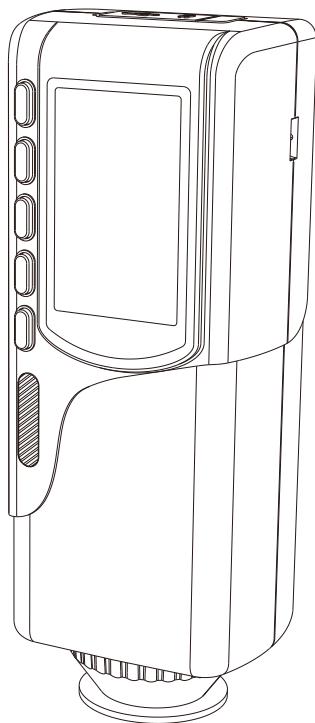# ColorReader
Operation Manual

V1.0

Read this manual carefully before use the spectrophotometer.

CONTENT

CONTENT

Instruction

ColorReader is a color measuring instrument independently developed by our company with independent intellectual property rights.It is researched and developed according to the CIE (international lighting committee) standard.It is a convenient to use, stable performance, rapid and accurate measurement of the spectrophotometer.The instrument is powered by lithium battery or DC external power supply.

The instrument has the following advantages:

1)Starting can be measured, without black and white correction every time, simplifying the operation steps;
2)Using light spot positioning or cross positioning, can quickly align the measuring site;
3)Automatically save data during measurement, easy to use;
4)Configuring SQCX high-end color management software, connecting PC to achieve more functions;
5)Manage the instrument through mobile APP to meet a variety of working conditions;
6)Precise, stable and portable structure makes the measurement easier.

Caution

1)This instrument is a precision measuring instrument.During measurement, drastic changes in the external environment of the instrument should be avoided, such as the flashing of ambient light and rapid changes in temperature, etc.;
2)During the measurement, the instrument should be kept stable, the measuring mouth should be close to the measured object, and avoid shaking and shifting. The instrument is not waterproof, and can not be used in high humidity environment or water mist;
3)Keep the instrument clean and tidy, avoid water, dust and other liquid, powder or solid foreign matter into the measuring caliber and the inside of the instrument, avoid the impact on the instrument, collision;
4)After using the instrument, the instrument and white board should be put into the instrument box and properly stored;
5)The instrument should be stored in a dry and cool environment;The user shall not make any unauthorized changes to the instrument.Any unauthorized changes may affect the accuracy of the instrument, or even irreversibly damage the instrument.

