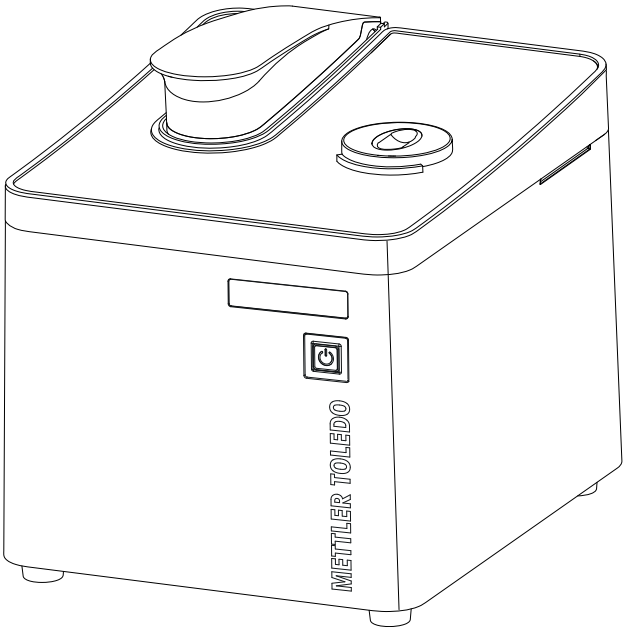
User Manual

UV/VIS Excellence

UV5Nano



METTLER TOLEDO

Table of Contents

1 Introduction

Thank you for choosing a METTLER TOLEDO UV/VIS Excellence spectrophotometer. The UV/VIS Excellence spectrophotometer is an easy-to-operate instrument for measuring molecular absorbance or transmittance in the ultra-violet (UV) and visible (VIS) range of analytical samples.

About this document

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

For a comprehensive description of the spectrophotometer and its functions, refer to the Operating Instructions.

The instructions in this document refer to UV5Nano spectrophotometers running firmware version 2.0 or higher.

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

▶ www.mt.com/contact

Conventions and symbols

Refers to an external document.

Note for useful information about the product.

Elements of instructions

- Prerequisites

1 Steps

2 …

  ⇨ Intermediate results

⇨ Results

2 Safety information

- Read and understand the information in this User Manual before you use the instrument.
- Keep this User Manual for future reference.
- Include this User Manual if you pass on the instrument to other parties.

If the instrument is not used according to the information in the Operating Instructions or if it is modified, the safety of the instrument may be impaired and Mettler-Toledo GmbH assumes no liability.

For a comprehensive description of the spectrophotometer and its functions, refer to the Operating Instructions.

2.1 Definition of signal words and warning symbols

Safety notes are marked with signal words and warning symbols. These show safety issues and warnings. Ignoring the safety notes may lead to personal injury, damage to the instrument, malfunctions and false results.

Signal words

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

Warning symbols

Electrical shock

Ultraviolet light beam

Hot surface

2.2 Product specific safety notes

Intended use

This instrument is designed to be used in analytical laboratories by trained staff. The instrument is suitable for measuring molecular absorbance or transmittance in the ultra-violet (UV) and visible (VIS) range of analytical samples.

Some chemical substances can interact with components of the micro volume platform. The substances below have been tested and are compatible with the micro volume platform. Do not place other chemical substances on the micro volume platform.

- Aceton (up to 5%)
- Acetonitrile
- Benzene
- Toluene
- Phenol (up to 1%)
- Carbon tetrachloride
- Chloroform
- Dichloromethane
- Methanol
- Ethanol
- n-Butanol
- n-propanol
- Isopropyl alcohol
- Diethyl ether
- Hexane

- HEPES (buffer)
- MES (buffer)
- MOPS (buffer)
- Buffers containing phosphate
- Buffers containing chloride
- Buffers containing citrates
- Buffers containing borates

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

Responsibilities of the instrument owner

The instrument owner is the person that uses the instrument for commercial use or places the instrument at the disposal of the staff. The instrument owner is responsible for product safety and the safety of staff, users and third parties.

METTLER TOLEDO assume that the instrument owner provides the necessary protective gear, appropriate training for the daily work and for dealing with potential hazards in their laboratory.

Safety notes

⚠ WARNING

Danger of death or serious injury due to electric shock!

Contact with parts that contain a live current can lead to injury and death.

1 Only use a METTLER TOLEDO power cable and AC adapter designed for your instrument.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids.
4 Replace damaged power cables and AC adapters immediately.

⚠ CAUTION

Risk of eye damage from exposure to ultraviolet light beam

The light beam emitted from the UV/VIS instrument contains ultraviolet radiation and can cause eye damage.

– Never look directly into the light source.

NOTICE

Danger of damage to the instrument due to incorrect parts!

Using incorrect parts with the instrument can damage the Instrument or cause the instrument to malfunction.

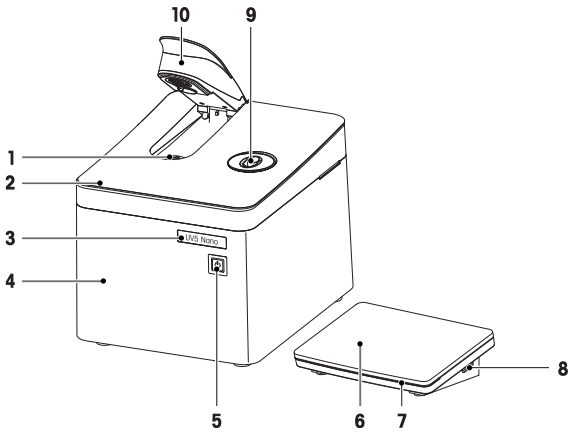
– Only use parts supplied with the instrument, listed accessories and spare parts from METTLER TOLEDO.

3 Design and Function

The UV/VIS excellence spectrophotometers based on an array setup. Array instruments have a robust mechanical design and do not contain any moving optical parts, improving the wavelength reproducibility. The array detector analyzes all wavelengths in parallel, measuring a complete spectrum very quickly.

3.1 Overview

UV5Nano

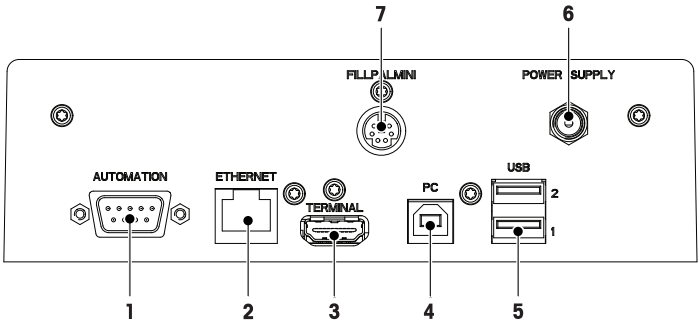


1	Micro volume platform	**6**	Terminal
2	Cover plate	**7**	LED instrument status (StatusLight™)
3	Type label	**8**	USB-connection e.g. for data transfer
4	Housing	**9**	1 cm cuvette holder
5	Power button	**10**	Micro-volume arm

The StatusLight provides information about the status of the instrument.

