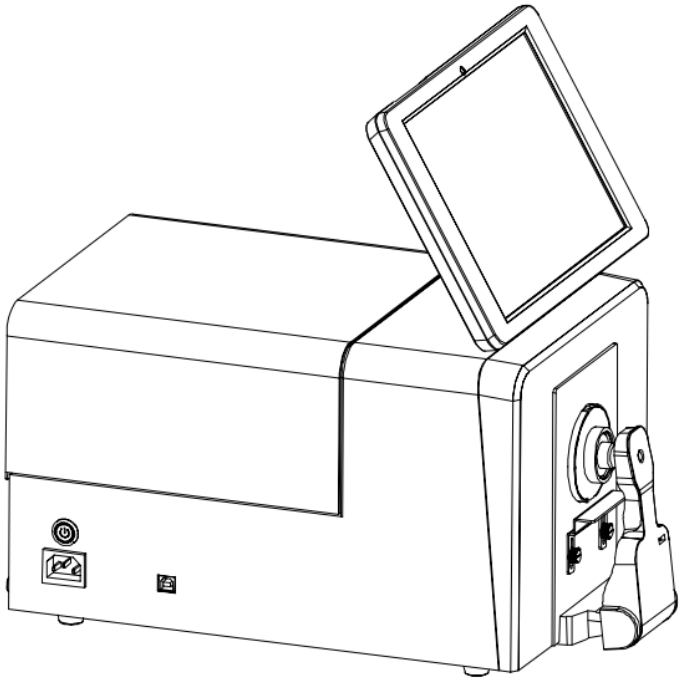
Benchtop spectrophotometer
Operation Manual



V1.0

Please read this manual carefully before use .

Safety Symbol

In order to avoid accidents caused by improper operation, the following symbols are used in this manual or on the instrument label.


This symbol instructs relative safety warnings or precautions.
Read these instructions carefully to use this instrument safely and correctly。


This symbol is a description of electrical hazards associated with electric shock.
Read these instructions carefully to use this instrument safely and correctly.


This symbol is a description of fire hazards。
Read these instructions carefully to use this instrument safely and correctly。


Represents a prohibiting execution. This is absolutely not executable


Represents an instruction.
The instruction must be strictly performed.


Represents a prohibiting execution.
Do not disassemble this instrument.


Represents an instruction.
Make sure that the AC adapter is pulled out from the AC socket.

Cautions

- No copy or copy of all or part of this manual is strictly prohibited without authorization from the company.
- The contents of this manual are subject to change without prior notice.
- When preparing this manual, we have done our best to ensure the accuracy of its contents. If you have any questions or find any errors, please contact your retailer or our authorized maintenance agency.
- The company has no liability for all consequences arising from the improper operation of this instrument。

Please keep this manual carefully for your reference at any time.

Safety Measures

To ensure proper use of this instrument, please read carefully and strictly observe the following points.

⚠ Warning: Failure to comply with the following points may pose a danger to personal safety.

	**1.** Do not use this instrument in a place where there are combustible or flammable gases (gasoline, etc.), otherwise it may cause fire. **2.** Do not allow liquid or metal objects to enter the instrument, otherwise it may cause fire or electric shock. If a liquid or metal object enters the instrument, turn off the power immediately, unplug the AC adapter plug, and contact the nearest authorized maintenance institution. **3.** Do not force, twist or pull the power cord of the AC adapter. Do not scrape or modify the power cord, or place heavy objects on the power cord, otherwise it may damage the power cord, and cause fire or electric shock. **4.** Do not use wet hand to plug AC adapter plug, otherwise it may cause electric shock. **5.** If the instrument or AC adapter is damaged, or smokes, do not continue to use this instrument, otherwise it may cause fire. In this case, power should be switched off immediately, AC adapter plug removed from the AC socket, and contact the nearest authorized maintenance institution. **6.** Do not measure the face directly on the sample measuring aperture, otherwise it may damage the eyes. **7.** Do not place the instrument on an unstable or inclined surface, or it may cause the instrument to slide or overturn, causing injury to personnel.
	**1.** Be sure to always use a standard AC adapter or an optional AC adapter and connect it to an AC socket with rated voltage and frequency. If you use a not specified AC adapter, it may damage the instrument or cause a fire or electric shock. **2.** Be careful not to put your hand in the notch of the instrument, or you may get stuck in your finger and cause injury.
	**1.** Do not disassemble or refit the instrument or AC adapter, otherwise it will cause fire or electric shock.
	**1.** If the instrument is not used for a long time, please pull the AC adapter plug from the AC socket. Because the dust

	or water stains on the AC adaptor pins may cause a fire, they should be pulled out immediately. **2.** When pulling the AC adapter plug out of the AC socket, be sure to always hold the plug itself to avoid pulling the power cord, which may damage the power cord and cause fire or electric shock.

Technical Description

The desktop spectrophotometer is designed for measuring color and color differences in industries such as plastic electronics, paints and inks, textile dyeing, and printing. It can measure reflected and transmitted colors with high precision.

Operating Environment

- Please use this instrument at ambient temperatures ranging from 0℃ to 40℃ without condensation. Do not use this instrument in areas where temperature varies dramatically.
- Do not place this instrument near direct sunlight or heat sources such as furnaces. In this case, the internal temperature of the instrument may be higher than the ambient temperature.
- Do not use this instrument in the presence of dust, cigarettes or chemical gases, or it may cause performance degradation or even system collapse.
- Do not use this instrument near devices such as loudspeakers that generate strong magnetic fields.
- The bench-top spectrophotometer and its standard AC adapter are designed for indoor use only. Because rain or other factors may damage the instrument, so do not use it outside.

White Calibration Plate

- Do not scrape or dirty the white correction board, for example, do not leave fingerprints.
- When white calibration plate is not used, be sure to place them properly to prevent white calibration plate from being exposed to light.
- To achieve accurate measurement, we advise that the white calibration plate should also be calibrated periodically.

Power

- Ensure that the power switch is switched to "O" when the benchtop spectrophotometer is not used.

- Make sure you always use a standard AC adapter and connect it to an AC socket with rated voltage and frequency.

CATALOGUE

Instruction

This benchtop grating spectrophotometer are independently developed by our company, who has complete intellectual property rights. A 10.5 -inch touch PAD is used as a display interactive interface. According to CIE, the geometric optical structure D/8 ° (reflection) and D/0 ° (transmitted), the instrument can measure Reflection/Transmission and colorimetric data of various samples. The instrument with Φ25.4mm, Φ15mm, Φ8mm, Φ4mm various reflective aperture to meet various test occasions. The instrument is equipped with 360 ~ 780nm full spectral light sources, 400nm cut-off, 420nm cut-off light source, 460nm cut-off light source, Xenon light source (Note: some models are equipped with differences), switch through on-off, and achieve color index measurement on various samples/fluorescent samples. This instrument with accuracy and stability measurement, large storage capacity, equipped with USB and Bluetooth dual communication modes, and PC -site color management software achieve more extension functions, which can be used for precision analysis and transmission of color. It is suitable for precise color transmission, quality control, chromatography, and chromatography etc. It is also widely used in the fields of scientific research institutions and laboratory drug analysis.

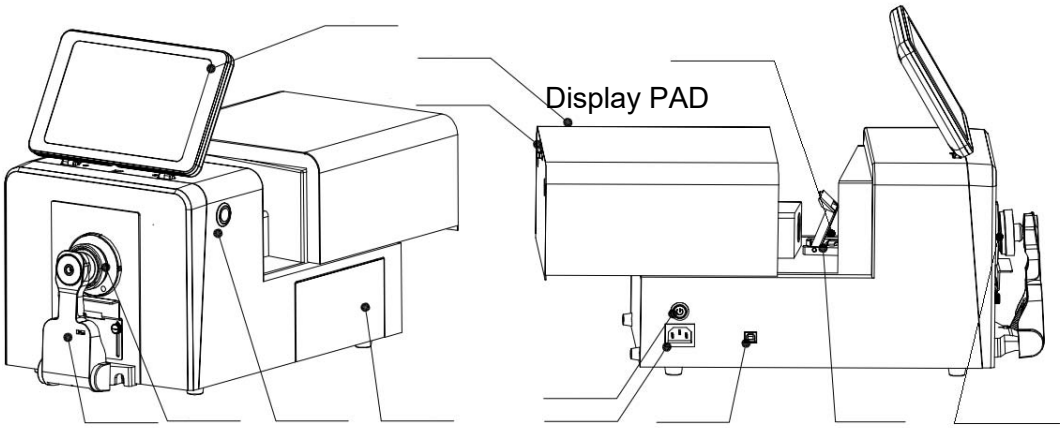
Precautions

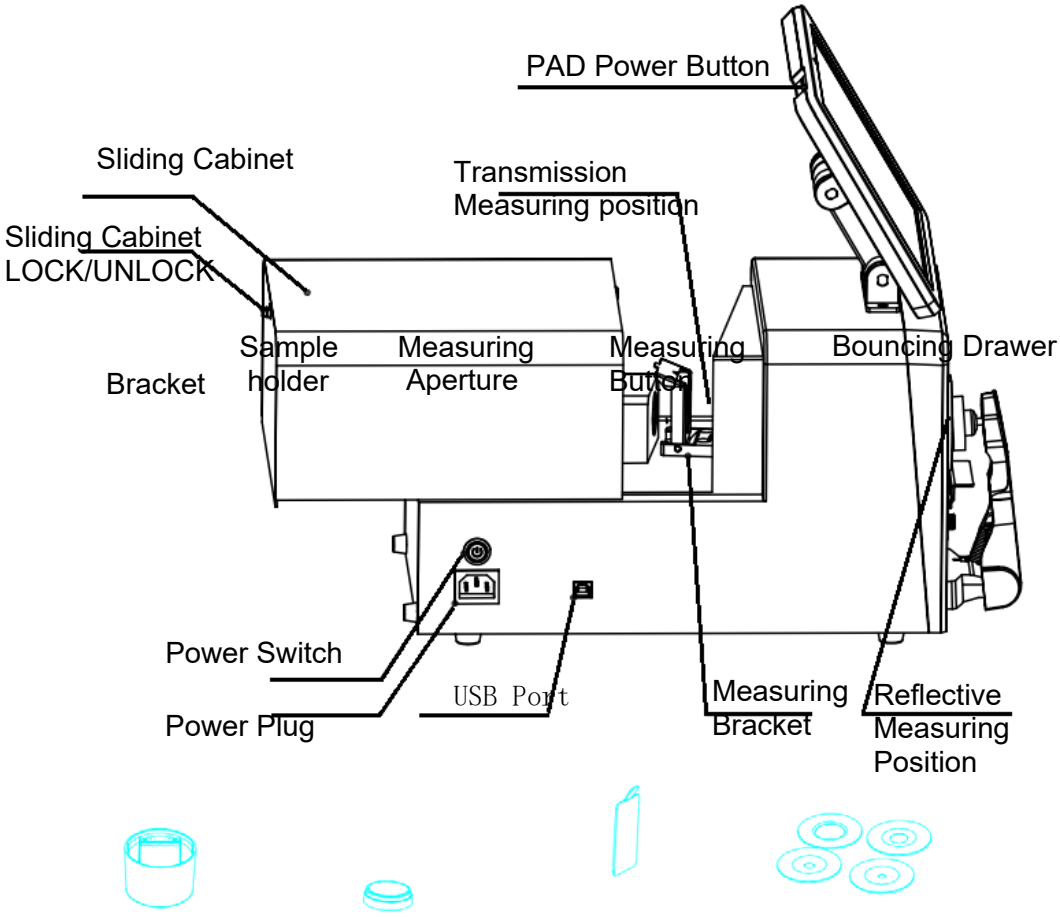
- The spectrophotometer is a precise measuring instrument. Please avoid drastic changes of external environment when measuring. These changes, including the flicker of surrounding light and the rapid change of temperature, will affect

measurement accuracy.

- Keep the instrument balanceable, make sure the measuring aperture touch the surface of the test sample placidly, and no shaking or shifting when measuring. Please prevent the colorimeter from fierce collision or crash.
- The instrument is not waterproof. Do not use it in high humidity environment or in water.
- Keep the instrument clean. Avoid dust, powder or solid particles entering the measuring aperture and the instrument.
- Replace the white calibration cavity and put the spectrophotometer into instrument case when not in use.
- Please turn off power to prevent the instrument from damage, place instrument, calibration plate, other accessories in the original package, and Store in a dry and cool environment if you don’t use it for a long time.
- Any unauthorized changes to the instrument are not permitted, or it will affect the measuring accuracy, even cause irreversible damage.

1. External structure and description





Reflective Black Calibration Cavity
Reflective White Calibration plate
Transmission Black Calibration Plate
Measuring Aperture
Cuvette

Figure 1 Instrument Structure Diagram

PAD：A 7-inch tablet with touch function is used for instrument measurement data display and operation navigation, and its startup status is directly controlled by the instrument's power button.

Bracket：Under reflective measurement mode, to fix samples in correct position, also there is holder to help support if sample is heavy.

Measuring Aperture：Reflective measuring apertures: Φ25.4mm/ Φ15mm /Φ8mm/Φ4mm; customer selects the appropriate measuring aperture according to the tested sample dimension. The bigger aperture customers choose, the more accurate the measurement data will be.
Transmissive measuring apertures:Φ25.4mm, and white plate must stay in reflective measuring position.

Wake-up/Measuring button：
In standby mode, briefly press the measurement key to wake up the system; briefly press to start measurement, key operations are invalid during the measurement process.

Bouncing Drawer：Store small sample or accessory

Reflective Measuring Position：During Reflective measuring mode, the sample should cling to the measuring aperture tightly fixed by sample holder.

Meanwhile, the transmission measurement aperture remains unshielded and the cover above the port should be closed.

Transmissive Measuring Aperture:
During Transmissive measuring mode, the sample should cling to the measuring aperture tightly fixed by clamp component. The cover above the port should be closed, meanwhile the Reflective white calibration plate should be placed to the reflective measuring port.

Reflective Black Calibration Cavity:
During Reflective measuring mode, black calibration is used as the 0 benchmark. For specific operation please refer to the section of black and white calibration.

Reflective White Calibration Plate:
During Reflective measurement mode, white calibration is used as the highest reflectance test benchmark of the instrument. For specific operation please refer to the section of black and white calibration.

Transmissive Black Calibration Plate:
During Transmissive mode, black calibration is used as the 0 benchmark. For specific operation please refer to the section of black and white calibration.

Sliding Cabinet: Open/Close transmission house, Keep transmissive measurement stable environment, avoid outside effective.

Sliding Cabinet Lock/Unlock：Lock or unlock sliding cabinet

USB Port：USB port is used to connect with PC computerized high-end color management software to achieve more extension functions.

DC Power Port: The power adapter connects Alternating Current (AC110V-240V) to power the instrument. The specification of external power adapter is DC 24V/3A.

Power Switch：Setting power switch to “I”, it turns the power ON, and setting to “O”, it turns the power OFF. We set power ON or OFF by toggling the switch.

PAD Power: Control Pad screen independently,When you do not use the instrument for a long time, you need to turn off the PAD power switch.

Note: The entire machine instrument includes measuring instrument modules and PAD modules, and the two modules are independent of each other. The measuring instrument module can connect to PAD module or the PC . At the same time, the measuring instrument module can only connect one of the modules (PAD modules or PC). The booting and shutdown of the PAD is controlled by its own PAD power switch

2. OPERATIONING INSTRUCTION

2.1 About Instrument

Click "instrument"，we can check instrument model,serial number,whiteboard number,software version,hardware version; click unconnected to change connection method.(Figure 2)

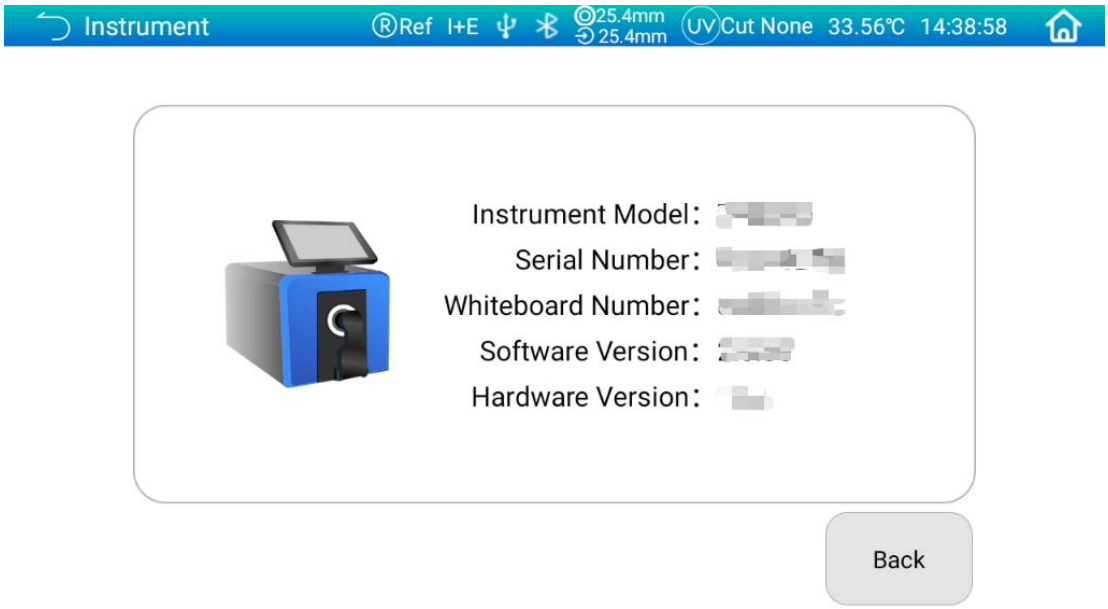


Figure 2 Instrument Information

2.2 Power On & Off

Press the power switch, and the indicator light stays red, indicating the instrument is powered on normally; press the power switch again to turn off the instrument, and the indicator light will go out.

If no operation is performed for an extended period while the instrument is on, it will automatically enter standby mode. In this state, press the measurement key to wake up the instrument and return it to working condition.

When the instrument is not in use for a long time, please disconnect its power supply.

2.3 Calibration

Black and white calibration is required under the following circumstances.

1、Before the first time of measuring after power is on.

2、Before the first time of measuring after switching measuring aperture.

3、Before the first time of measuring after switching reflective and transmissive mode.

4、Before the first time of measuring after switching UV mode.

5、When the environmental condition change relatively large (such as temperature changes exceeding 5 degrees Celsius).

6、Use the instrument for a continuous long time (over 8 hours).

7、When the user finds that the measuring data is inaccurate.

2.3.1 Reflection Measurement Mode Calibration

First of all, ensure that the instrument is in Reflective Measurement Mode

Calibration Steps:

1. Click “Start Calibration” and enter calibration page(Figure 3)in menu page. It will display if calibration still valid and rest valid time.