1.Button And Interface Instruction
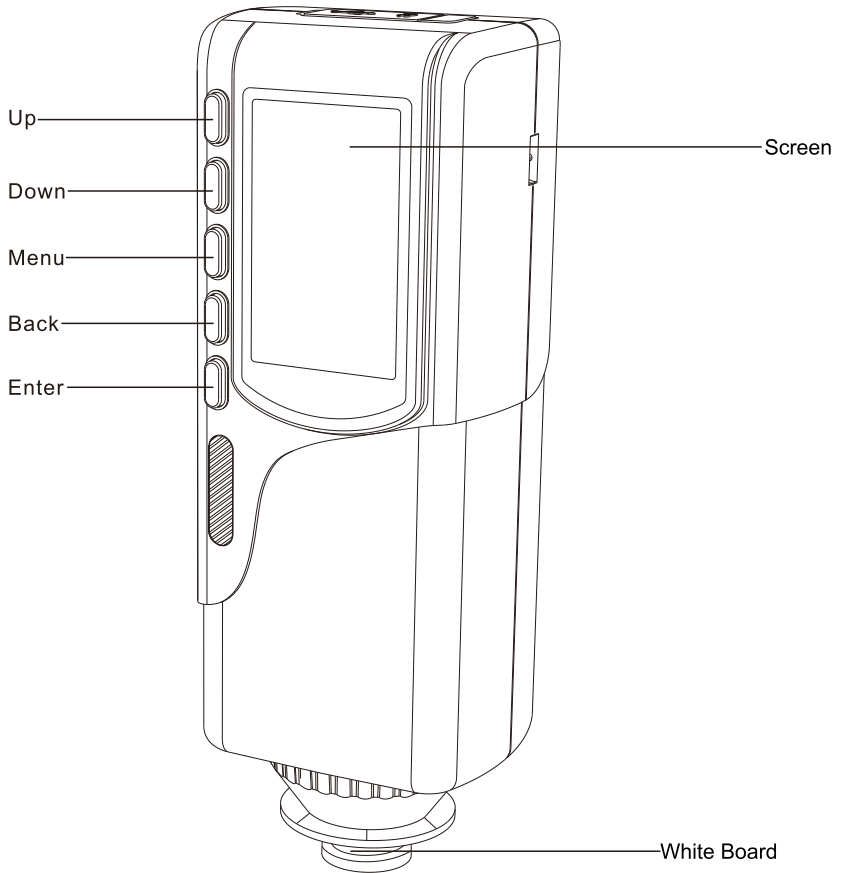
Up

Down

Menu

Back

Enter
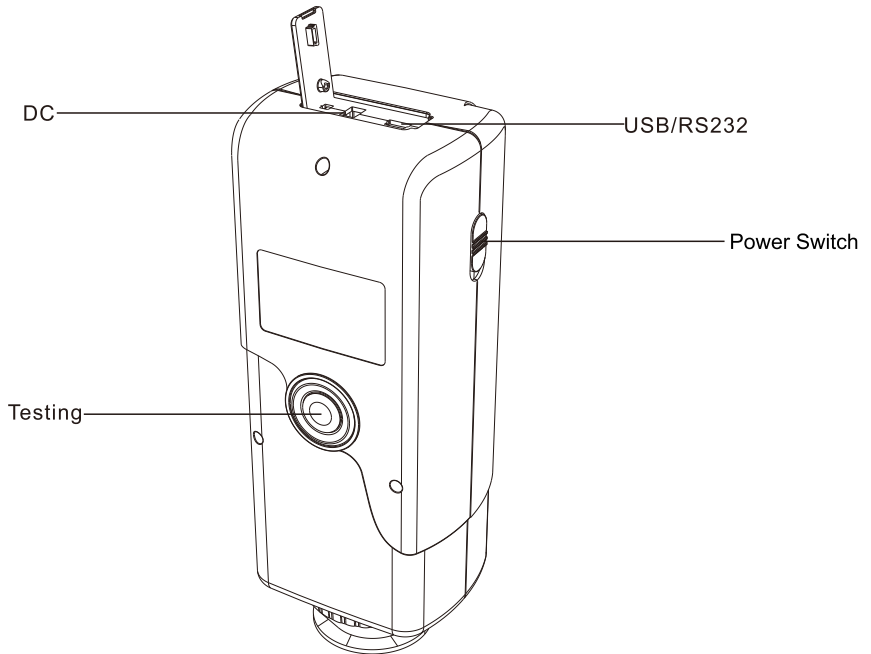
Screen

White Board

Figure 1 Diagram of Button Interface (Front)

Figure 2 2Diagram of Button Interface (Back)

Button and Interface Instruction:

1)Button function: up（⬆）、down（⬇）、menu（☰）、back（⬅）、enter（⏎）；

2)Power Switch: Push the power switch "1/0" to the position "1", and the instrument will be powered on.Power "1/0" switch toggle to "0" position, the instrument power off.

3)Screen: TFT true color 2.8inch@ (16:9), used to display measurement data.

4)White Board: During the white calibration, the measuring caliber shall be aligned with the white board according to the prompts to ensure that the measuring caliber is closely aligned with the white board during the calibration proces.

5)Measurement Button: Short press the measurement button in standby mode to wake up the system.In the working mode, press the measurement key to start the measurement.

6)DC Power Interface: Access to external power supply.Specification for external power adapter is 5V$=$2A.

7)USB/RS232 Interface: This interface is a common interface, and the instrument automatically determines the connection.USB interface is used to communicate with PC, and RS232 interface is used to connect printer.

2.Operating Intsruction

2.1Battery Instruction

1)Lithium battery specification is Li-ION 3.7V⎓0.5A, capacity is 3200mAh;
2)When charging the lithium battery, the instrument must be connected to the external power supply or USB interface on the PC;
3)When charging the battery, there is a dynamic battery icon on the upper right corner of the measurement interface for charging prompt;
4)The instrument uses a built-in lithium battery. Do not disassemble it without permission, otherwise it may damage the instrument.

2.2Power On& Off

Push the power switch "1/0" to the position "1", the instrument will be powered on, the display screen will be lit up and display LOGO interface.Power "1/0" switch toggle to "0" position, the instrument will be power off.Under the power-on state (the power "1/0" switch is moved to "1"), if no operation is carried out for a long time, the instrument will automatically enter the sleep state. At this time, press the "Measure" button or any button to wake up the instrument and enter the working state.After starting the machine and waiting for a few seconds, the instrument will automatically enter the standard sample measurement interface and display the L* A * B * measurement interface by default.This is shown in Figure 3.
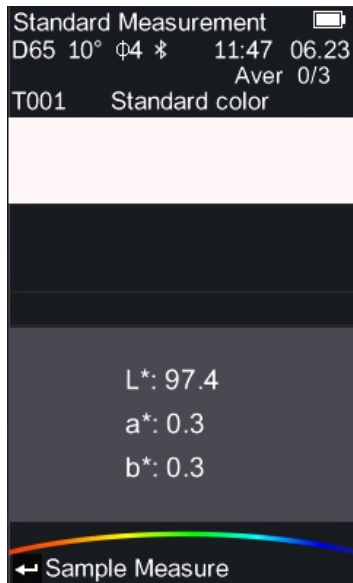
Figure 3 Standard Measurement Interface

Note: Please turn off the power when the instrument is not used for a long time.

2.3White and Black Calibration

Press the "Main Menu" button to enter the main menu interface. In the main menu, click the "Up" and "Down" button to position the cursor on the "Black and White Calibration" and press the "OK" button to enter the "White Correction" interface, as shown in Figure 4:

During the white calibration, please align the measuring caliber with the white board according to the prompts, and ensure that the measuring caliber is closely aligned with the white board during the calibration process. If the measuring caliber is not aligned with the white board, the white board correction may fail.

Press "OK" or "Test" for white correction.During the calibration process, you can also press the "Back" button to cancel the calibration as needed.

Figure 4 White Calibration

Note: the number of the white board corresponds to the instrument one to one, and "white board number" is displayed on the white board calibration interface.

When the white calibration is completed, it will automatically switch to the black calibration interface. This is shown in Figure 5.For black calibration, please empty the measuring port according to the instructions (please refer to the "Points for Attention" below Figure 5 for empty requirements).Press "OK" or "Test" for black calibration.During the calibration process, you can also press the "Back" button to cancel the calibration as needed.Black and white calibration completed, automatically enter the main menu interface.
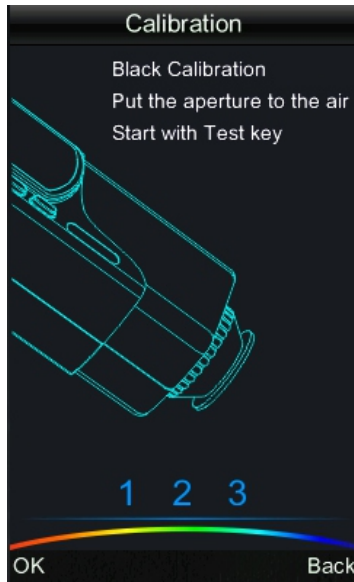
Figure 5 Black Calibration

Note:

1.When the instrument carries out "black calibration" on the air, the surroundings must be dark and without bright light source.There is no shelter within 1 meter of the air direction of instrument.