StatusLight	Instrument status
Green, steady light	The instrument is ready for operation.
Green, blinking light	The instrument is performing a task.
Orange, steady light	The instrument waits for the user to perform an action.

3.2 Rear panel connections

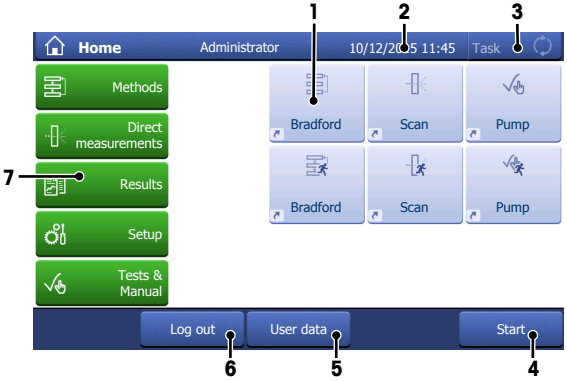


1	RS232 standard port	**2**	Ethernet connection

3	Terminal port	**4**	1x USB B port (connection to a PC with LabX™)
5	2x USB A ports (printer, flash drives, keyboard, mouse)	**6**	Power cable (24 V power supply)
7	Mini-Din port (6-pin) (FillPalMini)		

3.3 User Interface

3.3.1 Homescreen



	Name	Explanation
1	**Shortcuts**	User-specific shortcuts for frequently used methods are saved in this area. The shortcuts are saved in the user profile and can be defined, changed and deleted by the user.
2	**Status bar**	The status bar contains the current menu item, user name as well as date and time.
3	**Instrument status**	A light strip indicates the current working status of the instrument. **Yellow** A method / direct measurement / performance test or manual operation is running. **Blue** No measurement is running. **Green** A method / direct measurement / performance test or manual operation is running but is waiting for user interaction.
4	**Start button**	Starts the method or direct measurement as was last run by the user. This does not apply to the manual operations or performance tests. This button is active only once a new user has started a method or a direct measurement for the first time.
5	**User data**	Provides information about the user currently logged in .
6	**Log out**	Logs out the current user. The menu **Login** is displayed after logging out.

	Name	Explanation
7	Menus	**Methods** Create, adapt and save measuring methods. This can be done for every measurement type.
		Direct measurements Measure a sample easily as a direct measurement. Direct measurements include the measurement types fixed wavelength, scan, quant and kinetics, as well as ready to use bio applications, such as DNA and protein concentration determination.
		Results Display, print or export measurement results. Here you can also access detailed information for all results.
		Setup Choose all system settings in this menu, e.g. hardware settings, user management or user preferences. These settings are usually defined during the installation of the instrument.
		Tests & Manual Entry point for editing and starting the performance tests and manual operations.

See also

Create and handle shortcuts ▸ Page 25

3.3.2 Menu structure

Methods

Methods has the following submenus:

- **Fixed wavelength**
- **Scanning**
- **Bio applications**
- **Quant**
- **Kinetics**

Direct measurement

Direct measurement has the following submenus:

Fixed wavelength	–
Scanning	–
Bio applications	**Protein**
	Protein dye
	Protein assay
	Nucleic acid
	Nucleic acid dye
	Others
Quant	–
Kinetics	–

Results

Results has no submenus.

Setup

Setup has the following submenus:

Quant calibrations	–	–

User settings	**Language**	–
	Screen	–
	Audio signal	–
	StatusLight	–
	Shortcuts	–
	Keyboards	–
Dyes & Values	**Dyes**	–
	Auxiliary values	–
Hardware	**Automation**	–
	Peripherals	**Printer**
		Data export
		Network settings
		Network storage
		PC settings
		Barcode reader / Keyboard
		Fingerprint reader
		USB stick
	Performance test results	–
	Performance test history (Cuvette)	–
	Performance test history (Micro volume platform)	–
	Auxiliary instrument	–
Global settings	**System**	**Identification**
		Date/Time
		Data storage
	User management	**Users**
		Account policies
	Analysis and resources behavior	–
Maintenance & Service	**MT-Service**	–
	Import / Export	–
	Reset to factory settings	–
	Firmware	–
	Update	–
	Hardware / Firmware summary	–

Tests & Manual

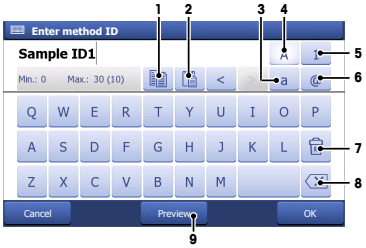
Tests & Manual has the following submenus:

- **Performance test**
- **Automation**

3.3.3 General navigation

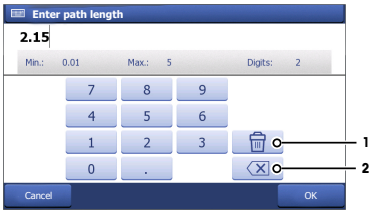
3.3.3.1 Keypads

Alphabetic keypad



- Tap (1) to copy selected text to the clipboard.
- Tap (2) to paste text from the clipboard.
- Tap (3) for lowercase letters.
- Tap (4) for capital letters.
- Tap (5) to switch to a numeric keypad and (4) to revert back to letters.
- Tap (6) to switch to a keypad with symbols and (4) to revert back to letters.
- Tap (7) to delete all entered letters or numbers.
- Tap (8) to delete the last entered letter or digit.
- Tap (9) to see what your input looks like.

Numeric keypad



- Tap (1) to delete all entered numbers.
- Tap (2) to delete the last digit entered.

3.3.3.2 Abbreviations

The following abbreviations are used in the user interface to describe the type of measurement performed. This is especially the case in the **Results** section.

Type of measurement	Abbreviation
Fixed wavelength	FW
Scanning	S
Quant	Q
Kinetics	K
Bio fixed wavelength	BFW
Bio quant	BQ

4 Installation

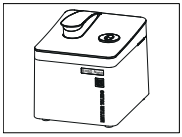
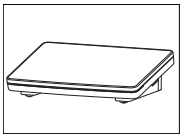
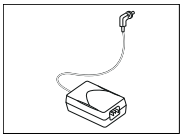
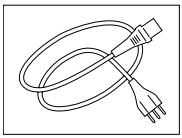
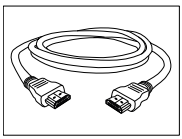
NOTICE

Danger of damage to the instrument due to incorrect parts!

Using incorrect parts with the instrument can damage the Instrument or cause the instrument to malfunction.

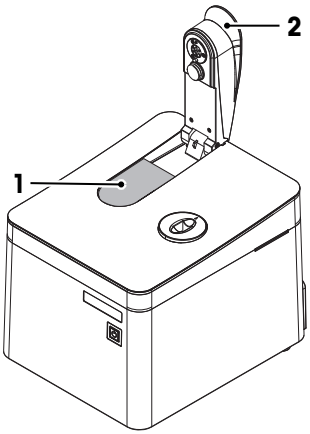
– Only use parts supplied with the instrument, listed accessories and spare parts from METTLER TOLEDO.

