NOTE

This manual only serves as a guide for operating the Model 722N Visible and 752N UV-Vis Spectrophotometer.

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2012C331-31 722N
2012C331-31 752N

722N Product Standard: Q31/0104000010C005
752N Product Standard: Q31/0104000010C005

1 Principle, Applications and Features

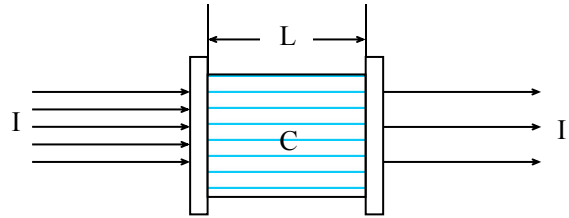
1.1 Principle

The light absorption of a substance is selective. As a substance is excited by the radiation of light, the light absorption effect will occur in the substance. Each substance has its own special absorption spectrum. When a homogeneous light passes through a solution, the light energy will be lessened, because some of the energy is absorbed by the solution. The loss of energy is in proportion to the concentration of substance.

The series of instruments can perform chemical quantitative analysis on sample substance according to the principle of colorimetry. Within the range of concentration, all parameters are in compliance with the Beer's law:

$$A = \lg\frac{1}{T} = KCL \qquad T = \frac{I}{I_0}$$

A:	Absorbance	C:	Concentration of the substance for measurement
T:	Transmittance	L:	Length of sample in optical path
I:	Intensity of transmitting light	K:	Absorption coefficient of sample
$I_{0:}$	Intensity of the incident ray		



1.2 Applications

The series of instruments can do quantitative and qualitative analysis for sample substance within the UV and visible spectral range. They are suited to wide applications in pharmaceutical manufacturing, health, clinic test, biochemistry, petrochemical industry, environmental protection, food safety and quality control. Besides, they can be used for the educational purpose, such as demonstration in class or serve as the common analysis instruments at physical or chemical laboratories in institutes or universities.

1.3 Features

- Large color touch screen
- Highly intelligent operating module and user-friendly interface
- Simple replacement of light source
- Concentration factor setup and direct reading of concentration
- USB port and UVWin8 PC communication software

2 Specifications and Functions

2.1 Technical Parameters

	722N	752N
Optical system	Single beam, 1,200 line/mm holographic grating system	
Source lamp	Tungsten halogen 12V20W	Tungsten halogen12V20W Xenon lampDD2.5
Receiving component	Silicon photocell	
Wavelength range	325nm～1000nm	200nm～1000nm
Transmittance range	0.00%T～125.0%T	
Absorbance range	0.000 A～4.000A	
Max. wavelength deviation	±2nm	
Wavelength	≤1nm	

reproducibility		
Max. transmittance deviation	±0.5%	
Transmittance reproducibility	≤0.2%T	
Min. spectrum bandwidth	4 nm	2 nm
Stray light	≤0.1%T (at 360nm)	≤0.1%T (at 220nm and 360nm)
Noise	100%T line noise ≤0.3%； 0%T line noise ≤0.1%	

2.2 Specifications

Screen	7 吋	
Weight	11kg	12kg
Power supply	AC85V~265V，50Hz±1Hz、60Hz±1Hz	

Dimensions	460mm×390mm×220mm

2.3 Main functions

Automatic control

- Power-on self-test of the internal system's working system;
- Automatic filters switching;
- Display and printing of spectrum and data;
- Error message indication;
- Drawing and printing of spectrum graph and data;

Analyzing, testing, and information processing

- Photometric measurement;
- Quantitative analysis;
- Chemical kinetics measurement;
- Saving and recalling of curve

3 Installation

3.1 Installation Environment

Place the instrument on a firm and leveled bench. Keep the working environment tidy and clean, free from serious dust.

To get the instrument working properly, the environment must meet the following requirements:

- Room temperature between 5°C - 35°C, and relative humidity not higher than 85%
- Power supply AC85V~265V, 50 Hz±1 Hz/60Hz±1Hz, with good earthing (and not share a same socket with other equipment)
- Free of direct sunlight, vibration, strong air flows and erosion by corrosive substances
- Away from strong magnetic fields, electric fields, and electrical devices generating high frequency waves

Note: Use AC stabilized voltage power supply of 500W or above in case of any noticeable voltage fluctuation.

3.2 Unpacking and Inspection

Tear off sealing tapes (keep the outer package for later use), and check the main device and accessories according to the packing list. If there is any missing part, please contact local distributor or our company directly.

