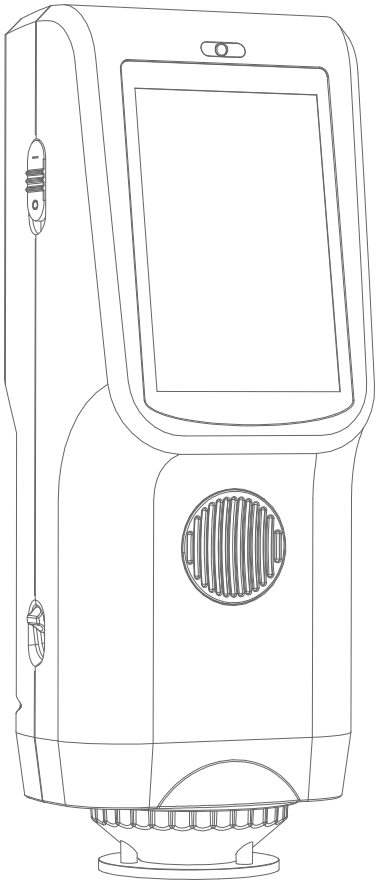
GRATING SPECTROCOLORREADER

Operation Manual



V1.0

Read this manual carefully before use the Spectrocolorreader.

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, 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 Spectrocolorreader 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.

Content

Content

Introduction

This instrument is a high-precision spectrocolorreader with independent intellectual property rights independently developed by the company. It is a leader in the field of portable spectrocolorreaders. 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 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 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

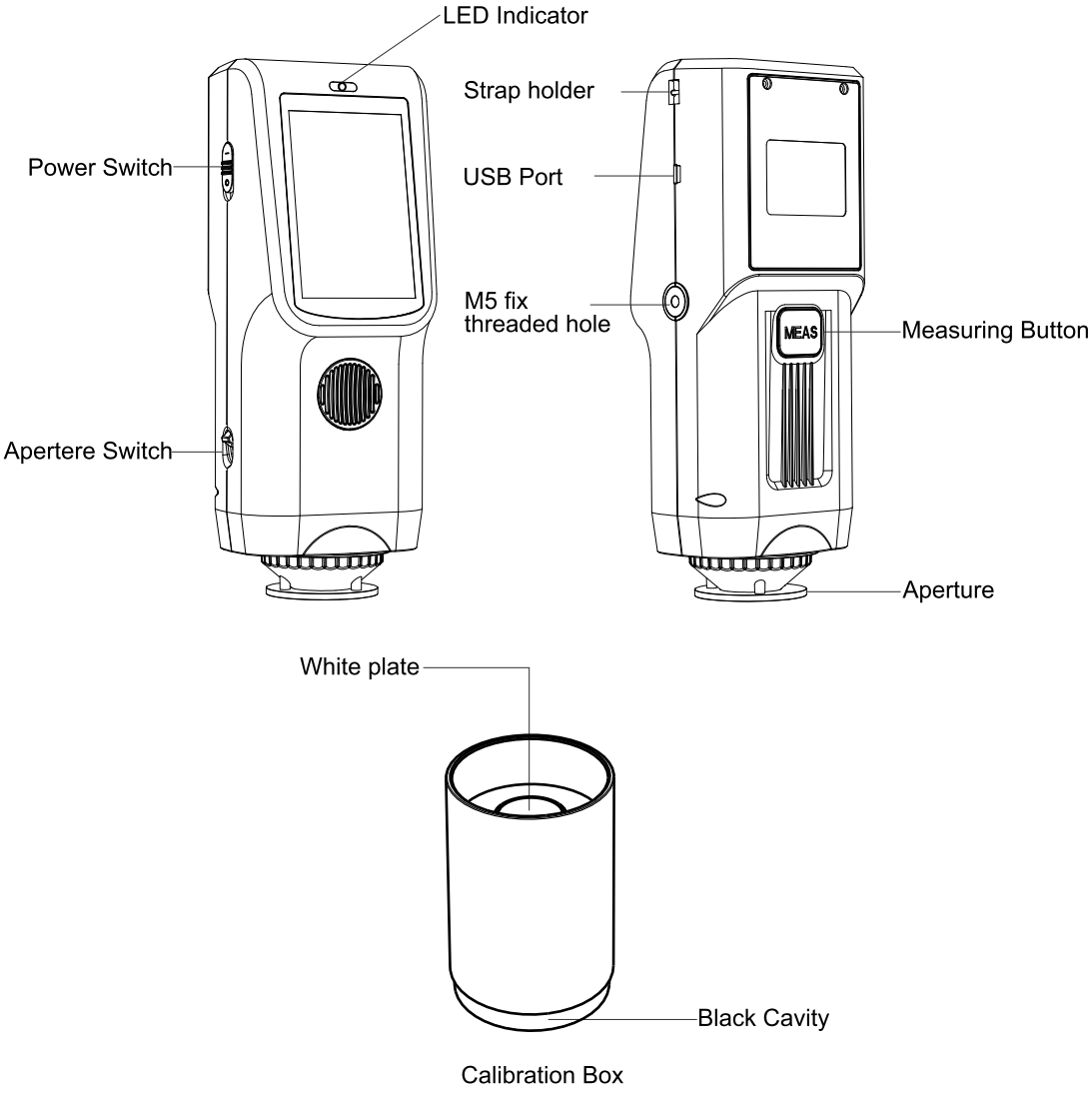


Figure 1 Interface Description

1.Power Switch 1/0: Push the switch to "T‘ to turn on the instrument.

Push the switch to "0” to turn it off.

2.USB/TTL/Charging portt: common interface. This instrument can automatically convert between USB and TTL serial (5V). The USB interface is used to connect and communicate with a PC, and the instrument automatically judges the connection. This interface is also used to connect a 5V TTL serial printer. Connect the USB cable to the power charger or PC computer to charge the instrument (the specification of the external power charger is 5V==2A)

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

4.Aperture switch: used for changing the measuring aperture (part of the models),When the switch shows "MAV", it means to switch to 8mm aperture position; when the switch shows "SAV", it means to switch to 4mm or 1x3mm aperture position.

5.Indicator light: LED has green, yellow and red 3 colors, which are used to indicate the working status of the instrument:

1)During power on and charging, when the battery capacity is greater than 90%, the green light on, otherwise the red light on.
2)During the normal start-up process, the instrument is in normal state (no power adapter is connected, black and white calibration is in the validity period, the power is more than 10%, the instrument has no fault), the green indicator light is on for 10 seconds, the green light flashes during the measurement process, and it goes out after the measurement.
3)When the instrument is working and the power is less than 10%, the red light will flash.
4)The yellow light is always on when the power is turned off and charging, and the yellow light is off when charging is complete.
6.M5 fixed thread hole: fixed instrument thread interface. Thread type is standard metric common coarse thread, pitch 0.8mm, depth 5mm.
7.Wrist strap fixing post: used to fix the wrist strap. When the wrist strap is put on the wrist, it can prevent the instrument from slipping accidentally.
8.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

2.1Power 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.

2.2Calibration

In the measurement interface, click to enter main menu, others please click ✓ or ← to enter main menu，as shown in Figure 2.