4.1 Scope of delivery

	Description	Order number
	Spectrophotometer UV5Nano	**30254729**
	Terminal	**30248720**
	External power supply 100-240VAC	**51105795**
	Power cable (Country specific)	-
	Terminal cable	**30249491**
	User manual (Country specific)	-
	Memo Card (Country specific)	-

4.2 Unpack the spectrophotometer

1 Remove the spectrophotometer (and accessories) from the protective packing material.
2 Store the packing material for later transport over long distances.
3 Lift the micro-volume arm (2).
4 Remove the pad (1) and store it for any later transport of the spectrophotometer.
5 Close the micro-volume arm (2).
6 Check if you have received all parts listed in the scope of delivery.
7 Inspect the parts visually for flaws or damage.
8 If parts are missing or damaged, report it immediately and file a freight claim if needed.



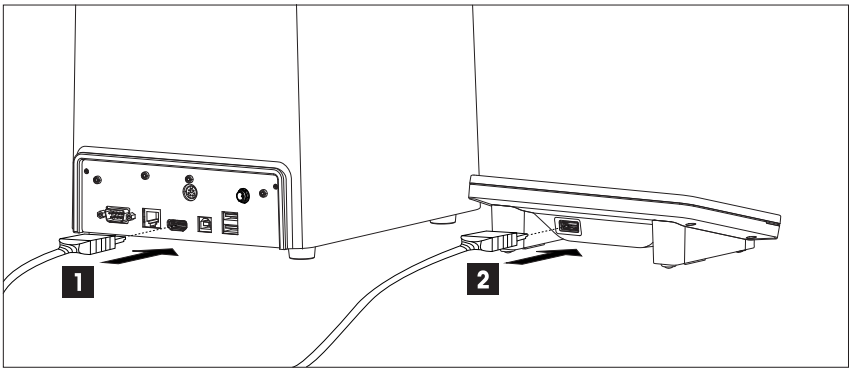
4.3 Position the spectrophotometer

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

- The ambient conditions are 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

4.4 Connecting the terminal

1 Connect the first plug (1) of the terminal cable to the terminal-socket of the instrument.
2 Connect the second plug (2) of the terminal cable to the terminal.
⇨ The terminal starts up automatically when turning on the instrument and once the power supply has been installed.



4.5 Connect the spectrophotometer to the power supply

⚠ WARNING

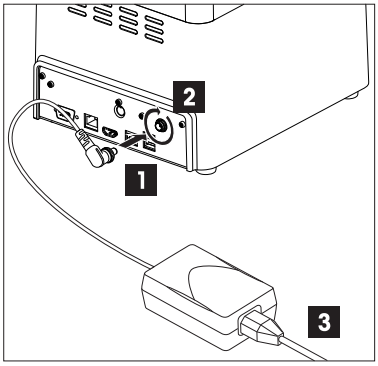
Danger of death or serious injury due to electric shock!

Contact with parts that contain a live current can lead to injury and death.

1 Only use a METTLER TOLEDO power cable and AC adapter designed for your instrument.
2 Connect the power cable to a grounded power outlet.
3 Keep all electrical cables and connections away from liquids.
4 Replace damaged power cables and AC adapters immediately.

The spectrophotometer is equipped with a universal power supply which is suitable for all line voltages in the range of 100 to 240 V, 50-60 Hz.

1 Install the cables in such a way that they cannot be damaged or interfere with operation.
2 Insert the plug of the AC adapter in the **POWER SUPPLY** socket (2) at the back of the spectrophotometer.
3 Secure the plug by firmly tightening the knurled nut.
4 Insert the plug of the power cable (3) in the socket of the AC adapter.
5 Insert the plug of the power cable in a grounded power outlet that is easily accessible.



5 Operating the Instrument

5.1 Start up and shut down the spectrophotometer

Start up the spectrophotometer

– Press the power button.
  ⇨ The spectrophotometer starts up and detects connected devices.
  ⇨ The spectrophotometer is ready for use when the StatusLight is steady and green.

Shut down the spectrophotometer from the touch screen

– Tap **Home** > **Log out** > **Shut down**.
  ⇨ The spectrophotometer stops running tasks and shuts down.

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

Shut down the spectrophotometer using the power button

– Press the power button for less than 1 s.
  ⇨ The spectrophotometer stops running tasks and shuts down.

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

Shut down of the spectrophotometer in emergency situations

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

5.2 Performing a measurement

⚠ CAUTION

Risk of eye damage from exposure to ultraviolet light beam

The light beam emitted from the UV/VIS instrument contains ultraviolet radiation and can cause eye damage.

– Never look directly into the light source.

NOTICE

Measuring errors!

Before use, rinse the cuvette with deionized or ultra pure water, inside and outside, several times. Foreign particles in the cell deflect the light beam, which leads to poor results. You can also rinse the cell with the sample or blank solution.

There should be no droplets on the outside of the cuvette before measuring. Pat the outside of the cell dry with an optical cleaning cloth or cuvette lens tissue to avoid scratches on the surface.

Take care not to touch the surface of the optical window of the cell. Fingerprints leave a UV active film on the surface that, even if it appears to have been wiped off, can result in measuring errors.

Handle the cuvettes with care. Keep them in their storage box.

Performing a measurement using a cuvette

- Do not use glass pipettes. They can scratch the quartz cuvettes.
- All measurements in the UV range should, as a rule, be done with quartz cuvettes. Regular plastic cuvettes are not transparent to UV light.
- If using UV-transparent disposable plastic cuvettes, take care to select the appropriate cuvette for your application. The various types of UV-transparent disposable plastic cuvettes cover a specific pre-defined range, e.g. 230 nm to 900 nm.

1 Switch on the instrument.

2 Configure the **Direct measurement** or **Method** to be performed. You will first be prompted to perform a blank measurement.

3 Lean the plastic tip of the pipette on the side of the cuvette and slowly load the **blank solution** to avoid bubbles forming. The blank solution is usually the pure solvent.

4 Hold the top of the cuvette on the opaque non-measuring side.

⇨ Be careful not to touch the transparent walls as any marks or fingerprints can significantly affect the measurement.

⇨ If necessary, clean the walls with a lint-free tissue.

5 Gently insert the cuvette vertically into the sample holder to avoid scratching or marking the glass.

6 Tap **Start** to start your measurement.

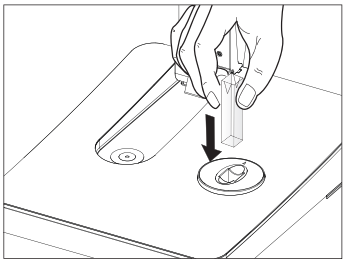
⇨ Tap **Measure blank**.

7 Remove the cuvette when the measurement is complete, being careful to hold it vertically, and rinse thoroughly.

8 Load the **sample solution** into the cuvette (see steps 3 to 5 above) and tap **Measure sample**.

9 Remove the cuvette when the measurement is complete, being careful to hold it vertically, and rinse thoroughly.

⇨ Repeat the steps above until the analysis is completed. Tap **End series** for a method or **End direct measurement**.



