3nh
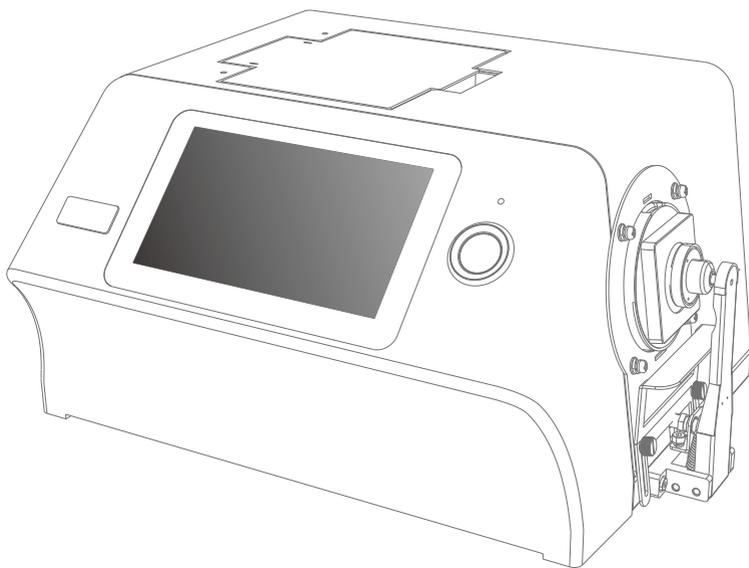
Benchtop spectrophotometer

OPERATION MANUAL

V1.0

Read this manual carefully before use the spectrophotometer.

FCC Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Safety Instructions

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.

Safety Instructions

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. 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.

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.

🛑	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.
🚫	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 benchtop spectrophotometer is designed for the measurement of color and color difference in all fields. It can measure the color for reflection and transmission with high accuracy.

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

CATALOGUE

Instruction

YS series benchtop grating spectrophotometer are independently developed by 3nh company, who has complete intellectual property rights. The instrument hold as large as 7 inch capacitive touch screen. According to the geometric optical illumination D/8°(Reflection) and D/0°(Transmission), the instrument can measure Reflection/Transmission and colorimetric data of various samples. In order to meet different measurement requirements, the instrument is equipped with kinds of reflective measuring apertures such as Φ25.4mm, Φ15mm (for partial model), Φ8mm, Φ4mm. The wavelength range is from 360~780nm, 400nm/420nm cut-off light source, 460nm cut-off light source (for partial model). By switching on-off, the instrument can measure colorimetric data for all kinds of sample/UV sample.

With USB, Bluetooth dual mode and with high-end color management software which can be connected to PC to achieve more extension functions, it has the character of stable working, accurate color measurement, large storage capacity and it is good to achieve the accurate color analysis and transmission. The instruments also can be accurate in measuring equipment for color matching system and widely used in color quality control area. They are widely used in plastic, electronics, paints, textile, printing, automobile, medical, cosmetic and food industries or science research institutes and laboratories.

Cautions

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

● Keep the instrument balanceable,--stable, 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 power it off to prevent the instrument from damage if you don't use it
for a long time.
● Please keep the instrument in a cool dry place.
● Any unauthorized changes to the instrument are not permitted, or it will affect
the measuring accuracy, even cause irreversible damage.

1.Interface Description

Transmissive Measure Port

TFT LCD screen

Indicator Light

Testing to Measuring

Sample Holder

Power Switch

DC Power Port

USB Port

Print Port

Measuring Aperture

Transmissive Black Plate

Reflective black trap

Reflective White Plate
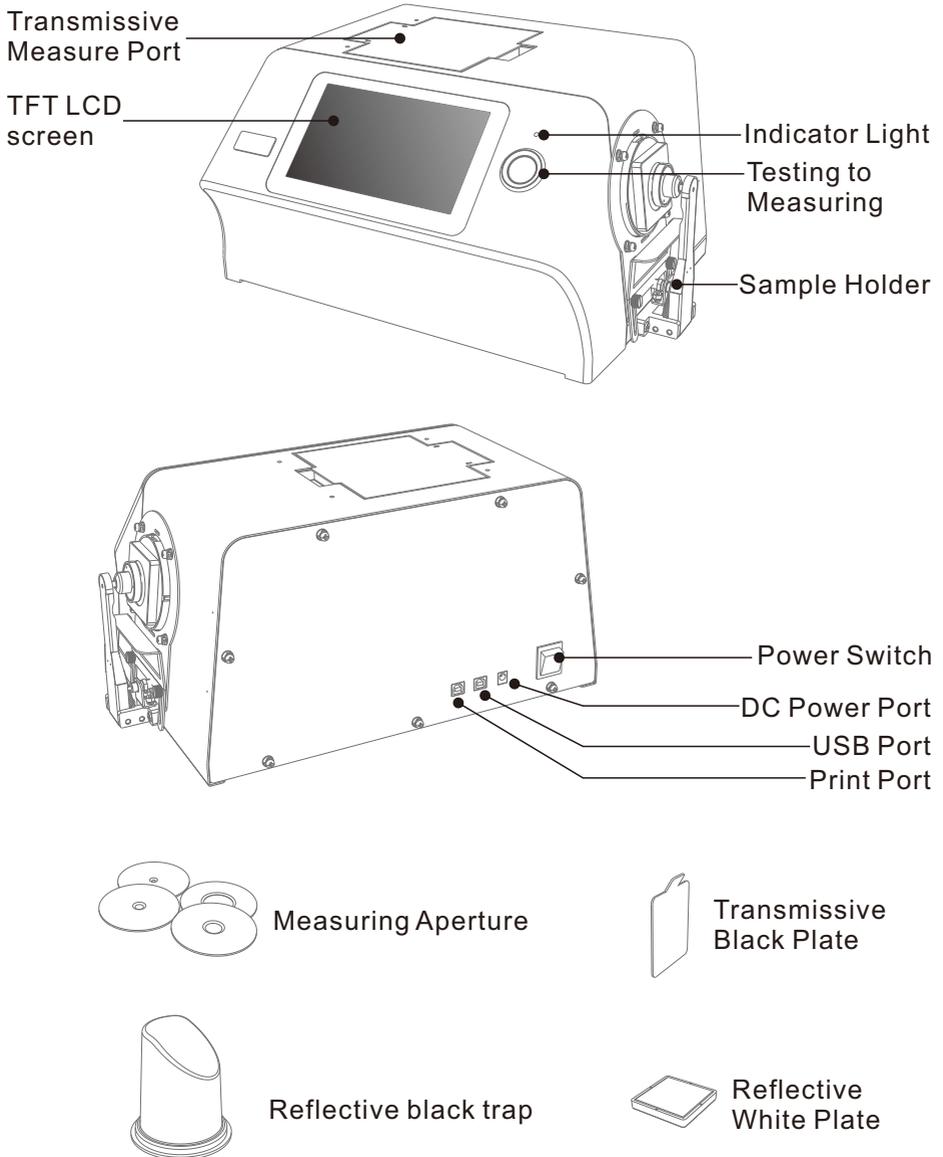
Figure 1   Instrument Structure Diagram

Display:7-inch TFT color LCD, Capacitive Touch Screen,
Used to display measurement data and instrument operation navigation.

Indicator Light:
* The instrument is energized (the power adapter is energized when the switch is turned to "I"), The indicator light is on.
* LED light includes green and red.
* Green LED light flashs during measuring and keep green after measuring. If during measurement the instrument runs abnormal, it turns to red and keep red.

Wake-up/Testing to Measuring ：
*Pressing the button shortly is to wake up the system and start measuring.
*Pressing the button during measurement will cause operation invalid.

Reflective Measuring Port：
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.

