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Instruction manual

VWR® M4 Spectrophotometer

NA Cat. No 76520-716

VWR®

Version 01 Issue 02/2022

Legal address of Manufacturer

United States

VWR International LLC
100 Matsonford Rd
Radnor, PA 19087
+1 800-932-5000
www.vwr.com

Country of Origin

China

Table of Contents

Spectrophotometer

Safety Information

Avoiding Electrical Shock

Please follow the guidelines below and read this manual in its entirety to ensure safe operation of the unit.

VWR recommends against the use of M4 Spectrophotometer.

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 area Danger!
- Do not use the device if it is damaged, especially if the main power cable way is in any 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 instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired.

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	4PCS
Quartz Cuvette	2PCS
Power Cord	1PC
Software USB Drive	1PC
USB Cable	1PC
Quick Manual	1PC
Dust Cover	1PC
Fuse	1PC

Unpacking

Open the package, according to carefully check the packing list for all items. If items are missing or damaged, please contact your local VWR/Avantor service provider or authorized contractual partner.

Installation

Placement

Place the instrument on a stable surface carefully.

Install printer (Optional)

Check to confirm instrument power switch is turned off before connecting the printer data cable to the Instrument's serial/USB port.

Connect the power cord

First, confirm that the instrument power switch is turned off, then plug the power cord into the power interface and the power supply socket apparatus.

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 100~240 V, 50~60 Hz
Dimension	456×360×185
Weight	10.5kg
Work Environment	15 to 35℃, 15 to 70% relative humidity
Store Environment	-10 to 50℃, 15 to 70% relative humidity

This instrument is compliant to the U.S. and Canada Directives on
UL 61010-1 Issued: 2012/05/11 Ed: 3
CSA-C22.2 No. 61010-1 Issued: 2012/05/11 Ed: 3
47CFR Part 15 (2011)
ANSI C63.4 (2009)

Overview

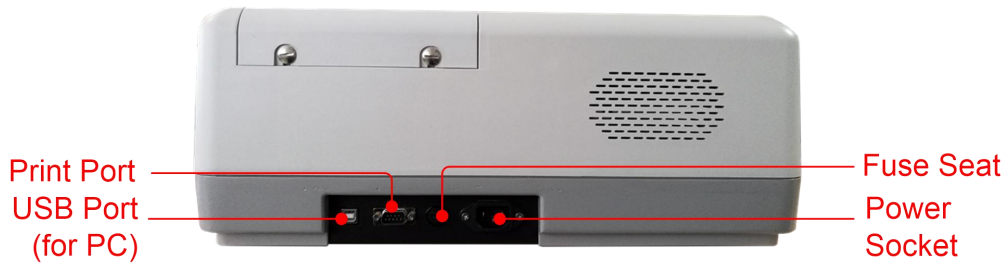
The M4 Spectrophotometer is used in Chemistry, Pharmaceuticals, Biochemical, Metallurgy, Light Industry, Textile, Material, Environments, Medical, Education and some other fields for Quality Control laboratories.

Description

Front View

Right View

Rear View



Getting Started

Turn On and Self-check

Switch on the power. Self-check includes the following steps: Turn On Lamp → Locating Filter Disc → Locating Automatic Sample Holder (If Installed) → Get Dark Current → Locating 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, 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 screen can be started with a touch. To make a selection, use your fingertips or stylus to press the screen. Do not press the screen with sharp objects (such as ball point).

Select Application

At the Main Interface, press the icon to select application.

	**Photometry** Measure the absorbance or transmittance of the sample.
	**Quantitation** Establish the standard curve and measure the concentration of the sample.
	**Spectrum** Scan the sample in a wavelength range.
	**File** Manage files stored in the instrument or USB disk.
	**System** System calibration and setup.
	**Performance verification** Verify the performance of the instrument.

Basic Operation

	**Home** Back to main interface.
	**Return** Back to the previous interface.
	**Page Up/Down** Go to previous/next page.

Measurement Results Operation

	**Open** Open result(s) from internal/USB memory.
	**Save** Save result(s) to internal/USB memory.
	**Print** Print result(s).
	**Delete** Delete selected result(s).

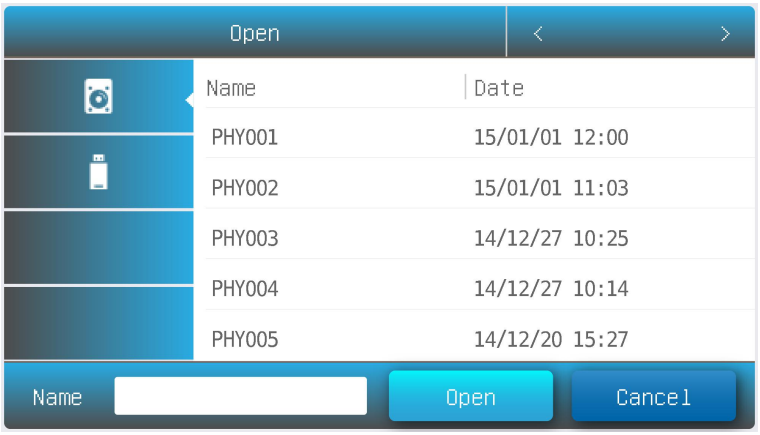
Rename, Print and Delete Results

Rename a Sample: **List** interface, press the area **Name**, key in the sample name (Up to 8 characters).

Print the Measurement Report: **List** interface, press the icon  .

Delete sample(s): **List** interface, press the **Check Box**, and press the icon  .

Open Results



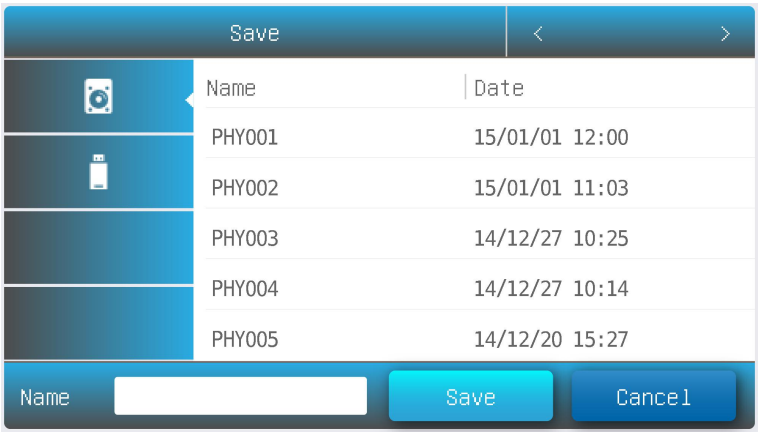
Open:

List interface, press the icon  .

Press the icon  /  to select the Internal/USB memory which the file saved.

Press file lists to select, press the button **Open**.

Save Results



Save:

List interface, press the icon  .

Press the icon  /  to select the Internal/USB memory which the file to save.

Type in the file name, press the button **Save**.

Files Operation

	**Internal Memory** Internal memory of the spectrophotometer.
	**USB Memory** USB extended mass memory.
	**Copy** Copy the selected file(s) from internal /USB memory to USB/internal memory.
	**Export csv** Export file(s) To *.csv format
	**Export txt** Export file(s) To *.txt format
	**Delete** Delete the selected file(s).

Rename, Import, Export and Delete Files

Rename a File:	**File management** interface, press the area **Name**, key in the file name (Up to 8 characters).
Copy File(s) From/To Internal Memory/USB Memory:	**File management** interface, press the **Check Box**, press the button  (Need USB disk) .
Export File(s) To *.csv Format:	**File management** interface, press the **Check Box**, press the button  (Need USB disk) .
Export File(s) To *.txt Format:	**File management** interface, press the **Check Box**, press the button  (Need USB disk) .
Delete File(s):	**File management** interface, press the **Check Box**, and press the icon  .

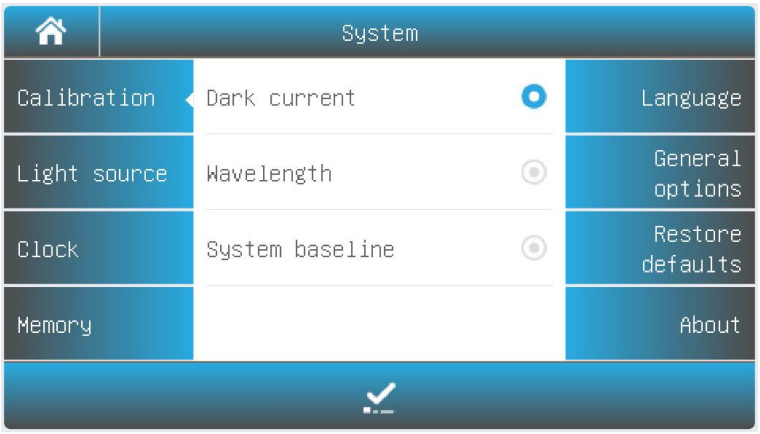
Calibration and System Settings

Select the icon  in the main interface. Display options to calibrate the system and configure the basic instrument settings.

Calibration

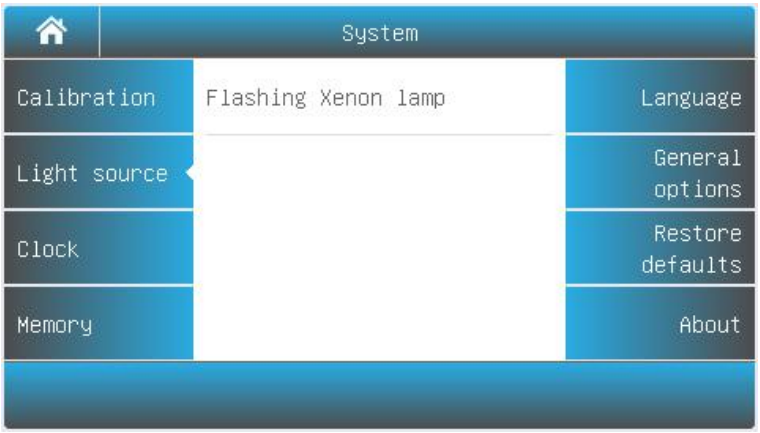
	**Calibrate** Starts the calibration process.

Select Tab **Calibration** in the **System** interface. Remove something in the measurement channel, close the sample chamber cover, select the item **Dark current**, **Wavelength** or **System baseline**, press the icon  to do calibration.



