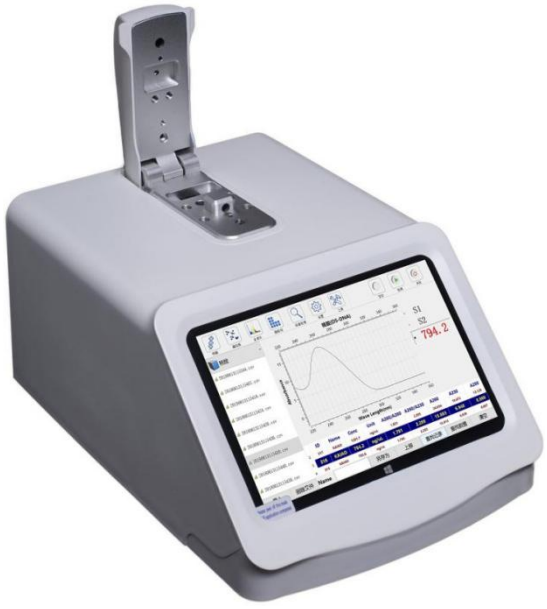
Drawell User Manual

K5600 micro spectrophotometer

V2.0 User manual



This manual will guide you to use the K5600 micro spectrophotometer correctly. Please read this manual carefully before you install, configure and use.

Shanghai Drawell Scientific CO,.Ltd. will not be held liable for any personal injury or loss caused by user data loss and other accidents mentioned in this manual. Shanghai Drawell Scientific CO,.Ltd. is not responsible for accidents caused by potentially bad operations not mentioned in this manual.

If you comply with the above regulations, from now on, you can enjoy the convenience brought by K5600 micro spectrophotometer in work and life.

Packing List

The following items are included in the box of each set of products. If you find that the following items are incomplete when you unpack the box for the first time, please contact Shanghai Drawell Scientific CO,.Ltd. or the product distributor to provide or replace related items for free.

Item	unit	Remarks
K5600 micro UV-Vis spectrophotometer	1	
Power cable	1	
Power Adapter	1	
Warranty Card	1	
Certificate of conformity	1	
Inspection report	1	
Instructions	1	

Daily maintenance of instruments

1. Light source. The life of the light source is limited. In order to extend the life of the light source, do not turn on the light source when the instrument is not in use. The continuous use of the instrument should not exceed 3h. If you need to use it for a long time, it is best to pause for 30min.

2. In order to avoid dust and contamination of the instrument, when the work is stopped, the dust cover should be covered.

3. The sample base should be regularly cleaned with 75% alcohol, and washed with water after each experiment to keep the test head clean.

4. Wipe the upper and lower bases with clean dust-free paper before the instrument can perform the next sample test. When using the cuvette mode, remove the cuvette, wash it thoroughly before proceeding to the next sample test.

5. If the instrument is not in use for a period of time, it should be powered on at least 20 ~ 30min each time to keep the machine dry and maintain the performance of the electronic components.

Requirements for the working environment of the instrument

1. The instrument should be placed in a dry room with a relative humidity not exceeding 85%.

2. The instrument should be placed on a solid and stable workbench, and avoid strong or continuous vibration.

3. The indoor lighting should not be too strong, and direct sunlight should be avoided.

4. The electric fan should not blow air directly to the instrument to prevent the light source lamp from affecting the normal use of the instrument due to unstable lighting.

5. Try to stay away from high-intensity magnetic fields, electric fields, and electrical equipment that generates high-frequency waves.

6. The power supply voltage to the instrument is AC 100-240V, the frequency is 50/60Hz, and a good ground wire must be installed. It is recommended to use an electronic AC regulator or AC constant voltage regulator with a power of more than 50W to enhance the anti-interference performance of the instrument. Output is DC 12V 4A.

7. Avoid use in places with corrosive gases such as hydrogen sulfide.

Product description

K5600 micro spectrophotometer is a new full-wavelength (190 ~ 850nm) micro spectrophotometer. The instrument can accurately measure micro samples of 1 ~ 2μL, and has good repeatability. Comes with a computer, display and 2 USB interfaces, built-in software, no need to install, can connect USB devices such as mouse, keyboard, printer, U disk, wireless network card. Just one detection modes microscale mode, and cuvette mode is unavailable. Low-concentration detection is more stable, and high-concentration detection is wider, which is 200 times that of conventional UV-Vis spectrometers, without dilution and baseline calibration. The microscale mode sample requires a small amount of sample and the minimum measurement volume is 1 μL. It can be used to detect nucleic acids, proteins, and conventional full-wavelength scanning. All data is automatically saved, easy to output data statistics, the software is convenient and easy to master.

Principle

After the spectrophotometer has made a blank control, the instrument will automatically record the spectral result of the blank reference solution and save it as the wavelength light intensity reference value. When testing a sample, the light intensity transmitted through the sample is recorded. The transmitted light intensity of the sample and the transmitted light intensity of the blank control are used to calculate the absorbance of the sample according to the following formula:

$$Absorbance = -\log\left[\frac{Intensity_{sample}}{Intensity_{blank}}\right]$$

In this way, the transmitted light intensity of the sample and the blank can be used to calculate the absorbance at a specific wavelength.

Use Lambert-Beer law to determine the relationship between sample concentration and absorbance:：

$$\boldsymbol{A = \varepsilon\, b\, c}$$

Where: A=absorbance (A)

ε= wavelength-dependent molar extinction coefficient (unit L / mol * cm)

b= optical path (in cm)

c= sample concentration (unit mol / L)

The reference solution, or blank solution, is usually the solvent that melts the targeting molecules. This solvent must have the same pH and ionic strength as the sample solution.

Instrument application range

K5600 series micro spectrophotometer can be used to measure:

Nucleic Acid:

1. The concentration and purity of nucleic acid samples, including double-stranded DNA, single-stranded DNA, RNA, and other nucleic acids.

2. The microarray sample can detect the concentration of nucleic acid and fluorescent dye at the same time, and directly give the concentration value.

Protein:

1. A280 measures protein concentration, including BSA, IgG, Lysozyme, Labels;

2. Kit method (Lowry method, BCA method, Bradford method) to determine protein concentration, the software automatically draws a standard curve, and directly gives the concentration value.

Conventional UV / Vis full wavelength scanning:

Scanning at full UV / Visible wavelength (190 ~ 900nm).

Performance parameters

Microscale model

Optical path: 1, 0.5, 0.05mm Adjustable

Minimum sample volume: 1-2.5μl

Light source: Long life xenon lamp

Detector type: 2048 pixel linear silicon CCD whole column

Wavelength range: 190-900nm

Wavelength accuracy: ± 1

Wavelength resolution: ≤2nm (FWHM @ Hg 546nm)

Light Absorption Accuracy: 0.002Abs

Light absorption accuracy: 1% (0.76 absorbance at 350nm)

Absorption value range: 0.02-100 (equivalent to 10mm optical path)

Concentration detection range: 0.4 ~ 15000ng / μl (DS-DNA) 0.1 ~ 100mg / ml (BSA)

