26

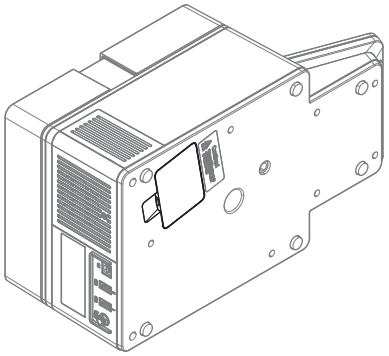
7.4.3 Replace the battery

Material

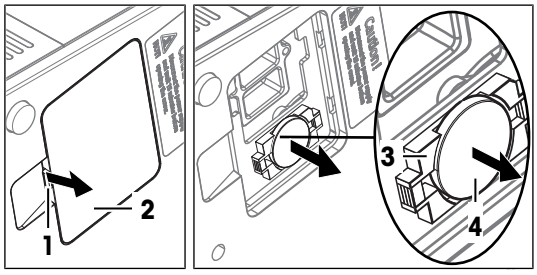
- Battery: CR2032

Remove the battery

1 Shut down the spectrophotometer.
2 Pull the plug of the power cable out of the power outlet.
3 Remove all cuvettes.
4 Tilt the spectrophotometer and carefully lower it onto its right side.

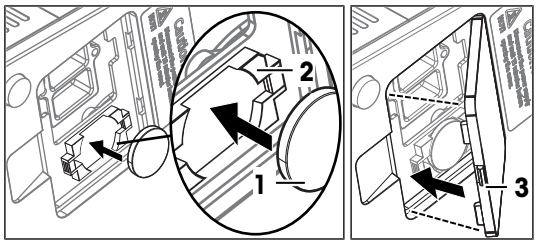


5 ⚠ **CAUTION: Burns due to hot surfaces. The light bulb heats up the surfaces of the lamp and battery compartment. Let the spectrophotometer cool down for 15 minutes.**
6 Pull the latch (1) and remove the cover (2).
7 Pull the battery (4) out of the battery holder (3).
8 Dispose of the battery according to local laws and regulations.



Install the battery

1 Push a new battery (1), with the plus side facing you, into the battery holder (2) until it snaps into place.
2 Install the cover (3).
3 Return the spectrophotometer to its upright position.
4 Connect the spectrophotometer to the power supply.



See also

- Top and bottom view ▸ Page 9
- Connect and disconnect the power supply ▸ Page 21
- Technical data ▸ Page 121

7.5 Update the firmware

The instrument firmware and optical unit firmware of your spectrophotometer can be updated. If you want to update the firmware, contact your authorized METTLER TOLEDO service representative or dealer.

Adjustments must be performed after updating the instrument firmware and optical unit firmware to ensure measurement accuracy. If adjustments are not performed when required, measurement results may be unreliable.

See also

- Perform adjustments ▸ Page 105
- View the firmware version and other system information ▸ Page 119

7.5.1 Update the instrument firmware

When updating the instrument firmware, you have the option to save user settings. If user settings are saved, system settings and method configurations are saved. If user settings are not saved, the spectrophotometer will be reset to factory settings. Language selection and EasySetup Tutorial will only appear during the first-time start up and after firmware updates, if system settings are not saved.

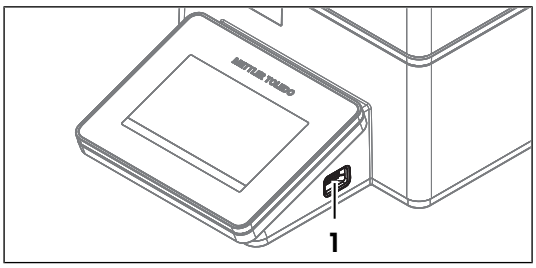
Procedure

Material

- USB flash drive containing the instrument firmware update software.

■ Spectrophotometer is running.