2.The instrument does not need to force black and white calibration, can be turned on to measure.It is recommended that black and white calibration should be carried out when the instrument is used for the first time, when the temperature difference environment changes significantly, when the instrument is not used for a long time, or when the measurement data of the instrument is found to be inaccurate.

2.4Measurement Instruction

When the instrument is measuring the sample, the upper part of the measuring interface is the working state area, which displays the standard light source, observer angle, measuring aperture, sample name, battery power, system time, etc.The middle part of the measurement interface is the sample simulation color display area and the data display area. The instrument displays the sample simulation color and the corresponding color difference data according to the current measured sample color.At the bottom of the measurement interface is the operation button prompt area, according to the prompt can be carried out related operations.

Standard sample name: when measuring in the standard sample measurement interface, the instrument will automatically generate the standard sample name, which is named by default with the serial number starting from T001.Sample name: During sample measurement, the instrument automatically generates sample name. The sample name associated with each standard sample is named with the serial number starting from No.001 by default.

The standard sample measurement interface is shown in Figure 6, and the sample measurement interface is shown in Figure 7.
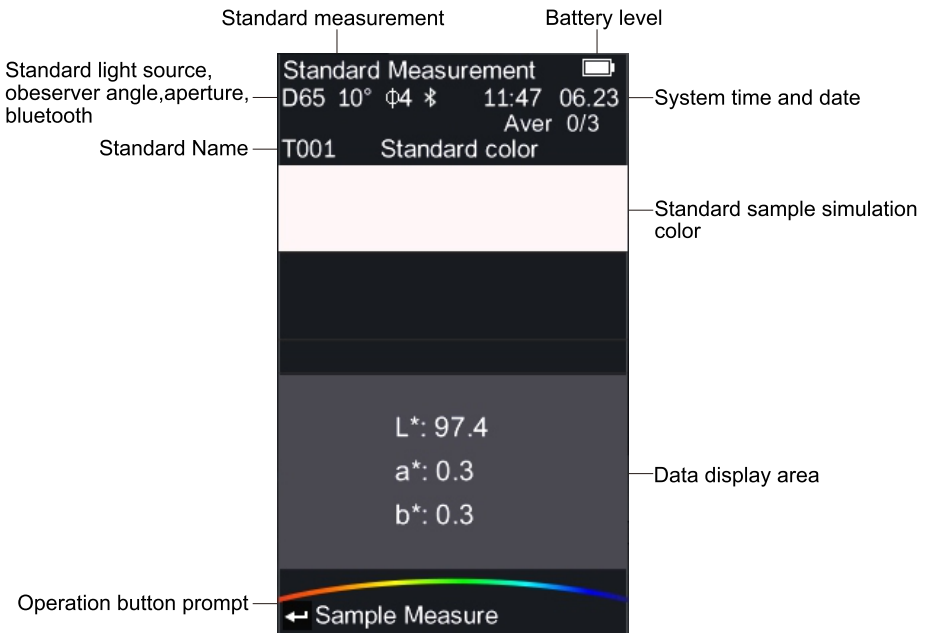
2.4.1Standard Measure

Figure 6 Standard Measurement

2.4.2Sample Measure

Sample measurement   Battery level

Standard light source, obeserverangle,aperture, bluetooth

Standard name

Sample name

Data display area

Operation button prompt

System time and date

Standard simulation color
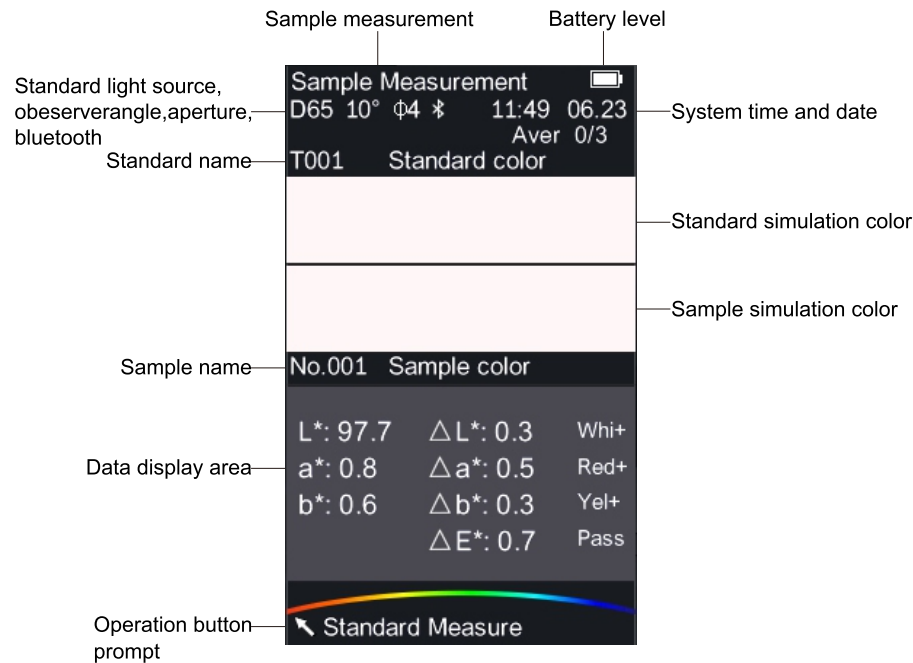
Sample simulation color

Figure 7 Sample Measurement

2.5Measurement

2.5.1Measurement Location

The instrument can be positioned by measuring light spot of the measuring port.The method is: enter the standard sample measurement interface or sample measurement interface, and then press the "Measure" button and hold, at this time the measurement spot will appear, by observing the degree of alignment between the spot and the position of the sample to be measured, at the same time, the measurement port is close to the sample to be measured and the position can be adjusted to achieve alignment.

After positioning, release the "Measure" button, the instrument will complete the measurement within 1.5 seconds, and display the color parameters of the sample under test.