Settings of Light Source

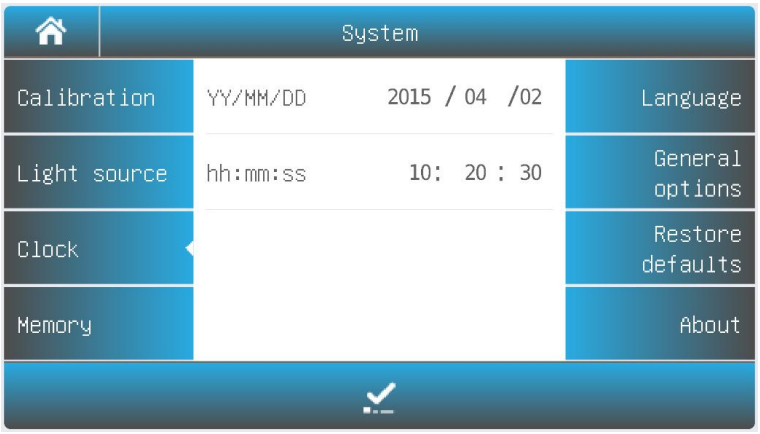
Select Tab **Light source** in the **System** interface. The light source information is displayed on the screen.



Edit Clock

	**Accept** Accepts the new value.

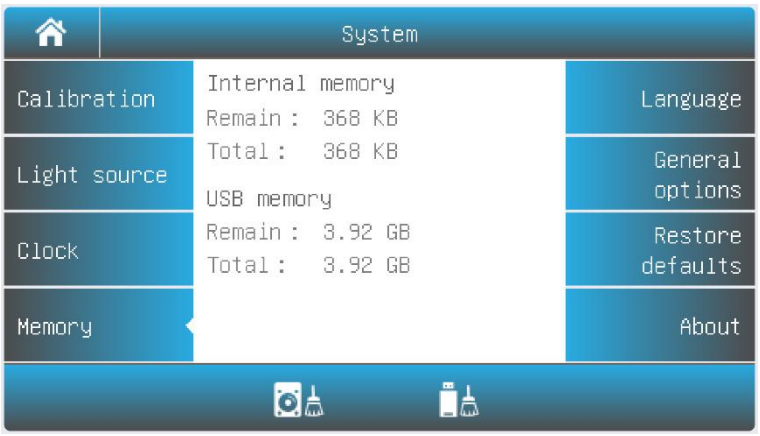
Select Tab **Clock** in the **System** interface. Press the value of year, month, date, hour, minute or second to change. Press the icon  to accept new value.



Memory Management

	Format Internal Memory Format the internal memory of the spectrophotometer.
	Format USB Memory Format the USB mass storage.

Select Tab **Memory** in the **System** interface. The use of the internal and USB memory (If inserted) are show. Press the icon / to format internal memory/USB memory.



Language Selection

	**Accept** Accept the new language.

Select Tab **Language** in the **System** interface. Select a language, press the icon  to change.

General Options

Select Tab **General Options** in the **System** interface.

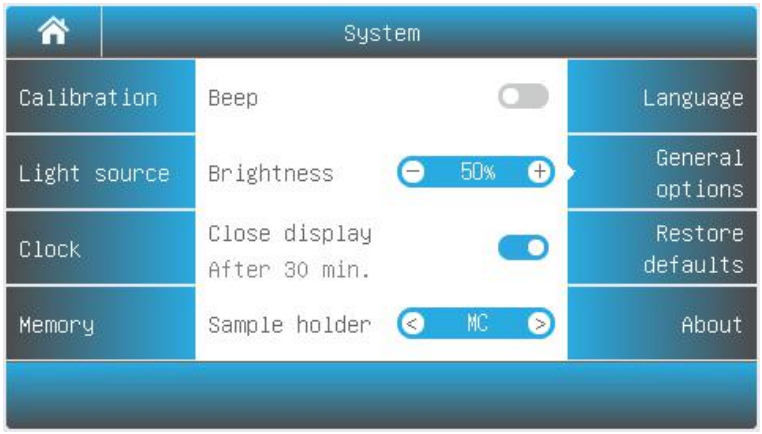
Beep: Press the icon  to turn on/off the beep.

Brightness: Press the icon  /  to decrease/increase the brightness of the LCD display.

Close display: Press the icon  to turn on/off. If turned on, the display will close automatically if no operation for 30 minutes.

Sample holder: If you have a new automatic sample holder installed, you need to set the sample holder type by pressing the icon  /  (AC-5: 5 cells automatic sample

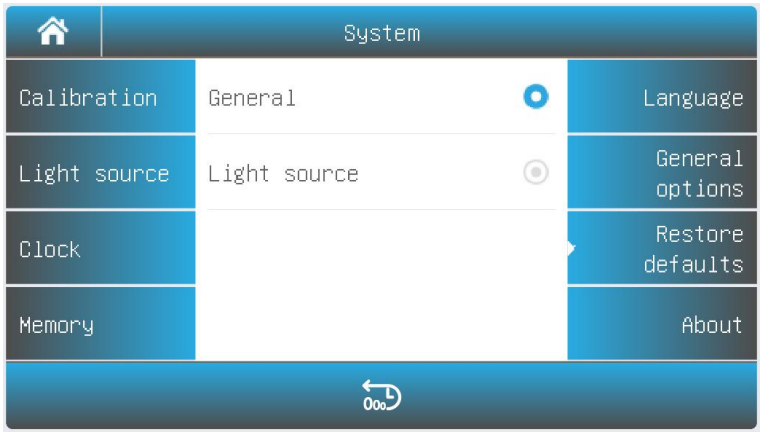
holder, AC-8：8 cells automatic sample holder).



Restore Defaults

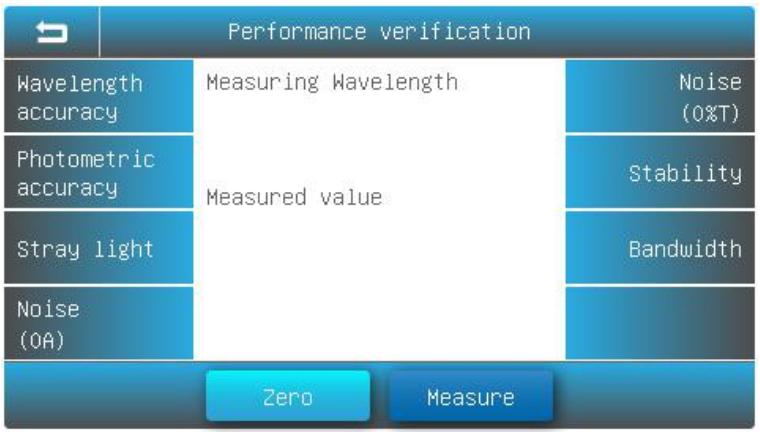
	Restore Restore the parameters to factory settings.

Select Tab **Restore defaults** in the **System** interface. Select an item, press the icon to restore.



Performance Verification

Select the icon  in the main interface. Display options to verify the performance of the instrument.



Important information ***Before verifying the performance, the instrument needs to be preheated for 30 minutes, and then re-measure dark current.***

Verifying Wavelength Accuracy and Wavelength Repeatability

Select Tab **Wavelength accuracy** in the **Performance verification** interface.

Standard Sample: Holmium oxide solution or equivalent filter

Measurement:

1. Remove anything in the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength of measurement, press the button **Zero**;
2. Put the **Standard Sample** in the measurement channel, press the button **Measure**;
3. Repeat step 2 to do measurement three times. The difference between the average of the three measurements and the standard value is the single-point wavelength tolerance. The difference between the maximum and minimum values of the three measurements is single point

wavelength repeatability;

4. Repeat step 1-3 to do measurement single-point wavelength tolerance one by one. The maximum value in the single-point wavelength tolerance is wavelength accuracy. The maximum value in the single-point wavelength reproducibility is wavelength repeatability.

Verifying Photometric Accuracy and Photometric Repeatability

Select Tab **Photometric accuracy** in the **Performance verification** interface.

Standard Sample: NIST 930D or equivalent filter

Measurement:

1. Clear the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength of measurement, press the button **Zero**;
2. Put the **Standard Sample** in the measurement channel, press the button **Measure**;
3. Repeat step 2 to do measurement three times. The difference between the average of the three measurements and the standard value is the single-point photometric tolerance. The difference between the maximum and minimum values of the three measurements is single point photometric repeatability;
4. Repeat step 1-3 to do measurement single-point photometric tolerance one by one. The maximum value in the single-point photometric tolerance is photometric accuracy. The maximum value in the single-point photometric reproducibility is photometric repeatability.

Verifying Stray Light

Select Tab **Stray light** in the **Performance verification** interface.

Standard Sample: 10g/L NaI solution or equivalent filter (220nm), 50g/L $NaNo_2$ solution or equivalent filter (340 or 360nm)

Measurement:

1. Clear the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength of measurement;
2. Put the **Reference** in the measurement channel, press the

button **Zero**;

3. Put the **Standard Sample** in the measurement channel, press the button **Measure**, the result is the stray light of this wavelength.

Verifying Noise (0A)

Select Tab **Noise (0A)** in the **Performance verification** interface.

Standard Sample: Air

Measurement:

1. Clear the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength 500, press the button **Zero**;
2. Press the button **Measure**, the result is the noise of this wavelength.

Verifying Noise (0%T)

Select Tab **Noise (0%T)** in the **Performance verification** interface.

Standard Sample: Block

Measurement:

1. Clear the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength 500, press the button **Zero**;
2. Put the **Block** in the measurement channel, press the button **Measure**, the result is the dark noise of this wavelength.

Verifying Stability

Select Tab **Stability** in the **Performance verification** interface.

Standard Sample: Air

Measurement:

1. Clear the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength 500, press the button **Zero**;
2. Press the button **Measure**, the result is the noise of 500nm.

Verifying Bandwidth

Select Tab Dark **Bandwidth in** the **Performance verification** interface.

Standard Sample: Low pressure quartz mercury lamp

Measurement:

1. Open the lamp cover, put the low pressure quartz mercury lamp into the lamp seat, and turn it on.
2. Remove something in the measurement channel, close the sample chamber cover, press the wavelength value, type in the wavelength 546.1;
3. Press the button **Measure**, the result is the bandwidth.

