Instruction manual

VWR® M4 UV/VIS Split Beam Spectrophotometer

EU cat. no 634-1227



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Spectrophotometer

Safety Information

Avoiding Electrical Shock

Please follow the guidelines below, and read this manual thoroughly to ensure safe operation of the unit.



To avoid electrical shock

- Do not open the device.
- Disconnect the device from the mains supply before carrying out maintenance work or changing the fuses.
- The inside of the device is a high-voltage danger zone.
- Do not use the device if it is damaged, especially if the main power cable is damaged or defective.
- Repairs may only be carried out by the service technicians from your local VWR office and authorized contractual partners.
- The device must be connected to a power outlet that has a protective ground connection.
- If the equipment is used in a manner not specified by the manufacturer, the protection function provided by the equipment may be compromised.



Avoiding Damage to the Instrument

- Do not allow any liquid to enter into the device.
- Do not operate the device in a hazardous location or potentially explosive environment.



Injury due to Gazing Directly at Xe Flash Lamp When Lit

- The Xe flash lamp radiates strong ultraviolet rays. Avoid gazing at directly when lit. For looking at the lamp, be sure to wear goggles equipped with a function for cutting off ultraviolet rays.

Package Contents

Description	Quantity
Spectrophotometer	1PC
Glass Cuvette (PN: 634-6013)	4PCS
Quartz Cuvette (PN: 634-6018)	2PCS
Power Cord (Euro/UK/CH Plug)	3PCS
Software USB Flash Drive	1PC
USB Cable	1PC
Quick Manual	1PC
Dust Cover	1PC
Fuse	1PC

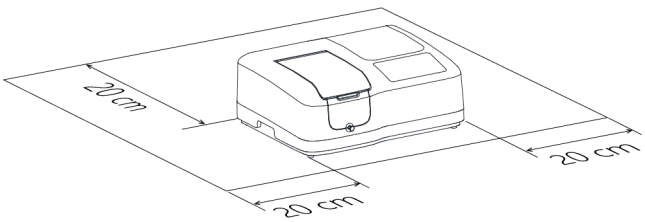
Unpacking

Open the package, carefully check the items on the packing list. If you find any missing or damaged items inside the package, please contact your local VWR/Avantor service provider or local authorized contractual service provider.

Installation

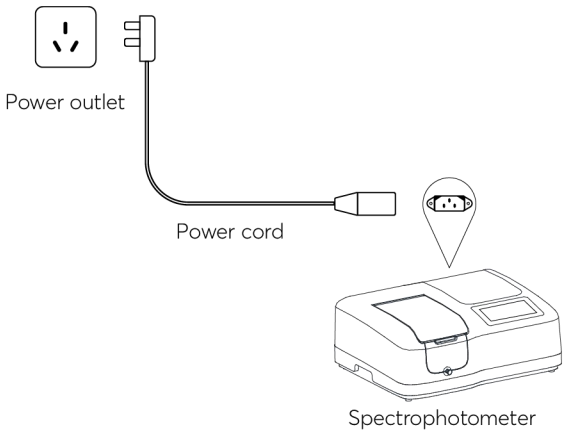
Placement

Place the instrument on the stable table carefully. Ensure at least 20 cm of clearance is maintained on the left, right, and rear sides of the instrument.



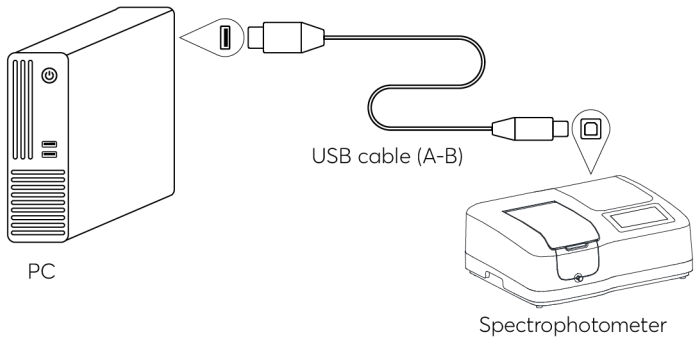
Connect the power cord

Ensure instrument power switch is turned off, plug-in the power cord to both wall power outlet and power supply input interface socket of instrument.



Connect to the computer

Insert the square plug (Type B) into the USB port on the back of the instrument. And Insert the flat plug (Type A) into the USB port on the PC.



Intended use

For research use only. Not intended for any animal or human therapeutic or diagnostic use.

Symbols and conventions

The following chart is an illustrated glossary of the symbols that are used in this manual.

	**CAUTION** This symbol indicates a potential risk and alerts you to proceed with caution.
	**CAUTION** This symbol indicates the presence of high voltage and warns the user to proceed with caution.
	**CAUTION** This symbol indicates risks associated with hot surfaces.

Product Specifications

Optical System	Split Beam
Wavelength Range	190-1100nm
Bandwidth	2nm
Stray Light	≤0.08%T @ 220nm & 360nm
Photometric Range	0 to 200%T, -0.3 to 3.0A, 0 to 9999C
Wavelength Accuracy	±0.5nm
Photometric Accuracy	±0.4%T or ±0.004A @ 1A
Stability	0.002A/h @ 500nm
Memory	236KB
Language	English, French, German, Spanish, Portuguese, Chinese
Display	TFT Color LCD (5", Touch Screen)
Interface	USB-A, USB-B, RS-232
Measuring Procedure	Photometry, Quantitation, Spectrum Scan
Power Supply	AC 100~240V, 50~60Hz, 60W
Dimension	456mm×360mm×185mm
Weight	10.5kg
Work Environment	15 to 35°C, 15 to 70% relative humidity
Store Environment	-10 to 50°C, 15 to 70% relative humidity

This instrument is compliant to the European Directives on Low Voltage Directive 2014/35/EU, Electromagnetic compatibility 2014/30/EU.

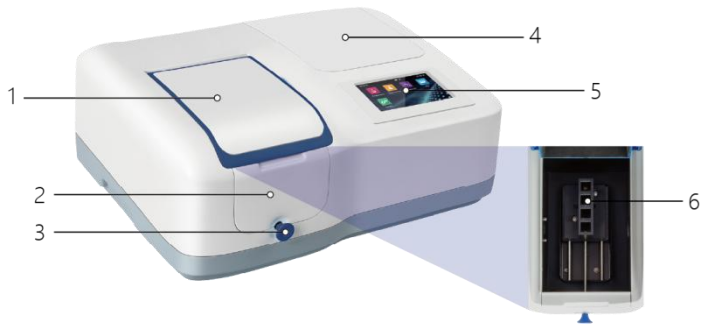
Restriction on use of Hazardous Substances RoHS 2011/65/EU and their amendments.

Overview

The M4 UV-Vis spectrophotometer covers a spectral range of 190~1100 nm (UV-Vis) with a 2 nm spectral bandwidth, which combines the resolution of qualitative analysis with the accuracy of quantitative analysis. The instrument has three built-in core modules: photometry (measuring absorbance, transmittance and other basic parameters), quantitation (calculating the concentration of unknown samples according to the Lambert-Beer law), and spectrum scanning (generating spectral curves to help qualitative identification and process monitoring). Equipped with a 5-inch colour touch screen, it is intuitive and convenient to operate, and is suitable for the needs of multiple scenarios. Widely used in education, chemical, biological, environmental protection, food and other industries, can meet the core needs of teaching experiments and quality control.

Description

Front View



1. Sample room lid	Provides access to sample room
2. Sample room front panel	For easy replacement of the special room front panel when installing certain accessories
3. Pull rod	Push/Pull to move the sample cell position
4. Lamp room lid	Allows access to lamp when replacement is necessary
5. Touchscreen color LCD display	User interface
6. 10 mm 4-cells manual sample holder	Placement of sample cuvette during measurement (10 mm)

Right View



1. Power button	Power on/off the unit
2. USB port	Allows connection to a USB flash drive/USB printer

Rear View



1. USB port	Allows connection to a PC
2. Serial port	Allows connection to a serial port printer (PN: 634-1137, RD-TH32-SC, thermal printer)
3. Fuse seat	Installation of power input fuse
4. Power in socket	Connection socket for power supply unit

Technical Principles

The UV-Vis spectrophotometer is an instrument that analyzes the concentration, purity, or structure of substances by measuring absorbance based on the principle of selective absorption of ultraviolet and visible light by matter, adhering to the core principle of Lambert-Beer's Law.

When a beam of parallel monochromatic light (light of a single wavelength) passes through a

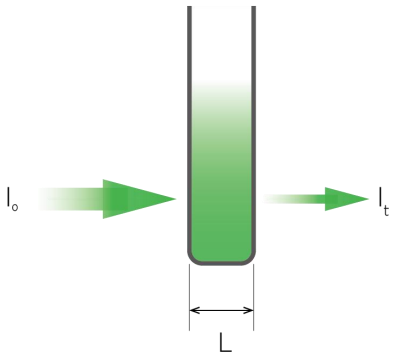
homogeneous solution under test, light absorption satisfies the following relationship:

$$A = \varepsilon bc$$

A	Absorbance (A = -lg(T), where T is transmittance)
ε	Molar absorption coefficient (unit: $L \cdot mol^{-1} \cdot cm^{-1}$)
b	Path length (Usually 1 cm, unit: cm)
c	Concentration (unit: $mol \cdot L^{-1}$)

In short: at a fixed wavelength and path length, the absorbance A is linearly related to the concentration of the substance c - this is the core basis for quantitative analysis in a spectrophotometer.

Transmittance is the proportion of the light which passes through the sample:



I_0 —— Incident light
I_t —— Transmitted light
L —— Path length

$$T = \frac{I_t}{I_0}$$

Absorbance is inversely related to transmittance:

$$A = -\log T = -\log\left(\frac{I_t}{I_0}\right)$$

Getting Started

Turn On and Self-check

Switch on the power. Self-check includes the following steps: Turn On Lamp → Positioning Filter Wheel → Positioning Automatic Sample Holder (If Installed) → Check Dark Current → Calibration Wavelength → Check Energy → Check System baseline.



Important Guidelines

- Reagents and dilution buffers can cause cauterization and other damage to health.
- Samples (nucleic acids, proteins, bacteria cultures) can be infectious and cause serious damage to health.
- During sample preparation, measuring procedures and maintenance and cleaning work, observe all local laboratory safety precautions (e.g. wear protective clothing and gloves, use of disinfectant) regarding the handling of sample material.
- Dispose of measuring solutions, cleaning and disinfectant materials in accordance with the relevant local laboratory regulations.

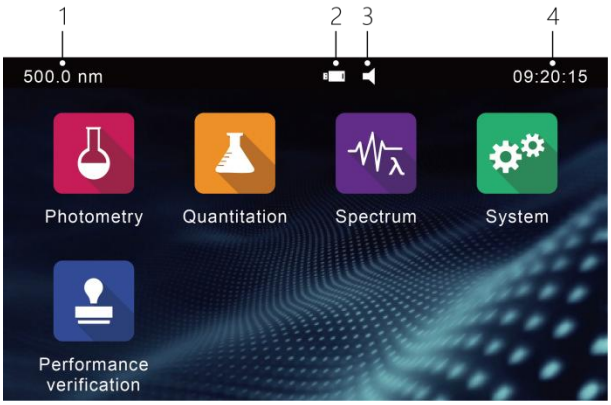
General Operating Instructions

Touch Screen Using Tips

The entire screen can be awakened with a touch. To make a choice, use your nails, fingertips, pencil, or stylus to press the screen. Don't press the screen with sharp objects (such as ball point).

Navigating

The home screen is displayed below.



Status bar

1. The current wavelength of the instrument.
2. USB flash drive indicator. This icon is displayed to indicate that the USB flash drive is connected.
3. Beep indicator.

   Beep on.

   Beep off.
4. Current instrument time.

Functions

On the Home screen, press the icon as below to access the function screen.

Photometry
Measures the absorbance or transmittance of the sample.

Quantitation
Establishes the standard curve and measures the concentration of the sample.

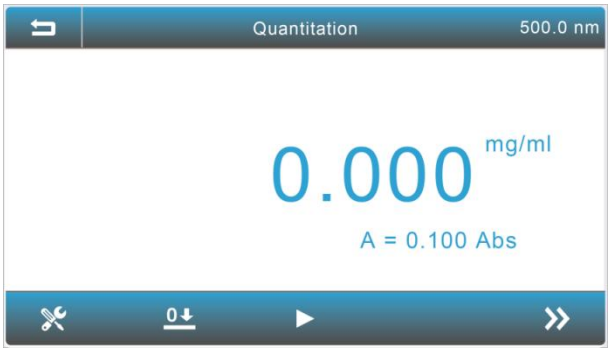
Spectrum
Scan the sample in a wavelength range.

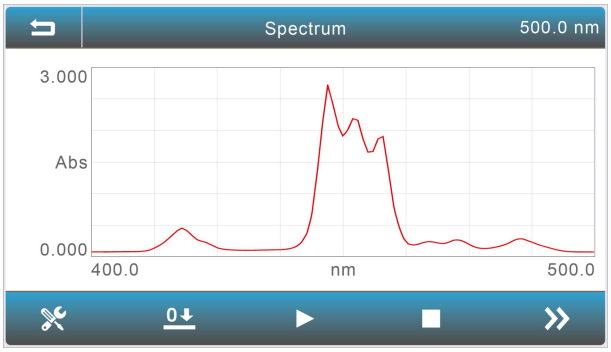
File
Manage files stored on the unit or USB flash drive.

System
System calibration and setup.

Performance verification
Verify the performance of the unit.

Basic Operation





Press the **Home** key to return to the Home screen.

Press the **Return** key to return to the previous screen.

Press the **Method** key to access the Method screen and set measurement parameters.



Put the reference into the measurement channel, press the **Zero/Baseline** key to do blank/scan baseline.



Put the sample into the measurement channel, press the **Run** key to measure/scan the sample.



Press the **Stop** key to cancel baseline/sample scanning.



Press **Expand** key to access the results list screen.

Measurement Results Operation



Browse Measurement Results



Press **Page up/Page down** key to turn to the previous/next page.



Press the page number display area to pop up the numeric keyboard, key in the page number, enter to jump directly to the target page.

Name the Samples



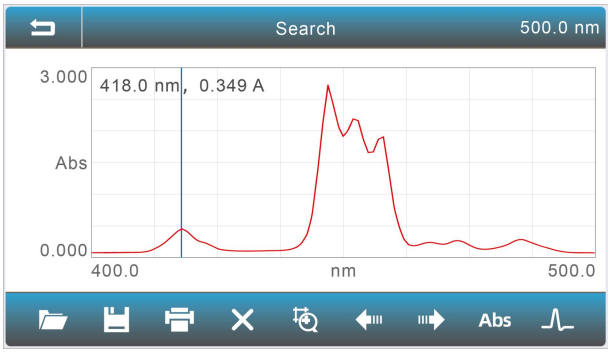


In the Photometry or Quantitation module. Press the cell in the Name column to pop up the keyboard, key in the sample name (up to 8 characters).

Remove the Samples

> ***Caution***
> *Once samples are removed, they cannot be recovered!*





On the results list screen of Photometry or Quantitation. Press the ⊘ / ⊘ icon to the right of the data to select/deselect the corresponding data row, press the **Remove** key to delete the selected data.

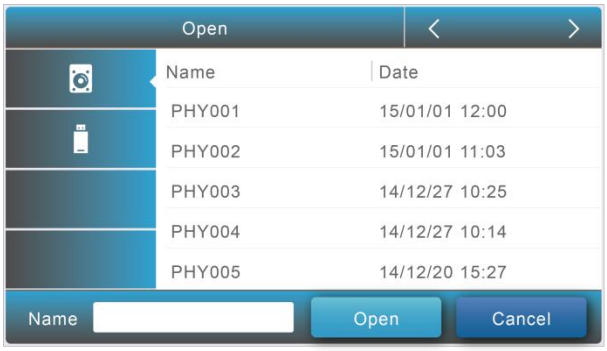
On the search screen of Spectrum. Press the **Remove** key to delete the selected data.

Print the Test Report

Press the **Print** key to print out the test report if the printer is ready.

Load the Measurement Results

Press the **Open** key to pop up the Open screen.



Press the **Internal storage** tab to access the internal storage and show the files list.

If the USB flash drive is available. Press the **USB flash drive** tab to access the USB flash drive and show the files list.

Press the **Page up/Page down** key to turn to the previous/next page of the files list.