1 Insert the USB flash drive containing the firmware update software into the front USB socket (1).



2 Tap (1) > > .

3 Tap **Update** (1) and select **Instrument FW** from the pulldown menu.

4 Tap (2).

➡ You are prompted to save user settings.

5 Select **Yes** or **No**.

➡ The instrument firmware update starts.

➡ The spectrophotometer will shut down and start up multiple times.

➡ When complete, the spectrophotometer will start up and remain on.

➡ The instrument firmware is updated.

See also

- Perform adjustments ▸ Page 105
- View the firmware version and other system information ▸ Page 119

7.5.2 Update the optical unit firmware

The optical unit firmware is separate from the instrument firmware. Do not unplug the power cable or the USB flash drive during the optical unit firmware update .

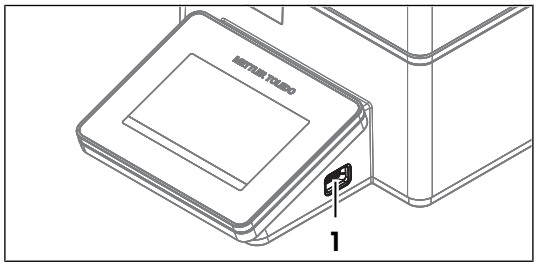
Procedure

Material

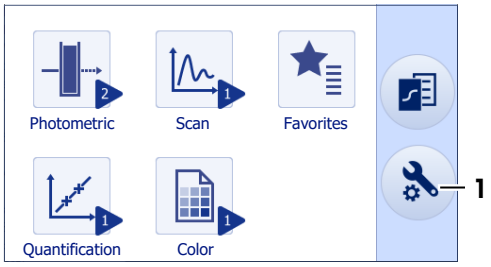
- USB flash drive containing the optical unit firmware update software.

■ Spectrophotometer is running.

1 Insert the USB flash drive containing the firmware update software into the front USB socket (1).



2 Tap (1) > > .



3 Tap **Update** (1) and select **Optical unit FW** from the pulldown menu.

4 Tap (2).

➡ You are warned not to unplug the power cable or USB flash drive during the update.

5 Tap **OK**.

➡ The optical unit firmware update starts.

➡ The spectrophotometer will shut down and start up multiple times.

➡ When complete, the spectrophotometer will start up and remain on.

➡ The optical unit firmware is updated.

See also

Perform adjustments ▸ Page 105

View the firmware version and other system information ▸ Page 119

7.6 Prepare the spectrophotometer for storage

Procedure

1 Shut down the spectrophotometer.

2 Remove all cuvettes.

3 Install one cuvette carousel in the analysis compartment and the other two carousels in the storage compartment.

4 Close the lid, the back cover and the cover of the front USB-A socket.

5 Disconnect the spectrophotometer from the power supply.

6 Disconnect any external accessories from the spectrophotometer. If an internal barcode reader is installed, do not remove it.
7 Clean the spectrophotometer.
8 Protect the spectrophotometer from dust.
9 Store the spectrophotometer in a dry and clean place.

See also

- Connect and disconnect the power supply ▸ Page 21
- Clean the spectrophotometer ▸ Page 102
- Technical data ▸ Page 121

7.7 Transport the spectrophotometer

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

www.mt.com/contact

Procedure

1 Shut down the spectrophotometer.
2 Remove all cuvettes.
3 Install one cuvette carousel in the analysis compartment and the other two carousels in the storage compartment.
4 Close the lid, the back cover and the cover of the front USB-A socket.
5 Disconnect the spectrophotometer from the power supply.
6 Disconnect any external accessories from the spectrophotometer. If an internal barcode reader is installed, do not remove it.
7 Clean the spectrophotometer.
8 Secure the Allen wrench in the storage compartment with adhesive tape.
9 Keep the spectrophotometer upright while you transport it.
10 If you transport the spectrophotometer over long distances, use the original packaging.