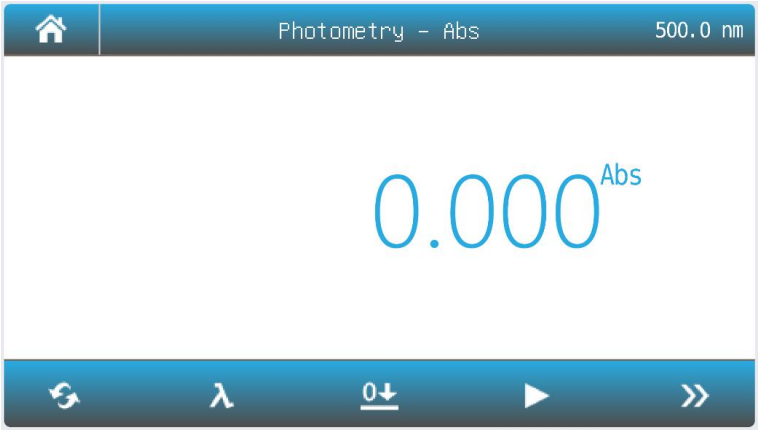
Operation

Important information *The cuvettes must be clear with no remains of the samples on the surface of it. Only Silicon (Quartz) cuvettes are permitted to be used in the range of UV area.*

Photometry

Photometry mode is used to measure the absorbance or transmissivity of the sample.

1. **Main** interface, press the icon  to start a **Photometry** application.



	**Mode** Switch measurement mode to %T, Abs or Energy.
	**Wavelength** Set measurement wavelength.
	**Zero** Do 0Abs/100%T.
	**Read** Measure sample and record the result.
	**List** View the result(s) list.
	**Increase/Decrease** Increase/Decrease the gain of signal. Only for **Energy** mode.

2. Press the icon  to switch to the measurement mode.

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. Press the icon  to set wavelength, key in the measurement wavelength.

4. Put the reference in the measurement channel, press the icon  to do zero.

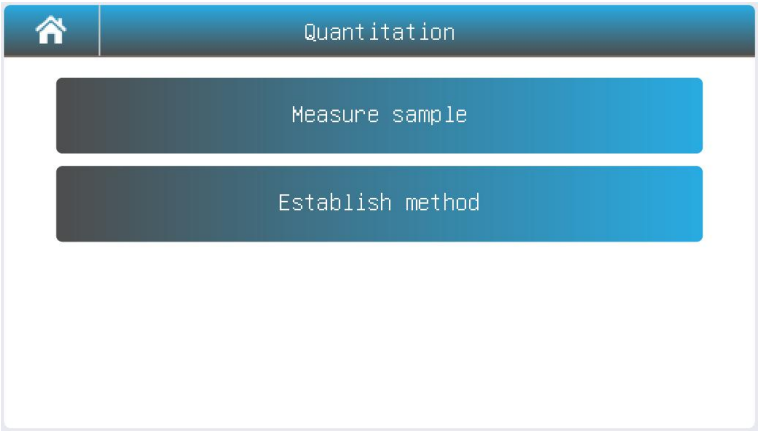
5. Put the sample in the measurement channel, press the icon  to measure a sample and record the result.

6. Press the icon  to browse the result(s).

Quantitation

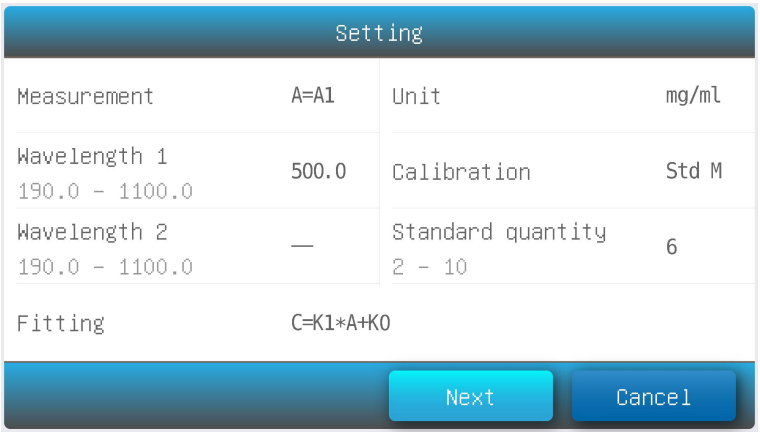
Quantitation mode is used to measure the concentration of the sample(s).

1 **Main** interface, press the icon  to start a **Quantitation** application.



2 Establish Method

2.1 **Quantitation** interface, press the button **Establish method**.



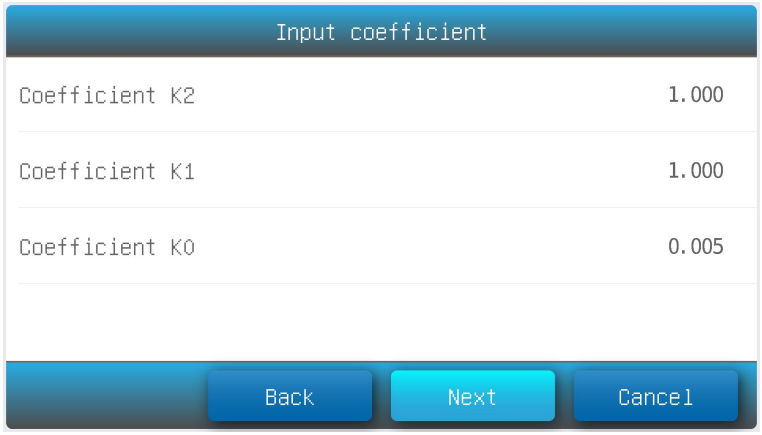
Measurement	**A=A1:** Absorbance is equal to the measured absorbance value of the measured wavelength 1 **A=A1-m*A2:** Absorbance is equal to the difference between the absorbance value of the measured absorbance at the wavelength 1 and the wavelength 2, m is the Coefficient **A=A1/A2:** Absorbance is equal to the ratio of the measured absorbance value of the measured wavelength 1 and 2
Wavelength 1	Measurement of wavelength 1
Wavelength 2	Measurement of 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 sample number (Up to 10)

2.2 Press the item to set measurement parameters.

2.3 After all the parameters are set up, press the button **Next** to start establishing the standard curve. If the item **Calibration** is set to the parameter Coe K, Std M or Std I, please refer to 2.3.1, 2.3.2 or 2.3.3.

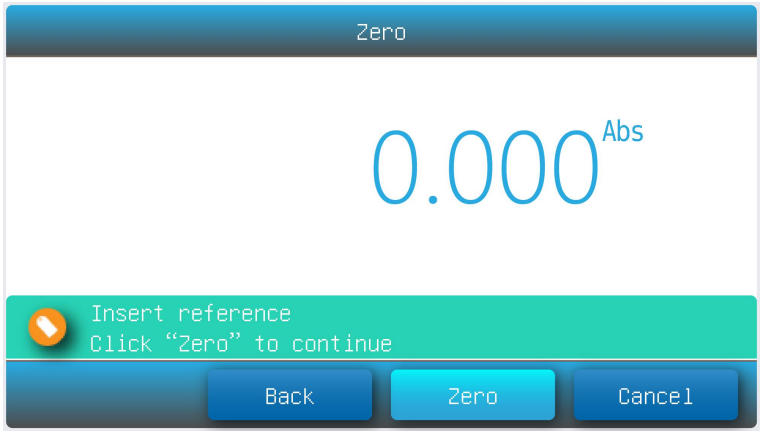
2.3.1 Input equation coefficient to establish standard curve.

(1) Input equation coefficient K0 ~ K3. Press button **Next**.



2.3.2 Measure standard sample to establish standard curve

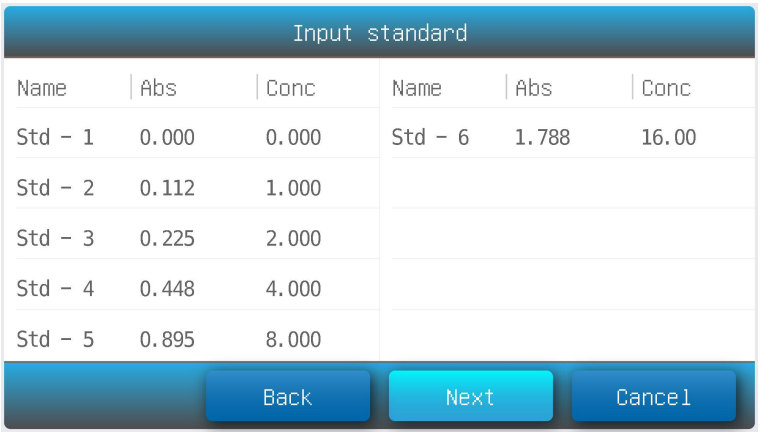
(1) Put the reference in the measurement channel, press the button **Zero** to do zero.



(2) Put the 1# standard sample in the measurement channel, press the button **Read** to measure.

(3) Repeat step 3.3 to measure the other standard samples.

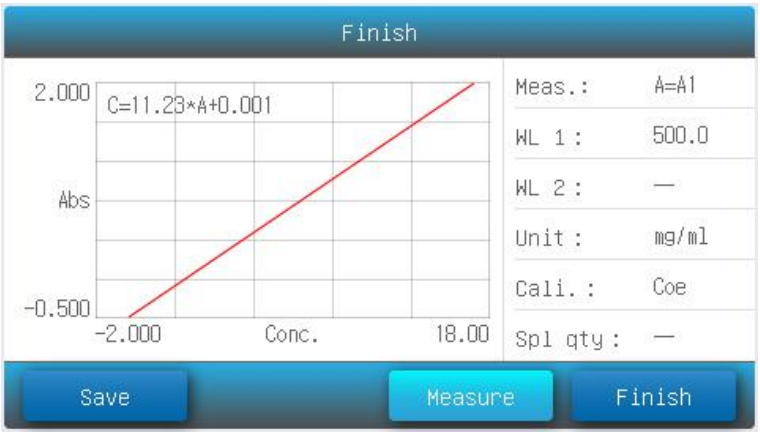
(4) Press the item to input concentration of standard samples, press the button **Next**.



2.3.3 Input standard sample to establish standard curve

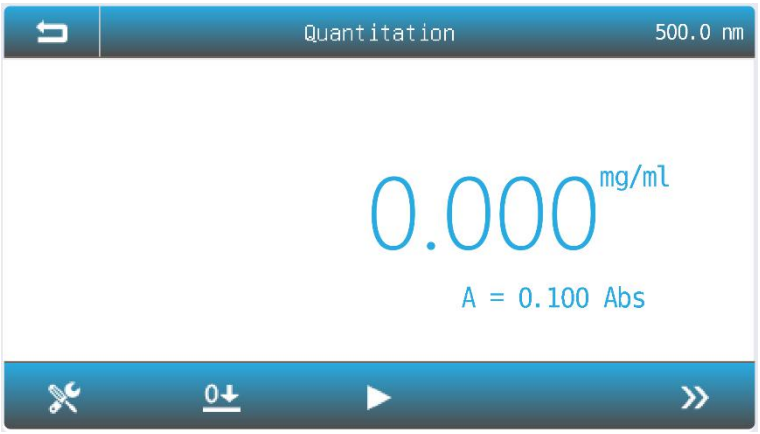
(1) Press the item **Abs** and **Conc** to input absorbance and concentration of standard samples, press the button **Next**.

