

ESPECTROFOTÓMETRO 4201/20
4201/20 SPECTROPHOTOMETER
SPECTROPHOTOMÈTRE 4201/20

REF. / CODE / RÉF. HJB003



Este manual es parte inseparable del aparato por lo que debe estar disponible a todos los usuarios del equipo. Le recomendamos leer atentamente el presente manual y seguir rigurosamente los procedimientos de uso para obtener las máximas prestaciones y una mayor duración del mismo.

This manual should be available for all users of these equipments. To get the best results and a higher duration of this equipment it is advisable to read carefully this manual and follow the processes of use.

Ce manuel est une partie indissociable de l'appareil et doit être mis à la disposition de tous les utilisateurs de l'équipement. Nous vous recommandons de lire attentivement ce manuel et de suivre scrupuleusement les procédures d'utilisation afin d'obtenir des performances maximales et une plus longue durée de vie de l'appareil.

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1 GENERAL INFORMATION

1.1 Safety information

Unpack and read this entire manual before installing or operating this equipment. Pay attention to all danger and warning instructions. Failure to do so may result in serious personal injury to the operator or damage to the equipment.

To ensure that the protection provided by this equipment is not impaired, do not use or install this equipment in any way other than as specified in this manual.

In addition to following the instructions in this manual, the user must also comply with the National Basic Safety and Accident Prevention Regulations in the country or region in which the instrument is used.

■ 1.1.1 Danger and warning information

Danger: Indicates a potentially or urgently hazardous situation that, if not avoided, could result in death or serious personal injury.

Warning: Indicates a potentially dangerous situation that may result in minor or moderate injury.

Important: Information that needs special emphasis.

Note: Supplement the main information in the main text.

■ 1.1.2 Prevention label

Read all the labels and tags attached to the instrument. Failure to comply can result in personal injury or damage to the instrument. If there is a symbol on the instrument, it will be included in the manual with danger or warning instructions.

	CAUTION Danger!
	CAUTION High Voltage!
	CAUTION Hot!
	RECYCLE This instrument will be called back by the appointed Electrical Treatment Department or by the original Manufacturer when wasted.

Tab. 1-1 Prevention label

1.2 Product information

■ 1.2.1 Product appearance



1 – LCD display

2 – Knob

3 – Membrane keyboard

4 – Sample room

5 – Pull rod

Fig. 1-1 Appearance

■ 1.2.2 Product description

This model of spectrophotometer can be used for laboratory and field analysis. The instrument has basic photometric and concentration measurements.

■ 1.2.3 Functions

This model of spectrophotometer contains the following application modes:

- **Absorbance measurement**

Measure the absorbance value of the sample.

- **Transmission measurement**

Measure the transmittance of the sample.

- **The calibration standard sample measures the unknown sample concentration**

By measuring the absorbance value of a standard sample and entering the corresponding concentration, a standard curve is established with the origin, and the concentration of the unknown sample is measured using the standard curve.

- **Enter the equation coefficient to measure the concentration**

A standard curve is established by inputting the coefficients K and B of the standard curve equation $C=K*A+B$, and the standard curve is used to measure the concentration of the unknown sample.

- **Energy measurement**

Measure the light energy value of the sample and set the energy gain as needed.

2 SPECIFICATIONS

Model	4201/20
Reference	HJB003
Optical system	Single beam, 1200 l/mm grating
Light source	Tungsten lamp
Detector	Silicon photodiode
Spectral bandwidth	4 nm
Wavelength range	325~1050 nm
Wavelength accuracy	± 1.5 nm
Wavelength repeatability	≤ 0.5 nm
Wavelength resolution	0.5 nm
Wavelength selection	Automatic
Wavelength calibration	Automatic calibration after power on
Wavelength moving speed	10000 nm/s
Photometric range	-0.3~3 A, 0~200 %T, 0~1999 C
Photometric accuracy	± 0.5 %T (0~100 %T)
Photometric repeatability	± 0.2 %T (0~100 %T)
Stray light	≤ 0.2 %T (360 nm)
Noise	≤ 0.001 A @ 500 nm
Sample holder	10 mm manual 4-cells holder
Display	3.5 inch TFT color LCD screen (Resolution: 480×320)
Interface	RS232 serial port × 1 (Printer), USB-B×1 (PC)
Power supply	100~240 VAC, 50/60 Hz
Size	450 (W) ×360 (D) ×160 (H) mm