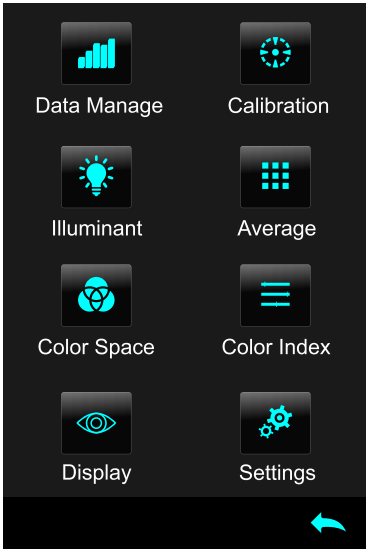


Figure 2 Main menu

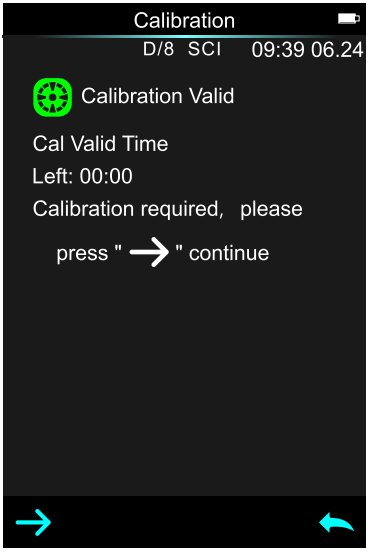


Figure 3 White and black Calibration

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.

Click → to continue and enter "Black Calibration" as shown in Figure 4. Fit the aperture to the black cavity according to the prompt, and then click the "Measuring Button" for black calibration. You can click the back button ↩ to cancel the calibration.

After black calibration, it will enter white calibration as shown in Figure 5. According to the prompt, confirm the serial number is correspond to the white plate and aperture setting is correct, then place the aperture on white plate and press

"Measuring Button" for white calibration, or click — to cancel the calibration.

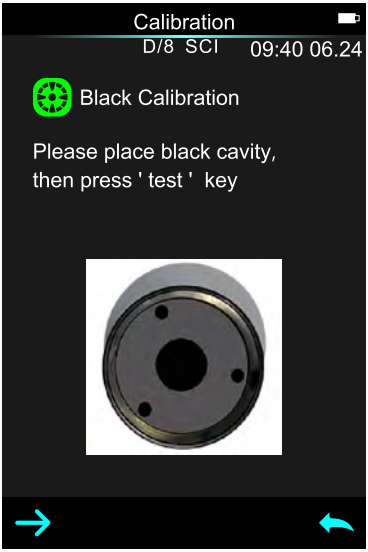


Figure 4 Calibration

Figure 5 Calibration

After the white calibration is completed, it will turn back to the interface shown in Figure 3 that displaying the remaining calibration effective time. Perform corresponding operations as needed. Clicking the key" ↩ " return to the standard measurement internee.

2.3Measurement Instruction

As shown in Figures 6, top of the standard interface is working condition, displaying the status of measurement mode (SCI/SCE), Bluetooth and UV conditions etc.The middle part of the interface is the data display area. It displays the corresponding chromaticity data according to the current user's settings.Under the data display is a shortcut display area, click ihe corresponding shortcut key to switch the test data quickly.The bottom of the standard interface is the operation key area, and the operation of the current data is realized by clicking the corresponding operation key. Figures 7 and 8 are reflectivity interface and color index interface.When the optional chromaticity index selects reflectivity it is the reflectivity display interface, as shown in Figure 7; when the optional chromaticity index selects other color indexes, it is the corresponding color index display interface, as shown in Figure 8. By sliding the interface left and right, you can switch between the measurement interface and the spectrum display internee or the color index interface, and the dot indicates the current interface.

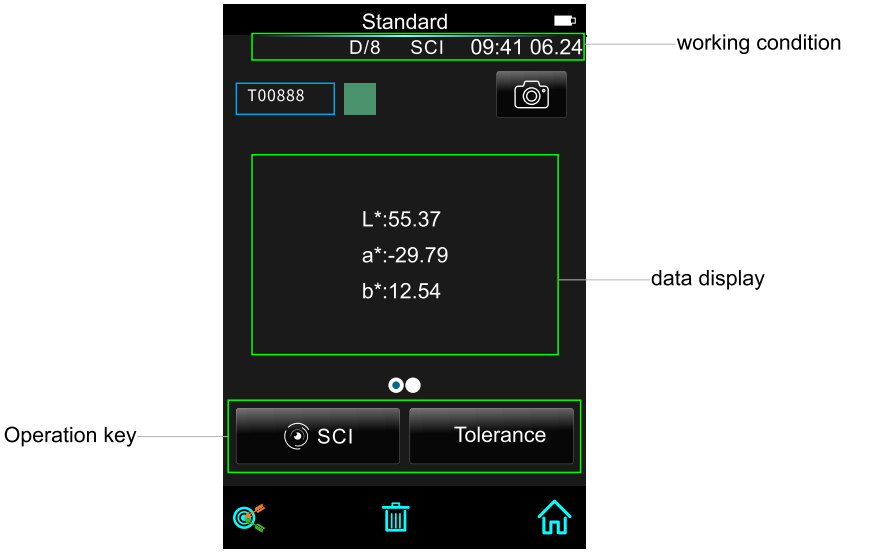


Figure 6 Standard Measurement Interface

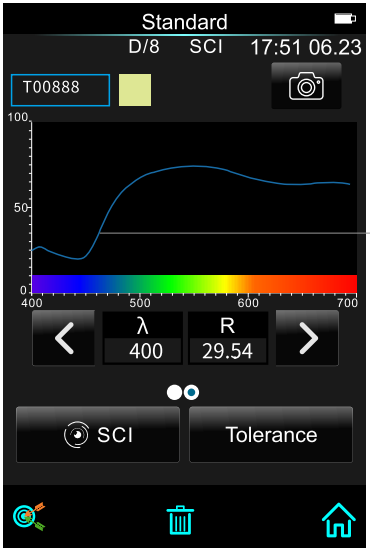


Figure 7 Reflectivity spectrum

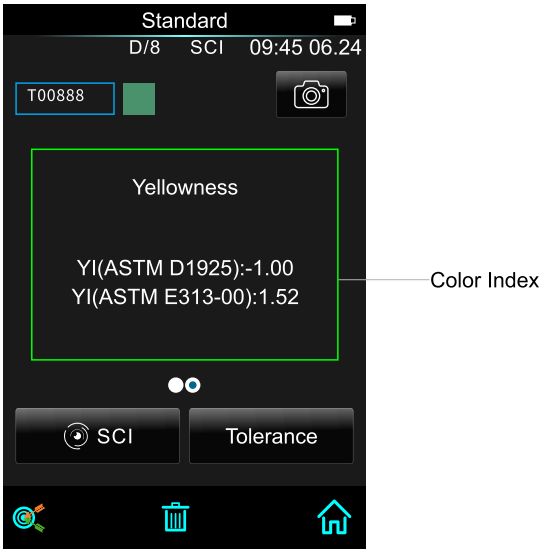


Figure 8 Color Index Interface

Some models of instruments have difference in Reflectivity display interfaces. Some display the reflectivity of the entire spectrum, as shown in Figure 7, some display partial reflectivity and light wavelength, as shown in Figure 9 or 10.