Performing a micro volume measurement

- Before starting a micro-volume measurement, configure the direct measurement or method to be performed.

1 Lift the arm of the micro-volume platform.

⇨ The quartz glass measuring window is now visible as a small clear circle within a black ring on the platform.

2 Carefully pipette a drop of blank/sample on to the centre of the measuring window.

⇨ The special coating on the measuring window helps keep the surface tension of the drop intact.

3 Close the arm of the micro-volume platform.

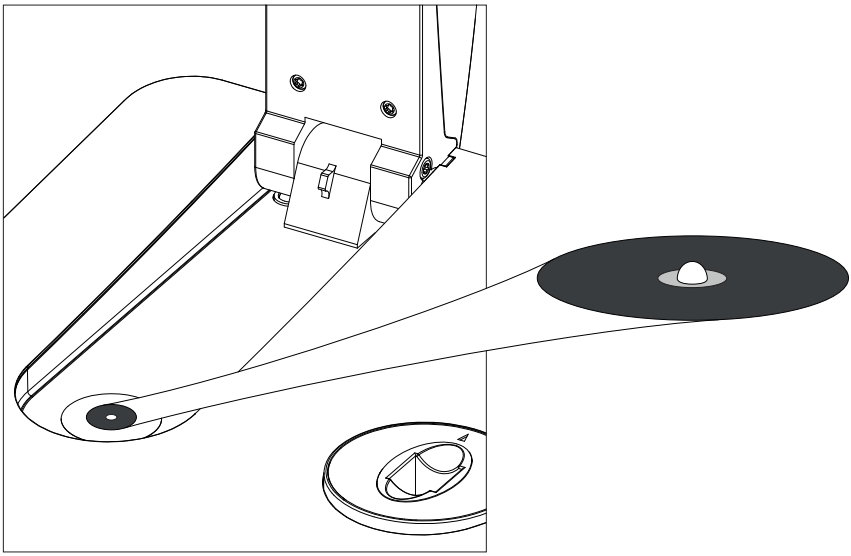
⇨ The drop shape of the blank/sample ensures that the mirror in the measuring arm does not create any air bubbles when you close it.

⇨ Only start the measurement once the arm is completely closed.

4 Tap **Start** to start your measurement.

5 Open the arm of the micro-volume platform to take a measurement with a new sample or blank.

⇨ Before doing new measurement wipe the blank/sample off the mirror in the arm and the quartz glass window in the measuring platform with a lint-free tissue.



Note

- Pipette 3 - 5 µL of sample for Automatic/Long path length measurements.
- Pipette at least 1 - 3 µL of sample for the short path measurements.

See also

Cleaning the micro volume platform ▸ Page 28

5.3 Direct measurement

Direct measurements provide an easy, reliable and fast way to do measurements. All parameters relevant to the measurement are quickly configured and once the settings have been chosen in direct measurements they can be saved in a OneClick shortcut. The measurement can then be started with just one click on the homescreen. No automation is possible when performing direct measurements.

Tapping **Start** on the homescreen initiates an analysis with the same settings as the measurement last done.

You can find more information on the different types of direct measurements in the chapter Method types.

5.3.1 Fixed wavelength

Further measurements

To perform further direct measurements, follow these steps:

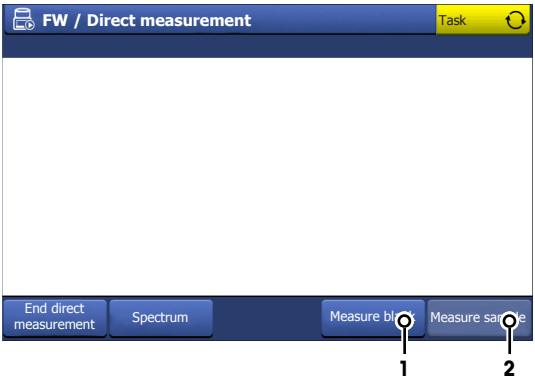
1 To start a new measurement, tap **Measure blank** or **Measure sample**
   ⇨ The **Spectrum** screen appears (if activated).
2 Tap **End direct measurement** to stop and return directly to the homescreen.

⇨ The results of each measurement are listed individually in the **Results** menu.

Performing a blank measurement

- Prepare a cuvette with the blank solution
- Perform a blank measurement.

1 Insert the cuvette with the blank solution into the cuvette holder.
2 Tap **Measure blank** (1) to start blank measurement.
3 Remove the cuvette with the blank solution.



Performing a sample measurement

- Prepare a cuvette with the sample.

1 Insert the sample into the cuvette holder.

2 Tap **Measure sample** (2 in the picture above).

3 Enter the **Sample ID** and the **Sample data**.

⇨ This screen only appears if applicable and varies depending on the settings, e.g. you can enter the **Dilution factor** and the **Correction factor**.

4 Tap **Start** to start measuring the sample.

Starting a measurement

- Start the instrument.
- Prepare the sample and clean the cuvette.

1 Go to **Direct measurement** > **Fixed wavelength**.

⇨ The measurement configuration menu opens.

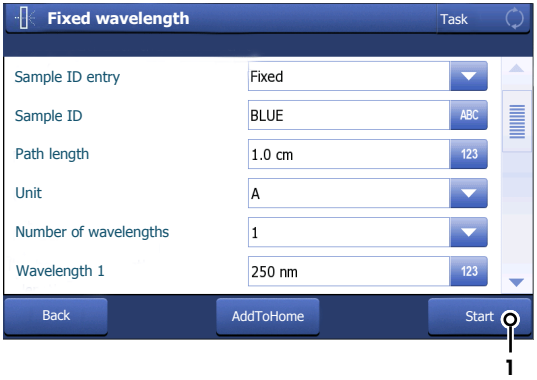
2 Define the measurement parameters (see **parameters** below).

3 To create a shortcut on the homescreen for this direct measurement, tap **AddToHome**.

⇨ The menu **Shortcut parameters** opens. For more information see [Create and handle shortcuts ▸ Page 25]

4 Tap **Start** (1).

⇨ The measurement screen appears.



Viewing the results

- Tap **Spectrum** to see the spectrum of the measurement.

1 Zoom in on spectrum details by pinching or stretching the touchscreen with two fingers.

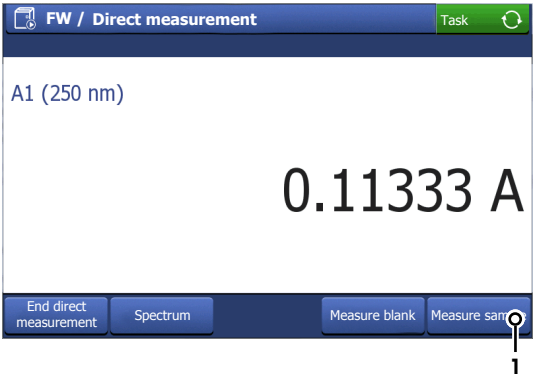
2 To label a peak press and hold a finger on the touchpanel for a few seconds.

⇨ A cursor appears allowing you to label a peak.

