Order: 010-59822688
Toll-free: 800-990-6057 /400-810-6057
TIANGEN BIOTECH (BEIJING) CO., LTD

Version No.: OS191217

TGem Pro Spectrophotometer
User's Manual

Catalog Number	Product Name
OSE-260-03	TGem Pro Spectrophotometer

Contents

Important Notes

1. Custom and usage

 Precautions	The items contain particularly important information. Please read it carefully. If you fail to follow the instructions, it may lead to malfunction or even instrument damage.

 Warning	The warning message requires you to be very careful in operating a certain step or method. If you do not follow the requirements correctly, it may lead to serious personal injury.

2. Safety

In the whole process of operation, maintenance and repair of this instrument, the following basic safety measures and warnings and precautions pointed out in this user's manual must be observed. If these measures or the warnings and precautions pointed out in this manual are not observed, the basic protection provided by the instrument may be affected. At the same time, it will not meet the safety standards of instrument design and manufacture, and affect the expected application range of the instrument.

TIANGEN BIOTECH (BEIJING) CO., LTD shall not bear any responsibility for all consequences caused by the user's failure to comply with the following requirements.

Precautions	The instrument is Class I equipment conforming to GB4793.1 standard, with protection grade of IP20. This instrument is a product for indoor use.

2.1 Instrument grounding

In order to avoid electric shock, the input power cord of the instrument must be grounded reliably. The instrument adopts the safety device, that is, the three-core grounding plug with a third (grounding) pin, which can only be used with a grounding power socket. If the plug cannot be inserted into the socket, please ask the electrician to install the correct socket and prevent the grounding plug from losing its safety protection function.

2.2 Keep away from live circuits

The operator shall not disassemble the instrument protection, replace the components or adjust the instrument without authorization. If necessary, it must be completed by certified professional maintenance personnel. It is strictly prohibited to replace the components when the power supply is connected.

2.3 Pay attention to power supply

Before switching on the AC power supply, ensure that the voltage of the power supply is consistent with the voltage required by the instrument (12 V) and ensure that the rated load of the power socket is not less than the maximum load of the instrument of 30 W.

2.4 Pay attention to the power cord

The instrument should use the supplied power cord. If the power cord is broken, it must be replaced. Do not repair it by yourself. It shall be replaced with a power cord of the same

type and specification. When the instrument is in use, do not place anything on the power cord and do not place the power cord in a place where people flow.

2.5 Power cord plugging

When plugging and unplugging the power cord, please hold the operating part of the plug correctly. When inserting the plug, ensure that the plug is completely and firmly inserted into the socket. Do not pull the power cord when unplugging.

2.6 Pay attention to the placement of instruments

The instrument shall be placed in a place without corrosive gas and smoke, and there shall be no strong light, strong air flow or strong magnetic field interference in the room. The work table on which the instrument is placed shall be level and stable.

Turn off the power supply when stopping working. If it is not in use for a long time, cut off the power supply, unplug the power plug, and cover the instrument with soft cloth or plastic film to prevent dust and foreign matter from entering.

2.7 Operation precautions

(1) During the measure operation, avoid liquid dripping on the instrument;

(2) When it is tested in base mode, the sample shall be added to the corresponding position of the instrument;

(3) When it is tested in the cuvette mode, the cuvette shall be placed in the corresponding position of the instrument.

Precautions	Under the following circumstances, immediately cut off the power supply, unplug the instrument from the power socket, and contact the supplier or ask qualified maintenance personnel to handle it: • There is liquid falling into the instrument; • The instrument gets wet due to rain or water; • The instrument fails to work normally, especially with any abnormal noise or smell; • The instrument is fallen down or the shell is damaged; • The function of the instrument has changed obviously.

3. Operation and maintenance of instrument

3.1 Base maintenance

(1) Sample compatibility statement

The base part of the TGem Pro is accessible to most solvents and solutions commonly used in life science laboratories, including methanol, ethanol, propanol, isopropanol, butanol, acetone, ether, chloroform, carbon tetrachloride, DMSO, DMF, acetonitrile, tetrahydrofuran, toluene, hexane, benzene, sodium hydroxide, sodium hypochlorite, dilute hydrochloric acid, dilute nitric acid and dilute acetic acid.

(2) Base operation and maintenance

Please wipe the liquid from the base immediately after testing the sample. If testing is not continued, please clean the base with pure water and dry it. In this way, the solution or solvent will not cause damage to the base.

Do not contact with any form of hydrogen fluoride (HF), and fluoride ions will dissolve the silica fiber in the base.

Do not allow any liquid to enter the gap between the base and the body, otherwise the instrument may be damaged. If liquid spills, wipe it immediately.

3.2 Operation and maintenance of the complete machine

Please read the User's Manual carefully before using the product.

Avoid direct sunlight. Avoid direct wind blowing during operation, so as not to affect the accuracy.

Avoid using in the environment with high humidity as far as possible.

Keep surfaces clean by wiping them frequently with a clean soft cloth. Strictly prohibit the corrosive cleaning agents.

If there is any abnormal situation, please record the process and phenomenon in detail, and contact our company in time.

Warning	The power supply must be cut off while the instrument is being cleaned. The surface of the instrument is strictly forbidden to be cleaned with corrosive cleaning agents.

4. After-sales service

The warranty period of TGem Pro spectrophotometer is 12 months. If the instrument is damaged due to improper operation, unqualified use and unauthorized maintenance or modification by users, it will not be covered by the warranty. For instrument maintenance after the warranty period, TIANGEN Company will charge maintenance fees according to after-sales service standards.

Precautions	• After the instrument is unpacked, the items in the packing box shall be accepted immediately according to the packing list. In case of damaged or missing items, please contact the supplier immediately. • After unpacking the instrument, please keep the packing boxes and packaging materials properly for maintenance. TIANGEN BIOTECH (BEIJING) CO., LTD will not be responsible for the instrument damage caused by improper packaging on the way to the maintenance department.

Product Introduction

TGem Pro spectrophotometer is a fixed wavelength ultra-micro ultraviolet-visible spectrophotometer (hereinafter referred to as TGem Pro). It not only provides a base mode (as shown in Figure 1-1) for measuring low dose samples, but also can use a traditional cuvette (as shown in Figure 1-2) for sample testing.

In base mode, this product can measure 0.5-2 μl samples with extremely high accuracy and repeatability. When the base mode is used to measure samples, the sample retention system applies surface tension to keep the samples between the two measureing optical fibers. In this way, the samples can be tested with higher concentration without dilution. The measurement range can reach 200 times of the concentration range tested by ordinary spectrophotometer, and the liquid column height between optical fibers can be adjusted in real time to obtain more accurate measure data. Compared with the traditional cuvette testing method, the base mode eliminates the complex cuvette cleaning process. The dust-free paper is convenient to clean. In addition, for samples with low concentration, high volatility or low surface tension that are not easy to form a liquid column, a cuvette can be used for measurement.