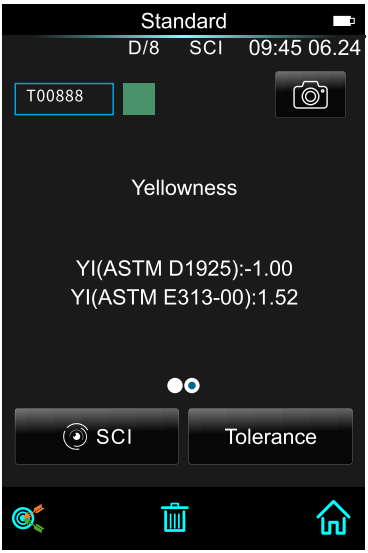


Figure 9 reflectivity display interface II

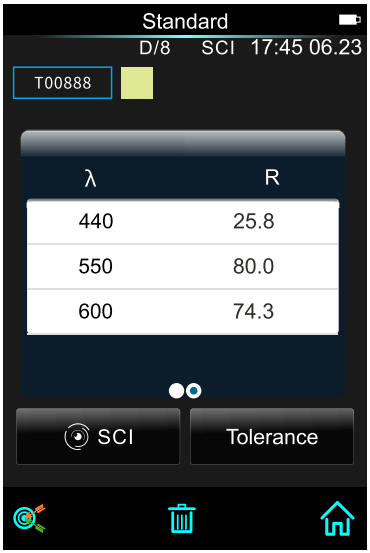


Figure 10 reflectivity display interface III

2.4Measurement

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 it is currently not at the measurement interface, continuously click the return key ↩ several times or press the "Measuring Button" to return to the measurement interface.Note: The system default setting is CIE lab color space, AE * ab color difference formula, and the color index is none.

2.4.1Standard 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 interface of the tested sample is shown in Figure 11, Figure 12 and Figure 13.

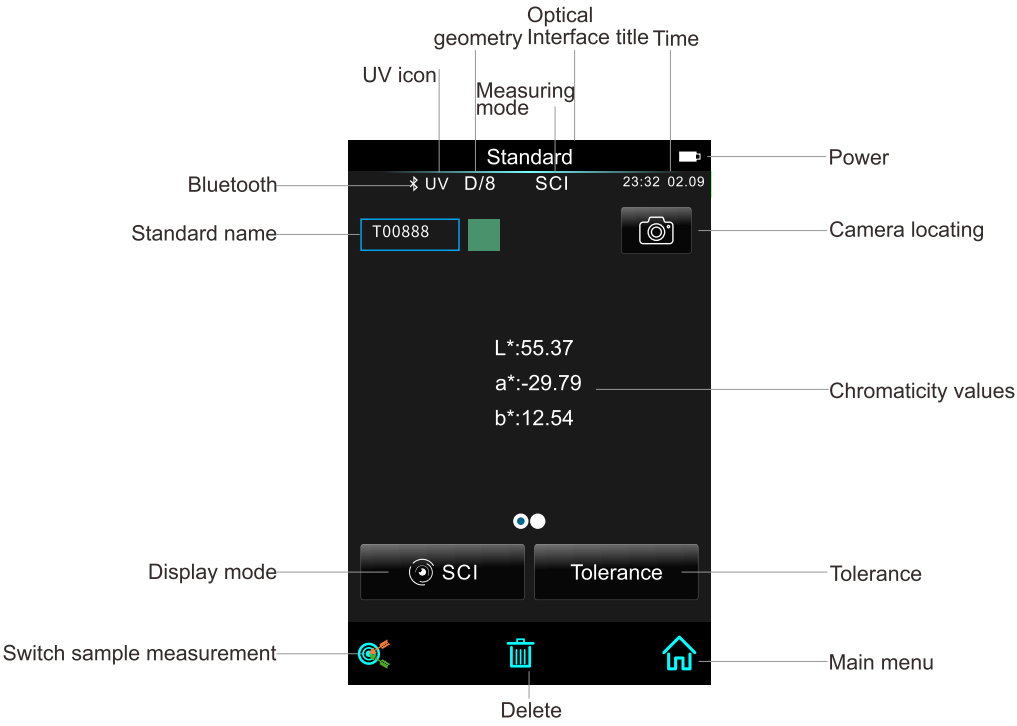


Figure 11 Standard Measurement

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 value: 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.

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"---").

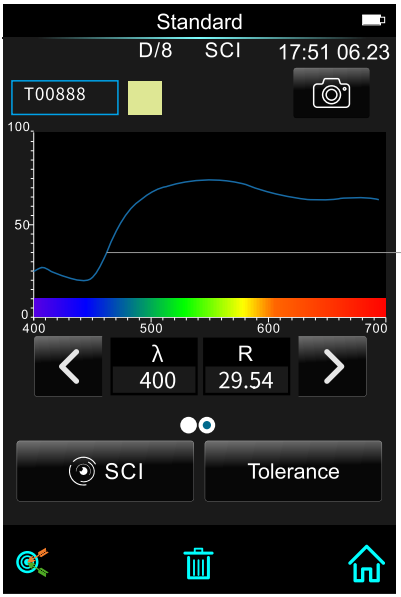


Figure 12 Standard reflectivity 1

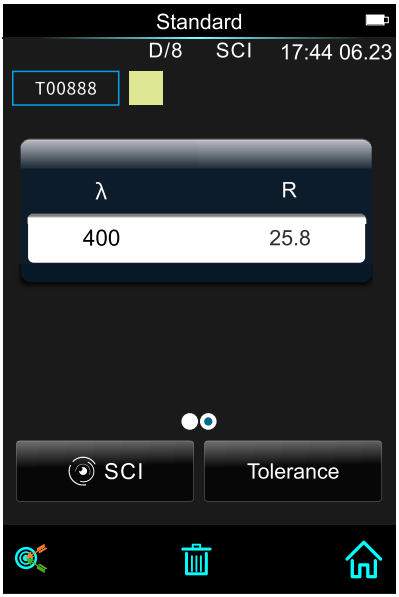


Figure 13 Standard reflectivity 2

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 12, click or , the wavelength and reflectivity of the current sample will be switch at the interval of 10nm. Partial instrument models only show partial reflectivity, as shown in figure 13.

2.4.2Sample 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 14, figure 15, and figure 16, detail explanation as follow:

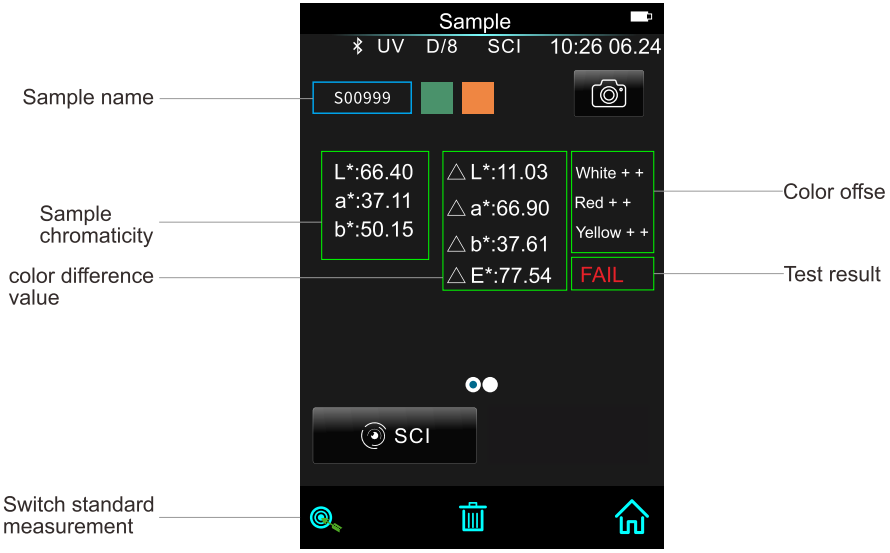


Figure 14 sample measurement interface

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.
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 15. Some models of the instrument do not have this function and only display part of the reflectivity, as shown in Figure 16.
8)Reflectivity difference : The difference between sample and standard underthe current reflectivity. As shown in figure 15, click ,The wavelength, reflectivity, and reflectivity difference of the sample and standard are switched at an interval of 10nm. Partial models of instruments do not have this function, and only display part of the reflectivity and light wavelength, as shown in Figure 16。