Sample Fixing Clamp：
It's for clamping sample during Reflective measuring mode.
When the sample is heavier, it can be supported by a bracket.

Measuring Aperture:
*Reflective measuring apertures: Φ25.4mm/ Φ15mm (some models without this model)/Φ8mm/Φ4mm;
*Transmissive measuring apertures: Φ30mm/Φ25mm;
*The customer selects the appropriate measuring aperture according to the

measured sample size. The bigger aperture customers choose, the more accurate the measurement date is.
*During transmissive measuring mode, only switch Φ25.4mm and place reflective white plate to the reflective measuring aperture.

Reflective black trap:
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.

Print Port:
It is to connect printer, used to print colorimetric data.

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.

2.Operating Instruction

2.1Power On & Off

Press the power switch to "I", to power up the instrument.

When the indicator light turns green, the instrument is on in normal. Press the power switch to "O", the instrument is turned off, and the indicator light goes out.

If the operation is not done for a long time when the instrument is on, it will automatically enter into standby mode. At this time, press the test key to wake-up the instrument to keep working. Please refer to the instruction section of screen backlight.

⚠️ Please cuff off the power if not to use the instrument for a long time.

2.2Calibration

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.

2.2.1 Reflection Measurement Mode Calibration

❗ First of all, ensure that the instrument is in Reflective Measurement Mode (for specific settings please refer to section 3.4).

Calibration Steps:

1.In Figure 2 standard measurement interface, click 🏠,or in other interfaces click ✓,or ←,to enter into Figure 3 main menu, as shown in the following figure.
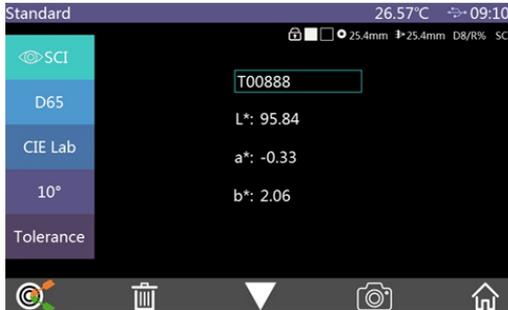
Figure 2 Standard Measurement

Figure 3 Main Menu

2.In the main menu to click "Calibration" to enter white and black calibration interface as shown in Figure 4. It will show whether the calibration is valid or not and how long the remaining time is.
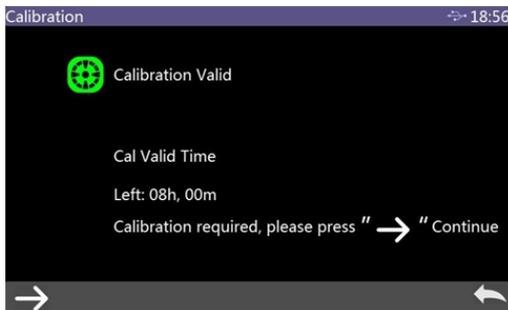

Figure 4 Black and White Calibration

3.Click   to enter Reflective Black Calibration interface as shown in Figure 5. Place well black cavity according to the warning, then press the test key to start black calibration, or click ← to cancel and quit the calibration.

Steps for placing Black trap:

(1), Pull out the sample holder and open it.

(2), Place the black cavity to joint with groove of instrument, then close the sample clamp to fasten the black cavity.

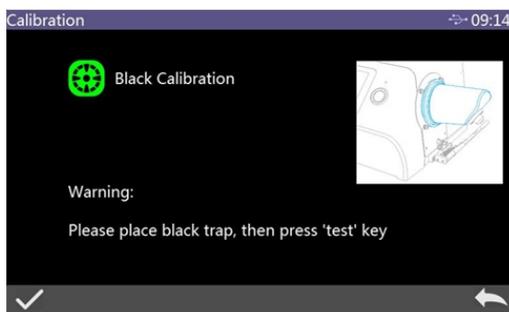Figure 5 Reflective Black Calibration Interface

4.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 test key to start white calibration, or click ← to cancel and quit the white calibration.
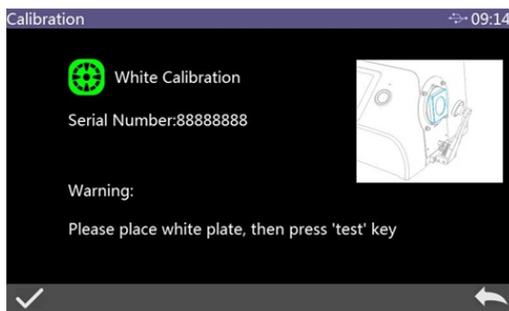

Figure 6 Reflective White Calibration

After black and white calibration are finished rightly, the instrument system will reset remaining time according to valid time after last calibration (As shown in Figure 4).

2.2.2 Transmission Measurement Mode Calibration

❶ First of all, ensure instrument is in Transmission Measuring Mode (For specific setting please refer to section 3.4)

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 3, click "Calibration" to enter transmission black calibration. Place the transmission black plate into transmission sample bin and stick it to the side of integrating sphere tightly, close the cover, and click the test key to start calibration.

2, After finishing transmission black calibration, take out the black plate, place the white calibration reference according to prompt, ensure it stick to the side of integrating sphere tightly, close the bin cover, and press test key to start calibration.

Cautions：

The users should choose relative white calibration reference according to different type of transmissive measured sample. For example, if measured sample is plastic or glass etc, air can be chosen as white calibration reference. If measured sample is liquid, then a cuvette filled with deionized water or distilled water can be used as a reference for white calibration. If the measured 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 (As shown in Figure 4).
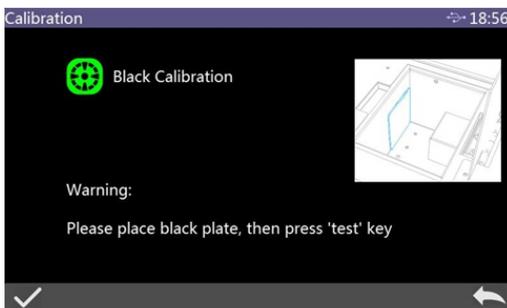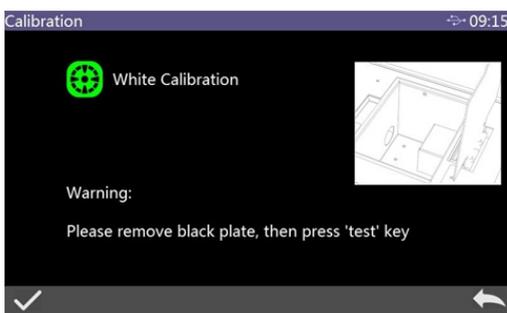

Figure 7 Transmission Black Calibration

Figure 8 Transmission White Calibration

2.3 MEASUREMENT

2.3.1 Measurement Instruction

As shown in Figure 9, it is working condition area at the top of measurement interface, displaying the status of measurement mode, including: Interface Name, USB Connection status, System time, Simulation color, Aperture dimension, Lens position, Measuring mode and so on.

At the left side, it is shortcut area, it could switch different modes by touching different icons.

At the middle, it displays different chromatic data according to different setting of color formula.

It is operation buttons area at the bottom, which could operate the data by touching the different icons.