See also

- Connect and disconnect the power supply ▸ Page 21
- Clean the spectrophotometer ▸ Page 102
- Technical data ▸ Page 121

7.8 Dispose of the spectrophotometer

Dispose of the battery

1 Remove the battery.
2 Dispose of the battery according to local laws and regulations.

Dispose of the spectrophotometer

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.

See also

- Replace the battery ▸ Page 111
- Technical data ▸ Page 121

8 Troubleshooting

8.1 List of errors and problems

Generic errors and problems

Problem	Possible cause	Measure
Not possible to run an analysis because the lid no longer locks.	The latch of the lock mechanism is broken.	1 To run an analysis, hold the lid closed during the analysis. 2 Order a new front-lid locker. See [Accessories ▸ Page 123] 3 Replace the front-lid locker.
Import of a method from Easy UV to Easy VIS fails.	One or more wavelength settings are outside of the range of 330… 1000 nm.	1 Check and correct the wavelength settings in the method on the Easy UV spectrophotometer. 2 Export the changed method.
The print icon is grayed out.	No printer is connected.	See [Connect and test a USB printer ▸ Page 25]
	The printer is switched off.	– Switch on the printer.
An unexpected result is shown.	Droplets or fingerprints on one of the lenses.	See [Clean the lenses ▸ Page 120]
The touch screen is dark but the spectrophotometer is running.	The screen saver is active.	– Tap the touch screen.
Date and time are no longer saved.	The battery in the spectrophotometer is empty.	See [Replace the battery ▸ Page 111]
The light source initialization fails and you are prompted to check the analysis compartment.	No cuvette carousel is installed.	– Install a cuvette carousel. See [Install the cuvette carousel ▸ Page 23]
	None of the cuvette holders is in the measurement position.	– Rotate a cuvette holder into the measurement position. See [Install the cuvette carousel ▸ Page 23]

Errors and problems for Spectroquant® methods

Problem	Possible cause	Measure
Spectroquant is not displayed on the home screen.	No SQKitReader internal barcode reader is connected.	See [Set up the SQKitReader internal barcode reader ▸ Page 26]
	The SQKitReader internal barcode reader is broken.	See [Replace the SQKitReader internal barcode reader ▸ Page 110]
The Spectroquant® method is not found when I scan the 2D barcode.	The installed Spectroquant® methods are not up to date.	– Update the Spectroquant® methods.
Exp. is shown before the result at the end of an analysis.	An expired water test kit was used.	– Order new water test kits.

Problem	Possible cause	Measure
Exp.? is shown before the result at the end of an analysis.	A catalog number was manually entered to start the Spectroquant® method.	– Scan the 2D barcode to start the Spectroquant® method. Or – Check the expiry date on the packaging to decide if you need to repeat the analysis.

Errors and problems for quantification methods

Problem	Possible cause	Measure
I want to replace a calibration curve but I am not prompted to measure a blank.	The blank value measured for the previous calibration curve is still stored as a valid blank value.	See [Measuring the blank solution for standards ▸ Page 61]
The measured result is far off the calibration curve and does not reflect the expected value.	The current blank value differs significantly from the blank value used to create the calibration curve.	1 Check that the new blank value has been measured correctly. 2 Create a new calibration curve based on the new blank value.
NaN is shown as result of a quantification method.	A division by zero occurred in the calculation.	– Check the formula.

Errors and problems for performance tests

Problem	Possible cause	Measure
A performance test fails and its results show a high deviation.	The glass filter is not inserted correctly.	1 Check if the glass filter is inserted correctly. 2 Repeat the performance test.
	Droplets or fingerprints on one of the lenses.	1 Clean the lenses. See [Clean the lenses ▸ Page 120]. 2 Repeat the performance test.
	The certified reference substance is contaminated.	– Repeat the performance test with an uncontaminated certified reference substance.
	On a Easy VIS spectrophotometer, the dark-current adjustment and the system-baseline adjustment were performed before the lamp reached a constant temperature.	1 Wait one hour after starting up the spectrophotometer. 2 Repeat the adjustments. See [Perform adjustments ▸ Page 105]. 3 Repeat the performance test.