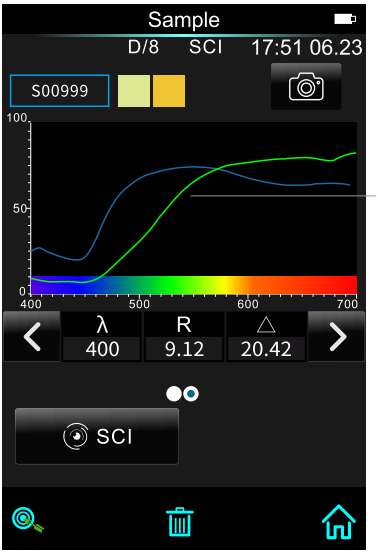


Figure 15 Sample Reflectance 1

Sample reflectance diagram

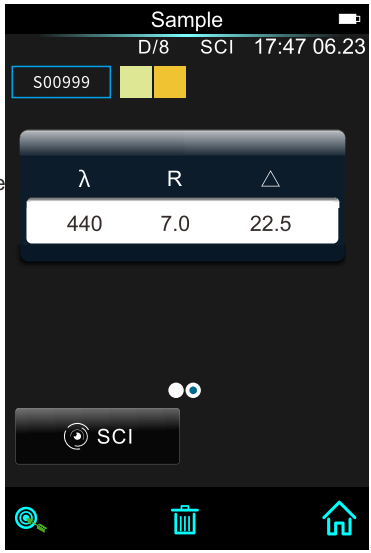


Figure 16 Sample Reflectance 2

2.4.3Average 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.

In the main menu, click "Average Measurement" as shown in Figure 17, input average times and click ✓ to confirm or ↩ to cancel.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.

Figure 17 Standard Average Measurement

2.5Connecting 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).

2.5.1USB 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.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

2.5.2Bluetooth 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.

2.6Print

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.

2.6.1USB Port Printer

The user can measure sample first, save the record to be printed, and then use USB printer to print the record out. First, connect the micro printer to the instrument via USB, and find the sample record to be printed in the standard or sample record, as shown in Figure 18. Then, click the " " icon and select "printer" in prompt (as shown in Figure 19), the instrument will send the current recorded data to the printer, and the printer will complete the printing work.

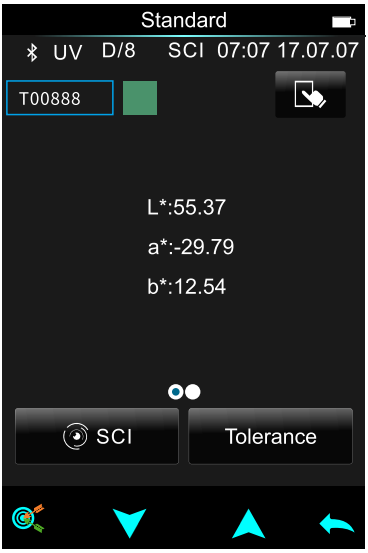


Figure 18 standard record to be printed

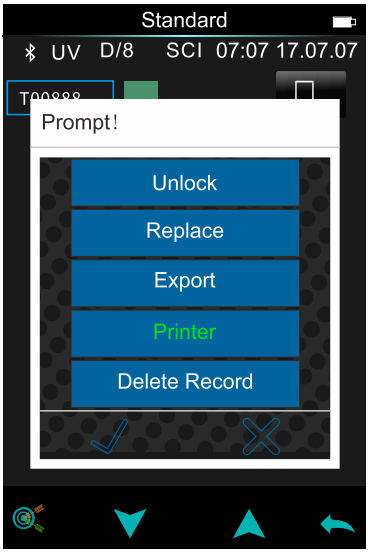


Figure 19 "Printer" operation interface

In addition, instruments also support printing while measuring. That is, use a USB cable to connect the micro printer and instrument, the data can be printed out while measuring.

2.6.2Bluetooth 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 to use 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 pop-up menu, 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.

3.1Data Management

Click "Data Manage" in main menu to enter data management interface as shown in Figure 20. Data management mainly realizes the viewing and operation of the measured records.

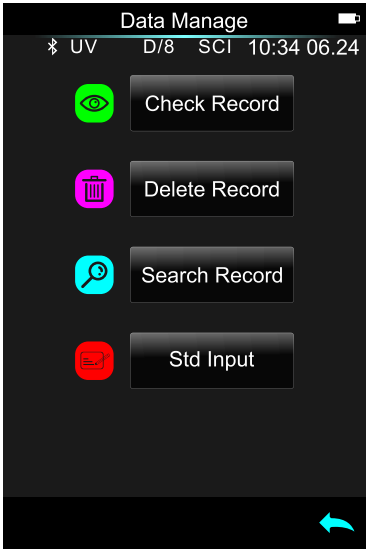


Figure 20 data manage interface

3.1.1Check Record

1)Check Standard Record

Select "Check Record" to enter "Standard Record" interface as shown in Figure 21. The measurement condition shows the standard light source, UV status and the measurement mode, measurement time & date.

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 Figure 22.

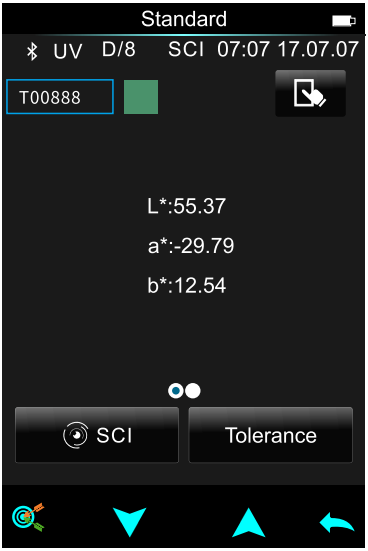


Figure 21 standard record

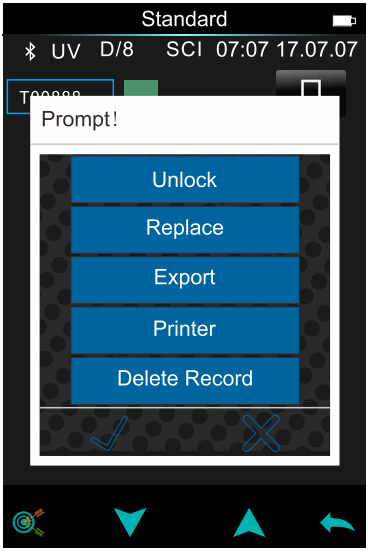


Figure 22 Standard record operation menu

Standard lock: 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 "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 22, 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" to delete data as shown in Figure 22, and click to confirm or to cancel delete back to operate menu.

Click the standard name in standard record interface to edit as shown in Figure 23,and input new name (no more than 8 characters), click ✓ to confirm or ↩ to cancel.

Figure 23 Edit Name

2)Check Sample Record

Click in sample record interface to check the sample record as shown in Figure 24.
Click ▼ or ▲ to check next or previous record.
Click" " "to perform operations: standard export, print data, delete record, as shown in Figure 25.
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.

