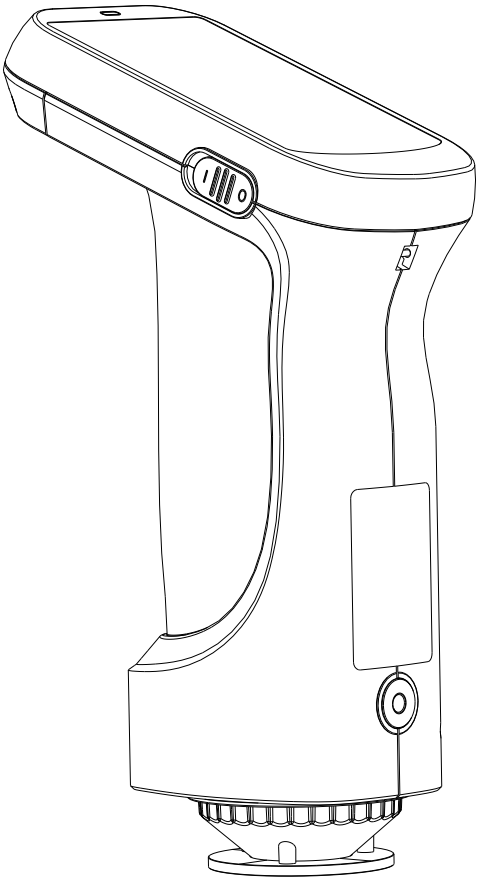
sisco

Spectrophotometer
Operation Manual



V1.0

Read this manual carefully before use the spectrophotometer.

Safety Instructions

This instrument is a very safe device, but in order to ensure that you can use it correctly and safely, Please read carefully and strictly abide by the following provisions to avoid accidental injury or harm. The company shall not be liable for any loss arising from the use of the instrument in violation of this manual.

Battery	1. This instrument uses built-in battery which can not be replaced with other batteries, in case of damage to the instrument or other malfunctions. 2. Do not dismantle, squeeze, strike and heat the battery, and do not put the battery in the fire or high temperature environment, otherwise the battery will explode and cause fire. 3. When the instrument is fully charged and not in use, cut off the external power supply to prevent electric shock and instrument damage. 4. If the instrument is not used for a long time, charge the instrument every two weeks, or the internal battery may be damaged and the instrument cannot be used again. 5. For the first three times of charging, it is better to get fully charged and then use it out before next charging.
External power	1 .When external power supply is required, please use the standard power adapter of the instrument, do not use other power adapters that do not meet the technical specifications, or it may shorten the battery life or even cause electric shock to damage the instrument or cause fire. 2.If the instrument is not used for a long time, the external power should be cut off to prevent burning the instrument Grating Spectrocol on meter and causing fire.
Instrument	1.Do not use the instrument in a place with flammable gas (gasoline, etc.), as this may cause a fire. 2.Do not dismantle the instrument privately, or it will be damaged. And if dust and metal foreign objects may enter the instrument, it may cause short circuit, generate electric shock, and damage to the instrument, even cause fire. 3.If the instrument emits peculiar smell like burning when using it, it should be stopped immediately and sent to the maintenance point for testing and maintenance.

Please keep this manual properly for reference.

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Instruction

This instrument is a portable and high-level grating spectrocolorimeter or spectrophotometer under the spectroscopic architecture, in addition to ensuring the accurate relative value ΔE, it also guarantees the long-term accuracy of the absolute values L, A, and B. It is suitable for precise color transfer and quality control of plastic electronics, chemical coatings, ink printing, textile printing and dyeing, automotive electronics, medical analysis, cosmetics and food analysis, etc. It is also widely used in scientific research institutions, laboratories and other fields. Under the condition of D/8° geometric optical illumination, the instrument has accurate and stable color measurement, large storage capacity, equipped with USB and Bluetooth dual communication modes, and its PC color management software has powerful extension functions, which can realized accurate measurement and presentation for different color difference formula and color indexes in a variety of color spaces.

Cautions

• The spectrocol on meter 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 stable; make sure the measuring aperture touch the surface of the test sample placidly, and no shaking or shifting when measuring.

• 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 particle entering the measuring aperture and the instrument. Please prevent the instrument from fierce collision or crash.

• White calibration cavity should be cleaned regularly with wiping cloth to ensure the surface clean, and kept it in a dark cool dry place.

• Please take out the battery 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

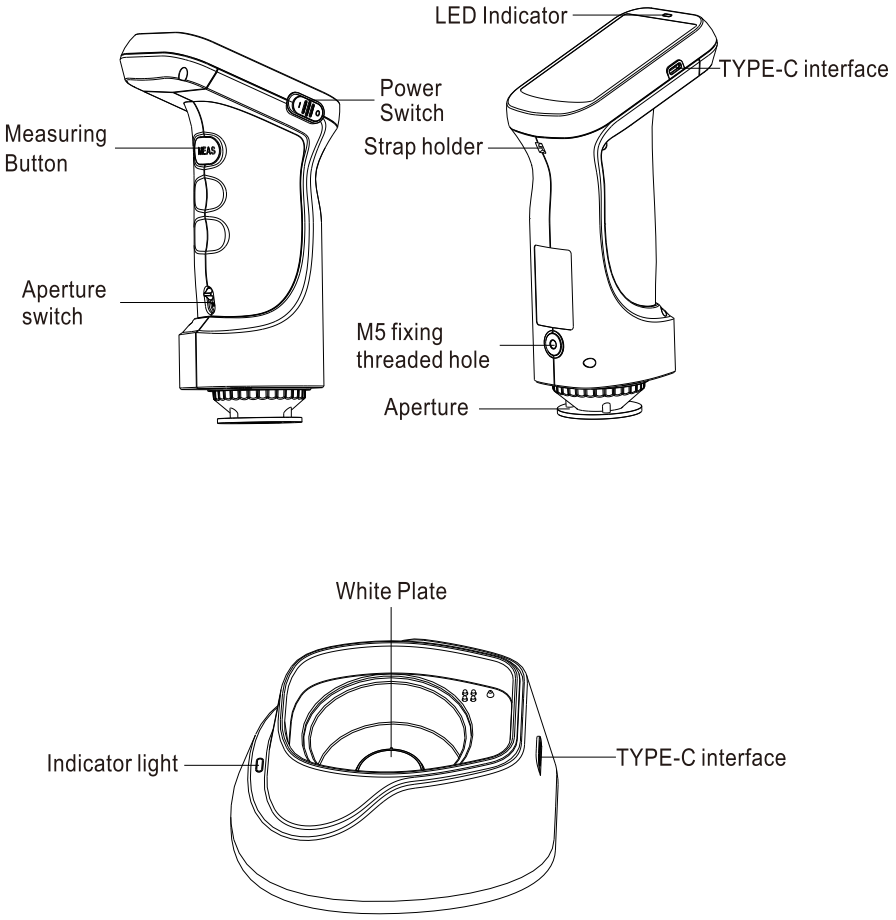


Figure1 Interface Description

Power Switch 1/0: Push the switch to "1" to turn on the instrument.Push the switch to "0" to turn it off.

TYPE-C interface: the TYPE-C interface on the instrument is a common interface, which can be used to connect and communicate with the PC, and the instrument automatically judges the connection; It can also be used to connect printers.

The TYPE-C interface on the base is a power charger, which can charge the instrument (5V⎓2A).

Note: Two TYPE-C interfaces cannot be connected to the data cable for charging at the same time, so as to avoid unknown danger.

Measuring Button: Long press for 3 seconds to turn ON/OFF power, short press for measurement

Aperture switch:used for changing the measuring aperture (part of the models),When the switch shows "MAV1', it means to switch to 08mm aperture position; when the switch shows "SAV", it means to switch to 04mm aperture position.Some models support 1×3mm measuring aperture. When 1× 3mm aperture is used, dial the aperture switch to "SAV".

LED Indicator: The indicator light on the instrument has three indicator states: green, yellow and red. Under the startup state, when charging less than 90%, the red light is red; More than 90% are green; Off state charging yellow light. The indicator blinks during measurement. The indicator on the base can only be steady green and off. When the USB is not connected, it is off. After the USB cable is connected, the green light will be steady on.

M5 fixed thread hole: fixed instrument thread interface. Thread type is standard metric common coarse thread, pitch 0.8mm, depth 5mm.

Strap holder: used to fix the wrist strap. When the wrist strap is put on the wrist, it can prevent the instrument from slipping accidentally.

Calibration Box: includes white plate and black cavity. White plate is used for white calibration and black cavity is used for black calibration. Please refer to the black and white correction section for details.

2. Operating Instruction

2.1 Power On & Off

As shown in Figure 1, press the power switch to "1", to start the instrument. Press the power switch to "0", the instrument is turned off.

If the instrument is without any operation for a long time, it will automatically enter into standby mode. At this time, press the Measuring Button or click the LCD screen to wake up the instrument.

2.2 Calibration

Click the main menu key (⌂) on the measurement interface or other interfaces to enter the main menu interface, as shown in Figure 2.

Select "Calibration" to enter white and black calibration interface as shown in Figure 3. It will show if the calibration is valid or not, and the remaining calibration effective time.