Problem	Possible cause	Measure
A performance test fails and **NaN** is shown as result.	• No peaks were found in a range of 5 nm around the reference wavelength. • More than one peak was found in a range of 5 nm around the reference wavelength.	1 Check that the correct reference wavelength is configured in the performance test and if needed repeat the performance test with the correct setting. 2 Check that you have used the correct certified reference substance, and if needed repeat the performance test with the correct certified reference substance. 3 If the problem reoccurs, contact your METTLER TOLEDO service representative or dealer.

See also

- Install the cuvette carousel ▸ Page 23
- Change the cuvette carousel ▸ Page 23
- Connect and test a USB printer ▸ Page 25
- Set up the SQKitReader internal barcode reader ▸ Page 26
- Start up the spectrophotometer ▸ Page 68
- Peaks/valleys settings ▸ Page 41
- Measuring the blank solution for standards ▸ Page 61
- Example: Analyze water samples with a Spectroquant® COD Cell Test ▸ Page 82
- Example: Analyze water samples with a Spectroquant® Iron Test ▸ Page 93
- Replace the SQKitReader internal barcode reader ▸ Page 110
- Replace the battery ▸ Page 111

8.2 Handle error messages

1 Write down the error code (1) and the measures described (2).
2 Follow the instructions (2).
3 If the error occurs again, prepare the required information. See [Request support ▸ Page 118].
4 Contact your authorized METTLER TOLEDO service representative or dealer.

▸ www.mt.com/contact

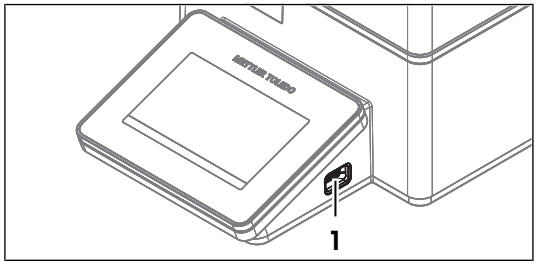
8.3 Request support

Collect the following information before you contact your authorized METTLER TOLEDO service representative or dealer for technical support.

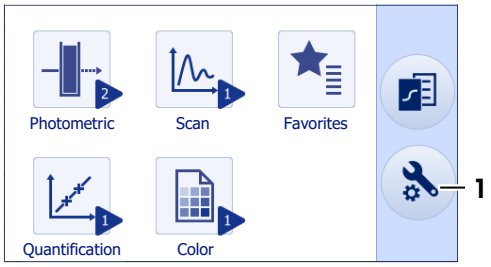
- Instrument model type (e.g., Easy VIS)
- Instrument serial number
- Error code
- A description of the actions that lead to the error or the issues that you cannot resolve.
- An export of the system information.

Export system information and instrument status

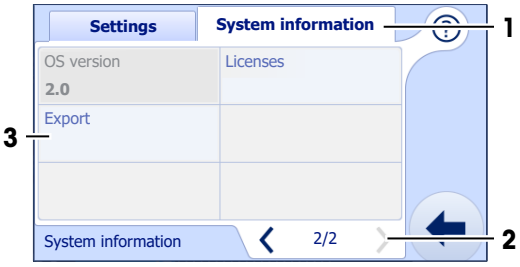
1 Insert a USB flash drive into the front USB socket (1).



2 Go to (1) > .



3 Select **System information** (1).
4 Tap the arrow (2) to switch to the next page.
5 Tap **Export** (3).
➡ A message opens when the export is completed.