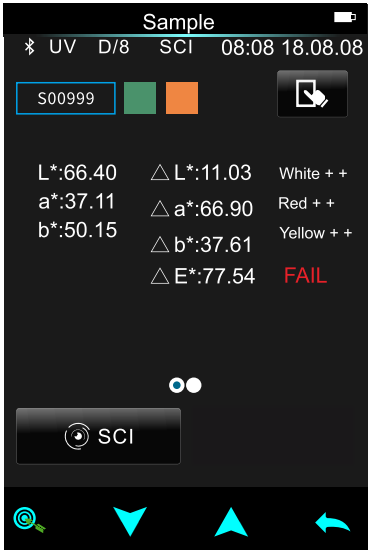


Figure 24 Sample record interface

3.1.2Delete Record

In the data management interface, click "Delete Record" to enter the delete record interface, as shown in Figure 26. 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 27.

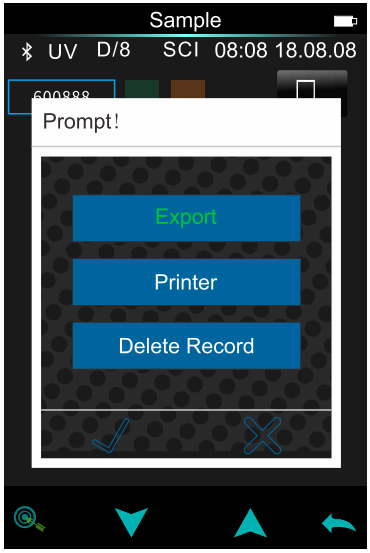


Figure 25 Sample record operate menu

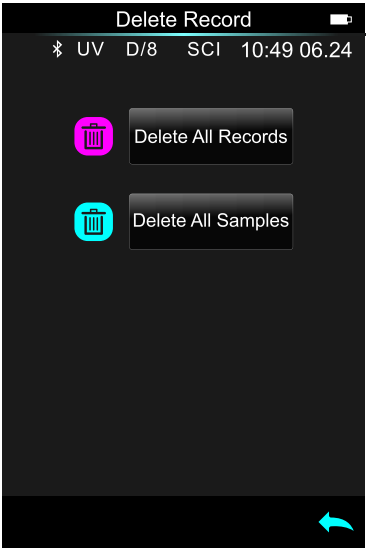


Figure 26 delete record interface

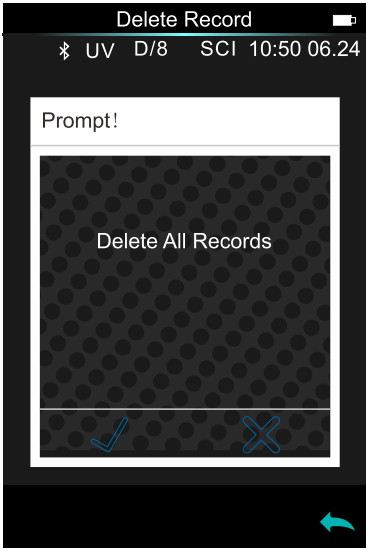


Figure 27 Delete Prompt

3.1.3Search Record

In the data management interface, click "Search Record" to enter the search menu, as shown in Figure 28. It can search by standard name or sample name.

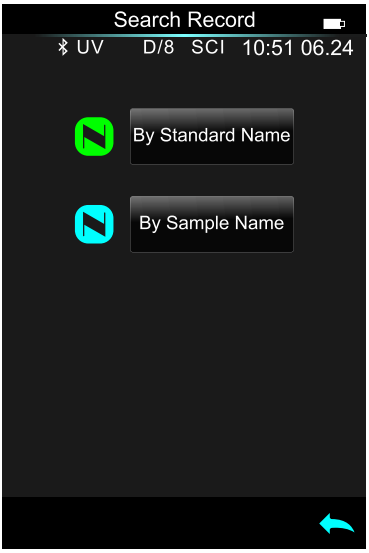


Figure 28 Search record interface

example to explain the search process in detail.Click "by standard name", pops up the search name interface, as shown in Figure 29.

Figure 29 Edit search name interface

Input searched name or contained character, then click ✓ to confirm, the instrument will search all standard records automatically and list all matching records, as shown in Figure 30. If there is no matching record, it will prompt "This record is empty" and return to the search record menu.

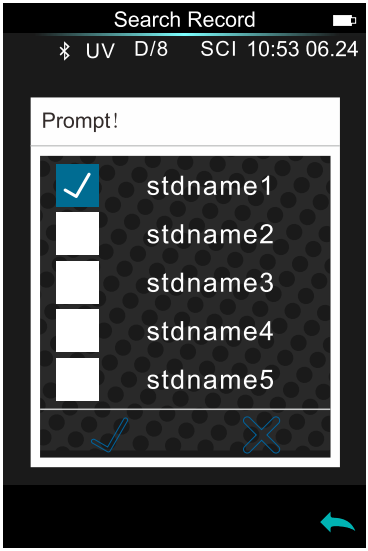


Figure 30 List of searched records

3.1.4Standard Input

In the data management interface, dick "Standard Input" to enter the standard input interface, as shown in Figure 31.

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 32. Enter the corresponding L value and confirm. After all the information of the standard are finished and click ✓ , the standard will be stored in the standard record list, and its serial number will be accumulated in turn.

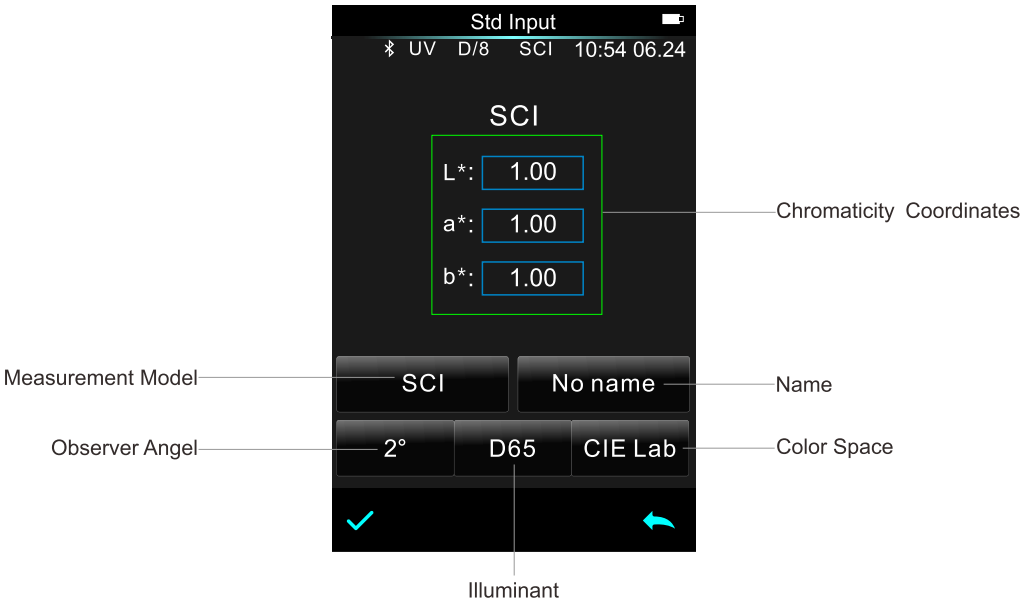


Figure 31 Standard Input

Figure 32 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“- -”

3.2Calibration

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. It is also recommended to re-calibrate if the calibration time is more than 24 hours from last successful calibration.
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.

3.3Illuminant

In the main menu interface, click "Illuminant” to enter the light source setting interface, as shown in Figure 33.