3 Return to the results by toggling between the **Results** and the **Spectrum** buttons.

⇨ The results of each measurement are listed individually in the **Results** menu and can be looked up at a later stage.

⇨ You can view the results after each sample measured.



5.3.2 Scanning

To perform a scanning direct measurement, follow these steps:

Preparing a measurement

1 Go to **Direct measurement** > **Scanning**.

⇨ The measurement configuration menu opens.

2 Define the measurement parameters (see the **parameters** below).

3 To create a shortcut on the homescreen for this direct measurement, tap **AddToHome**.

⇨ The menu **Shortcut parameters** opens. For more information see [Create and handle shortcuts ▸ Page 25]

4 Tap **Start**.

⇨ The measurement screen appears.

Starting a measurement

1 Insert the blank into the cuvette holder.

2 Tap **Measure blank** to start blank measurement.

3 Remove the blank.

4 Insert the sample into the cuvette holder.

5 Tap **Measure sample**.

⇨ Enter the **Sample ID** and the **Sample data**. This screen only appears if applicable and varies depending on the settings.

Viewing the results

- At the end of the analysis the screen displays the **Spectrum** and the **Peak** values of the measurement.

1 Tap **Maximize spectrum** to see the spectrum across the whole screen. For a closer look, stretching or pinching the touchscreen with two fingers zooms in and out of spectrum details.

⇨ Tapping **Minimize spectrum** returns you to the results overview screen.

2 Tap **Peak table** to see the complete peak table.
   ⇨ Tapping **Back** returns you to the results overview screen.

⇨ The results of each measurement are listed individually in the **Results** menu.

Further measurements

To perform further direct measurements, follow these steps:

1 To start a new measurement, tap **Measure blank** or **Measure sample**
   ⇨ The measurement screen appears (if activated).
2 Tap **End direct measurement** to stop and return directly to the homescreen.

⇨ The results of each measurement are listed individually in the **Results** menu.

5.3.3 Quant

To perform a quantitative direct measurement, follow these steps:

Preparing a measurement

1 Go to **Direct measurement** > **Method list: Quant**.
   ⇨ The measurement configuration menu opens.
2 Define the measurement parameters (see **Parameters** below) and define your standards. (See Define and select standards).
3 To create a shortcut on the homescreen for this direct measurement, tap **AddToHome**.
   ⇨ The menu **Shortcut parameters** opens. For more information see [Create and handle shortcuts ▸ Page 25]
4 Tap **Start**.
   ⇨ The measurement screen appears.

Starting a measurement

1 Insert the blank into the cuvette holder.
2 Tap **Measure blank** to start blank measurement.
3 Remove the blank.
4 Insert the first standard into the cuvette holder.
5 Tap **Measure standard** to start measuring the standards.
6 Remove the standard and repeat the procedure with the next standard. The list of the standards defined can be seen at any time by tapping the **Standards** button.
   ⇨ Measure all the standards defined to obtain a calibration curve.
7 Insert the sample into the cuvette holder.
8 Tap **Measure sample**.

Viewing the results

– At the end of the analysis the screen displays a summary of the results. You can also see the **Spectrum** and the **Calibration curve** of the measurement by tapping on their respective buttons.

Further measurements

- All new measurements are based on the same calibration curve as before.
- For a new calibration curve, end the direct measurement and start again.

1 Insert your blank/sample in to the cuvette holder and tap **Measure blank** or **Measure sample**
   ⇨ The measurement starts.
2 Tap **End direct measurement** to stop and return directly to the homescreen.

⇨ The results of each measurement are listed individually in the **Results** menu.

5.3.3.1 Define and select standards

The standards that will be used for the calibration curve in a direct measurement first have to be defined. They are stored in a list in the order in which they will be used in a measurement. This list can be modified or deleted as required.

Create a standard list

1 Tap the footer button **Define standards** to see and edit the list of standards.
   ⇨ **Note:** This screen is empty if no standards have yet been defined or all standards have been deleted. Only saved standards are shown in this list.
2 Fill in the **Standard data** fields as described in the table below.
3 **Save** to see the defined list of standards.
   ⇨ If you chose to add more than one standard in the **Standards to add** field, you can now edit each **ID** and **concentration** by tapping on each standard in turn. The standards will be used in the order in which they appear in the list.

⇨ Tap **Save** to save the changes.

Parameters	Description	Values
Standards to add	Select the number of standards to add to the list.	1…30
Standard ID	Define an arbitrary ID for the standard.	Any
Concentration	Enter the concentration of the standard.	0…100'000

Edit a standard

1 Tap **Define standards**.
   ⇨ The **Standard list** is shown with all standards previously defined.
2 Tap on the standard you wish to edit.
   ⇨ The **Standard data** window opens.
3 Edit the **name** and **concentration** of the standard.

⇨ Tap **Save** to save the changes.

Adding a standard

- You can save a maximum of 30 standards in the **Standard list**.

1 Tap **Define standards**.
   ⇨ The **Standard list** is shown with all standards previously defined.
2 Tap **Insert** to edit the list.
   ⇨ **Insert** tags appear between each standard.
   Note: The number of the standard in the list defines the sequence of execution during the measurement, starting with **No. 1**.
3 Tap the **Insert** tag where you wish to add one or more new standards.
   ⇨ The **Standard data** window opens.
4 Fill in the standard data fields as described above.

⇨ Tap **Save** to save the changes.

Delete a standard

1 Tap the footer button **Define standards**.
   ⇨ The **Standard list** is shown with all standards previously defined.
2 Tap on the standard you wish to delete.
   ⇨ The **Standard data** window opens.
3 Tap **Delete**.

⇨ The standards selected are deleted from the list.

To **clear** the entire list of standards, tap **Delete all** in the **Standard list**.

5.3.4 Bio applications

A large collection of commonly used life science applications are found in the **Bio applications**' menu. These include, amongst others, qualitative and quantitative analyses of DNA, RNA and proteins, colorimetric protein assays, pre-configured dyes, OD600 for cell density and an oligomer calculator for the concentration determination of DNA and RNA oligomers. A list of all the bio applications can be found in the description of the menu structure, see Menu structure.

The calculations of the molar mass for DNA and RNA oligomers are described below:

Calculation of molar mass for DNA and RNA oligomers

The molar mass for DNA and RNA is calculated as follows in the applications:

1. DNA (Sodium salt, assuming there is no 5′ monophosphate):
   M = An*313.21+Tn*304.2+Cn*289.18+Gn*329.21-61.96
2. RNA (for RNA transcript, assuming there is a 5′ monophosphate):
   M = An*329.21+Un*306.17+Cn*305.18+Gn*345.21+159.0

Where

- M = molecular mass of the nucleic acid in g/mol
- An = number of adenine bases
- Tn = number of thymine bases
- Gn = number of guanine bases
- Cn = number of cytosine bases
- Un = number of uracil bases

Performing a Bio applications direct measurement

- See the operating instructions for a comprehensive description of these applications.