2.4 Finished establish method. Press the button **Save** to save the method, press the button **Measure** to accept the new method and go to the **measurement interface**, Press the button **Finish** to exit.



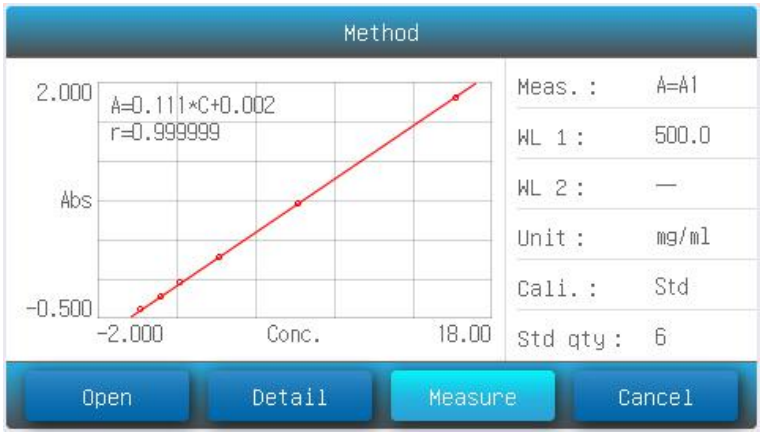
3 Measure Sample

3.1 **Quantitation** interface, press the button **Measure sample**.



	**Method** Select measurement method.
	**Zero** Do 0Abs/100%T.
	**Read** Measure the sample and record the result.
	**List** View the result(s) list.

3.2 Press the icon  to select method.



3.3 Press the button **Open** to load measurement method stored in the internal memory/USB disk.

3.4 Press the button **Measure** to accept the new measurement method and back to **measurement interface**.

3.5 Put the reference in the measurement channel, press the icon  to do zero.

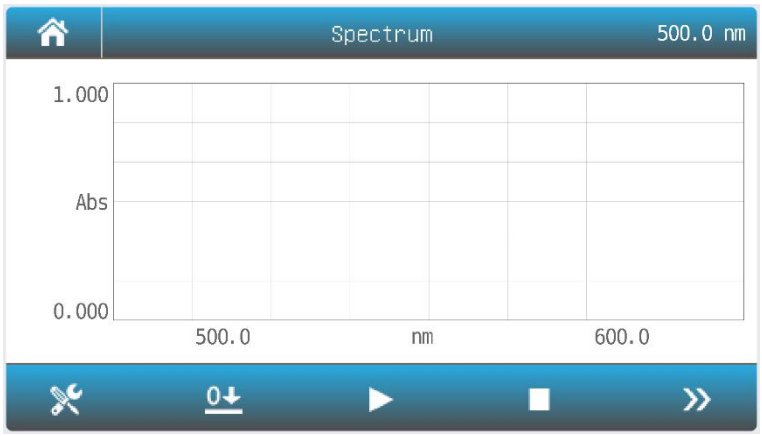
3.6 Put the sample in the measurement channel, press the icon  to measure a sample and record the result.

3.7 Press the icon  to browse the result(s).

Spectrum

Spectrum mode is used to scan the absorbance or transmissivity of the sample in a wavelength range.

1. **Main** interface, press the icon  to start a **Spectrum** application.



	**Method** Set the measurement parameters.
	**Zero** Scan baseline.
	**Read** Scan the sample and draw curve.
	**Stop** Stop scanning.
	**List** View the result(s) list.

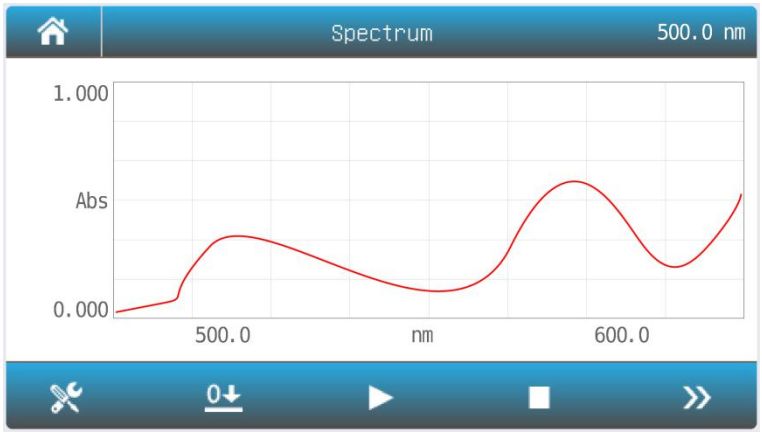
2. Press the icon  to setup the measurement parameters.

Start wavelength	Scan start wavelength
End wavelength	Scan end wavelength
Step	Scan interval: 0.1,0.2, 0.5, 1.0,2.0, 5.0,10.0 nm
Speed	**HS:** High speed **MS:** Medium speed **LS:** Low speed
Photometry mode	**Abs:** absorbance **%T:** transmissivity
Y minimum	Minimum ordinate
Y maximum	Maximum ordinate

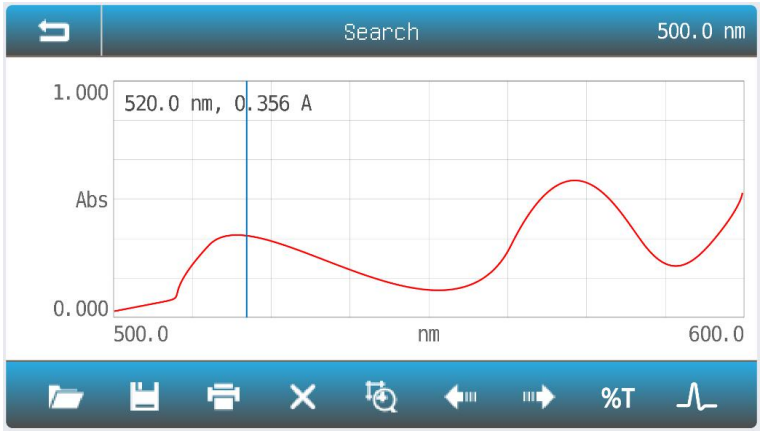
3. Press the item to select or key in the parameters, press the button **Measure** to accept the new parameters and back to measurement interface.

4. Put the reference in the measurement channel, press the icon  to scan baseline.

5. Put the sample in the measurement channel, press the icon  to scan a sample and record the result.



6. Press the icon  to browse the curve and result(s).



	**Scale**	Set the Coordinate value.
	**Left**	Moves the cursor to the left point(peak) to point(peak).
	**Right**	Moves the cursor to the left point(peak) to point(peak).
	**Mode %T**	Change the mode to %T.
	**Mode Abs**	Change the mode to Abs.
	**Peak**	Change the search mode point/peak.

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 burning	Replace fuse
Measurement uncertainty	Glass cuvettes used in UV Range	Use quartz cuvettes
	Sample is not Stable	Improve the sample
	The concentration of sample is too high	Diluted sample
	Power Supply Voltage Low or not Stable	Improve the Power Supply
	Lamp damage or lamp life maturity	Replace lamp
Dark Current Error when self-check	The lid of the compartment is open during self-check	Close the lid, restart
System Calibrate Failed	Something is blocking the Light path	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 Maintain

Check the compartment

After measurement, the cuvettes with sample solutions should be taken out of the compartment in a timely manner. The volatilization of the solution would make the mirror go moldy. Users must pay close attention to the corrosive sample as liquid will easily cause to volatilize. Any solution remaining in the compartment should be wiped off immediately.

Surface cleaning

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

Clean the cuvettes

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

Spare Parts Replacement

Replace the fuse

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

1. **Tools needed**
   A 3×75 Flat Blade screwdriver.
2. **Switch Off the power supply**
   Switch off the power supply and unplug from the socket.
3. **Take out the Fuse Seat**

Align the screwdriver with the fuse seat and turn it counter clockwise, the fuse seat will pop out when released.

4. **Replace a new fuse**
   Pick out the 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 turning it clockwise, the fuse seat will be locked.

6. **Switch on the power**

   Plug in 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	10037-444
CELL HOLDER, 4-CELL,10 TO 50MM	1PC	10037-446
CELL HOLDER, 4-CELL, 10 TO 100MM	1PC	10037-448
CELL HOLDER, FOR CYLINDRICAL CELL	1PC	10037-450
CELL HOLDER 1-POSITION TEST TUBE HOLDER	1PC	76520-718
CELL HOLDER WATER-JACKETED 4-POSITION	1PC	76520-720
CELL HOLDER WATER-JACKETED 1-POSITION	1PC	76520-722
CELL HOLDER FOR MICRO CELLS,BEAM HEIGHT:15MM	1PC	10037-490
CELL HOLDER, 5-POSITION AUTO CELL CHANGER, 10 TO 100MM	1PC	76520-724
CELL HOLDER, 8-POSITION AUTO CELL CHANGER, 10MM	1PC	10037-456
CELL HOLDER, SOLID SAMPLE	1PC	10037-458
CELL HOLDER, WATER-JACKED, 4 CELL, 10MM	1PC	10037-460
CUVETTE, SQUARE.GLASS,10MM	4PCS	10037-462
CUVETTE, SQUARE.GLASS,20MM	2PCS	10037-464
CUVETTE, SQUARE.GLASS,30MM	2PCS	10037-466
CUVETTE, SQUARE.GLASS,50MM	2PCS	10037-468
CUVETTE, SQUARE.GLASS,100MM	1PC	10037-470
CUVETTE, SQUARE.QUARTZ,10MM	2PCS	10037-472
CUVETTE, SQUARE.QUARTZ,20MM	2PCS	10037-474
CUVETTE, SQUARE.QUARTZ,30MM	2PCS	10037-476
CUVETTE, SQUARE.QUARTZ,50MM	2PCS	10037-478
CUVETTE, SQUARE.QUARTZ,100MM	1PC	10037-480
CELL,QUARTZ, 100UL, 10MM, BEAM HEIGHT:15MM	1PC	10037-492
CELL,QUARTZ, 200UL, 10MM, BEAM HEIGHT:15MM	1PC	10037-494
CELL,QUARTZ, 500UL, 10MM	1PC	10037-482
FLOW CELL, 5 MM, GLASS, BEAM HEIGHT:15MM	1PC	10037-524

FLOW CELL, 10 MM, GLASS, BEAM HEIGHT:15MM	1PC	10037-526
FLOW CELL, 20 MM, GLASS, BEAM HEIGHT:15MM	1PC	10037-528
FLOW CELL, 30 MM, GLASS, BEAM HEIGHT:15MM	1PC	10037-530
FLOW CELL, 5 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	10037-532
FLOW CELL, 10 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	10037-534
FLOW CELL, 20 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	10037-536
FLOW CELL, 30 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	10037-538
CONTROLLER SIPPER SYSTEM A1101	1PC	76520-728
CONTROLLER CONSTANT-TEMPERATURE A1001	1PC	76520-730
CONTROLLER CONSTANT-TEMPERATURE A1201	1PC	76520-732
PRINTER, THERMAL PRINTER, RD-TH32-SC	1PC	76520-726
THERMAL PAPER	1PC	10037-504
SAMPLE ROOM PANEL WITH PORT	1PC	76520-738
SOFTWARE EASYUV USED FOR PV/P1-4	1PC	76520-734
LAMP, FLASHING XENON - M4	1PC	76520-746

Technical service

Web Resources

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

• Access to the VWR Online Catalogue, and information about accessories and related products.