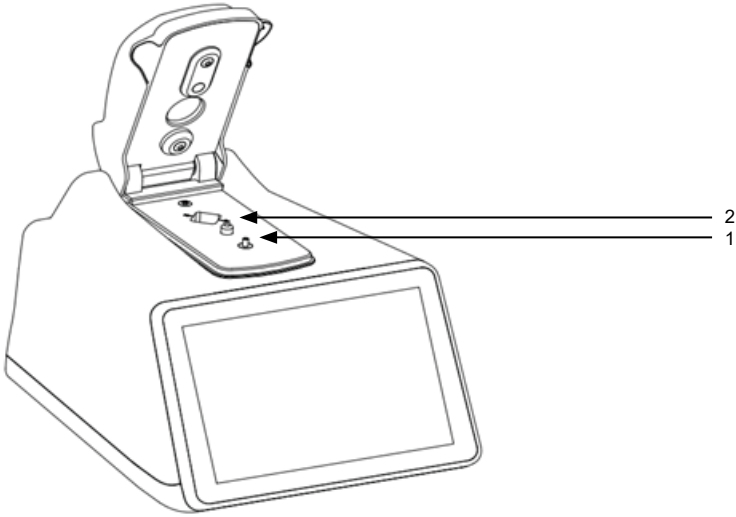


Figure 1

1. Instrument parameters

Cat. No.		OSE-260-03
Testing unit		3648 Pixel linear CCD array
Minimum sample amount (μl)		0.5
Path length (mm)		Automatic switching between 0.03/0.05/0.1/0.2/1.0
Wavelength range (nm)		230/260/280/340/600
Wavelength accuracy (nm)		±1
Spectral resolution (nm)		≤1.8(FWHM at Hg 253.7 nm)
Absorbance accuracy		0.002Abs (1 mm optical path), or 1% CV, and take the larger value
Absorbance accuracy		±2%(at 0.64A at 350 nm)
Minimum measure concentration of base		2 ng/μl dsDNA
Maximum measure concentration of base		27500 ng/μl dsDNA
Testing time		≤5 seconds
Cuvette	Heating temperature (°C)	37±0.5
	Stir speed (RPM)	10-900 rpm 10 adjustable gears
	Absorbance range	0-1.5A (10 mm)
	Minimum measure concentration	0.2 ng/μl dsDNA
Display screen		7-inch, 1280*800 pixel color display screen, capacitive touch screen, support gesture operation
Operating system		Android
Internal storage space		8 GB
Data interface		USB, WIFI
Power supply		AC110V-220V, 50Hz/60Hz(Power adapter)
Weight		2.3 KG

2. Packing list

Product name	Quantity	Unit
Host	1	Set
Power cord	1	Piece
Power Adapter	1	Piece
User manual	1	Piece
Product measure report	1	Piece
Conformity certificate	1	Piece
Product warranty card	1	Piece

Precautions before Using the Instrument

Before turning on the power switch of the instrument, open the upper arm to take away the anti-collision gasket, and then lower the upper arm gently, as shown in Figure 2. This anti-collision gasket is to prevent the upper arm from colliding with the positioning column during the movement of the instrument. After use of the instrument, it is recommended to put the anti-collision gasket back to the position shown in Figure 2.

Before using the instrument, connect the 12V adapter power cord to the power interface on the back of the instrument, insert the three-core plug into the power socket, and turn on the instrument power switch to start the instrument, as shown in Figure 3; Both USB type A interface can be used for product program upgrade and data export.

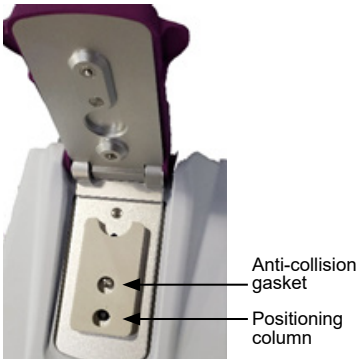


Figure 2

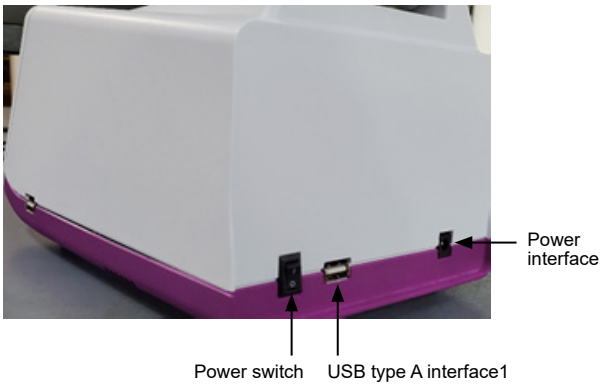


Figure 3

When the base mode and cuvette mode are switched, a prompt of channel switching progress will pop up on the screen. Do not open the upper arm during the channel switching process, and wait for the channel switching to succeed before proceeding to the next step, as shown in Figure 4.

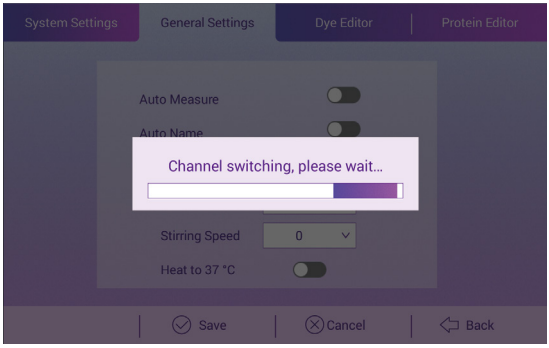


Figure 4

Software and Basic Operation

After the instrument is started, the self-checking is conducted as shown in Figure 5. After the self-checking is passed, the display screen displays the home page as shown in Figure 6, mainly including measure category selection, data browsing, setting, system status and instrument diagnosis.

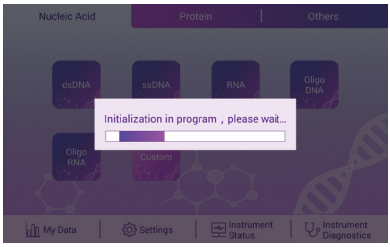


Figure 5

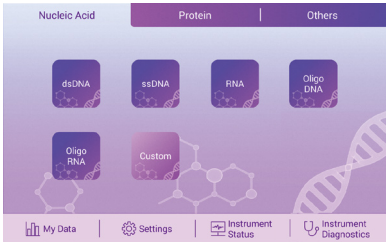


Figure 6

1. Testing interface (taking dsDNA as an example)

Select nucleic acid, protein and other three categories at the top, and the subcategories will be displayed in the middle window. Click nucleic acid category to enter the testing page, as shown in Figure 7. It mainly includes menu, status bar, data window and function key.

Figure 7

1.1 Menu

The menu is located in the upper left corner, as shown in Figure  . Click on the menu bar, as shown in Figure 8. It is mainly used for export and system setting functions.

(1) Export: Export the measure data to USB flash disk.