4 Exterior View and Interface Description

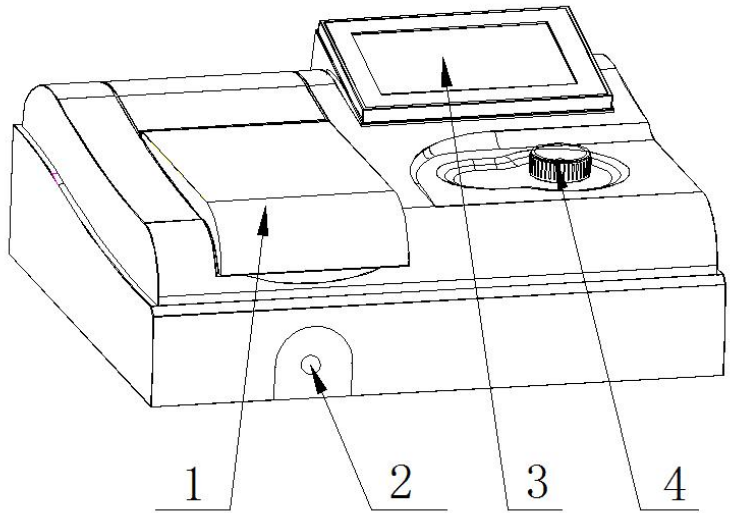
4.1 Exterior View

1. Sample chamber door

2. Sample holder lever

3. Touch LCD screen

4. Wavelength adjustment knob



4.2 External Interface

1. Cooling fan

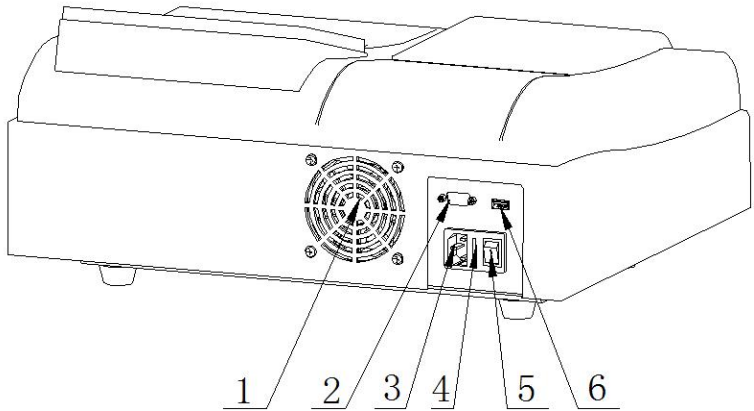
2. Printer DB9 interface

3. Power outlet

4. Fuse box

5. Power switch

6. USB A type socket



5 Preparation Before Test

5.1 Power-On Self-Test

After the instrument is powered on, it will automatically enter the main menu interface. Press the icon on the screen to enter the selected test function.

After entering the submenu, you can return to the main menu by pressing **[Menu]** in the upper right corner of the screen.

5.2 Warm-up

Before the instrument performs testing, it must be turned on for 30 minutes. To maintain a stable environment, ensure that the test station is level and free of vibration

5.3 Wavelength Setting

Manually rotate the right knob, observe the scale and set the dial reading to the desired wavelength value.

6 Application Operations

In this manual, the square brackets are used to indicate **[button]**, e.g., **[Display Settings]**; and angle brackets to indicate tag **<tag>**, e.g., **<K-factor method>**.

6.1 Photometric Measurement

6.1.1 Test Monitoring

Select **[Photometric]** in the main menu, and you can enter this function block.
Function buttons descriptions:
[0%]: Zero button.
[100%]: Adjust the fullness button.
[T% / Abs]: the conversion key between T (transmittance) and Abs (absorbance).
[Print]: Print the current real-time data.

Test example:

First, set the test wavelength with the knob. Cover the sample chamber door, press **[100%]** to adjust the scale to the fullness; then open the sample chamber door.

Press the **[0%]** key to zero the device.

Pour the sample to be tested into the cuvette. Open the sample chamber and place the cuvette into the cuvette holder. Pull the rod to put the sample into the light path.

Cover the sample chamber, and you'll get the data of the sample to be tested. You can switch between the transmittance and absorbance by pressing the **[T% / Abs]** key.

After each unknown sample is measured, you can press **[Print]** to print the measured data.

6.2 Quantitative measurement

Select **[Quantitative Measurement]** in the main menu, and you will enter this function block.