• Additional product information and special offers.

For technical assistance contact your local VWR representative.

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. 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.

Instrument disposal

This instrument must not be disposed of with unsorted waste.

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

from any potential health hazards.

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

By doing so, you will help to conserve natural and environmental resources and you will ensure that your instrument 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 or 60.0 Seconds);
- You can choose different Photometric Mode to display the curve (Transmittance-Time & Absorbance-Time).

Spectrum Scan

- You can choose the Scan Intervals(0.1, 0.2, 0.5, 1.0, 2.0 and 5.0nm);
- 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(W Lamp, D2 Lamp or automatically switch);
- You can choose the scanning intervals(0.1,0.2,0.5,1.0,2.0 and 5.0);
- 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.

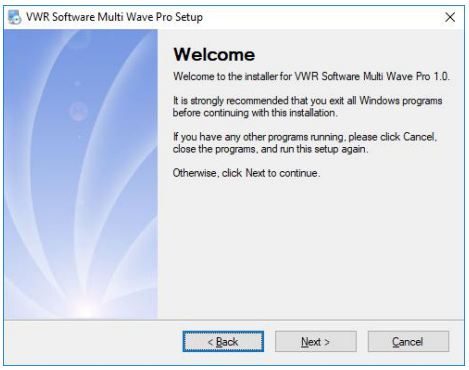
Install and Uninstall VWR Software Multi Wave Pro

PC System Requirements

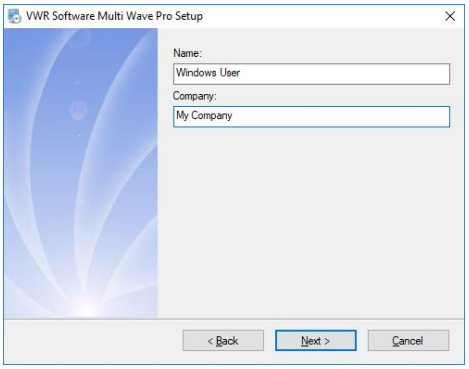
- Pentium or above PC;
- USB Ports.
- 512MB Memory(1GB or Above is strongly recommended);
- 50MB or above hard disc Space;
- Microsoft Windows XP/Vista/7/8/10.

Install VWR Software Multi Wave Pro

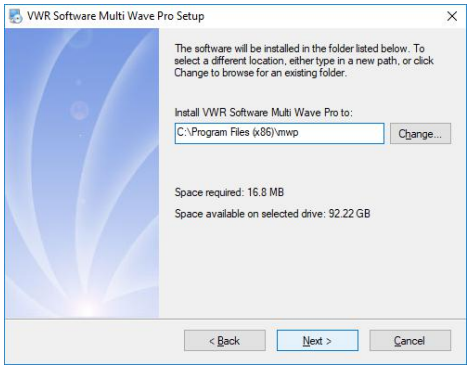
1. Insert VWR Software Multi Wave Pro USB Drive to the USB port of the PC;
2. Open the USB Drive, and double click **Setup.exe** to start the installation, "Welcome" form appear, click **Next**;

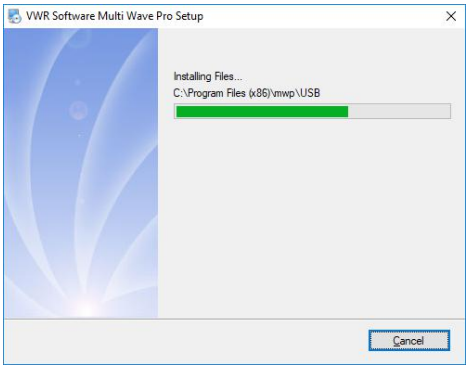


3. Input user's information, click **Next**;

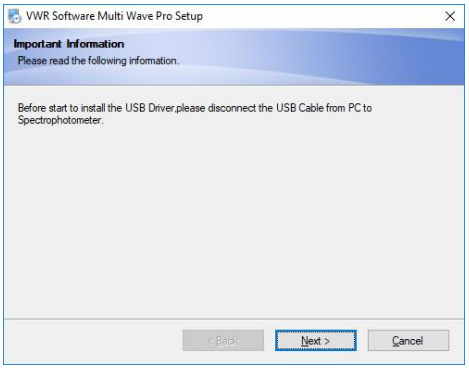


4. Choose install path, then click **Next** to copy files to Hard disc;

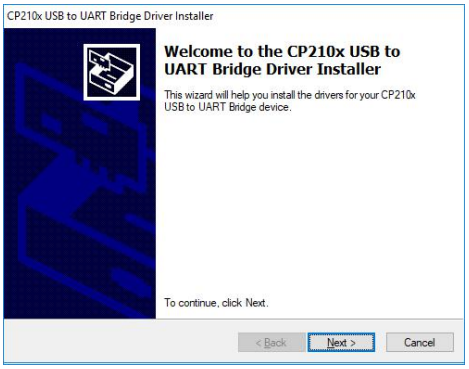




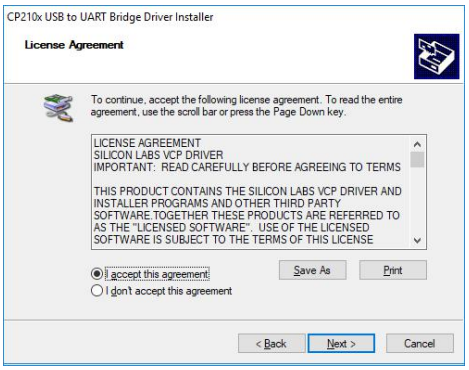
5. Unplug the USB cable if connected before, click **Next**;



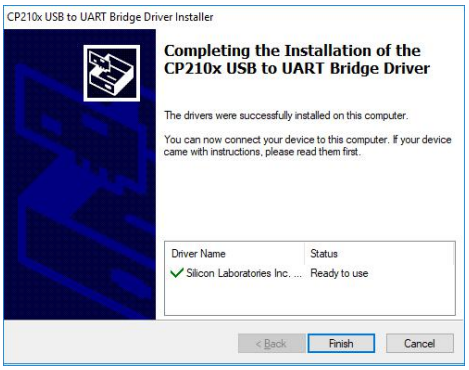
6. After finished copy all files of VWR Software Multi Wave Pro, it will start install the USB Drive. Click **Next**;



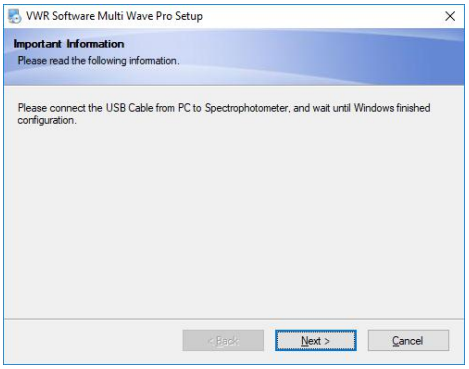
7. Select "I accept this agreement". Click **Next** to copy files to PC;



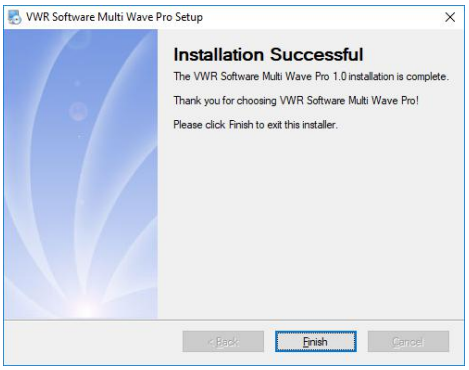
8. Click **Finish** to finish install USB Drive;



9. Plug the USB cable, click **Next**;

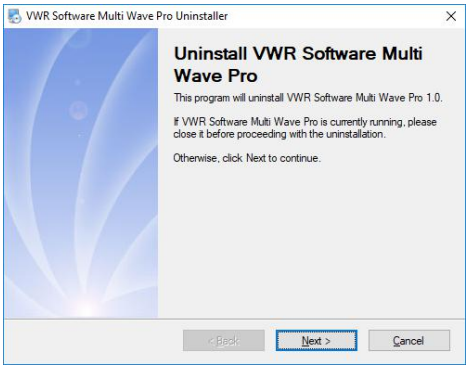


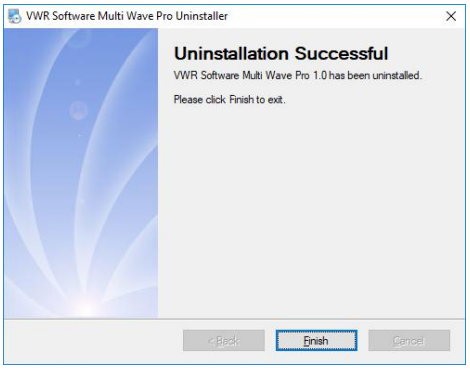
10. Click **Finish** to finish all the setup.



Uninstall VWR Software Multi Wave Pro

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





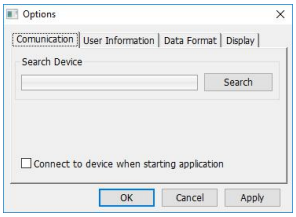
Run VWR Software Multi Wave Pro

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

Set up Communication Port

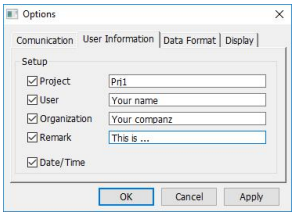
Important information *Be sure that the USB line which is connecting PC with instrument is working and the spectrophotometer is at the standby state interface.*

After VWR Software Multi Wave Pro being started, then click **Main Menu→Option**s, a dialog box of **Options** will display in the screen, click **Search** to automatically search the instrument's communication port, after get the communication port, click **OK** to save 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.