3 INSTALLATION

3.1 Unpack the instrument

This model of spectrophotometer contains the following parts:

- | | |
|------------------------|----------------------|
| • Spectrophotometer | 1 PC |
| • Instruction Manual | 1 PC |
| • 10 mm glass cuvette | 4 PCS |
| • 10 mm quartz cuvette | 2 PCS (UV-1150 only) |
| • Power Cord | 1 PC |
| • Dust cover | 1 PC |

If any of these items are missing or damaged, contact the manufacturer or dealer immediately.

Note: Keep the original packing material properly. When the instrument is recovered or repaired, the original packaging material shall be used for packing and transportation to prevent damage during transportation.

3.2 Operating environment

To ensure the best performance, the following conditions are required:

- **Avoid high temperature and humidity environment**

The best working temperature range is 16 ~ 35°C and the humidity is less than 80%.

- **Avoiding the instrument from being disturbed by external magnetic fields**

Keep it as far as possible away from the strong magnetic or electrical fields or any electrical device that may generate high-frequency fields.

- **Keep away from corrosive gases**

Set the unit up in an area that is free of dust, corrosive gases and strong vibrations.

- **The instrument should be placed on a stable work bench**

Remove any obstructions or materials that could hinder the flow of air under and around the instrument.

- **Power requirements**

The power requirement is 100~240V/50~60Hz. If the local voltage is not stable, a voltage regulator is required.

- **The power supply should have a good ground**

Use the appropriate power cord and plug into a grounded outlet.

- **Be away from direct sunlight**

- **Avoid dusty environment**

3.3 Connection

■ 3.3.1 Power connection

Check the instrument power switch to ensure that it is in the closed position, as shown in Figure 3-2, insert the female end of the power cord into the instrument's power connector and the male end into the power outlet.

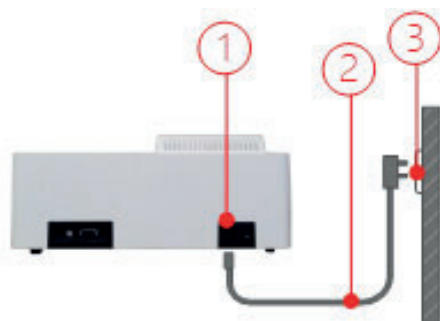


Fig. 3-2 Power connection

1 – Instrument power connector

2 – Power cord

3 – Power outlet

Tab. 3-1 Power connection instructions

■ 3.3.2 Serial printer connection

Both the instrument and the serial printer are turned off, as shown in Figure 3-3. The output of the printer's power adapter is inserted into the printer, and the adapter is plugged into a power outlet. The serial port of the printer is inserted into the serial port of the instrument and the male plug is inserted into the serial port of the printer.

Note: The serial printer is an optional accessory and must be purchased separately.

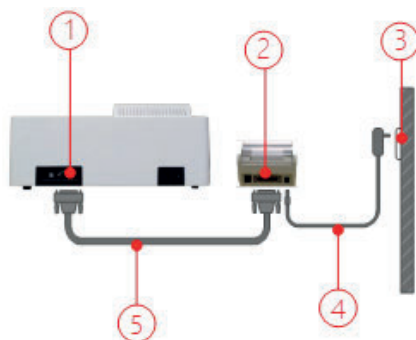


Fig. 3-3 Serial printer connection

1 – Serial port of instrument

2 – Serial port of printer

3 – Power outlet

4 – Power adapter

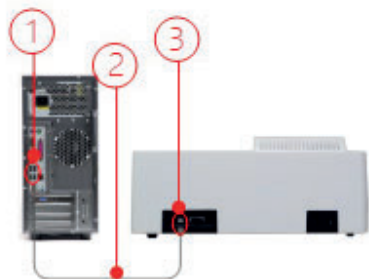
5 – Serial communication line

Tab. 3-2 Serial printer connection instructions

■ 3.3.3 Computer connection

As shown in Figure 3-5, plug one end of the USB communication cable into the instrument's USB port (Type B, square) and the other end into the computer's USB port (Type A, flat).