Detection cycle: less than 5 seconds

Working voltage: DC 12V / 4A

Maximum power: 25W

Sample base: stainless steel

Dimensions: 30cm * 20cm * 18cm

Weight: 3.2kg

1. Instrument structure

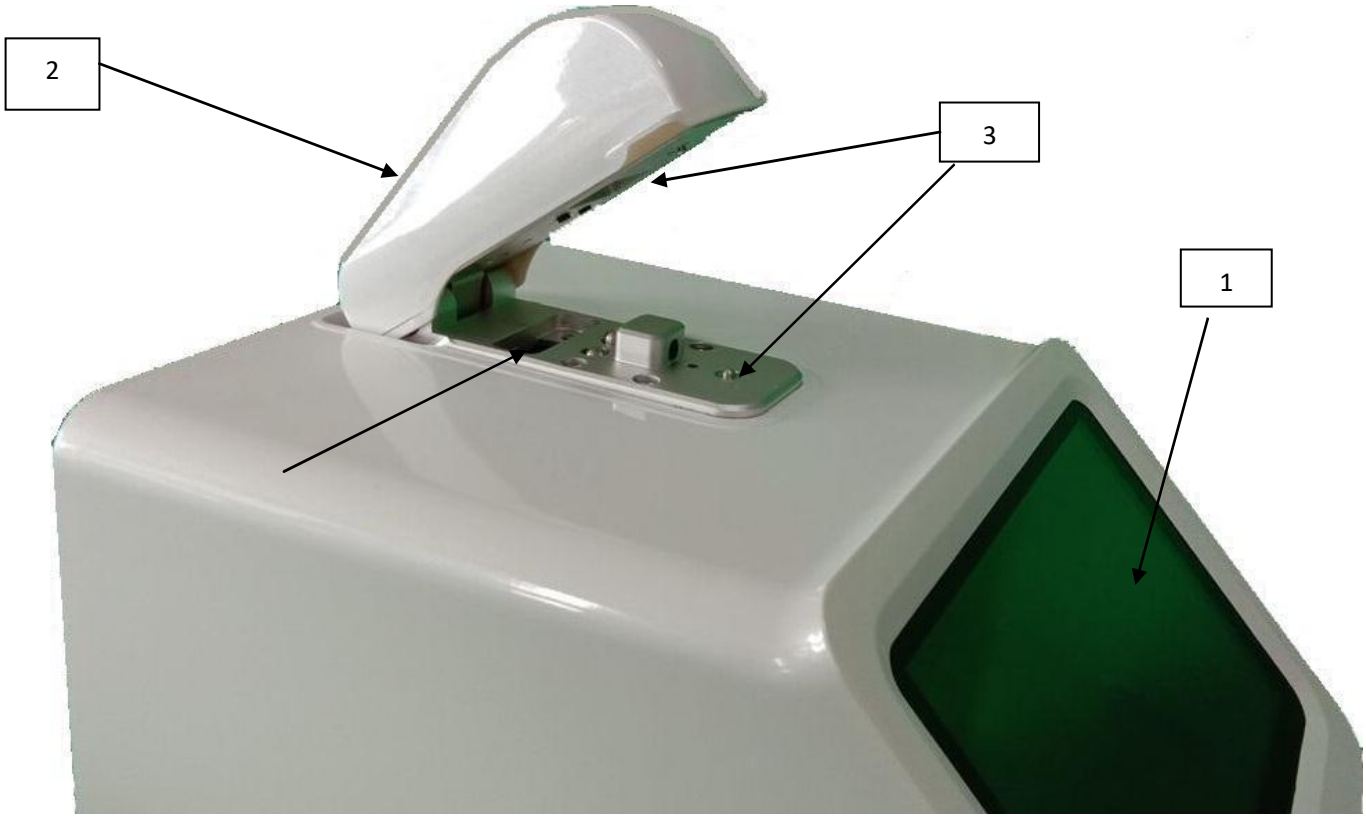


Figure 1 Instrument side view

1. Display 2. Detection arm 3. Pedestal

The instrument has a built-in computer, so no external PC is required. When testing a sample, you can drop the sample on the accessory and use the Microscale mode; you can also place the sample in the cuvette and use the cuvette mode. Mix the sample in the cuvette with a stirring device to make the test result more accurate.

Fig 2. Instrument Back view

1.1. Power socket 2. Instrument switch 3. USB port

After connecting the power, turn on the main switch, press and hold the system switch for 3s and then release it. The instrument system will start, and the test program interface will be entered directly after power-on. You can use an external mouse, keyboard, or U disk with a USB interface.

2. Introduction to detection mode

2.1 Microscale

1. Blank. Use a pipette to take 1-2.5μl (quantitated according to the actual situation) of the buffer solution and drop it on the detection base (the material of the detection base is stainless steel and the center point is quartz), the lower detection head is the receiving end, and the upper detection The head is the transmitting end.

2. Sample measurement Take 1-2.5μl of the sample to be tested with a pipette and drop it on the detection hole. The protein sample needs to be tested with a sample volume of 2.0μl.

3. Due to the inconsistency of the tension between different samples, in order to make the sample better form a liquid column, the recommended sample testing dosage is as follows (the user can adjust according to the actual situation):