1 Go to **Direct measurement** > **Bio applications**.
2 Choose your specific category (**Protein, Protein dye, Protein assay, Nucleic acid, Nucleic acid dye, Others**).
3 Choose your specific sub-category > See the table below.
   ⇨ The measurement configuration menu opens.
4 Define your parameters.
   ⇨ For a description of the parameters please see the general parameters as well as your respective application category.
5 Tap **Start** to start the measurement.
   ⇨ To create a shortcut on the homescreen for this direct measurement, tap **AddToHome**. The menu **Shortcut parameters** opens.

See also

Create and handle shortcuts ▸ Page 25

5.3.5 Kinetics

To perform a kinetics direct measurement, follow these steps:

Preparing a measurement

1 Go to **Direct measurement** > **Method list: Kinetics**.
   ⇨ The measurement configuration menu opens.
2 Define the measurement parameters (see the **parameters** below).
3 To create a shortcut on the homescreen for this direct measurement, tap **AddToHome**.
   ⇨ The menu **Shortcut parameters** opens. For more information see section [Create and handle shortcuts ▸ Page 25]
4 Tap **Start**.
   ⇨ The measurement screen appears.

Starting a measurement

1 Insert the blank into the cuvette holder.
2 Tap **Measure blank** to start blank measurement.
3 Remove the blank.
4 Insert the sample into the cuvette holder.
5 Tap **Measure sample**.

Viewing the results

The screen displays the measurement of the kinetic reaction as it occurs, as a graph of absorbance versus time. It also displays the summary of the results, namely:

- vInit1 = initial rate
- R^2(vInit1) = coefficient of determination for vInit1
- k1 (250nm) = first order absorbance rate constant (at the zero or first order rate constant at the chosen wavelength)
- R^2(k1) = coefficient of determination of k1)

1 Tap **Results** to see the results of the current measurement across the whole screen.

2 Tap **Kinetics curve**to go back to the results overview screen.

Further measurements

To perform further direct measurements, follow these steps:

1 To start a new measurement, tap **Measure blank** or **Measure sample**

⇨ The **Sample data entry** screen appears.

2 Tap **Start** to start measuring the sample.

3 Tap **End direct measurement** to stop and return directly to the homescreen.

⇨ The results of each measurement are listed individually in the **Results menu**.

5.4 Methods

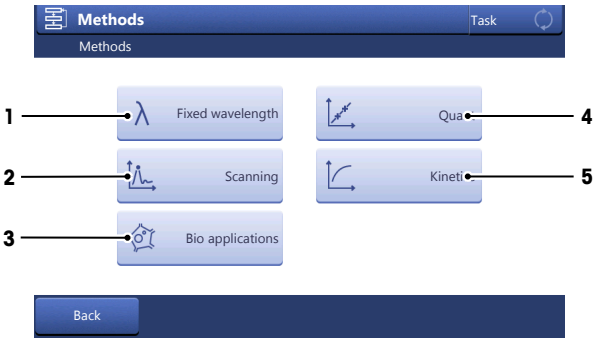
On the UV excellence instruments analyses can be run using editable methods. A method consists of a sequence of method functions that are executed consecutively when a method is processed. Running an analysis consists of four steps.

- Configuration of the method by the user
- Performance of the measurements
- Calculation of the results
- Creation of a report

To overcome the complexity of the parameters, the instrument offers pre-programmed METTLER TOLEDO methods for running measurements commonly performed in different laboratories. METTLER TOLEDO methods define the sequence of method functions including meaningful values for all of the parameters of the method functions suitable for a specific application.
You can also create your own method based on a METTLER TOLEDO method and save up to 50 of those methods on the instrument.

The instrument distinguishes between the following method types:

- **Fixed wavelength** (1)
- **Scanning** (2)
- **Bio applications**: **Bio fixed wavelength** and **Bio quant** (3)
- **Quant** (4)
- **Kinetics** (5)



5.4.1 Running a method

Creating a new method

Navigation: **Home** > **Method** > method type e.g. **Fixed wavelength**

1 Tap **New** to create a new method on the basis of a template.
   ⇨ The method function **Configuration** opens.
2 Configure the method as required.
   ⇨ See section below **Configuration**.
3 Tap **OK**.
4 Define the all relevant parameters for the new method.
5 Tap **Save**.

You can also insert additional method functions between the standard method functions. This is possible either when creating a new method or by editing an existing method:

1 Go to **Method** > method type e.g. **Fixed wavelength**.
2 Choose the method you want to edit or create a new method.
3 Tap **Insert**.
   ⇨ Blue tags appear between each method function.
4 Tap an **Insert** tag where you want to insert an additional method function.
   ⇨ A window with **Method function** opens showing a list of possible method functions.
5 Tap on the method function you want to insert (e.g. **Instruction**).
6 Define your method parameters.
7 Tap **OK**.
8 Tap **Save**.

Running a METTLER TOLEDO method

Navigation: **Home** > **Method** > method type e.g. **Fixed wavelength**

1 Go to **Method** > method type e.g. **Fixed wavelength**.
2 Select a pre-programmed METTLER TOLEDO method.
   ⇨ Tap **Start** to run the analysis.
   ⇨ All METTLER TOLEDO methods have the parameter "METTLER TOLEDO" as their author.

Adapting a METTLER TOLEDO method

1 Go to **Method** > method type e.g. **Fixed wavelength**
2 Select a pre-programmed METTLER TOLEDO method.
3 Tap the **Title**.
   ⇨ The method function **Title** opens.

4 Change the parameter setting **Method ID** to your own user defined ID.
   ⇨ Enter a new method ID and tap **OK**.
5 Edit the parameters settings as required (see **Create a new method** above).
6 Tap **Save** to save the method.
⇨ Tap **Start** to run the analysis.

See also

Configuration ▸ Page 24

5.4.2 Configuration

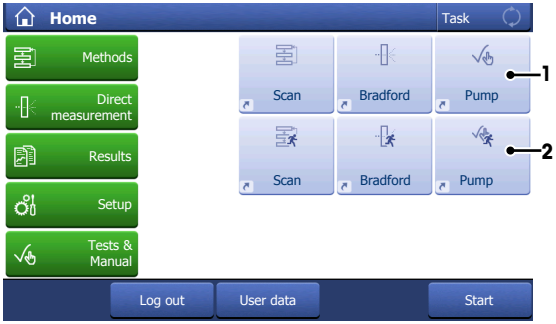
Parameters	Description	Values
Multiple determination	Define if only one or more than one sample shall be measured with this method.	Active I Inactive
Multiple determination mode	Define if the number of samples is fixed after starting the method or if samples can be added during the measurement. Only if **Multiple determination** is active.	Fixed number of samples I Open number of samples
Measurement cell	Defines whether to use the micro volume platform or the 1cm cuvette holder.	Micro volume platform I Cuvette
Measurement duration	Define how long the blank, sample and standard will be measured.	1…1000
Automation	Defines the automated-sampling device used in the method.	Available automated-sampling devices
Path length	Defines the path length for the measurement in [cm]. If **Cuvette** is selected, the user needs to enter the path length manually. If **Micro volume platform** is selected, the path length is set mechanically as follows: **Automatic**: Measurements are done with both a short and a long path length. **Short**: Measurements are done with a short path length. **Long**: Measurements are done with a long path length.	Path length for Cuvette: 0.001…1 [cm] Path length for Micro volume platform: Short I Long I Automatic
Kinetics stages	Define the number of stages for a kinetic measurement with different duration and intervals. Only in Method > **Kinetics**.	1 I 2
Kinetics time unit	Define the unit for the interval, duration and evaluation times. Only in Method > **Kinetics**.	s I min
Kinetics duration 1 Kinetics duration 2	Define the time span of a stage in which measurement points are taken with the defined interval. The total number of data points for a kinetic reaction must be smaller or equal to 2000. Only in Method > **Kinetics**.	1…500
Kinetics interval 1 Kinetics Interval 2	Define the time interval between the measurement points of a kinetics measurement. The interval must be smaller than or equal to the duration. It can happen that the actual time interval exceeds the time interval defined by the user, e.g. the changing of cuvettes with the FillPalMini and the measurement time together take longer than the interval defined. In this case the next measurement point is taken as soon as possible. Only in Method > **Kinetics**.	1…10000
Color	Defines whether colors can be calculated in the **Calculation** method function.	Active I Inactive