Note: The USB communication cable is an accessory of the computer application software (Optional configuration, need to be purchased separately) and is not configured with the instrument.



1 – Computer USB interface (Type A)

2 – USB communication cable

3 – Instrument USB interface (Type B)

Fig. 3-4 Computer connection

Tab. 3-3 Computer connection instructions

4 START UP

4.1 Turn the instrument on and off

- **Turn on the instrument**

Plug the power cord into a power outlet, turn on the power by pressing the power switch, and turn on the instrument.

- **Turn off the instrument**

Turn off the power by pressing the power switch, and turn off the instrument.

Note: Do not turn the instrument on and off in quick succession. Wait at least 30 seconds before turning on the instrument again, otherwise the electronic and mechanical systems may be damaged.

4.2 System initialization and calibration

Remove all in the measurement channel, close the cover of the sample room, and then turn on the power of the instrument to enter the warm-up interface (Figure 4-1). The user can decide whether to skip the warm up process according to the use environment and measurement requirements. After warm up or press “ENTER” to skip and enter the system initialization (Figure 4-2), and perform the following procedures in order: check the filter disc, light source switching device, calibrate the wavelength, calibrate the dark current and check the energy, and enter the main interface after finishing.

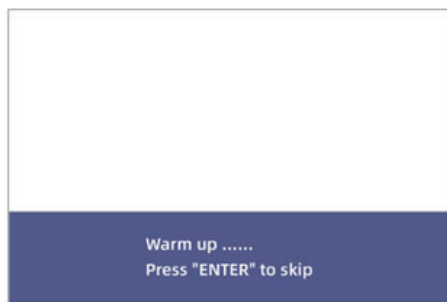


Fig. 4-1 Warm up

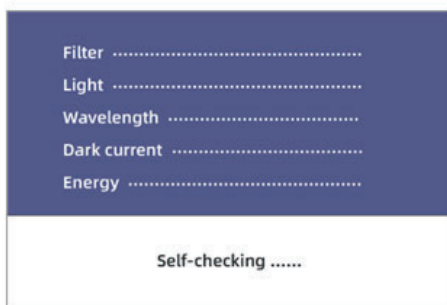


Fig. 4-2 System initialization and calibration

5 GENERAL OPERATION

5.1 Getting started

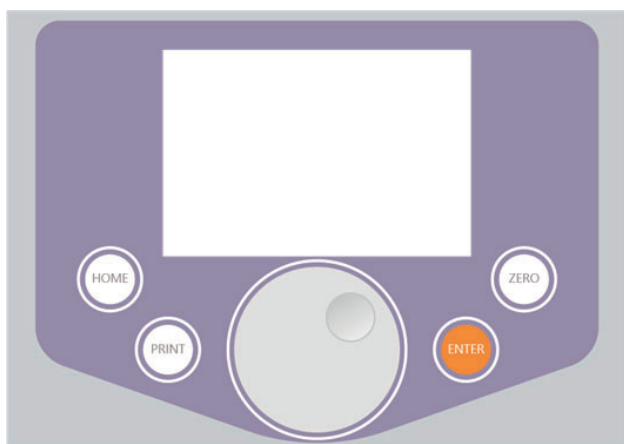


Fig. 5-1 Operation panel

■ 5.1.1 Use the knob

The knob of the instrument has two operation modes.

- **Rotating**

Rotate the knob to switch test mode in the main interface. Rotate the knob to change the parameter value in the parameter setting interface.

- **Pressing**

Press the knob to enter the setting parameter interface in the measurement interface. Press the knob to switch the step size of the parameter change in the parameter setting interface.

■ 5.1.2 Use the keyboard

The instrument provides a membrane keyboard for interactive operation.

	Exit or return to previous screen
	It is used to do the blank
	Print data
	Confirm operation or input parameters

Tab. 5-1 Keyboard instructions

■ 5.1.3 Main interface

Rotate the knob to select the icon on the screen. Press “ENTER” to enter the corresponding application module (Figure 5-3).