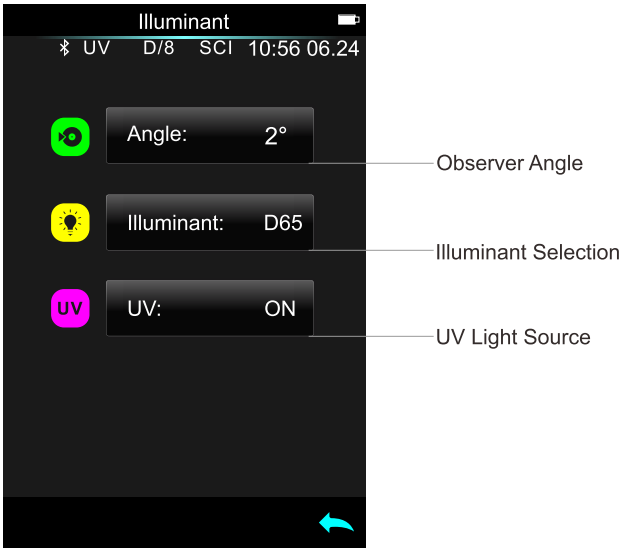


Figure 33 Light Source

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”, as shown in Figure 33, users could select 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 only have part of the illuminant), as shown in Figure 34.

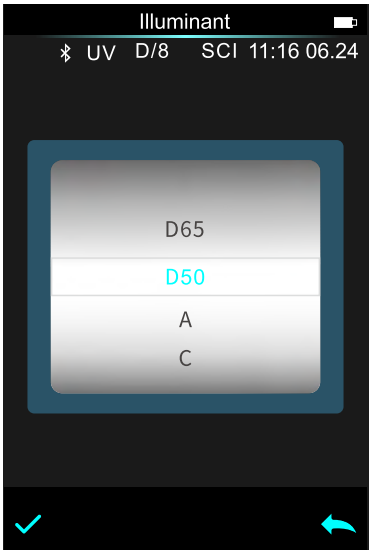


Figure 34 Illuminant

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.

3.4Average

When the measured sample is very large or relatively not very uniform, users need to measure several points to get an average reflectivity to show the sample true chromatic value. This instrument can achieve 2-99 times average measurement.In the main menu, click “Average”, input average times and click ✓ to confirm.

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.

Figure 35 Average

3.5Color Space

In the main menu, click "Color Space" to open the color space interface as shown in Figure 36. Select the corresponding color space and click ✓ to complete the setting.

Color space options include CIE LAB, XYZ, Yxy, LCh, CIE LUV, s-RGB, βxy, DIN Lab9, DIN Lab99 and Munsell(C/2), etc. Some models only have part of the options.

Figure 36 Color Space

3.6Set 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 37.

3.6.1Set Color Difference Formula

In the main menu, click "Color Index”as shown in Figure 37.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 DINΔE99.(Some models only have part of the options.)

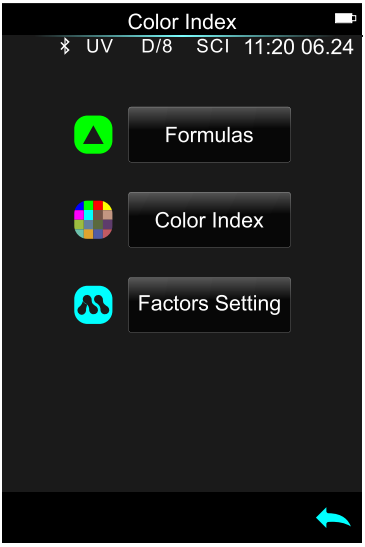


Figure 37 Color Index

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 38.

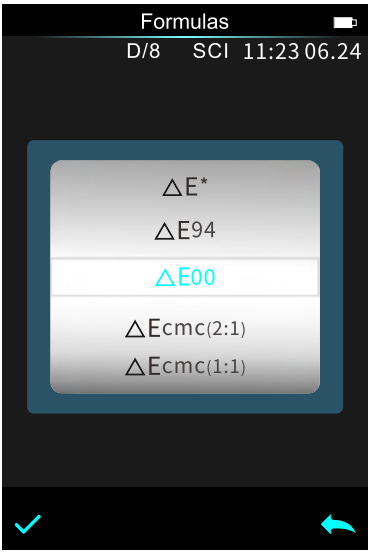


Figure 38 Choose color difference formula

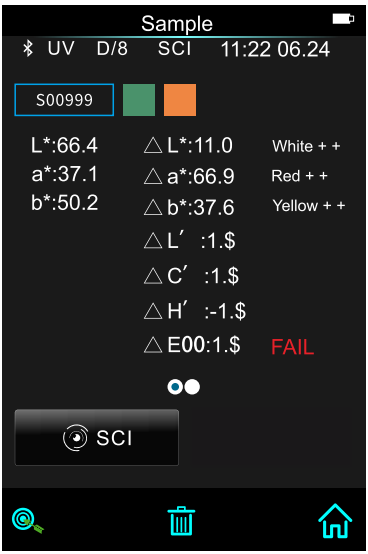


Figure 39 Formula ΔE00

The selected color difference formula will be used to calculate the color difference during sample measurement as shown in Figure 39. (some only display on measurement according to different 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.

3.6.2Set 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 40, 41 .

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

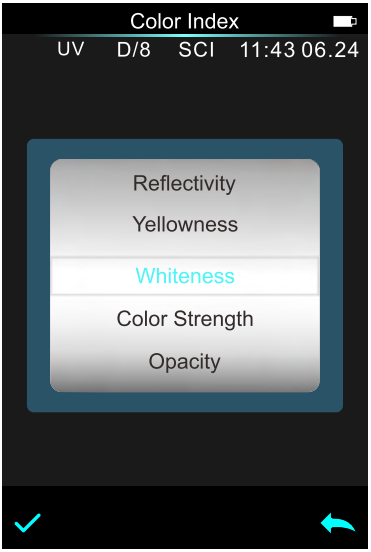


Figure 40 Color index interface I

Figure 41 Color index interface II

3.6.3Parameter Factors Settings and Metameric Index

In the color index interface, click “Parameter factors settings" as shown in Figure 42.

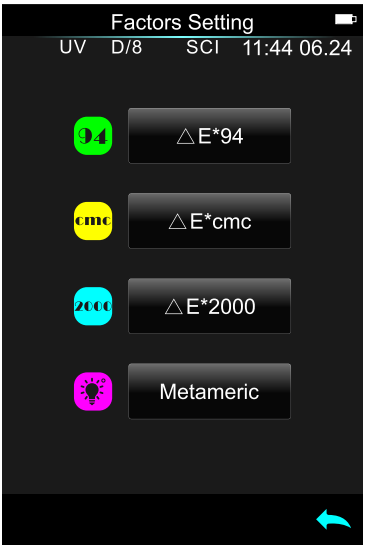


Figure 42 Factors Settings

1)Setting Factors

For CIE DE2000(ΔE00), CIE DE1994 (ΔE94), CMC(ΔEcmc (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 43.

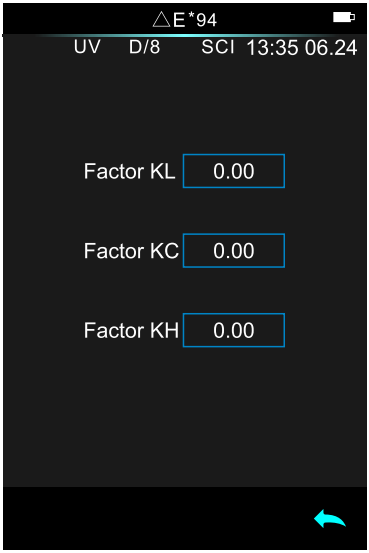


Figure 43 ΔE 94 Factors

Click KL, KC, KH to enter edit interface as shown in Figure 44, input a value to click ✓ to confirm or ↩ to cancel.