2.5.2Measurement Setting

Select "Average Measure" in the main menu interface to enter the average measurement setting interface in Figure 8. Users can set the average measurement times according to their needs.The instrument can set 0~99 average measurements for each group. When the average number of measurements set is "00" and "01", the instrument is in single measurement mode.When the set value of the average number of measurements is between "02 and 99", the instrument is in the average measurement mode.Add or subtract the number of times by " Up" and "Down" button, and press "OK" button to move the cursor to the next digit for setting.When the cursor is in the last digit, press OK to save your Settings and return to the main menu interface.

Figure 8 Average measurement times setting interface

2.5.3Single Measurement

Single measurement is generally used to measure the color difference or contrast color data between sample and standard, which can be intuitively compared to determine the qualified and unqualified.When the average number of measurements is set to "00" and "01", the instrument only carries out a single measurement. The default setting of the instrument is a single measurement.

1)Standard single measurement

In the standard single measurement interface, if the measurement interface is not present, you can continuously press the "back" button to enter the standard measurement interface. Align the instrument to the standard and press the "Measure" button to obtain the simulation color and chromaticity data of the standard.As shown in Figure 9.The standard measurement results are automatically saved after the measurement is completed.
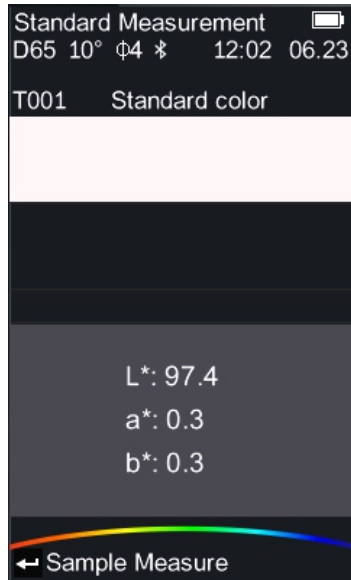
Figure 9 Standard Measurement

2)Sample single measure

After the standard single measurement is completed, press the "Confirm" button to switch the instrument to the single sample measurement interface. Align the instrument to the sample and press the "Measure" button to measure the sample. The instrument can obtain the simulated color and chromaticity data of the sample, as shown in Fig. 10.Automatic saving of sample measurement results after measurement.

Test result hint: when the tolerance hint is turned on (for the method of tolerance setting, please refer to Section 3.3), according to the tolerance setting of the instrument system, the total color difference "$\Delta E*$" value is considered qualified if it is less than the tolerance value, and it is considered unqualified if it is greater than the tolerance value.

Figure 10 Sample Measurement

2.5.4Average measure

When the measured sample is relatively large or not very uniform, the average reflectance of multiple points can be obtained by measuring several representative test points, and the calculated chromaticity data can better represent the true chromaticity value of the measured sample.When the set value of the average number of measurements is between "02 and 99", the instrument is in the average measurement mode.

1)Standard average measurement

On the standard average measurement interface, align the instrument with the standard and press the "Measure" button.Perform multiple measurements according to the set number of measurements until all the measurements are completed.During the measurement process, the average measurement results are automatically updated after each measurement is completed.A standard sample average value is automatically saved when the measurement is completed.

The average measurement interface of the standard is shown in Figure 11. "Ave 0/3" means that under the average measurement mode, 0 average measurements have been taken and the average measurement Settings are 3 times.The average measurement of the standard is shown in Figure 12.
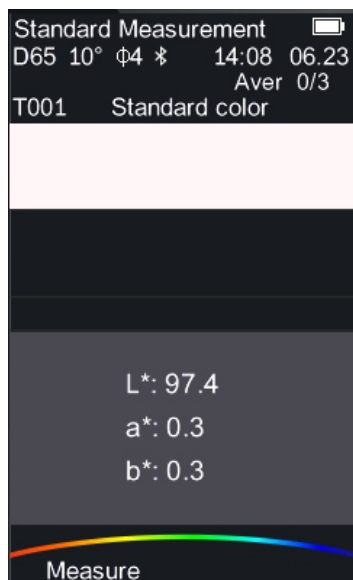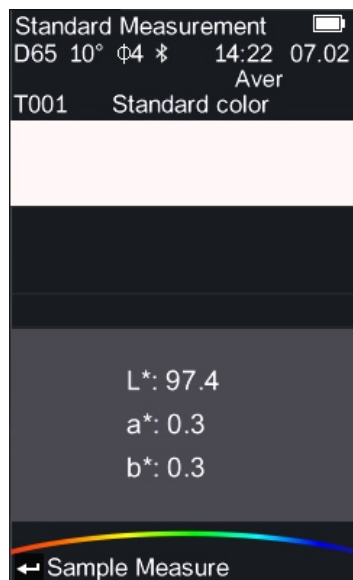
Figure 11 Standard average measurement interface

Figure 12 Standard average measurement completion

2)Sample average measurement

Press "OK" on the average measurement interface of standard, and the instrument switches to the average measurement interface of sample, as shown in Figure 13.The process of sample average measurement is the same as that of standard average measurement.During the measurement process, the average measurement result will be automatically updated after each measurement, and the average value of a sample will be automatically saved after the measurement.The average measurement of the sample is shown in Figure 14.

Measurement result Prompt: When tolerance prompt is turned on (please refer to section 3.3 for the method of tolerance setting), set tolerance according to the instrument system.If the total color difference "$\triangle$E" value is less than the tolerance value, it is qualified.Greater than the tolerance is a failure.

Figure 13 Sample average measurement interface

Figure 14 Sample average measurement completion

2.6Connecting to PC

PC software has powerful extension functions.More chroma data analysis can be achieved.This series of instruments can be connected to the color management software on PC through USB data cable or Bluetooth module (only for products equipped with Bluetooth module) for communication.

2.6.1USB Connection

Install the color management software on the PC.Connect the instrument to PC with USB data cable.The software will be able to automatically connect to the instrument.After successful connection, the terminal instrument can be fully controlled by software, and related samples can be measured and analyzed.(Some models do not have this function.)