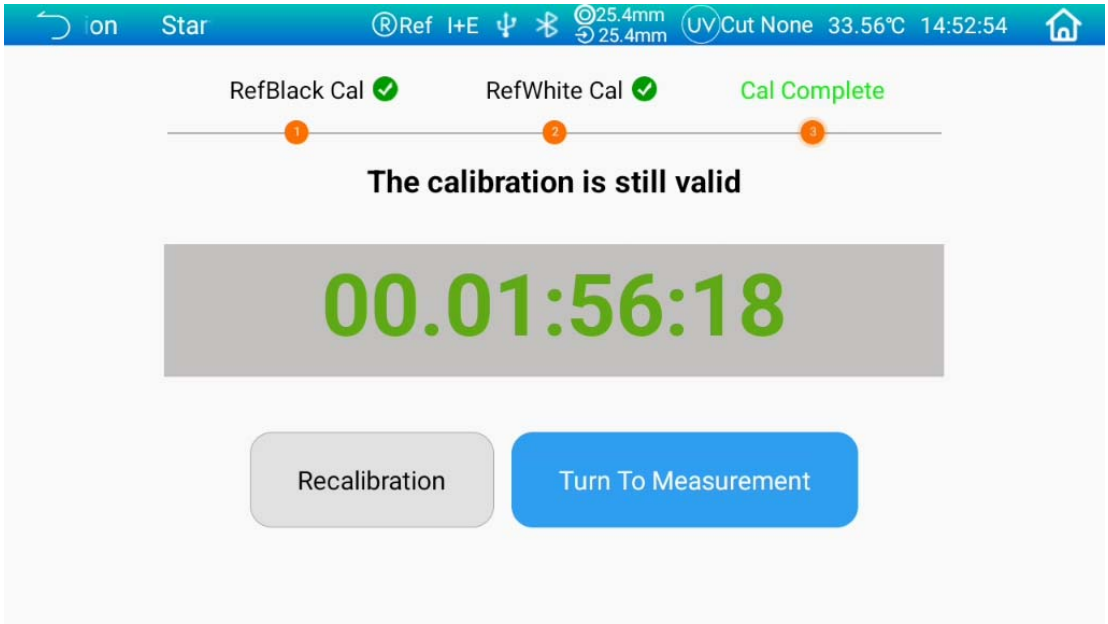


Figure 3 Calibration Page

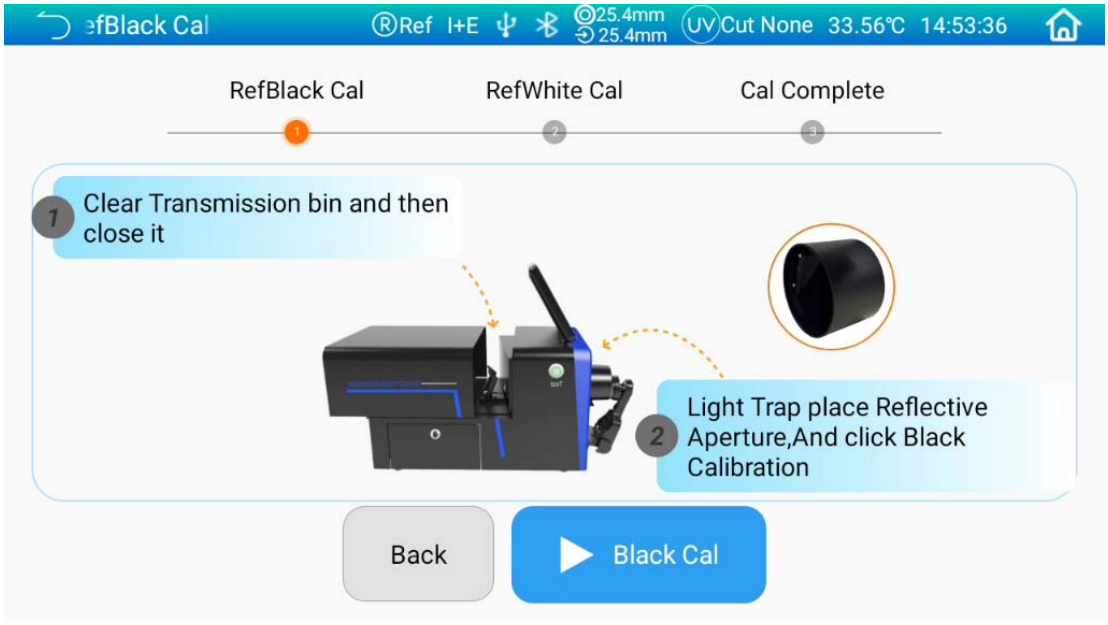


Figure 4 Calibration Expired

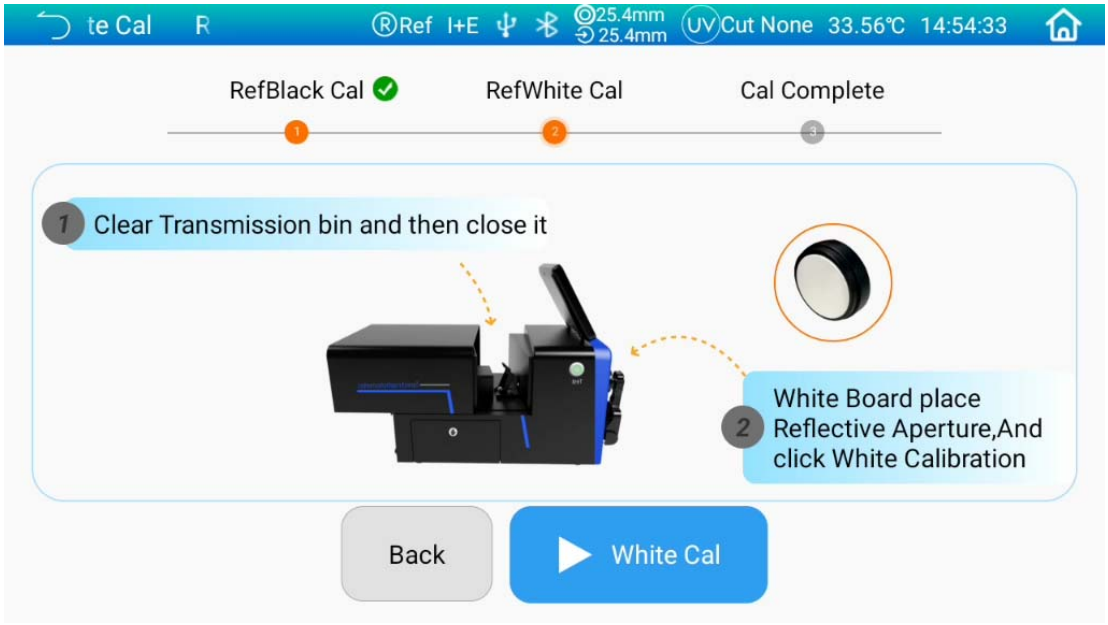
2. Click "Start Calibration" to enter Reflective Black Calibration interface as shown in Figure 5. Place well black cavity according to the warning, then press the measuring button to start black calibration, or click " ← " to cancel and quit the calibration

Steps for placing black cavity:

- Pull out and open the bracket
- Follow instruction,Place the black cavity to joint with groove of instrument, then close the sample clamp to fasten the black cavity, clear the transmission house

Figure 5 Black Calibration

3. It will automatically enter White Calibration after Black Calibration is finished as shown in Figure 6. Place well white plate (the same step as how to place black cavity), then press measuring button to start white calibration, or click " ← " to cancel and quit the white calibration.



After correct calibration, the instrument system will restart timing according to the validity period of black and white calibration set by the user.

2.3.2 Transmission Measurement Mode Calibration

First of all, ensure instrument is in Transmission Measuring Mode

Cautions: During transmission measuring mode, no matter if it's during calibration or measurement mode, please ensure transmission measuring aperture is Φ25.4mm, and fasten the reflection plate to the reflective measuring aperture.

Calibration Steps:

1. Enter into main menu as shown in Figure 8, click "Calibration" to enter transmissive black calibration. Place the transmission black plate into transmission sample bin and stick it to the side of integrating sphere tightly, put white board in reflective aperture and click the "Black Calibration" to start calibration.

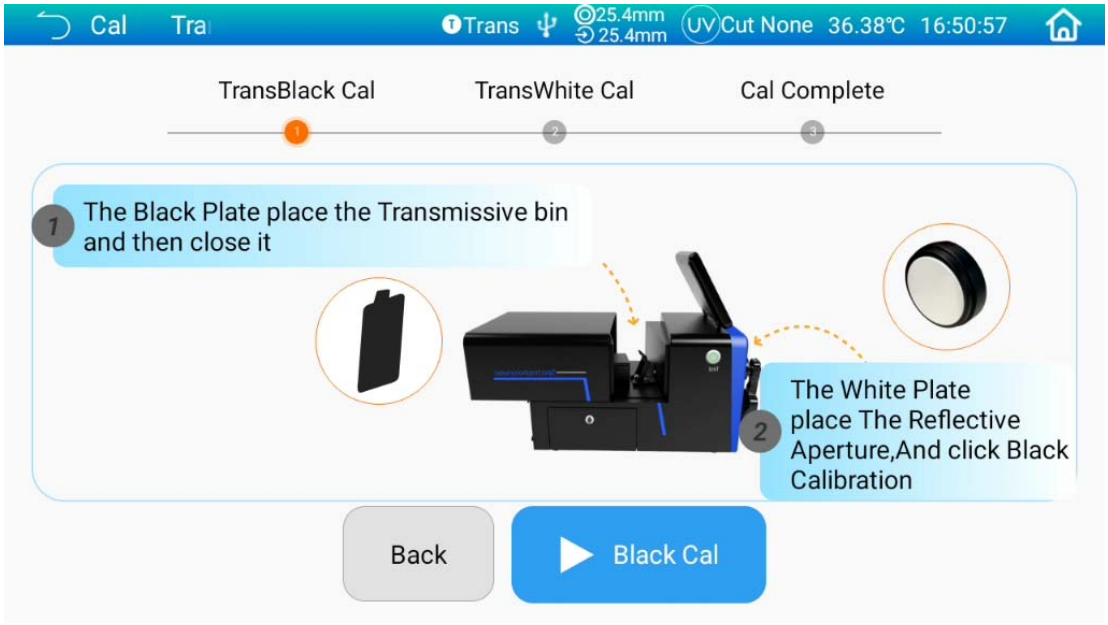


Figure 6 Transmissive Black Calibration

2. After finishing transmission black calibration, enter transmissive white calibration page(Figure 9), take out the black plate, place the white calibration reference according to instruction, ensure it stick to the side of integrating sphere tightly, close the bin cover, and click “White Calibration” to start calibration.

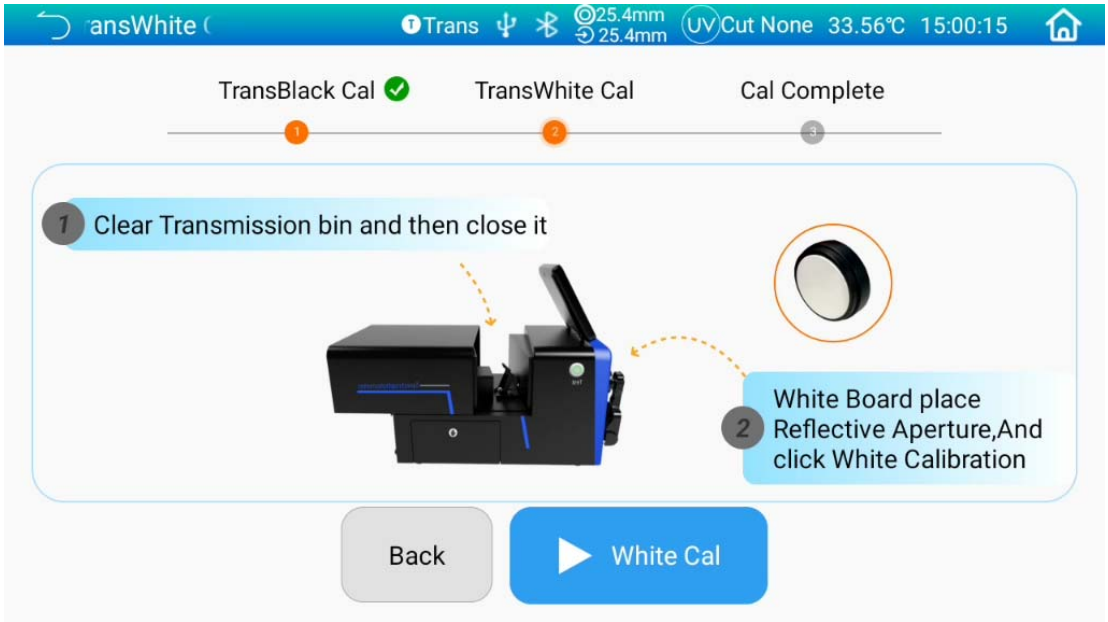


Figure 7 Transmissive White Calibration

Cautions：

The users should choose relative white calibration reference according to

different type of transmissive tested sample. For example, if tested sample is plastic or glass etc, air can be chosen as white calibration reference. If tested sample is liquid, then a cuvette filled with deionized water or distilled water can be used as a reference for white calibration. If the tested sample is powder packed in a cuvette, then an empty cuvette can be selected as a reference for white calibration. Of course, users can also choose the standard solution that has been calibrated (e.g. Potassium Permanganate solution with calibrated transmissivity) as a reference. Calibration channels should be chosen relatively for different calibration reference.

After finishing calibration rightly, the instrument system will reset remaining time according to valid time after last calibration

2.3.3 Haze Measurement Mode Calibration

First of all, ensure instrument is in Transmission Measuring Mode
Calibration steps:

1. On the main interface, click "Calibration" and complete the first step of calibration according to the transmission measurement mode.
2. On the main interface, click "Measurement" to enter the measurement interface. In the measurement interface, click "Display Settings," then select "Haze" in the display settings interface, and finally click "OK" at the bottom of the interface to proceed to haze measurement.

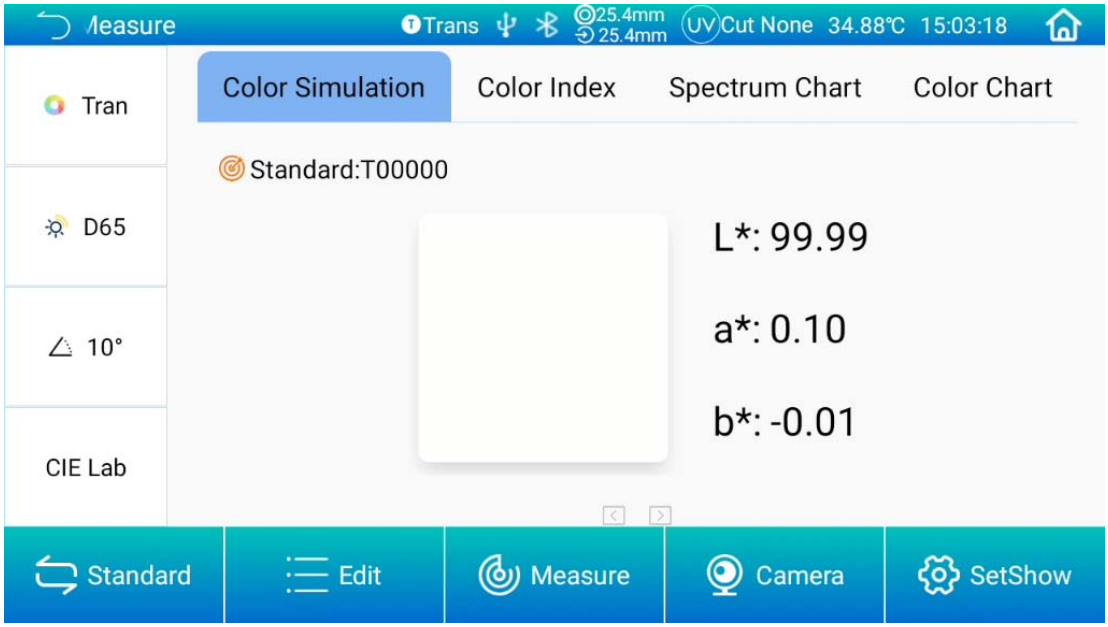


Figure 8 Transmission measurement interface

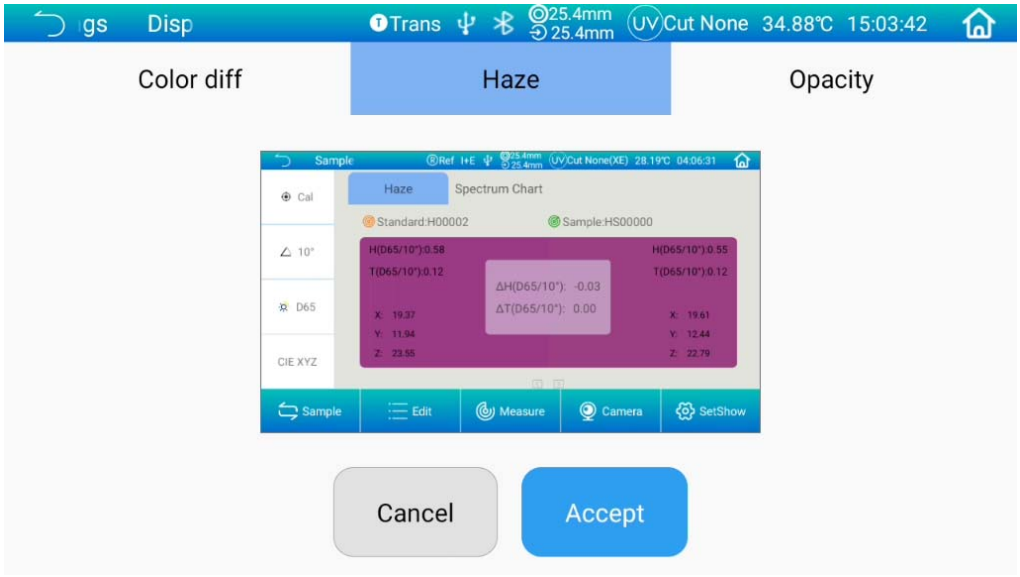


Figure 9 Setting interface

3. Click Calibration in the upper left corner of the haze measurement interface to enter the haze black reference calibration interface. Place the light trap cylinder on the reflection port, clear the transmission chamber as prompted, and then click Calibration.

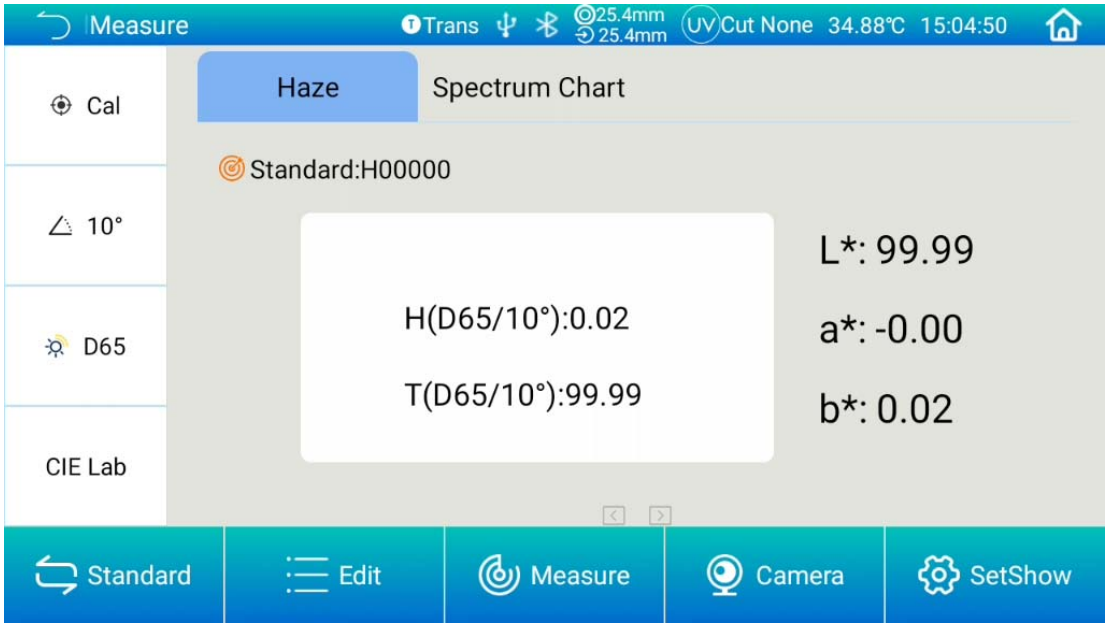


Figure 10 Haze Measurement

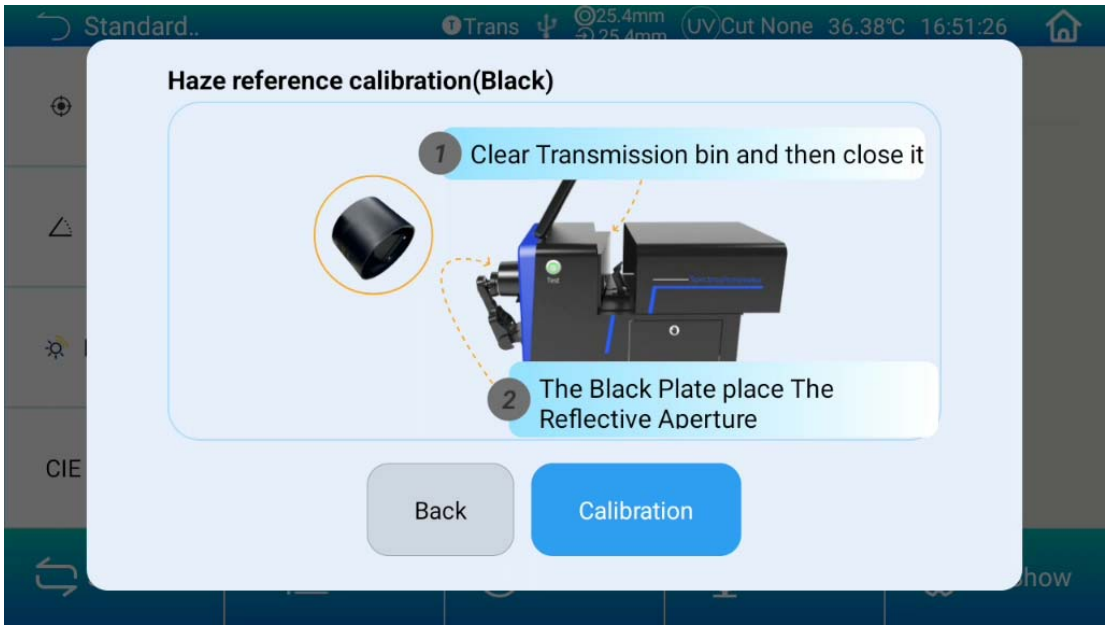


Figure 11 Haze black calibrate interface

4. After the calibration is completed, enter the haze white reference calibration interface. Place the whiteboard on the reflection port according to the prompt, clear the transmission chamber, and then click calibrate. After successful calibration, click accept.

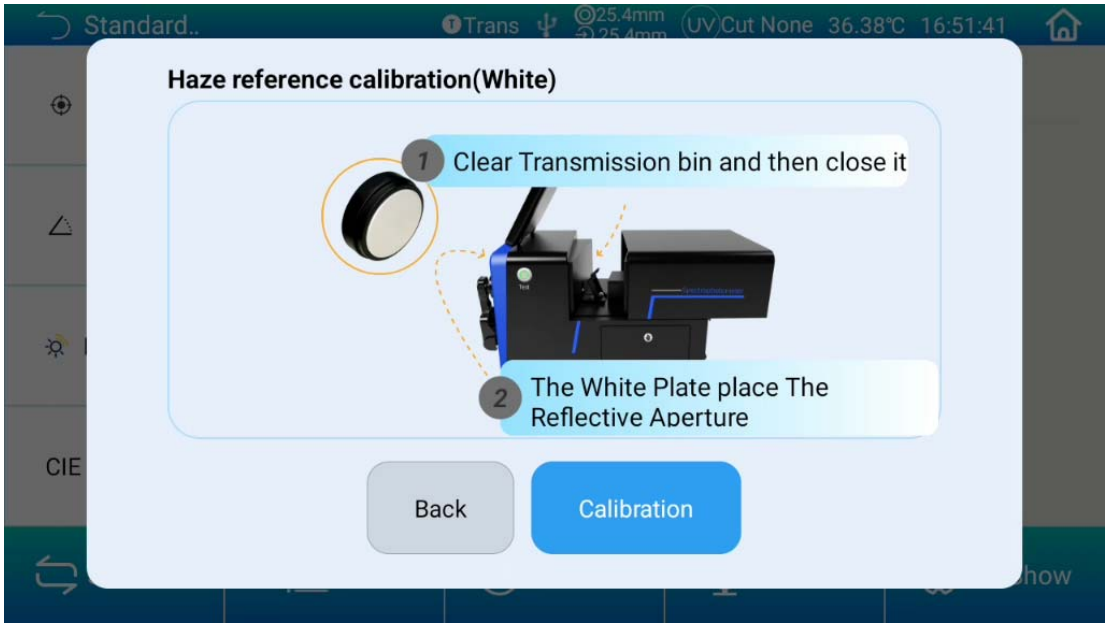


Figure 12 Haze white calibrate interface

3. Color options settings

In the color options interface, you can set the color space displayed when measuring samples, the color difference formula used for color index and comparative data, and the standard sample tolerance.