(2) Setting: Quickly enter the system setting page.

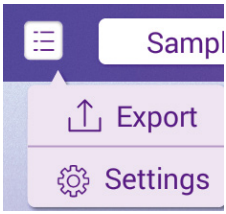


Figure 8

1.2 Status bar

The status bar corresponds to the testing name, testing type and current testing frequency from left to right, as shown in Figure 9.

(1) Testing name: Located on the leftmost side of the top status bar. It is used to display the testing name when a single measure is edited, which is editable. Click on the name to edit the content. If the "Automatic Naming" function is turned on in the setting (please refer to "Setting" for details), it will be named automatically according to the rules of Sample 1, Sample 2, Sample 3 and Sample 4 after each measure.

(2) Testing type: Located in the middle of the top status bar to display the category selection of the current experiment.

(3) The right icon  is used to display the current base/cuvette testing.

(4) Testing frequency: Located on the far right of the top status bar to display the current measure.

Figure 9

1.3 Data window

The data window mainly includes parameter setting, sample details and measure results. The table will be different for its different measure contents.

(1) Sample details: The details of the measure data results are listed in table form, as shown in figure 10.

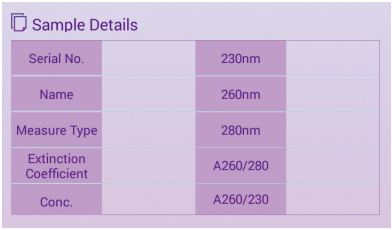


Figure 10

Figure 11

(2) List of measure results: Multiple tests will be displayed in the list box on the right side in the form of a list, and the list shows the content of the experiment. Click the list line to change the sample details on the left into the selected item, as shown in Figure 11.

(3) Parameter setting: Click "More" to enter the parameter setting, as shown in Figure 12.

Figure 12

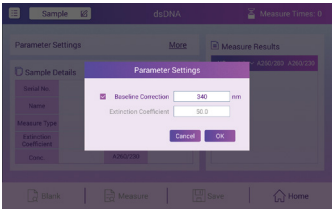


Figure 13

Baseline correction: The default correction wavelength is 340 nm, and users can select or deselect the baseline correction according to the experimental requirements. As shown in Figure 13.

Extinction coefficient: Enter the corresponding extinction coefficient, as shown in Figure 14.

Sample type: The corresponding sample type can be set for testing.

Absorbance calibration: The user-defined absorbance calibration input is used to display the absorbance calibration of the spectrogram, which is obtained by subtracting the absorbance calibration values from the absorbance values at all wavelengths in the sample spectrum (Figure 15).

Cell conversion coefficient 10^8: User-defined coefficient, a recognized coefficient for testing cell type, or a solution for studying cells empirically by using a known concentration of the same medium. The default value is $1.00x10^8$. It is the recognized coefficient for most bacterial cell suspensions, such as Escherichia coli (Figure 15).

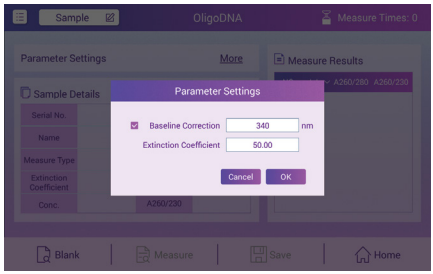


Figure 14

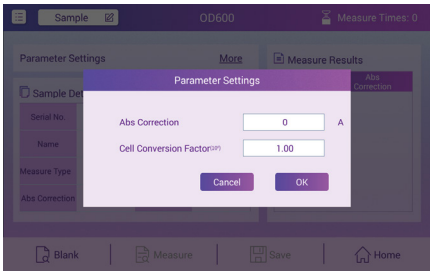


Figure 15

1.4 Function keys

The function keys are divided into four buttons, as shown in Figure 16, corresponding to "Blank Measure", "Measure", "Save" and "Back to Home Page".

Figure 16

(1) Blank measure: Use the buffer solution that dissolves the sample to make a blank control. Blank control must be made before the sample testing.

(2) Measure: The function key "Measure" is gray when users enter an application. It can only be used after blank control is done. When testing, click directly without lifting the upper arm to add samples. The software prompts "Please add samples again". Lift the upper arm, add samples again, put down the upper arm, and click "Measure" to start sample testing.

(3) Save: Save the current experiment record. When users enter it, the "Save" button is gray and cannot be clicked. It must be tested at least once before it can be used. It cannot be saved without measure data.

(4) Back to home page: Back to homepage.

2. Data browsing

Data browsing is used to view the saved experiment information. The experiment list matching the current retrieval condition setting is displayed on the screen, as shown in Figure 17. Retrieval condition includes time range and application type.

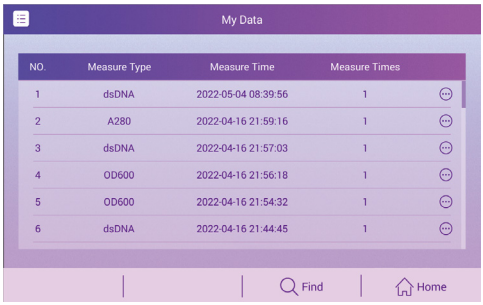


Figure 17

2.1 Main functions of data browsing

(1) Disk status: Click "Data Browsing" in the main interface to enter the data browsing home page, click the menu bar in the upper left corner to pop up the menu, click the disk status, and view the current disk space usage of the instrument, as shown in Figure 18.

(2) Search: Click "Data Browsing" in the main interface to enter the data browsing home page as shown in Figure 17, and click the "Search" to enter the search page and select screening conditions as shown in Figure 19.

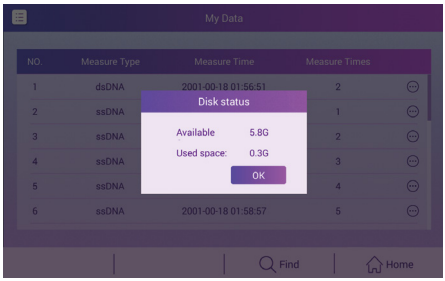


Figure 18

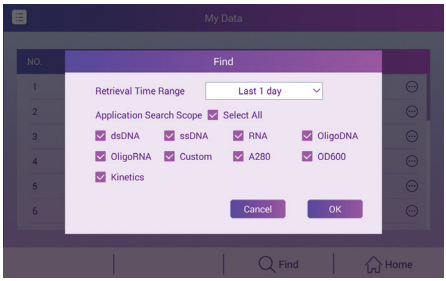


Figure 19

The search condition includes the following:

Retrieval time range--the time during the experiment, there are seven time ranges: "last 1 day", "last 2 days", "last 1 week", "last 2 weeks", "last 1 month", "last 2 months" and "last 6 months".

Application retrieval range--used to screen and view specified applications. After selection, only the checked application categories will be displayed. Click "All" to automatically select all applications.