Figure 10 is the interface of reflectance rate spectrum. Figure 11 is colorimetric index display area, fast switch by touching the ▼ icon.
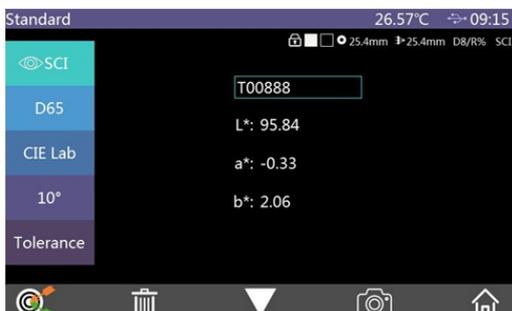
Figure 9 Colorimetric Measure

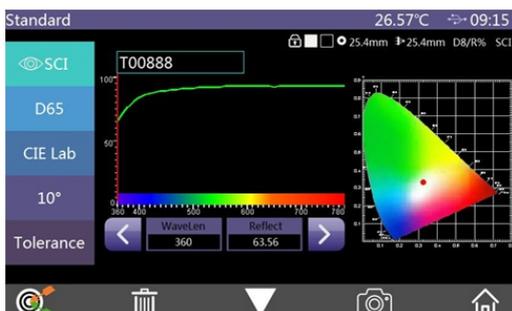Figure 10 Reflectance Spectrum

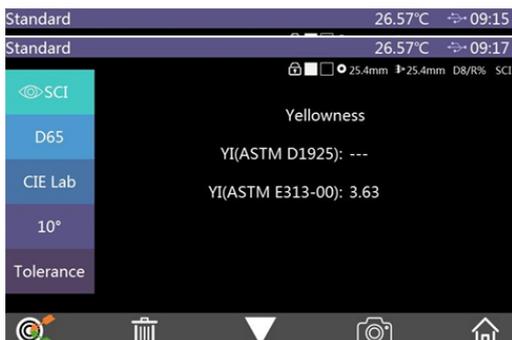Figure 11 Colorimetric Index Measurement Interface

2.3.2 Reflection Standard Measurement

Reflective Standard Sample Measurement Steps:

1. Set the current measurement mode to Reflective Measurement Mode (for details please refer to section 3.4).

2. Set the corresponding measuring aperture.

Main Menu → Measuring Mode → Measuring aperture/Lens Position, enter the

interface as shown in Figure 12, measuring aperture and lens position can be selected manually (default automatic mode).

Figure 12 Measuring Aperture / Lens Position Selected Interface

3.Illuminant setting

Main menu → light source settings, enter the light source settings interface, as shown in Figure 13, set the corresponding light source options according to users' requirement, and click ✓ to confirm.

Figure 13 Light Source Setting Interface

4, Standard Measuring Interface to Measure Sample

When above preparation is finished, enter Standard Measuring Interface (Figure 2), the measured sample is placed cling to the reflective measurement aperture of the instrument. The buzzer emits the sound of "beep" when the measuring key is pressed shortly. At the same time, the LED indicator flashes until the flashing stops, the buzzer emits the sound of "beep" again, then the measurement is finished. After it, the interface is shown as in Figure 14 and Figure 15. The following is a detailed description of the standard measuring interface.

(1) Interface Title: indicate the current interface name;

status, USB communication status, system time, etc.

(3) Standard simulation color: the corresponding color of standard test results;

(4) Sample simulation color : only show this point for sample measurement.

(5) Aperture: the aperture of the current system;

(6) Lens: the lens position of the current system;

(7) Transmission or Reflection: the measuring way of the current system, R is reflective and T is transmissive.

(8) Sample measurement mode: Standard sample measurement defaults to SCI + SCE data; it is able to choose SCI, SCE, I + E for sample measurement.

(9) Display mode: click ◉SCI or ◉SCE to switch the current mode of data display.

(10) Light source: click on the shortcut key, the current test data can be quickly switched between D65, D50 and other standard light sources;

(11) Color space: by clicking the shortcut key, the current test data can be quickly switched between CIE Lab, CIE XYZ, CIE Yxy, CIE LCh and other color spaces.

(12) Observer angle: click to quickly switch the observer angle between 10 degree / 2 degrees.

(13) Standard sample tolerance: Click to set the tolerance of current standard sample.If not set it, this is default system tolerance. For details please refer to section 2.5.

(14) Name of standard sample: showing the name of the current measured sample. Click to modify quickly.

(15) Switch to sample measurement: click 🎯 to enter the sample measurement interface.

(16) Delete: Click the icon of 🗑 to delete the current standard record, at this moment the system defaults to open the automatic saving function. If you turn off this function, the icon should be 💾 For details please refer to section 3.8.1.

(17) Page turn: click ▼ to look at other colorimetric data index of the current standard.

(18) Camera locating: click 📷 to view the position of the object to be measured at the reflective measurement aperture.

(19) Wavelength switch button: Click ◁ or ▷ button to switch the wavelength of the light wave, the reflectance of the sample and the reflectance
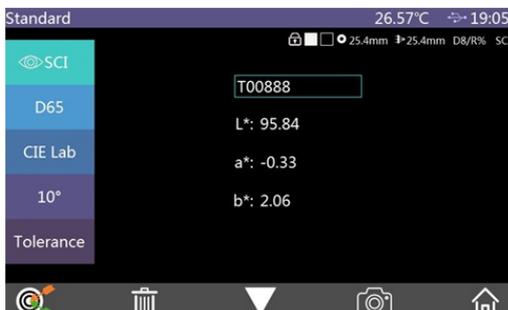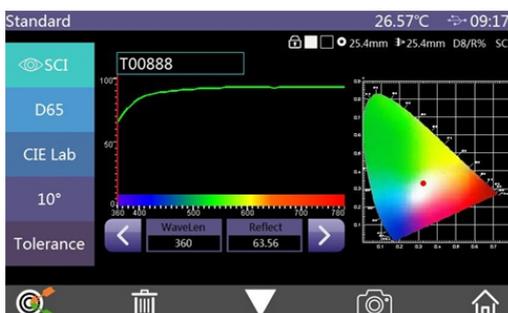
Figure 14 Standard Measure Interface

Figure 15 Reflectance Spectrum

2.3.3 Reflection Sample Measurement

The sample measurement of reflective sample is based on the standard measurement or standard record entering.

Under the standard measurement interface of reflective sample, click 🔍 switch to the sample measurement interface, short press the "measuring key" to start testing, the buzzer makes a "beep" sound and the LED indicator flashes at the same time. Until the flashing stops, the buzzer sounds again, indicating that the measurement is completed. After it, the interface is as shown in Figure 16.

The following is a detailed description of the different contents of the sample measurement interface and the standard measurement interface.

(1)Standard name: the name of the standard corresponding to the sample.

(2)Sample name: the name of the current measured sample, click to quickly modify.

(3)Simulation color: the simulation color of the current standard is displayed on the left side and on the right side is the simulation color of the current sample.

(4)Sample chromaticity value: the left side of the display area shows the chromaticity data of the current standard in the current system mode, and the right side shows the chromaticity data difference between the current sample and the current standard.

(5)Testing result: It is judged by the tolerance of the standard and the specified color difference formula. When the color difference exceeds the tolerance, the red will display "fail", or the green will display "Pass". It is only displayed when "Display Testing Results" is turned on in the system settings.

(6)Color Offset: The color deviation of the current sample compared to the standard. It is only displayed when "Color Offset" is turned on in the system settings.
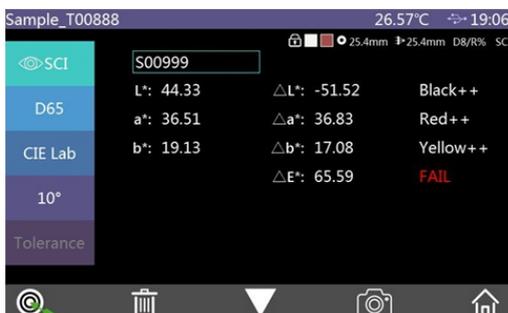

Figure 16 Sample measurement Interface

2.3.4 Transmission Standard Measurement

Steps to standard measurement of transmissive sample:

1.Set the current measurement mode to the transmissive measurement mode (refer to Section 3.4 for specific settings).