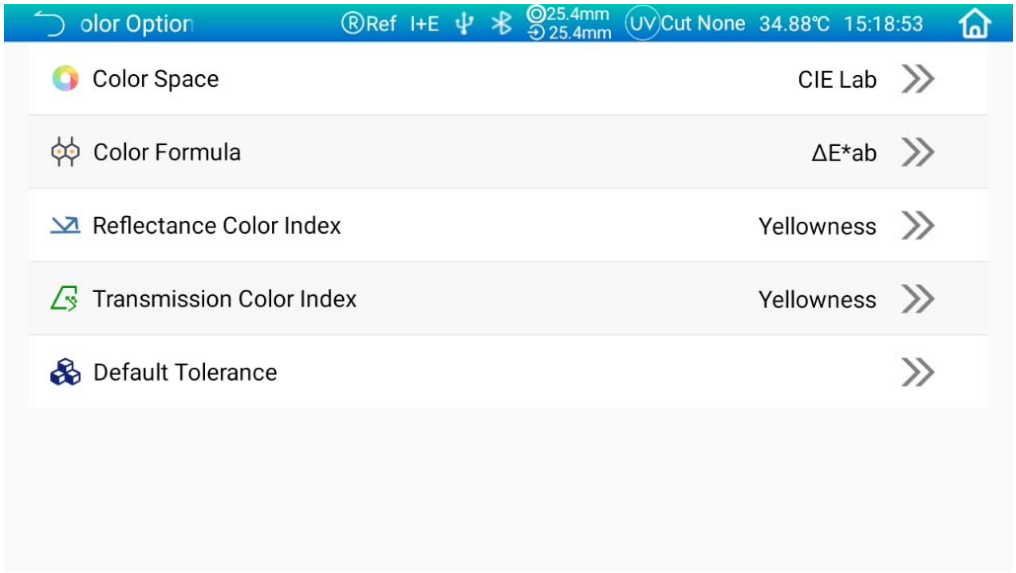


Figure 13 Color options settings

3.1 Color Space Settings

Click "Color Space" to enter the color space settings interface. In the color space settings interface, select the appropriate color space, then click "Confirm" to complete the color space configuration. Once set successfully, the measurement interface will display the selected color space.

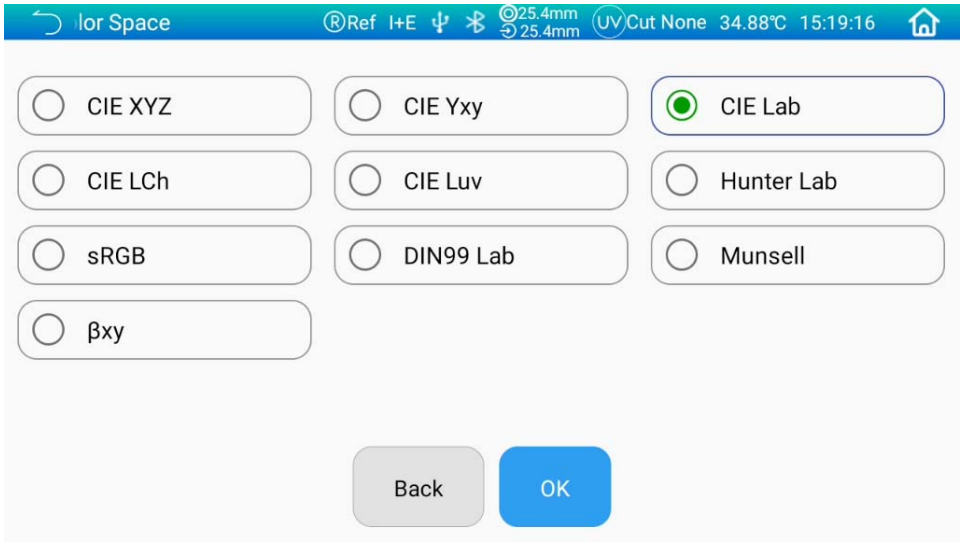


Figure 14 Color Space settings

3.2 Color Difference Formula Settings

Click on "Color Difference Formula" to enter the color difference formula settings interface. Select the appropriate color difference formula on the selection screen, then click "Confirm" to complete the color difference formula setup.

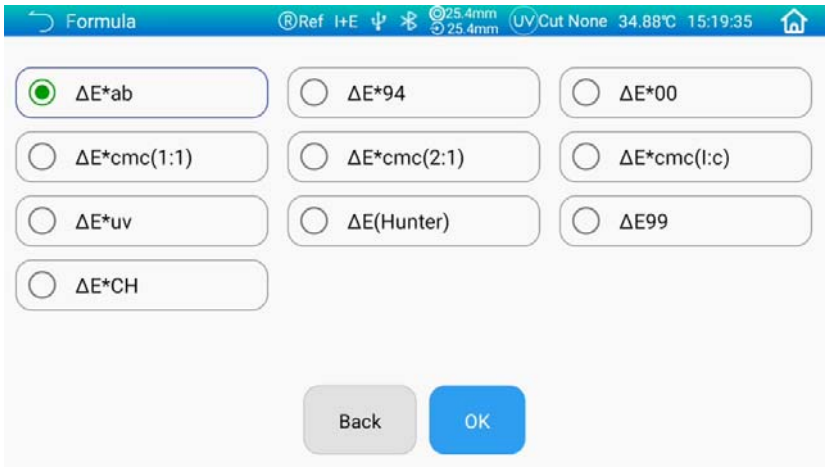


Figure 15 Color Difference Formula

3.3 Reflection Color Index Position

Click on "Reflection Color Index" to enter the reflection color index setting interface. In the reflection color index selection interface, choose the corresponding color index, and then click "Confirm" to complete the color index setup.

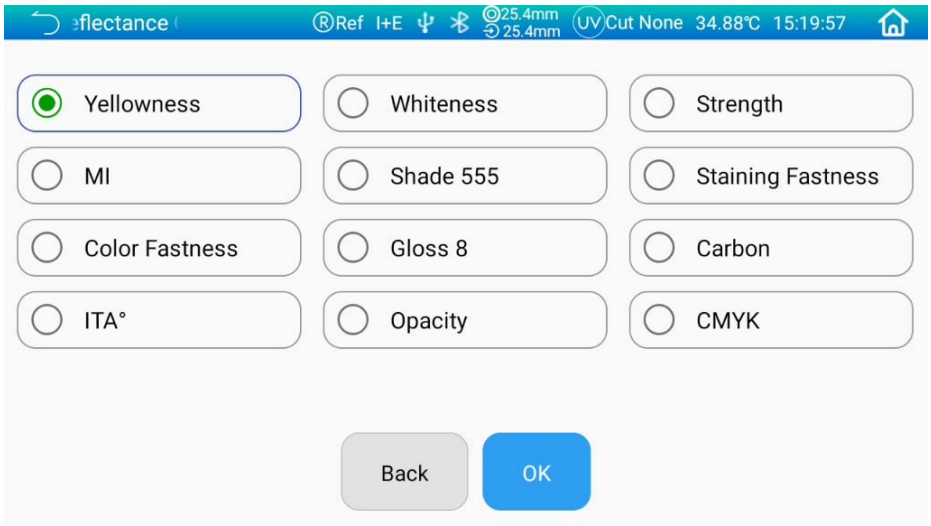


Figure 16 Reflection color index

3.4 Transmission Color Index Settings

Click "Transmission Color Index" to enter the Transmission Color Index settings interface. In the selection interface for transmission color index, choose the corresponding color index, then click "Confirm" to complete the transmission color index configuration.

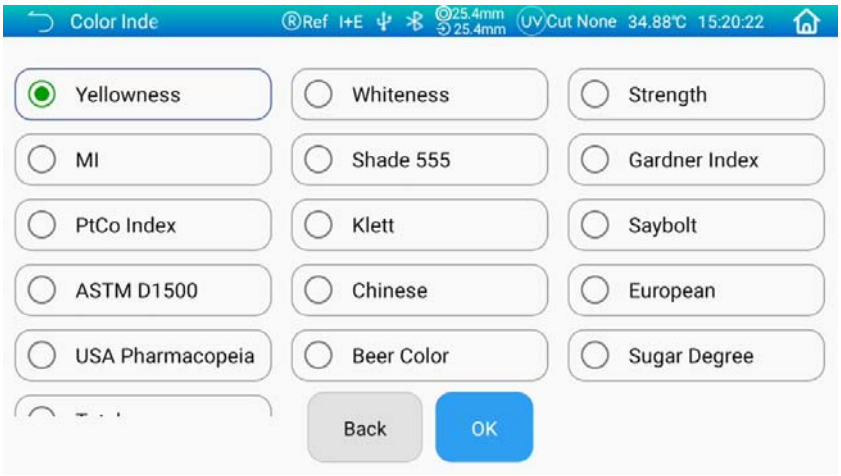


Figure 17 Transmission Color Index

3.5 Default Tolerance Settings

After entering the default tolerance settings interface, click on the edit box to modify the value of the corresponding tolerance item. The lower limit of the tolerance item must be less than the upper limit. Click the color difference formula dropdown menu to set the default tolerance for other color difference formulas; similarly, click the color space dropdown menu to set the default tolerance for other color spaces.

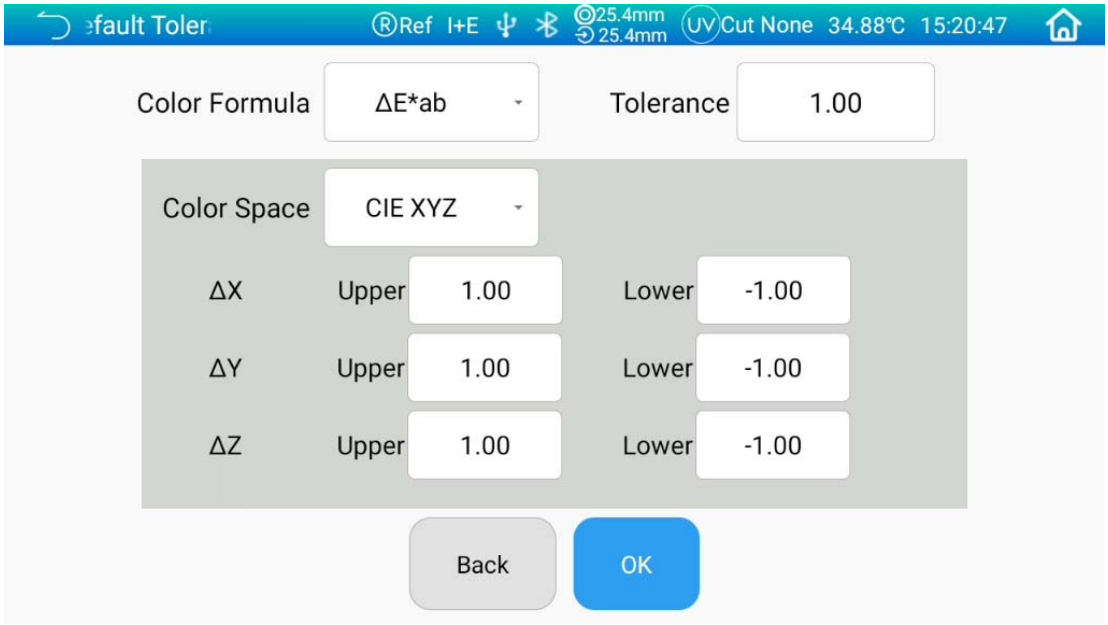


Figure 18 Default Tolerance

4.Measurement Mode Settings

The measurement mode settings interface allows for the configuration of various measurement parameters.

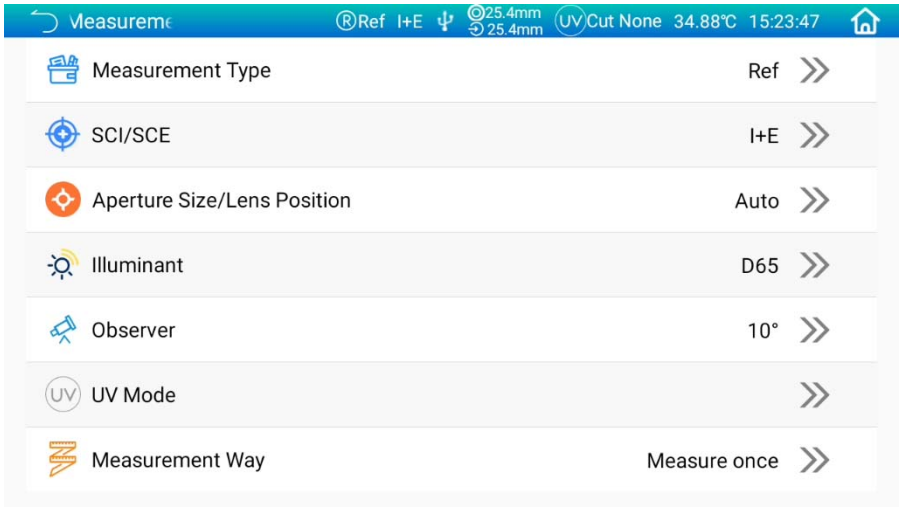


Figure 19 Measurement Mode

4.1 Measurement Type Setting

On this interface, users can choose to perform either reflection measurement or transmission measurement. Reflection measurement is used to measure the color of an object's surface, while transmission measurement is applied to transparent or translucent samples. The status bar at the top of the interface displays the currently set measurement type.

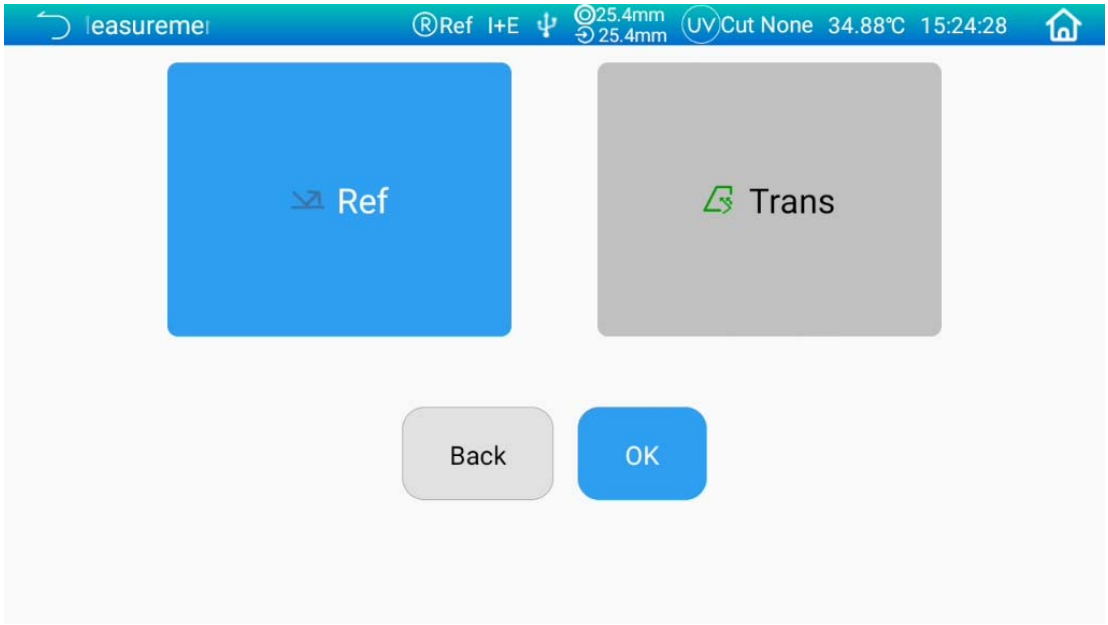


Figure 20 Measurement Type

4.2 SCI/SCE Settings

The SCI/SCE settings interface provides two measurement mode options for reflection measurement. The SCI (Specular Component Included) mode includes specular reflected light, which is suitable for evaluating the overall appearance of a sample (including gloss). The SCE (Specular Component Excluded) mode excludes specular reflected light, making it ideal for assessing the color of a sample's surface without being affected by gloss. When set to I+E mode, both measurement modes are enabled, and the status bar at the top of the interface will display the currently set measurement mode.

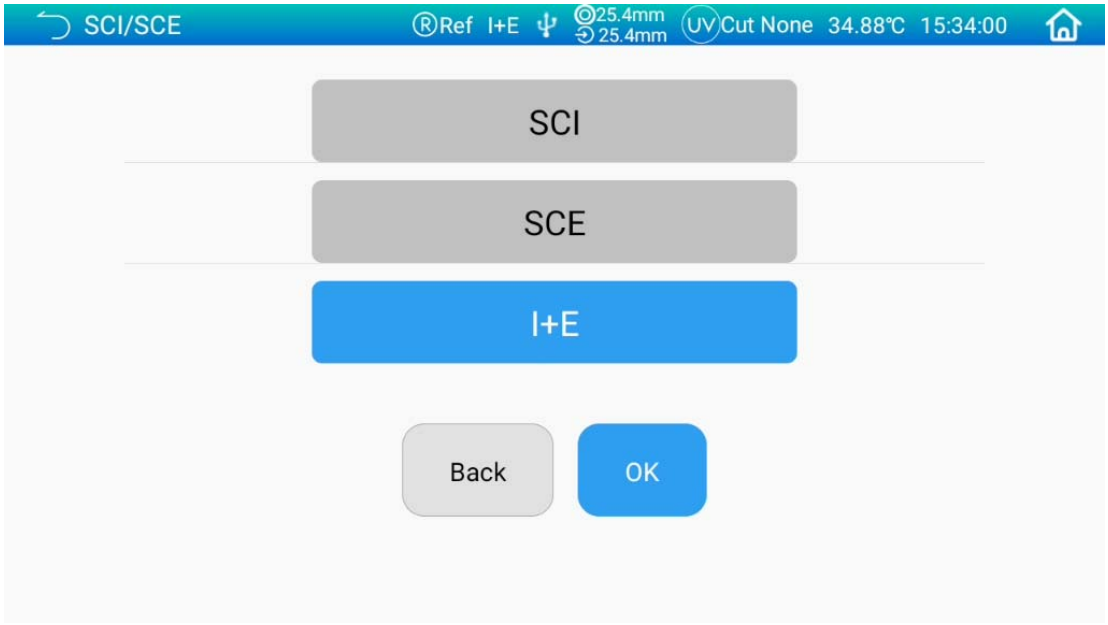


Figure 21 SCI/SCE setting

4.3 Measurement Aperture/Lens Position Settings

Users can select an appropriate measurement aperture (i.e., the size of the measurement area) based on the size and shape of the sample, or adjust the lens position to optimize the measurement area. It can be set to automatic recognition mode or manual mode. In automatic recognition mode, the instrument automatically recognizes the size of the placed aperture when the user changes it and adjusts the lens position accordingly. In manual mode, users can set the aperture size and adjust the lens position by themselves. The status bar at the top of the interface also displays the currently set measurement aperture and lens position.

Note: Only manual mode is supported in transmission mode, with the reflection aperture fixed at 25.4 mm. The transmission aperture size must be manually specified based on the installed transmission aperture fixture.

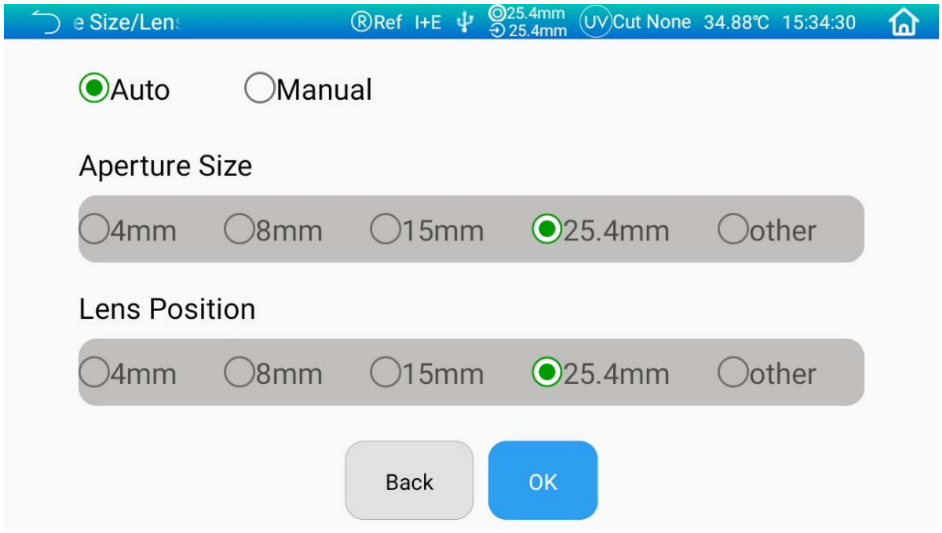


Figure 22 Measurement Aperture/Lens Position

4.4 Light Source Settings

Users can choose the type of light source used during measurement, such as D65, A light source, etc., to simulate color performance under different lighting conditions.

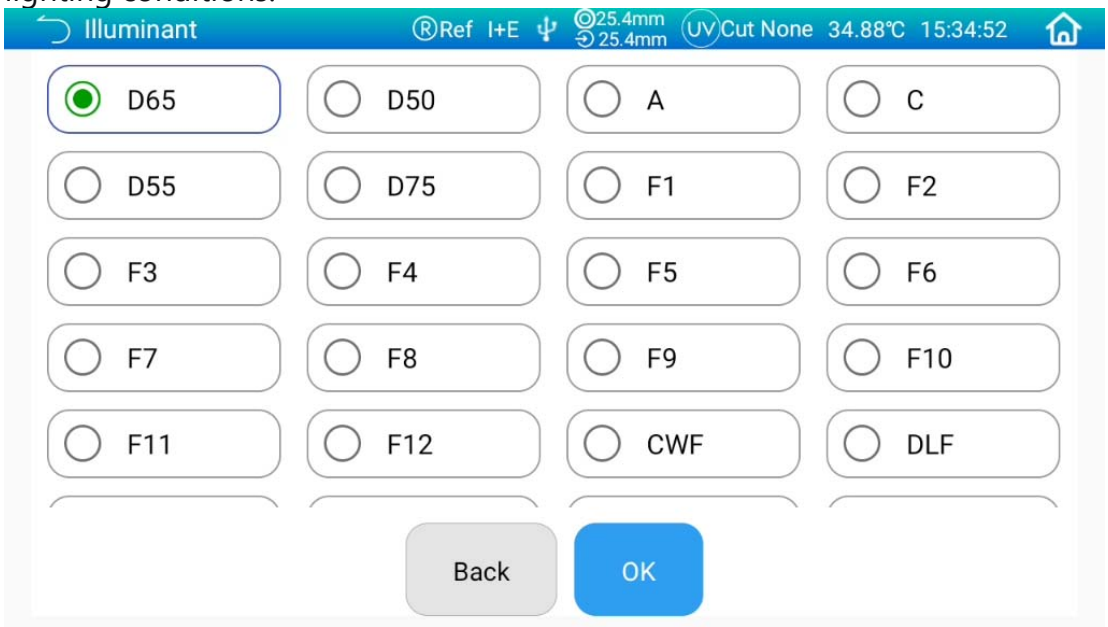


Figure 23 Light Source

4.5 Observer Angle Setting

Two standard observer angles are provided: 10° and 2°. The 10° observer angle (CIE 1964) is suitable for color evaluation in larger visual fields, while the 2° observer angle (CIE 1931) is closer to the foveal vision of the human eye.