See also

View the firmware version and other system information ▸ Page 119

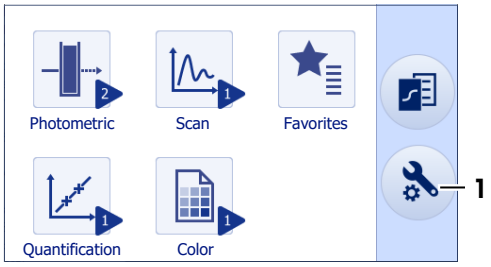
8.4 View the firmware version and other system information

Firmware versions and other system information can be accessed in the system settings. Parameters that can be viewed include:

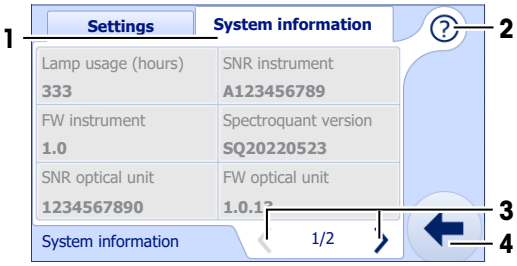
- Lamp usage
- Instrument serial number
- Instrument firmware version
- Spectroquant® version (only when SQKitReader internal barcode reader is installed)
- Optical unit serial number
- Optical unit firmware version
- Operating system version
- Licensing information
- System information export

Procedure

1 Go to (1) > .



2 Select **System information** (1).
3 To view parameter descriptions, tap ⓘ (2).
4 Tap the parameter that interests you.
5 To move between windows, use the arrows (3).
6 To return to the home screen, go to ← (4) > ⌂.



See also

Update the firmware ▸ Page 111

8.5 Clean the lenses

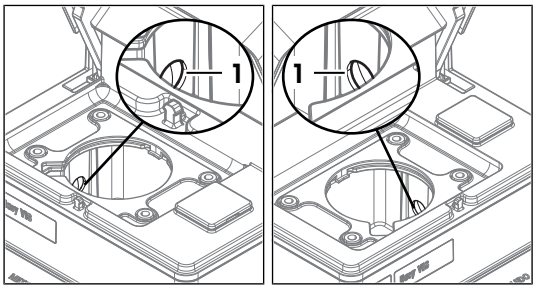
METTLER TOLEDO recommends the following cleaning agents:

- Spectroscopy grade ethanol
- Spectroscopy grade isopropanol

Some of the recommended cleaning agents are hazardous materials. Wear protective gear as required by the safety-data sheets of the cleaning agents you use and the safety rules of your workplace.

Procedure

1 Shut down the spectrophotometer.
2 Pull the plug of the power cable out of the power outlet.
3 Remove all cuvettes.
4 Remove the cuvette carousel.
5 Remove the drip tray.
6 Wipe the lenses (1) with a lint-free optical tissue moistened with cleaning agent.
7 Install the cuvette carousel.
8 Close the lid.
9 Connect the spectrophotometer to the power supply.



See also

Analysis compartment ▸ Page 11
Connect and disconnect the power supply ▸ Page 21
Clean the analysis compartment ▸ Page 103
Technical data ▸ Page 121

9 Technical data

9.1 Spectrophotometer

Power supply

Characteristic		Easy UV	Easy VIS
Spectrophotometer	Input rating	24 V DC, 2.5 A	24 V DC, 2.5 A
	Power consumption	35 W	40 W
	Socket	DC-Jack, 2.5 mm	DC-Jack, 2.5 mm
AC/DC adapter	Input rating	100…240 V AC ±10 %, 1.5 A	100…240 V AC ±10 %, 1.5 A
	Input frequency	50/60 Hz	50/60 Hz
	Output rating	24 V DC, 2.5 A	24 V DC, 2.5 A