(3) Delete: Click "Data Browsing" in the main interface to enter the data browsing home page as shown in Figure 20. Press and hold one line to enter the selected status. When

it is selected, the original "Search" button will change to "Delete", and then click "Delete" to delete this experiment from the database.

Note: Multiple lines can be selected for deletion at the same time.

(4) View data: Click "Data Browsing" in the main interface to enter the data browsing home page, and then click  to view the details of this group of data, as shown in Figure 20.

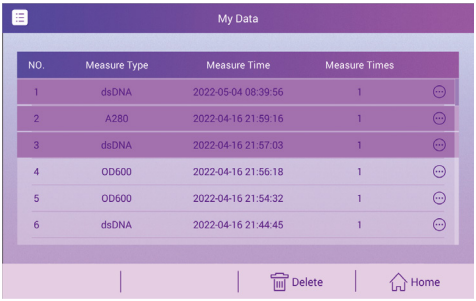


Figure 20

3. Setting

In the main interface, click the "Setting", or click  and select "Setting" in any measure item. The instrument setting is mainly divided into four modules: "System Setting", "General Setting", "Dye Editor" and "Protein Editor".

Save: Click the "Save" to save all operations of the settings on the setting page. And prompt "settings have been saved", as shown in Figure 21

Cancel: Click the "Cancel" to cancel the operation on this page and back to the previous page.

Back: Click the "Back" button to keep the deletion operation of the editor and return to the previous page.

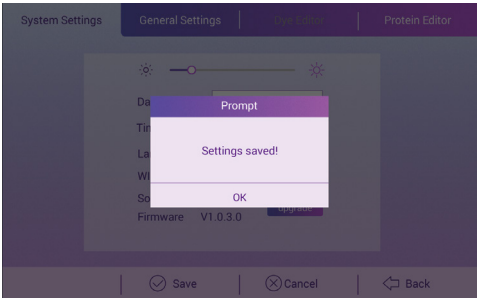


Figure 21

3.1 System settings

Includes the following content (as shown in Figure 22):

Brightness--adjust the brightness of the touch screen of the instrument

Date and time--manually set the time and date of the instrument, using the 24-hour time format

Language--switch the language of the instrument, and choose Chinese or English

WIFI--WIFI hotspot parameter setting

Software version--the current version of the software

Firmware version--the current version of the firmware

USB flash disk upgrade--please contact our after-sales technicians

Figure 22

3.2 General setting

Includes the following content (as shown in Figure 23):

Automatic testing--if the automatic testing function is turned on, put down the upper arm in the base testing and start the measure automatically without clicking the testing function key.

Automatic naming--automatically use the basic name (Sample by default) followed by a number starting with "1" to assign the sample name.

Use the cuvette--select the cuvette style as shown in Figure 24. If this option is selected, the following additional options will be provided:

Optical path: Set the cuvette optical path (width) before using the cuvette for blank measure or sample measure.

Stir speed: When stirring, put the stirring microspheres into the sample cuvette and set the stirring speed range.

Heat up to 37℃: If the sample cuvette needs to be heated, select this item and the cuvette heater will heat the cuvette to 37℃.

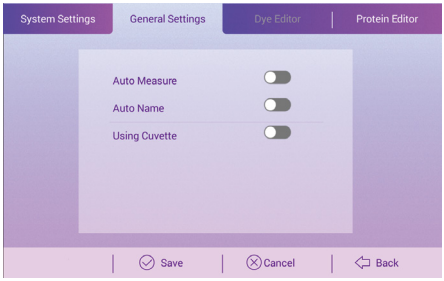


Figure 23

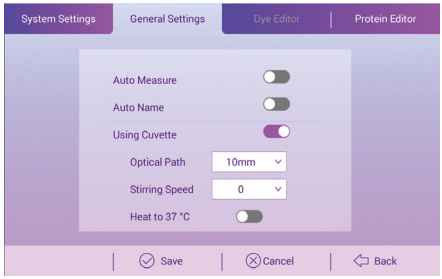


Figure 24

3.3 Protein editor

Use protein editor to add user-defined protein to the list of available protein sample types in protein A280 parameter setting and protein chip parameters setting. As shown in Figure 25.

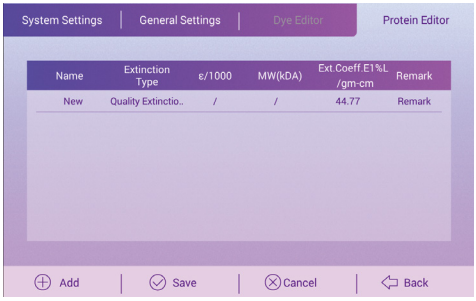


Figure 25

The protein editor includes the following operations:

(1) Add user-defined proteins: Click the "Add" to automatically add a self-defined protein at the bottom of the list;

(2) Edit user-defined proteins: Select a line and enter the editing status. As shown in Figure 26. Name: Enter a special name for the protein.

Extinction type: The molar extinction coefficient or mass extinction coefficient for self-defined protein used by the specified user. If the mass extinction coefficient is selected, enter the mass extinction coefficient for 10mg/ml(ε1%) protein solution in L/gm-cm. If the molar extinction coefficient (ε) is selected, the unit is M-10mm-1 divided by 1000 (i.e. ε/1000). For example, for protein with a molar extinction coefficient of 210000 M-10mm-1, input 210. The input unit is the molecular weight (MW) in kilodalton (kDa).

Notes: Add a note for protein.

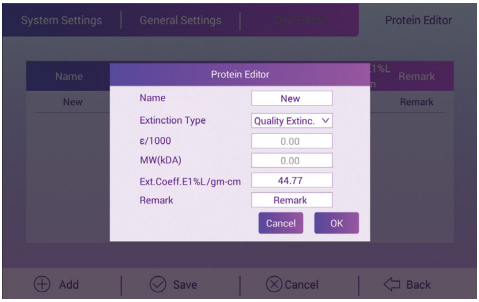


Figure 26

(3) Delete user-defined dye: Press and hold a line to select the protein, and click "Delete" to delete the user-defined protein permanently.

4. Instrument diagnosis

Use spectral intensity diagnosis to confirm normal operation and calibration of the internal spectrometer; Use spectrum diagnosis to confirm normal optical fiber motion. Enter the home page of the instrument, click the "Instrument Diagnosis" at the bottom right corner to enter the instrument diagnosis interface. As shown in the Figure 27:

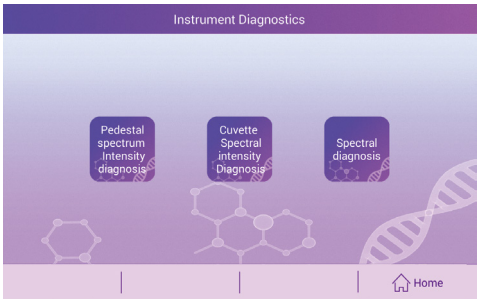


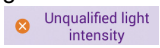
Figure 27

4.1 Base spectral intensity diagnosis

(1) Click "Base Spectral Intensity Diagnosis" on the interface of "Instrument Diagnosis" to enter the interface of "Base Spectral Intensity Diagnosis", as shown in Figure 28.