Press the file name in the files list to select a file, and press the **Open** button to load the data/curve.

Save the Measurement Results

> ***Important information***
> *File name may only contain uppercase letters and numbers. Up to 8 characters!*

Press the **Save** key to pop up the Save screen.



Press the **Internal storage** tab to access the internal storage and show the files list.

If the USB flash drive is available. Press the **USB flash drive** tab to access the USB flash drive and show the files list.

Press the **Page up/Page down** key to turn to the previous/next page of the files list.

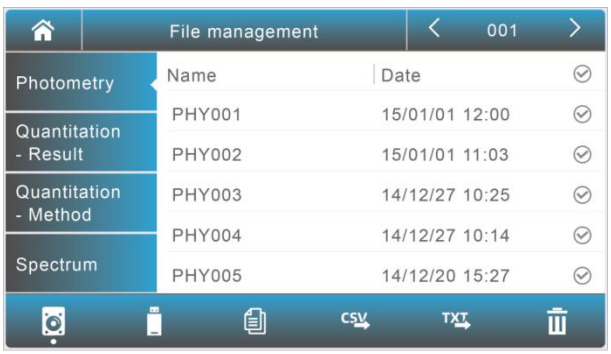
Press the file name input box, pop up the keyboard. Key in the file name and press the **Save** button to save the data/curve.



Files Operation

On the File management screen. The unit provides perfect management functions such as file renaming, deleting, copying and exporting.

> ***Important information***
>
> 1. *Copying and exporting operations are dependent on USB flash drive. Make sure that the USB flash drive is inserted and ready before use.*
> 2. *If a file with the same file name exists in the target path of copy, export, it will be overwritten.*



File Types

Depending on the application type, the instrument stores four different file types.

***.PHY**	Measurement results file for the Photometry module.
***.QUA**	Measurement results file for the Quantitation module.

*.MTD	Measurement method file for the Quantitation module.
*.SCA	Measurement results file for the Spectrum module.

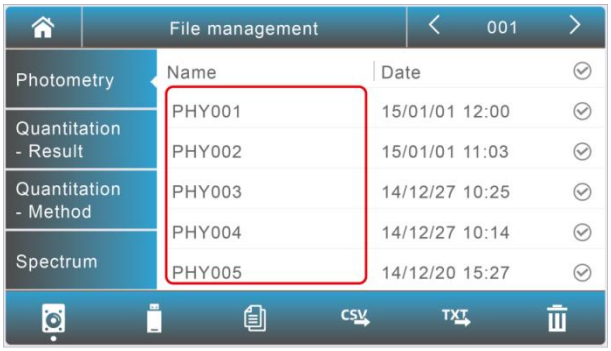
Browse the Files

Press the Photometry/Quantitation-Result/Quantitation-Method/Spectrum tab to switch the file type.



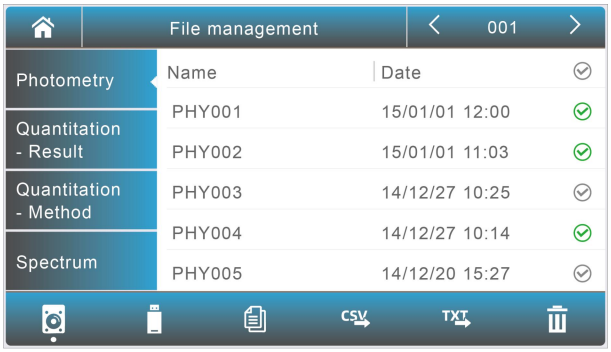
Press the **Page up/Page down** key to turn to the previous/next page.

Rename the Files



Press the cell in the Name column to pop up the keyboard, key in the file name (up to 8 characters).

Delete the Files

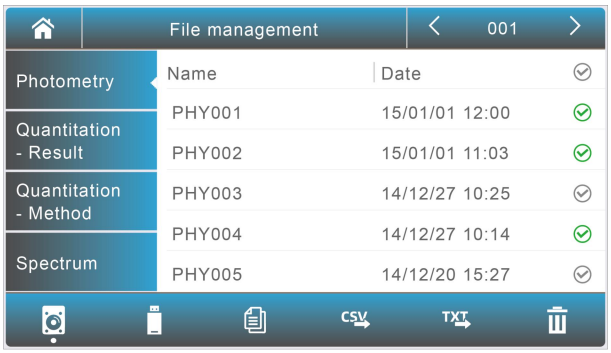




Press the ⊘ / ⊘ icon to the right of the data to select/deselect the

corresponding files row, press the **Delete** key to delete the selected data.

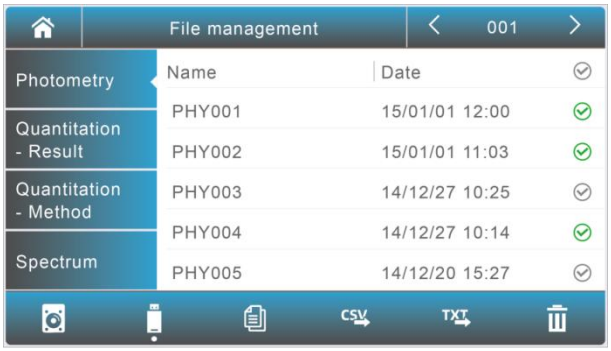
Copy Files from Internal Storage to USB flash drive



Press the **Internal storage** key to access the internal storage. Press the / icon to the right of the files name to select/deselect the files.

Press the **Copy** key to copy the selected files to the USB flash drive.

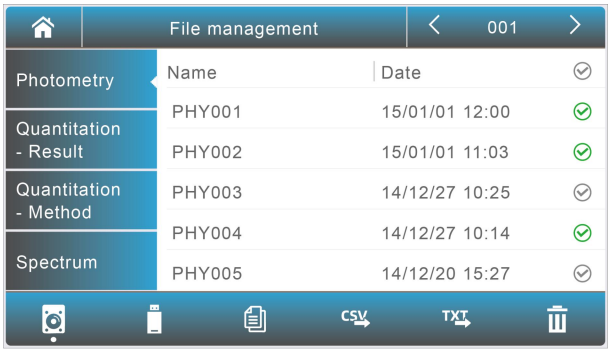
Copy Files from USB flash drive to Internal Storage



Press the **USB flash drive** key to access the USB flash drive. Press the / icon to the right of the files name to select/deselect the files.

Press the **Copy** key to copy the selected files to the internal storage.

Export the Files



Press the **Internal storage** key to access the internal storage. Press the / icon to the right of the files name to select/deselect the files.

Press the **Export to CSV** key to convert the selected files to CSV format and save them to the USB flash drive.

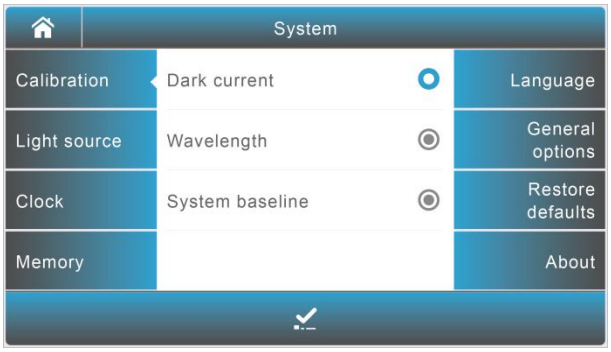
Press the **Export to TXT** key to convert the selected files to TXT format and save them to the USB flash drive.

Calibration and System Settings

This section covers settings related to instrument calibration, storage, clock, light source, language, and accessories.

On the Home screen, press the **System** icon to access the System screen.

Press the setup item tab to access the corresponding setup screen.



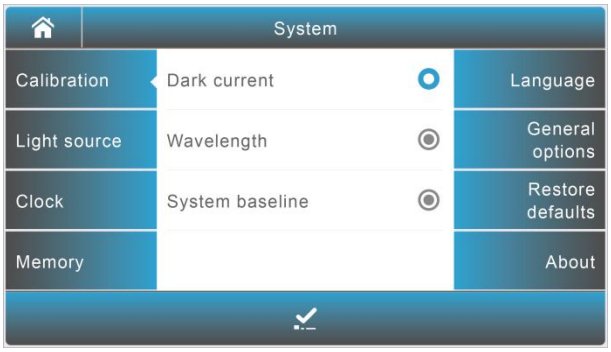
Calibration

The instrument provides three commonly used calibrations, Dark current, Wavelength, and System baseline, to ensure that the instrument is in optimal working condition in any operating environment.

It is recommended that the system be calibrated when the following occurs.

- When there is a significant change in the environment in which the instrument is used, e.g. after transport, change of laboratory, etc.
- Every 3 months under normal use.
- After repair and maintenance. For example, replacement parts, light sources, etc.

> ***Caution***
> *Keep the sample room lid closed until calibration is complete. If it is accidentally opened during calibration, close it and re-calibrate!*



Press the **Selection** icon to select the calibration item.

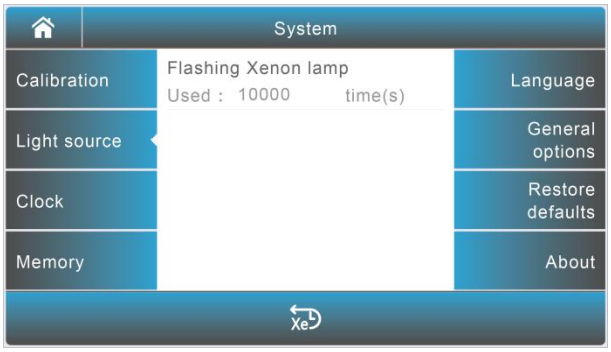
Remove anything from the measurement channel. Move the sample holder to the cell #1. Close the sample room lid.



Press the **Execute** key to do calibration.

Settings of Light Source

This section introduces the instrument's management functions such as light source switching, light source lifespan counter, and light source switching point setting.



Reset the lamp usage



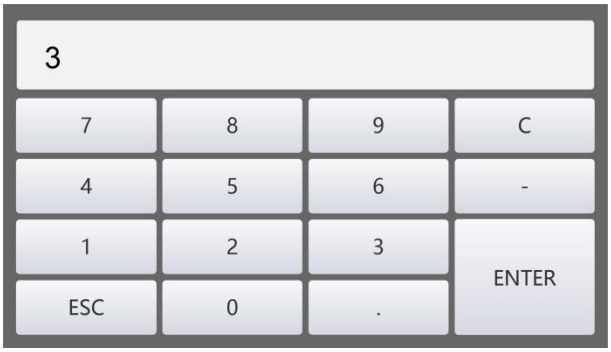
After replacing the tungsten lamp, press the **Flashing Xenon lamp reset** key to reset the tungsten lamp usage.

Edit Clock



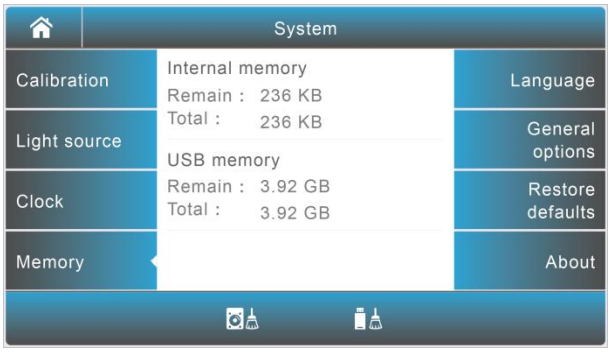
Press the value of year, month, date, hour, minute or second to key in the new value.





Press the **Execute** key to change the date and time.

Memory Management



> ***Caution***
> *Once the format command is executed, all data will be erased and cannot be recovered.*

Press the **Format internal storage** key to format the internal storage of the unit.

Press the **Format USB flash drive** key to format the USB flash drive (if available).

Language Selection

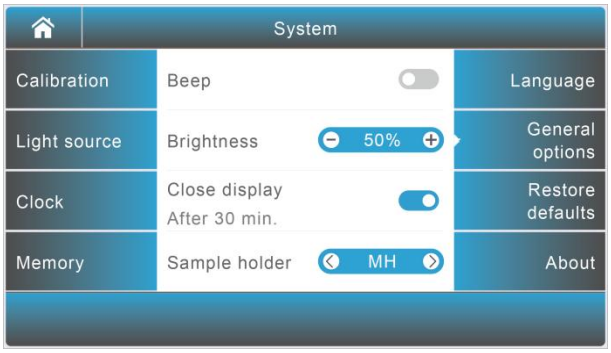
The unit features six built-in languages (English, German, French, Spanish, Portuguese, and Simplified Chinese) for users in different countries and regions to select.



Press the **Selection** icon to select the language and press the **Execute** key to change it.

General Options

This section introduces commonly used instruments and settings for user preferences.



Beep — Press the / icon to turn on/off the notification sounds.

Brightness — Press the / icon to decrease/increase the brightness of the LCD screen.

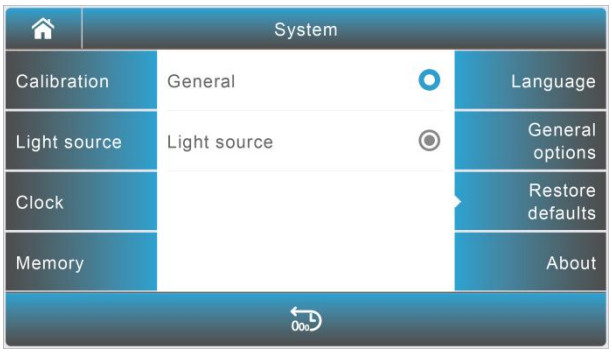
Close display — Press the / icon to turn on/off the Auto-Screen-Off Function. When enabled, the display will automatically turn off after 30 minutes of inactivity. To reactivate the display, simply touch any part of the LCD screen.

Sample holder — When the instrument detects that an automatic sample holder is installed, the setup function will be activated. Press the / icon to change the sample holder type.

- **MH** For manual or fixed sample holder
- **AC-5** For 5 cells automatic sample holder
- **AC-8** For 8 cells automatic sample holder

Restore Defaults

This section introduces the instrument's common peripherals, such as sound, display, and light source setup parameters recovery functions.

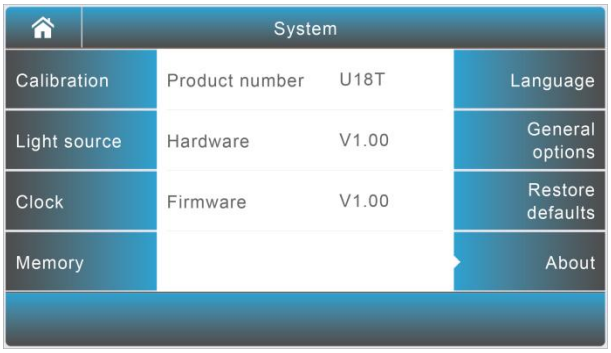


> ***Caution***
> *If the lamp switching point is changed, the system baseline must be re-calibrated.*

Press the **Selection** icon to select the item to restore and press the **Restore** key to reset the parameters to factory settings.

View Device Information

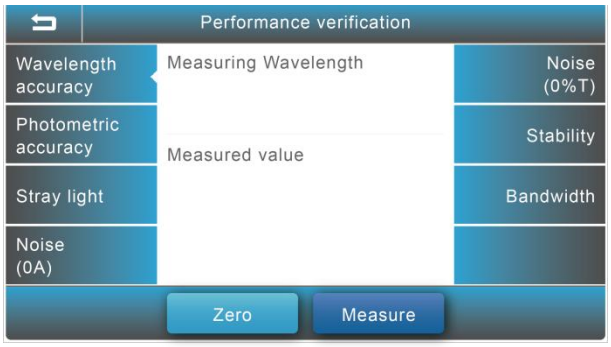
This section shows the hardware and software version information of the device.



Performance Verification

The device provides a complete performance verification function. Users can periodically verify the performance of the instrument to ensure accurate and stable measurements.

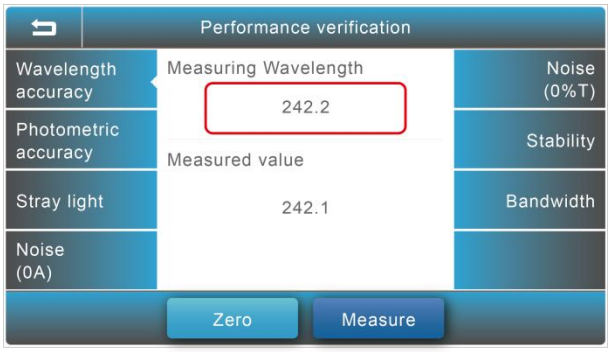
On the Home screen, press the **Performance verification** icon to access the Performance verification screen.