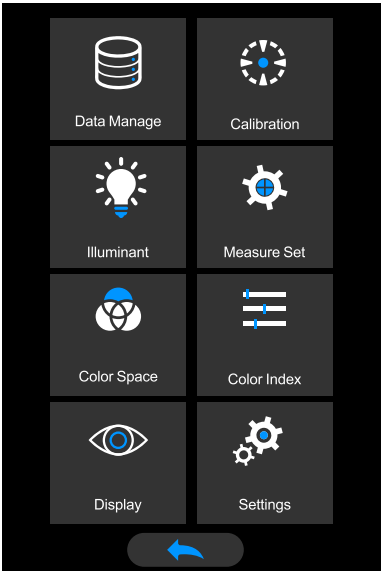


Figure2 Main menu

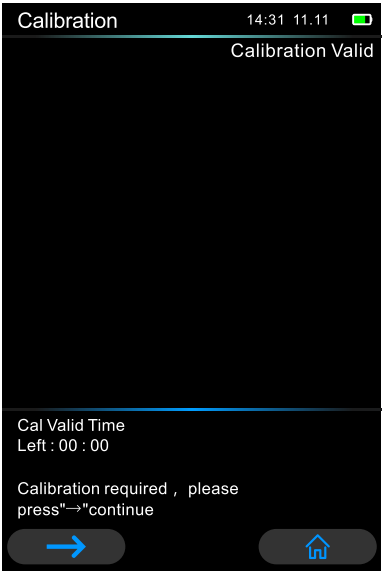


Figure 3 White and Black Calibration

Click the → to continue the correction, and jump to the reflection black correction interface, as shown in Figure 4;
Click ⌂ to return to the main menu interface.
The black calibration interface, according to the prompt requirements, performs black calibration on the empty space, that is, holds the instrument firmly and presses the measurement button against the air, and the words "being calibrated ..." appear on the interface, accompanied by the flashing of the indicator light. After flashing, the reflection black correction is completed.

After black calibration, it will enter white calibration as shown in Figure 5.
If there is an error in the black calibration, the corresponding reminder box will be displayed.

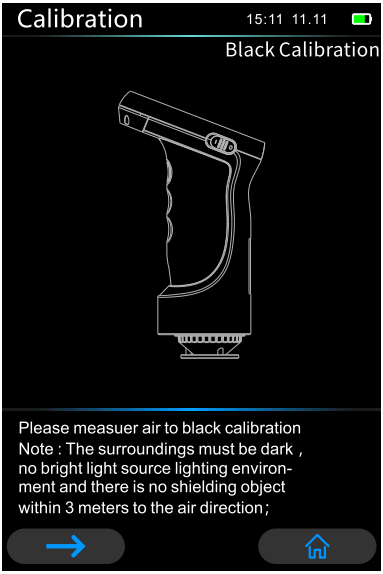


Figure4 Black Calibration

Figure5 White Calibration

After confirming that the whiteboard number and measuring caliber are set correctly, place the whiteboard, press the measuring button, and you will hear a click (the buzzer state set by the system is on). The word "being calibrated ..." appears on the interface with the flashing of the indicator light, and the white calibration begins. When you hear a click again, the white calibration is completed. Correct white correction will automatically jump to the interface of Figure 3; If there is any misunderstanding in the calibration, the corresponding reminder box will pop up.

2.3 Measurement setting

Users can set the measurement methods according to their own needs, including simple and normal.Click "Measurement Settings" in the main menu, enter the measurement settings interface (as shown in Figure 6), and then click "Measurement Method" to switch measurement methods.

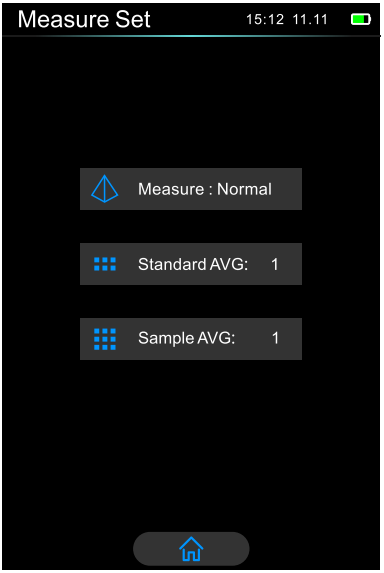


Figure6 Setup interface

However, the interface display of standard measurement and sample measurement corresponding to different measurement methods is different. For example, the measurement mode is set to simple, and the standard measurement interface is shown in Figure 7. The measurement mode is set to normal, and the standard measurement interface is shown in Figure 8.

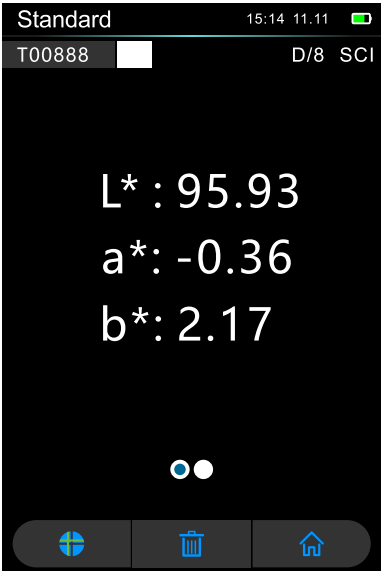


Figure7 Simple measurement method Standard Measurement Interface

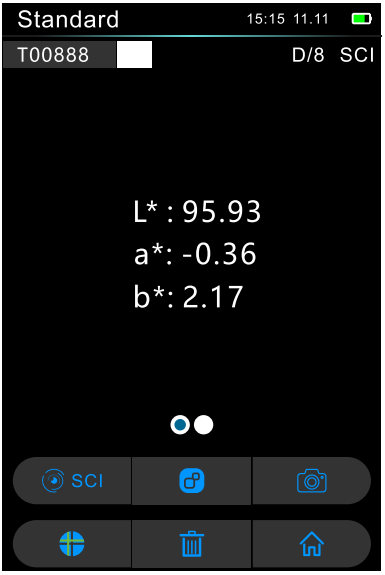


Figure 8 Normal measurement method Standard Measurement Interface

2.4 Measurement

Measurement includes standard measurement and sample measurement.

The standard measurement is to measure the chromaticity data of standard, while sample measurement is to measure the color difference or contrast chroma data between standard and sample.

After the instrument is turned on and the white and black calibration is completed, the measurement can be performed (the users can set the corresponding light source, color space and color index etc. in the main menu as needed). If you are not currently on the measurement interface, you can click the main menu ( ),Click return key ( ) to the measurement interface.

Note: The default color space of the system is CIE lab, the color difference formula is ΔE*ab, and the optional chroma index is reflectance.

2.4.1 Standard Measurement

In "Standard Measurement interface", Align the measuring aperture to sample tightly and press the "Measuring Button". Then there will be a "Beep" voice, and the LED indication light will flash then off. After that, sounds the "Beep" voice again that means measurement finished.(the buzzer state in the system settings is on) The interface of the tested sample after the test is completed is shown in Figure 9.

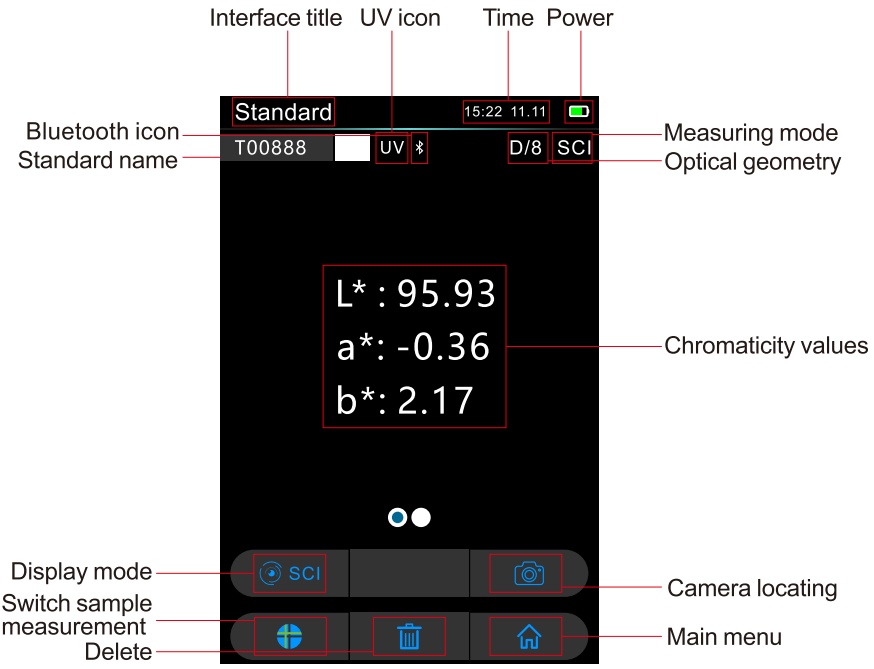


Figure 9 Standard measurement

1) **Interface Title**: Indicating the current interface is sample measurement.

2) **Status Bar**: Display system setting information, such as optical geometry, Bluetooth, UV, measurement mode, time, date, and battery. If turn on the Bluetooth and UV light, the status bar will display its icon, otherwise it will not be displayed.

3) **Camera Locating**: Click camera locating (partial models), you can use the camera to locate the measurement position. After the location is completed, click the measurement button to complete the measurement.

4) **Standard Name**: Display the name of the current tested standard, click to modify it, the default starts with "T" followed by the serial number, from T0001 to T1000.

5) **Standard Chromaticity lue**: the values of standard, partial models of instruments display one decimal place, and some display two decimal places.

6) **Display model**: Click SCI/SCE (partial models) to refresh the current data.

Note: The SCI and SCE mode only switches the currently displayed data. If you want to change the sample measurement mode to "SCI/SCE/I+E" mode, it is only done in the "System Settings". The standard measurement mode is I+E, and the sample measurement mode is default as SCI.

If the current tested data does not support the mode selected by user, the corresponding display may be"---" (for example: manually enter the Lab value (SCI/D65/10°when the customer switches to SCE or D50 or 2°,Lab will shown as"---").