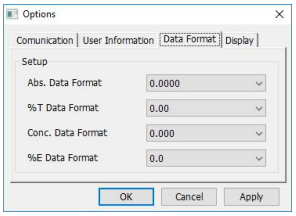
Set User's Information

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



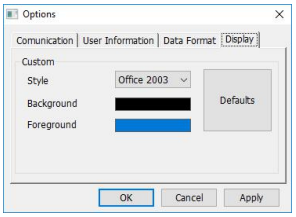
Set Data Format

Click **Main Menu→Options**, a dialog box of **Options** will display in the screen, click **Data Format** tag, choose the displaying format, and click **OK** to save setting.



Set Interface Style

Click **Main Menu→Options**, a dialog box of **Options** will display in the screen, and click **Interface** tag. You can custom the style and color schemes of the interface as you like. Click **OK** to save setting.



Connect to PC

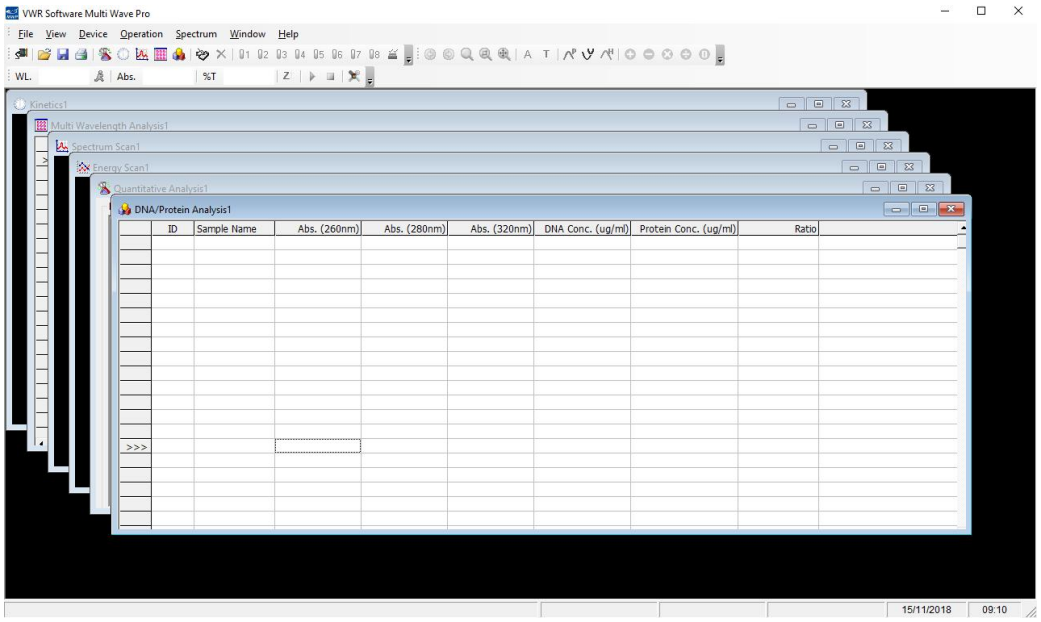
After enter the Main Interface, click  in the Tool Bar to connect with PC. After connection, the icon is on the pitched on state, you can release PC if you click the icon again.

Introduction

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

Main Interface

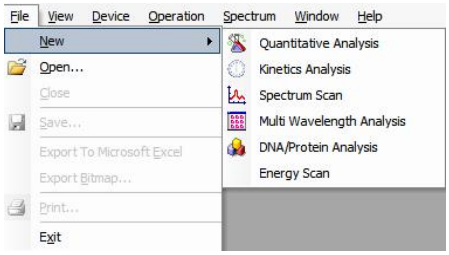
This is the main interface after start.

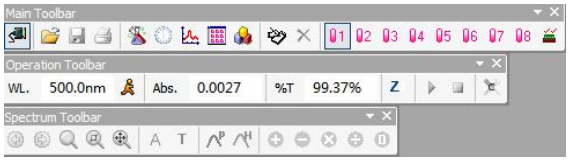


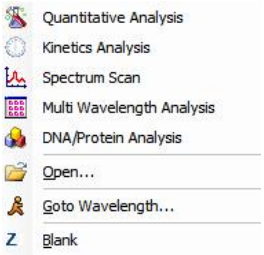
Menus Bar and Tools Bar

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 of the functions can be finished through the menu by Right-hand button.



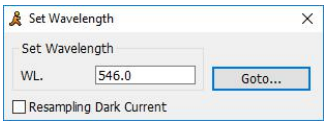




General Operating Instructions

Set Wavelength

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



Blank

Put reference into the light path, click the icon in the Tool Bar.

New a Testing

Main Menu → File → New, select a testing to click.

Lists of the file's type

- Quantity Analysis File *.qua
- Kinetics Analysis File *.kin
- Spectrum Scan File *.wls
- Multi-wavelength File *.mti
- DNA/Protein Analysis File *.dna
- Energy Scan File *.ens
- Standard Curve *.std

Test a Sample

Put sample into the light path, click the icon in the Tool Bar.

Set Test Parameters

Click the button of to set the parameters.

Modify a Sample

1. Choose the data frame you want to modify or set the curve as current curve;

2. Pull the unknown sample in light path;
3. Click the icon in Tools Bar to re-measure it, and save the current result to substitute the original one.

Delete a Test 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 line you want to rename.
2. Double-click **Sample Name**, input the sample's name, and press **Enter** on the keyboard to confirm.

Save a Testing

Click the icon in Tools Bar, input the file name and click **Save** to confirm in the dialog box.

Open a Testing

Click the icon in Tools Bar, choose the file name you need in the dialog box, then click **Open** to confirm.

Print Test Report

Click the icon in Tools Bar, then set Print Parameters in the dialog box, press **Print** to confirm.

Export Data to Excel (the Microsoft Excel should be installed)

Click **Main Menu→File→Export to Microsoft Excel**, Excel will be started up, and data will be stored in it.

Export Curve as bmp Picture

Click **Main Menu→File→Export Bitmap**, input the file name and click save to confirm the dialogue box.

Switch Display Mode

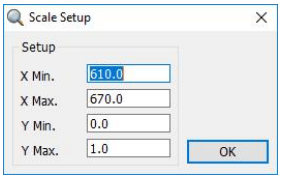
Click the icon A or T in the Tools Bar to switch the display mode (Abs. or Transmit).

Zoom Selected Area

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

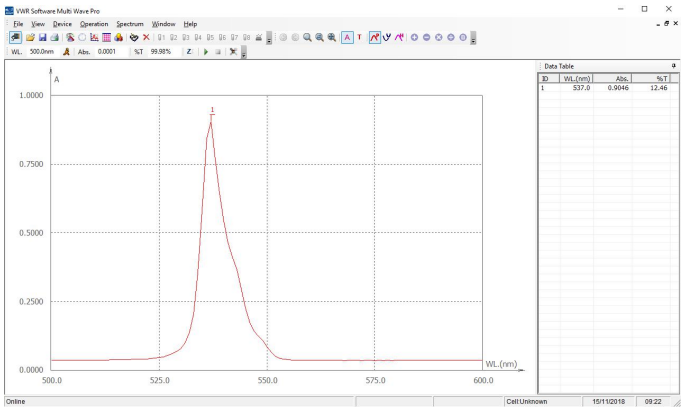


Auto Fitting
Click the icon on Tools Bar to change the scale to appropriate value.

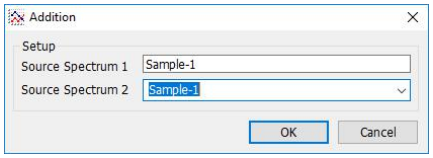
Select as Current Curve
Click **Main Menu→Curve Operate→**Choose the curve as you like.

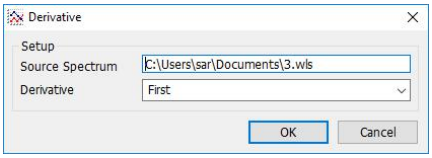
Change the Color of Current Spectrum
Click **Main Menu→Curve Operate→**Choose the color as you like.

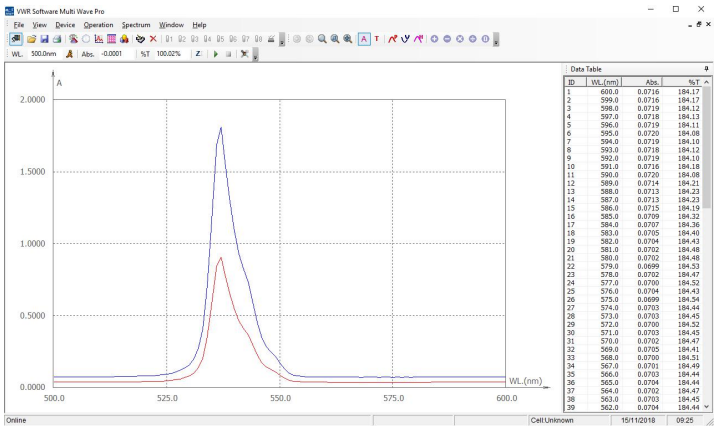
Search Peaks
Click the icon in Tools Bar to search the peaks, they labeled automatically on the curve, and the peaks will be listed in the Right Frame. You can set the Peak height by clicking icon.

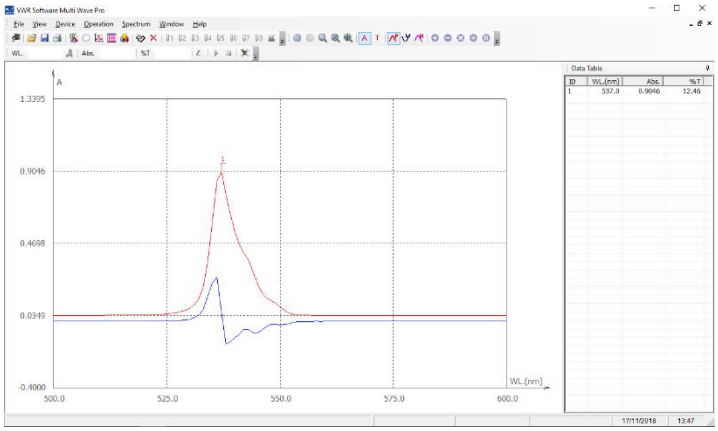


Mathematics Function
Click the icons or in the Tools Bar, a new dialog box will display on the screen respectively. You can add, subtract, multiply or divide two spectrums.









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. Click **Main Menu→Spectrum→Spectrum Smooth**.