2.6.2Bluetooth Connection

For the instrument equipped with Bluetooth module, it can communicate with the color management software on the PC through Bluetooth.

Install the color management software on the PC and use the matching Bluetooth adapter. Connect to the instrument via Bluetooth.After the connection is successful, the terminal instrument can be fully controlled by PC software, and the relevant sample measurement and analysis can be carried out.

2.7Connecting to Phone

For the instrument equipped with Bluetooth module, it can communicate with the color management software on the mobile phone through Bluetooth.

Install the color management APP on your mobile phone.Open the software and Bluetooth, and click "Connect Bluetooth".As shown in Figure 15, after successful connection, the terminal instrument can be fully controlled through mobile phone software, and multiple functions such as a variety of light sources,color space, color index and color difference formula are extended and expanded.Convenient for users to carry out related sample measurement and analysis.

Figure 15 Connect to the mobile APP via Bluetooth

2.8Printer

The mini printer is a non-standard part and needs to be purchased separately.The instrument is connected with a specially equipped micro printer, which can print the measurement data when "standard measurement" or "sample measurement".

3.System Funtion Instruction

On the measurement screen, press "Back" to enter the main menu.On other screens, you can continuously press "Back" to enter the main menu.From the main menu, you can enter each sub-menu to achieve all the system function settings.System functions include "Data", "Calibration", "Tolerance", "Illuminant", "Average", "Settings" and so on.As shown in Figure 16.

Figure 16 Main Menu

3.1Data Management

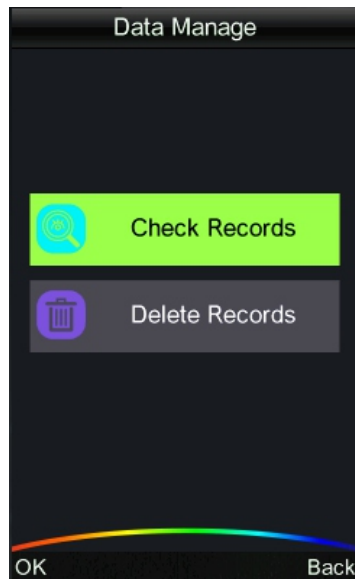Click "Up" and "Down" in the main menu to enter the "Data Manage" interface, as shown in Figure 17.

Figure 17 Data Manage

3.1.1Check Records

Click "Up" or "Down" to select "Check Records".Click "OK" to enter the standard record interface, as shown in Figure 18.The standard data is displayed. You can click "Up" and "Down" to check different standard data.
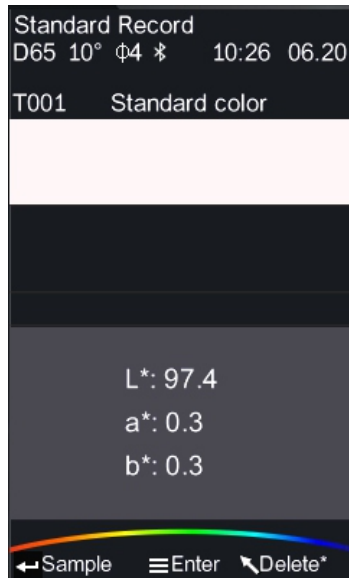

Figure 18 Check Standard Records

1)View sample records

Press "OK" to check the sample records associated with this standard.As shown in Figure 19, all sample records associated with the current standard can be viewed by "Up" and "Down" keys.If there is no sample record associated with the current standard, the message "Sample record is empty" will be displayed and the standard record interface will be returned.On the sample recording interface, press the "Back" key to quickly switch to the standard recording interface associated with the sample.

On the sample records interface, press the "Main Menu" key to enter the "Standard Entering" interface.You can adjust the sample record you are viewing to the current standard.

Long press the "Back" key to completely delete this sample record.However, its standard records will not be deleted.
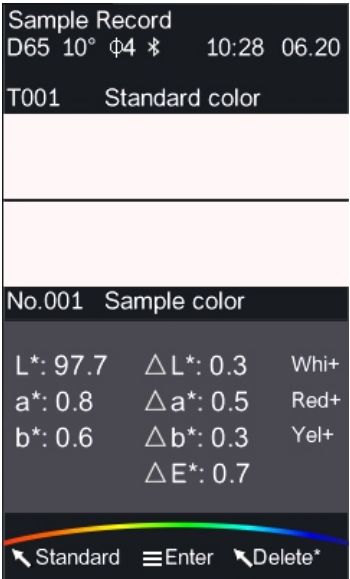
Figure 19 Check Sample Records

2)Standard Entering

On the standard records interface, press the "Main Menu" key to enter the "Standard Entering" interface.You can set the record of the standard being viewed to the current standard.Press "OK" to pop up the sample measurement interface associated with the standard.As shown in Figure 20.
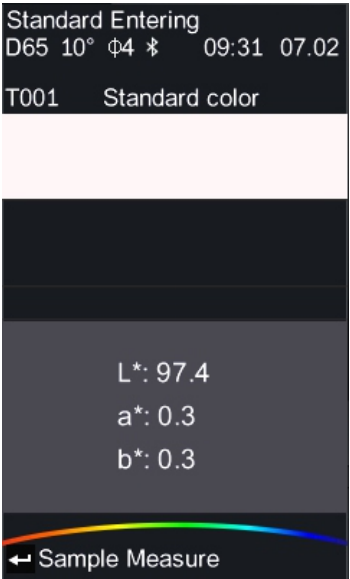

Figure 20 Standard Entering

3)Delete standard records

On the standard record screen, If long press the "Back" ,a message is displayed asking you to delete the record.Press "OK" to delete this standard record and its associated sample records. You can also press the "Back" key to cancel the operation.

3.2.2Delete Records

On the Data Management page, click "Up" or "Down" to select Delete Records.Press "OK" to enter the page for deleting records.As shown in Figure 21.