Press the verification item tab to access the corresponding verification screen.

> ***Important information***
> *Before verifying the performance, the unit needs to be preheated for 30 minutes, then measure dark current, calibration wavelength and correct system baseline.*

Verifying Wavelength Accuracy



Standard sample	Holmium oxide solution or equivalent filter
Test wavelength	640.8, 536.9, 485.3, 451.3, 416.6, 361.1, 333.5, 287.5, 278.1, 241.1 nm **The wavelengths listed above are for reference only, and the values**

given by the standards will be used for testing.

Acceptable range Expected value between -0.5 nm to +0.5 nm

Measurement

1. On the Wavelength accuracy measurement screen. Press the wavelength value, key in the test wavelength (Expected value).
2. Put the reference sample in the measurement channel, close the sample room lid, press the **Zero** key to do zero.
3. Put the standard sample in the measurement channel, press the **Measure** key to measure and record the result. Repeat 3 times.
4. Calculate wavelength accuracy.

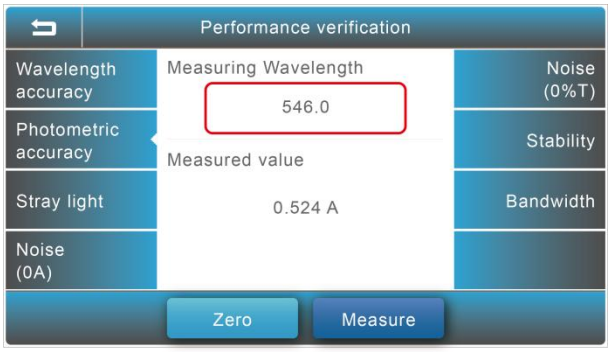
$$WA = \frac{m1 + m2 + m3}{3} - ev$$

$$WR = \text{Max}(m1, m2, m3) - \text{Min}(m1, m2, m3)$$

WA	——	Wavelength accuracy
WR	——	Wavelength repeatability
m1, m2, m3	——	Measured valuve
ev	——	Expected valuve

5. Repeat step 1-4 to measure the other measurement points.

Verifying Photometric Accuracy



Standard sample NIST 930D or equivalent filter

Test wavelength 235, 257, 313, 350 nm (UV)
440, 546, 635 nm (Visible)

Acceptable range Expected value between -0.004 A to +0.004 A

Measurement

1. On the Photometric accuracy measurement screen. Press the wavelength value, key in the test wavelength.
2. Put the reference sample in the measurement channel, close the sample room lid, press the **Zero** key to do zero.
3. Put the standard sample in the measurement channel, press the **Measure** key to measure and record the result. Repeat 3 times.

4. Calculate Photometric accuracy.

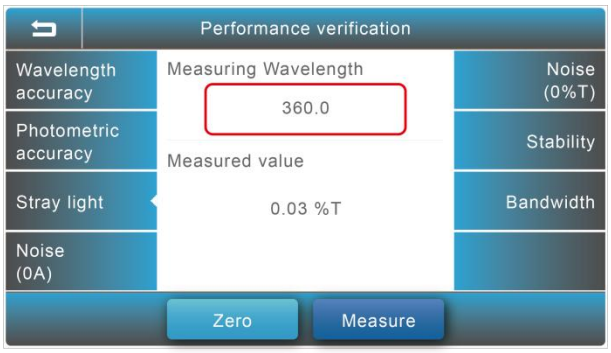
$$PA = \frac{m1 + m2 + m3}{3} - ev$$

$$PR = Max(m1, m2, m3) - Min(m1, m2, m3)$$

PA	——	Photometric accuracy
PR	——	Photometric repeatability
m1, m2, m3	——	Measured valuve
ev	——	Expected valuve

Repeat step 1-4 to measure the other measurement points.

Verifying Stray Light



Standard sample 10g/L NaI solution or equivalent filter (220nm)
50g/L $NaNo_2$ solution or equivalent filter (360nm)

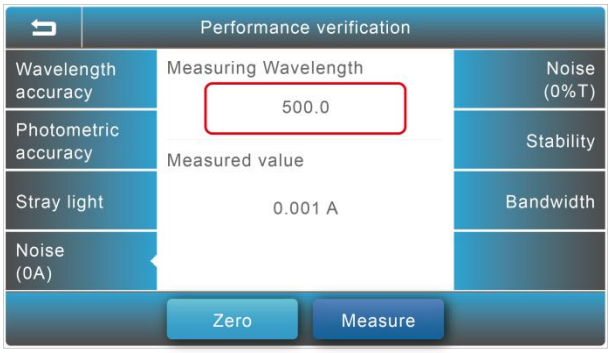
Test wavelength 220, 360 nm

Acceptable range <= 0.05 %T

Measurement

1. On the Stray light measurement screen. Press the wavelength value, key in the test wavelength.
2. Put the reference sample in the measurement channel, close the sample room lid, press the **Zero** key to do zero.
3. Put the standard sample in the measurement channel, press the **Measure** key to measure and record the result. The result is the stray light at this wavelength.

Verifying Noise (0A)



Standard Sample: Air

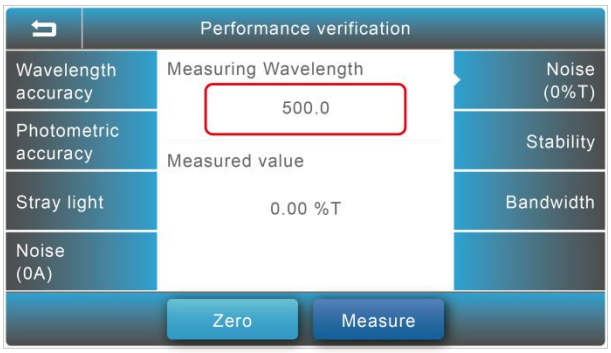
Test wavelength 500 nm

Acceptable range <= 0.002 A

Measurement:

1. On the Noise (0A) measurement screen. Press the wavelength value, key in the test wavelength.
2. Remove anything from the measurement channel, close the sample room lid, press the **Zero** key to do zero.
3. Press the **Measure** key to measure. The result will appear on the screen after 3 minutes.

Verifying Noise (0%T)



Standard Sample: Block

Test wavelength 500 nm

Acceptable range <= 0.05 %T

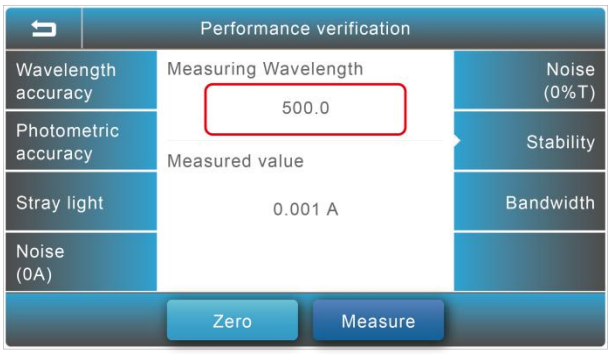
Measurement:

1. On the Noise (0%T) measurement screen. Press the wavelength

value, key in the test wavelength.

2. Remove anything in the measurement channel, close the sample room lid, press the **Zero** key to do zero.
3. Put the block in the measurement channel. Press the **Measure** key to measure. The result will appear on the screen after 3 minutes.

Verifying Stability



Standard Sample: Air

Test wavelength 500 nm

Acceptable range <= 0.002 A

Measurement:

1. On the Stability measurement screen. Press the wavelength value, key in the test wavelength.
2. Remove anything in the measurement channel, close the sample room lid, press the **Zero** key to do zero.
3. Press the **Measure** key to measure. The result will appear on the screen after 30 minutes.

Verifying Bandwidth



Standard Sample:	Low Voltage Quartz Mercury lamp
Test wavelength	546.0 nm
Acceptable range	1.6 to 2.4 nm
Measurement:	1. On the Bandwidth measurement screen. Press the wavelength value, key in the test wavelength. 2. Remove anything in the measurement channel, close the sample room lid, press the **Measure** key to measure. The result will appear on the screen.

Measurement

> ***Important information***
> *The cuvettes must be clear and there's no remains of the samples on the surface of them. Only Quartz cuvettes are permitted to be used in the range of UV range (190 -400 nm).*

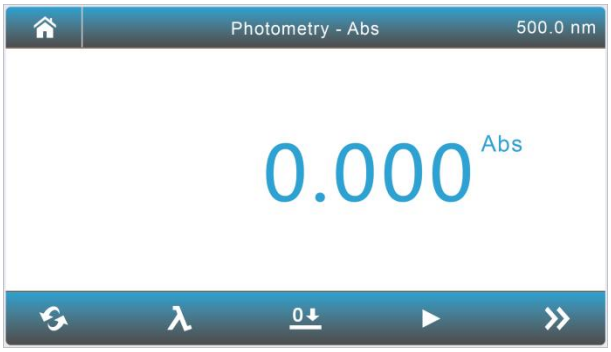
Photometry

Photometry (Photometric measurement) is for scenarios where sample properties are known and a specific reference wavelength is defined. Without complex calculations, it rapidly obtains absorbance (A) or transmittance (%T) at a specific wavelength to determine whether the sample meets "qualitative characteristics" or "rough compliance".

1. Start a Photometric measurement



On the Home screen, press the **Photometry** icon to access the Photometry measurement screen.



2. Switch the photometric mode



Press the **Mode** icon to switch the photometric mode (Abs,%T and E).

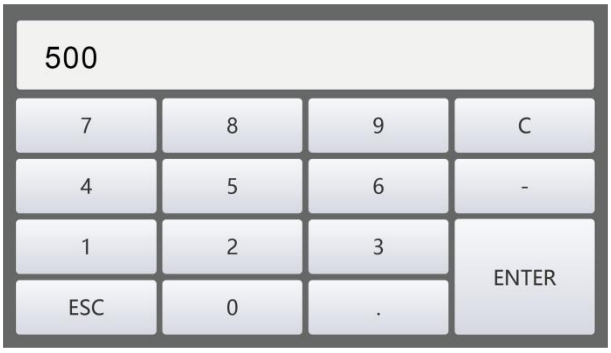
- **Abs** Measure absorbance value of the sample(s)
- **%T** Measure transmittance value of the sample(s)
- **E** Measure energy value of the sample(s)



3. Setup the measurement wavelength

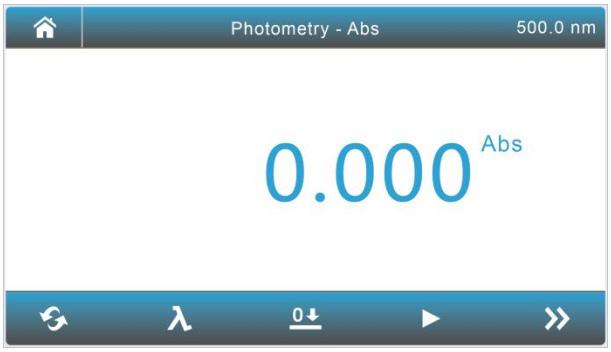


Press the **Wavelength** icon to pop up the numeric keyboard, key in the wavelength (190-1100, Step 0.1), press the **ENTER** key to go to the input wavelength and zero automatically (Abs and %T mode).



4. Zero (Blank)

In the Abs or %T mode. Put the reference sample into the measurement channel, press the **Zero** key.



5. Measure the absorbance or transmittance of the samples

In the Abs or %T mode. Put the sample into the measurement channel, press the **Run** key to record the result in the measurement list.



Press the **Expand** key to access to the results list screen.



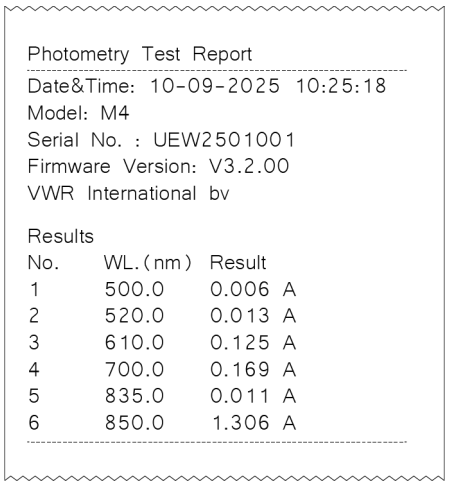
6. Save measurement results and print test reports



On the results list screen, Press the **Save** key to save the test results.



On the results list screen, press the **Print** key to print out the test report if the printer is ready.



Photometry Test Report
Date&Time: 10-09-2025 10:25:18
Model: M4
Serial No. : UEW2501001
Firmware Version: V3.2.00
VWR International bv

Results

No.	WL.(nm)	Result
1	500.0	0.006 A
2	520.0	0.013 A
3	610.0	0.125 A
4	700.0	0.169 A
5	835.0	0.011 A
6	850.0	1.306 A

Measure the energy of the samples

> ***Important information***
> *Energy values are displayed in real time only during measurement and are not recorded in the measurement list.*



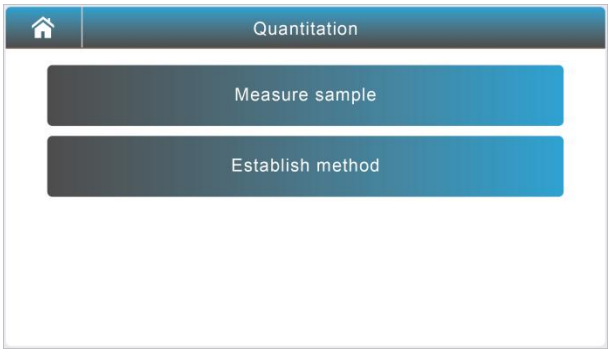
In the E mode. Put the sample into the measurement channel, Display the energy value at the current gain level. Press the **Up/Down** key to increase/decrease gain (1-8).

Quantitation

Quantitation (Quantitative measurement) is for analytical requirements where "specific content must be known". By optimizing measurement modes (single wavelength/dual wavelength), interference is eliminated and accuracy enhanced, ultimately calculating the precise concentration of target substances in the sample.

1 Start a Quantitative measurement

On the Home screen, press the **Quantitation** icon to access the Quantitation guidance screen.



2 Establish a Method

On the Quantitation guidance screen, press the **Establish method** key to access the Setting screen.



2.1 Setup the measurement parameters

Press the item to set the measurement parameters.

Measurement	**A=A1**	Absorbance is equal to the measured absorbance value of the measured wavelength 1.
	A=A1-m*A2	Absorbance is equal to the difference between the absorbance value of the measured absorbance at the wavelength 1 and the wavelength 2, m is the Coefficient.
	A=A1/A2	Absorbance is equal to the ratio of the measured absorbance value of the measured wavelength 1 and 2.
Wavelength 1	Measurement wavelength 1.	

Wavelength 2	Measurement wavelength 2.
Fitting	**LIN-0** Linear to zero. **LIN** Linear. **QUA** Quadratic.
Unit	- (No Unit),%, ppm, ppb, g/L, mg/L, µg/L, ng/L, g/dL, mg/dL, µg/dL, mg/mL, µg/mL, ng/mL, µg/µL, ng/µL, mol/L, mmol/L, IU, Custom (User input, Up to 8 characters).
Calibration	**Coe K** Input equation coefficient. **Std M** Measure standard sample (s). **Std I** Input standard sample (s).
Standard quantity	Standard samples number (Up to 10).

2.2 Establish standard curve

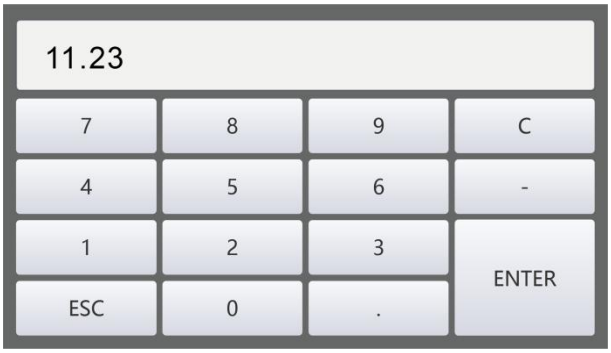
After completing all parameter settings, press the **Next** key to enter the standard curve establishment process. Based on the parameters set in the Calibration item, establish the standard curve according to the selected method.