Press the tab from the top of the screen to select one test method from three options: **<K-factor method>**, **<single point calibration>** and **<multi-point calibration>**.

6.2.1 K-factor method

The K-factor method is a simple application of the working curve method. With the absorbance which is measured by the system, it will calculate the concentration of a sample with the designated equation. The testing result will be directly shown on the screen.

Below is the function button description:

[Clear]: clear the test data.

[0%]: adjust zero.

[100%]: adjust the full scale.

[Test]: start the test.

[Access]: store or retrieve the test or existing data of K-factor.

[Print]: print the test data in the output list.

[↑] [↓]: flip the data page back and forth.

[Parameters]: press the button to pop up a dialog box to set the parameters of the K-factor method.

Description of the dialog box **[Parameters]**:

◆**Unit:**

To set the unit of test, 8 options in total.

◆**Equation Parameters:**

To set the parameters of equation: K and B value.

Press **[√]** to complete the configuration, and press **[×]** to close the dialogue box.

Example:

First, complete the parameters in the dialog box of **[Parameters]** and enter the values of K and B. Then, set the test wavelength with the wavelength knob. Cover the sample chamber door, press **[100%]** to adjust the full scale; then open the sample chamber door and press **[0%]** to adjust zero.

Pour the sample to be tested into the cuvette. Open the sample chamber and place the cuvette into the cuvette holder. Pull the rod to put the sample into the light path.

Cover the sample chamber and press **[Test]** to measure the concentration of the unknown sample.

After the measurement is completed, press **[Print]** to print out the measured data.

6.2.2 Single-point Calibration

Single-point calibration method is to measure the absorbance of a standard sample first, and with a coordinate zero, create a working curve. According to this working curve, the concentration of a sample can be determined. The testing result will be directly shown on the screen.

Below is the function button description:

[Clear]: clear the test data.

[0%]: adjust zero.

[100%]: adjust the full scale.

[Test]: start the test.

[Access]: store or retrieve the test or existing data of the single-point calibration.

[Print]: print the test data in the output list.

[↑] [↓]: flip the data page back and forth.

[Parameters]: press the button to pop up a dialog box to set the parameters of the single-point calibration.

Description of the dialog box **[Parameters]**:

◆**Unit:**

To set the unit of test, 8 options in total.

◆**Equation Parameters:**

Enter concentration value directly in the box Conc=[ ]. Press **[Calibrate]** to calibrate the concentration of the current standard.

Press **[√]** to complete the configuration, and press **[×]** to close the dialogue box.

Example:

First, set the test wavelength with the wavelength knob. Cover the sample chamber door, press **[100%]** to adjust the full scale; then open the sample chamber door and press **[0%]** to adjust zero. Then, in the dialog box **of** setting **[Parameters]**, complete the parameter settings and enter the concentration value in the Conc editable box.

Pour the sample to be tested into the cuvette. Open the sample chamber and place the cuvette into the cuvette holder. Pull the rod to put the sample into the light path.

Cover the sample chamber and press **[Test]** to measure the concentration of the unknown sample. After the measurement is completed, press **[Print]** to print out the measured data.

6.2.3 Multi-point calibration

The multi-point calibration method is a quantitative measurement method that measures the absorbance of a series of standard samples of known concentration, establishes a working curve first, and then measures the unknown concentration according to the established working curve. The testing result will be directly shown on the screen.

Below is the function button description:

[Clear]: clear the test data.

[0%]: adjust zero.

[100%]: adjust the full scale.

[Test]: start the test.

[Access]: store or retrieve the test or existing data of multi-point calibration.

[Print]: print the test data in the output list.

[↑] [↓]: flip the data page back and forth.

[Parameters]: press the button to pop up a dialog box to set the parameters of the multi-point calibration.

Description of the dialog box **[Parameters]**:

◆**Unit:**

To set the unit of test, 8 options in total.

◆**Standard parameters:**

Press [Calibrate] to enter the dialog box of **Calibration Settings**.

Below is the function button description:

[Clear]: clear the test data.

[0%]: adjust zero.

[100%]: adjust the full scale.

[Calibrate]: calibrate one value.

[Access]: store or retrieve the testing or existing data of multi-point calibration.

[Print]: print the test data in the output list.

[↑] [↓]: flip the data page back and forth.

[√]: save the calibration result and exit.

[×]: cancel calibration and exit.

[Curve]: display the curve of multi-point calibration curve.