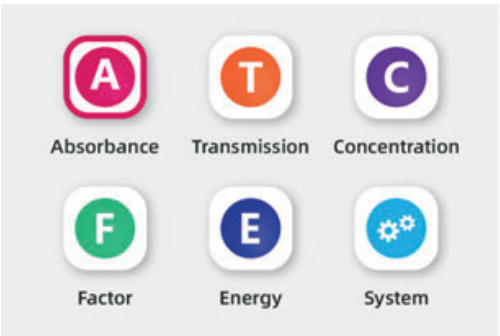


Fig. 5-3 Main interface

	Absorbance measurement Measure the absorbance value of the sample.
	Transmissivity measurement Measure the transmittance of the sample.
	The calibration standard sample measures the unknown sample concentration By measuring the absorbance value of a standard sample and entering the corresponding concentration, a standard curve is established with the origin, and the concentration of the unknown sample is measured using the standard curve.
	Enter the equation coefficient to measure the concentration A standard curve is established by inputting the coefficients K and B of the standard curve equation $C=K \cdot A+B$, and the standard curve is used to measure the concentration of the unknown sample.
	Energy measurement Measure the light energy value of the sample and set the energy gain as needed.
	System System general information.

Tab. 5-2 Application function description

■ 5.1.4 Common operations

- **Setting parameters**

In the measurement module, press the knob to pop up the setting interface. Rotate the knob +/- clockwise/counterclockwise to set the parameter (press the knob in the setting interface to switch the step of the parameter). Press “ENTER” to confirm the parameter.

- **Do blank**

In the measurement module (except energy mode), place the reference in the measurement channel, close the sample room, and press “ZERO” to calibrate the blank.

- **Sample measurement**

Place the sample in the measurement channel, close the sample room, and the measured value of the sample is taken after the display value is stabilized.

6 MEASUREMENT

6.1 Important guidelines

- Reagents and dilution buffers can cause cauterization and other damage to health.
- Samples (nucleic acids, proteins, bacteria cultures) can be infectious and cause serious damage to health.

- During sample preparation, measuring procedures and maintenance and cleaning work, observe all local laboratory safety precautions (e.g. wear protective clothing and gloves, use of disinfectant) regarding the handling of sample material.
- Dispose of measuring solutions and cleaning and disinfectant materials in accordance with the relevant local laboratory regulations.

6.2 Prepare and check

- In order to ensure the accuracy of the measurement results, the instrument should be completely warmed up before measurement.

6.3 Absorbance measurement

- On the main screen, turn the knob to the “Absorbance” and press “**ENTER**” to enter (Figure 6-1).

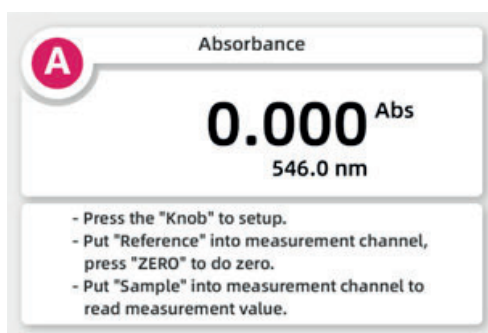


Fig. 6-1 Absorbance measurement

1. Press the knob to pop up the setting interface (Figure 6-2), rotate the knob to change the measurement wavelength, press “**ENTER**” to confirm;

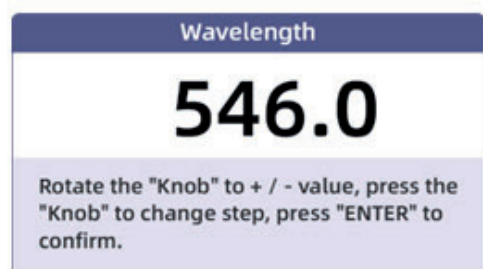


Fig. 6-2 Set the measurement wavelength

2. Place the “reference” in the measurement channel, close the sample room, and press “**ZERO**” to do blank.
3. Place the “sample” in the measurement channel, close the sample room, and wait for the measured value to read the result stably.