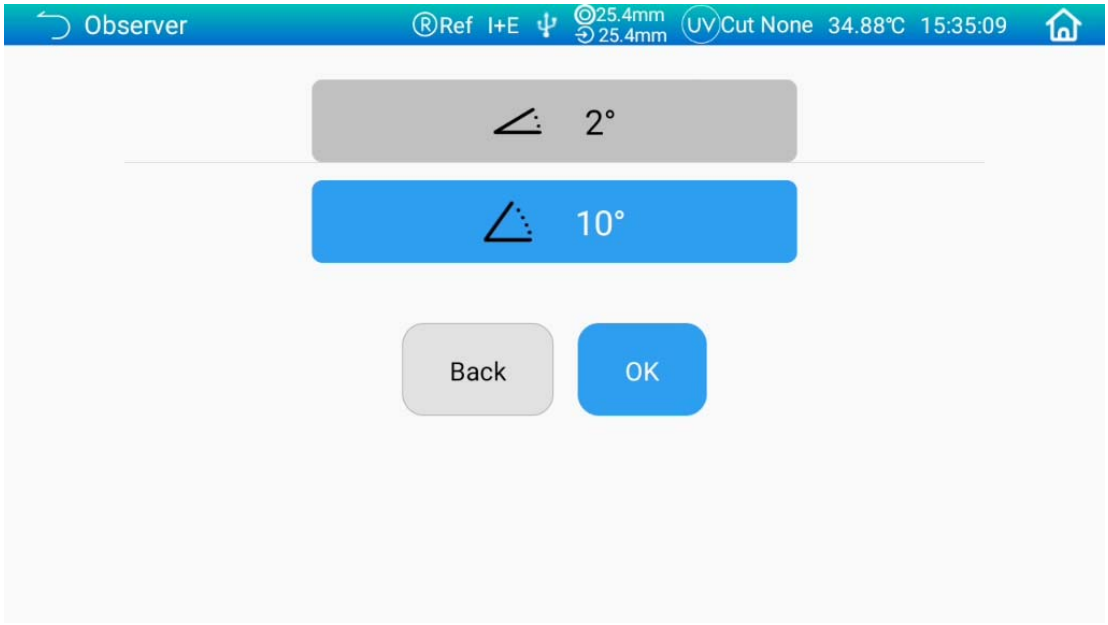


Figure 24 Observer Angle Setting

4.6 UV Mode Setting

Users can select between including or cutting off ultraviolet light. The available options include:

"400 nm cut-off" means the illumination source filters out spectral components from 360 nm to 400 nm through a color filter.

"420 nm cut-off" means the illumination source filters out spectral components from 360 nm to 420 nm through a color filter.

"460 nm cut-off" means the illumination source filters out spectral components from 360 nm to 460 nm through a color filter.
"No cut-off" means the illumination source has no color filter, providing full-spectrum illumination from 360 nm to 780 nm.
"No cut-off xenon lamp" means the illumination source uses a xenon lamp without a color filter, delivering full-spectrum illumination from 360 nm to 780 nm (note: specifications may vary with different models).

This setting is particularly important for samples containing fluorescent brighteners, because ultraviolet light can excite fluorescence and affect color measurement results.

The status bar at the top of the interface also displays the current setting. For example, if set to "No cut-off," the interface will show "UV No cut-off" at the top.

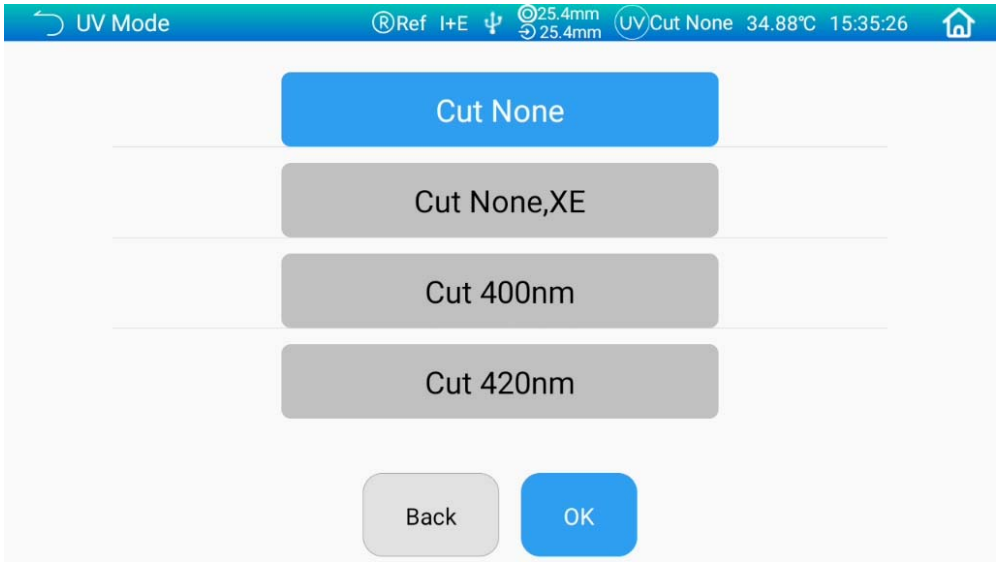


Figure 25 UV Mode Setting

4.7 Measurement Mode Settings

Single Measurement: A single triggered measurement that captures data once.

Continuous Measurement: When testing conditions are fixed and continuous measurement of samples is required, or in automated assembly line operations, the continuous measurement mode can be used to reduce operational steps and save testing time. Both standard sample measurements and test sample measurements can be set for a specific number of continuous measurements, and each measurement result can be saved. During continuous measurement, clicking the cancel button can terminate the process.

Average Measurement: When the measured item is relatively large or has uneven color distribution, measuring multiple representative test points to obtain the average reflectance and then calculating the colorimetric data can better represent the true colorimetric data of the sample.

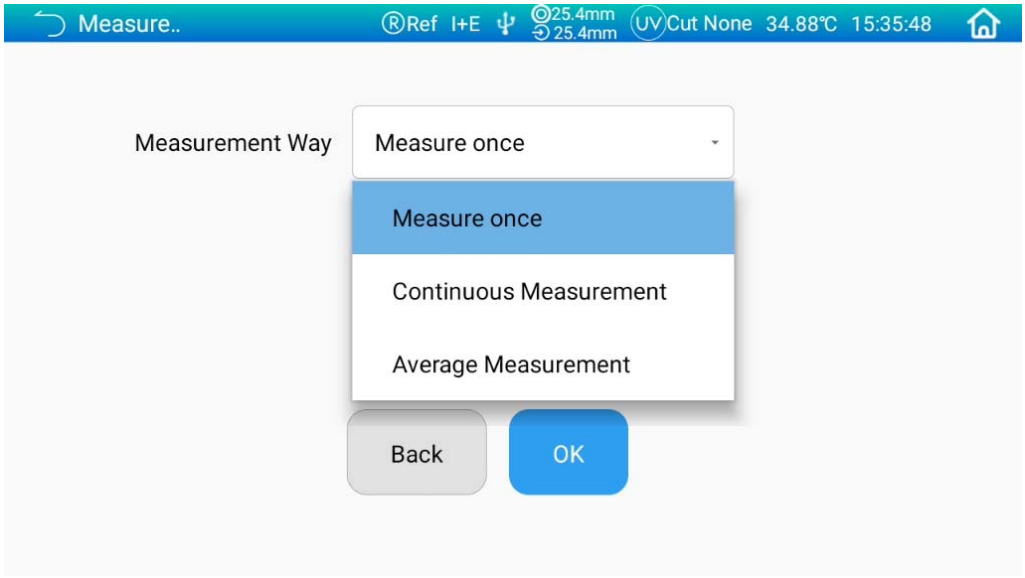


Figure 26 Measurement Mode Settings

5.Parameter Settings

Click on "Parameter Settings" in the main menu to enter the parameter settings interface. In this interface, you can configure the color difference formula parameters and factors, set the metamerism index, adjust yellowness and whiteness, configure the 555 hue classification settings, and define strength settings.

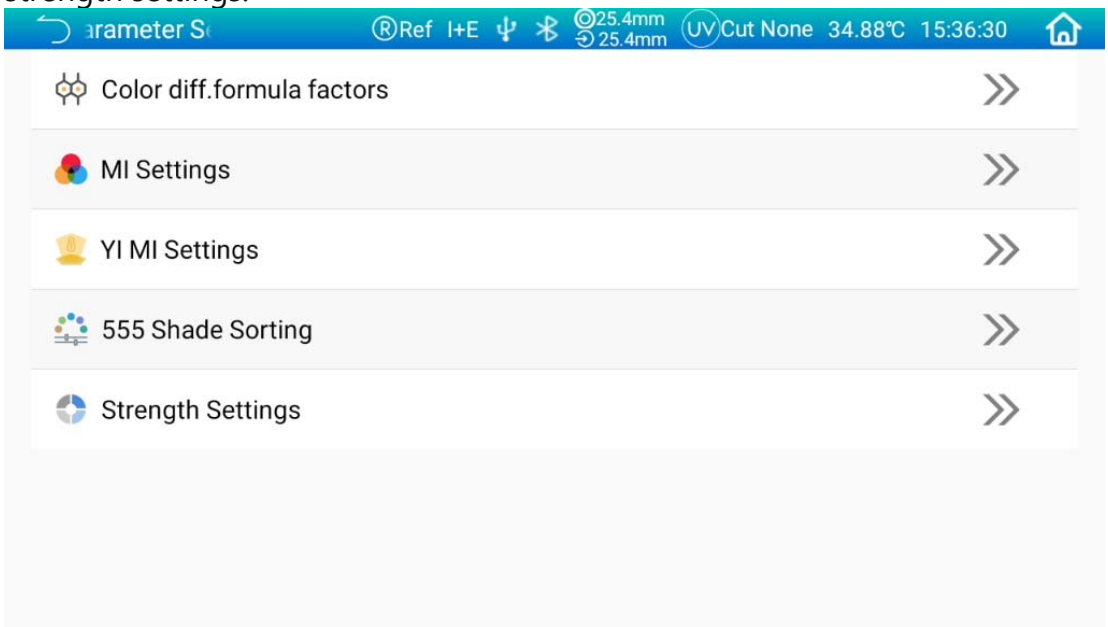


Figure 27 Parameter Settings

5.1 Chromatic Aberration Factor Setting

Click on "Chromatic Aberration Formula Parameter Factor Setting" to enter the setting interface, where you can set the parameter factors for the color formulas ΔE*94*, *ΔE*00, and ΔE*cmc(l:c).

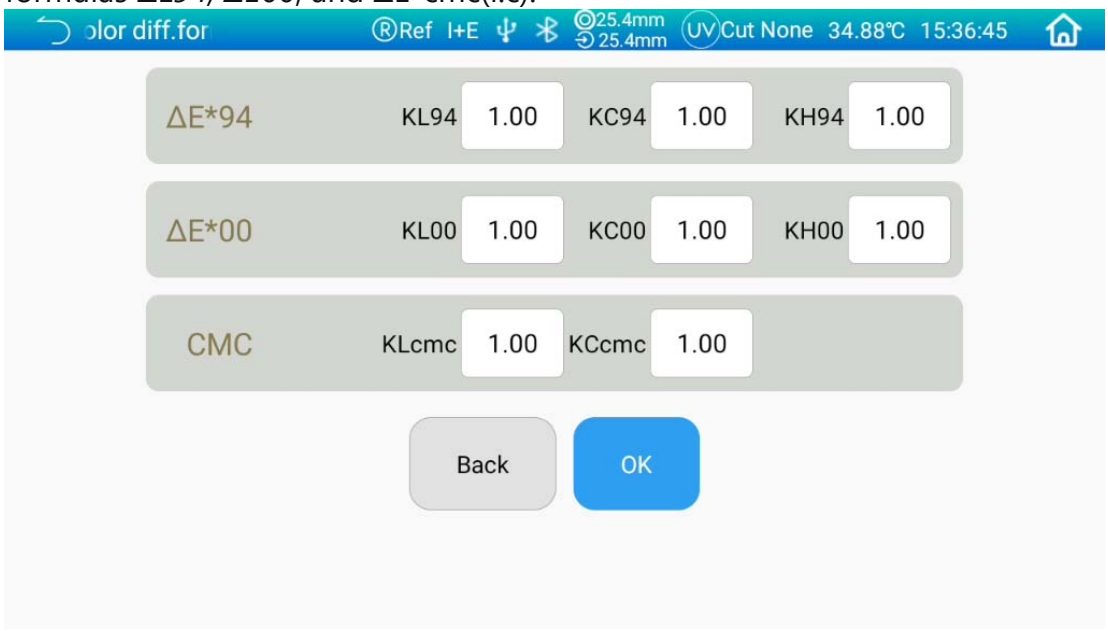


Figure 28 Chromatic Aberration Factor

5.2 Metamerism Setting

Click "Metamerism Index Setting" to enter the setup page, where you can configure the standard light sources and observer angles for metamerism reference 1 and reference 2.

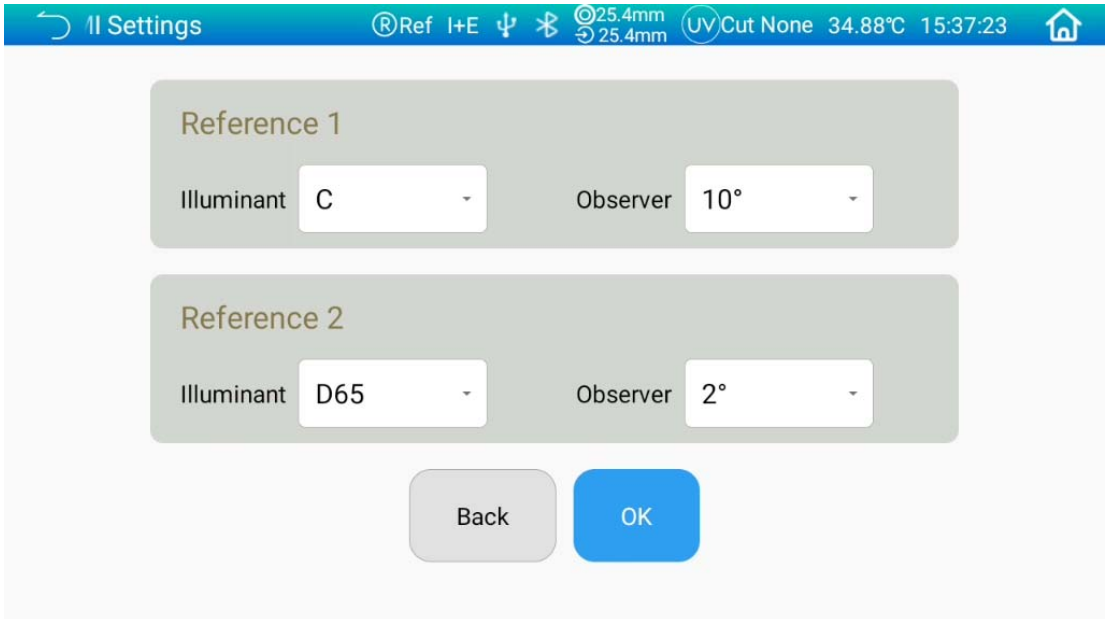


Figure 29 Metamerism Setting

5.3 Yellowness/Whiteness Setting

Click on "Yellowness/Whiteness Setting" to enter the setup interface. You can

select the displayed yellowness or whiteness index standard. A checkmark indicates display, while a blank space indicates no display. You are free to make your own selection.

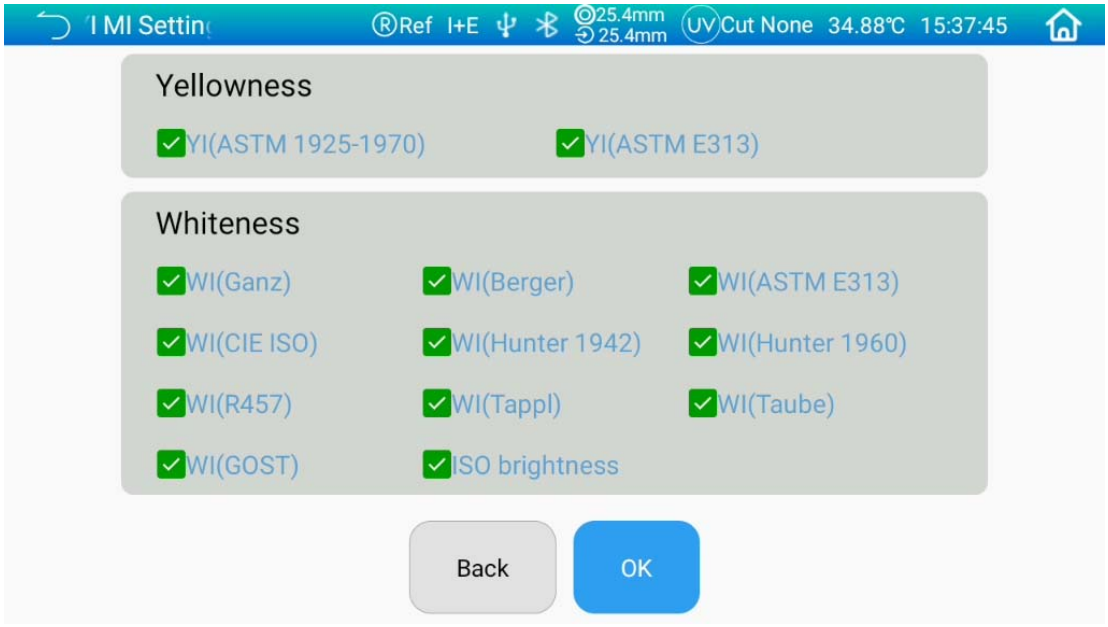


Figure 30 Yellowness/Whiteness

5.4 555 Tone Classification Settings

Click on "555 Tone Classification Settings" to enter the setup interface, where you can select the basis for 555 tone classification and the tone tolerance.

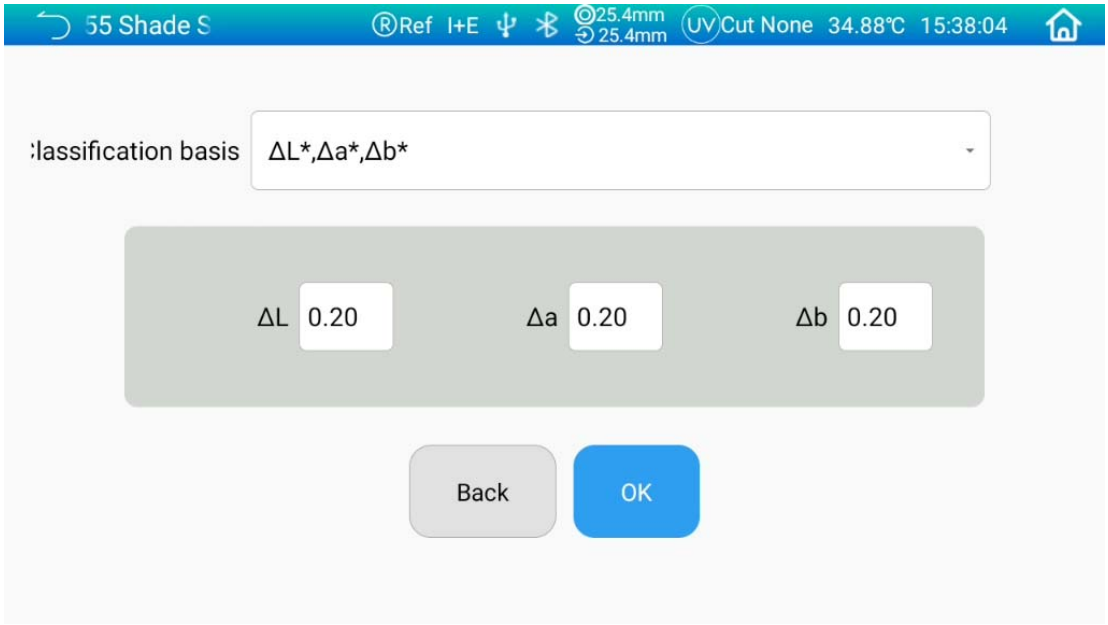


Figure 31 555 Tone Classification

5.5 Strength Setting

Click on "Strength Setting" to enter the setup interface, where you can select the type of strength to be displayed and specify the wavelength of the strength. Check the box to display it, leave it blank to hide it. You can freely choose the options.