2.Set the corresponding aperture.

There is only automatic mode for aperture size/lens position in transmissive measurement mode and it can't be set manually. **But the reflective measurement aperture should be only 25.4mm, and the white board is placed to the aperture.**

3.Set the illuminant (the same as the reflective standard measurement).

4.If any parameter settings changed, it needs to redo the transmissive black and white calibration (Refer to section 2.2.2).

5.Standard Measurement of Transmissive Sample

Return to the standard measurement of transmissive sample interface, place the sample in the transmissive sample compartment, cling to the measurement aperture, and close the sample compartment cover. Short press the measurement button to turn on the measurement, and the buzzer will make a "deep" sound, and the LED will flash until the flashing stops. The buzzer will sound again, indicating that the measurement is completed.

Note: Transmissive sample measurement only has SCI mode, so no matter if it is the system sample measurement mode or the test interface display mode, there is only the SCI chromaticity data of the sample.

2.3.5 Transmissive Sample Measurement

The sample measurement of transmit is similar to the sample measurement of reflection, except that the current measurement mode is the transmissive measurement mode.

Under the interface of standard measurement of transmissive sample, click to switch to the sample measurement interface. Place the sample to be measured in the sample compartment of the instrument. Place the sample against the measurement aperture of the integrating sphere side and close the sample compartment cover. Short press the measurement button to turn on the measurement, and the buzzer will make a beep sound if the buzzer switch is turn on. and the LED will flash until the flashing stops. The buzzer will sound "beep" again, indicating that the measurement is completed.

2.3.6 Average Measurement

When the measured object is relatively large, or the chromaticity is relatively uneven, the multi-points average reflectance is obtained by measuring a plurality of representative test points, and then the calculated chromaticity data is more representative of the true color of the measured sample. The instrument can achieve 1~10 times average measurement, and the average number of measurements can be set for both samples and standards.

Click "Measurement Mode" on the main menu, then click "Average Measurement" to enter the average measurement setting interface, as shown in Figure 17:
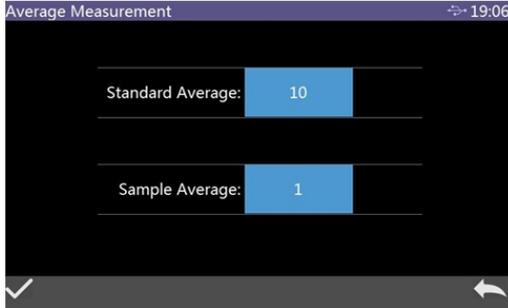
Figure 17 Setting Interface of Average Measurement

2.3.7 Continuous Measurement

When the test condition is fixed and the sample is required to be continuously measured, or in the automated production line operation process, continuous measurement mode can be used to reduce the operation and save test time. Both the standard measurement and the sample measurement can be set the number of consecutive measurements and the time between each measurement interval, and save each measurement result. During continuous measurement, continuous measurement can be terminated by pressing the measurement button.

Click the measurement mode on the main menu, and then click "Continuous Measurement" to enter the continuous measurement setting interface, as shown in Figure 18:
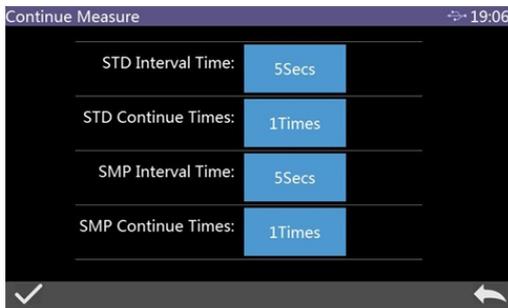

Figure 18 Continuous Measurement Mode Setting Interface

2.4 CONNECTION TO PC

The PC-side color management software has many functions to realize richer chroma data analysis. The instrument can communicate with the installed PC-side color management software via USB or Bluetooth module (only for product models equipped with Bluetooth modules).

2.4.1 USB Connection

When the color management software is installed on the PC, use USB cable to connect the instrument to the PC. The software will automatically connect to the instrument. If the connection is successful, the status bar of the instrument will display the USB connection icon ⇌ . Through the PC color management software, it can have or take over complete control of the terminal instrument, and related sample testing and analysis.

2.4.2 Bluetooth Connection

With Bluetooth-equipped instruments, first turn on the Bluetooth function in the system settings, open Bluetooth on the Bluetooth-enabled PC, search for devices such as 3nh-ble-device-01, and fill in the matching code to connect. If the connection is successful, the status bar of the instrument will display the Bluetooth connection icon ⁕ , then through the PC-side color management software, it can achieve complete control of the terminal instrument, and related sample testing and analysis.

2.5 TOLERANCE SETTING

The tolerance is for the standard, and the tolerance of the standard will affect the instrument's determination of the sample result. System tolerance is the tolerance that the instrument assigns to the standard by default. If the standard tolerance is not set, the system tolerance will be used by default, so the accuracy of the system tolerance is critical to the accuracy of the test result judgement.

2.5.1 System Tolerance Setting

From the main menu, enter the system setting interface (Figure 19), click ▼ to find the system tolerance, click on the "System Tolerance" to the editing interface, as shown in Figure 20.
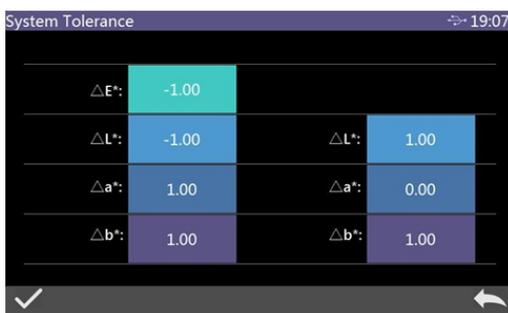
Figure 19 System Setting Interface

Figure 20 Interface of System Tolerance Settings

The total tolerance of the standard is set in the interface $\triangle E^*$ (CIE1976)
The left side $\triangle L^*$ is the lower limit of the set standard tolerance, the right side $\triangle L^*$ is the upper limit of the set standard tolerance, and the upper limit of the right tolerance must be greater than the lower limit of the tolerance. The setting method $\triangle a^*$ and $\triangle b^*$ is the same as $\triangle L^*$. Click the corresponding tolerance value to enter the corresponding value setting interface. After setting, click ✓ to confirm the saving, and this means the tolerance is the standard or click the lower side ← to cancel and exit the tolerance setting interface.
When the standard uses the default system tolerance, the sample is compared with the standard data, and only if the tolerance $\triangle E^*, \triangle L^*, \triangle a^*, \triangle b^*$ is within the tolerance range, the sample will be Pass, or the prompt will be Fail (the test result prompts the function to open).

2.5.2 Standard Tolerance Setting
Standard measurement interface (Figure 2) Click "Standard Tolerance" to enter

the editing interface, as shown in Figure 21:

The setting interface and method are the same as the system tolerance setting, but the difference is that the location of the click is different. When the user has special tolerance requirements for the standard, click the tolerance setting to set the tolerance for the standard.
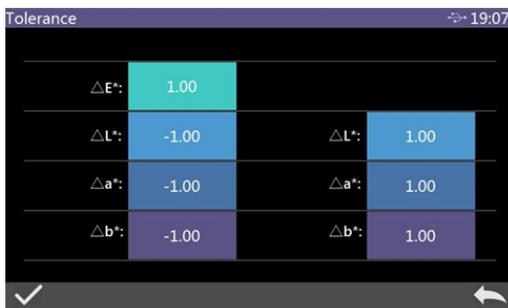

Figure 21 Interface of Standard Tolerance Settings

2.6 PRINT

There are two ways to print the sample chromaticity data of the instrument. One is to print it through the printer connected to the PC software when connecting the PC to the color management software; the other is to print by a micro printer connected to the instrument, and this way is described in detail below..