Note: Data cannot be restored after a record is deleted. Exercise caution when performing this operation to avoid deleting required historical records by mistake.
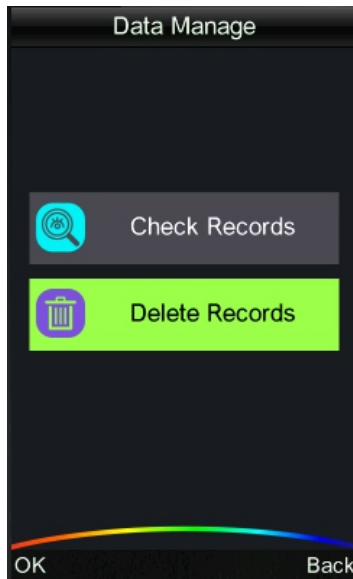

Figure 21 Data Manage

Click "Up" and "Down" to select "Delete All samples" and "Delete All Records".As shown in Figure 22.If you select "Delete all samples", all sample records in the instrument will be deleted and standard sample records will be retained.Select "Delete All Records" to delete all records in the instrument, including standard records and sample records.
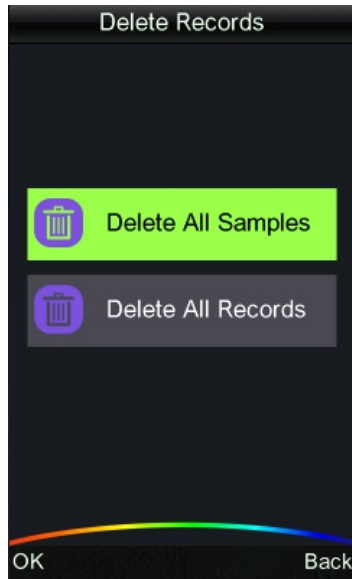
Figure 22 Delete Records

3.2White and Black Calibration

The white and black calibration is used as the datum for measurement of chromaticity data.It must be done accurately.Otherwise, the validity of the measured data will be affected.

It is recommended to make white and black calibration when the instrument is used for the first time, when the temperature difference environment changes substantially, when it is not used for a long time, or when the measurement data of the instrument is found to be inaccurate.

For white and black calibration methods, please refer to section 2.3.

3.3Tolerance Setting

On the main menu, select "Tolerance Settings" to enter the tolerance prompt setting interface, as shown in Figure 23.You can click "Up" or "Down" to set tolerance to "Off" or "On".
Select "Close" and press "OK" to disable tolerance prompt.After the tolerance prompt function is turned off, the measurement result judgment will not be prompted when the sample is measured.
Select "Open" and press "OK" to open the tolerance prompt and pop up the tolerance setting interface, as shown in Figure 24.
You can set the tolerance value on the tolerance setting page based on color management requirements.Click "Up" or "Down" to add or subtract the number where the cursor is located to the desired number.Press the "OK" key to move the cursor to the next digit.When the cursor is on the last digit, press "OK" to save the settings and return to the main menu interface.If you do not want to set or modify the tolerance, press The Back key to return to the main menu.
Tolerance setting is completed, in the sample measurement, the instrument according to the tolerance value set by the user, automatically judge the total color difference $\triangle E^*$ is qualified.If the total color difference $\triangle E^*$ value is less than the tolerance value is qualified, greater than the tolerance value is unqualified.
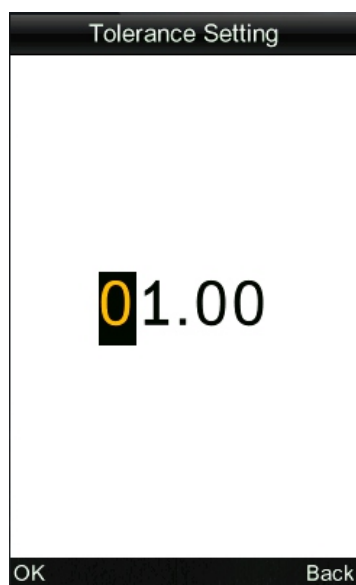
Figure 23 Tolerance prompt setting

Figure 24 Tolerance Setting

3.4Light Source

On the main menu, select Light Source Settings to enter the light source Settings screen.Light source selection window can select "D65", "D50", "A", "C" by "Up", "Down" key.Shown in Figure 25.Pressing the "OK" key will save your settings.The default light source of the instrument is D65. Some instruments only support D65.If you do not want to modify the settings, press "Back" to return to the upper-layer interface.

The selected light source is used to switch the light source during the measurement, as shown in Figure 26.Select D65 for light source in the measurement interface, and so on for other choices.

When using color management software to manage the instrument, the light source can be selected "Other" to achieve more light source selection.
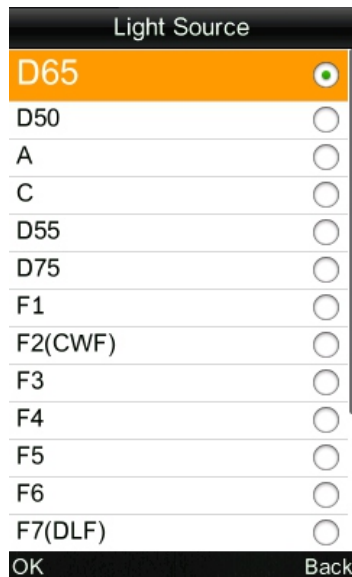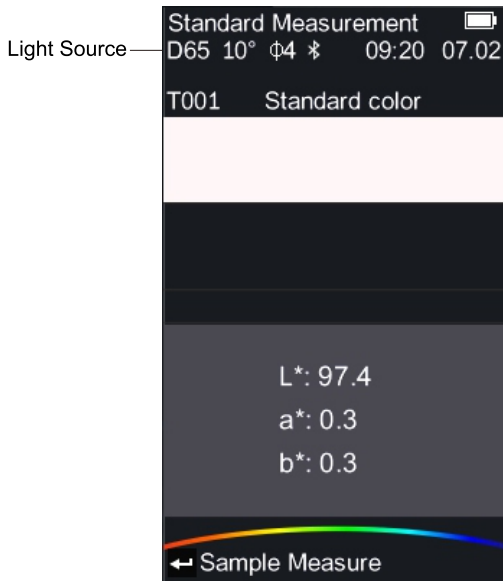

Figure 25 Light Source Setting

Light Source

Figure 26 Light Show

3.5Average Measurement

On the main menu, select "Average Measurement" to enter the average measurement setting screen.Users can set the average measurement times according to their needs.For the method of setting average measurement, refers to section 2.5.2.