- **Coe K** Refer to section 2.2.1
- **Std M** Refer to section 2.2.2
- **Std I** Refer to section 2.2.3

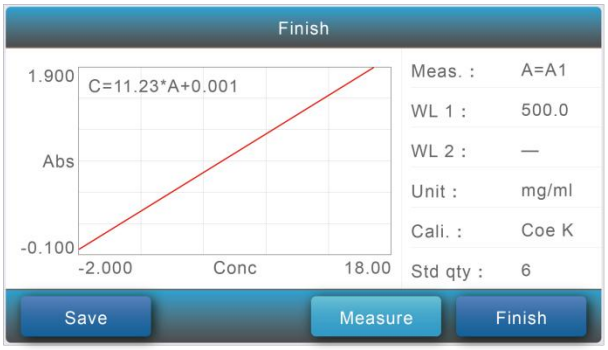
2.2.1 Input equation coefficient to establish standard curve

(1) On the Input coefficient screen. Press the coefficient value to pop up a numeric keyboard, key in the equation coefficient.



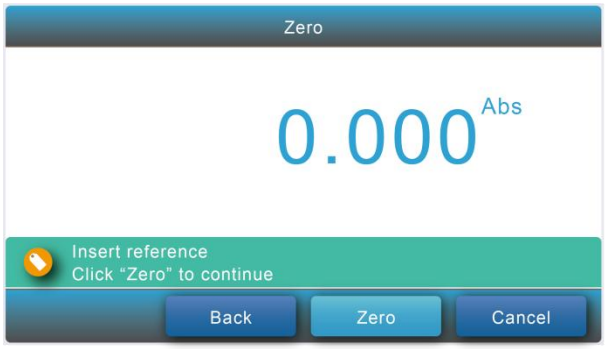


(2) Press the **Next** key to enter the Finish screen, and generate a standard curve.

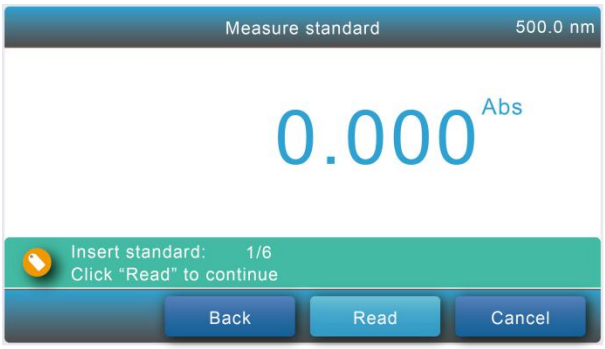


2.2.2 Measure standard samples to establish standard curve

(1) On the Zero screen. Put the reference sample in the measurement channel, press the Zero key. Access to the Measure standard screen after zeroing.

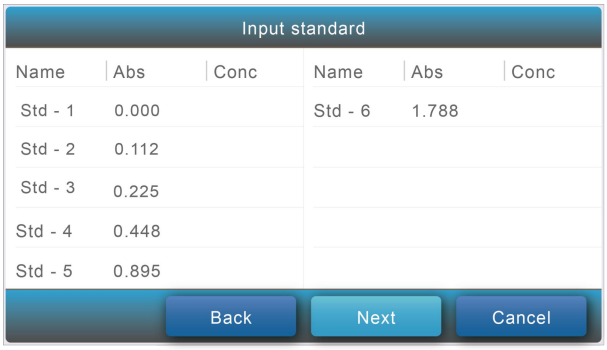


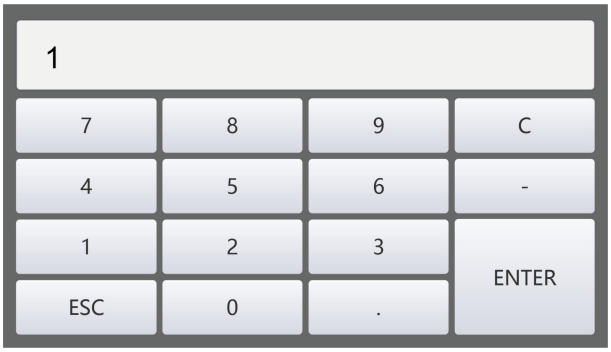
(2) On the Measure standard screen. Put the 1# standard sample in the measurement channel, press the **Read** key to measure.



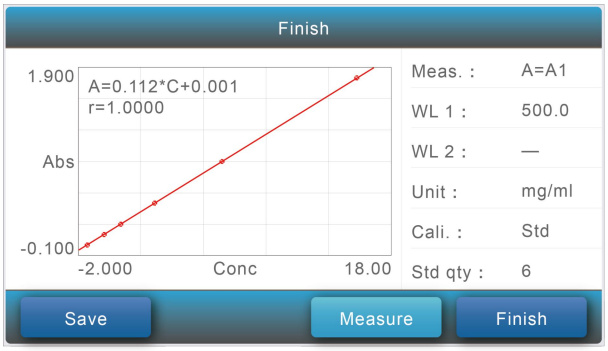
(3) Repeat step (2) to measure other of the standard samples. After measuring all standard samples, enter the Input standard concentration screen.

(4) Press the cell in the Conc column to pop up the numeric keyboard, key in the concentration value.



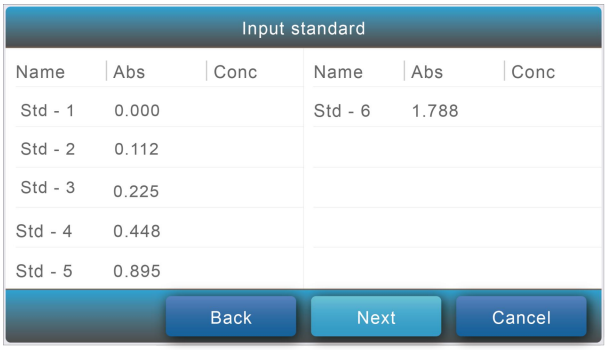


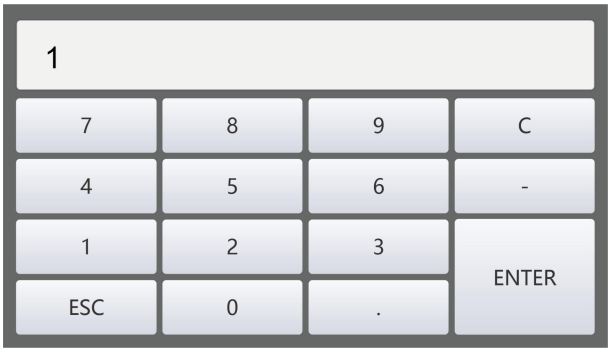
(5) After inputting all concentration values, press the **Next** key to enter the Finish screen, and generate a standard curve.



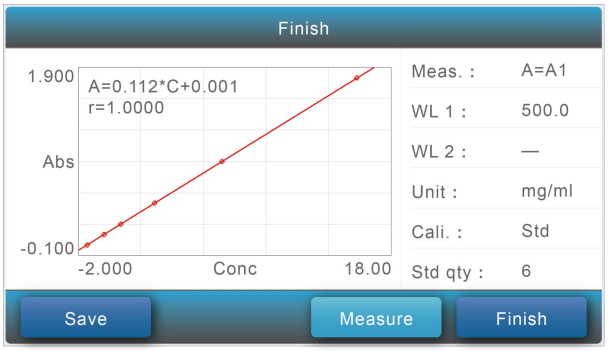
2.2.3 Input standard samples to establish standard curve

(1) On the Input coefficient screen. Press the cell in the Abs and Conc column to pop up the numeric keyboard, key in the absorbance and concentration value.





(2) After inputting all concentration values, press the **Next** key to enter the Finish screen, and generate a standard curve.



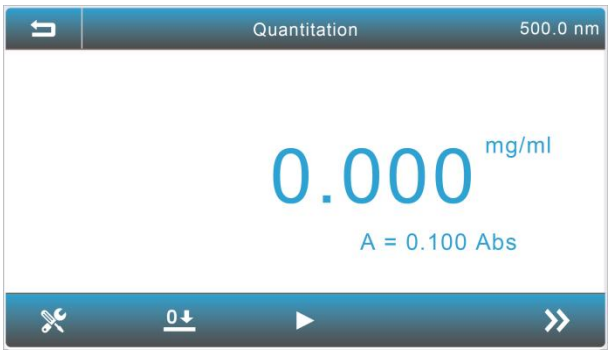
2.3 Save and Return

Finished establish method. Press the **Save** key to save the method, press the **Measure** key to accept the new method and enter the measurement screen. Press the **Finish** key to end and return to the Quantitation guidance screen.

3 Measure Sample

There are 2 ways to access the Quantitation measurement screen.

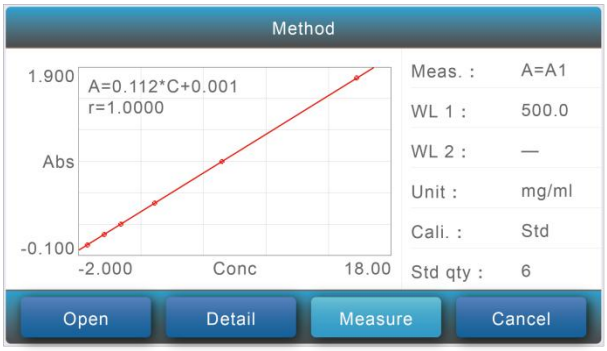
- On the Quantitation guidance screen, press the **Measure sample** key.
- On the Finish screen after method establishing, press the **Measure** key.



3.1 Load a measurement method

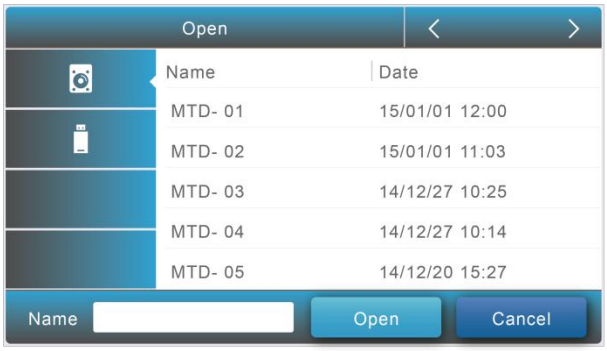


On the Quantitation measurement screen, press the **Method** key to enter the method screen. Displays the standard curve and measurement settings for the current measurement method. If the standard curve was established by measuring or inputting standard samples, press the **Detail** key to view the raw data of the standard samples, press the **Return** key to back.





On the Method screen, press the **Open** key to pop up the methods list screen. Press the method name to select and press the **Open** key to load the method.



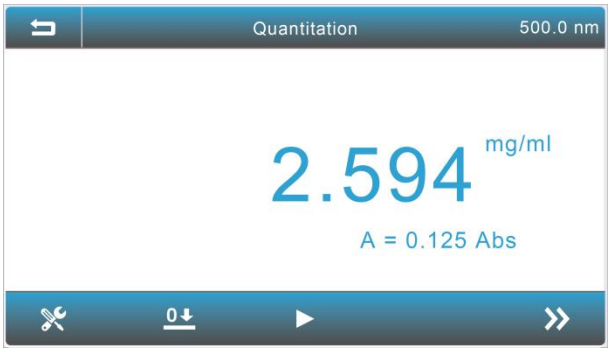
3.2 Zero (Blank)



On the Quantitation measurement screen, put the reference sample into the measurement channel, press the **Zero** key.

3.3 Measure the concentration of the samples

On the Quantitation measurement screen, put the sample into the measurement channel, press the **Run** key to record the result in the measurement list.



Press the **Expand** key to access to the results list screen.



3.4 Save measurement results and print test reports

Press the **Save** key to save the test results.

Press the **Print** key to print out the test report if the printer is ready.

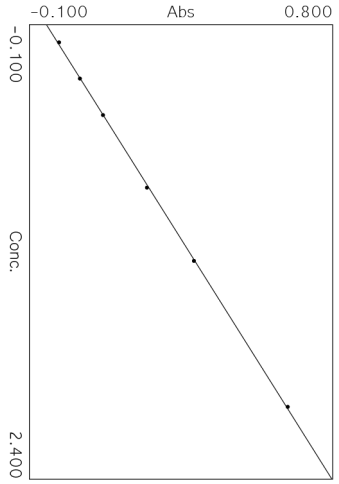
Quantitation Test Report

Date&Time: 10-09-2025 11:22:15
Model: M4
Serial No.: UEW2501001
Firmware Version: V3.2.00
VWR International bv

Meas.: A=A1
WL.: 546.0
Unit: mg/l
Cali.: Std M
Std qty: 6
A=0.334*C-0.005
r=0.9981

Standard Samples

No.	Abs	Conc.(mg/l)
1	0.001	0.0000
2	0.062	0.2000
3	0.129	0.4000
4	0.255	0.8000
5	0.394	1.2000
6	0.668	2.0000



Results

No.	Abs	Conc.(mg/l)
1	0.377	1.1437
2	0.378	1.1439
3	0.259	0.7904
4	0.161	0.4970

Spectrum

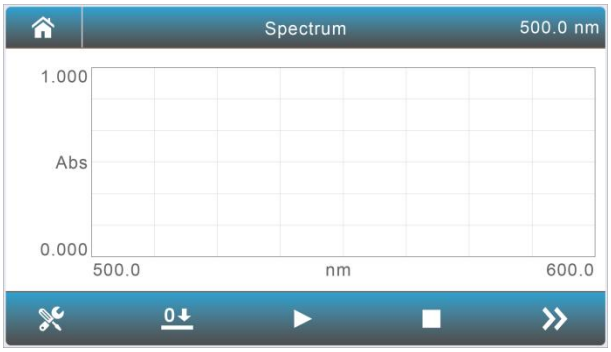
Spectrum scanning is for scenarios involving "unknown sample information" or "developing new analytical methods". It acquires the absorption curve of a sample across a continuous wavelength range, enabling qualitative identification through "characteristic absorption peak positions, peak

shapes, and peak counts", determining optimal measurement wavelengths, or verifying purity.

1 Start a Spectrum scanning



On the Home screen, press the **Spectrum** icon to access the Spectrum scanning screen.



2 Setup measurement parameters



On the Spectrum scanning screen, press the **Method** key to enter the method screen.



Start wavelength	Scan start wavelength (<=1100)
End wavelength	Scan end wavelength (>=190)
Step	Scan interval: 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10.0
Speed	**HS** High speed **MS** Medium speed **LS** Low speed
Photometry mode	**Abs** Absorbance

	%T Transmissivity
Y minimum	Minimum ordinate
Y maximum	Maximum ordinate
Smooth	Dynamically incorporate smoothing algorithms during scanning to filter out spike

3 Scan a sample

3.1 Baseline

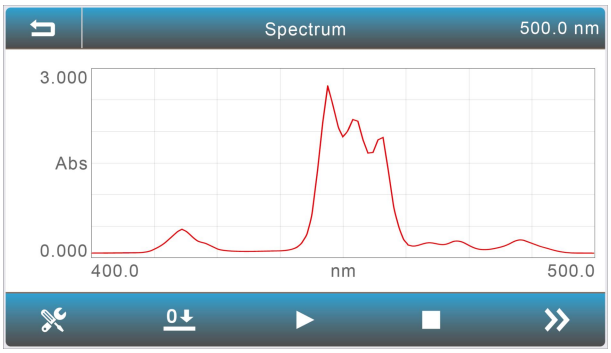


On the Spectrum scanning screen, put the reference sample into the measurement channel, press the **Baseline** key to scan.

3.2 Scan the sample



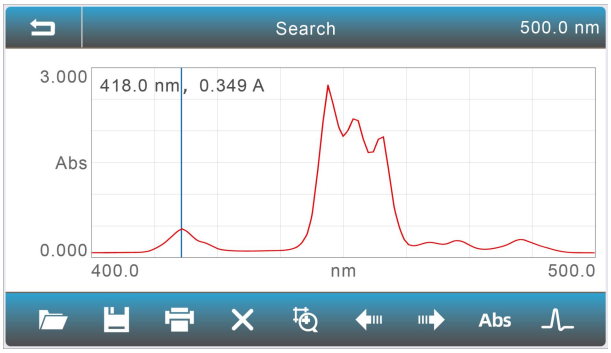
On the Spectrum scanning screen, put the sample into the measurement channel, press the **Run** key to record the result and draw the spectrum.



4 Spectrum search



Press the **Expand** key to access the spectrum search screen.