Function button description of the dialogue box of curve:

[×] Exit the dialogue box of curve and return to the dialog box of calibration settings.

Example:

First, set the test wavelength with the knob. Cover the sample chamber door, press **[100%]** to adjust the full scale; then open the sample chamber door and press **[0%]** to adjust zero. Then, press **[Parameters]** to enter the parameter setting sub-dialog box and set the measurement unit parameters. Then press **[Calibrate]** to enter the Calibration Settings sub-dialog.

Press on the column after Conc. to pop up a keyboard from where to enter the corresponding known concentration. Place the standard sample cuvette corresponding to the concentration in the cuvette holder. Pull the rod to put the standard sample into the light path. Cover the sample chamber and press **[Calibrate]** to calibrate the

input concentration value according to the current absorbance. Repeat this step to calibrate up to 10 samples of different standard concentrations.

After all the standard samples have been calibrated, press **[√]** to return to the multi-point calibration parameter setting dialog box. At this time, the dialog box will display the equation parameters calculated by the calibration program, and press **[√]** to return to the multi-point calibration test interface.

Open the sample chamber and place the sample cuvette in the holder. Pull the rod to put the sample to be tested in the light path. Cover the sample chamber and press **[Test]** to measure the concentration of the unknown sample.

After the measurement is completed, press **[Print]** key to print out the measured data.

6.3 Kinetics Measurement

6.3.1 Test Monitor

Press **[Kinetics]** from the main function menu to enter the function settings. Under the tab <Test Monitor>, the curve can be directly read out.

Below is the function button description:

[Clear]: clear the test data.

[0%]: adjust zero.

[100%]: adjust the full scale.

[Test]: start the test.

[Access]: store or retrieve the testing or existing curve.

[Print]: print the curve on the screen.

[↑] [↓]: flip the data page back and forth.

[Parameters]: modify the kinetic measurement parameters.

Below is description of the **[Parameters]** dialog box:

◆ **Measurement mode:** There are two measurement modes: transmittance (T%) and **[Abs]** absorbance (ABS). Click the icon to switch.

◆ **Measurement time**: Set the kinetic test time, the maximum should not exceed 180min or 3,600s.

Click the edit box [ ] after the selected measurement time and enter value.

◆ **Time unit:** There are two time units:**[min]** for minute and [s] for second, which can be switched by clicking the corresponding icon.

◆ **Recording range**: Set the test data record range, the left side of the field is the lower limit of measurement, and the right side is the upper limit of measurement.

Click the edit box [ ] after the selected recording range and enter value.

Where, the T% range is (0.00%T - 125.0%T), and the ABS range is (0.000A - 4.0000A).

◆ Test interval: The test interval is in seconds (s), and the instrument tests 64 points at a time, so Minimum interval = measurement time / 64 .

Click the edit box [ ] after the selected test interval and enter value.

[√]: Save the settings and exit.

[×]: Cancel the settings and exit.

When setting the parameters, the system will automatically check whether the entered value is within the range. The current input or other parameters will be adjusted appropriately (e.g., the measurement time is set to 64s, the test interval is 0.5s, and the instrument automatically changes the test interval to 1s and displays).

Example:

First, set the test wavelength with the wavelength knob. Cover the sample chamber door, press **[100%]** to adjust the full scale; then open the sample chamber door and press **[0%]** to adjust zero. Then, click **[Parameter]** to enter the sub-dialog box to set the dynamics measurement parameters. Click **[√]** to return to the Dynamics Test dialog.

Place the sample cuvette to be tested in the cuvette holder. Pull the rod to put the sample in the light path. Cover the sample chamber and press the **[Test]** key to start the dynamic test. During the test, the touch curve display panel can view the test point information in real time.

After the measurement is completed, you can press the **[Print]** key to print out the measured curve.

6.4 Access List

In each function dialog box, press **[Access]** to pop up the access list dialog box. In this dialog box, you can save or retrieve the corresponding file data.

Focus on Entry operation instructions:

The list bar will display the currently archived files, and press the list bar will focus on the corresponding entry. The highlighted item is grayed out. You can only focus on the entry of the existing file, or the next blank entry of the last file entry. When the storage space is full, you will not be able to focus on blank entries.

Function button description:

[Save] pop up the alphanumeric keyboard, enter the file name (up to 6 characters, and will automatically add suffix when the file name already exists). Press **[√]** to confirm. Now, the current curve data, calibration data or test result data will be stored in the focused entry of the list. If the focused entry is on a non-blank entry, the original file will be overwritten.