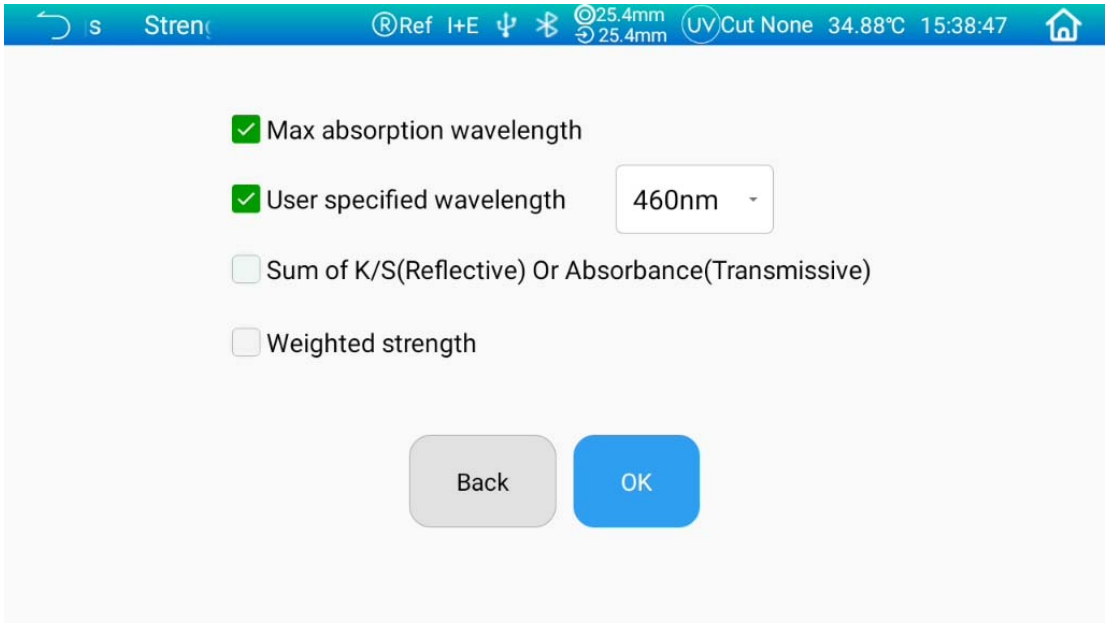


Figure 32 Strength Setting

6. Data Management

Clicking on Data Management on the main interface takes you to the data management screen, where you can view reflection and transmission data.

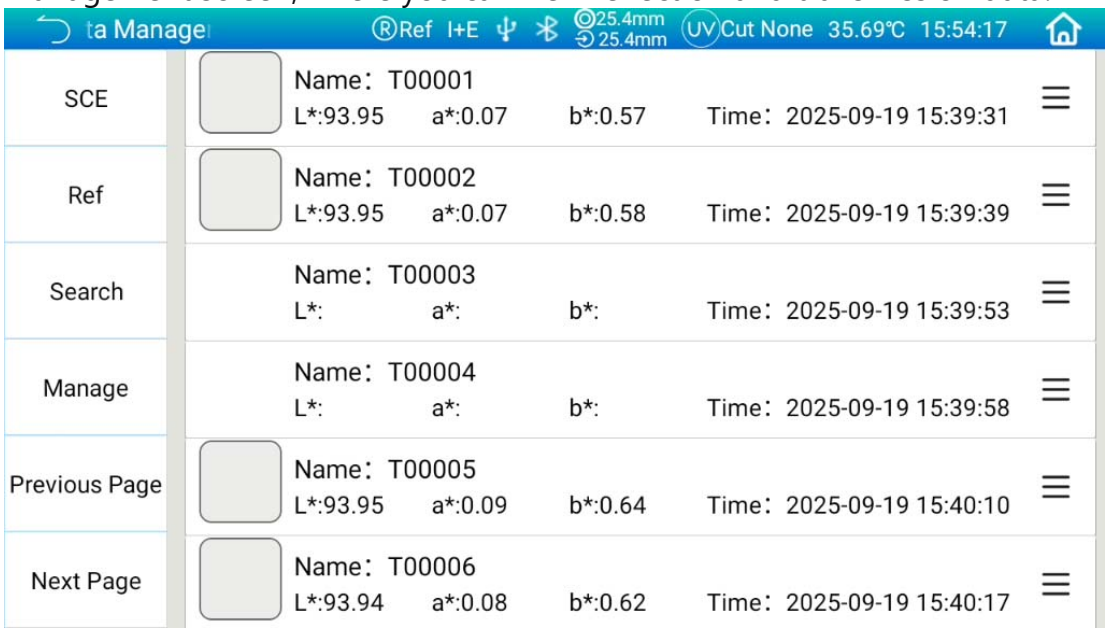


Figure 33 Data Management

1. Click on the "SCE" position in the upper left corner to switch between SCI/SCE data display; whether measurement data is displayed depends on the measurement mode of that data. Data measured in SCI mode will only show SCI data, and when switching to SCE, the interface will not display it.

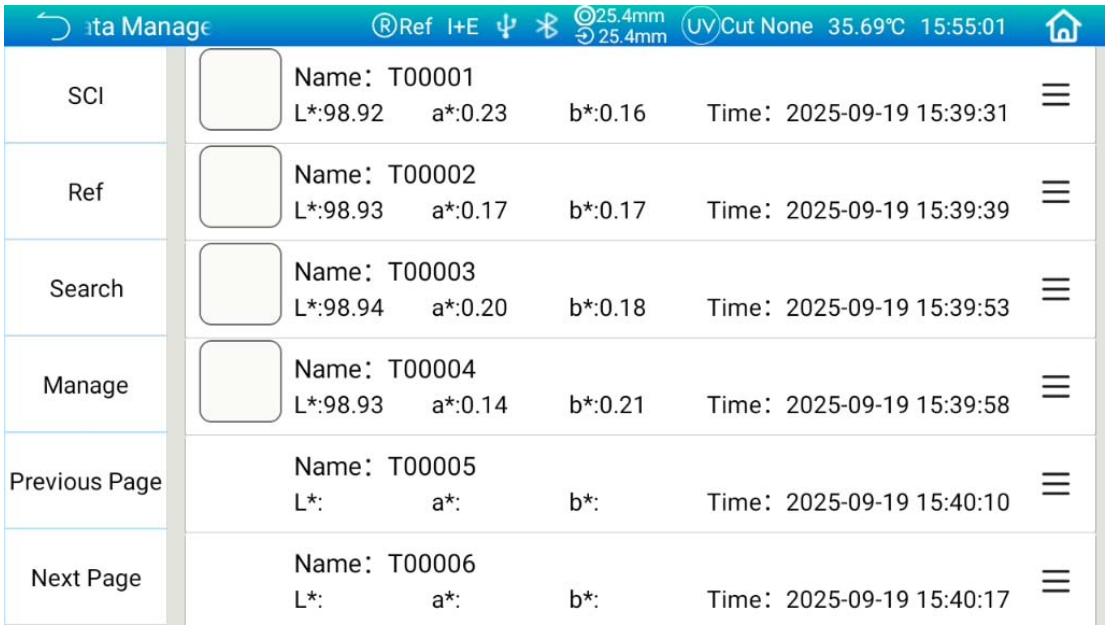


Figure 34 SCI/SCE data display switching interface

2. Click "Reflection" on the left side to switch the display between reflection and transmission measurement data.

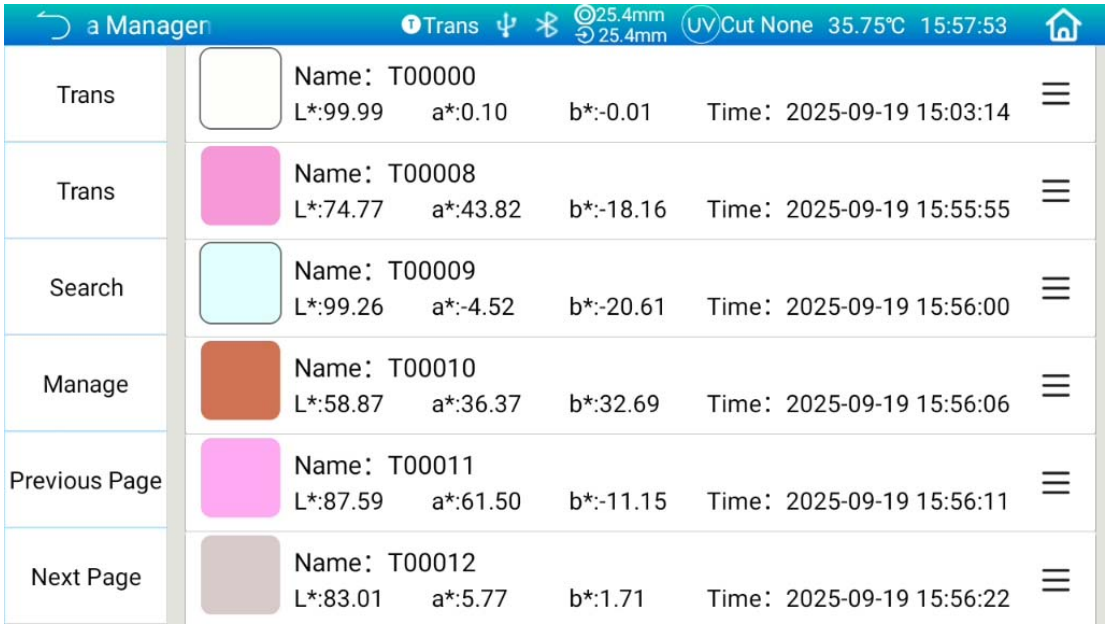


Figure 35 Reflection/transmission data display switching interface

3. Click 'Search' to find data based on measurement data names and measurement times.

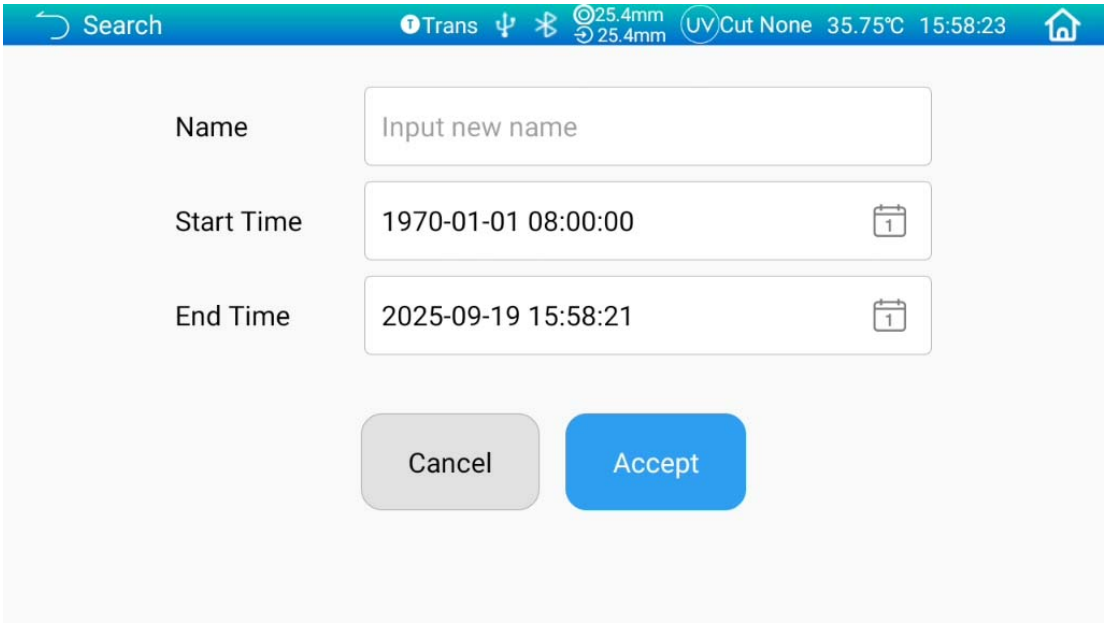


Figure 36 Data search interface

4. Click Manage to delete all data or delete selected data. Data cannot be recovered once deleted.

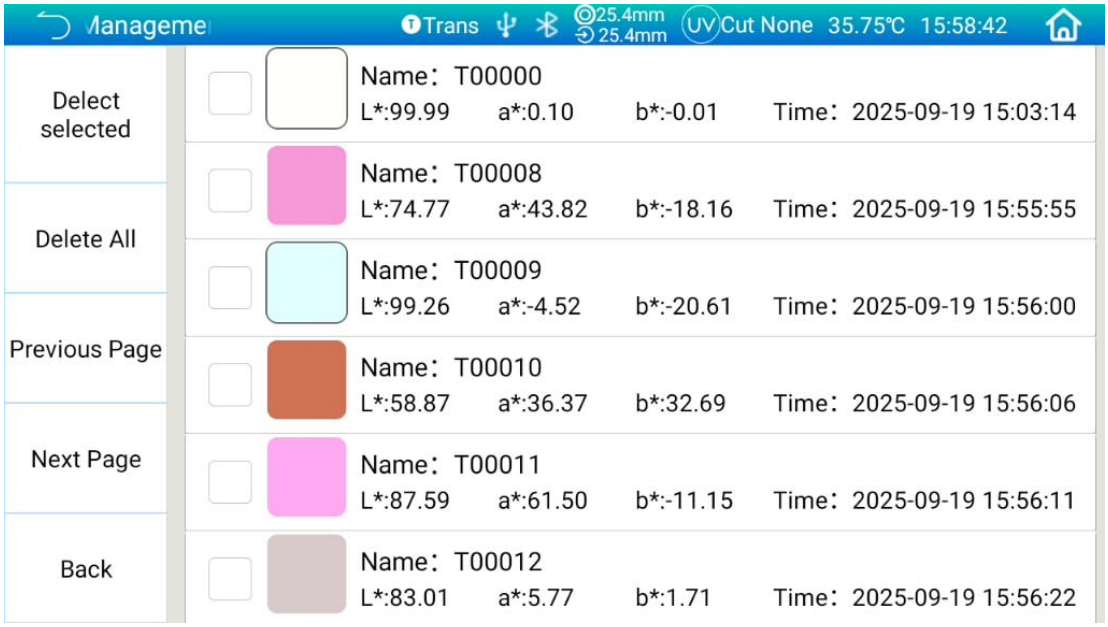


Figure 37 Data deletion

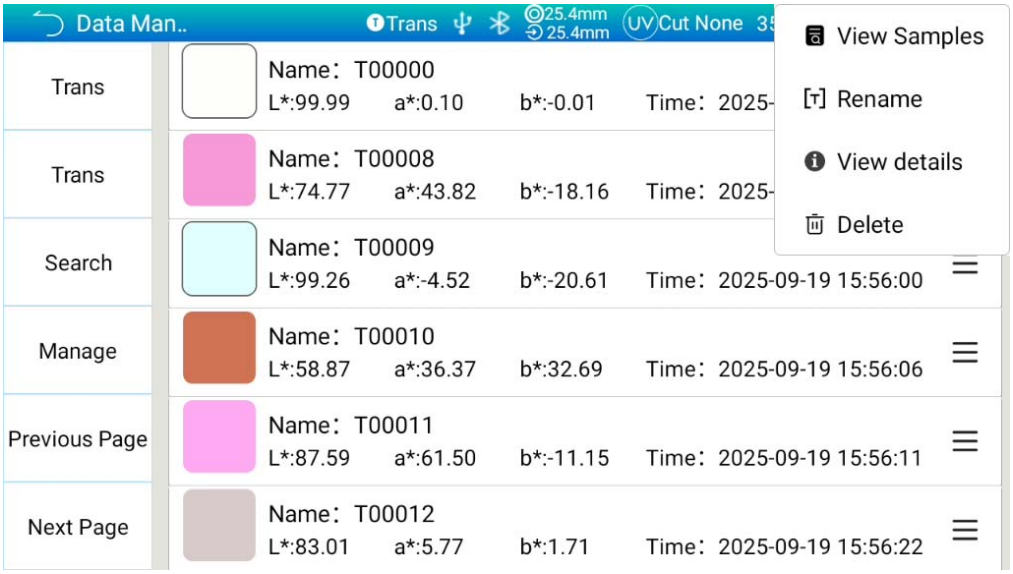


Figure 38 data record submenu

5. Click "Previous Page" or "Next Page" to flip through the data. If you click "Previous Page" when on the first page, a prompt will appear stating "This is already the first page." Similarly, clicking "Next Page" on the last page will trigger the message "This is already the last page."

6. Click "☰" on the right side of the data entry to perform the following actions: view all specimens under the current standard sample, rename this standard sample, view its detailed information, or delete this standard sample.

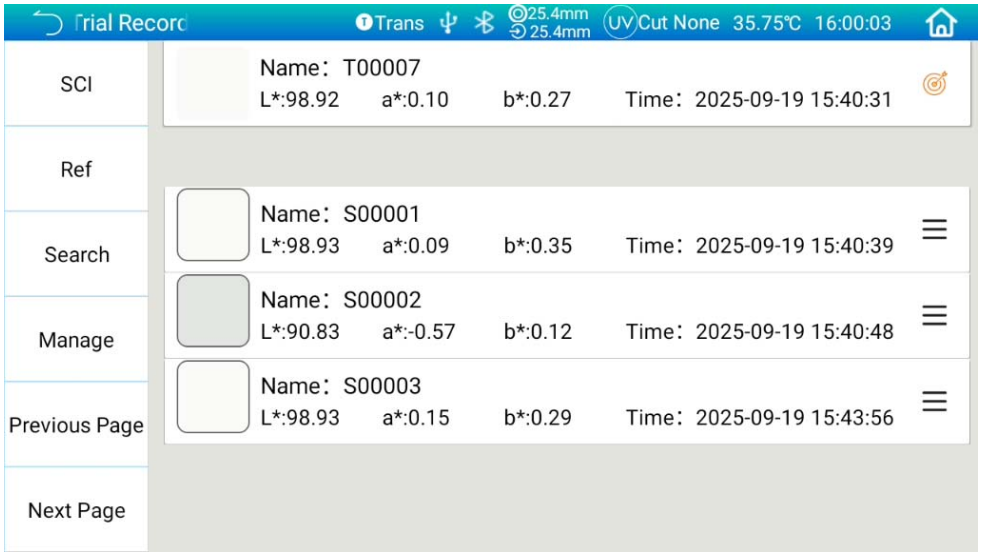


Figure 39: Interface for viewing sample data

7. Instrument Measurement

"Click Measurement" in main menu, enter measurement page.

7.1 Instrument Measurement Page

Measurement page instruction：

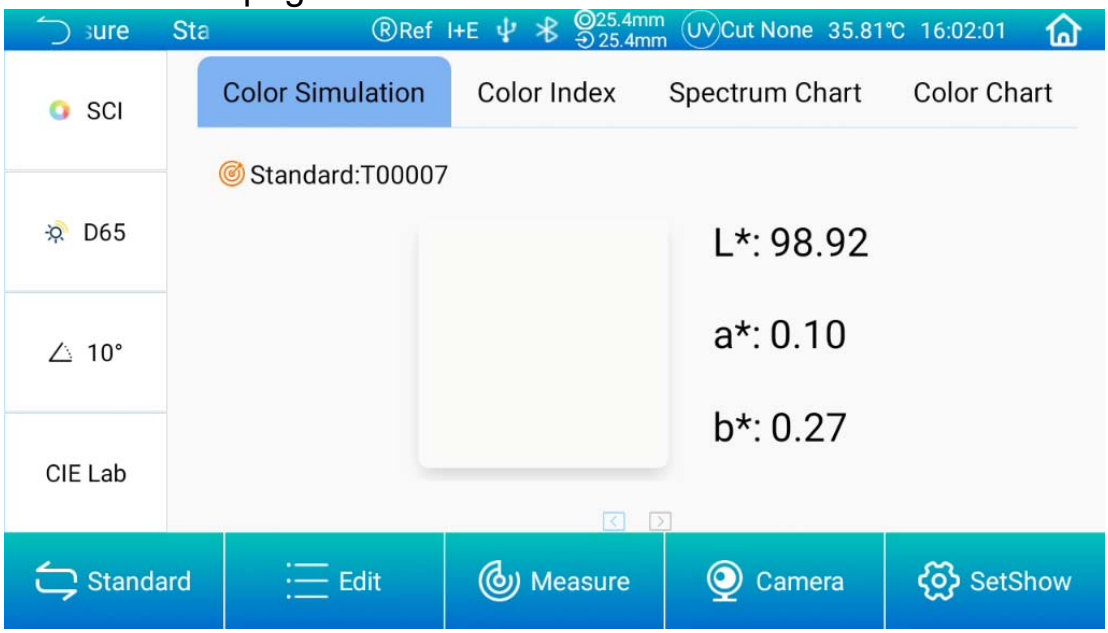


Figure 40 Standard Measurement Page

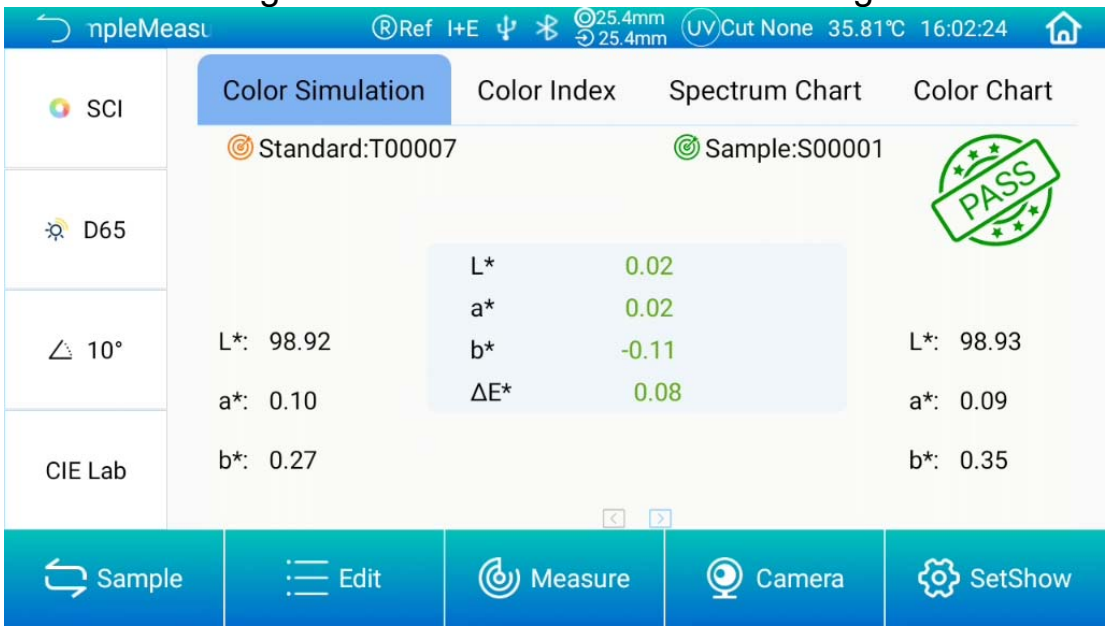


Figure 41 Sample Measurement Page

1. The status bar at the top of the interface displays information based on the measurement parameters set by the user. Taking the above image as an example:

(1) When the measurement type is set to "Reflection," it will display "Reflection."
(2) When the measurement mode SCI/SCE is set to "I+E," it will display "I+E."
(3) If the tablet is properly connected to the instrument, a USB icon will be displayed.
(4) If Bluetooth is enabled, a Bluetooth icon will be displayed.
(5) When the reflection aperture and lens position are set to 25.4mm, "25.4" will be displayed, with the upper value representing the reflection aperture and the lower value representing the lens position.
(6) When the UV mode is set to a 400nm cutoff, it will display "UV Cutoff 400nm."
(7) The displayed temperature is the internal temperature of the instrument.
(8) The time shown is the time set in the system settings.