Nucleic acid solution: 1.5 μl

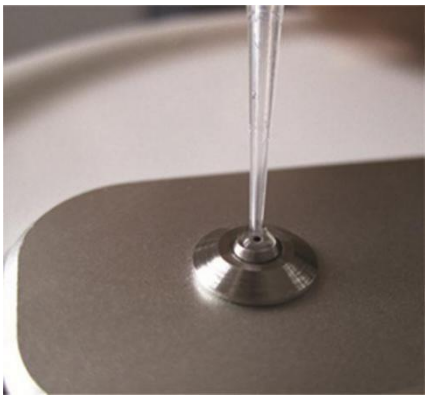
Protein solution: 2.0 μl

Microbial cell suspension: 2 μl

Other samples: 2μl

2.1.1 Basic operation of the base

1. Raise the sample arm, use a pipette to suck 1~2μL of sample solvent and drop it on the hole.

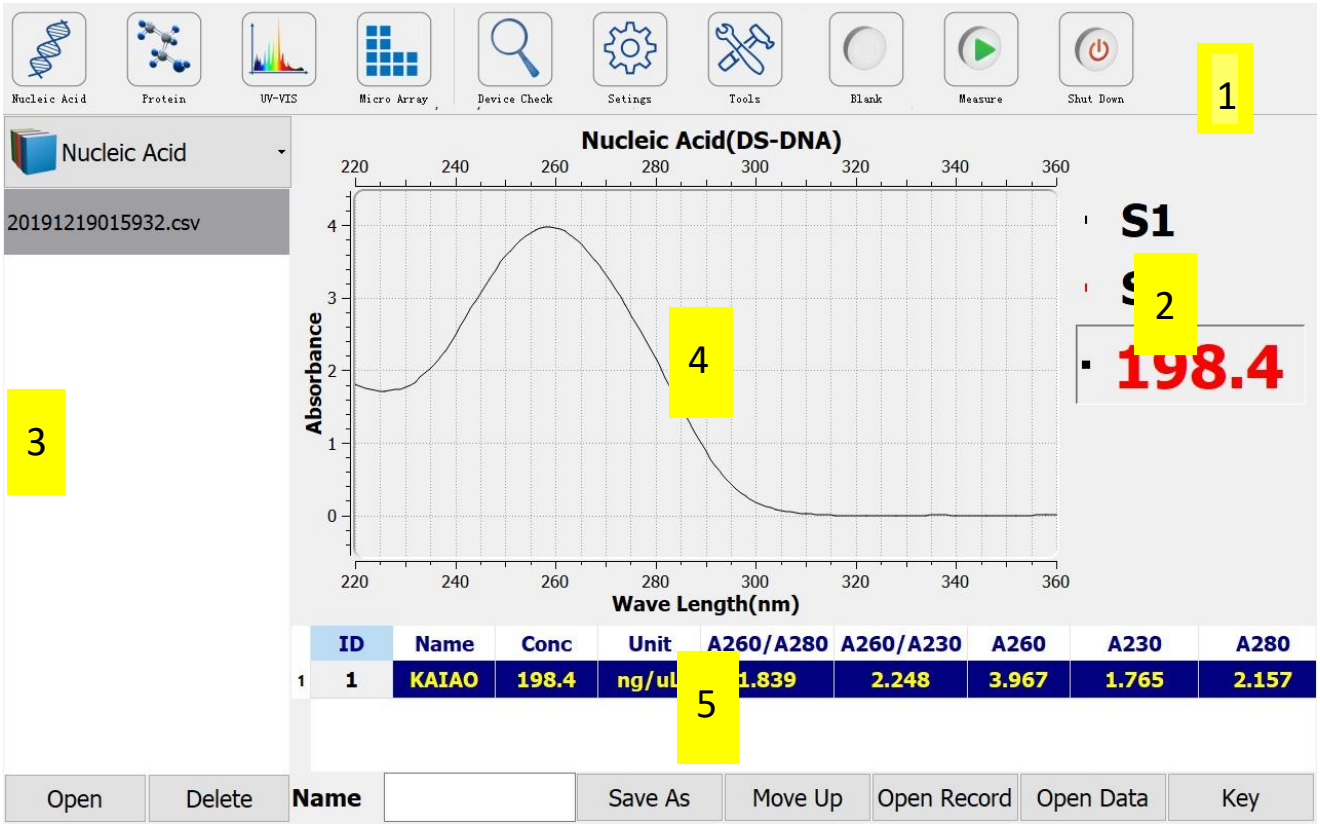


2. Lower the sample arm and start the absorbance measurement using the software on the computer. A sample column is automatically pulled out between the upper and lower optical fibers and then tested.

3. When the test is complete, lift the sample arm and wipe the sample on the upper and lower pedestal with clean dust-free paper. Wiping the sample in this way prevents the sample from remaining on the hole.

3. Software interface introduction

After the system is turned on, the nucleic acid detection interface is entered by default. As shown in the figure.



1.Function control area: Select the corresponding detection module and set the corresponding parameters according to the substance you want to detect.

2.Reference line and curve display buttons: check “OS_1” Choose to show or hide curves; check “OScale1” Show reference line, Drag the reference line to see the absorbance at different wavelengths.

3.History record data: Double-click the history record, and the corresponding spectrum and corresponding data appear on the right.

4. Spectrum display area: displays the spectrum of the detection substance.

5. Detection result display area: displays the parameters of the measured substance mass spectrum.

4. Module function and sample detection

4.1 Nucleic acid module

The K5600 micro spectrophotometer can measure the concentration of nucleic acid samples and evaluate the purity of nucleic acids. Since the nucleic acid has the highest absorption peak of ultraviolet light at a wavelength of 260nm, by measuring the absorbance of the nucleic acid sample at 260nm, the software can directly give the concentration of the nucleic acid sample through the concentration calculation formula (Lambert-Beer's law), and refer to A260 / A280 And A260 / A230 ratio, you can evaluate the purity of nucleic acid samples.

4.1.1 Sample dosage requirements

Volume (recommended): 1~2.5μL

4.1.2 Measuring range

Microscale mode:

DS-DNA: 2~15000 ng/μL

SS-DNA: 2~9900 ng/μL

RNA: 2~12000 ng/μL

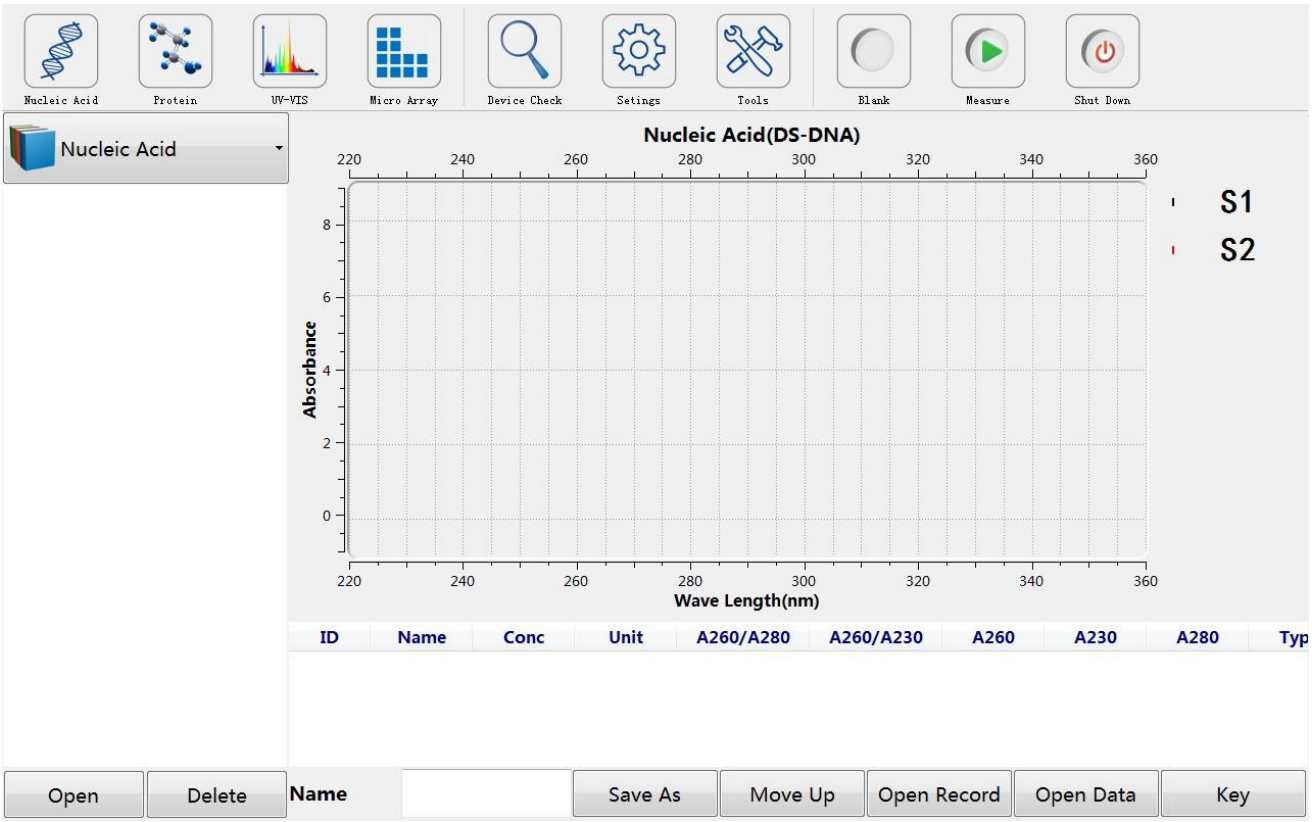
Repeatability (SD = ng/μL；CV= %）:

Sample range 2~100 ng/μL: ±2ng/μL

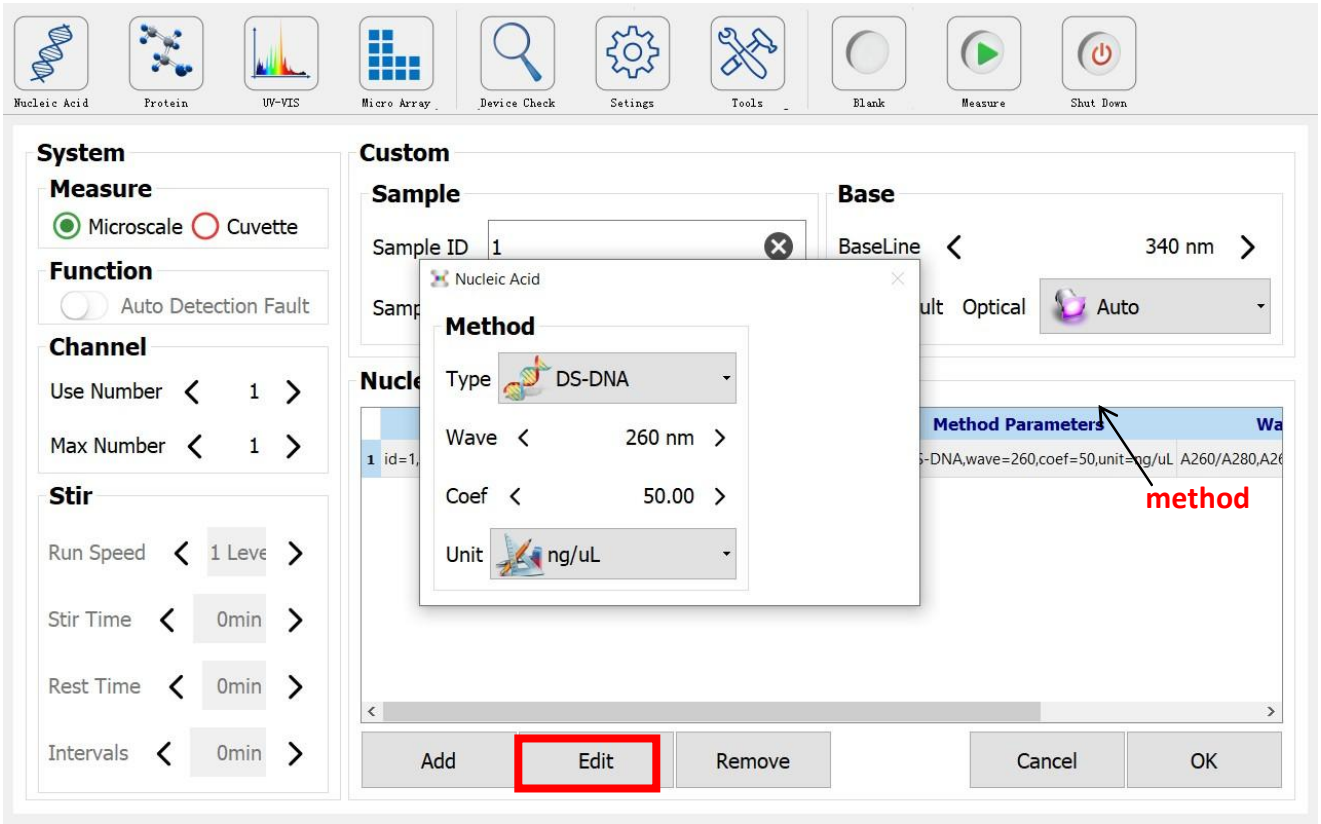
Sample range ＞100 ng/μL: ±2％

4.13 Measurement settings

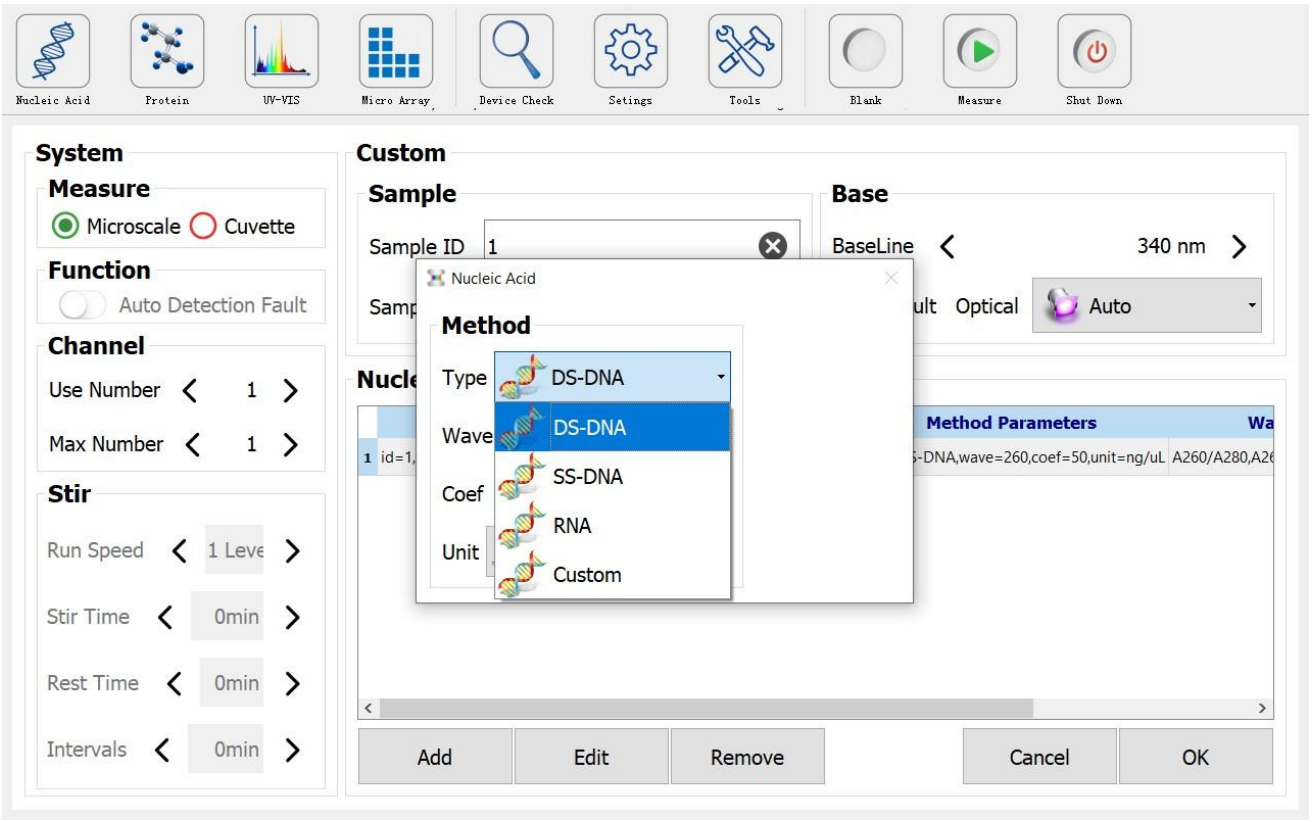
K5600, default interface is nucleic acid measurement interface as follows:



After entering the nucleic acid module, click Settings to enter the setting interface. First only the desired measurement mode in the measurement method "Microscale". Select the optical path according to the concentration. In the microscale mode, if the concentration range is unknown, select the instrument's default automatic optical path “Auto”. Second, choose a nucleic acid detection method. Select the method in the nucleic acid box and click Edit. The following interface will appear. You can change the detection method and concentration unit. As shown in the figure.



Click the drop-down arrow to display DS-DNA, SS-DNA, RNA and user settings. Select based on the type of sample being tested. The density conversion factor can be changed when the user setting is selected. As shown in the figure.



After the setting is completed, click "OK" in the "Method Settings" pop-up window and the "OK" button on the setting interface to return to the initial detection interface and start the detection.