[Call] Reads the file contents of the focused entry and exits the access dialog to return to the previous

dialog. The upper-level dialog box will get the contents of the file to be read, and the data will be displayed after parsing (can be displayed in curve, test results, calibration data, etc.). If the focus is on a blank entry, the call will be ignored.

[Delete] The file of the focused item will be deleted. If the focus is on a blank entry, the delete operation will be ignored.

[Rename] Pop up the alphanumeric keyboard, enter the file name (up to 6 characters, and will automatically add suffix when the file name already exists), press [√] to confirm. The file name of the focused item at this time will be changed to the content which just has been entered. If the focus is on a blank entry, the rename operation will be ignored.

[×] Exit the file storage dialog box and return to the previous dialog box.

6.5 System Settings

Press **[System Settings]** from the main menu to enter this function block. Click the tab on the top of the screen can switch the setting window between **<Basic Settings>** and **<Contact Us>**.

6.5.1 Basic Settings

Press **[System Settings]** from the main menu to enter the function module. The function is as follows:

◆ Date and time: Display the current date and time. Click the box [ ] after the date and time to edit.

[Language Selection]: Enter the language selection dialog.

Language selection dialog box function:

[中文]: select Chinese operation.

[English]: select English operation.

[√]: save the language selection result and exit

[×]: close the selection dialog box and exit.

6.5.2 Contact Us

Show the information of factory unit and distribution.

7 Maintenance and Troubleshooting

7.1 Maintenance

1. To ensure the stability of the instrument, it is recommended to use AC stabilized voltage power supply of 500W or above in case of noticeable voltage fluctuation. When the instrument is not in use, switch it off, and shut down the main power supply.
2. In order to maintain clean environment, cover the instrument with a piece of cloth when the main device is not in use to avoid dust. It's better to keep the room dry and at constant temperature when storing the instrument for long time without operation.
3. Use a soft cloth wetted with warm water to clean the instrument case. Do not use ethanol, ether, acetone or other organic solution. Cover the instrument with a dust cover after use. Don't touch any optical components with hands or any soft/hard objects. Once a trace is left, it will increase stray light and reduce effective energy, which might lead to breakdown of the equipment.
4. Clean the sample chamber and cuvette after use each time, to prevent the parts of instrument from rotting, which is caused by the samples. Use petroleum ether to clean cuvette after use each time, use lens tissue to clean the

cuvette, and place them in cuvette boxes for future use.

5. If the instrument is not in use for a long period of time, it will reduce the service life. It's better to turn it on once or twice a week, and get the power on for about half an hour each time, if it is not in use.

6. On the regular basis, check the wavelength of the instrument according to metrology rules, to ensure the instrument is available to operate with good precision. Remember move the device gently and don't place any heavy stuff on the shell of the device.

7. Don't remove any screws and nuts in the optical path, except those outside of the light source chamber. Otherwise, it might affect the proper work of the instrument. If you have any question regarding the optical path, please feel free to contact after-sale service of the manufacturer.

7.2 Source Lamp Replacement

Reminder: When replacing the tungsten halogen lamp or deuterium lamp, the instrument shall be disconnected to the power supply and the lamp is cool down enough. Please be mindful of the color of the cable. Don’t look at the lamp directly for a long time to prevent eyes from getting hurt.

Tungsten halogen lamp

1．Turn off the instrument and disconnect the power cord from power supply.

2．Slacken the fixing screws from both sides of the outer shell and remove the shell.

3．Remove the protective board from the lamp chamber.

4．Wear clean gloves to pull off the old lamp, and fit the new lamp.

5. Put the outer shell back.

Deuterium lamp (for UV only)

1．Turn off the instrument and disconnect the power cord from power supply.

2．Slacken the fixing screws from both sides of the outer shell and remove the shell.

3．Remove the protective board from the lamp chamber.

4．Wear clean gloves to pull off the old lamp, and fit the new lamp. (Note: Be mindful of the color of the lamp's cable)

5． Put the outer shell back.