2. The left area of the interface allows for quick configuration of some measurement parameters. Taking the standard sample measurement interface diagram as an example:

(1) Click on the "SCI" position in the interface to switch between SCI and SCE data display.
(2) Click on the "D65" position in the interface to set the light source. For available light source types, refer to the technical specifications at the end.
(3) Click on the "2°" position in the interface to set the observer angle.
(4) Click on the "CIE Lab" position in the interface to set the color space.

3. The lower area of the interface allows for operations such as switching between standard samples and test samples, opening the camera to position the sample, measuring data, display settings, accessing the haze measurement and hiding power measurement interfaces, and performing actions like deleting, locking, or renaming the current data. Taking the standard sample measurement interface diagram as an example:

(1) Click on the "Standard Sample" position in the interface to switch to the test sample measurement interface.

(2) Click on the "Edit" position in the interface to perform operations such as deleting, renaming, locking, setting tolerances, printing, or inputting custom standard samples for the current sample.

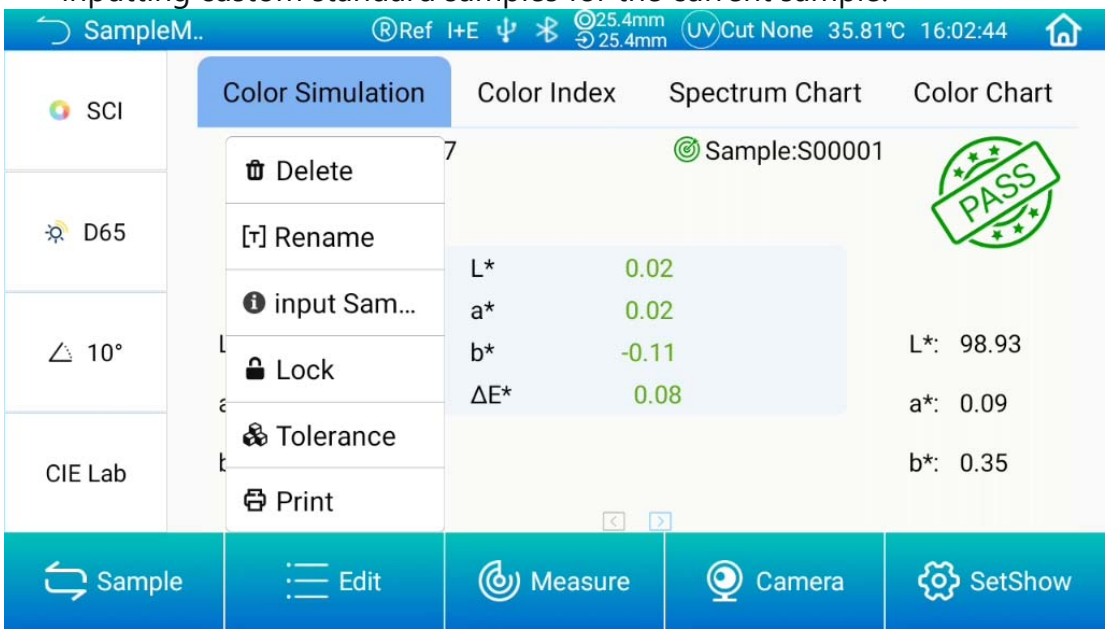


Figure 42 Editing interface

(3) Click on the "Measurement" position in the interface to perform sample measurement. If the instrument is not within the valid calibration period when measuring, a prompt will appear reminding you to proceed to the calibration interface for black-and-white correction.

(4) Click on the "Camera" position in the interface to open the internal camera of the integrating sphere, which is used to observe the side of the sample placed at the reflection measurement port that is closer to the integrating sphere.

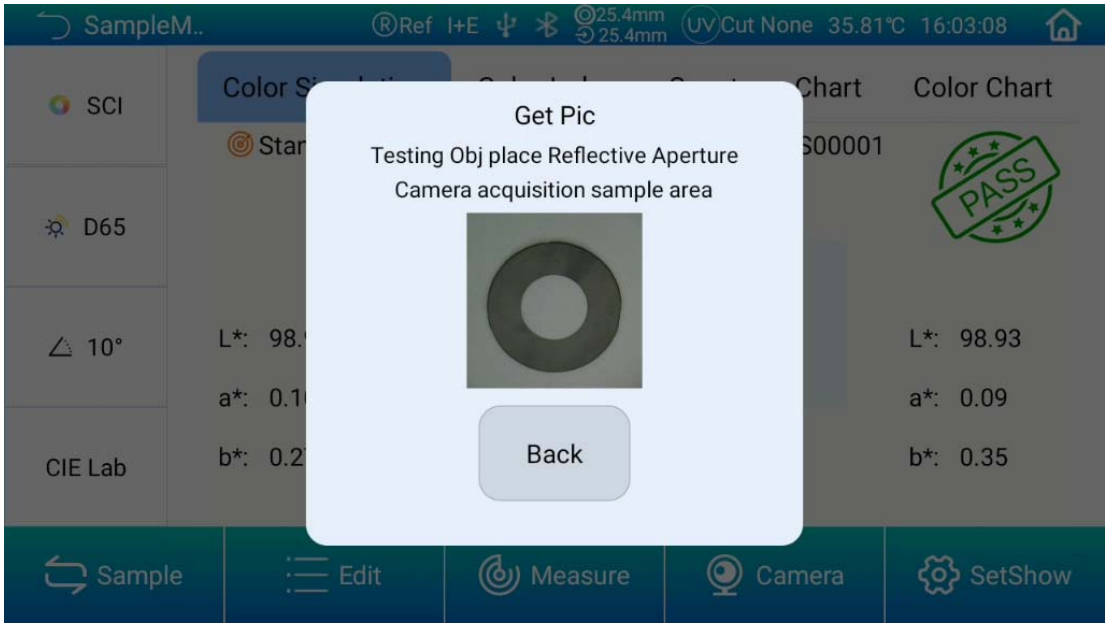


Figure 43: Turn on the camera

(5) Click the "Display Settings" position on the interface to adjust the color bias of the interface, choose whether to display test results and display indices; haze measurement and hiding power measurement can also be accessed from this interface—click on haze/hiding power and then confirm by clicking the confirmation button at the bottom of the interface.

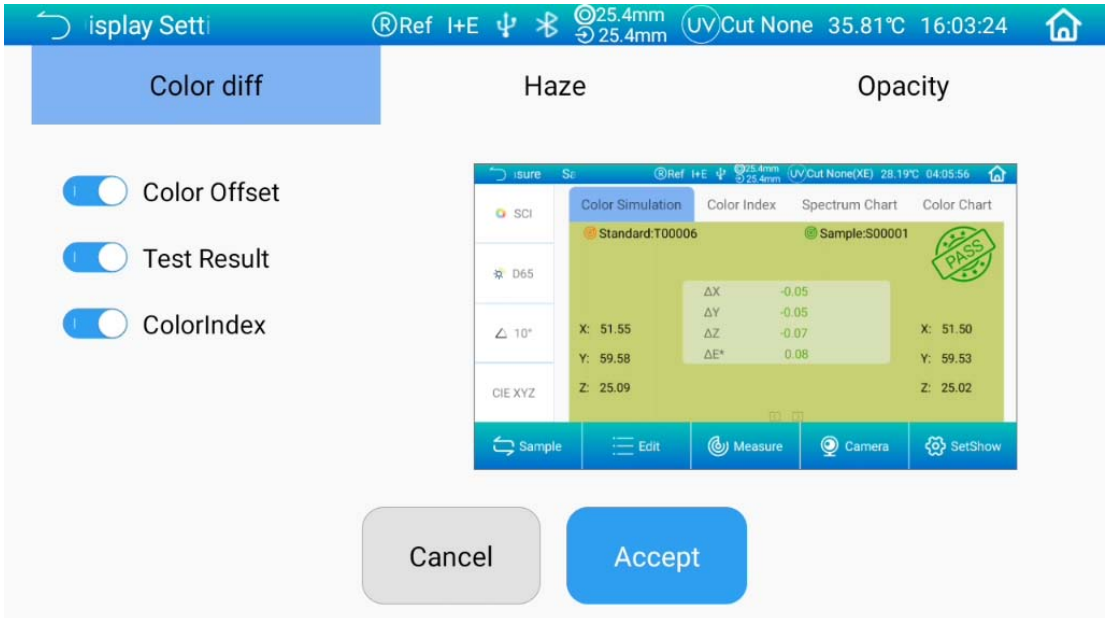


Figure 44 Display Settings interface

4. The central area of the interface primarily displays measurement data information. Swiping left or right allows switching between measurement data displays. Take the standard sample measurement interface diagram as an example:

(1) The simulated color interface will display the number of current measurement data, the simulated color, and the color space value of the measurement. After switching to the sample interface, it will also show the difference between the sample and the standard, color deviation, and measurement results.

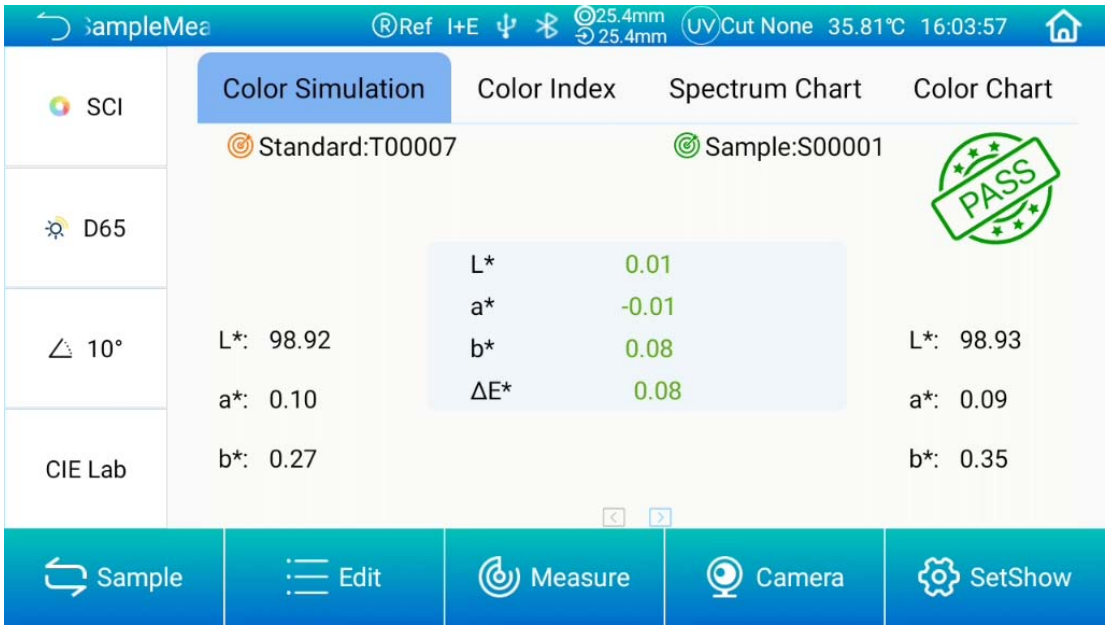


Figure 45 Simulated color interface

(2) The color index interface will display the color indices selected by the user in the color options interface. Some color indices have specific display requirements; for example, the yellowness index YI (ASTM 1925-1970) will only show data when measured under C light source and a 2° observer angle. If the measurement data is out of range, it will be displayed as "--".

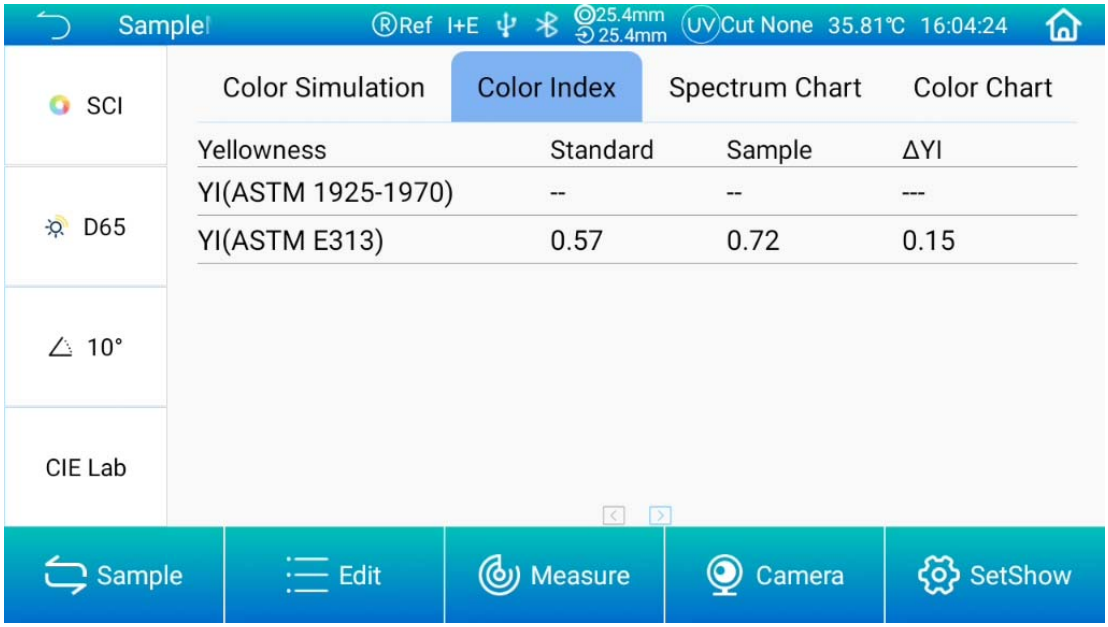


Figure 46 Color Index interface

(3) The spectral diagram interface displays the spectral information of the measured sample. After measuring the sample, selecting the spectral diagram interface in the sample measurement screen will show the spectral information of both the standard and sample, as well as their differences. Once the UV cutoff is set, the corresponding fluctuations in the spectral diagram will be removed. The spectral diagram only displays one standard and one sample.

Figure 47 Spectrum interface

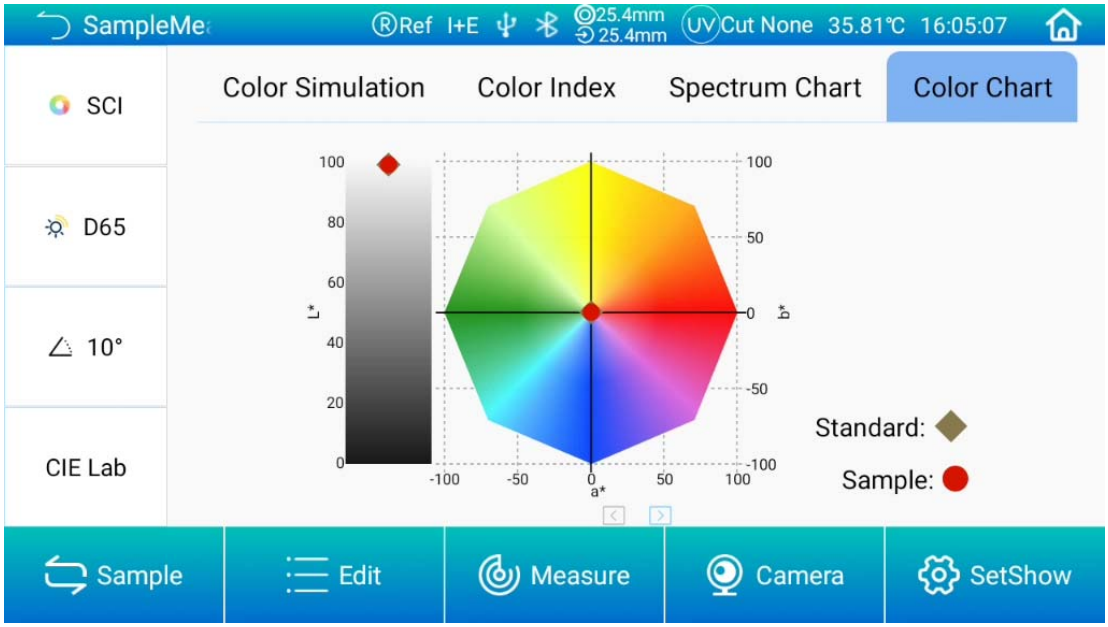


Figure 48: Chromaticity interface

(4) The chromaticity diagram interface will display the position of the measured sample in the Lab coordinate system. When selecting the chromaticity diagram interface from the sample interface, the coordinates of the standard sample and the test sample will be displayed simultaneously. The chromaticity diagram will only show one standard sample and one test sample.

Instructions for the Haze Measurement Interface:
The haze measurement interface can be accessed via the haze section in the display settings. To perform haze measurement, the measurement state must be set to transmission. After entering the haze measurement interface, haze calibration is required. For specific steps, please refer to the black-and-white calibration section.

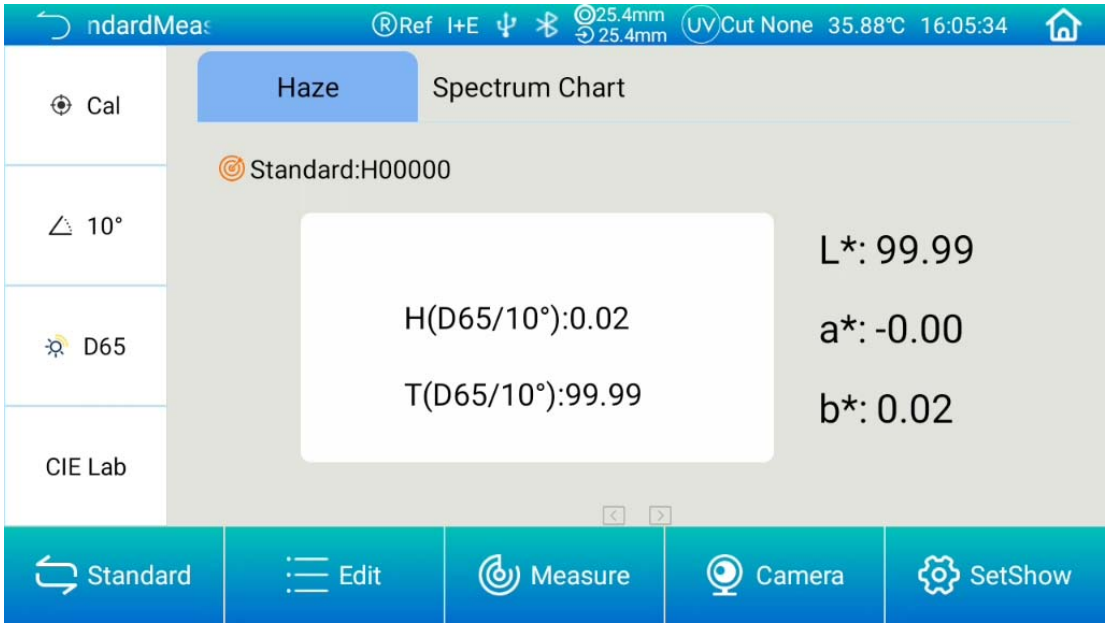


Figure 49 Haze measurement interface

Instructions for the Opacity Measurement Interface:

The Opacity measurement interface can be accessed through the opacity section in the display settings. the measurement status must be set to reflection. The measurement method involves first measuring the data on a black background and then on a white background. The sample being measured should have a certain degree of transparency.

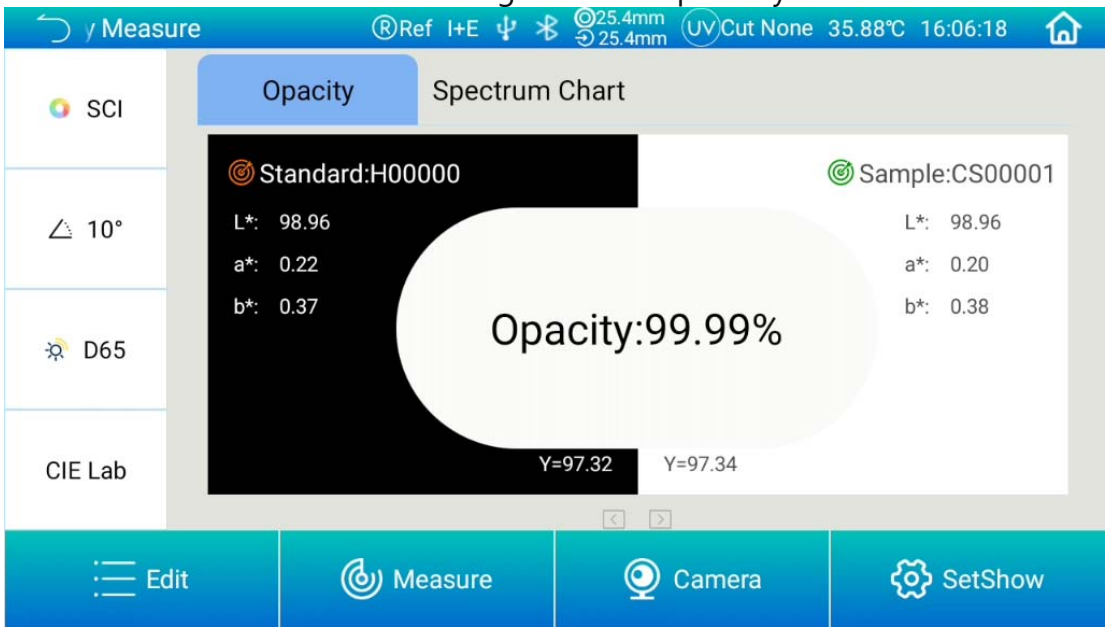


Figure 50 Opacity measurement interface

7.2 Sample Measurement

7.2.1 Measurement Procedure

(1) Reflection Measurement:

Set sample type to Reflection → Set aperture → Set light source → Set UV → Perform black/white calibration → Place sample → Press measurement button/click to measure.

(2) Transmission Measurement:
Set sample type to Transmission → Set aperture → Set light source → Set UV → Perform black/white calibration → Place sample → Press measurement button/click to measure.