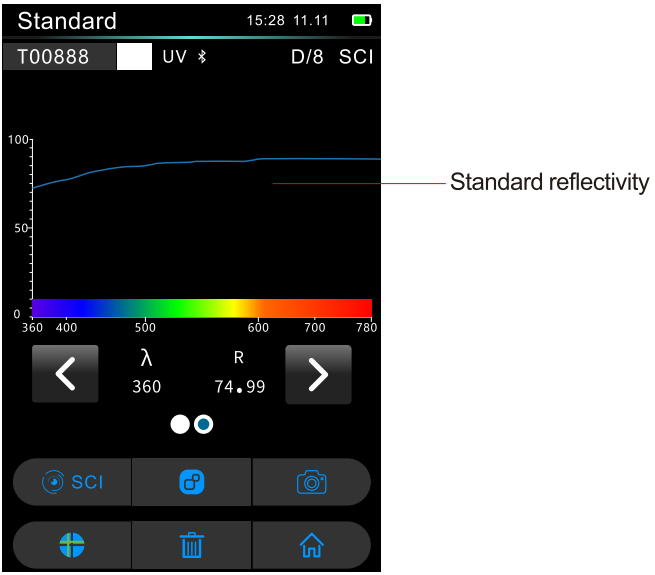


Figure.10 Standard reflectivity

7) **Tolerance Setting**: click to set the current standard tolerance

8) **Switch sample measurement**: Click to switch to the sample measurement interface

9) **Delete/Save**: When turn on the "auto save" in system setting, click "delete" to delete the current data. When the "auto save" is turned off, the display icon is" ", click to save the current data.

10) **Wavelength switch button**: As shown in Figure 10, click or , the wavelength and reflectivity of the current sample will be switch at the interval of 10nm. At this time, the optional chromaticity index is reflectivity. If it is other options, this interface displays other chromaticity index values.

Note: The measurement interface can be manually slid left and right, and the " " in the middle indicates the current interface.

2.4.2 Sample measurement

In the "Standard measurement" interface, click "Sample measurement" to enter Sample Measurement interface. It is the same steps with standard measurement. After measurement, it will display as shown in figure 11 detail explanation as follow:

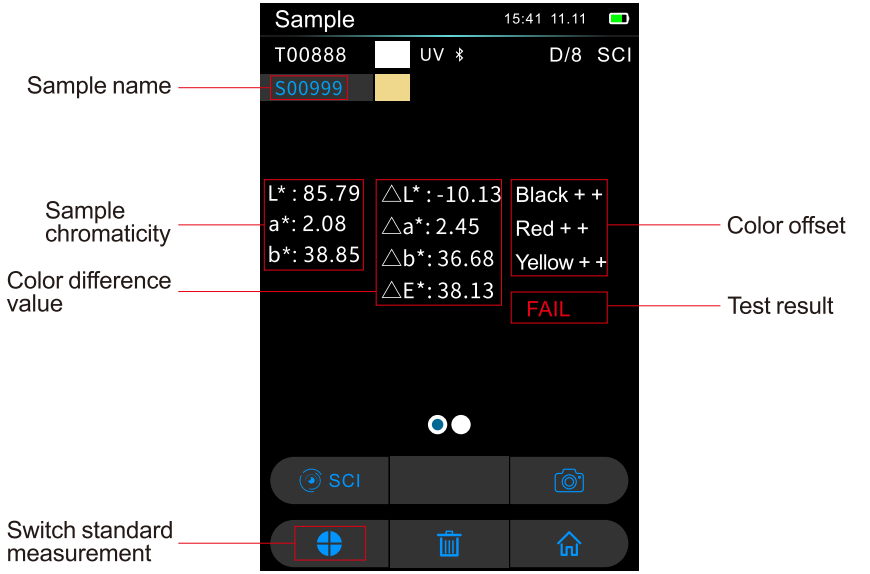


Figure11Sample Measurement Interface

1) **Interface Title**: it is in the current sample measurement interface.
2) **Sample Name**: Display the name of the currently tested sample, click to modify it, by default it starts with "S" followed by the serial number.
3) **Sample Chromatic Data**: Display the current chromatic data. Partial models of instruments display one decimal place, and some display two decimal places.
4) **Delta E (Color Difference)**: The color difference between standard and sample.
5) **Color Offset**: Color deviation of the current sample compared with standard. It only displays color offset when you turn on the function in the system setting.
Measurement Result: Display the test result under the color difference formula and tolerance. If the result is larger than the tolerance value, it will show red "Failure", or show green "Pass". It only exists when you turn on the "Display Measurement Result" function in the system setting.

6) **Measurement Result**: Display the test result under the color difference formula and tolerance. If the result is larger than the tolerance value, it will show red "Failure", or show green "Pass". It only exists when you turn on the "Display Measurement Result" function in the system setting.
7) **Sample reflectivity**: display both standard and sample reflectivity curve at the same time. Blue represents standard, and green represents sample, as shown in Figure 12.
8) **Reflectivity Difference**: The difference between sample and standard under the current reflectivity.

As shown in figure 12,click < > .The wavelengthreflectivity,and reflectivity difference of the sample and standard are switched at an interval of 10nm.

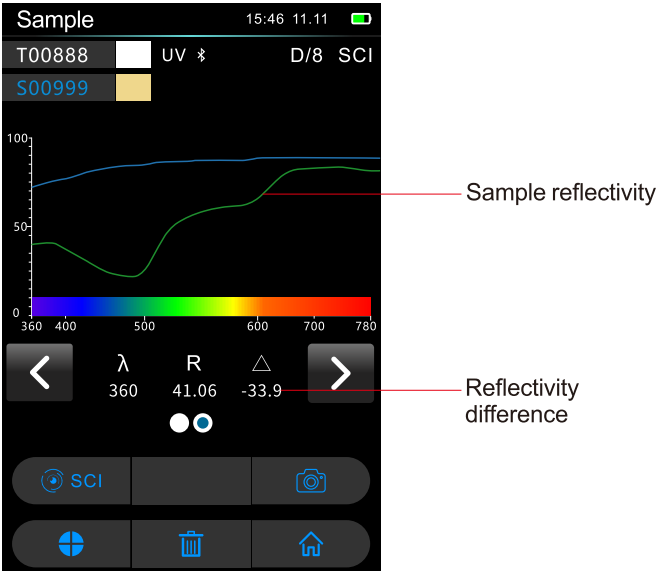


Figure.12 Sample reflectivity

2.4.3 Average measurement

When the sample is very large relatively not very even, it needs to measure several points to get an average data to show the sample relative true chromatic value. This instrument can realize 299 times average measurement.

Click "Measurement Settings" in the main menu interface to enter the measurement settings interface (as shown in Figure 6), and then select "Standard Average" or "Sample Average" to enter the average editing interface, as shown in Figure 13. After entering the value, click ✓ to confirm. If you don't change the average measurement times, click ↩ to cancel the modification.

If the average measurement is 1 time, the measurement will be done in the usual way; if it is greater than 1, after measuring the set number of times for standard and sample measurement, the measurement results will be average calculated and displayed.

Figure13 Standard average measurement

2.5 Connecting to PC

The instrument has a PC software with powerful extended function, and it could realize more chromatic data analysis. It can connect to PC through USB cable or Bluetooth (Only for the model with Bluetooth function).

Note: System Settings in the main menu can set the communication interface to choose USB or Bluetooth.

2.5.1 USB Connection

When software is installed on PC, connect the instrument to PC with USB cable, they will automatically recognize and connect. If the connection is successful, the measurement interface of the instrument will display the USB connection icon, otherwise will not display. The software can overall control the terminal instrument, and carry out the test and analysis of related samples after connection success.

Note: Partial models of instruments need to be set to "USB" in "Communication" of the system settings. Other types of instruments use USB communication by default

2.5.2 Bluetooth Connection

For those models with Bluetooth function, it can connect to PC software through Bluetooth. When software is installed on the PC, set "Communication" to "Bluetooth" in the "System Settings", and pair the computer with Bluetooth. After the pairing is successful, the software uses the Bluetooth connection mode to connect instrument. If the Bluetooth icon appears in the lower right corner of the software, it means the connection is successful via Bluetooth.The software can overall control the terminal instrument, and carry out the test and analysis of related samples after connection success.

2.6 Printing

Micro Printer is an optional accessory and is required to be purchased separately.Use USB printer or Bluetooth printer can print out the measurement records (partial models). "Print Settings" is in the "System Settings", main menu, and it is closed by default. When you need to print data, select the corresponding printer to turn on.

2.6.1 Use port printer

In "System Settings" of the main menu, check "USB printer" for printing settings.The user prints the measured sample record. Operation steps:
Connect the micro printer to the instrument via USB, and find the sample record to be printed in the standard record or sample record, as shown in Figure 14.

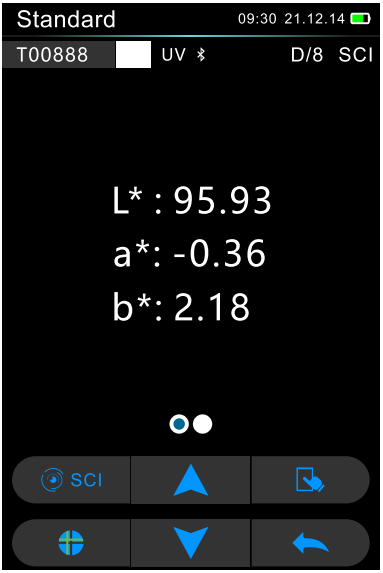


Figure14 standard record to be printed

1，Then, click the " " icon and select "Printer " in prompt (as shown in Figure 15).

2，Click the ✓ to confirm printing, the instrument will send the current recorded data to the printer, and the printer will finish printing.