4.1.4 Detection steps

After completing the settings, the test starts. Proceed as follows:

1. Aspirate the nucleic acid solvent with a pipette, drop it on the base, close the detection arm, and click "Blank";

2. Wipe off the solvent with dust-free paper;

3. Drop the sample on the base and click "Measure";

4. After a few seconds, the test results, values and spectra are displayed.

5. Click "Save As" to export the test report (you can select multiple boxes).

The above steps are in microscale mode.

Nucleic acid test results, the sample data will be displayed below the working interface: A230, A260, A280, A260 / A280, A260 / A230, concentration, etc.

- A230 - The absorbance at 230 nm is shown.
- A260 - The absorbance at 230 nm is shown.
- A280 - The absorbance at 230 nm is shown.
- 260/280 - The ratio of the absorbance at 260nm and 280nm. This value is used to determine the purity of DNA and RNA. The ratio of pure DNA is around 1.8 and the ratio of pure RNA is around 2.0. If this ratio is too small, it indicates that protein, phenol or other pollutants are present, and these materials have obvious light absorption at 280nm.
- 260/230 - The ratio of absorbance at 260nm and 230nm. This is a minor indicator of nucleic acid concentration. This ratio of pure nucleic acid is larger than the ratio of 260/280, generally between 1.8 - 2.2. If the ratio is low, it means that there are contaminants in the nucleic acid.
-

4.2 Protein module

K5600 micro spectrophotometer can detect protein concentration. This software provides you with four detection methods, A280, BSA, IgG, Lysozyme. The protein has the highest absorption peak of ultraviolet light at 280nm. For pure protein, the concentration of the protein sample can be directly given by the software's concentration calculation formula (Lambert-Beer law) through the absorbance of the protein sample at 280nm.