(2) Without adding any reagent to the base, click the "Measure" on the screen.

(3) After the testing, observe the green 

icon in the diagnosis bar in Figure 29, and the base light intensity diagnosis is passed; If the red 

icon appears, please contact our after-sales technicians for cooperation in troubleshooting.

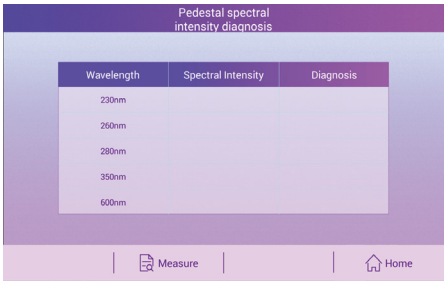


Figure 28

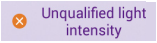
Figure 29

4.2 Cuvette spectral intensity diagnosis

(1) Click "Cuvette Spectral Intensity Diagnosis" on the interface of "Instrument Diagnosis" to enter the interface of "Cuvette Spectral Intensity Diagnosis", as shown in Figure 30.

(2) There is no reagent in the cuvette testing tank, click the "Measure" on the screen.

(3) After the testing is completed, the green 

icon in the diagnosis bar represents qualified cuvette spectral intensity diagnosis at this wavelength, as shown in Figure 31; The red 

icon indicates that the cuvette spectral intensity diagnosis at this wavelength is not qualified. Please contact our after-sales service for troubleshooting.

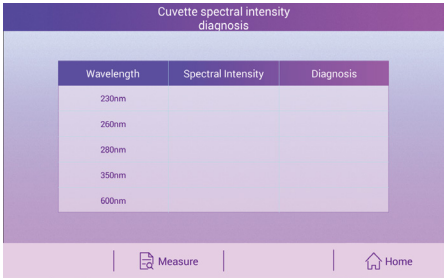


Figure 30

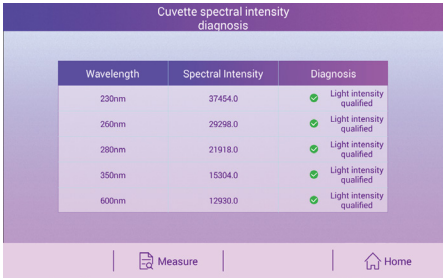


Figure 31

4.3 Spectrum diagnosis

(1) After the spectral intensity diagnosis, click "Spectrum Diagnosis" to enter the " Spectrum Diagnosis" interface. As shown in Figure 32.

(2) Add 1-2 μl blank solution to the bottom base, put down the upper arm and click "Blank Measure".

(3) Wipe the blank liquid on the base with clean and dust-free paper and add 2 μl potassium dichromate to the bottom base and click the "Measure" button for testing.

(4) The measure value will be displayed in the current absorbance value and average absorbance value (average value of multiple potassium dichromate tests), and the corresponding error shall be within 2% of 1 mm error, 5% of 0.2 mm error, 15% of 0.1 mm error, 35% of 0.05 mm error and 45% of 0.03 mm error.

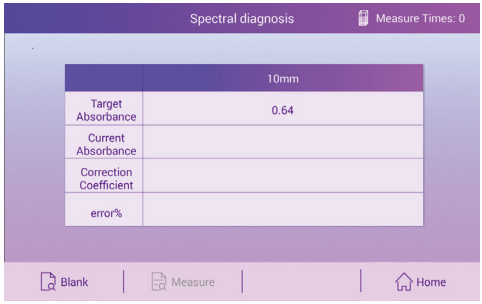


Figure 32

Precautions	Spectrum diagnosis needs to be done for ten times. After ten tests, the relevant data will be automatically stored in the software to complete the spectrum diagnosis.

Basic Measuring Operation

1. Basic operation of base testing

(1) Lift the upper arm (as shown in figure 33-1), add the blank solution to the testing base (as shown in figure 33-2), put down the upper arm, and click "Blank Measure" to measure the blank value.

(2) Lift the upper arm, wipe the solution on the upper and lower bases (as shown in Figure 33-2 and 33-3) with clean and dust-free paper, add 1-2μl sample to the testing base, put down the upper arm, and click "Measure" to complete the sample measurement.

(3) Lift the upper arm and wipe the samples on the upper and lower base with clean and dust-free paper to avoid the residue of the samples on the base after the measure is completed.

(4) Click "Save", enter the file name, and click "Confirm" after the measure is completed.

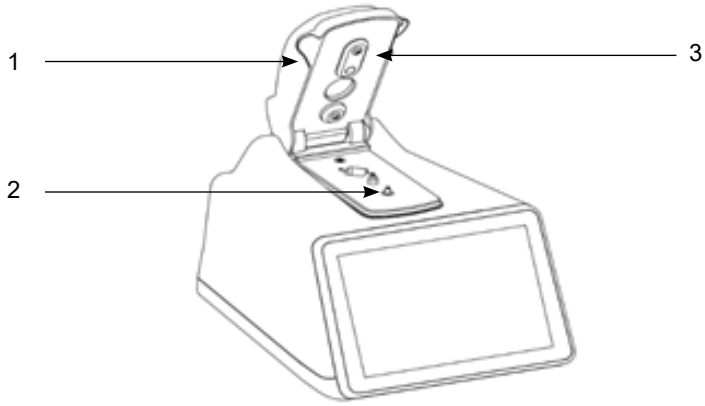


Figure 33

2. Basic operation of cuvette testing

Measurement specification of cuvette	• External dimensions of cuvette: 12.5 mm (L) x 12.5 mm (W) x 45 mm (H); • Optional cuvette optical path: 10, 5, 2 and 1 mm; • Testing area: The testing area is 8.5 mm high from the bottom; • Please choose quartz or other ultraviolet-transparent cuvette, if the measurement wavelength is less than 340 nm.

(1) Click "Settings" in the main interface, or click "Menu" and select "Settings" in any measure items, select "Use Cuvette" in "General Setting", set "Optical Path", "Stir Speed" and whether to "Heat to 37℃" and click "Save".

(2) Prepare two cuvettes, one with blank measure liquid and the other with sample, to ensure that the amount of liquid added is sufficient to cover the optical beam. The optical beam (2 mm wide) is positioned 8.5 mm above the bottom of the cuvette, add liquid as recommended by the manufacturer. (3) Click the "Settings" on the home page of the display screen to enter the setting page, click "General Setting", select "Use Cuvette", insert cuvette, check baseline correction, and set corresponding parameters for blank measure and measure.

(4) Lift the upper arm and insert the cuvette with the blank solution into the apparatus, paying attention to the illuminating surface when inserting the cuvette, which should be corresponded to the direction pointed by the optical path on the instrument (as shown in the arrow direction in Figure 34) Lower the upper arm and click "Blank Measure" to measure the blank value.