6.4 Transmission measurement

- On the main screen, turn the knob to the “Transmission” on the screen and press “**ENTER**” to enter (Figure 6-3).

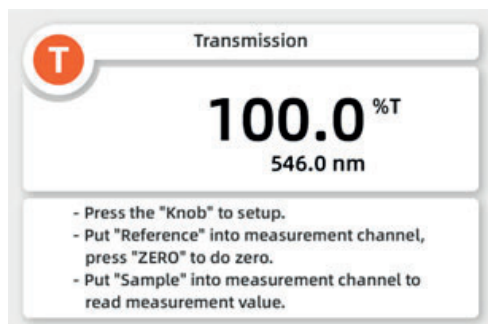


Fig. 6-3 Transmissivity measurement

- Press the knob to pop up the setting interface (Figure 6-4), rotate the knob to change the measurement wavelength, press “**ENTER**” to confirm;

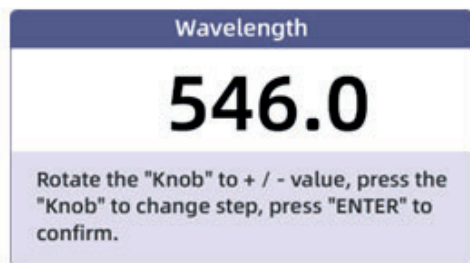


Fig. 6-4 Set the measurement wavelength

- Place the “reference” in the measurement channel, close the sample room, and press “**ZERO**” to do blank.
- Place the “sample” in the measurement channel, close the sample room, and wait for the measured value to read the result stably.

6.5 The calibration standard sample measures the unknown sample concentration

- On the main screen, turn the knob to the “Concentration” and press “**ENTER**” to enter (Figure 6-5).



Fig. 6-5 The calibration standard sample measures the unknown sample concentration

- Press the knob to pop up the setting interface (Figure 6-6), rotate the knob to change the measurement wavelength, press “**ENTER**” to confirm;

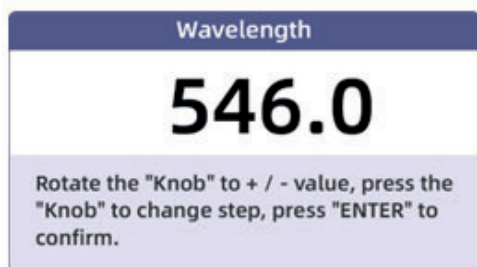


Fig. 6-6 Set the measurement wavelength

- According to the prompt (Figure 6-7), place the “reference” in the measurement channel, close the sample room, and press “**ENTER**” to do blank;

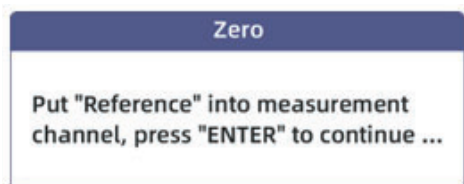


Fig. 6-7 Do blank

- Place the “standard sample” in the measurement channel, close the sample room, rotate the knob to input the standard sample concentration (Figure 6-8), and press “**ENTER**” to finish the measurement standard sample;

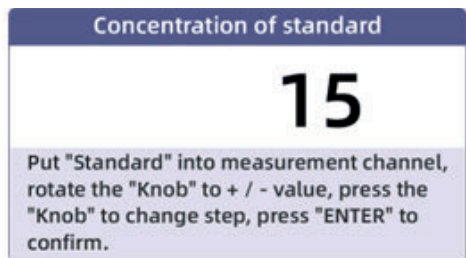


Fig. 6-8 Measuring standard sample

4. Place the "reference" in the measurement channel, close the sample room, and press **"ZERO"** to do blank.
5. Place the "sample" in the measurement channel, close the sample room, and wait for the measured value to read the result stably.

6.6 Enter the equation coefficient to measure the concentration

- On the main screen, turn the knob to the "Factor" on the screen and press **"ENTER"** to enter (Figure 6-9).