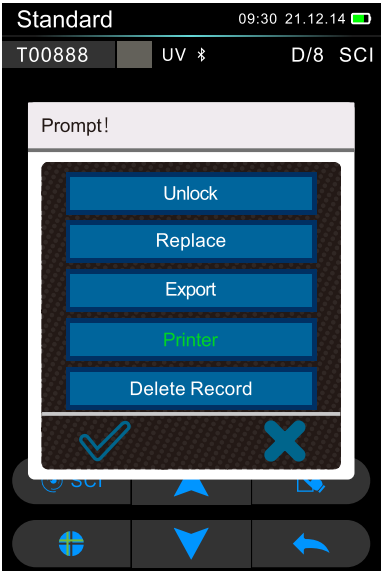


Figure 15 “Printer” operation interface

In addition, the instrument also supports the function of printing while measuring. That is, after the micro printer is connected to the instrument via USB, it can measure and print in the measurement interface.

2.6.2 Bluetooth Printer

Similar to using a USB printer, the user can first measure sample, save the sample record to be printed, and then perform the printing.

Steps for using Bluetooth printer:
1. Long press the power button of the Bluetooth printer and let it go when the indicator light flashes.
2. Set the "Print" to Bluetooth in "system setting"
3. Enter the mac address on the back of the Bluetooth printer in the BLE MAC, the length is fixed at 12 characters (for example, "4CE173C3F00E"), the mac address is automatically saved.
4.Click to Connect Printer .
5. After the Bluetooth printer is connected, find the record to be printed in the standard or sample record, and click the "operation" icon,
6. Select "Printer" in the prompt, and the printer will complete the printing job.Same as USB printers, Bluetooth printers also support printing while measuring.

3. Main Menu

Enter main menu by clicking in the measurement interface (as shown in figure 2), In other interfaces, you can enter the main menu by clicking the return button . From the main menu, you can enter each sub-menu to achieve all system function settings.

3.1 Data Management

Click "Data Manage" in main menu to enter data management interface as shown in Figure 16. Data management mainly realizes the viewing and operation of the measured records.

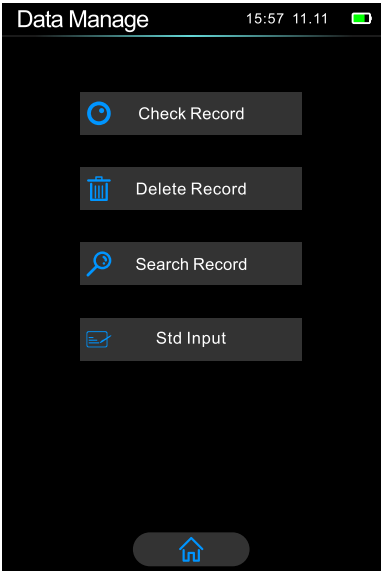


Figure16 data management interface

3.1.1 Check records

1) Check standard record.

Click "Check Record" to enter the "Standard Record" interface, as shown in Figure 17.
Note: Partial models of instruments display one decimal place when viewing the standard record chromaticity value, and some models display two decimal places.
Click ▼ to view the next record, and click ▲ to view the previous record.
Click " " to perform operations: standard lock, standard replace, standard export, print data, delete record, as shown in Figure18

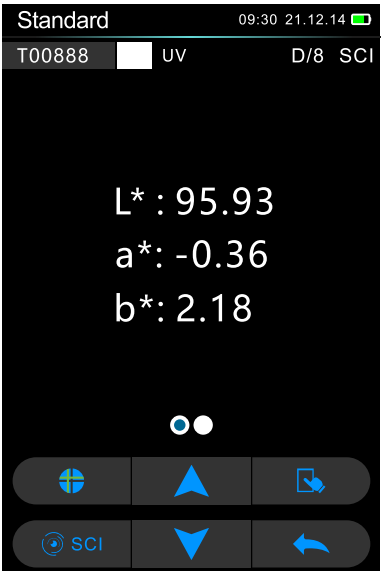


Figure17standard record

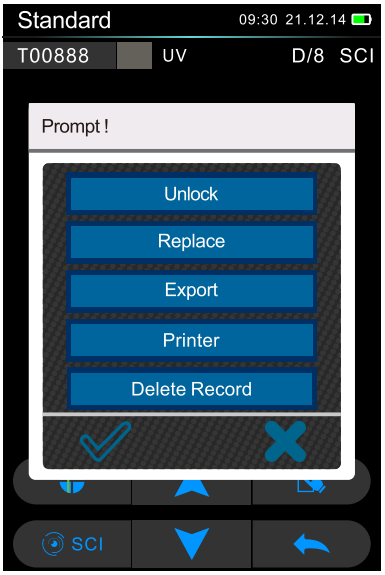


Figure18 standard record operation menu

Unlock/Lock Standard: Click "lock", the user can lock the current standard values to prevent misoperation of the sample. Samples cannot be deleted or edited in locked mode. If you want to operate the locked standard, you need to unlock it first.

Standard Replace: Click "Standard Replace", the user can replace the current standard with a new standard and the samples under the current standard are not affected.

Standard loading: Click "Export" to set the standard record to the current standard as shown in Figure 18, and click "Sample" to make sample measurement.

Print data: Click "Printer". if connect a mini printer (optional, need to be purchased separately), the current standard data can be printed out.

Delete record: click "Delete record" and then click "OK" to finish deleting; Or click ”Cancel”to delete and return to the operation menu.

Click the standard name in standard record interface to edit as shown in Figure 19, and input new name (no more than 8 characters), click ✓ to confirm or ↩ to cancel

Figure19 Edit name

2） Check Sample Record

Click "Sample" under the interface of standard sample recording to view the sample record under this standard sample, as shown in Figure 20

Click ▼ or ▲ a to check next or previous record.

Click" ✎ "to perform operations: standard export, print data, delete record, as shown in Figure 21.

Standard Input: Click “export” to set the current sample record as the new standard, and then click "Sample Measurement" to perform sample measurement under this standard. The operations for printing data and deleting records are similar to those for standard records.Click the sample name in standard record interface to edit, and input new name (no more than 8 characters), click ✓ to confirm or ↩ to cancel.

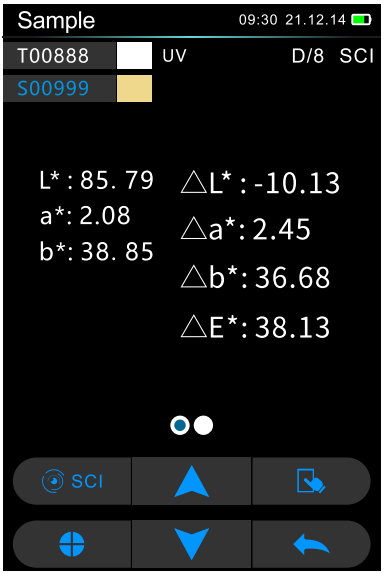


Figure 20 Sample record

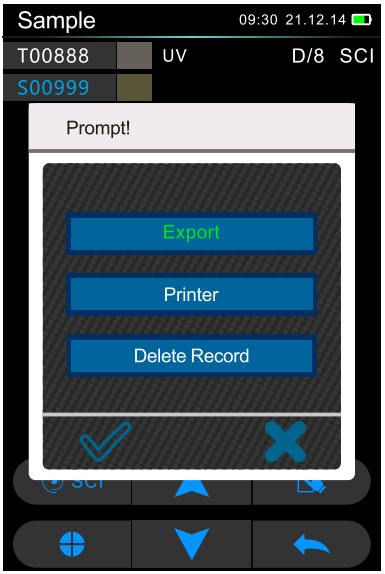


Figure 21sample record operate menu

3.1.2 Delete Record

In the data management interface, click "Delete Record" to enter the delete record interface, as shown in Figure 22. Delete records include "Delete All Samples" and "Delete All Records.

Click the corresponding option, will enter the delete warning interface first, click on ✓ the warning interface to delete all corresponding records; click to ↩ cancel, as shown in Figure 23.

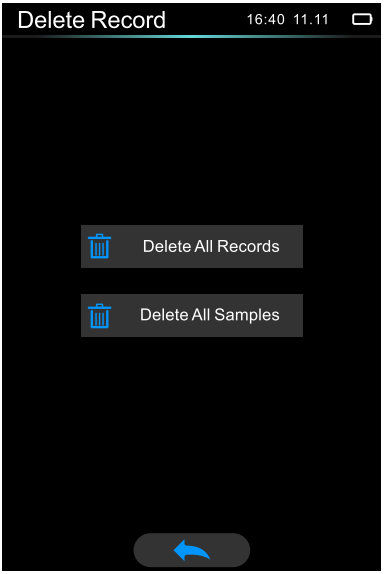


Figure22 Delete record interface

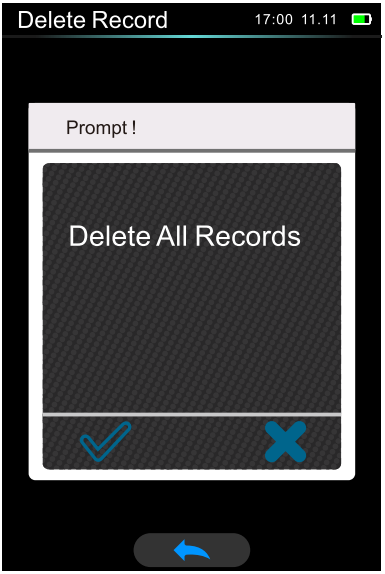


Figure23 Delete prompt

3.1.3 Search records

In the data management interface, click "Search Record" to enter the search menu, as shown in Figure 24. It can search by standard name or sample name.

The following uses the standard sample name as an example to explain the search process steps:

1、Click "Search Record". The search name interface is displayed.

2、Enter the name to search for or the characters contained in the name, and click ✓ confirm.

3、Click "by standard name", pops up the search name interface, as shown in Figure 25. Otherwise, it will prompt "This record does not exist" and return to the search record menu.