Observer	The chromatic response of each observer (2° CIE 1931; 10° CIE 1964) is described by a set of three color matching functions each. They describe the spectral sensitivity of the three different light detectors.	2° I 10°
Illuminant	The illuminants are the spectral power distributions of theoretical light sources. In simple terms: The emission spectra of different light sources. These spectra are available from the CIE. Illuminant A mimics a tungsten-filament lamp, C mimics daylight, the D series are also approximations of daylight where the number behind the D is one hundredth of the CCT (correlated color temperature) or the temperature of the Planckian radiator.	A I C I D50 I D55 I D65 I D75

5.5 Create and handle shortcuts

One Click™ **Shortcuts** allow you to start measurements, performance tests, and manual operations directly, without first going to the menus **Methods**, **Direct measurement** or **Tests & Manual** to select the required task.

- **Shortcuts** can be created for methods, direct measurements, performance tests (CertiRef) and for the manual operation of automation units.
- With a One-Click™ indirect shortcut (1) you can open the start window of the task directly from the homescreen.
- With a One-Click™ direct shortcut (2) you can start a task directly from the homescreen.
- You can save a maximum of 24 shortcuts on the homescreen.
- Users that belong to the user groups **Technician**, **Expert** or **Administrator** can manage the shortcuts that they have created themselves.



Create a shortcut for a method

1 Go to **Methods** and select your method category.
2 Create a **New** method or choose an existing method in the list.
3 Tap **Start**.
   ⇨ The analysis dialog opens. Here you can change some parameters and add information to the method, however, the changes will not be saved in the shortcuts!
   ⇨ **Exception:** In **Quant** and **Bio quant** the parameters **Use previous calibration** and **Omit sample measurement** are saved.
4 Tap **AddToHome** to create a shortcut.
5 Define the shortcut parameters.
6 Tap **Save**.
⇨ The shortcut is now set on the homescreen.

Create a shortcut for a direct measurement

- This description also applies to manual operations and performance tests.

1 Go to **Direct measurement** and select the type of analysis you wish to perform.
2 Configure the measurement parameters as required.
3 Tap **AddToHome** to create a shortcut.
4 Define the shortcut parameters.
5 Tap **Save**.

⇨ The shortcut now appears on the homescreen.

Delete a shortcut

1 Go to **Setup** > **User settings** > **Shortcuts**.
2 Select the shortcut that you want to delete from the list.
3 Tap **Delete**.

⇨ The shortcut is deleted.

Change the shortcut parameters

1 Go to **Setup** > **User settings** > **Shortcuts**.
2 Select the shortcut that you want to change in the list.
3 Change the parameters.
4 Tap **Save**.

⇨ The new shortcut parameters are saved.

Changing the measuring parameters

You can only change the measuring parameters of indirect shortcuts. Changes to the measuring parameters are executed but are not saved to the shortcut. The only exceptions are changes to the parameters **Use previous calibration** and **Omit sample measurement** in **Quant** and **Bio quant** that are saved to the shortcut.

To permanently change the measuring parameters of a shortcut, you need to create a new shortcut.

5.5.1 Parameters

Parameters	Description	Values
Type	Describes what type of shortcut will be created.	Tests & Manual I Method I Direct measurement
Description	Write a description for the shortcut that will appear on the homescreen.	Arbitrary
Immediate start	Executing a shortcut with **Immediate start** takes you to the corresponding online screen without any further prompting. This is providing that: • The resources are available, • The parameter "Show required resource at start" is not selected, • and that validation has not failed.	Yes I No
Homescreen position	Select where the shortcut should appear on the home screen.	Position 1…24
Created by	Indicates which user created the shortcut. This cannot be edited.	-

6 Maintenance and Care

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

Do not open the housing of the instrument; it does not contain any parts that can be maintained, repaired or replaced by the user. If you experience problems with your instrument, contact your authorized METTLER TOLEDO dealer or service representative.

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

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6.1 Cleaning the 1 cm cuvette holder

NOTICE

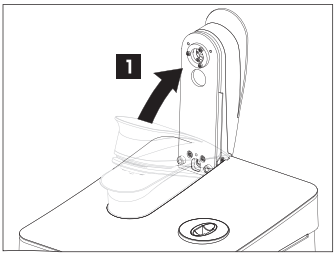
Damage to the micro volume platform arm during cleaning!

The closed arm of the micro volume platform will get scratched by lifting the metal cover plate to clean the 1 cm cuvette holder.

– Always first open the arm of the micro volume platform before removing the cover plate.

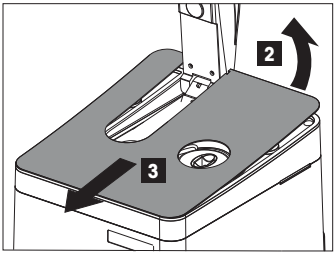
The drip pan of the 1 cm cuvette holder must be cleaned and dried at appropriate intervals.

1 Open the arm of the micro volume platform.



2 Lift the cover lid carefully from the back.

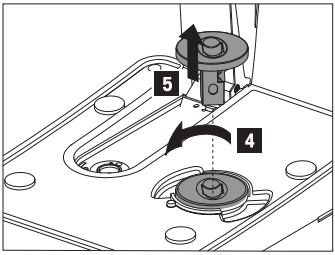
3 Pull on the front side to remove it from the instrument.



4 Lift and twist the 1 cm cuvette holder counter-clockwise until it unlocks from the instrument (approx. 45°).

5 Remove the 1 cm cuvette holder

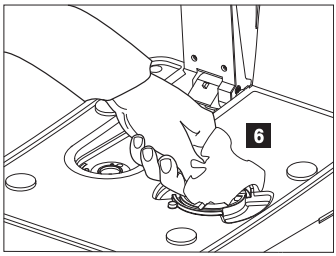
⇨ Clean the cuvette holder with a suitable lint free cloth and deionized water. If necessary clean with ethanol.