Micro-printers are non-standard accessories and required to be purchased separately.

Printing steps:

1.First test the standard and save the test record to print;

2.Enter "System Settings" from the main menu, click "Print Data" to open this function;

3.Connect the micro printer to the instrument via USB;

4.Enter "Data Management" from the main menu, view the record, and find the sample record (standard record or sample record) to be printed by → or ←

5. Click 🖍 to select "Print Data" in the pop-up menu and click "Confirm" to start printing the sample chromaticity data, as shown in Figure 22:

Figure 22 Printing Interface

3. MAIN MENU

In the measurement interface (Figure 2) click ⌂ to enter the main menu, or click ← in other interfaces to enter the main menu. From the main menu, it can enter each sub-menu to achieve all system function settings.

3.1 DATA MANAGEMENT

Click "Data Management" on the main menu interface to enter the data management interface, as shown in Figure 23. Data management can realize functions such as "Check Record", "Delete Record", "Search Record" and "Standard Input".
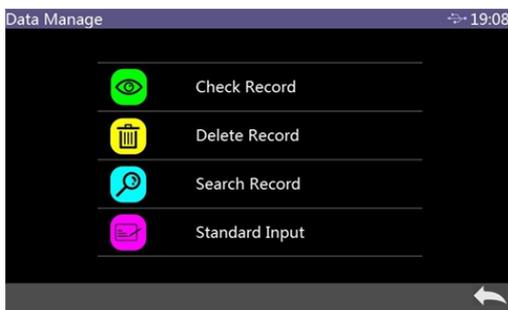

Figure 23 Data Management

3.1.1 Check Record

(1) Check Standard Record

Click "Check Record" to enter the "Standard Record" interface in the data management interface. As shown in Figure 24.
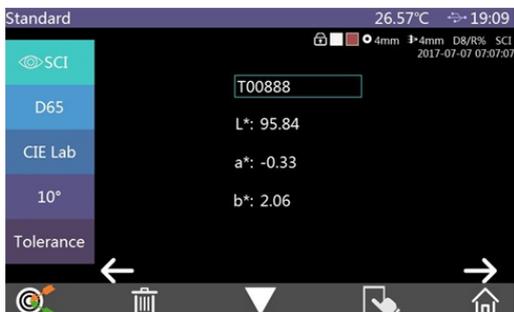
Figure 24 Standard Record

Switch records by clicking → or ←Switch among chromaticity data, reflectance curve and color index by clicking ▼ Click ⬇to replace,lock, to current STD, and print data as shown in figure 22.
Delete the current viewing standard record: click "Delete Record" and enter deleting record interface as shown in Figure 25. Click ✓ to confirm delete; Click ← to cancel deletion and return the menu.
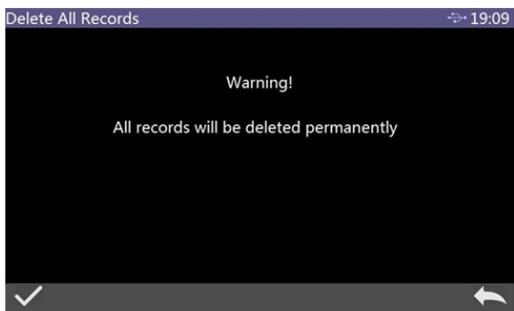

Figure 25 Delete Record

Edit the current viewing standard record name: click standard name to enter Edit Name interface, then input new name and click "ENTER" to save. The maximum name is 16 characters. Press "ENTER" to confirm the save or Click←to cancel editing operation as shown in Figure 26.

Figure 26 Edit Name

Set the viewing standard as the current standard: Click ![icon] and "Standard Input" to set the current viewing standard as the current standard. Then click ![icon] to perform the sample measurement under this standard.

Reset the current viewing standard record: Click ![icon] and "Replace" to remeasure and replace the viewing standard record. The is switched to standard measurement and short press the measurement button to remeasure the standard as shown in Figure 27.
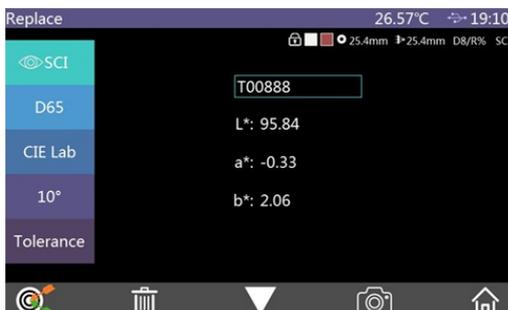

Figure 27 Replace the standard record

(2) Check Sample Record

Click ![icon] on the standard record interface to switch to the sample record interface and check the corresponding sample record. Click ![icon] on the sample record interface to return the standard record interface as shown in Figure 28.

Figure 28 Check Sample Record

3.1.2 Delete Record

Click "Delete Record " to enter delete record menu on the Data Manage
interface as shown in Figure 29. "Delete Record" includes "Delete All Samples"
and "Delete All Records".

Click the corresponding option to enter Warning on "Delete Records". Click ✓
on the Warning to delete all corresponding records. Click ← to cancel delete
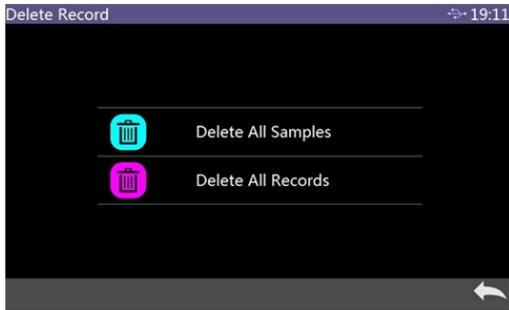as shown in Figure 30.
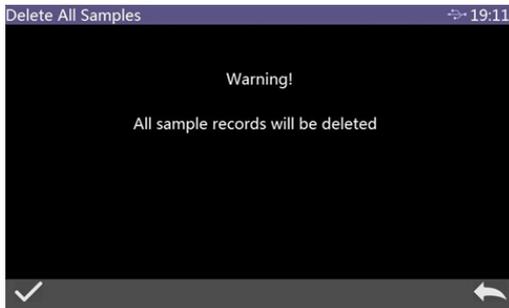

Figure 29 Delete Record

Figure 30 Delete All Sample Records

3.1.3 Search Record

Click "Search Record" on the Data Manage interface to enter search menu as shown in Figure 31.

Select "Search Standard" and "Search Sample". Search by inputting searching name wei search name as shown in Figure 32.

Figure 31 Search Record

Figure 32 Input Search Name

3.1.4 Standard Input

Click "Standard Input" to enter "standard inputting" in the Data Manage interface as shown in Figure 33.

Click Measure Mode to set standard measure mode to SCI or SCE or SCI+SCE.

Click the standard light source to set the light.

Click Color Space to select the color space of standard input. Currently only support CIE Lab and CIE XYZ.

Click Observer Angle to set the standard's observer angle.

Click standard tolerance to set standard tolerance value. Use system tolerance

without setting default.

Click standard name to input standard name.

Click the corresponding chromaticity coordinate value to input the chromaticity value of the corresponding coordinate. Input all standard information and click ✓ to confirm then the standard is saved in the standard record list, whose standard number is added in order.

Figure 33 Standard Input

3.2 CALIBRATION

As the basis of chromaticity measurement, black and white calibration must be carried out accurately, or it will affect the validity of test data.