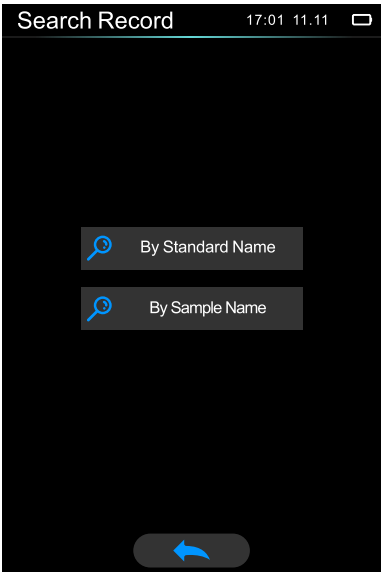


Figure24 Search record interface

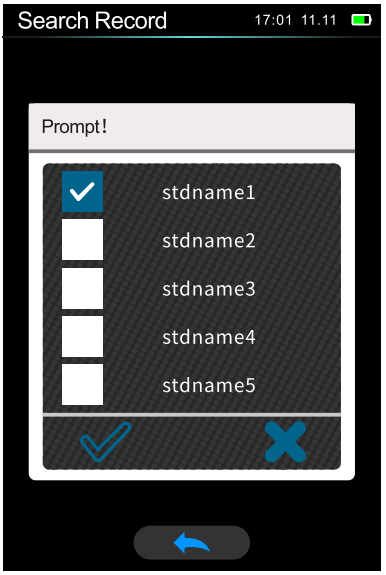


Figure25 List of searched records

3.1.4 Standard Input

In the data management internee, dick "Standard Input" to enter the standard input interface, as shown in Figure 26.

Click "Measurement Mode" to set the standard measurement mode, including SCI, SCE, SCI+SCE (I+E).

Click "Name" to input the standard name. The default is "No Name".

Click "Illuminant" to set the standard light source.

Click "Color Space* to select color space. At present, it only supports CIE LAB, and CIE XYZ.

Click "Observer Angle" to set the standard observer angle (2 or 10 degree).

Click "Chromatic Coordinates" to enter the corresponding chromatic value, click "L" to input L value as shown in Figure 27. Enter the corresponding L value and confirm. After all the information of the standard are finished and click OK, the standard will be stored in the standard record list, and its serial number will be accumulated in turn.

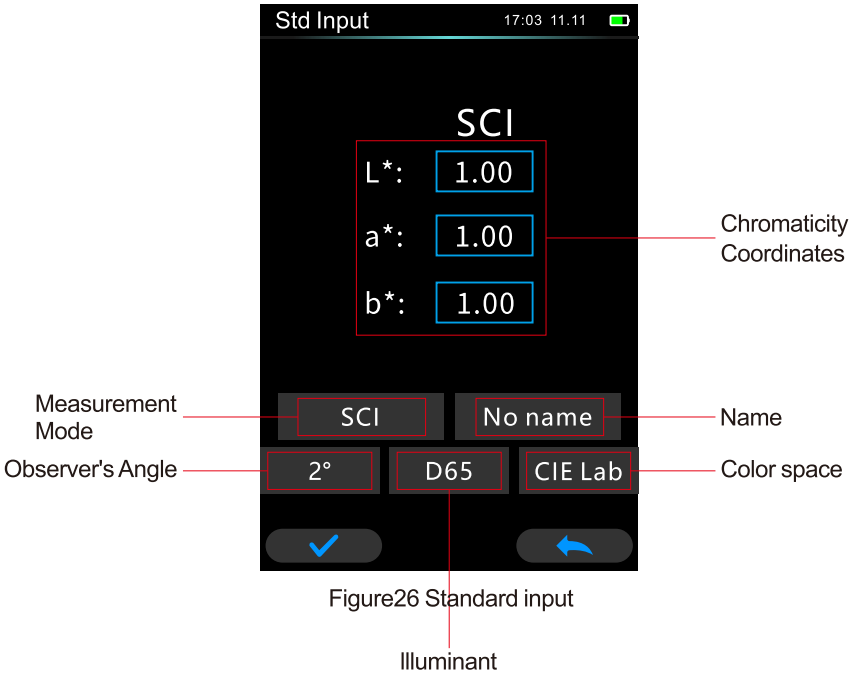


Figure26 Standard input

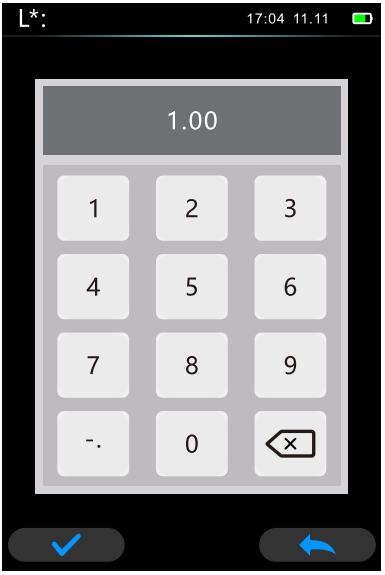


Figure27 Input L value

Note: The manual input of the standard on the instrument only supports CIE Lab / XYZ chromaticity coordinate. If you want to input the standard reflectivity, you need to input it through the PC software and download it to the instrument. The input standard data matches a specific observer angle, illuminant, and observer angle. To view the input standard data, you need to set the corresponding conditions to view it. When viewing the standard record interface, if the observer's angle, test mode, and illuminant change, the corresponding chromaticity data will be displayed as"- -".

3.2 Calibration

White and black calibration as a standard for chromatic data, is required to be done correctly, otherwise it will affect the validity of the data.

When the calibration environment is very different from the test environment of the current sample (for example temperature fluctuate violently), the instrument is required to be re-calibrated timely.

Recalibration is also recommended when the instrument is used continuously for 8 hours or when the instrument is switched on and off again.

Black and white board is required to be cleaned regularly.and kept in dark, dust-proof, and dry conditions.

For white and black calibration operation, please refer to Section 2.2.

3.3 Illuminant

In the main menu interface, click "Illuminant" to enter the light source setting interface, as shown in Figure 28.

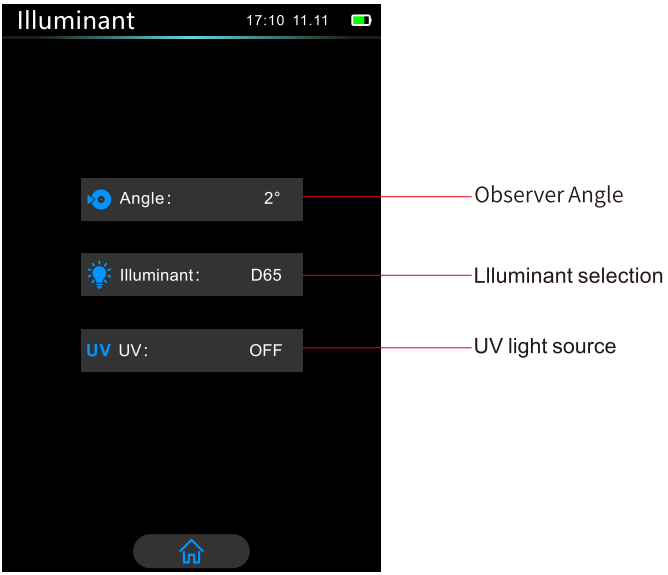


Figure28 light source

User should set corresponding illuminant according to the actual test conditions. In the “illuminant ”interface, it can set the standard observer angle, light source and UV light source (different model has different configuration).
Click "Observer Angle" to switch 10 degree or 2 degree. 10 degree is CIE1964 standard, while 2 degree is CIE1931 standard.

Click "illuminant" and there are options in the light source selection interface: D65, A, C, D50, D55, D75, F1, F2 (CWF), F3, F4, F5, F6, F7 (DLF), F8, F9, F10 (TPL5), F11 (TL84), F12 (TL83/U30) (some models include some options), as shown in Figure 29.

Click "UV illuminant" to select the UV light source switch. 100% means the UV light source is on, while 0% means off. It is recommended to turn on the UV light source when measuring fluorescent sample, and turn off when measuring general sample.

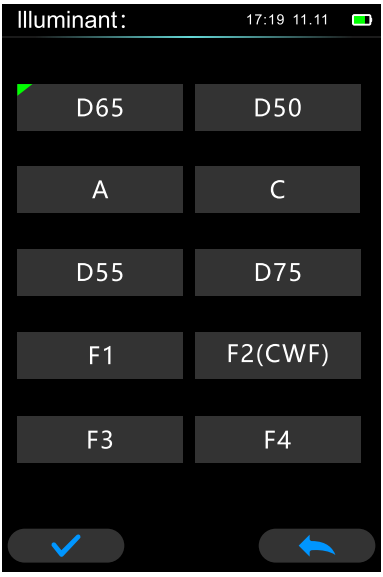


Figure29 Illuminant

3.4 Measurement settings

Click "Measurement Settings" in the main menu interface to enter the measurement settings interface, including measurement method, standard sample average value and sample average value, as shown in Figure 6.

For the specific setting method, refer to 2.3 Measurement Mode Setting and 2.4.3 Average Measurement in Chapter 2 Operating Instructions.

3.5 Color Space

In the main menu, click "Color Space" to open the color space interface as shown in Figure 30. Select the corresponding color space and click " ✓ "to complete the setting. Color space options include CIE LAB, XYZ, Yxy, LCh, CIE LUV, s-RGB, pxy, DIN Lab9, DIN Lab99 and Munsell(C/2), etc. Some models only have part of the options.

Figure30 color space

3.6 Color index

Color Index interface could select the current color difference formula, color index, as well as set the parameter factors of color difference formula and metameric index, as shown in Figure 31.

3.6.1 Set color difference formula

In the main menu, click "Color Index" as shown in Figure 31.