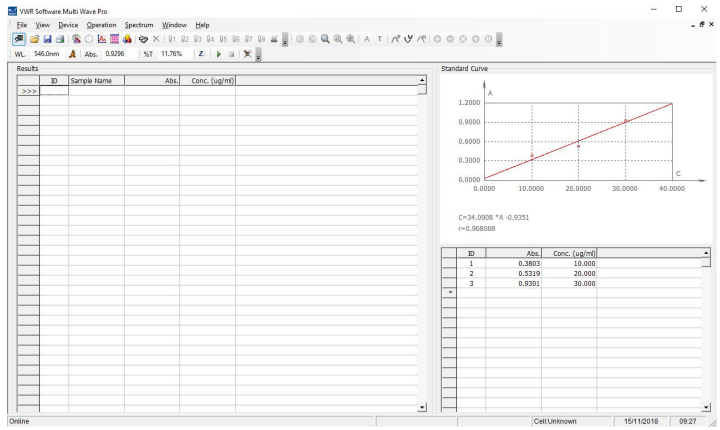
Operation

We will introduce you how to use VWR Software Multi Wave Pro.

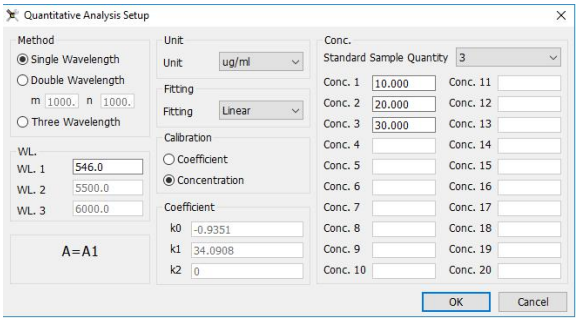
Quantitative Analysis

VWR Software Multi Wave Pro use Standard Curve to test the sample's concentration at a fixed wavelength point.

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 in **WL** Frame;
- Choose the Concentration Unit ;
- Choose curve fitting method;

Create Standard Curve

Two methods are under your choice to create a new curve.

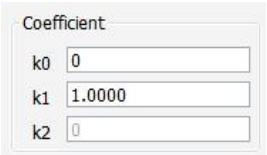
Method 1: Coefficient

(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 **OK** to finish setting.*

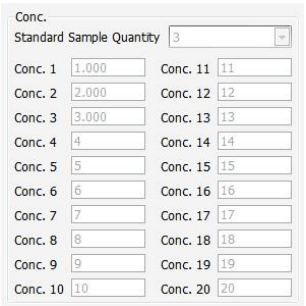


Method 2: Use Standard Samples to create a new curve

*(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 **OK** to finish setting;*

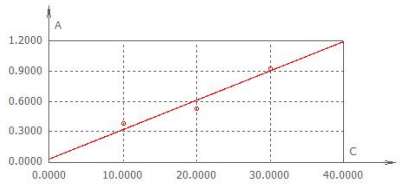
(5) Pull the Reference into the light path and click the icon , then the system will move the wavelength to the one you just set, it blanks then;

*(6) Put **1# standard sample** into the light path and move the cursor on the fist frame of Abs. The sample Absorbance value will appear in this frame after click in the shortcut toolbar;*

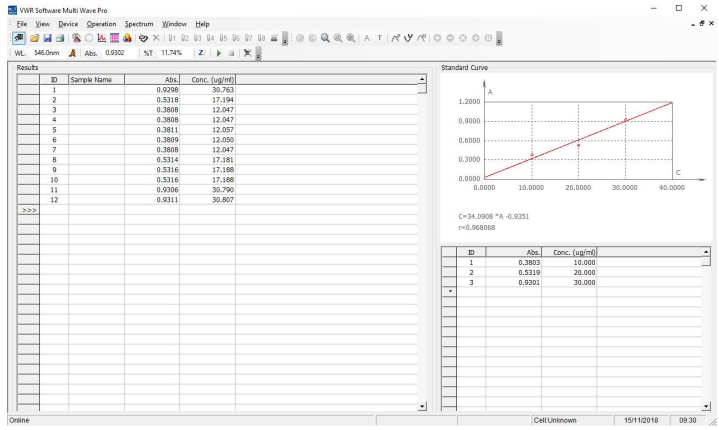
(7) Measure other standard samples in the same way as step (6) shows. The curve displays automatically when finish;

	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 , and you can reload it by clicking next time.



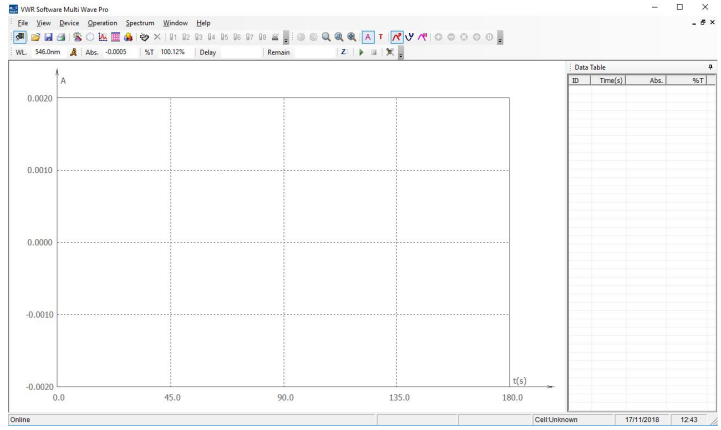
3. Pull the unknown into the light path (if it is Automatic 8-cell Holder in the instruments, click to set the location of the relative cell first), Then click the icon, click in the shortcut toolbar to test, the test result will display in the data sheet.



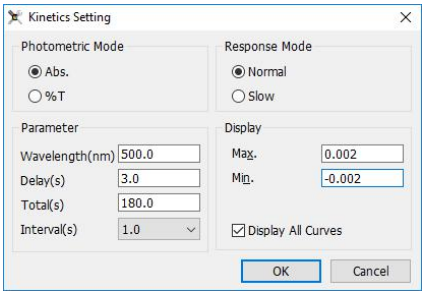
Kinetics Analysis

We will introduce how to measure a sample's change over a selected period of time.

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



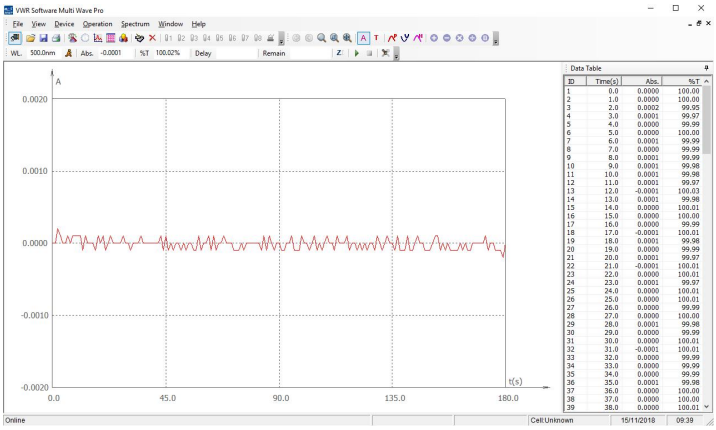
2. Click the button of  to set the parameters;



3. Choose Photometric Display Mode, input the Wavelength, Display Time, Total Time,

Intervals, Responsible Mode and Coordinates Values;

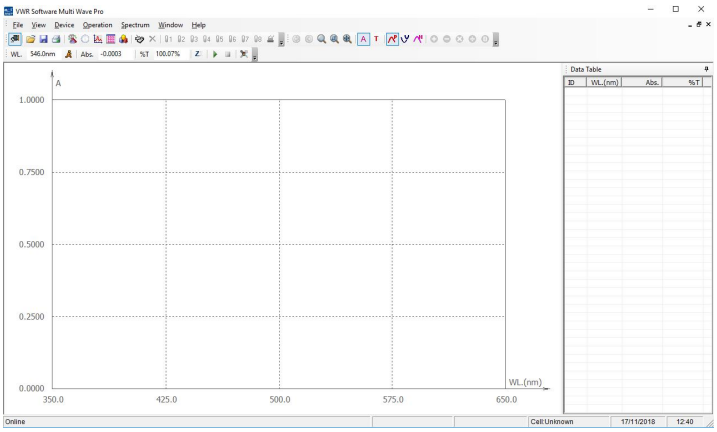
4. Click OK to finish and exit setting;
5. Pull the reference into the light path and click icon  in the Tool Bar to do blank.
6. Pull the sample into the light path and click the button of to begin the test.You can click icon in the Tools Bar to cancel at any time.



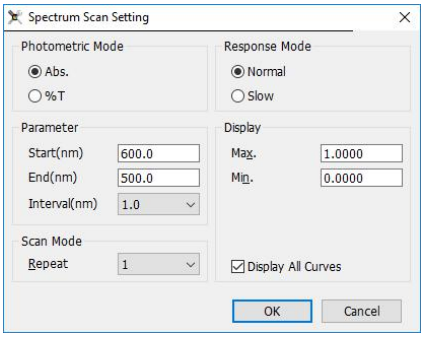
Spectrum Scan

We'll introduce how to create the spectrum while using Spectrum Scan function.

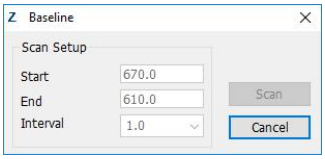
1. Click the icon  on the Tools Bar to start a new Spectrum scan;



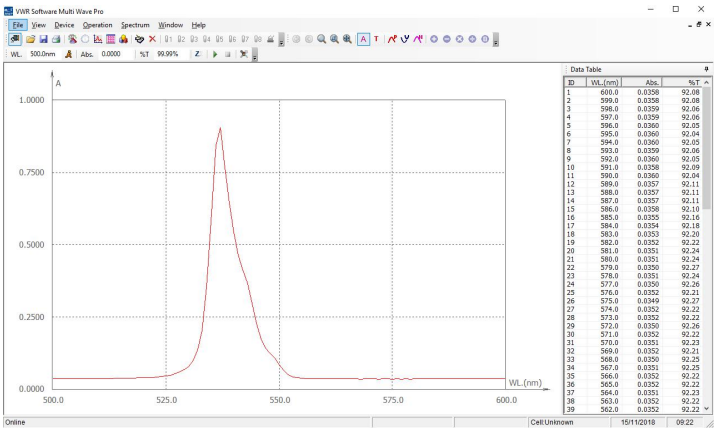
2. Click the icon  in the Tool Bar to set the parameters of Wavelength Scan;



3. Choose the Photometric Mode, Wavelength Range for Scanning, Intervals, Repeat Times, Response Mode, and Coordinate Range;
4. Click **OK** to finish and exit setting;
5. Put reference into the light path, click the icon  in the Tool Bar, then the dialog box of **Baseline** displays in the screen, click **Scan** to scan baseline, click **Cancel** to interrupt scanning and exit the course;



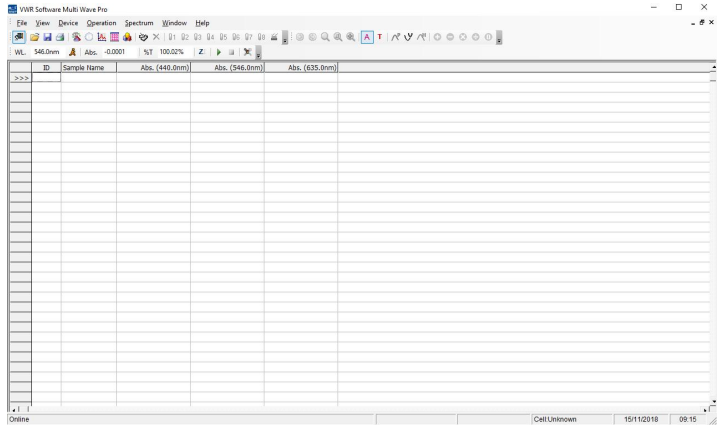
6. Put the unknown sample in the light path, click the icon  in the Tools Bar to start scanning, click  to interrupt and **cancel** scanning.