3.6Instrument Settings

On the main menu, select "Instrument Setting" to enter the instrument setting interface.Instrument Settings include "Calibrate Mode", "Language", "Time Setting", "Restore Factory", and "About instrument".Shown in Figure 27.
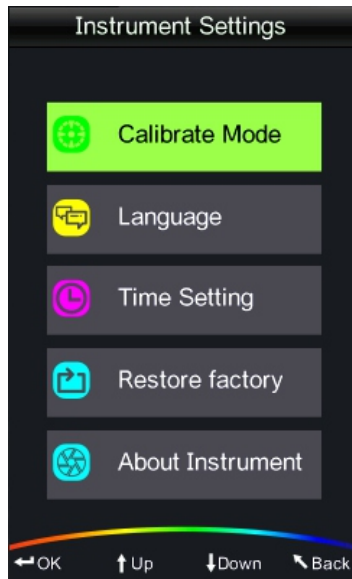
Figure 27 Instrument Settings

3.6.1Calibrate Mode

This instrument does not need to be forced to black and white calibration.It is recommended that black and white calibration be performed only when the instrument is used for the first time, when the temperature difference environment changes substantially, when it is not used for a long time, or when the measurement data of the instrument is found to be inaccurate.

Through the main menu "instrument Settings" in the "Calibrate Mode" for black and white calibration mode management.Shown in Figure 28.Through the "up", "down" key, can choose "Manual Calibrate", "Auto Calibrate".

If you select "Manual Calibrate", the user can manually correct the black and white according to the need.

If you select "Auto Calibrate" before starting up, align the measuring aperture with the whiteboard, and the instrument will automatically carry out white calibration when starting up.If the measuring aperture is not closely aligned with the whiteboard, the whiteboard calibration fails. You need to manually calibrate black and white again.

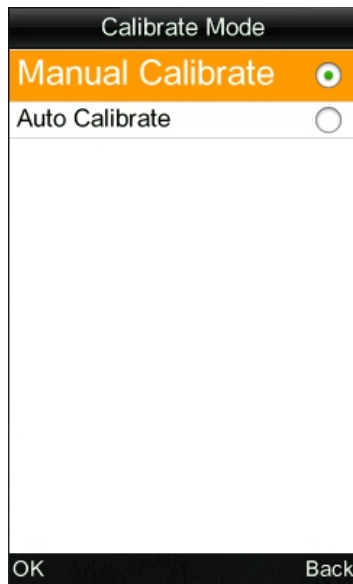For the method of black and white calibration, shown in section 2.3.

Figure 28 Calibration Mode Settings

3.6.2Language Settings

Select "Language Settings" from "Instrument Settings" to enter the language setting interface as shown in Figure 29.You can select a language by flipping "up" or "Down" as required.Press "OK" to save the Settings and return to the main menu.

Figure 29 Language Settings

3.6.3Date&Time

When the instrument leaves the factory, it is usually synchronized with the local time of the manufacturer.Users can also set the time of the instrument according to the actual situation.In the "Instrument Setting" interface, select "Date & Time" to enter the interface as shown in Figure 30.

After changing the time and date, the instrument will not automatically update the time, as shown in Figure 31.If you do not want to change the date and time, press the "Back".If you need to modify, press "OK" to enter the interface for setting time and date, as shown in Figure 32 and 33.Scroll "up" and "down" to select the time and date.After the Settings are complete, press "OK" to save the settings.You can also press the "Back" key to cancel the saving as required.
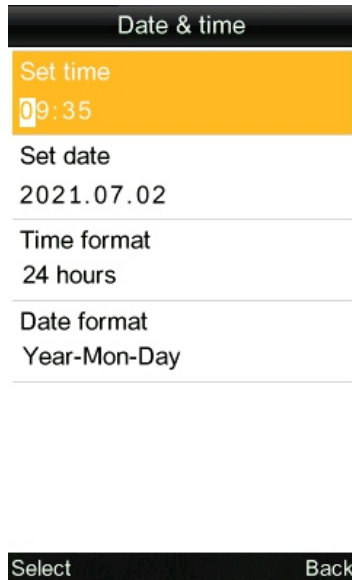

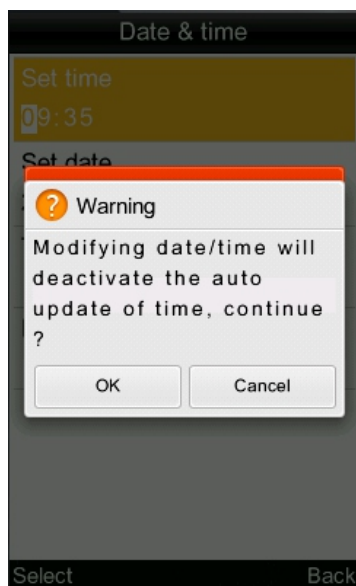Figure 30 Date & Time Settings

Figure 31 Modify Time/Date Prompts

Figure 32 Set Time

Figure 33 Set Date

To modify "Time Format" and "Date Format", click "Up" and "Down" to select a time and date format.After the Settings are complete, press "OK" to save the settings.You can also press the "Back" key to cancel the saving as required.Shown in Figure 34 and Figure 35.
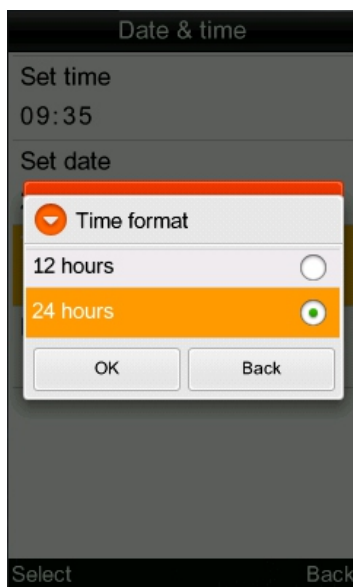
Figure 34 Time Format Settings