7.3 Troubleshooting

The failures of the instrument can be divided into categories, one is normal wear and tear of parts or components, and the other is the malfunction of instrument. As the equipment is high precision device, if it doesn't work, the user shall instantly contact the after-sale service department of the manufacturer and provides description of malfunctions, so can the engineer determine whether the user can fix it with his instruction. If the user cannot solve the problem,

the manufacturer will arrange engineer to provide on-site support. Below are some examples of common failures only for reference:

7.3.1 The device cannot perform zero or full scale adjustment.

Failure	Cause(s)	Troubleshooting
Press **[100%]** and the device cannot adjust 100%T or 0.0000A.	a. There is an object which obstructs light in the sample chamber. b. The preamplifier is broken. c. The motor for filters doesn't work properly. d. The conversion mirror motor of lamp source drops out of step. e. The mirror in the light chamber is aging. f. The source lamp is broken.	a. Remove the object which obstructs light. b. Fix the preamplifier. c. Replace the filter motor. d. Replace the conversion mirror motor. e. Replace the mirror. f. Replace the lamp.

7.3.2 The device doesn't work.

Failure	Cause(s)	Troubleshooting
The display is dark when power on.	a. No voltage in the power socket. b. The power cord is not properly connected. c. The fuse of power supply is broken. d. The switch of power is broken. e. The cable of display is not well connected. f. The power PCB is broken. g. The CPU PCB is broken. h. The display is broken.	a. Check the power supply. b. Get the power cord properly connected. c. Replace with a new 2A fuse. d. Replace with a new switch. e. Get the cable well connected. f. Repair or replace g. Repair or replace h. Repair or replace

7.3.3 Monochromator failure

Failure	Cause(s)	Troubleshooting
Wavelength is inaccurate.	a. Dial is deformed. b. The monochromator is vibrated and the optical path structure changes	Contact the factory for aftersales service.
UV and visible does not switch	a. In the system settings, the energy mode was wrongly selected. b. The switching motor does not work 1) Motor damage 2) Motor drive circuit board is broken	a. Select the correct energy mode. b. 1) Replace the motor 2) Repair the CPU board

7.3.4 Tungsten lamp doesn’t work properly.

Failure	Cause(s)	Troubleshooting
Tungsten lamp is not bright. (DC is about 11.5V)	a. Poor contact of tungsten lamp plug b. Tungsten lamp is broken c. Pre-amplified plate is broken d. CPU board is broken	a. Re-connect the plug b. Replace the tungsten lamp. c. Repair Pre-amplified plate d. Repair CPU board
Tungsten lamp is bright.	a. The life of the tungsten lamp has reached (the light bulb is black) b. The energy of tungsten lamp isn’t completely emitted into the slit c. There is a light blocker in the sample chamber	a. Replace the lamp.. b. The switching lamp motor drops out of step. c. Remove the light blocker

7.3.5 The graph and data cannot be printed.

Failure	Cause(s)	Troubleshooting
The display is right.	a. The printer is not turned on. b. The cable between main device and printer is not well connected. c. There is something wrong with the output system of main device. d. There is something wrong with the printer.	a. Turn on the printer. b. Get the cable well connected with both ends. c. Fix it. d. Fix the printer.
The printer doesn't work properly.	The printer is broken down.	Replace printer

7.3.6 The deviation of sample reading is huge.

Failure	Cause(s)	Troubleshooting
The reading deviates from the standard reading.	a. There is big error in sample agent. b. The cuvettes are not well matched. c. The cuvette is stained. d. The device is not stable. e. Due to the time or temperature, the sample solution might fluctuate.	a. Inspect the process of sample preparation and the gauge used. b. Calibrate the matched cuvettes, or replace with new ones. c. Clean the cuvette. d. Fix the device. e. Strictly follow sample testing procedures.

7.3.7 The reading is not stable.

Failure	Cause(s)	Troubleshooting
Numbers flash to an increase or decreasing direction unstably.	a. The preheating time is not enough. (Generally 30mins) b. The instrument is affected by environment. The device is moistened.	a. Increase the preheating time, and reduce the humidity of room. b. Increase preheating time.
Numbers fluctuate unstably.	a. The earthing of the device is not good. b. The device is moistened. c. The source lamp is aging. d. The room temperature is too high. e. 220V power supply is not stable. f. The optical path has some bias. g. The preamplifier is broken.	a. Make sure the earthing is good. b. Improve working environment. c. Replace with a new lamp. d. Improve the working environment. e. Use an AC regulated power. f. Readjust the optical path. g. Fix or replace with a new lamp.

7.4 Wavelength Correction

Inspection Frequency: once to twice a year or after the source lamp is replaced. Should the lamp be replaced, contact the factory.

8 Warranty

The manufacturer will repair the instrument for free, if it fails to work due to defective workmanship within 12 months following the purchase date, provided that the damage is not caused by intentional act (wearable parts, lamp and cuvette are not covered by this warranty).