Take ΔE*00 "color difference formula" as an example to explain in the following: Color Index page, choose "Formulas", formulas options are ΔE*ab, ΔE*uv, ΔE*94, ΔE*cmc(2:1), ΔE*cmc(1:1), ΔE*00 and DIN ΔE99.(Some models only have part of the options.)

Click any color difference formula or color index to choose the corresponding color difference formula or color index and click to confirm as shown in Figure 32.

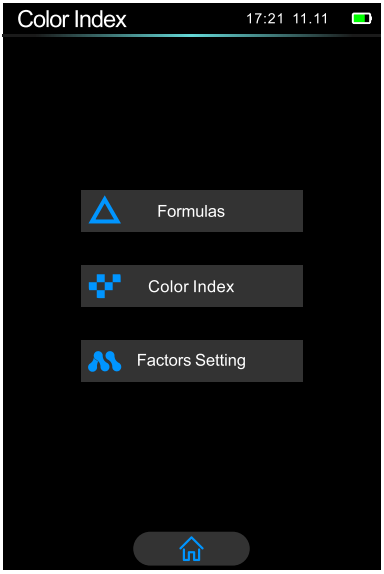


Figure31 color index

The selected color index will be displayed in the color index interface of the standard and sample (depending on the selected index, it may only be displayed in the sample interface), and you can view the index by sliding the measurement or the data viewing interface to the right.

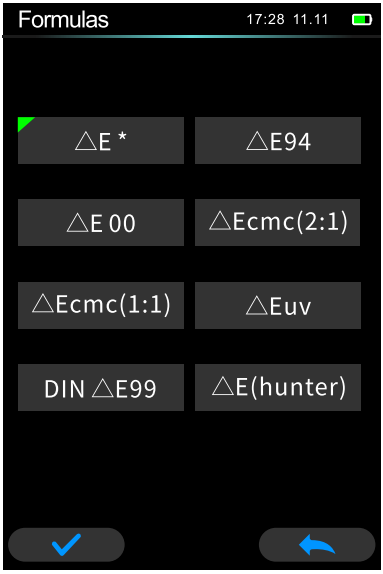


Figure.32 Choose color difference formula

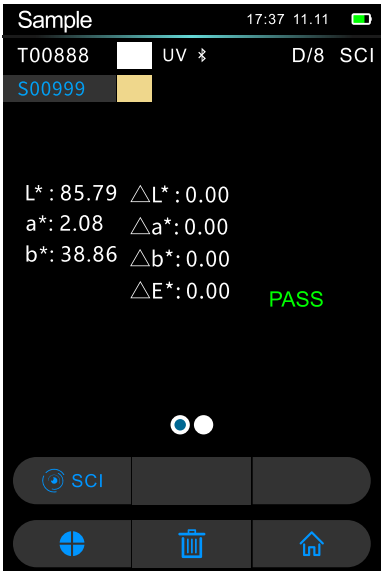


Figure.33 Formula ΔE00

3.6.2 Set Color Index

Optional color indexes include reflectivity, yellowness, whiteness, metamerism index, staining fastness, color fastness, color strength, opacity, etc. Some models have only some options, as shown in Figure 34 .

The index set here can display the corresponding index value on the measurement interface or the view record interface

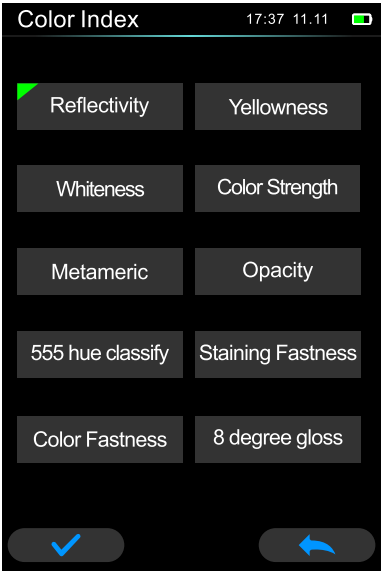


Figure34 Color index interface

3.6.3 Parameter Factors Settings and Metamerism Index

In the color index interface, click “Parameter factors settings" as shown in Figure 35.

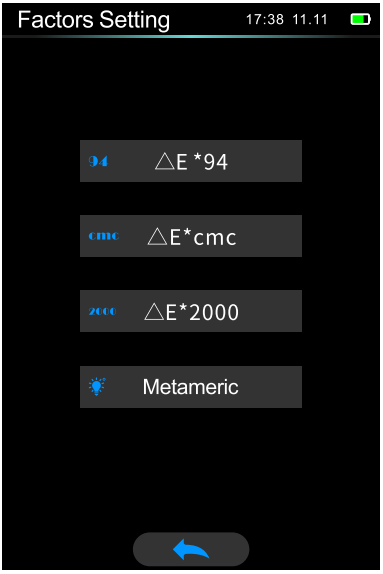


Figure35 Choose color differenc formula

1) Setting Factor

For CIE ΔE2000(ΔE00), CIE ΔE1994 (ΔE94), CMC(ΔE cmc(l:c)), users can set L, C, H value (CMC only sets L and C). Take ΔE94 for example. Click ΔE94 to enter the ΔE94 setting interface as shown in Figure 36.

Click KL, KC, KH to enter edit interface as shown in Figure 37, input a value to click ✓ to confirm or ↩ cancel.

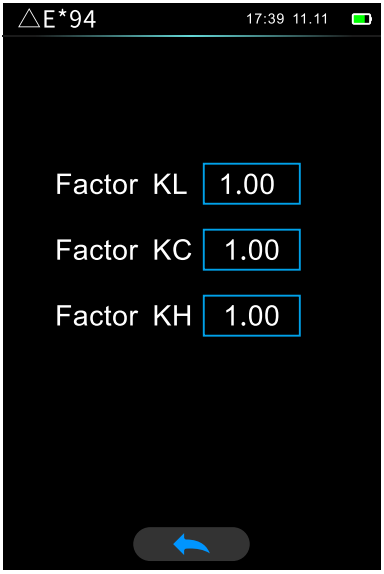


Figure36 ΔE94 factor

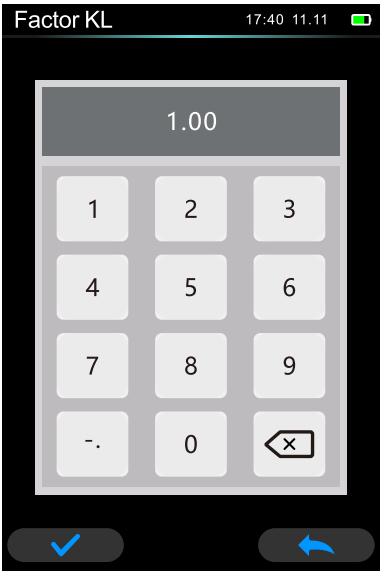


Figure37 Factor KL

2) Metamerism Index

In the Parameter factors settings interface, click "Metamerism index" as shown in Figure 38, separately set light 1 and light 2, and click ✓ to confirm or ↩ to cancel.

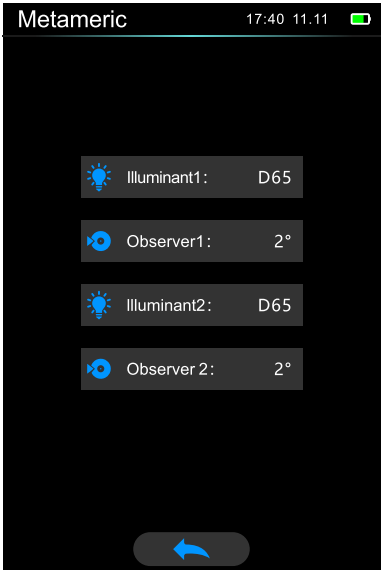


Figure 38 Metamerism Settings interface

3.7 Display Settings

In the main menu, click "Display' as shown in Figure 39. You can set color offset, test result.If turn on the color offset, it will display the color offset on the sample measurement， if turn off, it won't display color offset.

If turn on the function of test result, when the measurement result is larger than the tolerance value, it will display red failure, if smaller, it will display green pass, as shown in Figure 8

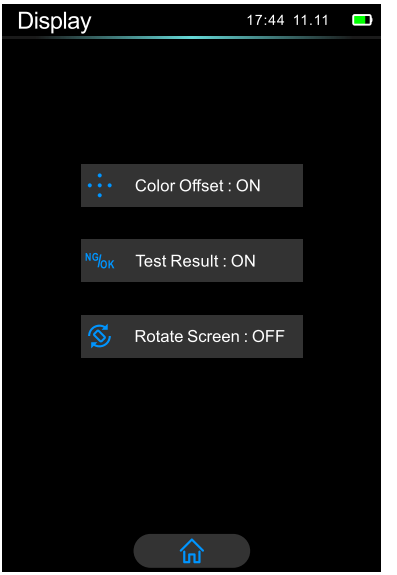


Figure39 Display the setting interface

3.8 System Setting

In the main menu, click "System Setting" as shown in Figure 40.

System Settings include automatic measure save, measure aperture, PC software connection way, buzzer, sample measure mode, calibration validity, measurement control mode, language, time, screen backlight time, screen brightness, etc., By sliding up and down the interface, you can view and select different system setting options, and there is a sliding bar on the right to display the current location.

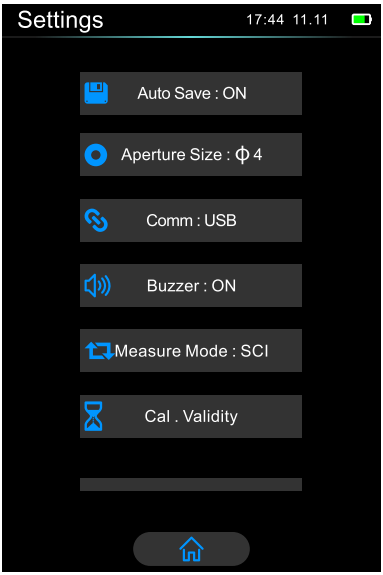


Figure40 System Settings

3.8.1 Auto Save

When turn on the function of auto-save, it will automatically save data when measured, or it is required to manual click " " to save as shown in Figure 41.