When the current black and white calibration environment is greatly different from the current sample test environment (such as temperature drastic fluctuation), the instrument is required to be re-calibrated in time. After the last successful black and white calibration exceeds the setting time, it is also recommended to redo black and white calibration before the measurement.

The whiteboard should be cleaned regularly, and properly kept under the dark, dust-proof and dry environment. Please refer to section 2.2 for black and white calibration method.

3.3 Illuminant

The user can set the corresponding light source according to the actual measurement condition. It can set the system standard observer angle, standard light source type and UV light source opening in this illuminant setting interface.

Click "Illuminant" to enter illuminant setting on the main menu (Figure 13). Click observer angle to switch between 10° and 2°. 10° is CIE1964 standard. 2° is CIE1931 standard.

Click "Illuminant" as shown in Figure 34. In the Illuminant option window, D65, A, C, D50, D55, F1~F12 and other light sources can be selected.

Click UV light source to switch UV light source mode. 400 CUT means that light source filtered the 360-400nm spectral components through the filter. 420 CUT means that light source filtered the 360-420nm spectral components through the filter. 460 CUT means that light source filtered the 360-460nm spectral components through the filter. CUT NONE means light source without filter and full spectrum lighting between 360-780nm. There is a little difference among different product types.
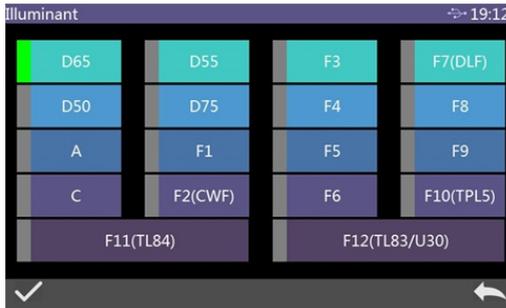

Figure 34 Illuminant

3.4 MEASUREMENT MODE
Clicks "Measure Mode" on the main menu to enter this interface, which includes Reflective/Transmissive Measure, Aperture size/lens position, Average Measurement, Continue Measure, Sample Measure Mode as shown in Figure 35.
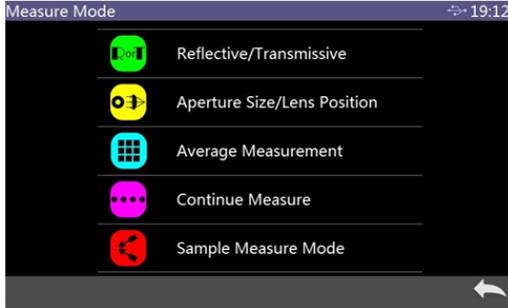
Figure 35 Measure Mode

After entering Reflective/Transmissive Measure, Reflective
Measure/Transmissive Measure can be selected as shown in Figure 36.

Figure 36 Reflective/Transmissive Mode Select

When Transmissive Measure is selected, the main measurement interface
displays T%, representing the current Measure Mode as Transmissive (R%
representing Reflective Measure as shown in Figure 14).

What needs to be emphasized here is that black and white calibration is
required every time when switches between Reflective Measure and
Transmissive Measure. Please refer to section 2.2 for black and white
calibration.

Aperture size/lens position can be set as automatic recognition and manual
mode.

Figure 37 Aperture size/lens position

For the average measurement setting and description, please refer to section 2.3.6.

For continuous measurement setting and description, please refer to section 2.3.7.

3.5 COLOR SPACE

In the main menu, click "Color Space" to enter the color space interface as shown in Figure 38, select the corresponding color space there, and then click ✓ to confirm the setting.

Figure 38 Color Space Selection Interface

3.6 COLOR INDEX

The color index interface can select the currently use color diff formula, Optional chromaticity index, and parameter factors setting, as shown in Figure 39:
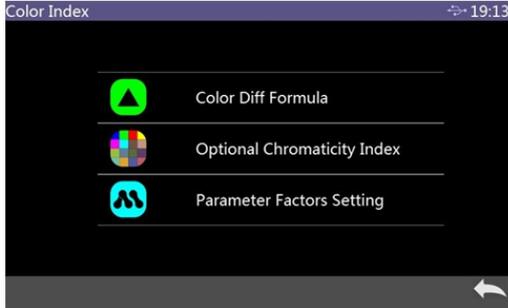
Figure 39   Color Index Interface

When set the Color Diff Formula, the user can choose $\triangle E^*$, $\triangle E_{cmc(2:1)}$, $\triangle E_{94}$, $\triangle E_{cmc(l:c)}$, etc. After selecting, click ✓ to confirm the Color Diff Formula, as shown in Figure 40:
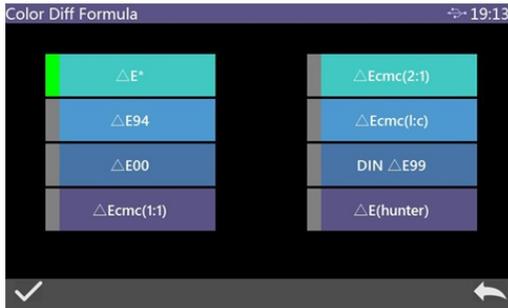

Figure 40 Color Diff Formula Selection Interface

After the chromaticity index is set, the selected color index will be displayed in the color index of the standard and sample measurement (depending on the index, part of the index is only displayed in the sample and is also affected by the type of transmission and reflection). Click ▼ on the measurement interface or check record interface to page to the color index display area, as shown in Figure 41 for the whiteness display interface.
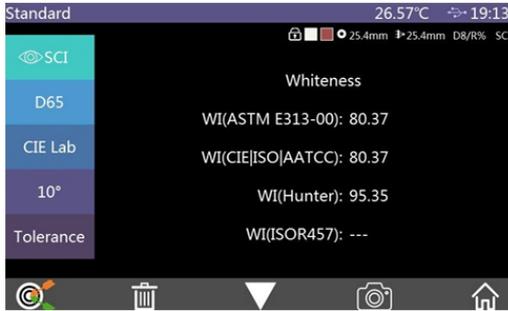
Figure 41 Whiteness Display Interface Under Standard Measurement

Click "Parameter Factor Settings" on the color index interface to enter the parameter factor setting interface, as shown in Figure 42:

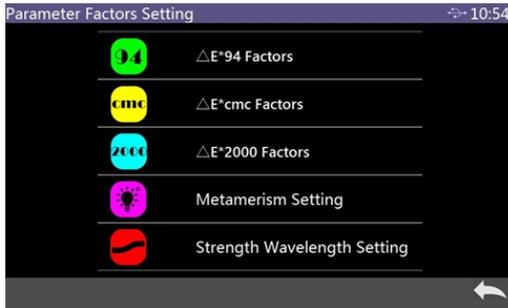
Figure 42   Parameter Factor Setting Interface

In the parameter factor setting interface, click$\triangle E^*_{94}$ to enter the $\triangle E^*_{94}$ factors setting interface (as shown in Figure 43).

Figure 43 ΔE*94 Factor setting interface

Click on the factor KL, factor KC, and factor KH to enter the editing interface (as shown in Figure 44), then input the new value, click ✓ to confirm saving parameters, or click ⬅ to cancel the saving settings.
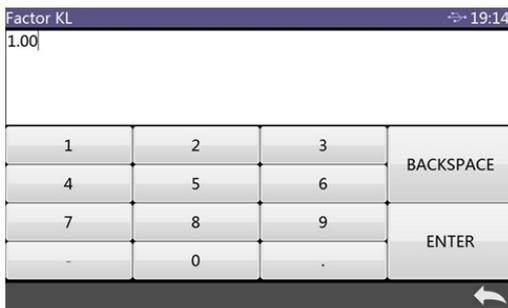

Figure 44 Factor KL Editing interface

3.7 DISPLAY SETTING

Click "Display Settings" on the main menu interface to enter the display setting interface, as shown in Figure 45. In this interface, the user can set some functions like open the Color offset or not, test result prompt, display mode, difference value or absolute value display.