Fig. 6-9 Enter the equation coefficient to measure the concentration

1. Press the knob to pop up the setting interface (Figure 6-10), rotate the knob to change the measurement wavelength, press **"ENTER"** to confirm;

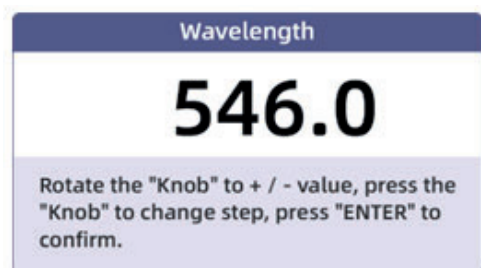


Fig. 6-10 Set the measurement wavelength

2. According to the prompt (Figure 6-11), enter the slope K and intercept B values of the equation $C=K \cdot A+B$, and press **"ENTER"** to finish;

Slope

2

Rotate the "Knob" to + / - value, press the "Knob" to change step, press "ENTER" to confirm.

Intercept

1

Rotate the "Knob" to + / - value, press the "Knob" to change step, press "ENTER" to confirm.

Fig. 6-11 Input slope and intercept

3. Place the "reference" in the measurement channel, close the sample room, and press **"ENTER"** to do blank.

4. Place the "sample" in the measurement channel, close the sample room, and wait for the measured value to read the result stably.

6.7 Energy measurement

- On the main screen, turn the knob to the "Energy" on the screen and press **"ENTER"** to enter (Figure 6-12).

E

Energy

10000^E

546.0 nm / G=1

- Press the "Knob" to setup.
- Rotate the "Knob" to set gain.
- Put "Sample" into measurement channel to read measurement value.

Fig. 6-12 Energy measurement

1. Press the knob to pop up the setting interface (Figure 6-13), rotate the knob to change the measurement wavelength, press **"ENTER"** to confirm;

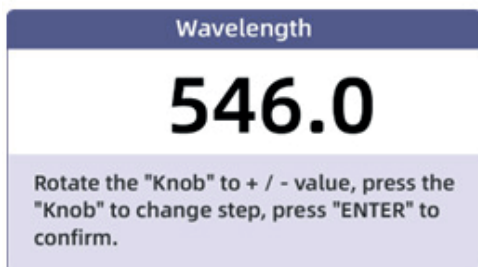


Fig. 6-13 Set the measurement wavelength

2. Rotate the knob to set the gain of the amplifier (1, 2, 4 or 8 times);
3. Place the "sample" in the measurement channel, close the sample room, and wait for the measured value to read the result stably.

7 REPAIR AND MAINTENANCE

In order to keep the instrument in the best working condition, the daily maintenance of the instrument must be done. This chapter introduces some things that you need to pay special attention to so that you can easily solve some minor problems.

7.1 Daily maintenance

- **Check the sample room**

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

- **Surface Cleaning**

If paint drops fall on the instrument cover, wipe them off immediately with a damp towel. Organic solution is forbidden to be used to clean the cover. Please wipe off the dirt on the cover timely.

- **Cleaning the Cuvettes**

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

7.2 Troubleshooting

Problem	Cause	Solution
Power on, no response	1 The power supply to the instrument is not turned on 2 Power cord connection is not reliable 3 Fuse destroyed	1 Turn on the power supply 2 Improve connection 3 Replace fuse
Boot, light source positioning error during self-checking	1 Light source drive motor is damaged	1 Contact your distributor
Boot, filter positioning error during self-checking	1 Filter wheel drive motor is damaged 2 Filter wheel initial positioning sensor is damaged	1 Contact your distributor 2 Contact your distributor
Boot, dark current error during self-checking	1 The sample room is opened during self-test	1 Close the sample room, and reboot
Boot, wavelength calibration error during self-checking	1 Light blocking in measurement channel 2 The sample room is opened during self-test 3 Wavelength drive motor is damaged 4 Wavelength initial positioning sensor is damaged	1 Remove it, close the sample room and reboot 2 Close the sample room, and reboot 3 Contact your distributor 4 Contact your distributor
Printer does not work, print error	1 The power supply to the printer is not turned on 2 Power cord connection is not reliable 3 Serial communication cable connection is not reliable	1 Turn on the power supply 2 Improve connection 3 Improve connection
Unstable readings	1 Warm up is not enough 2 Sample is not stable 3 The concentration of sample is too high 4 Power supply voltage low or not stable 5 Lamp damage or lamp life maturity	1 Warm up more time 2 Improve the sample 3 Dilute sample 4 Improve the power supply 5 Replace lamp
Poor measurement repeatability	1 Cuvette was contaminated 2 Sample was contaminated 3 Unstable power supply	1 Clean the cuvette 2 Improve sample 3 Improve power supply
Inaccurate reading of measurement sample	1 Wavelength error 2 Light source life is exhausted 3 Bad matching of the cuvettes	1 Restart, calibration wavelength 2 Replace light source 3 Improve the matching of the cuvettes