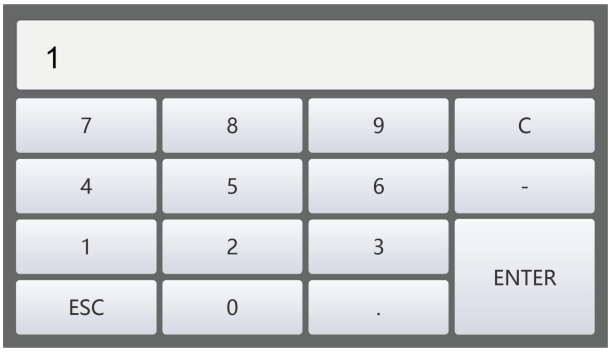


4.1 Zoom in/out spectrum



On the Spectrum search screen, press the **Scale** key to pop up the Scale screen. Press the coordinate values to pop up the numeric keyboard. key in all the new coordinate values. Press the **OK** key to zoom in/out the spectrum.





4.2 Point-by-point spectrum search



On the Spectrum search screen, press the **Peak** key and keep it unselected.

Press the **Left/Right** key to move the cursor to view the wavelength and measurement value point-by-point.

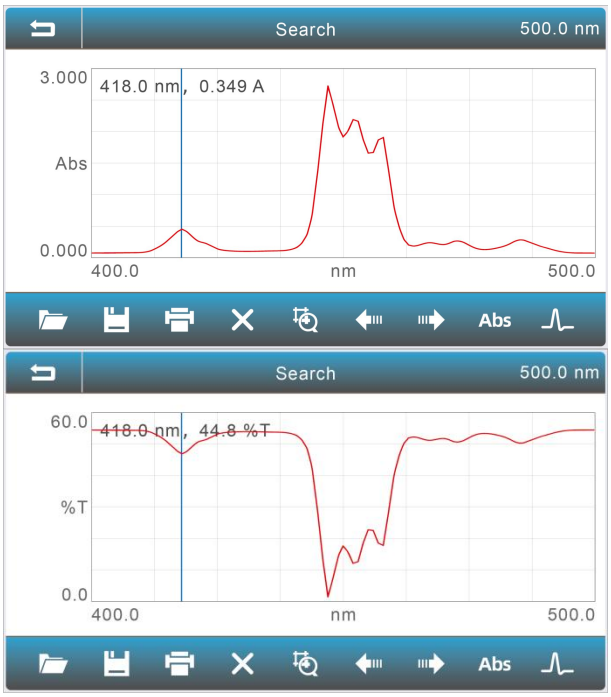
4.3 Peak-by-peak spectrum search

On the Spectrum search screen, press the **Peak** key and keep it selected.

Press the **Left/Right** key to move the cursor to view the wavelength and measurement value peak-by-peak.

4.4 Photometric mode switching

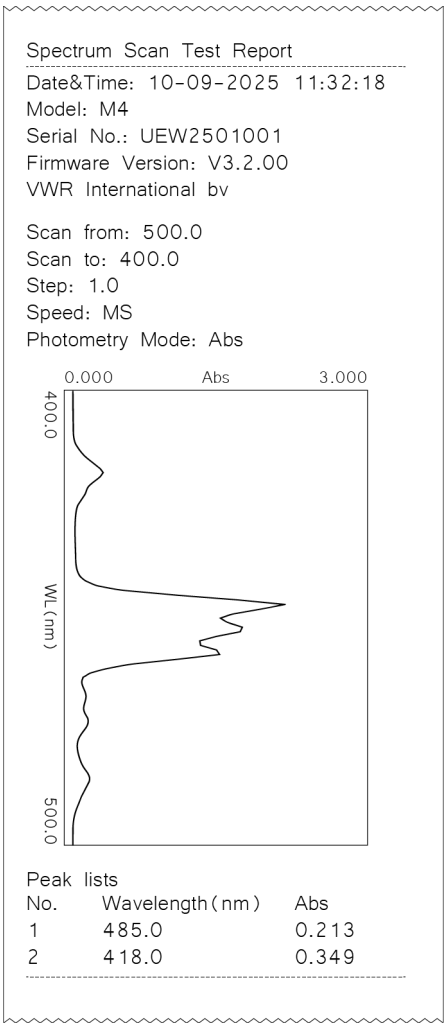
On the Spectrum search screen, press the **Abs** or **%T** key to switch the photometric mode.



5 Save measurement results and print test reports

Press the **Save** key to save the test results.

Press the **Print** key to print out the test report if the printer is ready.



Troubleshooting

Review the information in the table below to troubleshoot operating problems.

Problem	Cause	Solution
Power on, no response	Power cord connection is not reliable.	Improve connectivity.
	Fuse burned.	Replace fuse.

Measurement uncertainty	Glass cuvettes used in UV Range	Use quartz cuvettes.
	Sample is not stable.	Improve the sample.
	The concentration of the sample is too high.	Dilute the sample.
	Power Supply Voltage Low or not Stable.	Improve the Power Supply.
Dark Current Error when self-check	The lid of the compartment is open during self-check.	Close the lid, restart.
System Calibrate Failed	Something blocked the measurement channel	Remove it, calibrate again.
Measurements inaccurate	Cuvettes were contaminated.	Clean cuvettes
	Samples were contaminated.	Improve samples.
	Worse matching of the cuvettes.	Improve the matching of the cuvettes.
	Dark current error.	Resample dark current.

Repair and maintenance

Daily Maintenance

Check the compartment

After measurement, the cuvettes with sample solutions should be taken out of the compartment in time. Or the volatilization of the solution would make the mirror go moldy. Users must pay more attention to the corrosive sample and liquid easy to volatilize. Any solution remaining in the compartment should be wiped off immediately.

Surface clean

The cover of the instrument is painted. Please use a wet towel to wipe off the drips on the surface immediately. Organic solution is forbidden to be used to clean the cover. Please wipe off the dirt on the cover timely.

Clean the cuvettes

After every test or after a solution change, the cuvettes should be cleaned carefully, or the remains on the surface will cause measuring error.

Check Lamp

The light sources used in this instrument are consumables. It is recommended that you obtain a sufficient number of these parts, taking into account the frequency of use of the instrument.

Assuming that the instrument runs for 8 hours per day, the light source will be used for approximately 160 hours/month (20 working days) and approximately 1920 hours/year (240 working days). You need to replace the light source every 10 to 12 months.

Spare Parts Replacement

Replace the fuse

Danger! ***Be sure to switch off the power and unplug the socket before replacement!***

1. **Tools preparation**
   Prepare a 3×75 Flat Blade screwdriver.
2. **Switch Off the power supply**
   Switch off the power supply, and unplug the socket.
3. **Take out the Fuse Seat**
   Push the fuse case by using the screwdriver, and turn it counter clockwise, the fuse seat will pop out when released.



4. **Replace a new fuse**
   Pick out the spare fuse (3.15A/250V) and replace it.



5. **Reset the fuse seat**
   Replace the fuse seat in the power socket. Push the fuse case by using the screwdriver, and turn it clockwise, the fuse seat will be locked when released.



6. **Switch on the power**

   Plug the socket and switch on the power.

Replace Flashing Xenon lamp

Please contact your local VWR representative.

User replaceable accessories and spare parts

Description	Quantity	Cat. No.
CELL HOLDER, 4-CELL, 10MM	1PC	634-6003
CELL HOLDER, 4-CELL, 10 TO 50MM	1PC	634-6004
CELL HOLDER, 4-CELL, 10 TO 100MM	1PC	634-6005
CELL HOLDER, FOR CYLINDRICAL CELL	1PC	634-6006
CELL HOLDER FOR TEST TUBES	1PC	634-6009
CELL HOLDER, WATER-JACKETED, 1 CELL, 10MM	1PC	634-1135
CELL HOLDER FOR MICRO CELLS, BEAM HEIGHT: 15MM	1PC	634-0687
CELL HOLDER FOR TEST TUBES, D=16mm	1PC	634-1133
CELL HOLDER, 8-POSITION AUTO CELL CHANGER, 10MM	1PC	634-1232
CELL HOLDER, 5-POSITION AUTO CELL CHANGER, 10 TO 100MM	1PC	634-1233
CELL HOLDER, SOLID SAMPLE	1PC	634-6011
CELL HOLDER, WATER-JACKED, 4 CELL, 10MM	1PC	634-1134
CUVETTE, SQUARE. GLASS, 10MM	4PCS	634-6013
CUVETTE, SQUARE. GLASS, 20MM	2PCS	634-6014
CUVETTE, SQUARE. GLASS, 30MM	2PCS	634-6015
CUVETTE, SQUARE. GLASS, 50MM	2PCS	634-6016
CUVETTE, SQUARE. GLASS, 100MM	1PC	634-6017
CUVETTE, SQUARE. QUARTZ, 10MM	2PCS	634-6018
CUVETTE, SQUARE. QUARTZ, 20MM	2PCS	634-6019
CUVETTE, SQUARE. QUARTZ, 30MM	2PCS	634-6020

CUVETTE, SQUARE. QUARTZ, 50MM	2PCS	634-6021
CUVETTE, SQUARE. QUARTZ, 100MM	1PC	634-6022
CELL, QUARTZ, 100UL, 10MM, BEAM HEIGHT: 15MM	1PC	634-0688
CELL, QUARTZ, 200UL, 10MM, BEAM HEIGHT: 15MM	1PC	634-0689
CELL, QUARTZ, 500UL, 10MM	1PC	634-6025
FLOW CELL, 5 MM, GLASS, BEAM HEIGHT: 15MM	1PC	634-0690
FLOW CELL, 10 MM, GLASS, BEAM HEIGHT: 15MM	1PC	634-0691
FLOW CELL, 20 MM, GLASS, BEAM HEIGHT: 15MM	1PC	634-0692
FLOW CELL, 30 MM, GLASS, BEAM HEIGHT: 15MM	1PC	634-0693
FLOW CELL, 5 MM, QUARTZ, BEAM HEIGHT: 15MM	1PC	634-0694
FLOW CELL, 10 MM, QUARTZ, BEAM HEIGHT: 15MM	1PC	634-0695
FLOW CELL, 20 MM, QUARTZ, BEAM HEIGHT: 15MM	1PC	634-0696
FLOW CELL, 30 MM, QUARTZ, BEAM HEIGHT: 15MM	1PC	634-0697
SIPPER UNIT WITHOUT PELTIER TEMP. CONTROL, A-1101	1PC	634-1138
SIPPER UNIT WITH TEMP. CONTROL, A-1001	1PC	634-1139
PELTIER UNIT, A-1201	1PC	634-1140
PRINTER, THERMAL PRINTER, RD-TH32-SC	1PC	634-1137
THERMAL PAPER	1PC	634-6043
SAMPLE ROOM PANEL WITH PORT	1PC	634-1143
FUSE, 3.15A/250V	1PC	634-0651
VWR SOFTWARE MULTI WAVE PRO	1PC	634-1141

Technical service

Web Resources

Visit the VWR website at **www.vwr.com** for:

- Complete technical service contact information
- Access to the VWR Online Catalogue, and information about accessories and related products
- Additional product information and special offers

Contact us For information or technical assistance, contact your local VWR representative or visit www.vwr.com.

Warranty

VWR warrants that this product will be free from defects in material and workmanship for a period of two (2) years from date of delivery. Flashing Xenon Lamp have a warranty of five (5) years. If a defect is present, VWR will, at its option and cost, repair, replace, or refund the purchase price of this product to the customer, provided it is returned during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication, or from ordinary wear and tear. If the required maintenance and inspection services are not performed according to the manuals and any local regulations, such warranty turns invalid, except to the extent, the defect of the product is not due to such non-performance.

Items being returned must be insured by the customer against possible damage or loss. This warranty shall be limited to the aforementioned remedies. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

Compliance with local laws and regulations

The customer is responsible for applying for and obtaining the necessary regulatory approvals or other authorisations necessary to run or use the Product in its local environment. VWR will not be held liable for any related omission or for not obtaining the required approval or authorisation, unless any refusal is due to a defect of the product.

Equipment disposal



This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste.

Instead, it's your responsibility to correctly dispose of your equipment at lifecycle -end by handing it over to an authorized facility for separate collection and recycling. It's also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect from health hazards the persons involved in the disposal and recycling of the equipment.

For more information about where you can drop off your waste equipment, please contact your local dealer from whom you originally purchased this equipment.

By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Thank you!

Software

Functions

We'll introduce the main functions of **VWR Software Multi Wave Pro** in this chapter.

Quantitative Analysis

- Provide 2 methods to establish a Standard Curve.
- Up to 20 standard samples to establish a new curve or input the coefficients to make a standard curve.
- There are three methods, which are Linear zero, Linear and Square to fit the standard curve.

Kinetics Analysis

- We can choose the Time Intervals (0.5, 1.0, 2.0, 5.0, 10.0, 30.0 and 60.0 Seconds).
- You can choose a different Photometric Mode to display the curve (Transmittance-Time, Absorbance-Time).
- Reaction rate calculation.

Spectrum Scanning

- You can choose the Scan Intervals (0.1, 0.2, 0.5, 1.0, 2.0, 5.0 and 10.0 nm).
- You can choose the Photometric Mode to display the spectrum (Wavelength-Transmittance, Wavelength-Absorbance).
- Automatically list spectrum peaks.
- Mathematics and smooth.

Multi-wavelength Analysis

- Up to 20 wavelengths to measure a sample.

DNA/Protein Analysis

- We provide 2 methods.
- You can input the coefficients by yourself.

Energy Scan

- You can switch the light source point (Tungsten lamp, Deuterium Lamp or automatically switch).
- You can choose the scanning intervals (0.1, 0.2, 0.5, 1.0, 2.0, 5.0 and 10.0 nm).
- You can set the gain (1 to 8 times).
- Automatically list spectrum peaks.

Installation

We will show you how to install VWR Software Multi Wave Pro on your PC in this chapter.

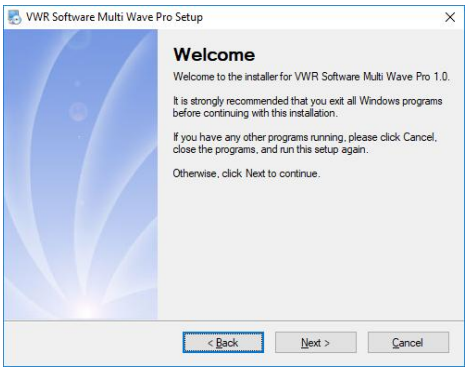
Install and Uninstall VWR Software Multi Wave Pro

PC System Requirements

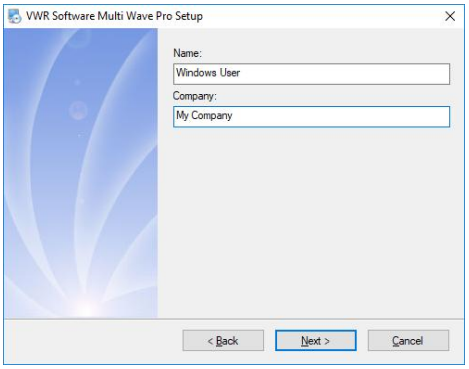
- Pentium or above PC.
- USB Ports.
- 512MB Memory (1GB or Above is strongly recommended).
- 50MB or above hard disc Space.
- Microsoft Windows XP/Vista/7/8/10/11.

Install VWR Software Multi Wave Pro

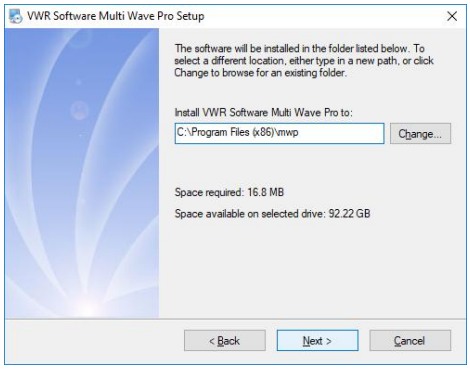
1. Insert VWR Software Multi Wave Pro USB flash drive to the USB port of the PC.
2. Open the USB flash drive, and double click the **Setup.exe** icon to start the installation. The "Welcome" form will appear. Click the **Next** button.