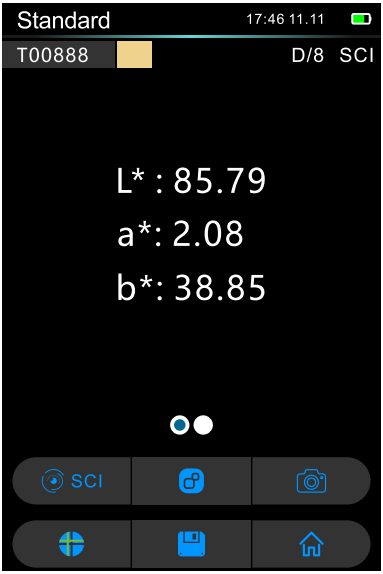


Figure 41 Manual save the result when the auto save is turned off

3.8.2 Measuring Aperture

The series spectrocolorimeter features with Φ8mm, Φ4mm and 1×3mm aperture. Different model has different aperture. When the area of measured sample is large and uniformity, it is recommended to use 8mm aperture, while it is small, recommenced 4mm or1×3mm aperture.

Measuring Aperture Switching Steps:

Step 1: As shown in Figure 42, counterclockwise rotates the measurement aperture, and take off it, then install the new aperture clockwise. When you hear "DA", it means that the measuring aperture and the integrating sphere button position are well matched, then the measuring aperture is installed well

Step 2: Optical lens position switch. if it is Φ4mm or 1×3mm aperture, it is required to switch to SAV; if it is Φ8mm aperture, switch to MAV.

Step 3: Switch the aperture in device setting. If the measurement aperture in setting is auto mode, the instrument will automatically recognize the aperture and do the corresponding software processing when re-calibrate the device, or you need to manually set the corresponding aperture.

Note: After aperture is switched, the black and white correction must be performed again before a new data test can be performed.

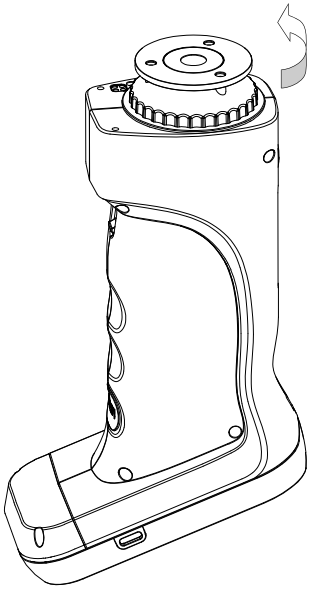


Figure 42 Measurement Aperture Uninstall

3.8.3 Bluetooth ®

For product that equipped with Bluetooth®, you can choose to communicate with PC software via Bluetooth®.
When Bluetooth® is turned on, the Bluetooth® icon will be displayed on the status bar of the measurement interface. When software is installed on PC, turn on Bluetooth® in the "System Settings" of instrument, and pair the computer with Bluetooth. After the pairing is successful, the software uses the Bluetooth to connect device, and a prompt will appear in the lower right corner of the software means connection is successful. The software can overall control the terminal instrument, and carry out the test and analysis of related samples.

3.8.4 Buzzer

The buzzer controls whether the alarm sounds when measuring. When the buzzer is turned on, a prompt will sound at the end of each measurement; otherwise, there will be no prompt during the test.

3.8.5 Measurement Mode

SCI: Specular Component Include
SCE: Specular Component Exclude
In this instrument, the SCI / SCE test mode is switched through the traditional way of setting mechanical optical well. The SCI measurement mode is when the motor drives the paddle to block the mechanical optical well, and the SCE measurement mode is when the paddle is opened.In the standard measurement, the instrument default completes SCI and SCE measuring mode and test time is about 3.2 second.
In the sample measurement , the instrument is measured according to users' setting. It could be set for: SCI, SCE, or I+E (Some models have only some options). I+E is SCI & SCE modes. Only SCI or SCE mode test time is about 1.5 seconds, and both SCI+SCE test time is about 3.2
seconds.If the current instrument measurement mode is SCI (the working status area is displayed as SCI), the instrument only tests the sample SCI data. If the display mode is set to SCE, since there is no test SCE data, the corresponding chromaticity data is displayed as"- Spectral data and color index will also not be displayed

3.8.6 Calibration Validity

White and black calibration as the benchmark for chromatic data, is required to be done correctly.otherwise it will affect the data accuracy.

When the calibration environment is very different from the test environment of the current sample (for example temperature fluctuate violently) or when the data is obviously abnormal, the instrument is required to be re-calibrated timely.

If the instrument is used continuously for 8 hours or the instrument is turned on and off again, it is also recommended to make a black-and-white board calibration again.

In the system menu, click "Calibration Validity" to set the validity of black and white board correction.

As shown in Figure 43, you can choose 4-hour calibration, 8-hour calibration, 24-hour calibration, and normal start-up calibration.

Note: If the instrument is used continuously for 8 hours or the device is switched on and off again, it is recommended to do calibration again.

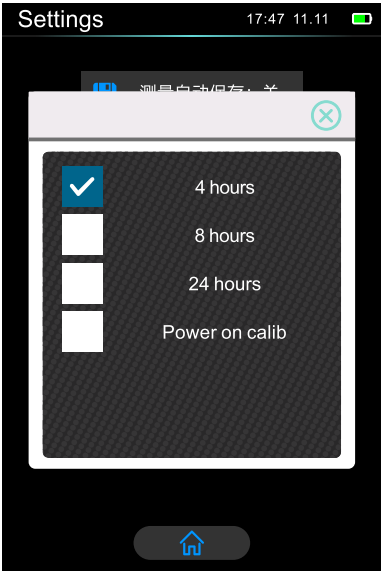


Figure 43 Calibration Validity

3.8.7 Control Mode

When the instrument communicates with PC software, the customer can set the specific measurement control mode according to the need. Click " Control Mode" on the system setting interface to open the interface for selecting measurement control mode, select the corresponding mode, and confirm.

Key: if select this mode, when the instrument is connected with PC software, it only could use measuring keys to complete the test and upload data to PC software.

PC software: if select this mode, when instrument is connected to PC software, the instrument only could use software to complete the test. User completes the data test by clicking the PC software test button, and uploads the data to the PC software.

Key I PC software: if select this mode, the instrument could use software or keys to complete the test and upload data to PC software. This mode is the default setting for the instrument

Note: The control mode is only valid when connecting to the PC software. If unconnected, it is only measured by keys.

3.8.8 Language Settings

Language setting is used to set the language of the instrument interface. Click "Language Setting " in "Settings" interface to choose the corresponding language.

3.8.9 Time setting

General the instrument is default set with the manufacture local time. In the setting menu to click "Time setting" in the system setting interface to enter the time editing interface, and the instrument time will be updated synchronously after it is confirmed and saved.

3.8.10 Backlight Time

Click "Backlight Time" in the system settings interface to enter the "Backlight Time" selection interface.

It includes: "Normally Open", "5 minutes", "60 seconds", "30 seconds" and "15 seconds". If selecting normally open, It will not automatically stop the screen or shut down when there is no operation except no power.

If selecting normally open, It will not automatically stop the screen or shut down when there is no operation except no power.

If it is set to "60 seconds", the instrument will be timed from the last operation, the screen will disappear after 60 seconds, and the instrument will automatically soft shut down after 3 minutes, then enter the power saving mode. "5 seconds", "30 seconds", "15 seconds" is the same setting as above.

When the screen is disappear, it is able to short press the key to light up the screen,, and if the instrument is soft shut, it is able to long press the key to wake it up. Please refer to Section 2.1 for detail. The default backlight time is "1 minute", which makes it in power saving mode.

3.8.11 Restore Factory Setting

Click "Restore Factory Setting" in "Settings" as shown in Figure 44. Click ✓, the instrument will restore factory settings and all records will be cleared, while click ↩ to cancel this operation.

Note: Restore factory setting will delete all test data and settings. All are irrecoverable so please operate it carefully.

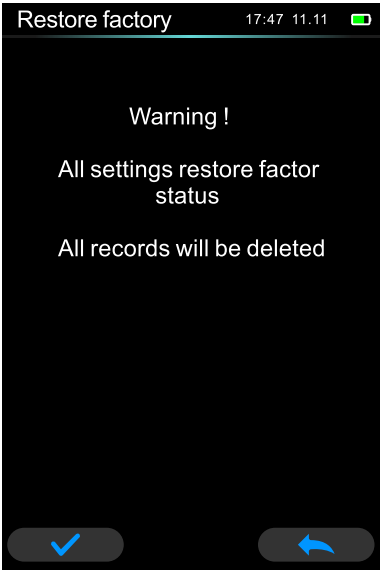


Figure 44 Restore Factory Setting

4. Daily Maintenance

1) The 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 dusty environment. It is recommended to use and store the instrument in a standard laboratory environment (temperature 20 degrees Celsius, 1 standard atmospheric pressure, humidity 50 ~ 70% RH).

2) The white board is a precision optical component. It should be stored and used properly. Avoid rubbing the working surface with sharp objects, avoid soiling the working surface with dirt, and avoid exposing the White board under strong light Regularly clean the whiteboard working surface with a cloth and alcohol. When calibrating, clean the dust on the working surface of the whiteboard in time.