421 Sample dosage requirements

Volume (recommended): 1~2.5μL

422 Measuring range

Microscale mode

BSA: 0.10~100mg/mL

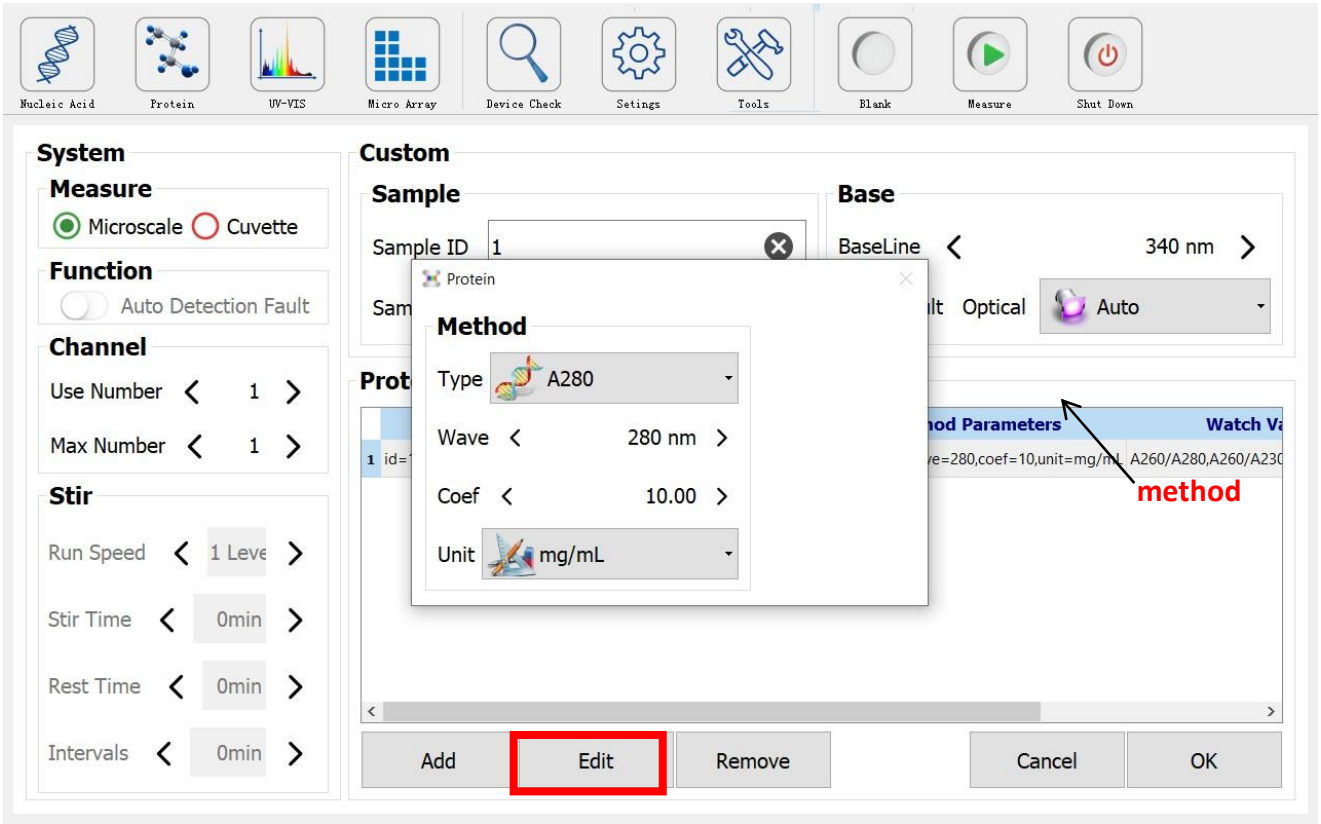
Repeatability（SD = mg/mL；CV = %）：

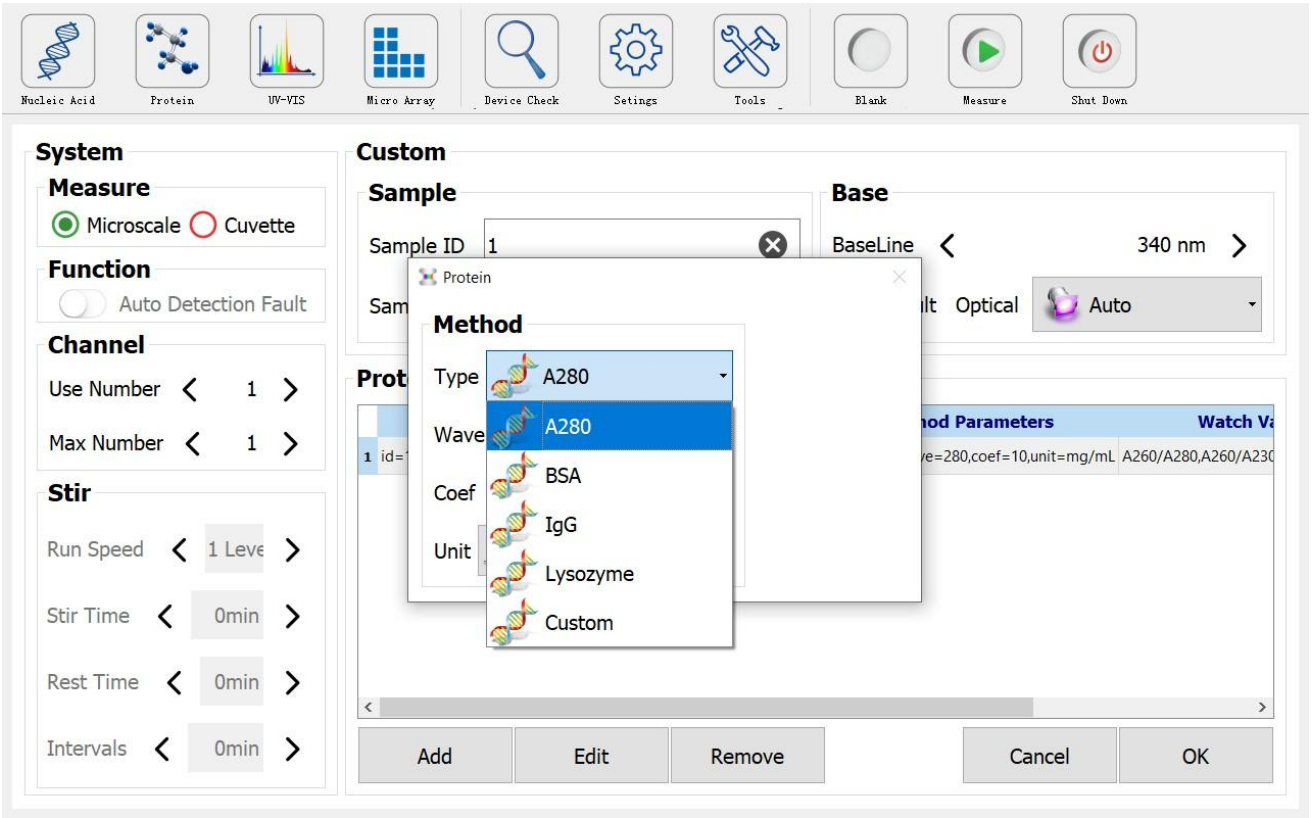
Sample range 0.1~10mg/mL: ±2mg/mL

Sample range >10mg/mL: ±2 %

423 Measurement settings

Click the "Protein" button in the function control area to enter the protein measurement interface. In the protein interface, click Settings to enter the protein setting interface, only "microscale" detection mode, and then select the optical path. Then select the method in the protein setting box and click Edit. The method selection interface appears, as shown in the figure.





The four built-in detection methods are: A280, BSA, IgG, Lysozyme.

A280 is used to measure protein with a concentration of 1mg / mL and a light distance of 10mm with an absorbance of about 1.0.

BSA, IgG and Lysozyme used to measure pure bovine serum albumin, immunoglobulin G and lysozyme.

4.2.4 Measurement steps

1. In the settings, select the type of protein to be measured "A280", "BSA", "IgG" or "Lysozyme". If the sample to be tested is bovine serum albumin, select "BSA".

2. First use the solvent to dissolve the protein as a blank control, add the solvent to the base, and click the "Blank" button in the measurement function area, and the program will automatically record the blank value.

3. Wipe off the solvent on the base with a clean absorbent paper.

4. Drop the sample on the base and click the "Detect" button.

5. The test result (value and graph) is displayed after a few seconds.

6. When the test is completed, lift the sample arm and wipe the sample on the upper and lower bases with clean dust-free paper. Wiping the sample in this way prevents the sample from remaining on the base.

7. After measuring a sample, the data of the sample will be displayed below the working interface: A230, A260, A280, A260 / A280, A260 / A230, concentration. On the left is the history.

4.3 UV-VIS

K5600 micro spectrophotometer has the function of ordinary UV-VIS spectrophotometer, can perform full wavelength scanning, the wavelength scanning range is 190 ~ 900nm, the software provides five detectable wavelength positions, users can choose the detection according to their needs Absorbance at different wavelengths.

4.3.1 Sample dosage requirements

Volume (recommended): 1 ~ 2.5μL

4.3.2 Measuring range

Measuring range: 0.1 ~ 75Abs

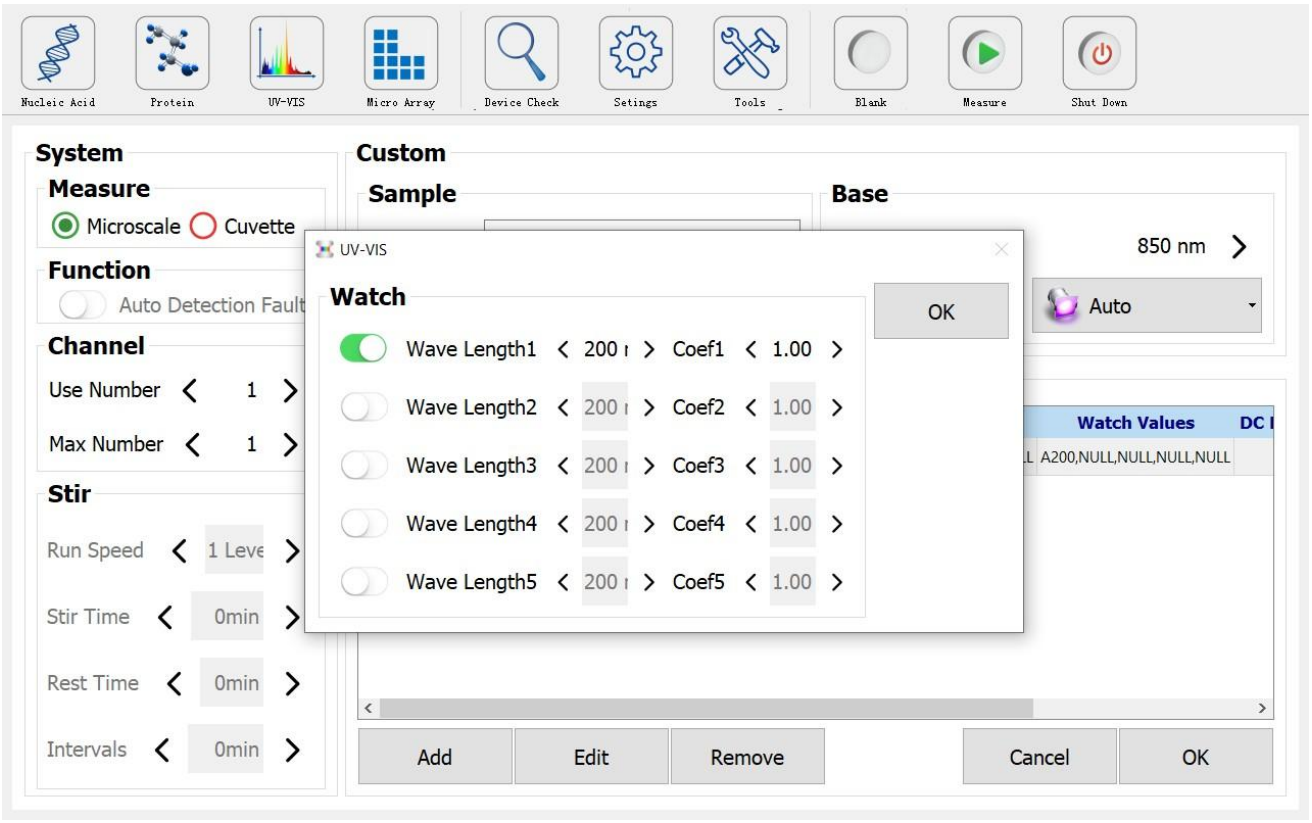
Repeatability (SD= Abs; CV= %)

Measuring range: 0.1~ 5Abs: ±0.1%

Measuring range: 5~75Abs: ±2 %

4.3.3 Measurement settings

After entering the full wavelength mode, just and only the measurement method: microscale. Select the program, click Edit to set the wavelength detection value, and you can set five. After the setting, a reference line appears at the wavelength in the detection result spectrum, and the absorbance at this wavelength is displayed. As shown in the figure.



After the setting is completed, click the "OK" button in the detection value popup window, and then click the "OK" button on the setting interface. Back to the full wavelength detection interface, you can perform the detection.