7.3 Spare Parts Replacement

■ 7.3.1 Fuse replacement



Danger! Be sure to turn off the power of the instrument and unplug the power cable before replacement!

1. Prepare a 3×75 flat blade screwdriver;
2. Turn off the device and unplug the power cord;
3. Remove the fuse seat by the screwdriver (Figure 7-1):



Fig. 7-1 Fuse position

4. Pick out the spare fuse (Mark 1, 3.15A/250V) and replace it to the working position (Mark 2) (Figure 7-2):

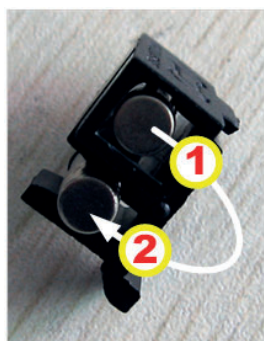


Fig. 7-2 Fuse



5. Install the fuse seat back to the power socket;
6. Plug the power cord into the power socket and turn on the instrument.

■ 7.3.2 Light source replacement

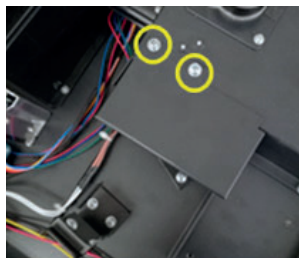


Hot! Wait 20 minutes before open the lamp chamber after power off to avoid scald!

1. Prepare a 6×150 screwdriver, a 6×150 Phillips screwdriver, and a pair of cotton gloves.
2. Turn off the instrument's power switch, unplug the instrument's power cord, and wait for 20 minutes to cool the light source;
3. Rotate the rod counterclockwise and take it out. Use a screwdriver to loosen the 4 screws (Figure 7-3) holding the instrument case and slowly lift the cover to the right side;

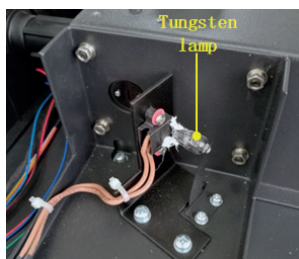


Fig. 7-3 Instrument case fixing screws



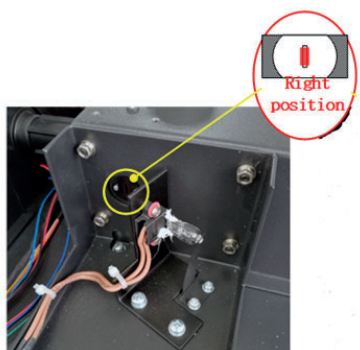
4. Unscrew the fixing screws of the lamp housing cover (Figure 7-4) and remove the lamp housing cover;

Fig. 7-4 Open the lamp housing cover



5. Replace the tungsten lamp (Figure 7-5). Wear cotton gloves. Remove the old tungsten lamp, and insert the new tungsten lamp into the tungsten lamp holder;

Fig. 7-5 Replace the tungsten lamp



6. Turn on the power of the instrument (Figure 7-6). You need to turn the light source switching mirror. As long as the spot passes through the entrance slit, the up-down direction is in the center of the slit, and the spot is left or offset. At the right, loosen the two screws holding the tungsten lamp holder, fine tune the tungsten lamp holder and observe the light spot, adjust it to a suitable position and fix it;

Fig. 7-6 Tungsten lamp light spot

7. Install the lamp housing, instrument case, and the rod to finish the replacement.