(5) Lift the upper arm, remove the cuvette with the blank solution, put it into the cuvette with the sample, lower the upper arm and click "Measure" to complete the sample measurement.

(6) Remove the cuvette, pour out the sample and clean the cuvette when the measure is finished.

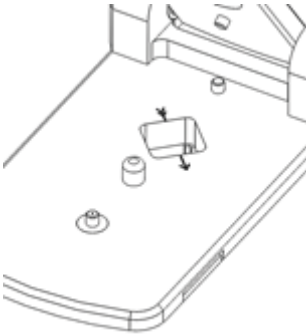


Figure 34

Precautions	Regardless of the mode used for testing, the upper arm must be lowered. The interface of the instrument will show "Please close the upper arm" or "Abnormal experimental data" if the upper arm is not lowered. Remove the cuvette to ensure that the upper arm is placed in the correct position before the base testing.

3. Blank cycle of base testing

It is recommended to use the blank control as a sample to confirm that the instrument is performing well and there is no sample residuals on the base, and operate the blank cycle as follows:

(1) Click "dsDNA" in the "Nucleic acid" interface of the display screen to enter the testing interface, add 2 μl pure water to the base with a pipette, lower the upper arm, click "Blank Measure" in the testing interface, lift the upper arm and wipe the samples on the upper and lower bases with clean dust-free paper after finishing the measure.

(2) Add 2 μl pure water to the measure base with a pipette, lower the upper arm, click "Measure" on the testing interface, lift the upper arm, and wipe the samples on the upper and lower bases with clean dust-free paper after finishing the measure.

(3) Repeat the pure water testing step twice. Save the results, lift the upper arm, wipe the samples on the upper and lower bases with clean and dust-free paper, and then lower the upper arm after finishing the measure.

(4) Observe the change of absorbance of three testing results on the display screen, which should not exceed 0.04 A; Although it is unnecessary to perform a blank measure between each sample, it is recommended to perform a blank measure every 30 min in the measure of multiple samples.

Nucleic Acid Testing

Sample types in this category include "Double-stranded DNA (dsDNA)", "Single-stranded DNA (ssDNA)", "RNA", "Oligo DNA", "Oligo RNA" and "Custom". "Oligo DNA", "Oligo RNA" and "User-defined". Click the corresponding key of sample type, and the nucleic acid measurement interface will be displayed on the display screen, as shown in Figure 35.

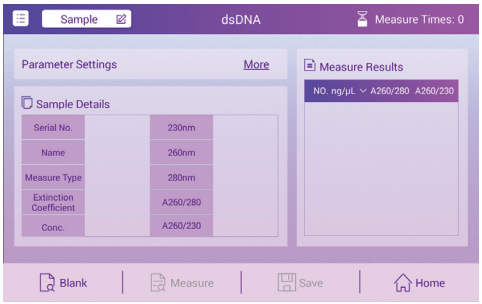


Figure 35

1. Calculation of nucleic acid concentration

Beer-Lambert law is used to calculate nucleic acid concentration:

C=(A*ε)/b

C——The unit of nucleic acid concentration is ng/ml

A——The unit of absorbance is AU

ε——The unit of extinction coefficient is ng-cm/ml

b——The unit of optical path is cm

Types and extinction coefficients of samples

Sample type	Extinction coefficient	Sample type	Extinction coefficient
dsDNA	50	ssDNA	30
Oligo DNA	Enter by users	Oligo RNA	Enter by users
RNA	40	Others	Enter by users

When the base mode is selected, the instrument will use a short optical path of 1.0 mm to 0.05 mm for testing. The highly concentrated samples can be tested without dilution. The instrument can accurately measure double-stranded DNA concentration ≤ 27500 ng/ul without dilution. The software will automatically select the best testing optical path for each sample.

A small amount of samples can be used for testing, when the absorbance of the testing sample is ≥3.0 (under 10 mm optical path)

2. Measure of nucleic acid concentration

Refer to "Basic Measurement Operation".

The measure results include the following content:

Sample type: Type of sample testing.

Sample name: Enter the name of the sample before testing.

Testing mode: Measure the cuvette or the base.

Creation time: System time for testing.

A230 (10 mm optical path): The absorbance at 230 nm under 10 mm optical path is displayed.

A260 (10 mm optical path): The absorbance at 260 nm under 10 mm optical path is displayed.

A280 (10 mm optical path): The absorbance at 280 nm under 10 mm optical path is displayed.

260/280: The ratio of absorbance at 260 nm and 280 nm, which is used to determine purity. If this ratio is small, it indicates that there are protein, phenol or other contaminants, which have obvious light absorption at 280 nm.

260/230: The ratio of absorbance at 260 nm and 230 nm, which is a secondary indicator of nucleic acid purity. The ratio of pure nucleic acids is larger than 260/280 ratio. If the ratio is low, it indicates that there are contaminants in the nucleic acid.

Concentration: The concentration calculated from the absorbance and extinction coefficient at 260 nm, and the concentration unit can be selected in the following drop-down box.

Protein A280 Testing

Proteins are highly diverse. A280 is mainly used to detect those pure proteins containing Trp, Tyr residues or Cys-Cys disulfide bonds, which have higher absorbance at 280 nm. As shown in Figure 36.

Note: Please use protein A205 instead of protein A280, if the sample contains major peptide bonds and few or no amino acids (this instrument cannot complete it).

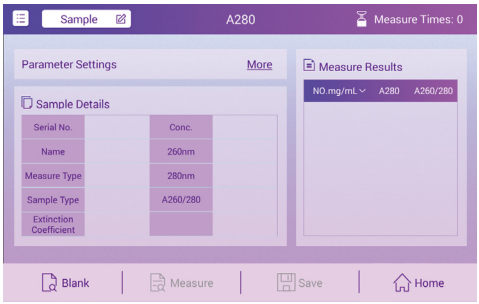


Figure 36

1. Range of testing concentration

The maximum value of BSA without dilution is 400mg/ml in base mode of this instrument. The software can automatically use different optical paths to measure the absorbance of each sample.

The small capacity measure can be selected, when the 10mm absorbance of the sample is >3.0 (>4.5 mg/ml BSA)

Option of protein A280 measure type

1Abs＝1 mg/ml	The absorbance of 1 mg/ml protein at 280 nm is 1A.
BSA	The protein concentration is calculated by mass extinction coefficient with reference to calf serum albumin: The mass extinction coefficient of 10 mg/ml protein at 280 nm is 6.7.
IgG	The protein concentration was calculated by mass extinction coefficient with reference to IgG: The mass extinction coefficient of 10 mg/ml protein at 280 nm is 13.7.
Lysozyme	The protein concentration was calculated by mass extinction coefficient with reference to lysozyme: The mass extinction coefficient of 10 mg/ml protein at 280 nm is 26.4.
(ε+MW)	Users can input molar extinction coefficient by themselves as a reference for protein measure.
(ε1%)	Users can input the mass extinction coefficient by themselves, as a reference for 10 mg/ml protein measure.