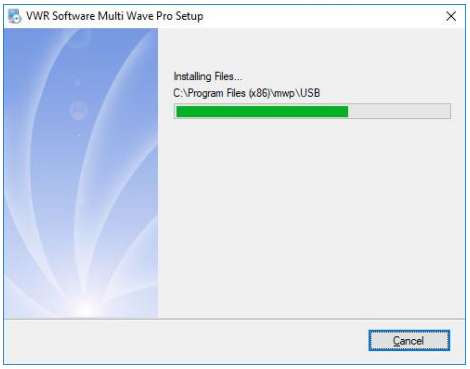


3. Input user's information, click the **Next** button.

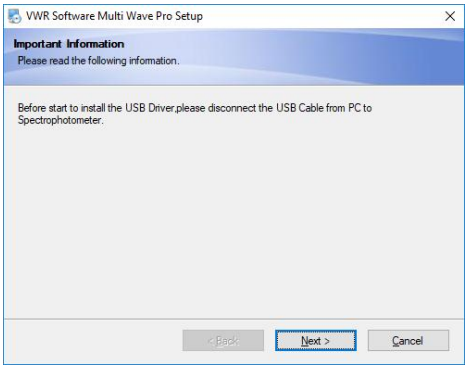


4. Choose install path, then click the **Next** button to copy files to hard disc.

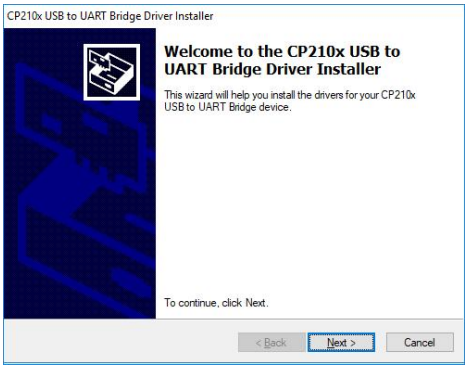




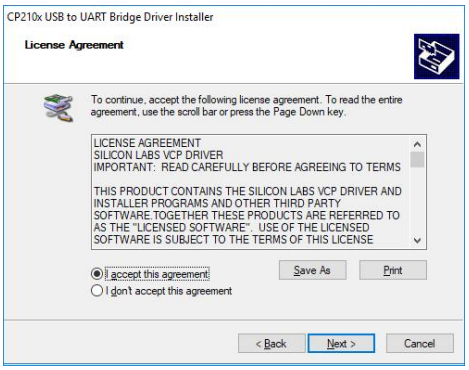
5. Unplug the USB cable if connected before, click the **Next** button.



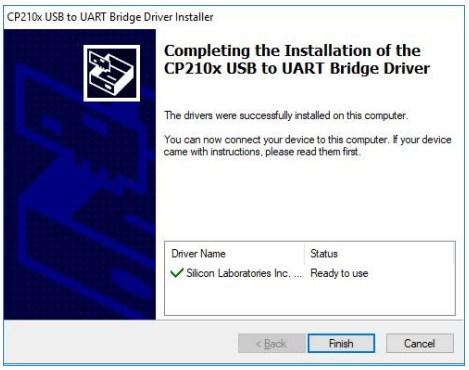
6. After you have copied all the files of VWR Software Multi Wave Pro, it will start installing the UART Bridge driver. Click the **Next** button.



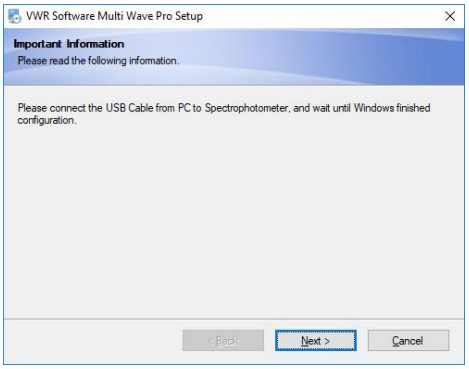
7. Select "I accept this agreement". Click the **Next** button to copy files to PC.



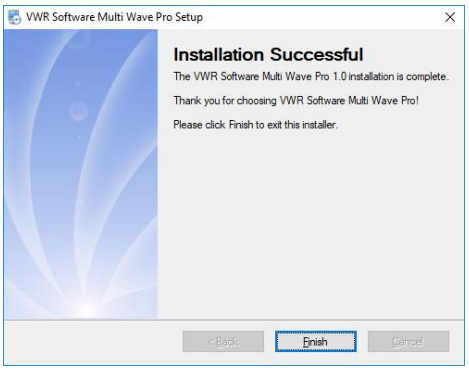
8. Click the **Finish** button to finish installing USB to UART Bridge Driver.



9. Plug in the USB cable, click the **Next** button.

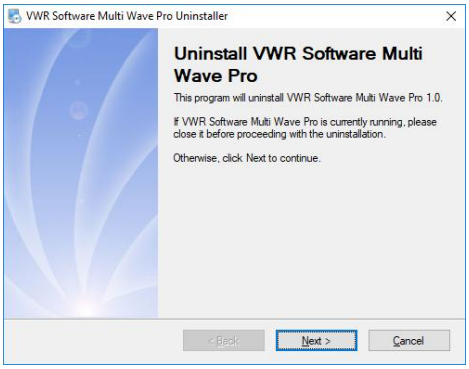


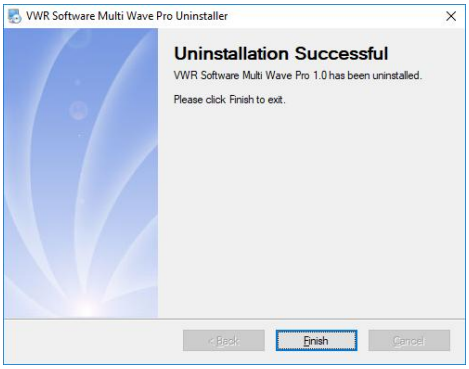
10. Click the **Finish** button to finish all the setup.



Uninstall VWR Software Multi Wave Pro

1. Start → All Files → VWR Software → Uninstall VWR Software Multi Wave Pro 1.0, click the **Next** button to uninstall.
2. After all the files were removed, click the **Finish** button to complete uninstallation.



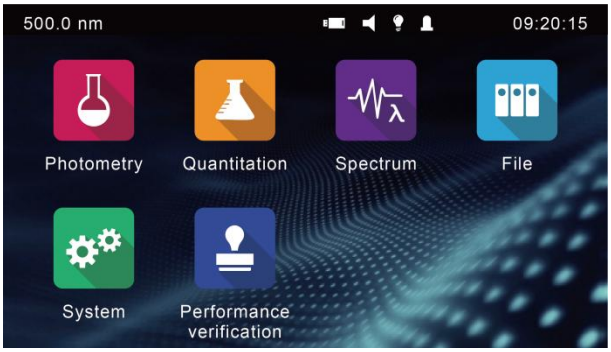


Run VWR Software Multi Wave Pro

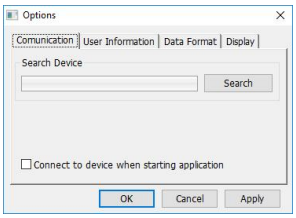
- Double click the MWP icon on desktop.
- Start → All Files → VWR Software → VWR Software Multi Wave Pro 1.0.

Set up Communication Port

> ***Important information***
> *Be sure that the USB cable which is connecting the PC with the instrument is working and the spectrophotometer is on the Home screen.*

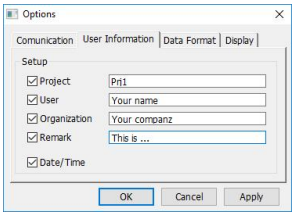


Run the VWR Software Multi Wave Pro application, then click **View → Options** in the main menu, a dialog box of **Options** will display on the screen. Click the **Search** button to automatically search for the instrument's communication port. After you get the communication port, click the **OK** button to save the setting. If you choose the option of Connect to Spectrophotometer When Start, the instrument will connect to the PC automatically when you run VWR Software Multi Wave Pro next time.



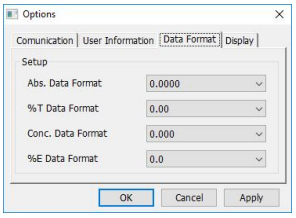
Set User's Information

Click **View → Options** in the main menu, pop-up **Options** window, click **User's Information** tag, choose it and input relative user information, click the **OK** button to save settings, all this information will appear in your testing report.



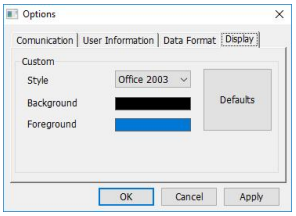
Set Data Format

Click **View → Options** in the main menu, a dialog box of **Options** will display on the screen. Click the Data **Format** tag, choose the displaying format, and click the **OK** button to save settings.



Set Interface Style

Click **View → Options** in the main menu, a dialog box of **Options** will display on the screen, and click **Interface** tag. You can customize the style and color schemes of the interface as you like. Click **OK** to save settings.



Connect to PC

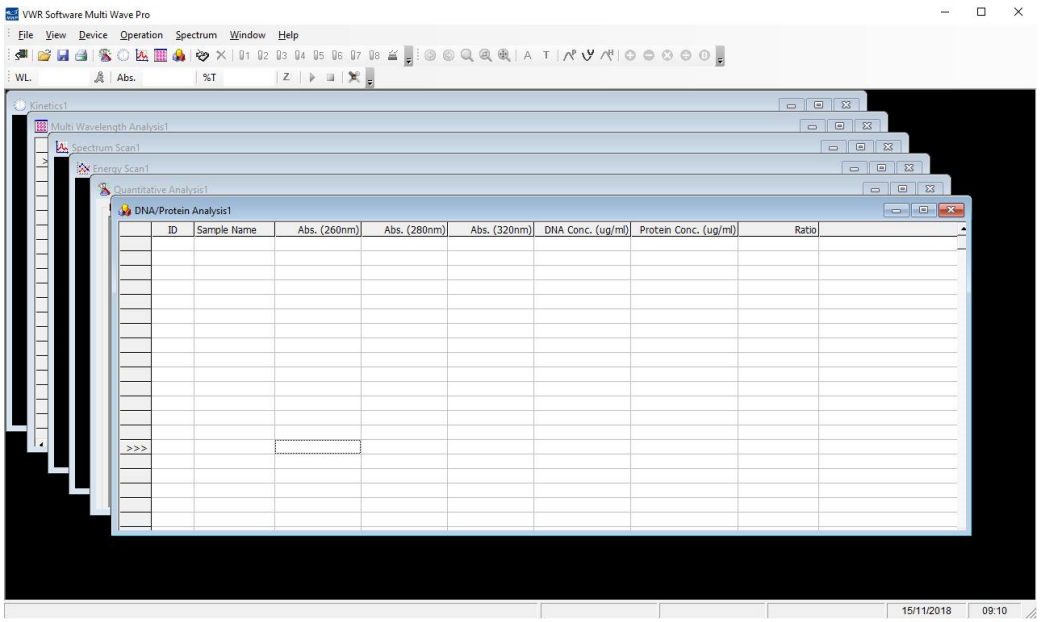
After entering the Main Interface, click the  icon on the Tool Bar to connect with PC. After connection, the icon is on the pitched on state, you can release PC if you click the icon again.

Introduction

We will introduce the VWR Software Multi Wave Pro in this chapter.

Main Interface

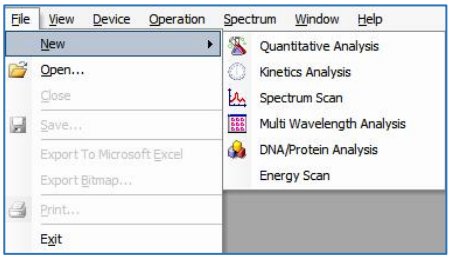
This is the main interface after start.

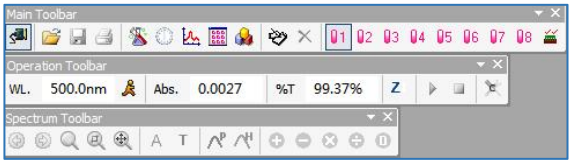


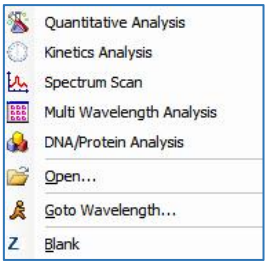
Menus Bar and Tools Bar

Menus Bar and Tools Bar provide three different ways to operate this software.

- You can finish all the operation through Keyboard or Mouse.
- Most of the functions can be finished through the Shortcut Bar.
- Most functions can be accessed through the context menu that appears when you right-click with the mouse.



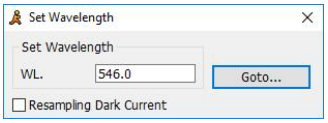




General Operating Instructions

Set Wavelength

Click the  icon on the Tools Bar to set wavelength. Input the value and click the **Goto** button to confirm. Then the instrument will move the wavelength to the point you want, then it blanks automatically.



Blank

Put reference into the measurement channel, click the  icon in the Tool Bar.

New a Measurement

In the main menu, click **File → New**, Select a measurement and click to enter.

Shortcut	Measurement Type
	Quantity Analysis File
	Kinetics Analysis File
	Spectrum Scanning File
	Multi-wavelength File
	DNA/Protein Analysis File
	Energy Scanning File

Measure a sample

Put sample into the measurement channel, click the  icon in the Tool Bar.

Set measurement parameters

Click the  icon to set the parameters.

Modify a Sample

1. Choose the data frame you want to modify or set the curve as current curve.
2. Put the sample in the measurement channel.
3. Click the  icon in the Tools Bar to re-measure it, and save the current result to substitute the original one.

Delete a Result

1. Choose the data frame you want to modify or set the curve as current curve.
2. Click the  icon in the Tools Bar to delete the data.

Name a Sample

1. Select the sample you want to rename.
2. Double-click **Sample Name** cell, input the sample's name, and press **Enter** on the keyboard to confirm.

Save a Test File

Click the  icon in the Tools Bar, pop up the **Save** dialog box. Type in the file name and click the **Save** button to save the test file.

Open a Test File

Click the  icon in the Tools Bar, pop up the **Open** dialog box. Choose the file name and click the **Open** button to open the selected file.

Print Test Report

Click the  icon in the Tools Bar, pop up the **Print** dialog box. Click the **Print** button to print the

test report.

Export Data to Excel (Microsoft Excel should be installed)

In the main menu, click **File → Export to Microsoft Excel.** Excel will be started up, and data will be stored in it.

Export Curve as bmp Picture

In the main menu, click **File → Export Bitmap**, pop up the **Save** dialog box. Input the file name and click the **Save** button to save the exported file.

Switch Display Mode

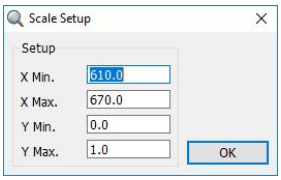
Click the  or  icon in the Tools Bar to switch the display mode (Abs. or %T).

Zoom Selected Area

Click the  icon in the Tools Bar, choose the area you want to magnify, then you'll see the magnified one, the Mouse's cursor turns into the form of "+". Click the  icon again to cancel the current status.

Modify Scale

Click the  icon in the Tools Bar to display coordinates as you like.



Auto Fitting

Click the  icon in the Tools Bar to change the scale to the appropriate value.

Select as Current Curve

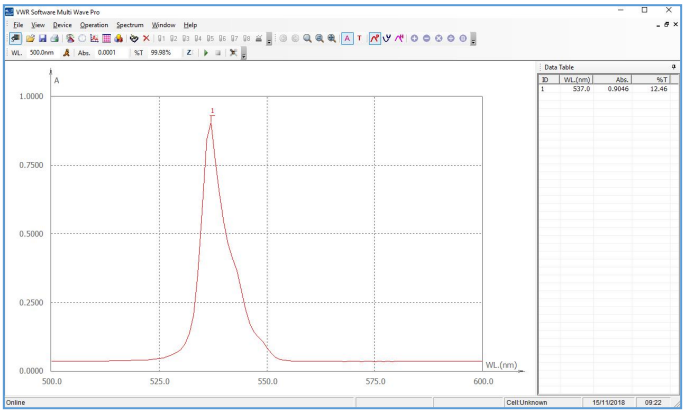
In the main menu, click **Curve Operate** → Choose the curve as you like.

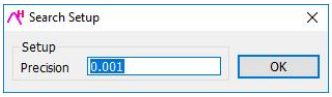
Change the Color of Current Spectrum

In the main menu, click **Curve Operate** → Choose the color as you like.