Instrument

Characteristic		Value
Dimensions	Width	201 mm
	Depth	362 mm
	Height	176 mm
Weight		4.25 kg
Display	Technology	Color display with capacitive touch screen
	Size	4.3 "
	Resolution	480 x 272 pixel
Materials	Cuvette carousel	PA66 (polyamide)
	Touch screen	Alkali-aluminosilicate glass
	Housing	PP (polypropylene)
	Analysis compartment	PP (polypropylene)
	Drip tray	PP (polypropylene)
	Measurement chamber	PP (polypropylene)
	Storage compartment	PP (polypropylene)
Battery	Type	CR2032

Site requirements

Characteristic		Value
Ambient conditions	Ambient temperature	5…40 °C
	Recommended ambient temperature for operation	20…25 °C
	Relative humidity	Non-condensing, max. 80 % for temperatures up to 31 °C, decreasing linearly to 50 % at 40 °C
	Altitude	≤5000 m above sea level
	Use	Indoor
	Overvoltage category	II
	Pollution degree	2
Storage conditions	Temperature	-20…+70 °C
	Relative humidity	10…90 %

Connections

Characteristic		Value
PC	Socket	Device, USB B 2.0, full speed
	Cable length	Max. 3 m
USB 1/USB 2/ front USB socket	Socket	Host, USB A 2.0 , full speed
	Output current	Max. 500 mA
	Cable length	Max. 3 m
Internal barcode reader socket	Socket	Spring-loaded pin
	Voltage	3.3 V DC
	Current	0.17 A

9.2 Measurements

Characteristic		Easy UV	Easy VIS
Optical configuration		Dual beam	Dual beam
Light source		Flashing Xenon lamp	Tungsten lamp
Detector		Dual silicon photo-diodes	Dual silicon photo-diodes
Scanning speed		max. 2000 nm/min	max. 2800 nm/min
Spectral bandwidth		3 nm	4 nm
Wavelength	Range	190…1000 nm	330…1000 nm
	Accuracy	±1.5 nm	±1.5 nm
	Repeatability	≤0.5 nm	≤0.5 nm
Photometric	Display range	-3.0 ... +5.0 A	-3.0 ... +5.0 A
	Accuracy at 0.5 A	±0.002 A	±0.002 A
	Accuracy at 1.0 A	±0.005 A	±0.005 A
	Accuracy at 2.0 A	±0.005 A	±0.005 A
	Accuracy at 2.5 A	±0.010 A	±0.010 A
	Repeatability at 1 A	≤0.001 A	≤0.001 A
Stray light	at 340 nm	≤0.1 %T	≤0.1 %T
	at 220 nm	≤0.5 %T	–
	at 198 nm	≤2.5 %T	–
Noise	at 0 A	≤0.001 A	≤0.001 A
	at 1 A	≤0.002 A	≤0.002 A
	at 2 A	≤0.004 A	≤0.004 A
Drift	at 260 nm	≤0.002 A/h	–
	at 500 nm	–	≤0.002 A/h
Baseline flatness		±0.003 A	±0.003 A

10 Accessories

All parts and accessories are specified with their order number.

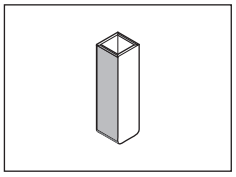
If you have any questions, contact your authorized METTLER TOLEDO service representative or dealer.

www.mt.com/contact

Cuvettes

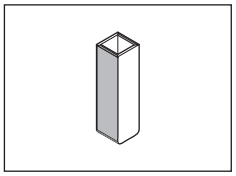
For more information about cuvettes, see the following link:

https://www.mt.com/ch/de/home/products/Laboratory_Analytics_Browse/uv-vis-spectrometers/uv-vis-cuvettes.html



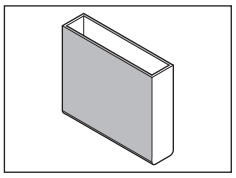
Cuvette Standard Q Quartz Glass 10mm
Optical path length: 10 mm

30675051



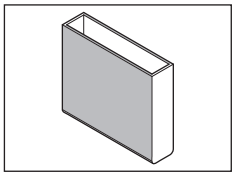
Cuvette Standard O Optical Glass 10mm
Optical path length: 10 mm