3) In order to ensure the validity of the test data, the instrument and white board are recommended to be calibrated by the manufacturer or a qualified metrology institute every one year from the date of purchase

4) The instrument has built-in lithium battery. If not using the instrument for a long time, please charge it every 2 weeks to protect the performance of lithium battery and extend the lifespan.

5) Please do not disassemble the instrument. If there is any question, please contact the relevant after-sales staff. Do not tear the labels, or it will affect its after-sales maintenance service.

5. Technical Parameters

5. 1 Technical Features

1、Perfect combination of beautiful appearance and the human body mechanics structural design;

2、D / 8 geometric optical structure, conforming to CIE No.15, GB / T 3978, GB 2893, GB / T 18833, iso7724 /1.ASTM e1164, din5033 teil7;

3、Adopt combined LED light source with high life and low power consumption, *including UV / excluding UV;

4、*Switchable 8mm & 4mm apertures (*the flat/ tip measuring aperture can be switched easily, which is suitable for more tested sample)

5、Dual optical path system, the optical resolution in the visible range is less than 10nm, *which can precisely measure the SCI and SCE spectrum of the sample at the same time;

6、Accurate spectrum and lab data, used for color matching and accurate color transmission;

7、High hardware configuration: 3.5-inch TFT true color screen, capacitive touch screen, 1000 line blazed grating, silicon photocell array detector with large photosensitive area, etc;

8、*USB / Bluetooth dual communication mode, wider adaptability;

9、Super dirt resistant and stable standard white calibration board;

10、Large storage space, which can store 500 standard pieces and 2000 sample pieces. (APP/PC mass storage).

11、*2/10 standard observer's angle, multiple light source modes, multiple surface color systems, meet various standards of chromaticity indicators and the needs of various customers for color measurement;

12、*Camera locating position and Stabilizer cross measurement position;

13、PC software has powerful function expansion;

Note:* means some models of instruments are different.

5.2 Technical specifications

(refer to the technical specifications attached to specific models)

Optical Geometry	Reflect: D:8 (diffused illumination, 8-degree viewing angle) SCI/SCE measurement; Include UV/ exclude UV measurements. Comply with standards CIE No.15, GB/T3978, GB 2893, GB/T18833, ISO 7724-1, ASTM E164, DIN 5033 TEIL 7.
Integrating Sphere size	Φ40mm
Light source	Combined full-spectrum LED light source, UV light source (different models are different)
Spectrophotometric mode	Flat Grating
Sensor	Silicon photodiode array (different models vary)
Wavelength range	360 ~ 780 nm (different models have differences)
Wavelength interval	10nm
Semiband Width	10nm
Measuring Range	Reflectivity: 0 ~ 200%;
Measuring Aperture	Multi-caliber: 8mm platform +8mm tip +4mm platform +4mm tip +1*3mm （There are differences between the different models）
Specular Component	SCI/SCE
Color space	CIE Lab, XYZ, YXY, LCH, CIE LUV, S-RGB, Hunter Lab, β XY, DIN Lab 99 Munsell (C/2) (different models are different)
Color difference formula	ΔE * AB, ΔE * UV, ΔE * 94, ΔE * CMC (2: 1), ΔE * CMC (1: 1), ΔE * 00, DIN ΔE99, ΔE (Hunter) (different models are different)
Other Colorimetric Index	Spectral reflectance, WI(ASTM E313, CIE/ISO, AATCC, Hunter, Taubebergerstensby),YI(ASTM D1925， ASTM 313), Metamerism index Mt, Staining Fastness, color fastness, Color strength (dye strength, coloring power), Opacity, 8 degree gloss, 555 tone classification, blackness (My,dM), color density CMYK (A,T,E,M), Tint, color density, Munsell (some functions are realized by the upper computer)

Observer Angle	2°/10°
Light source	D65,A,C,D50,D55,D75,F1,F2(CWF),F3,F4，F5，F6, F7(DLF),F8,F9，F10(TPL5),F11(TL84),F12(TL83/U30), B,U35,NBF,ID50, ID65, LED-B1, LED-B2, LED-B3, LED-B4, LED-B5, LED-BH1, LED-RGB 1, LED-V1, LED-V2, LED-C2, LED-C3, LED-C5, customizable light sources (a total of 41 kinds of light sources, some of which are approved by
Displayed Data	Spectrogram/Values/ Samples Chromaticity Values, Color Difference Values/Graph, PASS/FAIL Result, Color Offset, Color simulation
Measuring time	About 1.5s
Repeatability	Chromaticity value: MAV/SCI,ΔE*ab 0.02 (after preheating and correction, measure the average value of whiteboard for 30 times at intervals of 5s) Spectral reflectance: MAV/SCI, standard deviation within 0.07% (400~700nm) (different models are different)
Inter-instrument Error	MAV/SCI,ΔE*ab ≤ 0.2 (measured average value of 12 color plates in BCRA series Ⅱ) (different models are different)
Measurement Mode	Single Measurement, Average Measurement(2-99times)
Locating Method	Camera Locating, stabilizer cross position
Dimension	L*W*H =114X70X208mm
Weight	Approx 435g (excluding the correction seat)
Battery	Lithium battery, 3.7V, 5000 mAh, 8500 times in 8 hours
Illuminant Life Span	More than 1.5 million measurements in 10 years
Display	TFT true color 3.5inch, capacitive touch screen
Data Port	USB, Bluetooth 5.0 (different models vary)
Language	Simplified Chinese, English, traditional Chinese
Operating Environment	0~40°C, 0~85%RH (no condensing), Altitude < 2000m

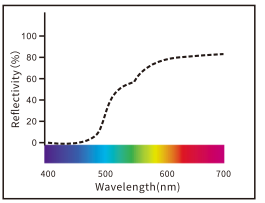
Storage Environment	-20~50°Cz 0~85%RH (no condensing)
Standard Accessory	Power Adapter, User Guide, * PC Software(Down load from office website), USB cable, White and Black Calibration Cavity, Protective Cover, Wrist strap, Aperture, Quality Management Software (download from official website)
Optional Accessory	USB Micro Printer, Powder Test Box, *Bluetooth Micro Printer
Notes	1.Technical parameters are for reference only, subject to actual sales 2.The content marked with * differs in some models.

Appendix I

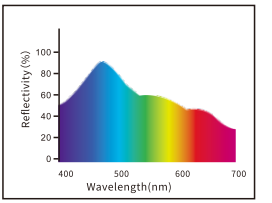
1. Color

There are three elements to observing color: lighting source, object, and observer. Changes in any of these three will affect the color perception of the observer. When the lighting source and the observer do not change, then the object will determine the color perception formed by the observer.

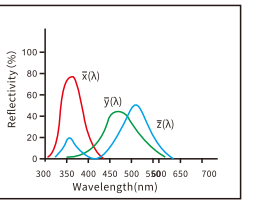
The reason why an object can affect the final color perception is that the reflection spectrum (transmission spectrum) of the object modifies the light source spectrum. Different objects have different reflection spectra (transmission spectrum). (Spectrum) modulation to obtain different results, because the observer does not change, so it presents different colors, the principle is shown in the figure below.



X



X



Reflectance spectrum　　Light source　　Standard observer

=

L=70.95
a=69.72
b=40.35

2.Color Difference Formula

CIE 1976 ΔE*ab

$$\Delta E^*_{ab}=[(\Delta L^*)^2+(\Delta a^*)^2+(\Delta b^*)^2]^{1/2}$$

$$\Delta L^* = L^*_1 - L^*_0$$
$$\Delta a^* = a^*_1 - a^*_0$$
$$\Delta b^* = b^*_1 - b^*_0$$

CIE 2000 ΔE00

$$\Delta E_{00} = \left[\left(\frac{\Delta L'}{K_L S_L}\right)^2 + \left(\frac{\Delta C'}{K_C S_C}\right)^2 + \left(\frac{\Delta H'}{K_H S_H}\right)^2 + R_T\left(\frac{\Delta C'}{K_C S_C}\right)\left(\frac{\Delta H'}{K_H S_H}\right)\right]^{1/2}$$

$$L' = L^*$$

$$a' = a^*(1+G)$$

$$b' = b^*$$

$$G = 0.5\left(1 - \sqrt{\frac{\overline{C}^{*7}_{ab}}{\overline{C}^{*7}_{ab} + 25^7}}\right)$$

CIE 1994 ΔE*94

$$\Delta E^*_{94} = \left[\left(\frac{\Delta L^*}{K_L S_L} \right)^2 + \left(\frac{\Delta C^*_{ab}}{K_C S_C} \right)^2 + \left(\frac{\Delta H^*_{ab}}{K_H S_H} \right)^2 \right]^{1/2}$$

$$S_L = 1$$
$$S_C = 1+0.045\ C^*_{ab}$$
$$S_H = 1+0.015\ C^*_{ab}$$

3. Color Offset Judgment

△L+ represent whitish, △L- represent blackish

△a+ represent reddish, △a- represent greenish

△L+ represent yellowish, △L- represent bluish

4. Human Eye distinguishes colors

The color difference unit of NBS is derived from the unit of the color difference calculation formula established by Judd-Hunter. The color difference of a color is called "NBS color difference unit" when the absolute value is 1. The new color difference formulas developed later often consciously adjusted the units to be close to the NBS units. For example, the units of the color difference formulas such as Hunter Lab and CIE LAB, CIE LUV are almost the same as the NBS units (not equal). Therefore, do not misunderstand that the color difference units calculated by other color difference formulas are all NBS.

Annexed Table

NBS unit and color difference perception degree

NBS unit and color difference value range	**Perceptual color difference**
0.00—0.50	(small color difference) feels very small (Neglectable)
0.50∽1.50	(small color difference) feels slightly (slight)(smaller
1.5—3	chromatic aberration) feels noticeable (noticeable)
3∽6	(larger color difference) feels obvious (appreciable)
>6	(large color difference) feels strong (much)