Search Peaks

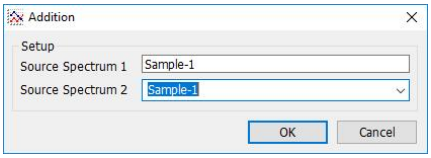
Click the  icon in the Tools Bar to search for the peaks, they are labeled automatically on the curve, and the peaks will be listed in the Right Frame. You can set the peak height by clicking the  icon.

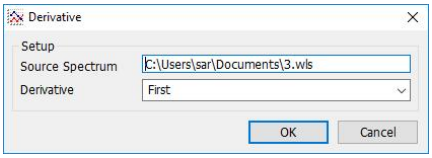


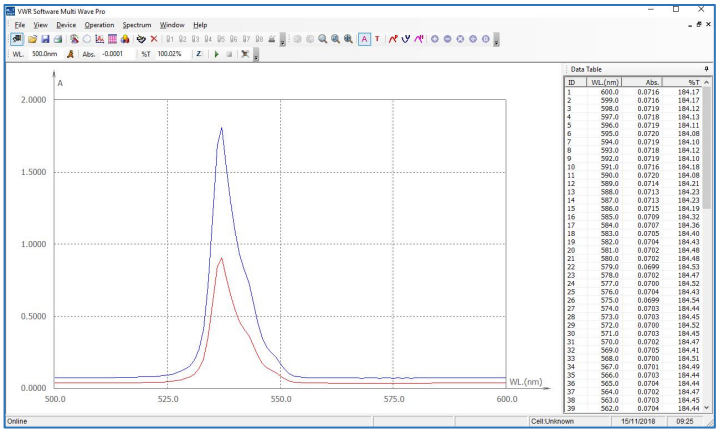


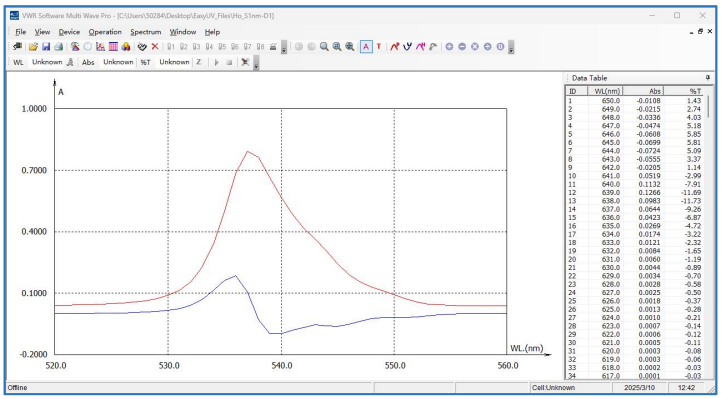
Mathematics Function

Click the  icons in the Tools Bar, a new dialog box will display on the screen respectively. You can add, subtract, multiply or divide two spectra.









Spectrum Smooth

We use this function to wipe off the interferer of noise during the course of scan, so as to make the spectrum look much smoother. In the main menu, click **Spectrum → Spectrum Smooth**.

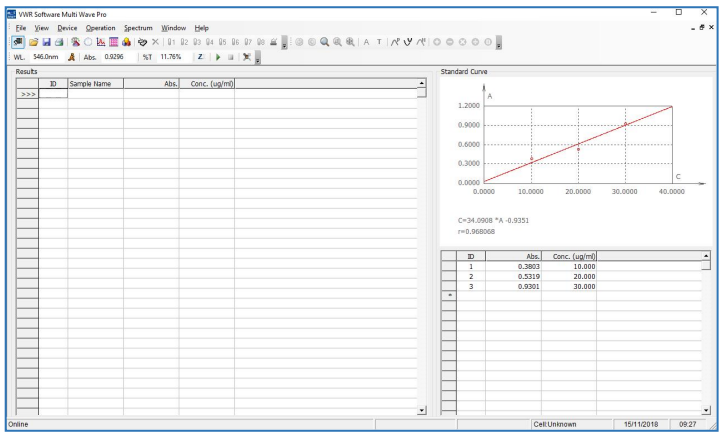
Operation

This chapter introduces how to use Software VWR Software Multi Wave Pro to measure samples.

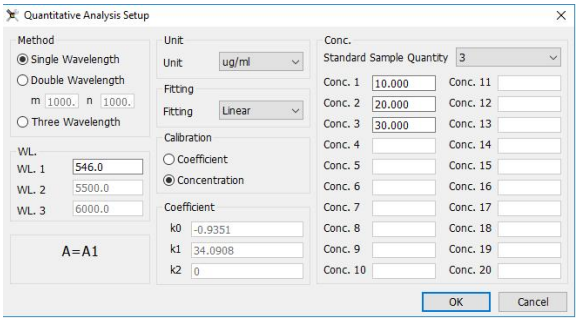
Quantitative Analysis

This section introduces how to establish a standard curve and how to measure the concentration of samples using the standard curve.

1. Click the  icon in the Tools Bar shortcut to create a new Quantitative Analysis.



2. Click the  icon in the Tools Bar Shortcut to set the parameters of Quantitative Analysis.



- Choose test method.
- Input test wavelength.
- Choose the Concentration Unit.
- Choose curve fitting method.

Create Standard Curve

Two methods are available to create a new curve.

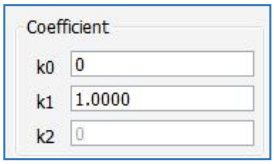
Method 1: Coefficient

(1) Click Coefficient option.

(2) Click Fit Method to choose Fit Curve method.

(3) Input the curve equation's coefficients in corresponding frames.

*(4) Click the **OK** button to finish setting.*

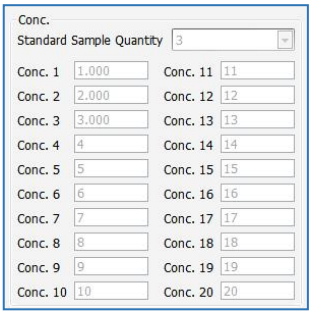


Method 2: Use Standard Samples to create a new curve

*(1) Click **Standard Sampling** option.*

*(2) Click **Standard Sample Quantity** to choose the quantity (≤20).*

(3) Input the sample concentration in corresponding Frame.

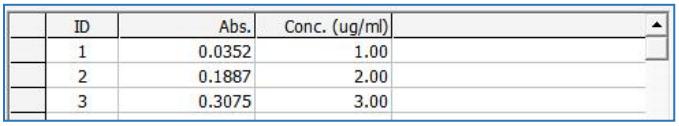


*(4) Click the **OK** button to finish setting.*

*(5) Pull the **Reference** into the measurement channel and click the*  *icon, then the system will move the wavelength to the one you just set, it blanks then.*

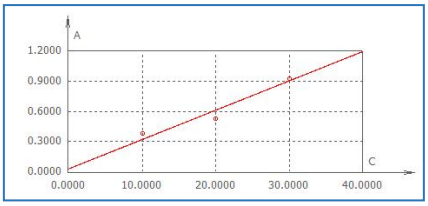
*(6) Put **1# Standard sample** into the measurement channel and move the cursor to the first frame of Abs. The sample Absorbance value will appear in this frame after clicking the*  *icon in the shortcut toolbar.*

(7) Measure other standard samples in the same way as step (6) shows. The curve displays automatically when finished.

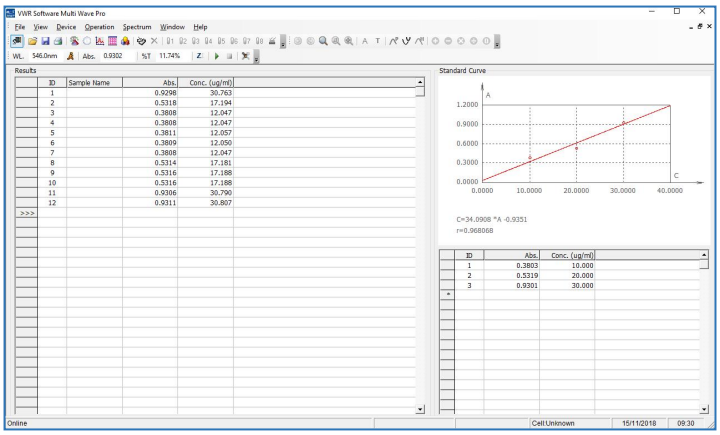


	ID	Abs.	Conc. (ug/ml)
	1	0.0352	1.00
	2	0.1887	2.00
	3	0.3075	3.00

You can modify the curve's coordinates by clicking the  **icon. You can also save the curve by clicking the**  **icon.**



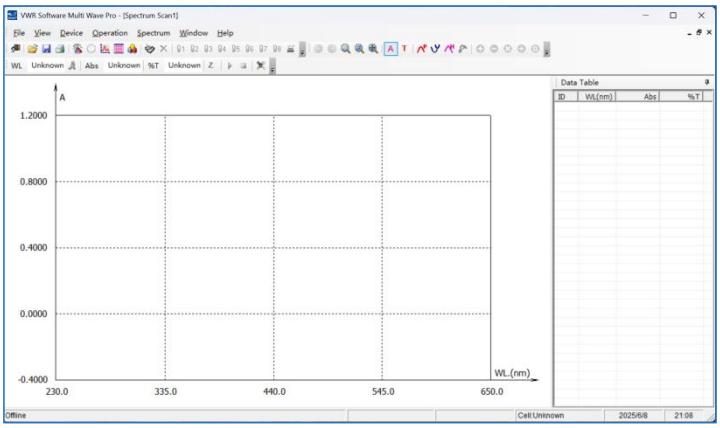
3. Pull the sample into the measurement channel (if it is an Automatic 8-cell Holder in the instrument, click the  icon to set the location of the relative cell first), then click the icon, click the  icon in the shortcut toolbar to test, the test result will display in the data sheet.



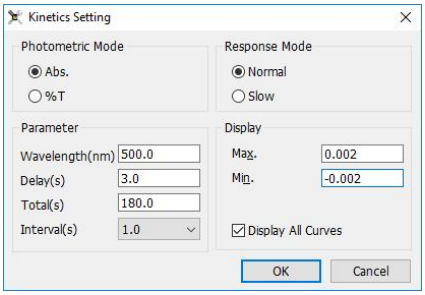
Kinetics Analysis

This section introduces how to measure changes in a sample over time. Primarily used for observing the reaction process of samples.

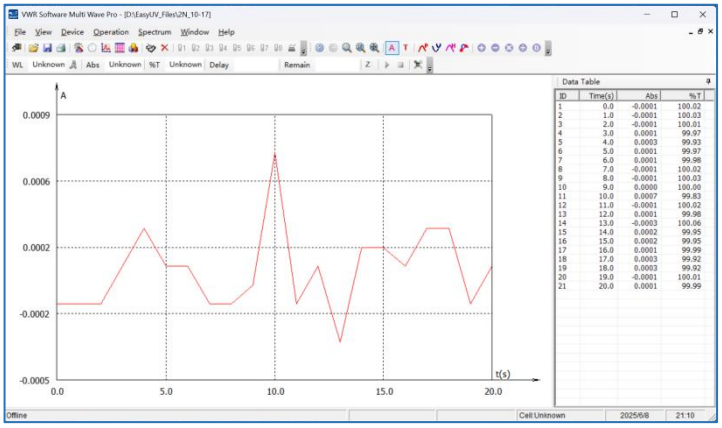
1. Click the  icon to begin a new test of Kinetics.



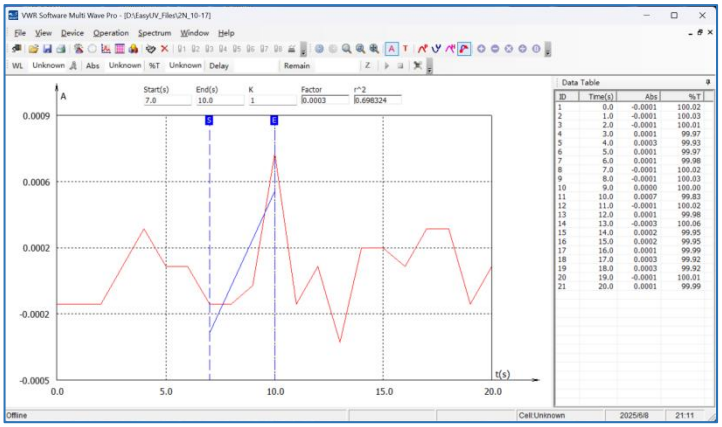
2. Click the  icon to set the parameters.

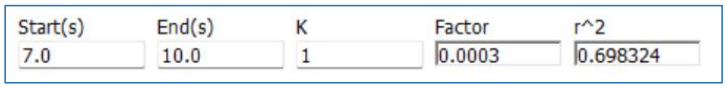


3. Choose Photometric Display Mode, input the Wavelength, Display Time, Total Time, Intervals, Responsible Mode and Coordinates Values.
4. Click OK to finish and exit settings.
5. Pull the reference into the measurement channel and click the icon in the Tool Bar to do zero.
6. Pull the sample into the measurement channel and click the button to begin the test. You can click the icon in the Tools Bar to cancel at any time.



7. Click the icon on the Tools Bar to calculate the reaction rate. Enter the Start and End values (or click the left mouse button to pull the "S" and "E" cursors) and the coefficient K. The software will automatically calculate the slope and correlation coefficient.



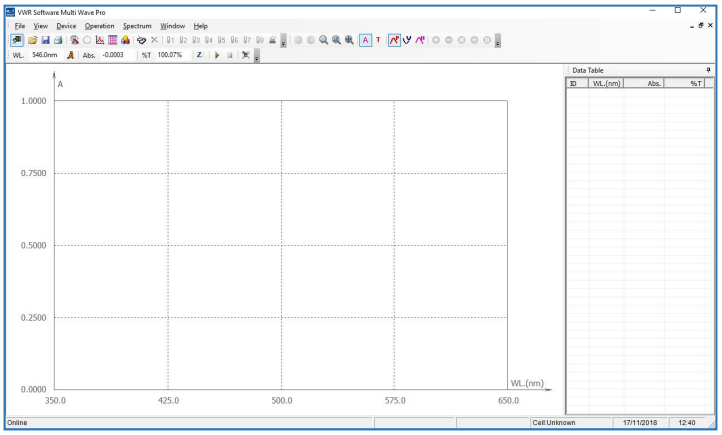


Spectrum Scanning

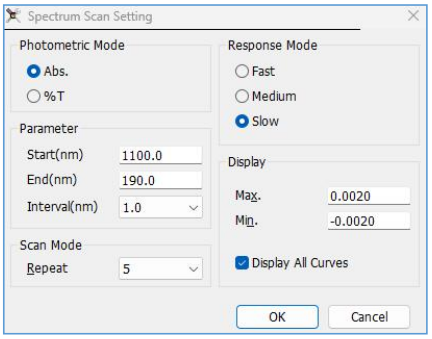
This section introduces how to scan the spectrum of a sample. It is primarily used for identifying

samples with unknown characteristics.

1. Click the  icon on the Tools Bar to start a new Spectrum scanning.



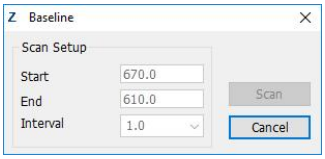
2. Click the  icon in the Tool Bar to set the parameters of Spectrum scanning.



3. Choose the Photometric Mode, Wavelength Range for Scanning, Intervals, Repeat Times, Response Mode, and Coordinate Range.

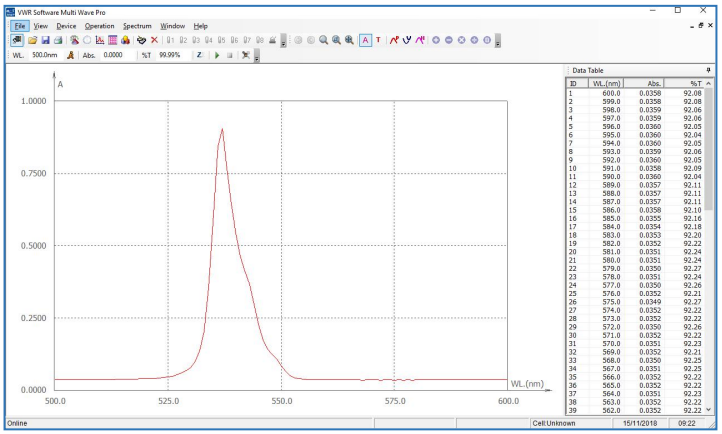
4. Click the **OK** button to finish and exit settings.