4.3.4 Measurement steps

1. Pick up the solvent of the sample to be tested with a pipette, drop it on the base, close the detection arm, and click "Blank";

2. Wipe off the solvent with dust-free paper;

3. Drop the sample on the base and click "Measure";

4. After a few seconds, the test results, values and spectra are displayed.

5. When the test is completed, raise the sample arm and wipe the sample on the upper and lower bases with clean dust-free paper. Wiping the sample in this way prevents the sample from remaining

on the base.

6. Click "Save As" to export the test report; export the history (you can select multiple boxes).

The above steps are in microscale mode.

4.4 Microarray

The K5600 micro spectrophotometer can detect the concentration of fluorescent dye-labeled nucleic acids and proteins (microarray samples). This software can measure the concentration of nucleic acids and proteins while measuring the concentration of fluorescent probes. Quantify the protein and the concentration of the fluorescent probe from the maximum absorption peak of the fluorescent probe. The software can directly give the concentration of the nucleic acid and the concentration of the fluorescent dye through the concentration calculation formula (Lambert-Beer law). The software provides 10 fluorescent dyes. You can also add new fluorescent dyes by setting.

4.4.1 Sample dosage requirements

It can also be tested in micro quantities. Sample volume (recommended): 0.3 to 2 μL.

4.4.2 Measuring range

DNA: 2～750ng/μL

Repeatability (SD = ng / μL; CV =%):

Sample range 2 ～ 100ng / μL: ± 2ng /μL

Sample range > 100ng / μL: ± 2%

Cy3: 0.2～100pmol/μL

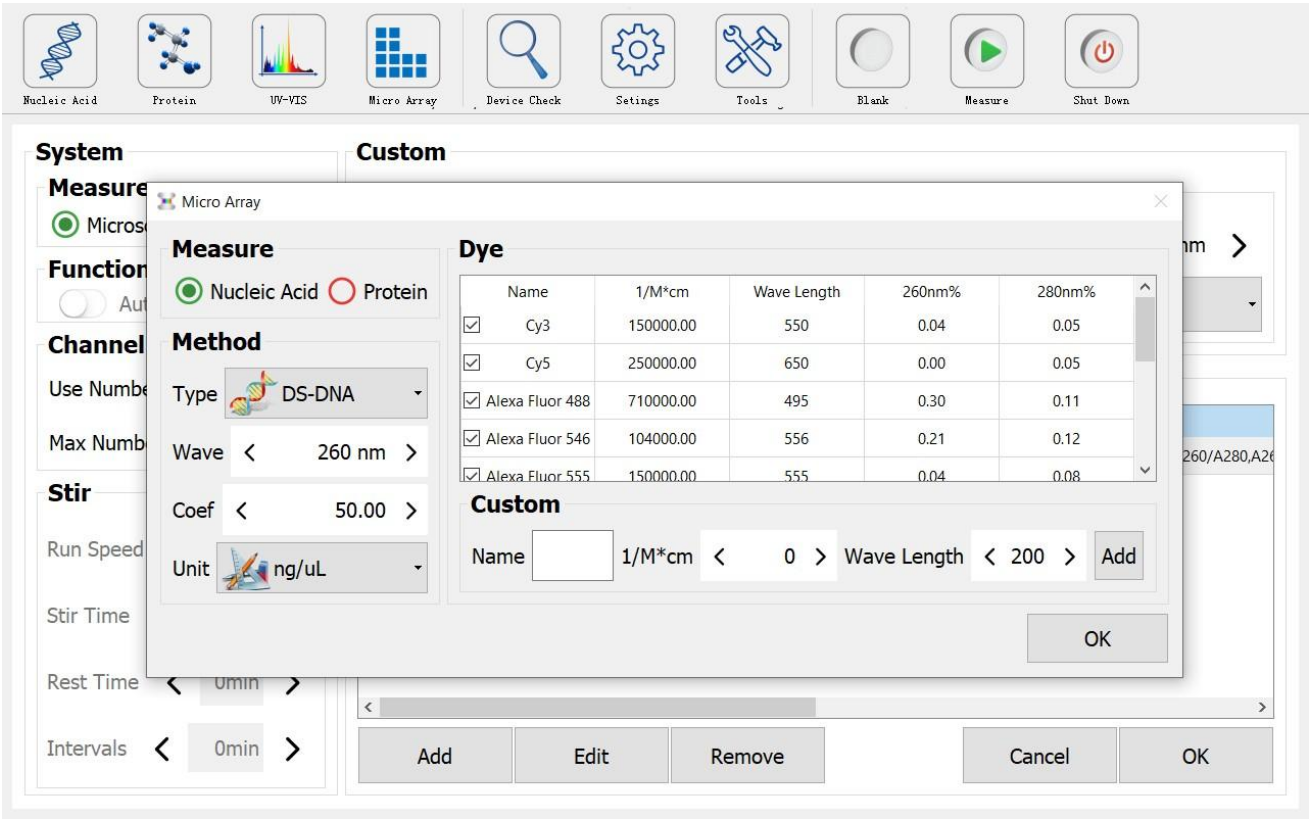
Repeatability (SD = ng / μL; CV =%):

Sample range 0.2～4.0pmol / μL: ± 0.2pmol / μL

Sample range ＞4.0pmol/μL: ±2%

4.4.3 Measurement settings

After entering the microarray mode, click “Settings” to enter the microarray detection setting interface. In the setting interface, you can only select "microscale" in the measurement method column and select the optical path. Then in the microarray settings, select the method and click Edit. The following interface appears.



Select a nucleic acid or protein based on the sample. There are three types of nucleic acids: DS-DNS, SS-DNA, and RNA; proteins have four types: A280, BSA, IgG, and Lysozyme. After selecting the type, select the fluorescent dye of the sample to be tested, or use the dye / chromophore editing function to add a new dye. To add a new dye, in the user settings area, follow the dye manufacturer's instructions to fill in the appropriate calibration parameters. When the appropriate dye is selected, a 260nm calibration will be automatically applied to the nucleic acid concentration calculation. When all parameters are filled in, save this information. After selecting the nucleic acid dye, click OK, and then click OK on the setting interface to return to the microarray detection interface for detection.

4.4.4 Measurement Steps

1. Pick up the solvent of the sample to be tested with a pipette, drop it on the base, close the detection arm, and click "Blank";

2. Wipe off the solvent with dust-free paper;

3. Drop the sample on the base and click "Detect";

4. After a few seconds, the test results, values and spectra are displayed.

5. When the test is completed, raise the sample arm and wipe the sample on the upper and lower bases with clean dust-free paper. Wiping the sample in this way prevents the sample from remaining on the base.