Figure 44 Factor KL

2)Metameric Index

In the Parameter factors settings interface, click "Metameric Index*' as shown in Figure 45, separately set light 1 and light 2, and click ✓ to confirm or ↩ to cancel.

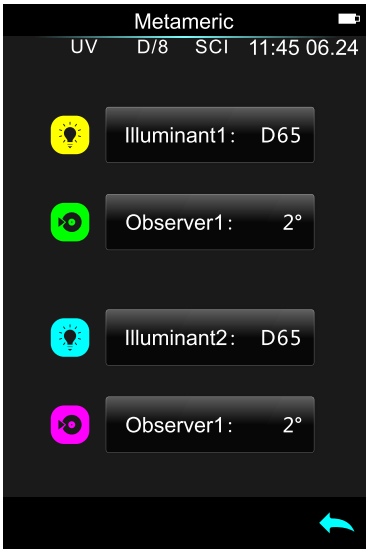


Figure 45 Metameric Settings

3.7Display Setting

In the main menu, click "Display" as shown in Figure 46. You can set color offset, test result.If turn on the color offset, it will display the color offset on the sample measurement as shown in Figure 47; 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 47.

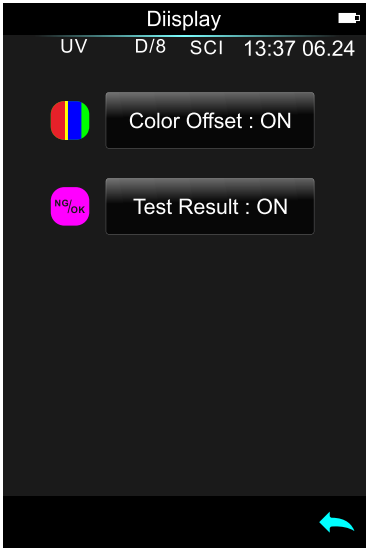


Figure 46 Display

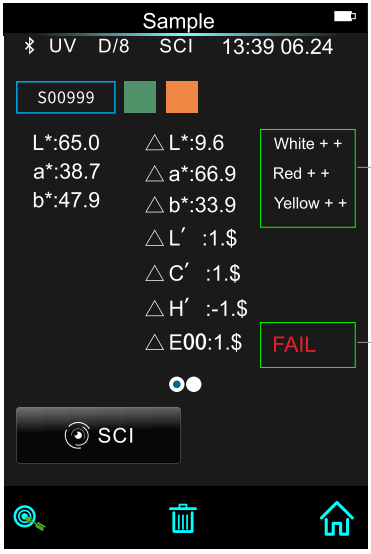


Figure 47 Sample Measurement with color offset

3.8System Setting

In the main menu, click "System Setting" as shown in Figure 48.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.

Figure 48 Systerm Settings

3.8.1Auto 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 49.

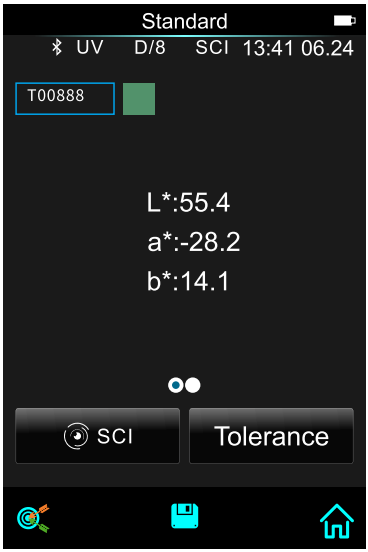


Figure 49 Manual save the result when the auto save is turned off

3.8.2Measurement Aperture

The series spectrocolorReader features with 8mm or 4mm 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 aperture.Measuring Aperture（Φ8mm / Φ4mm）Switching Steps:

Step 1: As shown in Figure 50, 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. As shown in Figure 48, if it is Φ4mm 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:The using aperture, optical lens position, and device aperture setting must be matched to ensure accurate test results. Φ4 aperture, the corresponding optical lens position is SAV, and the setting displays Φ4; Φ8 aperture, the corresponding optical lens position is MAV, and the setting displays Φ8; there is a corresponding display in the test interface status column.

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

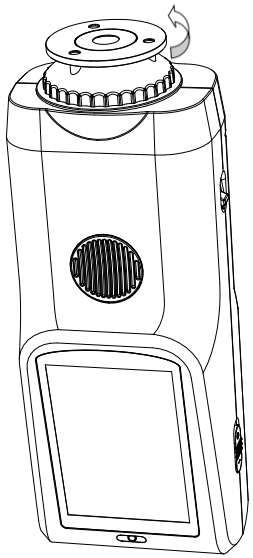


Figure 50 Measurement caliber disassembly

3.8.3Bluetooth ®

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.

3.8.4Buzzer

The buzzer switch controls whether or not a beep will sound during measurement. When the buzzer is turned on, a beep will sound at the end of each measurement, otherwise, there will be no beep during the test.

3.8.5Measurement 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.

3.8.6Calibration 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 51, you can choose 4-hour calibration, 8-hour calibration, 24-hour calibration, and normal start-up calibration.

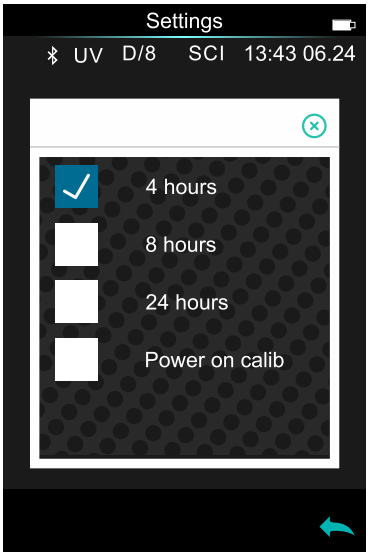


Figure 51 Calibration Validity

If "power on calibration" is selected, it will process the white and black calibration every time when you turn on the instrument. If not, it will be only able to check records and not able to complete the test.

If 4 Hours validity is selected, the validity of Calibration will expire in 4 hours. If Expired, it would be only able to check records and not complete the test. Until re-calibrate it, the calibration is valid.

If 8 Hours validity is selected, the validity of Calibration will expire in 8 hours. If Expired, it would be only able to check records and not complete the test. Until re-calibrate it, the calibration is valid.

If 24 Hours validity is selected, the validity of Calibration will expire in 24 hours. If Expired, it would be only able to check records and not complete the test. Until re-calibrate it, the calibration is valid.

3.8.7Control Mode

When the instrument communicates with the PC software, the customer can set up the specific measurement control mode according to the need. In the system settings interface click “Measurement control mode”open measurement control mode selection interface, as shown in figure 52 or 53, select the corresponding way, and then confirm.

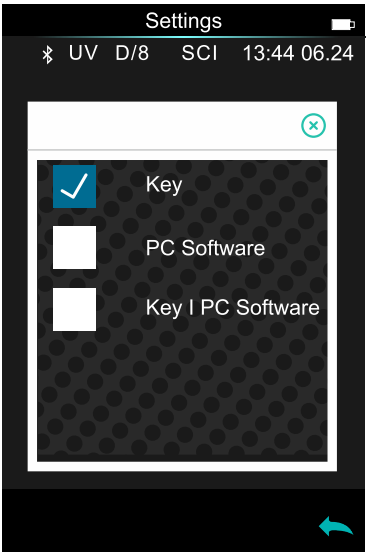


Figure 52 Control Mode interface 1

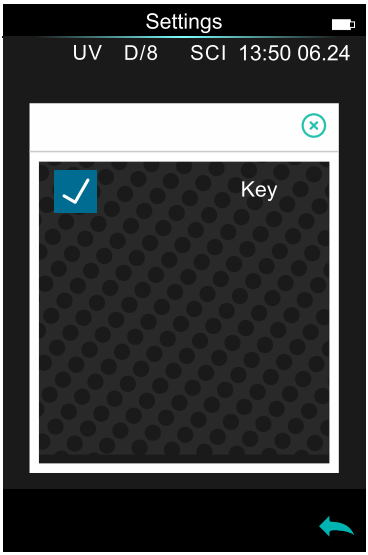


Figure 53 Control Mode interface 2

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|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.