5. Put reference into the measurement channel, click the  icon in the Tool Bar, then the dialog box of **Baseline** displays on the screen, click **Scan** to scan baseline, click the **Cancel** button to interrupt scanning and exit the course.



6. Put the sample in the measurement channel, click the  icon in the Tools Bar to start

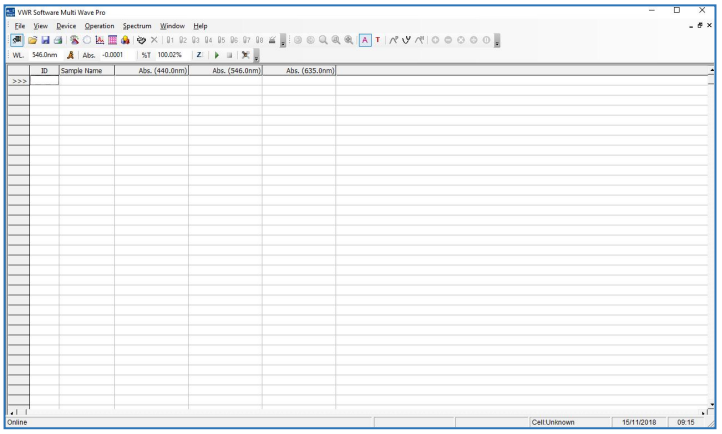
scanning, click the  icon to interrupt and cancel scanning.



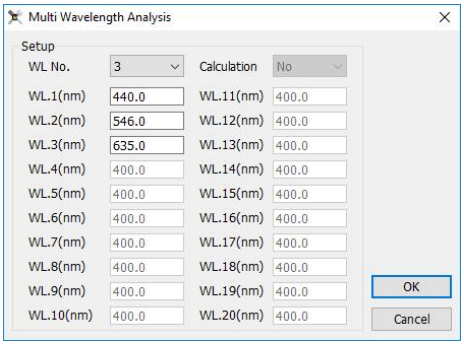
Multi-wavelength Analysis

This section describes how to quickly test the absorbance or transmittance of a sample at one or more wavelengths (up to 20).

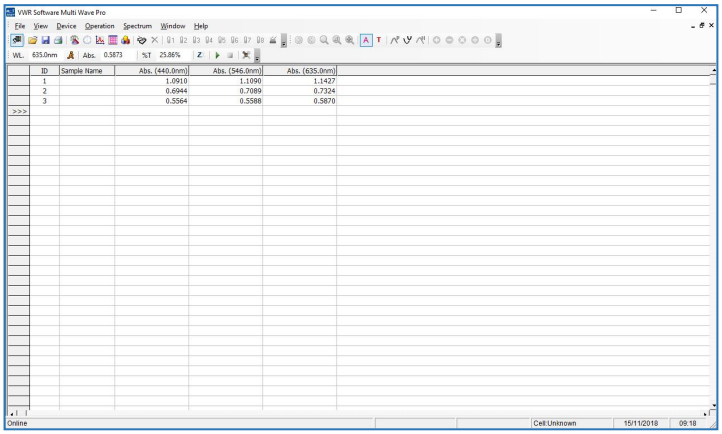
1. Click the  icon on the Tools Bar, a new form appears on the screen.



2. Click the  icon on the Tools Bar to set the parameters.



3. Choose the quantity of the wavelength, you need to input the value of each wavelength.
4. Click the **OK** button to finish and exit settings.
5. Pull the reference into the measurement channel, click the icon in the Tools Bar to do zero.
6. Pull the sample into the measurement channel, click the icon to start test. And the test result will be listed in the data sheet.



DNA/Protein Analysis

This section introduces the measurement of nucleic acid and protein purity and concentration using the UV-Vis method.

UV-Vis is the mainstream laboratory method for measuring DNA concentration and purity. It relies on the absorbance (A value) of nucleic acids at 260 nm (characteristic absorption peak of nucleic acids), 280 nm (absorption peak of proteins), and 230 nm (absorption peak of salts/organic substances) for calculations.

Important information

Method 1 (Protein Contamination Correction)

Method 1 focuses on correcting protein contamination (the most common impurity in DNA samples) by using A_{280} (protein's characteristic absorption peak) as A_2.

1. *Formula 1: DNA Concentration ($C_{(}DNA_{)}$)*

   $C_{(}DNA_{)} = (A_1 - A_{(}ref_{)})\times f_1 - (A_2 - A_{(}ref_{)})\times f_2$

   ***$(A_1 - A_{(}ref_{)})$:** Corrected DNA signal — Subtracts background (A_{320}) from the raw DNA absorbance (A_{260}) to get the "true" signal of DNA.*

   ***$(A_2 - A_{(}ref_{)})$:** Corrected protein interference — Subtracts background from raw protein absorbance (A_{280}) to quantify protein contamination.*

   Coefficient meanings:

   ***$f_1 = 62.9$:** DNA signal-to-concentration conversion coefficient. It converts the corrected A_{260} signal into actual DNA concentration (unit inferred as ng/µL, the standard unit for DNA quantification). The value (62.9) is slightly higher than the standard dsDNA absorptivity (50 ng/(µL·A_{260})) because it accounts for minor cross-absorption of other impurities at 260 nm.*

   ***$f_2 = 36.0$:** Protein interference correction coefficient. It quantifies how much the corrected A_{280} signal (protein) overlaps with and distorts the A_{260} signal (DNA). This term subtracts the "false DNA signal" caused by protein contamination, ensuring $C_{(}DNA_{)}$ reflects only pure DNA.*

2. *Formula 2: Protein Concentration ($C_{(}Protein_{)}$)*

   $C_{(}Protein_{)} = (A_2 - A_{(}ref_{)})\times f_3 - (A_1 - A_{(}ref_{)})\times f_4$

   ***$(A_2 - A_{(}ref_{)})\times f_3$:** Primary protein concentration calculation — Converts the corrected A_{280} signal into protein concentration (unit also inferred as ng/µL).*

   ***$(A_1 - A_{(}ref_{)})\times f_4$:** DNA cross-interference correction — DNA also absorbs weakly at 260 nm (its main peak) and slightly at 280 nm. This term subtracts the "false protein signal" caused by DNA's cross-absorption at 280 nm.*

   Coefficient meanings:

   ***$f_3 = 1552$:** Protein signal-to-concentration conversion coefficient. Proteins (e.g., BSA) have a lower molar absorptivity at 280 nm than DNA at 260 nm, so a larger coefficient (1552) is needed to convert the weak A_{280} signal into measurable protein concentration.*

   ***$f_4 = 757.3$:** DNA cross-interference correction coefficient. It quantifies DNA's minor absorption at 280 nm and removes this interference from the protein signal.*

3. *Formula 3: Purity Ratio (DNA vs. Protein)*

Ratio = $(A_1 - A_{(ref)})/(A_2 - A_{(ref)}) = (A_{260} - A_{320})/(A_{280} - A_{320})$

This is the classic DNA purity index for evaluating protein contamination.

Interpretation:

A ratio of 1.8–2.0 indicates high-purity DNA (minimal protein contamination).

A ratio < 1.8 means significant protein contamination (the A_{280} signal is too strong, diluting the ratio).

A ratio > 2.0 may indicate RNA contamination (RNA also absorbs at 260 nm) or sample degradation.

Method 2 (Small-Molecule Impurity Correction)

Method 2 focuses on correcting small-molecule impurities (e.g., salts like Tris/EDTA, phenols from DNA extraction, or carbohydrates) by using A_{230} (their characteristic absorption peak) as A_2.

1. *Formula 1: DNA Concentration ($C_{(}DNA_{)}$)*

   $C_{(}DNA_{)} = (A_1 - A_{(ref)})\times f_1 - (A_2 - A_{(ref)})\times f_2$

   ***$(A_1 - A_{(ref)})$:** Same as Method 1 — Corrected DNA signal ($A_{260} - A_{320}$).*

   ***$(A_2 - A_{(ref)})$:** Corrected small-molecule interference — Subtracts background from raw A_{230} (impurity signal) to quantify salts/phenols.*

   Coefficient meanings:

   ***$f_1 = 49.1$:** DNA signal-to-concentration conversion coefficient. Similar to Method 1 but slightly lower (closer to the standard 50 ng/(µL·A_{260})), indicating this method assumes less cross-interference from small molecules at 260 nm.*

   ***$f_2 = 3.48$:** Small-molecule interference correction coefficient. Small molecules (e.g., salts) have weaker absorption at 260 nm than proteins, so a smaller coefficient (3.48) is sufficient to subtract their "false DNA signal" from A_{260}.*

2. *Formula 2: Protein Concentration ($C_{(}Protein_{)}$)*

   $C_{(}Protein_{)} = (A_2 - A_{(ref)})\times f_3 - (A_1 - A_{(ref)})\times f_4$

   Note: A_2 here is A_{230} (not A_{280}), so this formula is not a direct protein quantification tool — it primarily accounts for how small-molecule impurities at 230 nm may indirectly interfere with protein signal estimation (e.g., phenols can quench protein fluorescence or alter A_{280} readings).

   Coefficient meanings:

   ***$f_3 = 183$:** Small-molecule interference coefficient for protein signal. It adjusts for how impurities at 230 nm distort protein concentration calculations (e.g., phenols may increase A_{280}, so this term corrects that bias).*

   ***$f_4 = 75.8$:** DNA cross-interference coefficient for small-molecule signals. It*

subtracts DNA's minor absorption at 230 nm from the impurity signal, ensuring the correction for small molecules is accurate.

3. *Formula 3: Purity Ratio (DNA vs. Small Molecules)*

   Ratio = $(A_1 - A_{(ref)})/(A_2 - A_{(ref)}) = (A_{260} - A_{320})/(A_{230} - A_{320})$

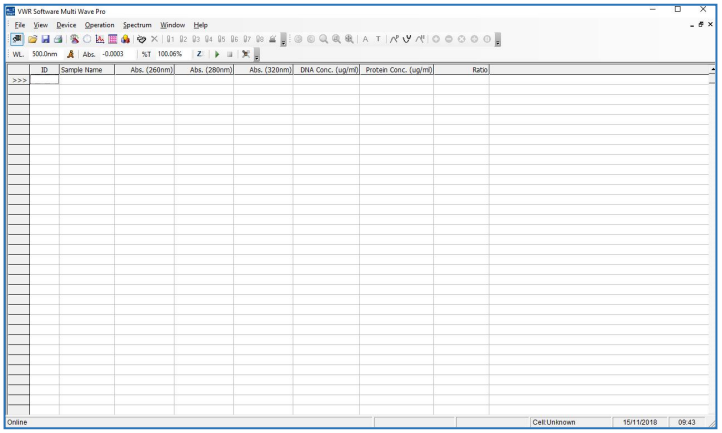
   This is the DNA purity index for small-molecule contamination.

   Interpretation:

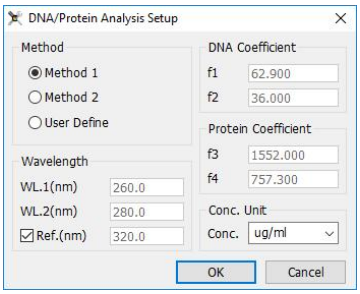
   A ratio of > 2.0 indicates high-purity DNA (minimal salt/phenol contamination).

   A ratio < 1.5 means severe small-molecule contamination (the A_{230} signal is too strong, diluting the ratio) — this can inhibit downstream experiments (e.g., PCR, sequencing).

1. Click the  icon on the Tools Bar to begin a DNA/Protein Analysis.



2. Click the  icon to set parameters.

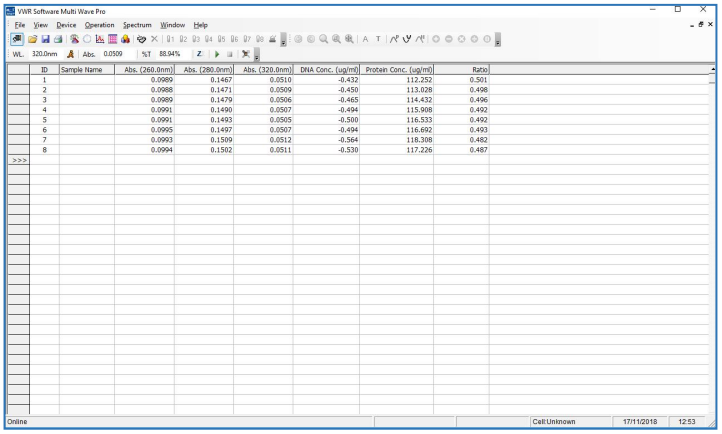


3. Choose the measuring method first. We provide you with 2 methods to measure, and you can also define the coefficients and wavelength by yourself.

4. Click the **OK** button to finish and exit the settings.

5. Pull the reference into the measurement channel, click the  icon on the Tools Bar to do zero.

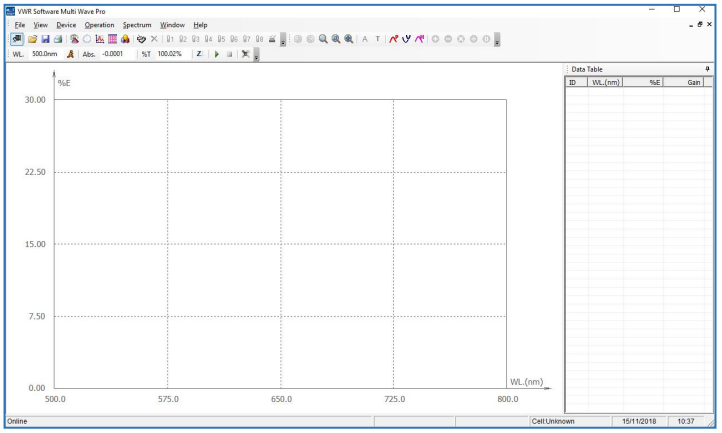
6. Pull the sample in the measurement channel, click the  icon to measure. The result will display in the data sheet.



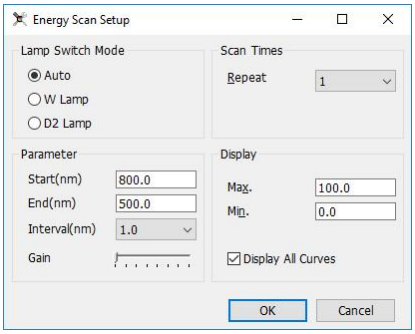
Energy Scan

This section introduces how to scan the energy distribution of a sample in the range of wavelength.

1. In the main menu, click **File → New → Energy Scan** to build Energy Scanning.

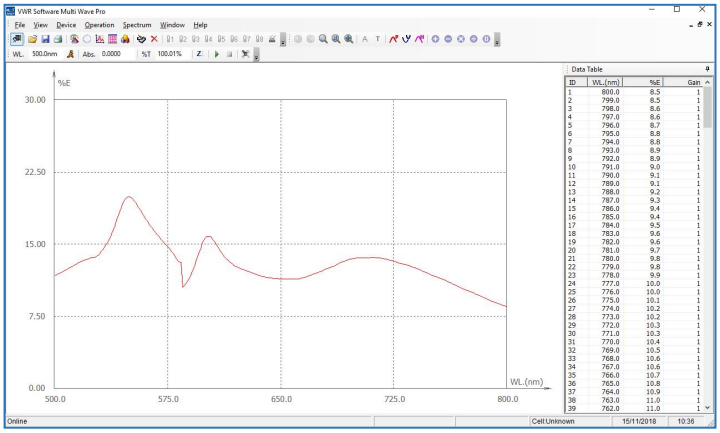


2. Click the  icon on the Tools Bar to set parameter.



3. Click the **OK** button to finish and exit settings.

4. Pull the unknown sample into the measurement channel, click the  icon in the Tools Bar to start scanning, click the  icon to interrupt scanning and exit the course.



Other Functions

We will introduce the additional function of VWR Software Multi Wave Pro in this chapter.

Get Dark Current

Click **Main Menu→Device→Get Dark Current**, the system will reacquire the dark current and the new data will replace the old one.

Automatic Multi-Position Changer (Accessories)

Click the  icons to pull the corresponding cell in the measurement channel.

Appendix

Methods of Quantitative Analysis

Single Wavelength Method:	$Abs = A_1$
Double Wavelengths Method:	$Abs = m*A_1-n*A_2$
Three Wavelengths Method:	$Abs = A_1-(WL_1-WL_2)*(A_2-A_3)/(WL_2-WL_3)-A_3$

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