When open the function of the color offset, it will display the color deviation between the sample and the standard when the sample is measured. When it is closed, there is no corresponding prompt.

When open the test result prompt, if the test result exceeds the tolerance range set for the standard during the sample measurement, the red font "Fail" will be prompted. If it is within tolerance range, the green "Pass" is displayed.

The instrument can be configured in either the Quality Mode or the Sample Mode. The quality mode is multi-standards, each standard corresponds to multiple samples display mode; while the sample mode is single standard, and all other test data are samples of the current standard, and the standard data can be replaced with the sample data.

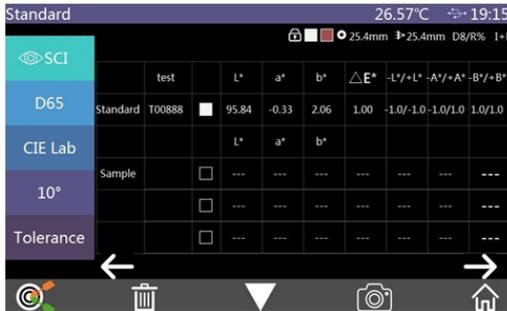Figure 45 Display Setting Interface

Figure 46 Sample Mode

The difference and absolute values are related to the data description of the sample. Figure 16 shows the difference mode. The absolute value mode is shown in Figure 47:
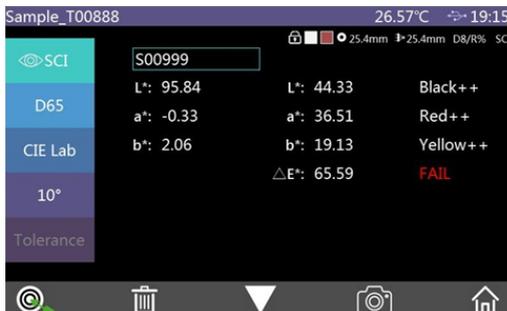
Figure 47 Sample Measurement Interface Under Absolute Value Mode

3.8 SYSTEM SETTING

Click "System Settings" in the main menu to enter the system setting interface,

as shown in Figure 48, Figure 49 and Figure 50.

System settings include: Auto Save, Bluetooth, Buzzer, Print Data, Control Mode, Language Setting, Time Date Setting, Backlight Time, System Tolerance, Screen Brightness, TEMP threshold, Calibration Validity, system error, Restore factory settings, About Instrument.

Figure 48   System Settings Interface 1

Figure 49   System Settings Interface 2

Figure 50   System Settings Interface 3

3.8.1 Auto Save

When Auto Save is turned on, all test results for every standard measurement will be automatically saved in the instrument. Or when the standard measurement is finished, the record will not be saved automatically and it is required to click the save icon 💾 to save manually as shown in Figure 51:
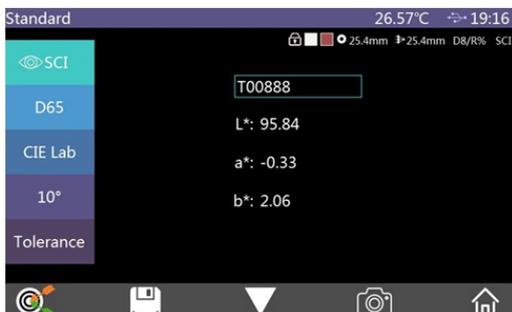

Figure 51 Data Saved Manually

3.8.2 Bluetooth

When the Bluetooth function is turned on, the instrument will automatically turn on the Bluetooth module and open the Bluetooth function of the PC color management software. The two will be paired. If the pairing is successful, the instrument would communicate with the PC color management software.

3.8.3 Buzzer Switch

The buzzer switch controls whether a beep sounds when measuring. When the buzzer is on, a beep will sound every time when the measurement starts; or there is no buzzer prompt during the measurement.

3.8.4 Print Data

Open the print data switch and connect the printer to print data output. For more information, please refer to section 2.3.6.

3.8.5 Control Mode

When the instrument communicates with the PC software, the user can set a specific control method as needed. In the system setting interface, click "Control Mode" to open the control mode interface. There are three options:

Key, PC software, Key and PC Software. Select the corresponding method, and then confirm, as shown in Figure 52:

Figure 52 Control Mode Interface

Key: Select this mode. When the instrument communicates with the PC software, the instrument is only triggered by the instrument measure key. The user needs to complete the data measurement through the instrument measure key and upload the data to the PC software.

PC Software: Select this mode. When the instrument communicates with the PC Software, the instrument measurement can only be controlled by the PC color management software to complete the data measurement and upload the data to the PC software.

Key and PC Software: Select this mode. The user can complete the sample measurement through the instrument measure key or PC software command, and upload the data. This is the instrument default mode.

3.8.6 Language Setting
Click "Language Settings" to select the appropriate language.

3.8.7 Time Date Setting
When the instrument is out of the factory, it is the local time of the manufacturer, and the user can set the time according to their requirement. In the system setting interface 2, click "Time Date Setting" to set the date and time as shown in Figure 50. By pulling down to set the date and time, click "confirm" button to save.
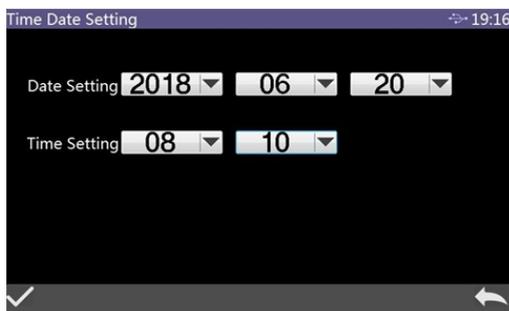
Figure 53 Time Date Setting Interface

3.8.8 Backlight Time

Click "Backlight Time" on the system setting interface to enter the "Backlight Time" interface.

The options of the backlight time are: Always on, 30 mins, 10 mins, 5 mins, 1 min. If you select Always On, the screen will always be lighted even instrument not in use for long time; if it is set to other modes, the instrument will start counting down from the last operation, and will enter the power saving state with screen lights out if there is no operation after the countdown ends.

When the instrument enters the power saving state, short press the measure key to wake up the instrument.

3.8.9 System Tolerance

Click "System Tolerance" on the system setting interface to enter the default system tolerance interface. Please check the section 2.5.1 for system tolerance settings.

3.8.10 Screen Brightness

Click "Screen Brightness" on the system setting interface to enter this interface. Click "+" to increase the screen brightness, and click "-" to decrease the screen brightness. Adjust it according to the actual situation, after it, click ✓ to save the settings, click ← to cancel the save.

3.8.11 Temperature Threshold

Click "TEMP threshold" on the system setting interface to enter this interface. Set the temperature value upper and lower limits. When the temperature is abnormal and it changes greatly even exceeds the threshold (normally, the threshold is set to 3 degrees Celsius), the instrument will prompt that the black and white plate calibration is required to be done again.

3.8.12 Calibration Valid

Click "Calibration Validity" on the system setting interface to enter this interface. Set the effective time of the black and white plate calibration. If the effective time is exceeded, the instrument will prompt to perform the black and white plate calibration again. The optional valid time is 4 hours, 8 hours, and 24 hours.

3.8.13 System Error

Click "System Error" on the system setting interface to enter this interface. View the list of system hardware errors, as shown in Figure 54.

Figure 54 System Error Interface

3.8.14 Restore Factory Settings

Click "Restore Factory Settings" on the system setting interface to enter this interface, as shown in Figure 55. Click ✓ to clear all measurement records and parameter settings and restore to the factory state; click ← to cancel this operation.