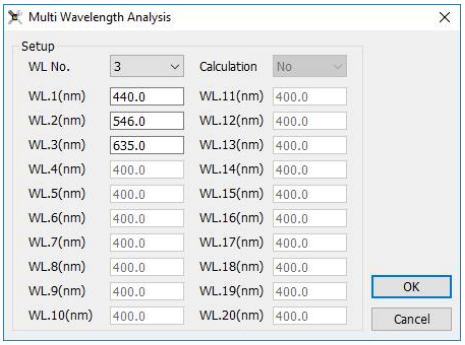
Multi-wavelength Analysis

We'll introduce how to measure a sample in different wavelengths (≤20).

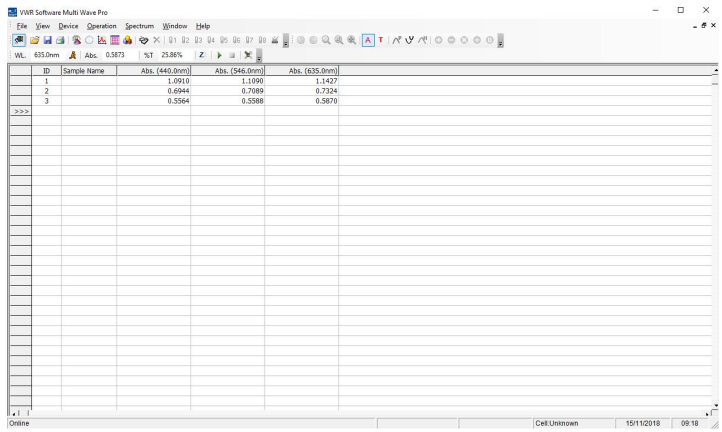
1. Click the icon  on the Tools Bar, a new form appears on the screen;



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



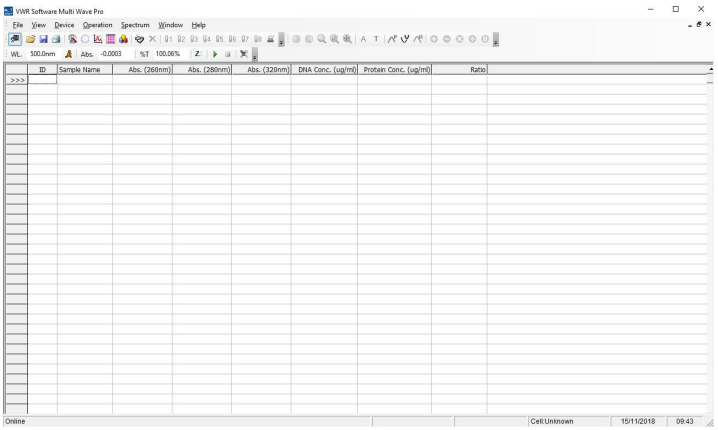
3. Choose the quantity of the wavelength, you need input the value of each wavelength;
4. Click **OK** to finish and exit setting;
5. Pull the reference into the light path, click the icon  in the Tools Bar to do blank;
6. Pull the sample into the light path, click  to start test. And the test result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



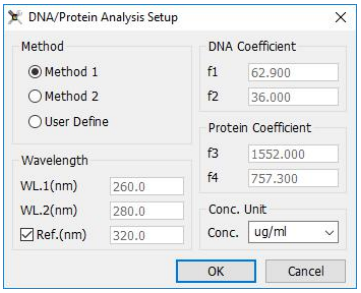
DNA/Protein Analysis

We will introduce how to operate a DNA/Protein Analysis.

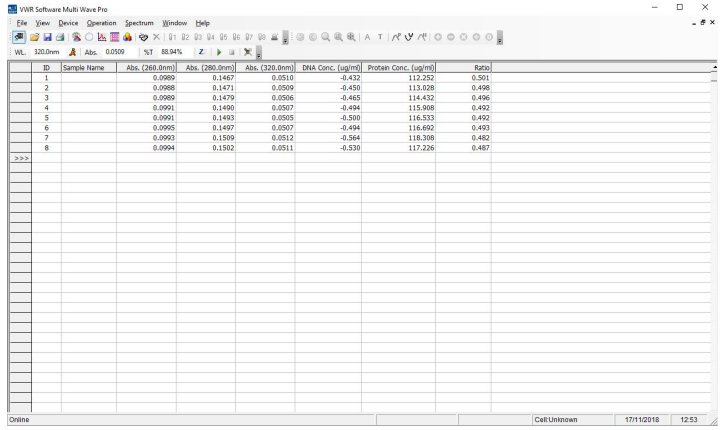
1. Click the icon  on the Tools Bar to begin a DNA/Protein Analysis;



2. Click the icon  to set parameters;



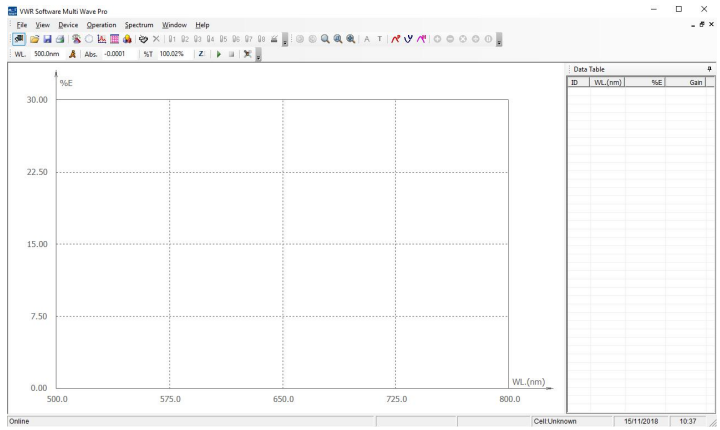
3. Choose the measure method first. We provide you 2 methods to measure, and you can also definite the coefficients and wavelength by yourself;
4. Click **OK** to finish and exit the setting;
5. Pull the reference into the light path, click  in the Tools Bar to do blank;
6. Pull the sample in the light path, click the icon  to measure. The result will display in the data sheet.



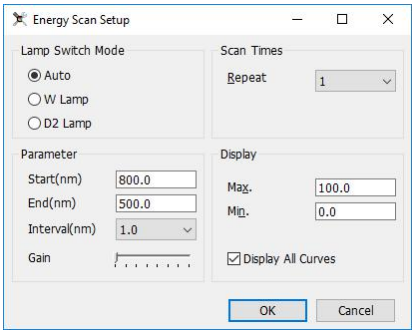
Energy Scan

We will introduce how to scan the variability of energy in the range of wavelength.

1. Click **Main Menu→File→New→Energy Scan** to build Energy Scanning;

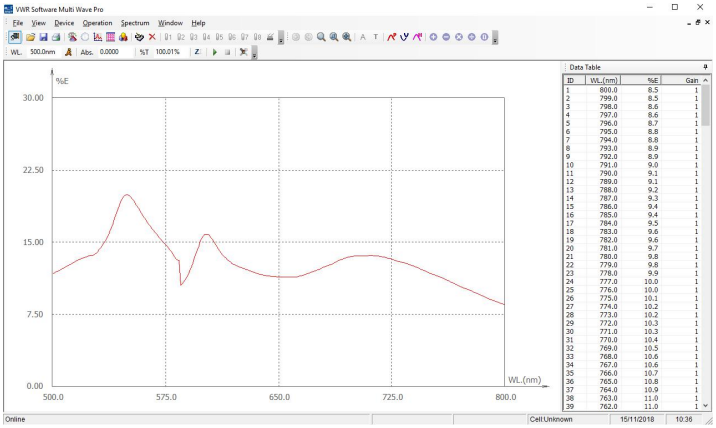


2. Click the icon  on the Tools Bar to set parameter;



3. Click **OK** to finish and exit setting;

4. Pull the unknown sample in the light path, click the icon  in Tools Bar to start scanning, click  to interrupt scanning and exit the course;



Other Functions

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

Get Dark Current

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

Automatic Multi-Position Changer (Accessories)

Click the icon 1…8 to pull the correspond cell in the light path.

Appendix

Methods of Quantitative Analysis

Single Wavelength Method: $Abs.=A_1$

Double Wavelengths Method: $Abs.=m*A_1-n*A_2$

Three Wavelengths Method: $Abs.=A_1-(WL_1-WL_2)*(A_2-A_3)/(WL_2-WL_3)-A_3$

Methods of DNA/Protein Analysis

Method 1: $C_{DNA}=(A_1-A_{ref})*f_1-(A_2-A_{ref})*f_2$

$C_{Protein}= (A_2-A_{ref})*f_3-(A_1-A_{ref})*f_4$

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

$A_1=A_{260nm}$,$A_2=A_{280nm}$, $A_{ref}=A_{320nm}$ (Optional)

$f_1=62.9$, $f_2=36.0$, $f_3=1552$, $f_4=757.3$

Method 2: $C_{DNA}=(A_1-A_{ref})*f_1-(A_2-A_{ref})*f_2$

$C_{Protein}= (A_2-A_{ref})*f_3-(A_1-A_{ref})*f_4$

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

$A_1=A_{260nm}$, $A_2=A_{230nm}$, $A_{ref}=A_{320nm}$ (Optional)

$f_1=49.1$, $f_2=3.48$, $f_3=183$, $f_4=75.8$

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