2. Protein A280 Testing

Refer to "Basic Measurement Operation".

The measure results include the following content:

Sample name: Enter the name of the sample before testing.

Testing mode: Measure the cuvette or the base.

Creation time: System time for testing.

Sample type: Six preset samples are available for protein analysis and concentration calculation. These selections can be made in the drop-down box next to the type. The default is 1 Abs=1 mg/ml.

Concentration: Concentration is calculated from the absorbance of the protein at 280 nm and the selected extinction coefficient The concentration unit can be selected from the drop-down box next to it. The default unit is mg/ml.

A260 (10 mm optical path): The absorbance at 260 nm under 10 mm optical path is displayed.

A280 (10 mm optical path): The absorbance at 280 nm under 10 mm optical path is displayed.

260/280: The ratio of absorbance values at 260 nm and 280 nm.

OD600 Testing

The cell measure is to use a spectrophotometer to measure the scattered light through the cell suspension and calculate the corresponding absorbance. The optical path is the biggest difference between base testing and cuvette measure for this instrument. By testing the absorbance of cell growth culture at 600 nm, the OD600 is used to measure the growth rate of bacteria or other microbial cells. The Beer-Lambert equation and user-entered conversion coefficients are used to correlate absorbance with concentration. The growth cycle of the cultured cell population is determined according to the reported concentration. As shown in Figure 37.

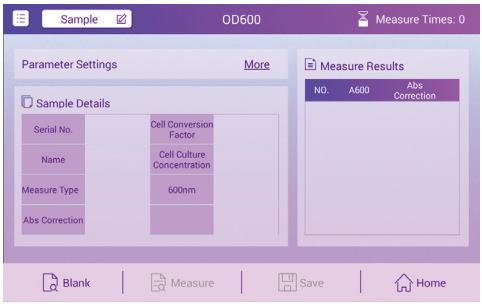


Figure 37

1. Sample uniformity

Ensure the uniformity of samples before testing. The samples should be mixed uniformly before base testing and then added to the base for testing. The stirring function can be used when the measure is conducted with cuvette.

2. Measure range

The instrument can measure relatively high concentration of cell suspension because the relatively short optical path is used. Users can also use cuvette to measure thinner samples.

3. Disinfection of the base

Please use disinfectant if disinfection is required. For example, 0.5% sodium hypochlorite can be used to clean the base to ensure that there are no bioactive substance residues on the base.

Precautions	Pay attention to the upper and lower bases and the outside of the instrument, clean the instrument with dust-free paper wetted with pure water, and finally wipe the instrument with dry paper.

4. Measure the concentration of OD600

Refer to "Basic Measurement Operation".

The measure results include the following content:

Sample name: Enter the name of the sample before testing.

Testing mode: Measure the cuvette or the base.

Creation time: System time for testing.

Absorbance calibration: User-defined baseline values can be adjusted by entering data with absorbance values between 0 and 300A. The absorbance correction value is subtracted from the absorbance at all wavelengths in the sample spectrum

600 nm (Abs): The user-defined baseline and the absorbance at 600 nm.

Coefficient (10): User-defined coefficients. A recognized coefficient for testing cell type, or a solution for studying cells empirically by using a known concentration of the same medium. The default value is $1x10^8$. It is the recognized coefficient for most bacterial cell suspensions, such as Escherichia coli.

Cell culture concentration (10): The reporting unit is cell number/ml. It is calculate by using corrected A600 absorbance based on Beer-Lambert equation.

Kinetics Testing

It can be used for kinetics testing of samples in cuvette. At most 3 wavelengths between 190 nm and 850 nm can be specified for continuous absorbance measure in up to 5 phases at user-defined intervals. As shown in Figure 38.

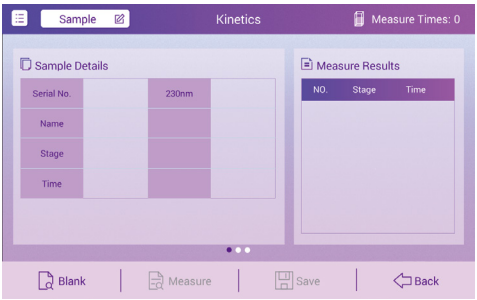


Figure 38

1. Kinetics Testing

(1) Select the "Other" option on the home page and click "Kinetics".

(2) Display the "Kinetics" screen as shown in Figure 39. If one or more kinetics methods are available for the currently selected data storage location, they will be listed in the box on the left and a description of the selected method is displayed in the box on the right.

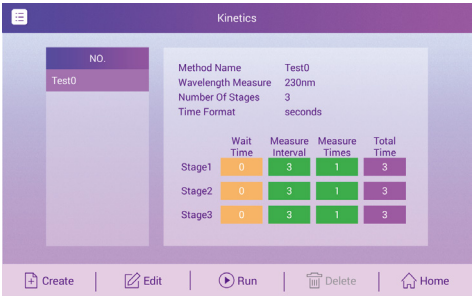


Figure 39

(3) Select a method:

Click the method name in the left box and select an existing method

Create a new method by clicking "Create", specify method settings, and select the save method.

Edit an existing method by clicking "Method Name" and selecting "Edit"

Delete an existing method by clicking on "Method Name" and selecting "Delete" (if there is only one kinetics method, deletion is not available).

Set cuvette options, such as heating or stirring, by clicking "General Setting" in Settings (the detailed information is shown in the General Setting).

Note: Specify the correct optical path in "General Setting" if the cuvette optical path is not 10 mm.

(4) Click "Run".

(5) Perform the blank measure, fill enough blank measure solution in a clean and dry cuvette to cover the optical path of the instrument. Lift the upper arm of the instrument and insert the blank measure cuvette into the cuvette slot, make sure the optical path of the cuvette is aligned with the optical path of the instrument, and click "Blank Measure".

(6) If "Heat to 37°C" is selected in the general setting, the current temperature will be displayed, and wait for the heater to reach the target temperature before starting the measure. Click "Blank Now" to start blank measure, as shown in Figure 40.

(7) Take out the cuvette when the blank measure is finished.

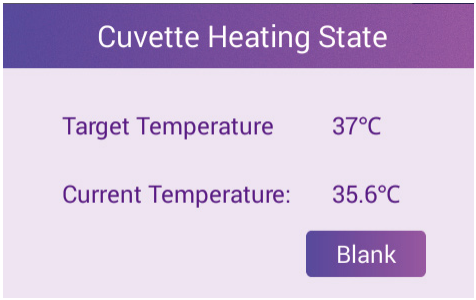


Figure 40

Precautions	Samples tested each time must be newly added.

(8) Measure the sample, fill sufficient blank measure solution in a clean and dry cuvette to cover the optical path of the instrument. Insert the sample cuvette into the cuvette slot, make sure it is aligned with the optical path, and click "Measure". After the measure starts, click "Stop" before all phases are finished, to end the measure ahead of time and wait for all measure phases to be finished.