Figure 55 Restore Factory Settings Interface

3.8.15 About Instrument

Click "About Instrument" on the system setting interface to enter this interface. View the product model, Instrumental SN, software version, hardware version, black plate number, white plate number and other information as shown in Figure 56:
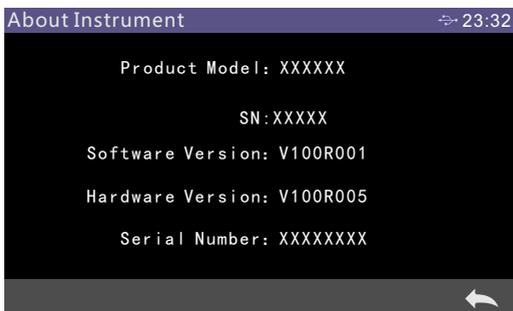

Figure 56 About Instrument Interface

4. DAILY MAINTENANCE

(1)This instrument is a precision optical instrument. Please keep and use the instrument properly. Avoid using and storing the instrument under humid, strong electromagnetic interference, strong light and dust. It is recommended to use and store the instrument in a standard laboratory environment.

(2)The white plate is a precision optical component. It should be kept and used properly. Avoid rubbing the work surface with sharp objects, avoid soiling the work surface with dirt, and avoid exposing the white plate under strong light.

Regularly clean the white plate working surface with a cloth and alcohol. Before calibration, clean the dust on the white plate surface in time.

(3)In order to ensure the validity of the measured data, it is recommended to inspect the instrument and the white plate to the manufacturer or a qualified metrological institute for every year from the date of purchase.

(4)This instrument get power from the external supply power adapter. The power supply should be used in a standard manner to avoid frequent plugging and unplugging, to protect the power supply performance and to extend the service life.

(5)Please do not disassemble the instrument privately. Please contact the relevant after-sales staff If there is any problem. Torn the easy-to-tear label will affect the after-sales maintenance service of the instrument.

5.TECHNICAL PARAMETERS
5.1 PRODUCT FEATURE

1, High hardware configuration: 7-inch TFT pure color capacitive touch screen; Bluetooth 4.0; concave grating.

2, Dual array 256-pixel CMOS detector; high lifetime stable LED / UV LED / xenon lamp.

3, Measuring reflective and transmissive spectrum of sample, accurate Lab data, can be used for color matching and accurate color transfer.

4, Automatic identification of aperture change, Φ 25.4/15/8/4mm four apertures can be switched at will, taking into account the special needs of customers.

5, Temperature monitoring and compensation, built-in temperature sensor, monitor and compensate the test environment to ensure more accurate measurement results.

6, Measurement wavelength range of 360~780nm, while built-in 400nm / 420nm

/ 460nm（460nm limited to xenon edition),measuring UV more professionally.

7, Independent illuminant detector, monitoring the illuminant changes at all times to ensure reliable illuminant.

8, Multiple measure modes: quality mode, sample mode, to meet more customer needs.

9, A variety of accessories: holding tool of reflective sample, transmission holder, for more conditions.

10, Large-capacity storage space, which can store about 40,000 measurement.

11, Built-in Camera measured area positioning.

12, PC color management software has powerful extensions.

5.2 TECHNICAL SPECIFICATIONS

Optical Geometry	Reflectance：D/8（Diffused illumination，8-degree viewing angle）;SCI/SCE, include UV/Exclude UV； Transmittance：D/0（Diffused illumination，0-degree viewing angle）SCI/SCE, Include UV/Exclude UV； Conforms to CIE No.15，GB/T 3978,GB 2893,GB/T 18833,ISO7724/1,ASTM E1164,DIN5033 Teil7
Characteristic	For accurate analysis and delivery of laboratory colors; Used for color transfer and quality control in plastic electronics, paint and ink, textile and garment printing and dyeing, printing and other industries.
Integrating Sphere Size	Φ154mm

Light Source Device	360~780nm combined LED light source, 400nm cut-off light source, 420nm cut-off light source, 460nm cut-off light source (some models are equipped with different)
Spectral mode	Concave grating
Sensor	256 Image Element Double Array CMOS Image Sensor
Wavelength Range	360~780nm
Wavelength Interval	10nm
Half Bandwidth	10nm
Reflectance Range	0~200%
Measuring Aperture	Reflective：Φ30mm/Φ25.4mm，Φ18mm/Φ15mm，Φ10mm/Φ8mm，Φ6mm/Φ4mm； Transmissive：Φ30mm/Φ25.4mm Remarks: (Some models are equipped with differences) 1.Automatic identification when switching aperture 2. Customers can configure the caliber and lens position according to their needs.
Specular Component	Reflectance: SCI/SCE，Transmittance:SCI
Color Space	CIE LAB, XYZ, Yxy, LCh, CIE LUV, Musell, s-RGB, HunterLab, βxy, DIN Lab99
Color Difference Formula	$\Delta E*ab$, $\Delta E*uv$, $\Delta E*94$, $\Delta E*cmc(2:1)$, $\Delta E*cmc(1:1)$, $\Delta E*00$, $DIN\Delta E99$, $\Delta E(Hunter)$
Colorimetric Index	WI (ASTM E313，CIE/ISO, AATCC, Hunter)， YI(ASTM D1925，ASTM 313), TI(ASTM E313，CIE/ISO), ,MI(Metamerism Index), Staining Fastness, Color Fastness, Color Strength, Opacity, Gardner Index, Pt-Co Index, 5551ndex,
Observer Angel	2°/10°

Illuminants	D65,A,C,D50,D55,D75,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,F11,F12
Displayed Data	Spectrogram/data, sample chromaticity value, color difference/graph, chromaticity diagram, color simulation, pass/fail result, color offset
Measurement Time	About 3 s (simultaneous measurement SCI/ SCE about 6 s)
Repeatablity	Spectral reflectance: Φ25.4mm/SCI, standard deviation within 0.05% (400nm to 700nm: within 0.04%): Chromaticity value: Φ25.4mm/SCI, ΔE*ab within 0.02 (When a white calibration plate is measured 30 times at 5 seconds intervals after white calibration) Spectral transmittance: Φ25.4mm/SCI, standard deviation within 0.05% (400nm to 700nm: within 0.04%): Chromaticity value: Φ25.4mm/SCI, ΔE*ab within 0.03 (When a white calibration plate is measured 30 times at 5 seconds intervals after white calibration)
Inter-instrument Error	Φ25.4mm/SCI, ΔE*ab within 0.15 (Average for 12 BCRA Series II color tiles) (some models' configuration is different)
Size	Length*width*Height=370X300X200mm
Weight	About 9.6kg
Power Supply	DC 24V,3A Power Adapter
Illuminant Life Span	More than 3 million measurements in 5 years / more than 200,000 measurements in 3 years (some models'
Display	7 inches TFT color capacitive screen-touch display
Date Port	USB，Bluetooth® 4.0 (select models), print serial port

Data Storage Capacity	Standard:5000 Pcs; Sample:4000 Pcs. (one PCS can include both SCI and SCE.
Language	Simplified Chinese, Traditional Chinese, English (German, French, Spanish can be customized)
Working Environment	0~40℃（32~104°F）
Storage Environment	-20~50°C（-4~122°F）
Standard Accessory	Power adapter, manual, CD (including management software), USB cable, standard calibration plate, inspection green plate, black calibration box, sample holder, 25.4mm caliber, 15mm caliber, 8mm caliber, 4mm caliber, transmission test fixture assembly
Optional Accessory	Micro-Printer; Transmissive Measure Clamp Component
Note：	The technical parameters are for reference only, the specific values are subject to the actual product of sales.