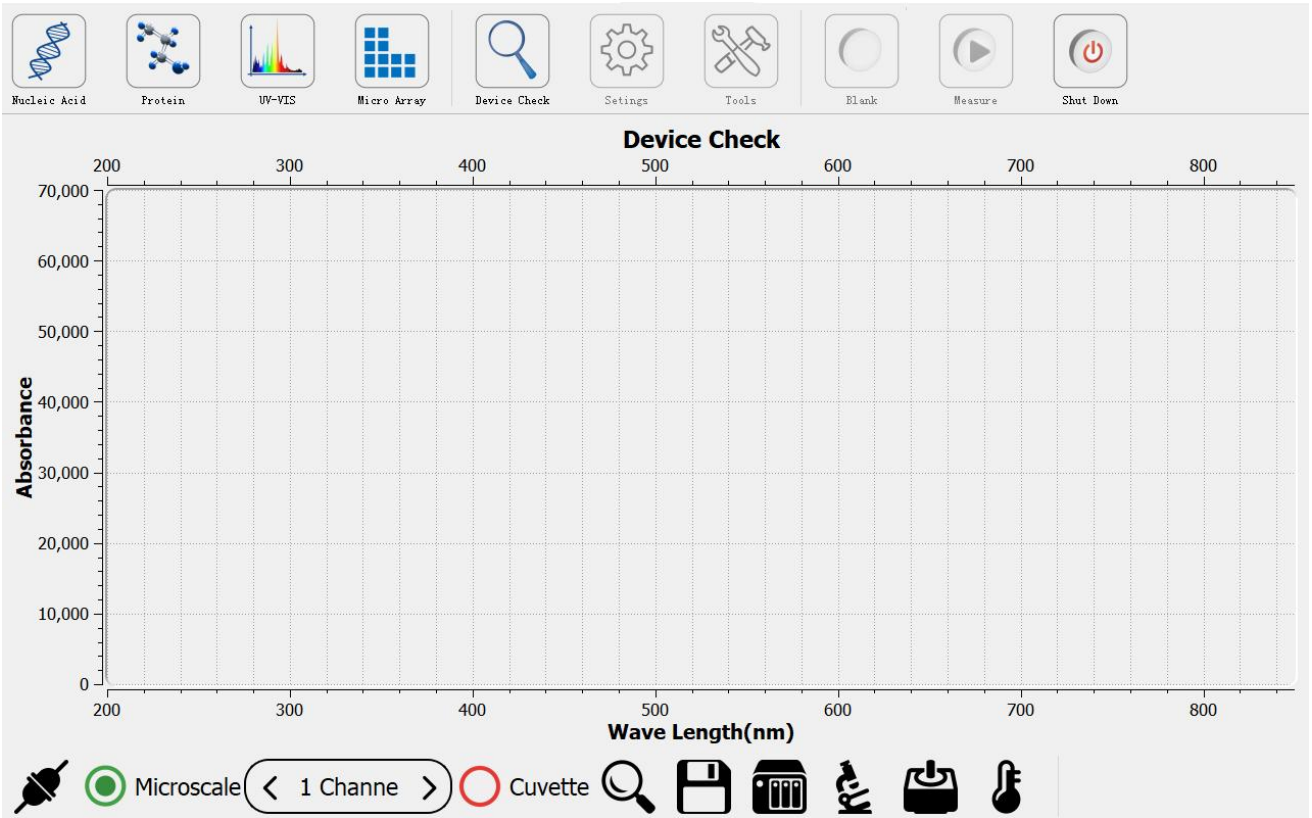
6. Click "Save As" to export the test report; export the history (you can select multiple boxes).

The above steps are in microscale mode.

5. Other functions

5.1 Equipment inspection

Equipment testing is used to check the health of the instrument. After default microscale mode, click  to perform the test. As shown in the figure.。



5.2 Setting

After selecting a certain detection mode, under its detection interface, click "Settings" to enter the setting interface of the method.

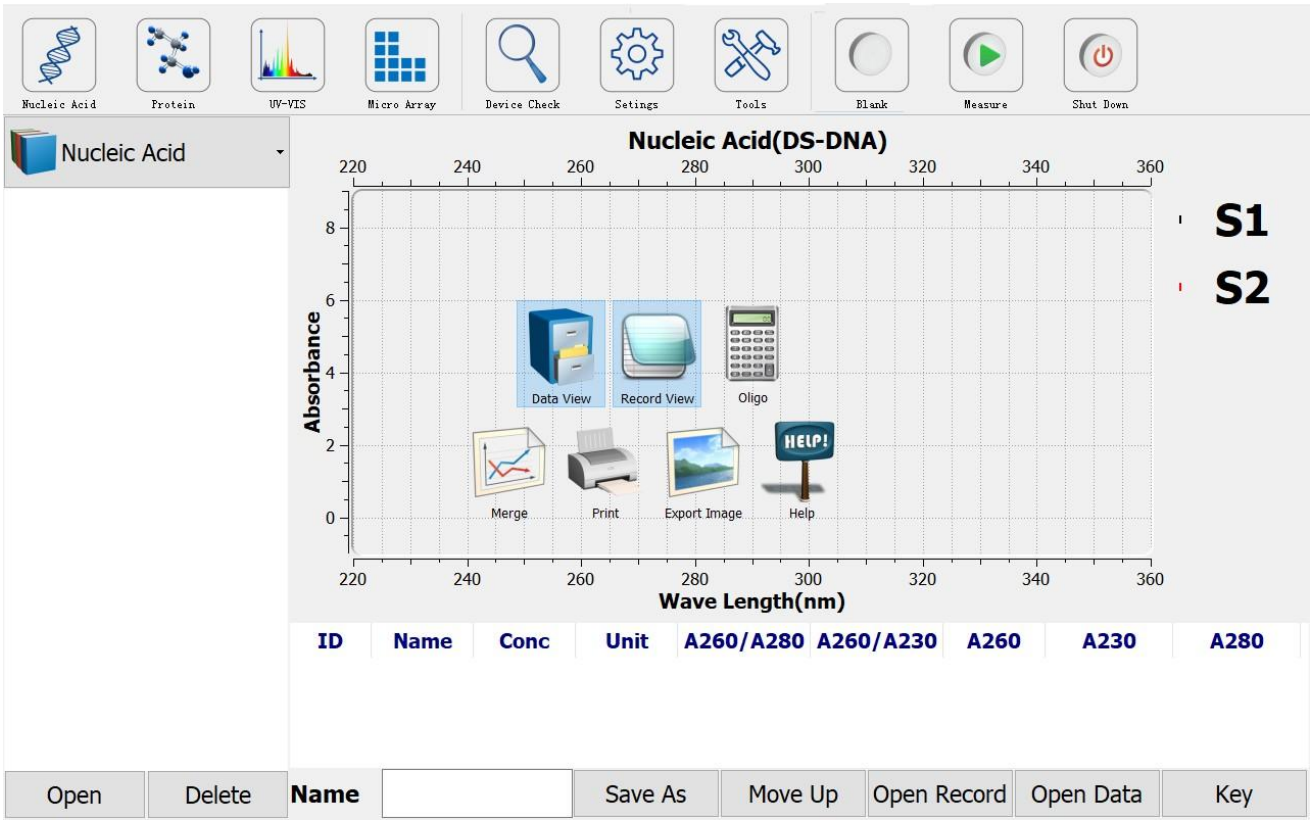
1. Firstly, select "Microscale" method in "Detection Method" of "System Settings".

2. In the basic settings, the default setting of the baseline correction wavelength is 340nm, that is, the absorbance at the 340nm wavelength is zero. You can also enter a correction wavelength yourself.

3. In the setting interface, there is a unique setting interface for each detection method, as shown below, the nucleic acid setting interface. In each setting interface, there is a system preset detection method. Select the method and click Edit to select different detection methods based on the sample.

5.3 Tool

Click "Tools", and the following view appears on the interface.



1. Data View: Click "Data View" to hide the data frame on the left, and click Restore again;

2. Record View: Click "Record View" to hide the data below, and click Restore again;

3. Curve merge: After clicking “Merge”, when detecting the next sample, the detection spectrum does not disappear, and it appears in the same interface with the next spectrum for easy comparison;

4. Picture printing: “Print” the spectrum in the current interface;

5. Export picture: The current spectrum is exported and saved as a picture.

6. Use HELP!: manual for the instrument.

5.5 Shut down

Click the "Shut Down" button to shut down the system. Turn off the main switch and disconnect the power. As shown in the figure.