Precautions	Reagents can be added to the sample solution at any time during retesting.

(9) Take out the cuvette and clean it according to the manufacturer's specifications after the measure is finished.

2. Creating Kinetics

(1) Select the "Other" option on the home page and click "Kinetics".

(2) Create a new method by clicking "Create", specify method settings, and select the save method. (It will automatically enter the kinetics method creation page, if there is no kinetics method at present) as shown in Figure 41.

(3) Enter the method name and specify a maximum of three testing wavelengths.

(4) Select the number of phases and the unit of time (minutes and seconds)

(5) Specify the number of intervals in each phase and the delay between interval time and phases. The specific phases are clearly indicated by the color lines and boxes on the right. Colored lines indicate the start and end times of each phase, and colored boxes correspond to the specific delays and the number of tests for each phase.

(6) Click "Save" to save the method and return to the kinetics menu.

(7) Click "Run" to run it.

Figure 41

3. Carry out kinetics editing

Refer to "Creating Kinetics".

The measure results include the following content:

Sample name: Enter the name of the sample before testing.

Testing mode: Measure the cuvette or the base.

Creation time: System time for testing.

Sample type: Testing type.

Phase: Testing phase

Time: Time from start of measure to current measure

Cuvette optical path: Optical path used in the measure.

A230 (10 mm optical path) The absorbance at 230 nm under 10 mm optical path is displayed.

Alarm and Prompt

1. Experimental data anomaly

Information in prompt box: Abnormal experimental data

Solution: Whether the upper arm is opened during the experiment. Wipe the base and cuvette slot with dust-free paper, and remeasure it.

2. Xenon lamp anomaly

Information in prompt box: Xenon lamp anomaly.

Solution: Check whether the upper arm is opened and the base is clean, and whether there is a shade in the cuvette slot. Clean the base optical fiber with dust-free paper, and restart the instrument to finish the experiment.

3. Spectrometer communication failed

Information in prompt box: Spectrometer communication failed.

Solution: 1) Retest 2) Restart the instrument and retest.

4. Base motor anomaly

Information in prompt box: Base motor anomaly.

Solution: Restart the instrument and retest.

5. Base motor blocked

Information in prompt box: Base motor blocked.

Solution: Restart the instrument.

6. The base channel was not found

Information in prompt box: Base channel was not found.

Solution: Check whether the upper arm is opened and whether there is foreign matter on the base. Wipe the optical fiber on the base with dust-free paper, and restart the instrument to measure.

7. Cuvette channel was not found

Information in prompt box: Cuvette channel was not found.

Solution: Check whether the upper arm is opened and whether there is foreign matter on the cuvette. Wipe the optical fiber on the cuvette with dust-free paper, and restart the instrument to measure.

8. Communication failed

Information in prompt box: Communication failed

Solution: Restart the instrument and retest.

9. Operation timeout

Information in prompt box: Operation timeout

Solution: Restart the instrument and retest.

10. Initialization failed

Information in prompt box: Initialization failed

Solution: Restart the instrument.

11. USB flash disk was not found

Information in prompt box: USB flash disk was not found

Solution: Confirm that the USB flash disk is inserted into the port of the instrument. Ensure that it is in place by plugging and unplugging it.

12. USB flash disk has been pulled out, export failed

Information in prompt box: USB flash disk has been pulled out, export failed

Solution: Confirm that the USB port of the instrument has been connected to the USB flash disk when exporting data, Ensure the normal communication of the USB flash disk by plugging and unplugging it, and export the data again.

13. Please close the upper arm

Information in prompt box: Please close the upper arm.

Solution: Check whether the upper arm is covered properly and retest.

14. Please re-add the sample

Information in prompt box: Please re-add the sample.

Solution: Wipe the base and optical fiber (or cuvette optical fiber) with dust-free paper, re-add samples with the standard amount, and retest it.

15. The initial sequence number should not be greater than the terminal sequence number

Information in prompt box: The initial sequence number should not be greater than the terminal sequence number.

Solution: The initial sequence number entered should be less than or equal to the terminal sequence number.

16. The initial sequence number should not be 0

Information in prompt box: The initial sequence number should not be 0.

Solution: The initial sequence number should be greater than 0

17. Maximum is *

Information in prompt box: Maximum is * (* is the total number of experimental results in the instrument).

Solution: The amount of experimental data imported from the network should not be greater than the total amount of experimental data inside the instrument.

18. File already exists

Information in prompt box: File already exists!

Solution: Please select experimental data that is not imported in local import.

19. Incorrect file type:

Information in prompt box: Incorrect file type:

Solution: Select the file type "CSV" with correct content to import.

20. The selected file does not exist, please reselect.

Information in prompt box: The selected file does not exist, please reselect!

Solution: Select the files that exist in the import directory.

21. Please connect the instrument first

Information in prompt box: Please connect the instrument first.

Solution: Perform online operations before importing.

22. Connection failed, please try again

Information in prompt box: Connection failed, please try again

Solution: Confirm that the WIFI is on and the upper computer is connected to it, and then click the "Online" again.

23. The instrument is being tested, please try again later

Information in prompt box: The instrument is being tested, please try again later.

Solution: Confirm that the instrument is in idle state before connecting.

24. The same file name exists, please close it and try again

Information in prompt box: The same file name exists, please close it and try again

Solution: Error is reported when the file has been exported and opened in the upper computer. Please close the file before exporting it.

25. Error, please check the local network connection

Information in prompt box: Error, please check the local network connection

Solution: 1) Restart the instrument and re-operate according to the steps; 2) Contact our after-sales personnel.

26. Start time cannot be greater than end time

Information in prompt box: Start time cannot be greater than end time.

Solution: The start time should not be greater than the end time when experimental data is screened.

Malfunctions and Troubleshooting

In case of malfunctions, check the cause according to the following table, and take corresponding countermeasures to eliminate them.

Malfunctions, Reasons and Solutions

Malfunctions	Reasons	Solutions
No response when powering on	Loose plug	Insert the plug
Photometric accuracy error, repeatability error and out-of-tolerance	1. The absorbance of the sample is too high (>2A)	1. Dilute the sample
	2. Use the glass cuvette in the wave band below 350 nm	2. Use quartz cuvette
	3. The cuvette is not clean enough	3. Clean the cuvette
	4. There is the dirt is on the base	4. Remove dirt from the base
	5. Other reasons	5. Please contact us
Error is reported after power-on self-test or channel switching	1. There is a shade in the cuvette slot	1. Remove the shade in the sample pool
	2. Use the glass cuvette in the wave band below 350 nm	2. Use quartz cuvette
	3. The cuvette is not clean enough	3. Clean the cuvette
	4. There are foreign matters in the base	4. Clean the base optical fiber
	5. Base fibers are not aligned	5. Please contact us
	6. Switch parts jammed	6. Please contact us

In case of malfunctions other than the above table, please contact us immediately so as to help you solve the problems in time.