(3) Haze Measurement:
Set sample type to Transmission → Set aperture → Set light source → Set UV → Perform black/white calibration → Enter measurement interface → Display settings → Select Haze → Enter haze measurement interface → Perform haze black reference calibration → Perform haze white reference calibration → Place sample → Press measurement button/click to measure → Haze black substrate data → Haze white substrate data.

7.2.2 Reflection Sample Measurement
Steps for measuring reflection reference samples:

① Set the current sample type to Reflection (refer to section 4.1 for measurement type settings).
② Set the corresponding measurement aperture:
Main menu → Measurement mode → Measurement aperture/lens position → Enter the aperture/lens setting interface → Manually select the corresponding measurement aperture and lens position.
③ Set the light source:
Measurement interface → Light source settings → Enter the light source selection interface → Select the corresponding light source option based on user requirements (click to check) → Click "Return" to go back to the measurement interface.
④ When the UV light source is changed, re-perform black/white calibration.
⑤ Measure the standard at the Standard measurement interface:
After completing the above preparations, enter the standard measurement interface → Place the sample on the instrument's reflection measurement port → Click to measure or briefly press the measurement button to start the measurement → The LED indicator will flash until it stops, indicating the completion of the measurement.

Reflection Measurement of samples is similar to that of Reflection Standard measrements .

7.2.3 Transmission Sample Measurement
Steps for measuring transmission standards:

(1) Set the current measurement type to Transmission.
(2) Set the corresponding measurement aperture:
In transmission measurement mode, the measurement aperture/lens position only has a manual mode. Select the appropriate transmission aperture based on the size of the transmission fixture, and ensure that the reflection measurement aperture can only be set to 25.4 mm.
(3) Set the light source.
(4) Re-perform black/white calibration.
(5) Measure the transmission standards:
Return to the transmission standards measurement interface → Place the sample inside the transmission measurement port, ensuring it is close to the integrating sphere transmission measurement aperture → Close the sample chamber lid → Briefly press the measurement button to start the measurement. Transmission data will also be displayed in the color index interface.

Transmission sample measurement: Measurement of transmission samples is similar to that measurement of transmission standards.

7.2.4 Haze Sample Measurement
Haze is a chromaticity index in transmission measurement, used to objectively measure total transmittance and transmission haze according to international standards. It is applicable to the measurement of haze values for all transparent and translucent parallel-plane samples (such as plastic plates, sheets, plastic films, and flat glass) and has a wide range of applications in defense research, industrial production, and agriculture.

When a reflective whiteboard is positioned above the reflection measurement aperture, the measurement geometry for transmission color measurement becomes di:0°. When a reflective black tube (instrument zero reference) is positioned above the reflection measurement aperture, the measurement geometry for transmission color measurement becomes de:0°. Haze measurement requires the values under both conditions as reference values.

① Set the current sample type to transmission.
② Set the measurement aperture:
In transmission measurement mode, the measurement aperture/lens position is only available in manual mode. Ensure that the reflection measurement aperture is set to 25.4 mm.

③ Enter the display settings interface in the measurement menu and select haze measurement.

④ Follow the measurement prompts for haze measurement and perform the required operations. Once all operations are completed, the haze measurement is finished.

8.System Settings Interface

Click on Settings on the main interface to enter.

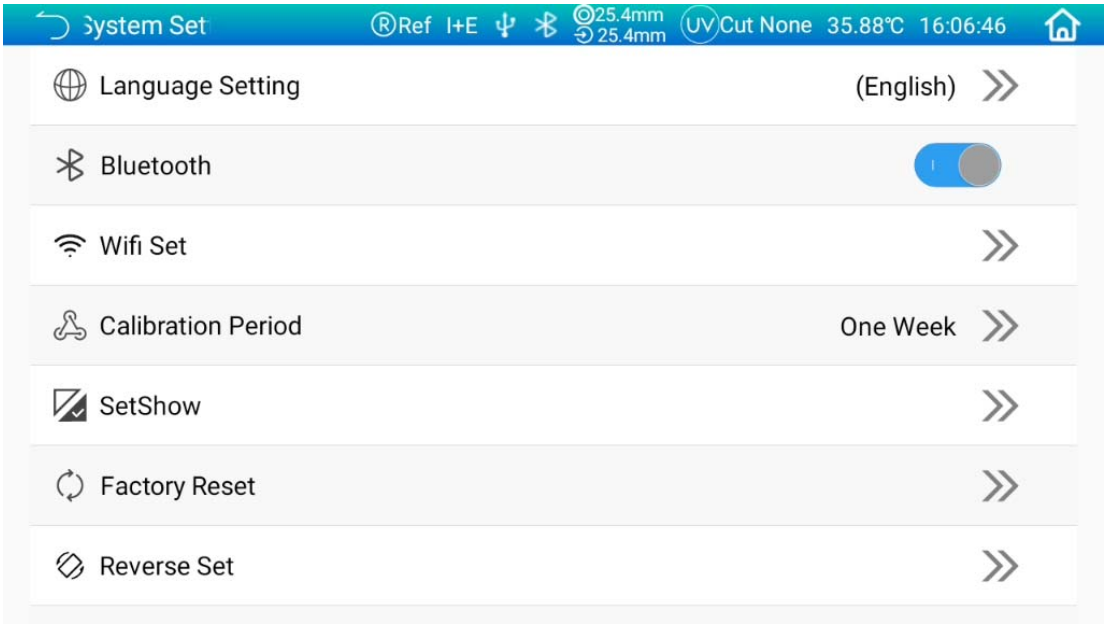


Figure 51 on the system Settings interface

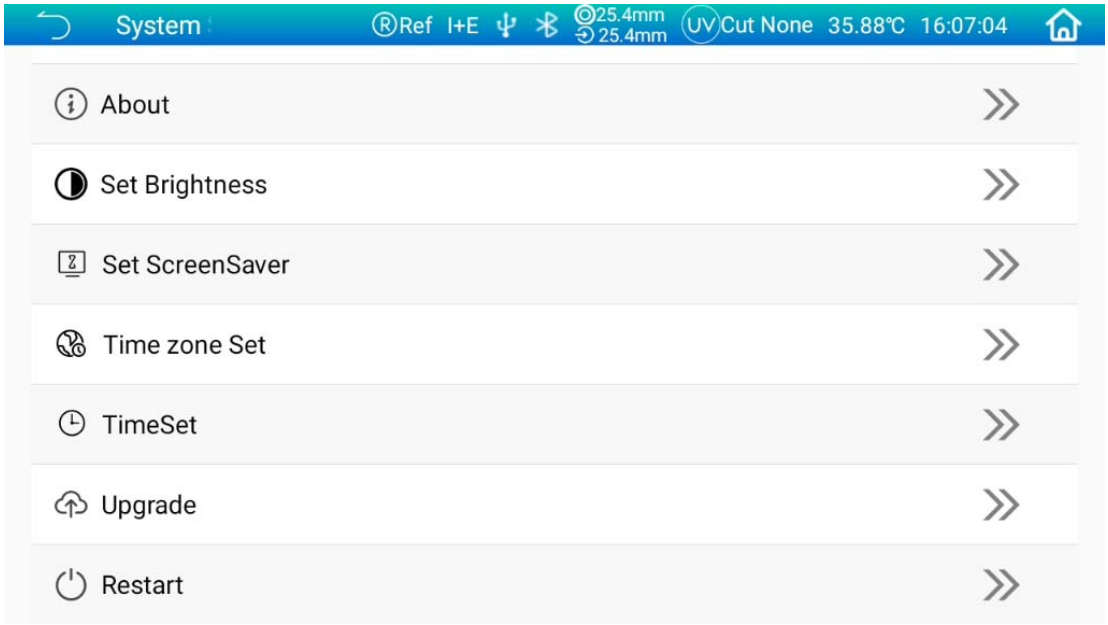


Figure 52: Under the system Settings interface

8.1 Language Settings

Currently, the software only supports Simplified Chinese, Traditional Chinese, and English.

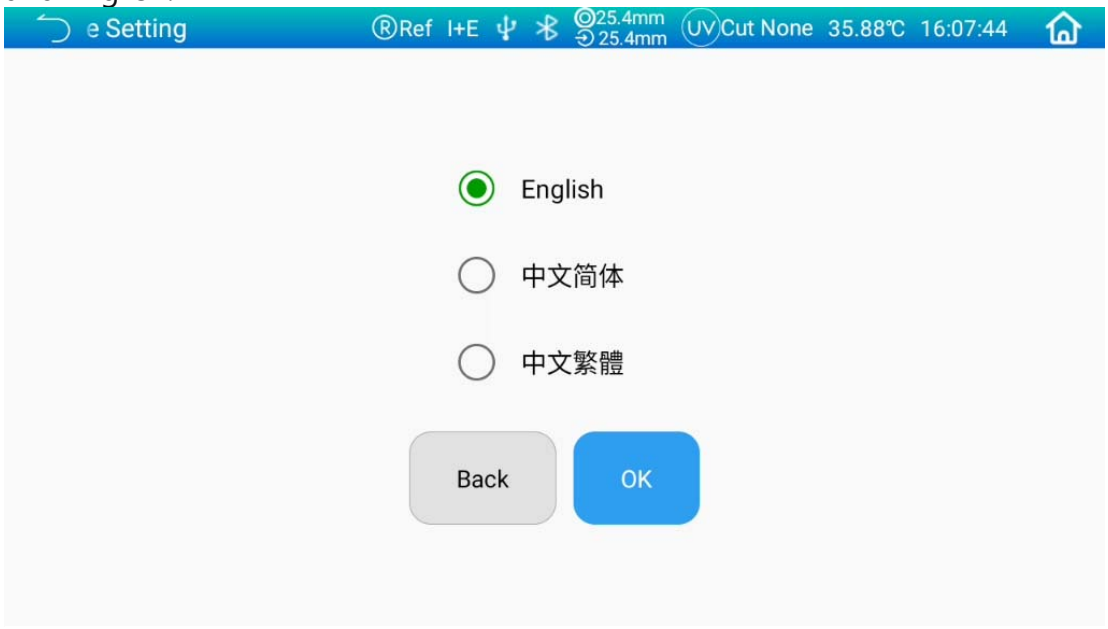


Figure 53 Language Settings interface

8.2 Bluetooth Settings

Control the Bluetooth on/off of the instrument. "I" indicates Bluetooth is on, and "O" indicates it is off. Simultaneously, the status bar at the top of the interface will display an icon based on the Bluetooth switch status.

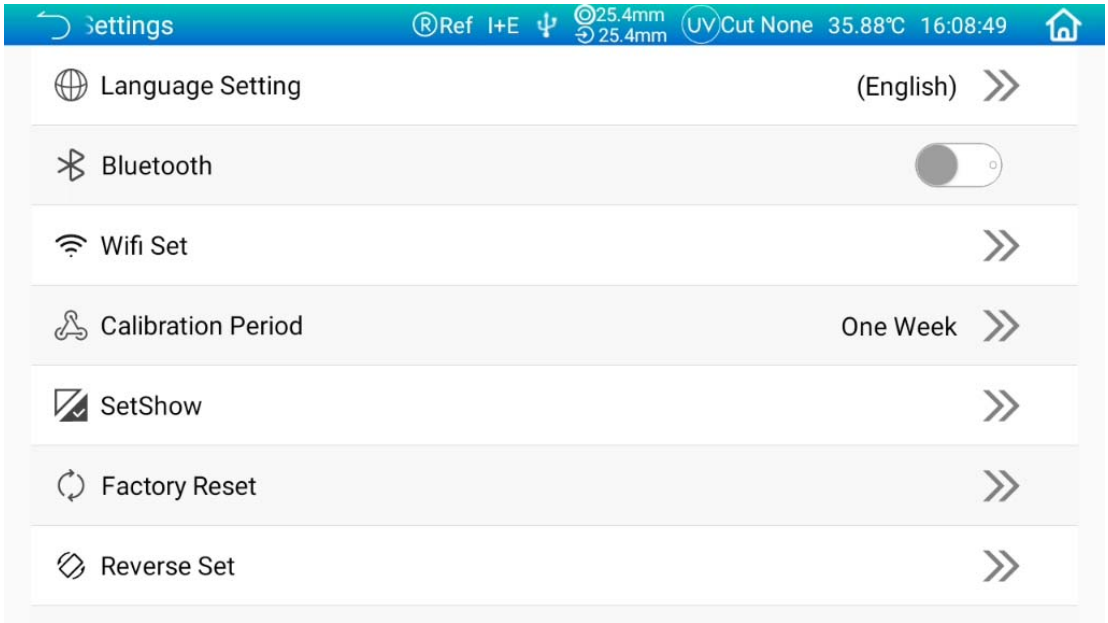


Figure 54 Bluetooth Settings

8.3 WiFi Settings

Control the network connection of the tablet. After connecting to the network, the tablet can perform upgrade operations.

Figure 55 WiFi connection

8.4 Calibration Cycle Settings

The calibration validity period of the instrument can be set. If the calibration validity period expires, recalibration is required. Available options include calibration upon startup, 4 hours, 8 hours, 24 hours, and one week. It is typically set to 8 hours.

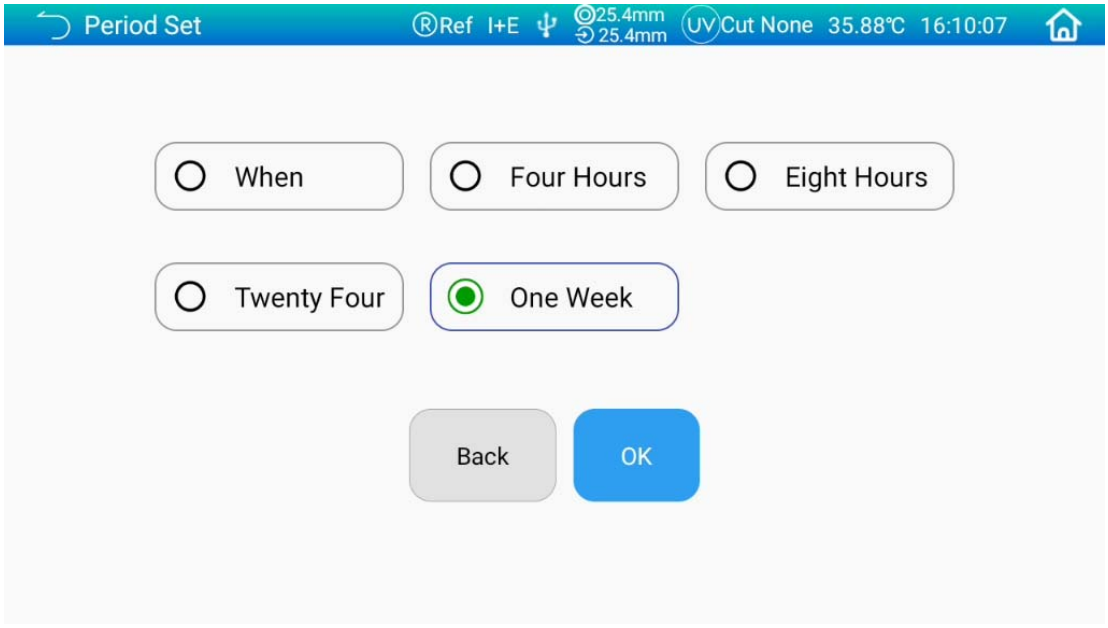


Figure 56 Calibration Settings

8.5 Display Settings

Similar to the display settings in the measurement interface, color bias, test results, display index, haze measurement, and hiding power measurement can be configured.

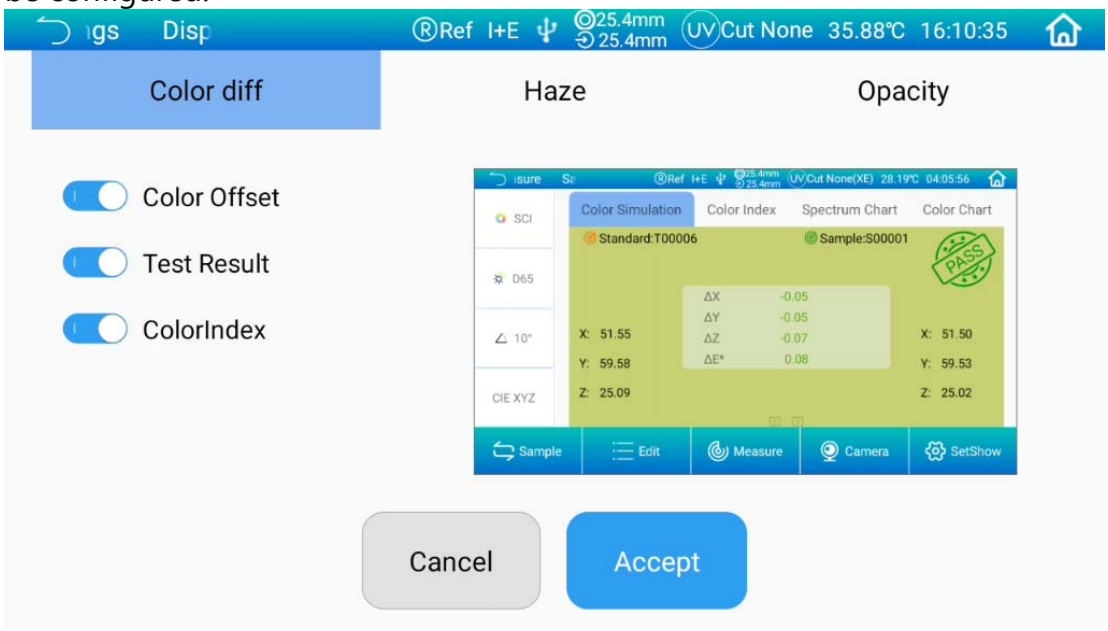


Figure 57 display the Settings

8.6 Restore Factory Settings

Clicking "Confirm" will clear all data and reset any other setting parameters to their initial state.

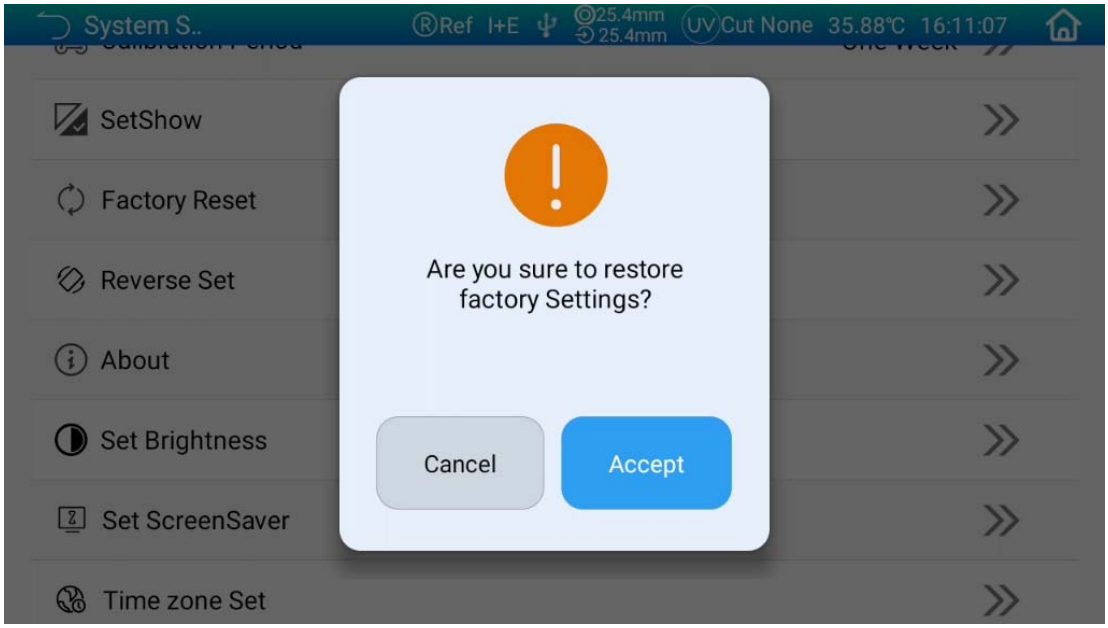


Figure 58 Restores factory Settings

8.7 Flip Settings

After clicking, the tablet will immediately flip the screen display vertically.

8.8 About

Clicking allows you to view the current version information of the tablet

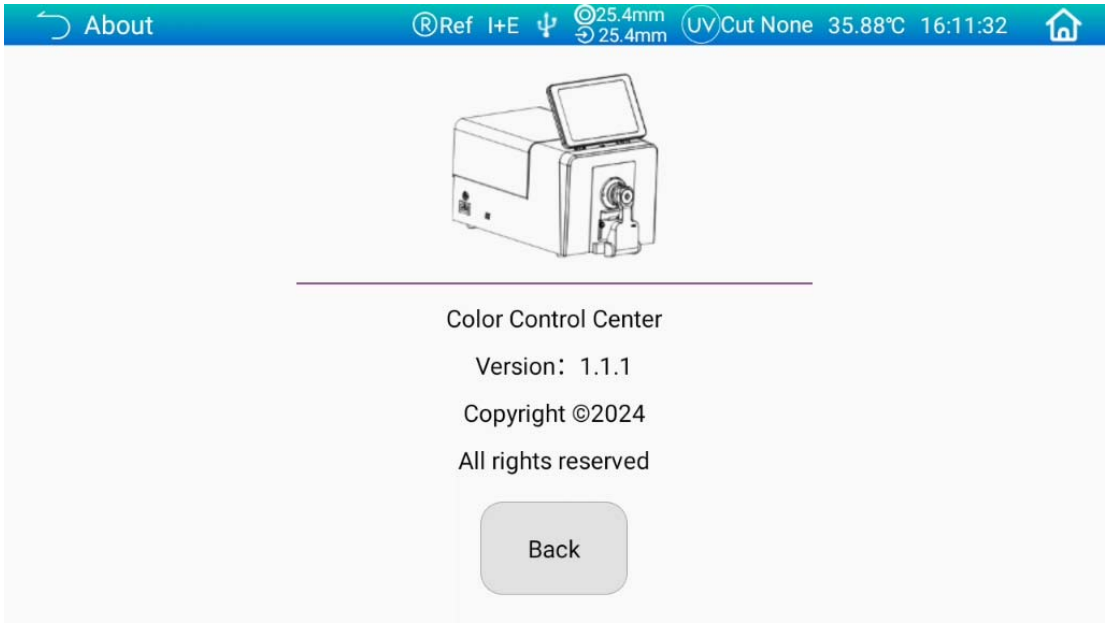


Figure 59 about

8.9 Screen Brightness Settings

The interface brightness can be adjusted.