6 Dry and clean the drip pan with a suitable lint free cloth dampened with deionized water. If necessary wipe with ethanol.

Note

- Reassemble in the reverse order as described above.
- The small arrow on top of the cuvette holder should point towards the back of the instrument as it indicates the direction of the light beam .



6.2 Cleaning the micro volume platform

NOTICE

Damage when cleaning the micro volume platform!

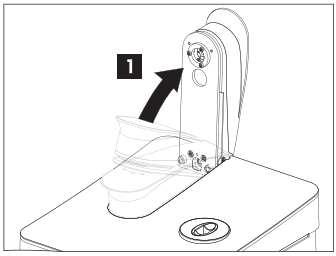
Never use abrasive detergents for cleaning any parts of the instrument.

Do not immerse the micro volume platform in water or cleaning solutions.

The micro volume platform must be wiped with a lint free optical tissue after every measurement to prevent measuring errors.

Clean the platform more thoroughly after each measurement series.

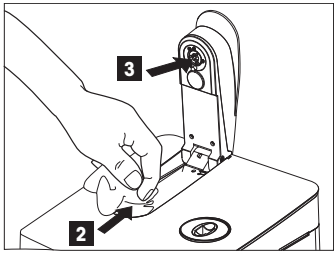
1 Open the arm of the micro volume platform.



2 Clean the micro volume platform with a suitable lint free optical cleaning cloth and deionized water.

3 Similarly, clean the measuring cell in the arm.

⇨ If necessary, clean with spectroscopy grade isopropanol and wipe dry with a lint free optical cleaning cloth.



6.3 Cleaning the cuvette

NOTICE

Danger of damage to the cuvette wrong cleaning methods!

Cuvettes can be scratched, damaged by heat or vibration.

1 Always use a wood-free optical polishing cloth to clean cuvettes so as to avoid scratching the optical surface of the cuvette.
2 Do not place your cuvettes in an ultrasonic cleaning bath.
3 Do not heat glass cuvettes above 35 °C.
4 Do not heat quartz cuvettes above 60 °C.

Cleaning the inside of the cuvette

1 Hold the cuvette on its opaque non-measuring side when cleaning it.
2 Rinse the cuvette under warm running water.
3 Rinse the inside of the cuvette with deionized or ultra pure water.
4 If the cuvette is still dirty, use an appropriate optical cell cleaning solution taking care to follow the instructions of the supplier.

Cleaning the outside of the cuvette

1 Hold the cuvette on its opaque non-measuring side when cleaning it.
2 Moisten the outside of the cuvette with spectroscopy grade isopropanol and rub up and down the vertical length of the cuvette with an optical cleaning cloth.
3 Rub up and down the vertical length of the cuvette with a dry optical cleaning cloth.

Note

- Store your cuvettes in their original packaging or in an appropriate cuvette holder.

6.4 Cleaning the housing

NOTICE

Water can cause damage to the instrument!

The instrument is not waterproof. Water or other liquids seeping into the instrument may cause damage.

1 Do not immerse the instrument.
2 Wipe off any spills.

The housing is made of coated polypropylene (PP). This material is sensitive to certain acids and organic solvents, such as toluene, xylene and methyl ethyl ketone (MEK).

– Clean the housing of the instrument using a soft cloth dampened with water. If necessary use ethanol or isopropanol.

6.5 Transport the instrument

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

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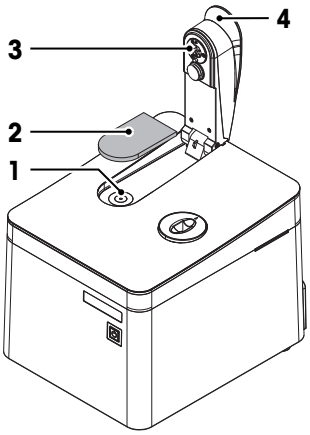
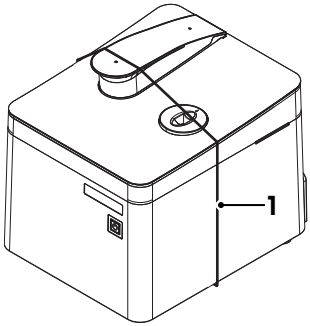
1 Shut down the instrument.
2 Disconnect the instrument from the power supply.
3 Remove all cuvettes.
4 Disconnect and uninstall any accessories from the instrument.
5 Clean the instrument.

6 Lift the micro-volume arm (4).
7 To protect the mirror (3) in the micro-volume arm, place the pad (2) on the micro-volume platform (1).
8 Close the micro-volume arm (4).



9 Use a cord (1) to secure the micro-volume arm.
10 If you transport the spectrophotometer over long distances, use the original packaging.
11 Keep the spectrophotometer upright while you transport it.



7 Disposal

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 (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

8 Technical Data

8.1 Spectrophotometer

Power rating AC adapter	Line voltage	100 - 240 V ~ ±10 %
	Input frequency	50-60 Hz
	Input current	0.8 A
	Output voltage	24 V ⎓
	Output current	1.25 A
Power rating instrument	Input voltage	24 V ⎓
	Input current	0.9 A
Dimensions (without terminal)	Width	208 mm
	Depth	255 mm
	Height	217 mm
Weight	Unit incl. terminal	7.2 kg
Materials	Housing	Coated polypropylene
	Micro volume platform	Heraeus Suprasil, quartz glass
	Micro volume arm	Heraeus Suprasil, Epoxi EP 220
Ambient conditions	Ambient temperature	5 °C - 40 °C
	Recommended ambient temperature (for guaranteed performance)	20 °C - 25 °C
	Relative humidity	Max 80% (non condensing) at 31 °C, linearly descending to 50% at 40 °C
	Overvoltage category	Class II
	Pollution degree	2
	Range of application	For indoor use only
	Max. operating altitude	Up to 2000 m

8.2 Measurement

Wavelength	Optical Configuration	Single beam FastTrack™ technology
	Optics	In-plane aberration corrected grating spectrograph
	Grating	Concave holographic grating
	Light Source	Pulsed xenon flash lamp
	Detector	2048 pixel CCD array detector
	Measurement range	190 - 1'100 nm
	Accuracy (holmium)	< ±1.0 nm
Measurement data	Data collections speeds	1 s (fastest) - 10 s (max); 5 s (typical)
	Data intervals	0.2 nm
	Ordinate Modes	Abs, %T
Photometric	Display range	-0.3 ~ 5.0 A
	Accuracy	< ±0.01 A (potassium dichromate, Ph.Eur./USP method)
Stray light	at 198 nm (potassium chloride)	> 1.7 A

Resolution	Ratio toluene in hexane abs	> 1.7

8.3 Terminal

Dimensions	Width	194 mm
	Depth	129.5 mm
	Height	56.7 mm
	Weight	638.4 g
Angle adjustment	Mechanical	2-stage
Materials	Top housing	EN ZL-ZnAl4Cu1 (EN ZI-0410)
	Lower housing	Crastin SO653
	Cover glas	Gorilla glas

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/uv-vis
For more information

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