Figure 35 Date Format Settings

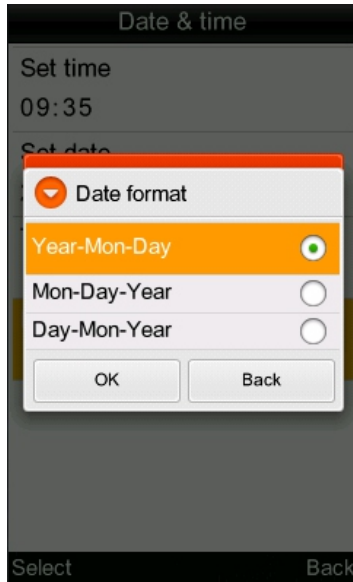### 3.6.4Restore Factory Settings

Select "Restore factory Settings" from "Instrument Settings" to enter the interface shown in Figure 36. Press "OK" to restore the instrument to the factory state and clear all records.
Note: This setting has a warning, please operate with caution!If you do not want to restore factory Settings, press the "Back".

Figure 36 The Warning of Restore Factory Settings

3.6.5About Instrument

Display the instrument model, current software version number and other information.

4.Daily Maintenance

1)This instrument is a precision optical instrument, please keep and use the instrument properly. Avoid using and storing the instrument in a humid, strong electromagnetic interference, strong light, and dust environment.It is recommended to use and store the instrument in a standard laboratory environment (temperature 20 ° C, 1 standard atmosphere, humidity 50 to 70%RH).
2)The white board is a precision optical element.To be properly stored and used, avoid using sharp objects knock against the working face, avoid using dirt dirty working face, avoid exposure to the white board under strong light.Clean the whiteboard working surface regularly with a wipe cloth dipped in alcohol.The dust of the working face should be disposed of in time when calibrating.
3)In order to ensure the validity of the measurement data, it is recommended that the whole instrument and whiteboard should be inspected by the manufacturer or a qualified metrology institute one year from the date of purchase.
4)Please do not disassemble and assemble the instrument without permission. If there is any problem, please contact the relevant after-sales staff. Tearing the easy-to-tear labels will affect the after-sales maintenance service of the instrument.

5.Technical Parameter

5.1Products Features

1)This instrument takes full account of the user's experience, and adopts the theme concept of humanized design to make the measurement simpler.
2)The original light spot positioning or cross platform positioning, convenient, fast and accurate.
3)This instrument starts without black and white correction, can directly enter the measurement, improves the convenience of using the instrument.
4)This instrument adopts a new photoelectric integrating sphere design, which greatly improves the repeatability accuracy and stability of measurement.
5)The instrument has a variety of technical specifications users can choose according to their needs.

5.2Technical Specifications

OpticalGeometry	8/D (8°illumination diffuse acceptance) SCI Comply with standard CIE No.15 GB/T 3978
Application	Used for color difference quality control in plastic electronics paint and coating textile and garment printing and dyeing ceramics and other industries.Find the color card through the mobile APP
IntegratingSphereSize	40mm
Light Source Device	360nm-780nm Combined LED Lamp
SpectroscopicMethod	Plane-Grating
Sensor	CMOS Sensor
SpectralRange	400~700 nm
Measurement Aperture	Φ4mm
Light-included Mode	SCI
Color Spaces	CIE LAB XYZ Yxy LCh CIE LUV s-RGB HunterLab βxy DIN Lab99 (Part of them are only implemented in APP)
Color difference formulas	△E*ab ΔE*uv ΔE*94 ΔE*cmc(2:1) ΔE*cmc(1:1) ΔE*00 DINΔE99 ΔE(Hunter) (Part of them are only implemented in APP)
OtherColorimetricData	WI(ASTM E313,CIE/ISOAATCCHunter) YI(ASTM D1925, ASTM 313) Mt(metamerism Index) Staining Fastness Color Fastness Color Strength Opacity 555 Index Munsell(C/2) Spectro Curve (Part of them are only implemented in APP)
Division Value	0.01
Observer	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	Chromaticity Values Color Difference Values Pass/Fail Result Color Simulation Color Offset
Measurement Time	About 1.2s
Repeatability	Chromaticity value: withinΔE*ab 0.05 (After calibration measure the average value of the whiteboard 30 times at 5s intervals)
Accuracy	Pass the national metrology
MeasurementMethod	Single measurement average measurement (2~99 times)

LocateMode	Light Spot Positioning
Size	205X67X80mm
Weight	About 500g
Battery Performance	Rechargeable Li-ion battery 3.7V @ 3200mAh
Life Lamp	More than 1.6 million measurements in 5 years
Screen	TFT true color 2.8inch@(16:9)
Interface	USB (charge only); Bluetooth 5.0 Button
Data storage	1000pcs standard samples 20000pcs samples storage can be extended through mobile APP
Data viewing	APP supports massive search;Device supports all data viewing
Languages	Simplified Chinese English
Operating Environment	Temperature: 0~40°C; Humidity: 0~85% (No Condensation) Altitude: less than 2000m
Storage Environment	−20~50℃ 0~85%RH (no condensation)
Standard Accessories	Power adapter manual MOBCCS APP software (download from official website Android platform) USB cable whiteboard box wrist strap Φ4mm flat aperture
Optional Accessories	USB Micro PrinterPowder test box
Note	Technical parameters are for reference only subject to actual product