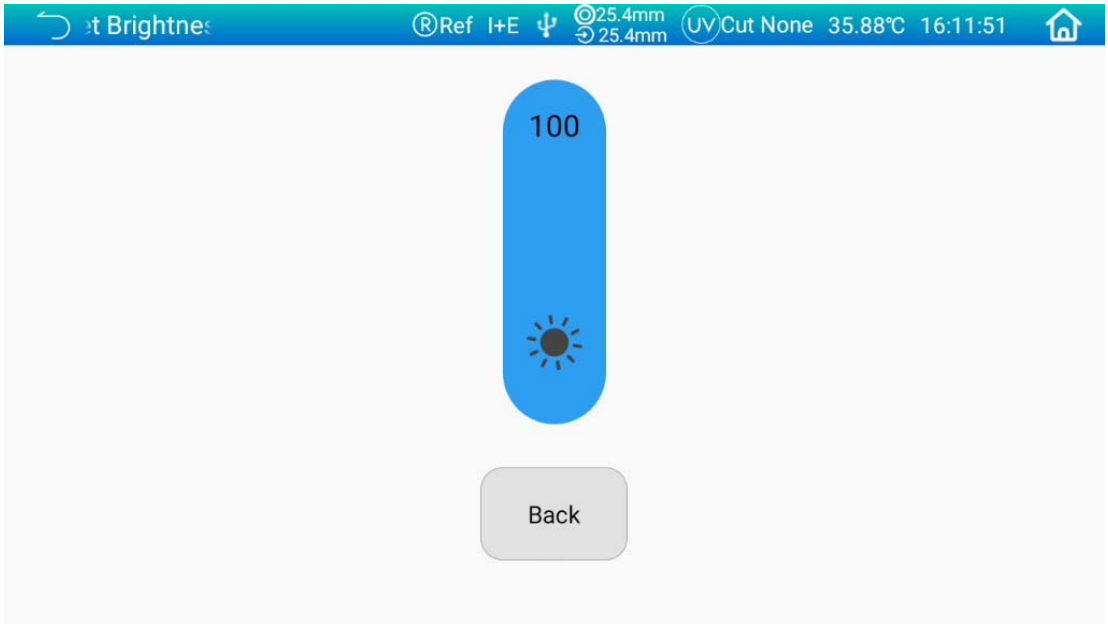


Figure 60 Screen brightness Settings

8.10 Screen Saver Settings

The interface sleep time can be set.

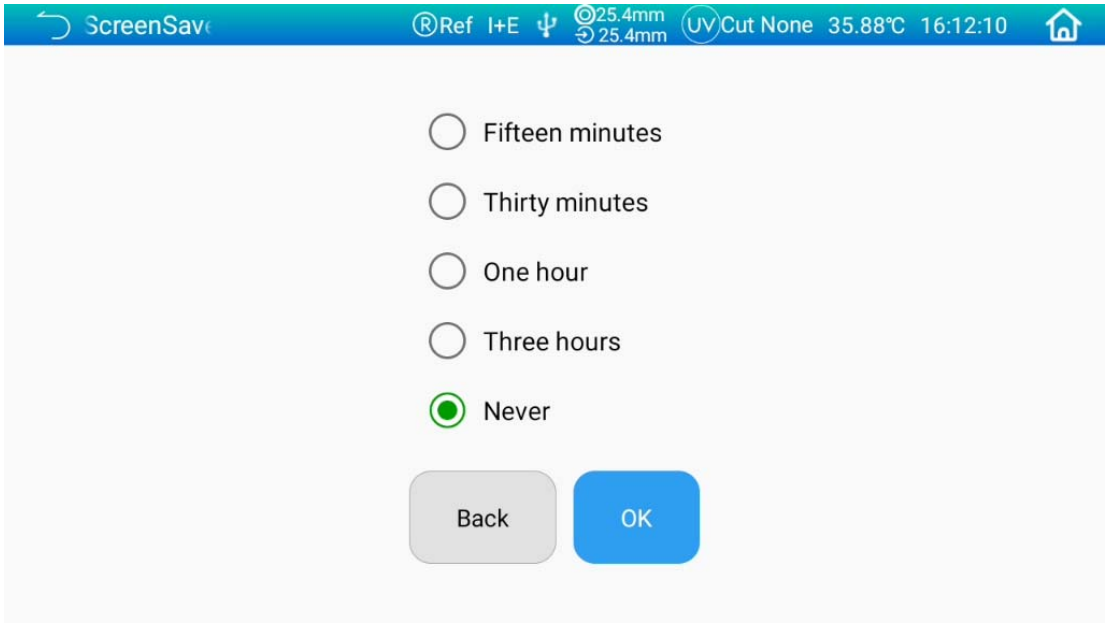


Figure 61 Screen saver Settings

8.11 Time Zone Settings

The time zone can be set based on your location.

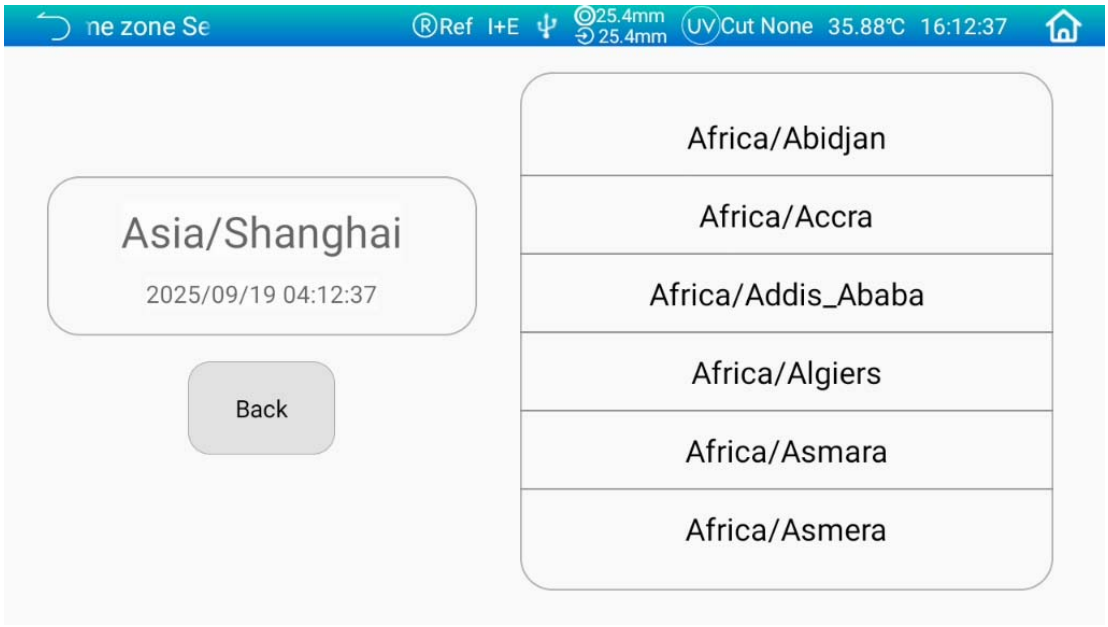


Figure 62 Time Zone Settings

8.12 Time Settings

Set the date and time.

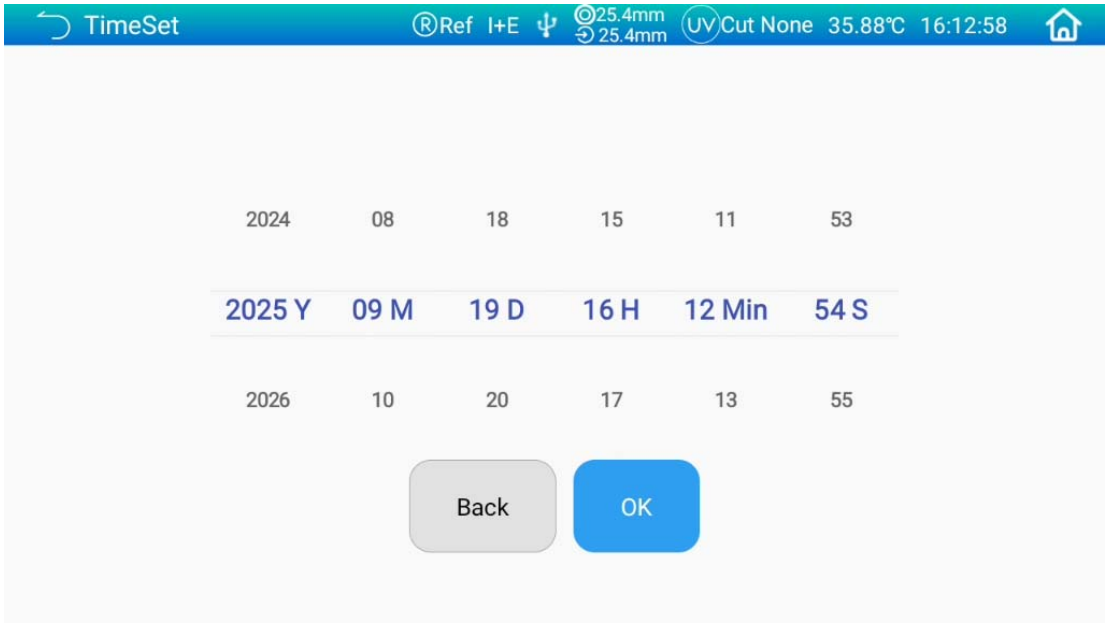


Figure 63 Time Settings

8.13 Update

While the instrument is powered off, press and hold the measurement button without releasing it, then press the power button to turn on the device. Once the measurement button indicator flashes, release the measurement button and enter the update interface in the settings menu. Click "Network Update" and follow the prompts to press the measurement button twice consecutively to upgrade the program.

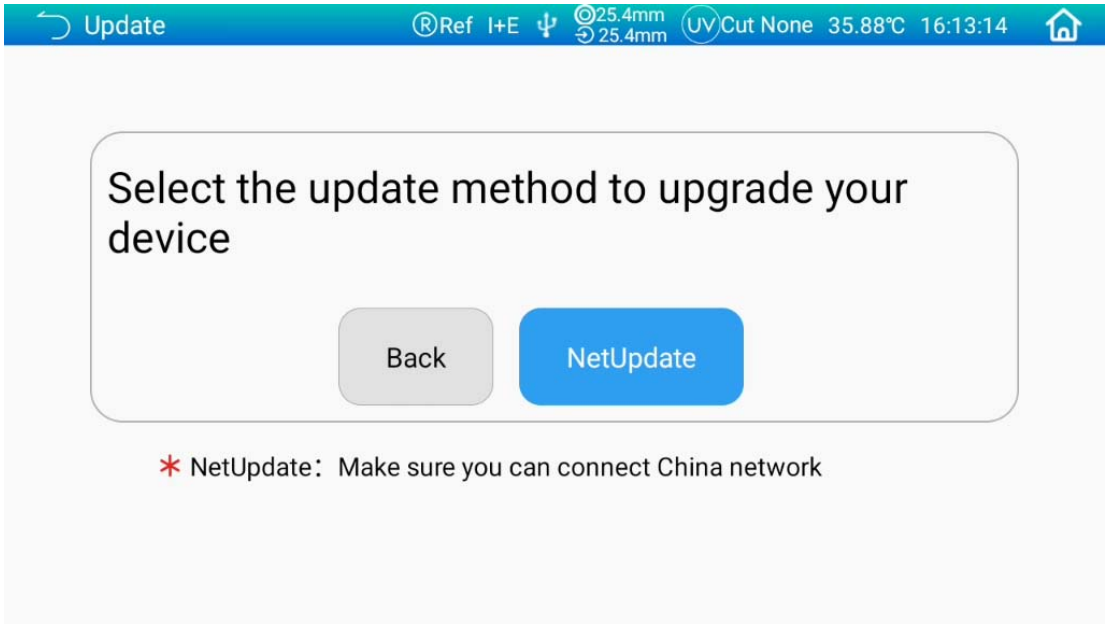


Figure 64 Software Update

8.14 Restart

After clicking "Confirm," the instrument's program will restart.

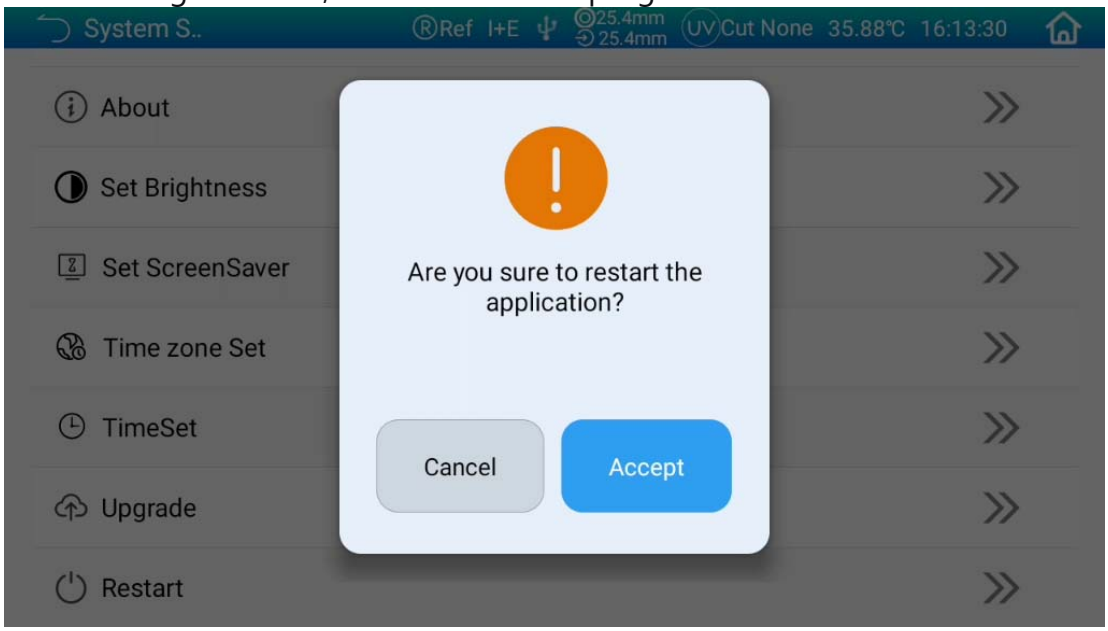


Figure 65: Restart the instrument

3. Daily Maintenance and Care of the Instrument

1.This instrument is a precision optical device. Please store and use it with care. Avoid using or storing the instrument in environments that are humid, have strong electromagnetic interference, intense light, or high dust levels. It is recommended to use and store the instrument in a standard laboratory environment.

2. The whiteboard is a precision optical component. Handle and use it with care to avoid scratching the working surface with sharp objects, soiling it with contaminants, or exposing it to direct sunlight. Regularly clean the working surface of the whiteboard with a cloth dampened with alcohol. Before calibration, promptly remove any dust from the whiteboard's working surface.

3. To ensure the validity of test data, it is recommended that both the instrument and the whiteboard undergo metrological inspection at the manufacturer or an accredited metrology research institute every year from the date of purchase.

4. The measurement module of this instrument is powered by an external AC power source, while the tablet PAD module is powered by a built-in lithium

battery. Use the power sources properly to avoid frequent plugging and unplugging, thereby protecting their performance and extending their lifespan. When the instrument is not in use for an extended period, turn off the tablet PAD and the switching power supply.

5. Do not disassemble the instrument without authorization. If issues arise, please contact the relevant after-sales personnel. Tampering with or removing the tear-off label may affect the instrument's after-sales maintenance services.

4. Technical Specifications

4.1Product Features

(1) High hardware configuration: Industrial-grade high-performance MCU control module with USB/Bluetooth dual communication modes.

(2) 154mm integrating sphere, featuring long-life full-spectrum LED and full-spectrum xenon lamp as illumination sources (Note: Some models may vary). High-precision concave grating serves as the spectroscopic component. Dual-array 256-pixel CMOS detector with a dual optical path design.

(3) Measures sample reflection and transmission spectra. Provides accurate Lab data for color matching and precise color transmission.

(4) Supports multiple measurement orientations: side measurement, upward measurement, and downward measurement (using accessories).

(5) Automatic recognition of reflection apertures. Four reflection apertures (Φ 25.4/15/8/4mm) can be switched freely. Open transmission measurement with a 25.4mm aperture (customizable to other transmission apertures) to accommodate special customer needs.

(6) Temperature and humidity compensation function ensures more accurate measurement results.

(7) Wavelength measurement range: 360–780nm. Built-in 400nm cut-off / 420nm cut-off / 460nm cut-off (Note: Some models may vary) for professional UV testing.

(8) Independent light source detector continuously monitors light source changes to ensure reliability.

(9) Multiple measurement modes to meet diverse customer needs.

(10) Various accessories: reflection sample clamping tools and transmission fixtures for broader application scenarios.

(11) Large storage capacity capable of storing over 100,000 test data entries.

(12) Built-in camera for framing and positioning.

(13) PC-based color management software with powerful extended functionalities.

(1) as powerful extensions.

4.2 Technical Specifications

Optical Geometry	Reflect: D/8(diffused illumination, 8-degree viewing angle) ; SC/SCE ; Include UV / excluded UV light source; Transmittance: D/0 (diffuse illumination: 0° viewing) SC/SCE ; Include UV / excluded UV light source; HAZE (ASTM D1003); Standards meet: CIE No.15，GB/T 3978,GB 2893,GB/T 18833,ISO7724/1,ASTM E1164,DIN5033 Teil7,JIS Z8722 under condition C
Characteristic	1. It is used for accurate analysis and transmission of laboratory color. Apply in paints, inks, textiles, garments, printing and dyeing, printing etc industries 2. 10.5 inch rotatable display pad，128G storage，camera real-time positioning 3. Instrument can be measured on the side, upward measurement, and the downward measurement (use accessories) and other gestures.

	4. Open transmission warehouse, available thickness of 54mm transmitted samples. 5. Automatic temperature and humidity compensation function 6. Built -in full spectral high life LED light source and Xenon lighting sources, testing fluorescent samples have better recognition
Integrating Sphere Size	Φ154mm
Light Source Device	360nm–780nm Wavelength range ,combined LED Light. Including UV, 400nm / 420nm /460nm cut-off light source, 360~780nm Xenon Lamp.
Spectrophotometric Mode	Concave Grating
Sensor	256 Image Element Double Array CMOS Image Sensor
Wavelength Range	360~780nm
Wavelength Interval	10nm
Semiband Width	5nm
Measured Reflectance Range	0~200%
Measuring Aperture	Reflective： XLAV Φ25.4mm/Φ30mm LAVΦ15mm/Φ18mm MAVΦ8mm/Φ10mm SAVΦ4mm/Φ6mm Transmissive: Φ25.4mm(No limit on sample height and width, but thickness≤54mm) Remark: 1. Automatic identification of aperture switch 2. Customized Configuration caliber and lens position

Specular Component	Reflectance: SCI&SCE / Transmittance: SCI&SCE
Color Space	CIE LAB,XYZ,Yxy,LCh,CIE LUV,Musell,s-RGB,HunterLab,βxy,DIN Lab99
Color Difference Formula	ΔE*ab, ΔE*uv, ΔE*94, ΔE*cmc(2:1), ΔE*cmc(1:1), ΔE*00, DINΔE99, ΔE(Hunter) , ΔE*CH555 color shade sorting
Other Colorimetric Index	WI(ASTM E313，CIE/ISO,AATCC,Hunter，Taube,Berger Stensby) YI(ASTM D1925，ASTM 313),ISO brightness,R457 MI (Metamerism Index), Staining Fastness, Color Fastness, Color Strength, Opacity, APHA/Hazen/Pt-Co Index，Gardner Index 8° Gloss,555 Index, Haze,Transmission(ASTM D1003)， Saybolt index, ASTM D1500 Color code，carbon（My,dM）,Color density CMYK(A,T,E,M),Tint，Color density（part function achieved via software in PC）
Observer Angle	2°/10°
Illuminant	D65,A,C,D50,D55,D75,F1,F2,F3,F4，F5，F6,F7,F8,F9，F10,F11,F12,CWF,DLF,TL83,TL84,TPL5,U30，B,U35,NBF ID50,ID65,LED-B1,LED-B2,LED-B3,LED-B4,LED-B5,LED-BH1,LED-RGB1,LED-V1,LED-V2,LED-C2,LED-C3,LED-C5, customized light source(41 light sources in total,part achieved via software in PC)
Displayed Data	Spectrogram/Values, Samples Chromaticity Values, Color Difference Values/Graph, PASS/FAIL Result, Color Offset, Color assessment, haze, liquid chromaticity
Measuring Time	2.0s（Measure SCI & SCE meantime about 4s ）
Repeatability	Reflectance chromaticity value:Φ25.4mm/SCI, Standard deviation within ΔE*ab 0.01 (When a white calibration plate is measured 30 times at 5 second intervals after white calibration); spectrum reflectance /transmission：≤0.1%

Inter-instrument Error	Φ25.4mm/SCI, Within ΔE*ab 0.1 (Average for 12 BCRA Series II color tiles)
Dimension	L*W*H=440x248x283mm
Weight	Approx. 13.5kg
Power	AC 24V, 3A Power adapter power supply
Illuminant Life Span	5 years, more than 3 million times measurements
Display	10.5-inch rotatable display pad
Data Port	USB & Bluetooth
Data Storage	128G storage，above 100,000pcs
Language	Simplified Chinese, Traditional Chinese, English,(Optional Customized German,Russian, French ,Spanish ,Japanese, Thai, Korean, Polish, Portuguese)
Operating Environment	0~40℃（32~104°F）
Storage Environment	-20~50℃（-4~122°F）
Optional Accessory	Micro Aperture(4mm) transmission test clamp component, Instrument inversion components,culture dish,Film fixture
Standard Accessory	Power Adapter, User Guide, CD Disk(PC Software), USB cable, Standard Calibration Board, Black Calibration Cavity, Transmission black baffle, Sample holder, 25.4 caliber, 15 caliber, 8 caliber, 4 caliber,Transmissive Test Component, cuvette
Notes	The specifications are subject to change without notice.