3.8.8Language Setting

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

3.8.9Time Setting

General the instrument is default set with the manufacture local time. In the setting menu to click "Time setting" as shown in Figure 54.

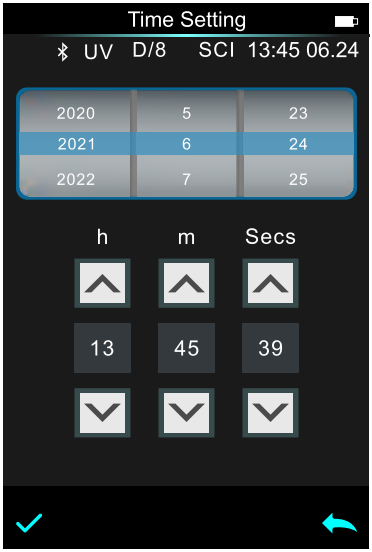


Figure 54 Time Setting

3.8.10Backlight 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.

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 "60 seconds", which makes it in power saving mode.

3.8.11Restore Factory Setting

Click "Restore Factory Setting" in "Settings" as shown in Figure 55. 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.

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 workingsurface 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.

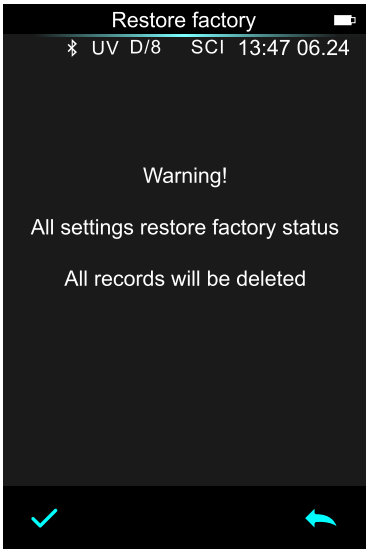


Figure 55 Restore Factory Setting

5.Technical Parameters

5.1Technical Features (Advance)

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 or 1x3mm 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 capacity storage space, which can store more than *30000 pieces of test data
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 and phone app has powerful function expansion;

Note:* means some models of instruments are different.

5.2Technique Specification

（Refer to the technical specification attached to the specific model ）

Optical Geometry:	Reflect: D:8 (diffused illumination, 8-degree viewing angle) *SCI/SCE measurement Conforms to CIE No. 15, GB/T 3978, GB 2893, GB/T 18833, ISO7724-1, ASTM E1164, DIN5033Teil7
Characteristic:	*(Φ8mm/Φ4mm/1x3mm Aperture, Wider adaptability: used for accurate color measurement and quality control in plastic electronics, paint and ink, textile and garment printing and dyeing, printing, ceramics and other industries.
Integrating Sphere Size：	① 40mm
Light Source:	Combined full spectrum LED light source, * UV light source
Spectrophotometric:	ModeFlat Grating
Sens or:	Silicon photodiode array (*double row 32 groups)
Wavelength Range:	400~700nm
Wavelength Interval:	10nm
Semiband Width:	10nm
Measuring Range:	*L:0~120; reflectivity: 0~200%;
Measuring Aperture:	*Double Apertures: MAV:Φ8mm/10mm; SAV:Φ4mm/5mm; 1x3mm
Specular Component:	*SCI/SCE
Color Space:	CIE LAB,XYZ,Yxy,LCh,*CIE LUV,*s-RGB,*βxy,*Munsell(C/2)Color Difference FormulaΔE*ab/*ΔE*uv/*ΔE*94/*ΔE*cmc(2:1)/*ΔE*cmc (1:1)/ΔE*00
Other Colorimetric Index:	*WI(ASTM E313, CIE/ISO,AATCC,Hunter), *YI(ASTM D1925, ASTM 313),*Metamerism Index Mt, *Staining Fastness,*Color Fastness/Color Strength,*Opacity,* Color Card Matching
Observer Angle:	*2°/10°
Illuminant:	D65,A,*C,*D50,*D55,*D75,*F1,F2(CWF),*F3,*F4,*F5,*F6,*F7(DLF), *F8,*F9,*F10(TPL5)/F11 (TL84),*F12(TL83/U30)
Displayed Data:	*Spectrogram/Values/ Samples Chromaticity Values, *Color Difference Values/Graph, PASS/FAIL Result, Color Offset, Color simulation

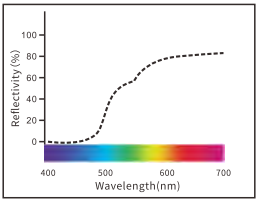
Measuring Time:	About 1.5s (*Measure SCI & SCE about 3.2s)
Repeatability:	*Chromaticity value: MAV/SCb within AE*ab 0.05 (When a white calibration plate is measured 30 times at 5 second intervals after white calibration)
Inter-instrument Error:	*MAV/SCI, Within ΔE*ab 0.3 (Average for 12 BCRA Series II color tiles) MAV/SCIzAE*ab
Measurement Mode:	Single Measurement, Average Measurement(2-99times)
Locating Method:	* Camera Locating, stabilizer cross position
Dimension:	L*W*H =81X71X214mm
Weight:	Approx 460g
Battery:	Li-ion battery, 6000 measurements within 8 hours
Illuminant Life Span:	5 years, more than 3 million times measurements
Display:	3.5-inch TFT color LCD, Capacitive Touch Screen
Data Port:	USB, *Bluetooth ®5.0
Data Storage:	’Standard 1000 Pcs, Sample 30000 Pcs (One data can include SCI/SCE at the same time) , APP Storage
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, 8mm flat aperture, * 8mm tip aperture, *4mm flat aperture, *4mm tip aperture, *MOBCCS Mobile Phone APP (Download from office 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

1.Color

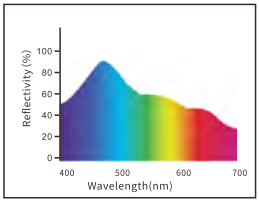
There are three elements to observing color: lighting source, object, and observer. Changes in any of these three will affect the color perception of the observer. When the lighting source and the observer do not change, then the object will determine the color perception formed by the observer.

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.



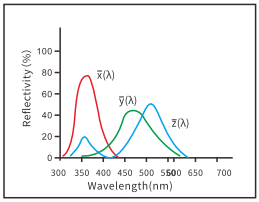
Reflectance spectrum

X



Light source

X



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 ΔE*ab

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

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

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

CIE 1994 ΔE*ab

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

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

3.Color Offset Judgment

△L+ represent whitish, ΔL- represent blackish
Δa+ represent reddish, Δa- represent greenish
ΔL+ represent yellowish, ΔL- represent bluish

4.The 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)
1.5～3	(smaller chromatic aberration) feels noticeable (noticeable)
3～6	(larger color difference) feels obvious (appreciable)
>6	(large color difference) feels strong (much)