30675053



Cuvette Standard Q Quartz Glass 50mm
Optical path length: 50 mm

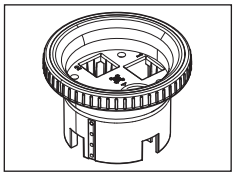
30675052



Cuvette Standard O Optical Glass 50mm
Optical path length: 50 mm

30675054

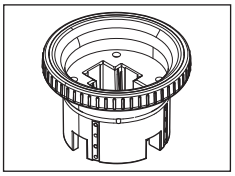
Cuvette carousels



XPathHolder cuvette carousel 10/16

- 10 mm cuvette holder
- Ø16 mm cuvette holder

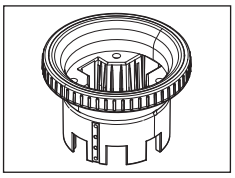
30705122



XPathHolder cuvette carousel 20/30

- 20 mm cuvette holder
- 30 mm cuvette holder

30705123

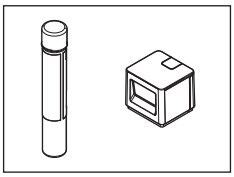


XPathHolder cuvette carousel 40/50/1

- 40 mm cuvette holder
- 50 mm cuvette holder
- 1 inch cuvette holder

30705124

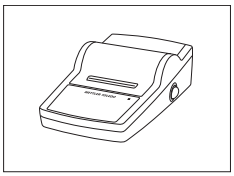
Water testing



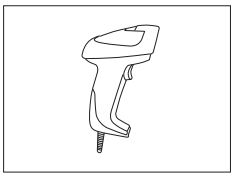
SQKitReader internal barcode reader set **30705183**

- SQKitReader internal barcode reader
- Zero Cell Spectroquant®

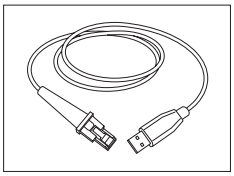
Peripheral instruments



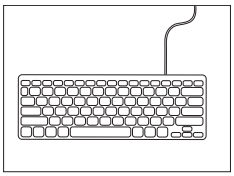
USB-P25/00 Printer **30702998**



Handheld barcode reader with USB interface **21901297**



USB Cable 412 for barcode reader **21901309**



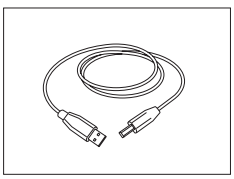
USB Keyboard **51192111**

Software

The EasyDirect software is only supported in firmware version 1.1.0 or higher.

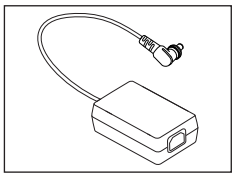
EasyDirect™ UV/VIS PC software
License for 1 instrument **30657871**

EasyDirect™ UV/VIS PC software
License for 5 instruments **30657877**

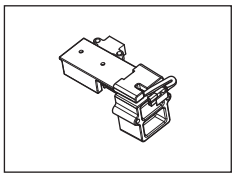


USB cable A-B (for PC or printer)
180 cm **51191926**

Miscellaneous accessories

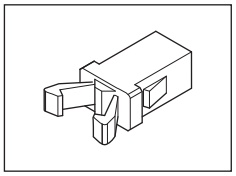


AC adapter with power cable **30472916**



Tungsten lamp set Easy VIS **30705148**

- Tungsten lamp
- Screws (2 pcs)



Front-lid locker EasyPlus UV/VIS **30705158**

Index

D

E

F

H

I

L

M

N

O

S

T

U

V

W

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.

www.mt.com/service

www.mt.com/easyplus-uvvis
For more information

Mettler-Toledo GmbH
Im Langacher 44
8606 Greifensee, Switzerland
www.mt.com/contacts

30729506A

30729506