SAUTER

Colour Spectrometer

JCS

JCS 100 / JCS 200

PROFESSIONAL MEASURING

English Version

Operating Instructions Colour Spectrometer

Version 1.1
2024-02
en
JCS-BA-e-2411

English

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Table of contents:

1 Technical data

SAUTER model	JCS 200	JCS 100
Optical Geometry	D/8 (diffuse illumination, 8-degree viewing angle), SCI/SCE mode (specular component included/specular component excluded), complies with CIE No. 15, GB/T 3978, GB 2893, GB/T 18833, ISO7724-1, ASTM E1164, DIN5033 Part7	
Characteristic	CMOS sensor with double beam splitting; used for quality control of colour differences in plastics technology, paints and inks, printing and dyeing of textiles and garments, printing, in the ceramics industry and in other industries for the measurement of fluorescence samples.	
Light Source	Combined full spectrum LED light source, UV light source	
Integrating Sphere Size	Φ40mm	
Sensor	CMOS sensor with double beam splitting	
Wavelength Range	400-700nm	
Measuring Aperture	JCS 200 two openings: MAV: Φ8mm/Φ10mm ; SAV: Φ4mm/Φ5mm	JCS 100 six apertures: MAV: Φ8mm/Φ10mm ; SAV: Φ4mm/Φ5mm ; LAV:1x3mm
Specular Component	SCI/SCE	
Colour Space	CIE LAB, XYZ, Yxy, LCh, CIE LUV, s-RGB, HunterLab, βxy, DIN Lab99	
Colour Difference Formula	ΔE*ab, ΔE*uv, ΔE*94, ΔE*cmc(2:1), ΔE*cmc(1:1), ΔE*00, DINΔE99, ΔE(Hunter)	
Colorimetric Index	Spectral reflectance, WI (ASTM E313, CIE/ISO, AATCC, Hunter), YI (ASTM D1925, ASTM 313), metamerism index Mt, colour fastness, colour fastness, colour strength, opacity, 555 tone classification, Munsell (C/2) (implementation of a mobile APP)	
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),U35,NBF,ID50,ID65	
Display	Spectrogram/values, colour sample values, colour difference values/graphics, PASS/FAIL result, colour simulation, colour offset	
Measuring Time	Approx. 1s	

Repeatability	Chromaticity: MAV/SCI, within ΔE*from 0.03 (After preheating and correction, the average value of the panel was measured 30 times in an interval of 5s); Spectral reflectance: MAV/SCI, standard deviation within 0.08% (400 nm to 700 nm: within 0.18%)	Chromaticity: MAV/SCI, within ΔE*from 0.02 (After preheating and correction, the average value of the panel was measured 30 times in an interval of 5s); Spectral reflectance: MAV/SCI, standard deviation within 0.08% (400 nm to 700 nm: within 0.18%)
Inter-instrument Error	MAV/SCI, within ΔE*from 0.3 (average for 12 BCRA Series II colour tiles)	MAV/SCI, within ΔE*from 0.2 (average for 12 BCRA Series II colour tiles)
Display Accuracy	0.01	
Measured Reflectance Range	0-200%	
Reflection Resolution	0.01%	
Measurement Mode	Single measurement, average measurement (2-99 times)	
Localisation Method	Position of the stabiliser	Position of the stabiliser + camera positioning
White Calibration Mode	Automatic contact calibration	Non-contact automatic calibration
Dimension	94X68X188mm	
Weight	270g	
Battery	Lithium battery, 3.7 V, 5000 mAh, 8000 cycles in 8 hours	
Mounting hole	M5 x 5 mm pitch 0.8 mm	
Illuminant Life Span	More than 1.2 million measurements over 10 years	
Screen	2.8-inch TFT true colour touchscreen, capacitive	
Interface	USB, Bluetooth®5.0	
Data Storage	Standard 500 pcs, sample 10000 pcs (one file can contain SCI/SCE); PC mass memory	
Software Support	Android, Windows	
Language	English, Chinese	
Operating Environment	0~40℃, 0~85%RH (no condensation), altitude < 2000m	
Storage Environment	-20~50℃, 0~85%RH (non-condensing)	

2 Declaration of Conformity

The current EC/EU Declaration of Conformity can be found online at
https://www.kern-sohn.com/shop/de/DOWNLOADS/

3 Overview of the device

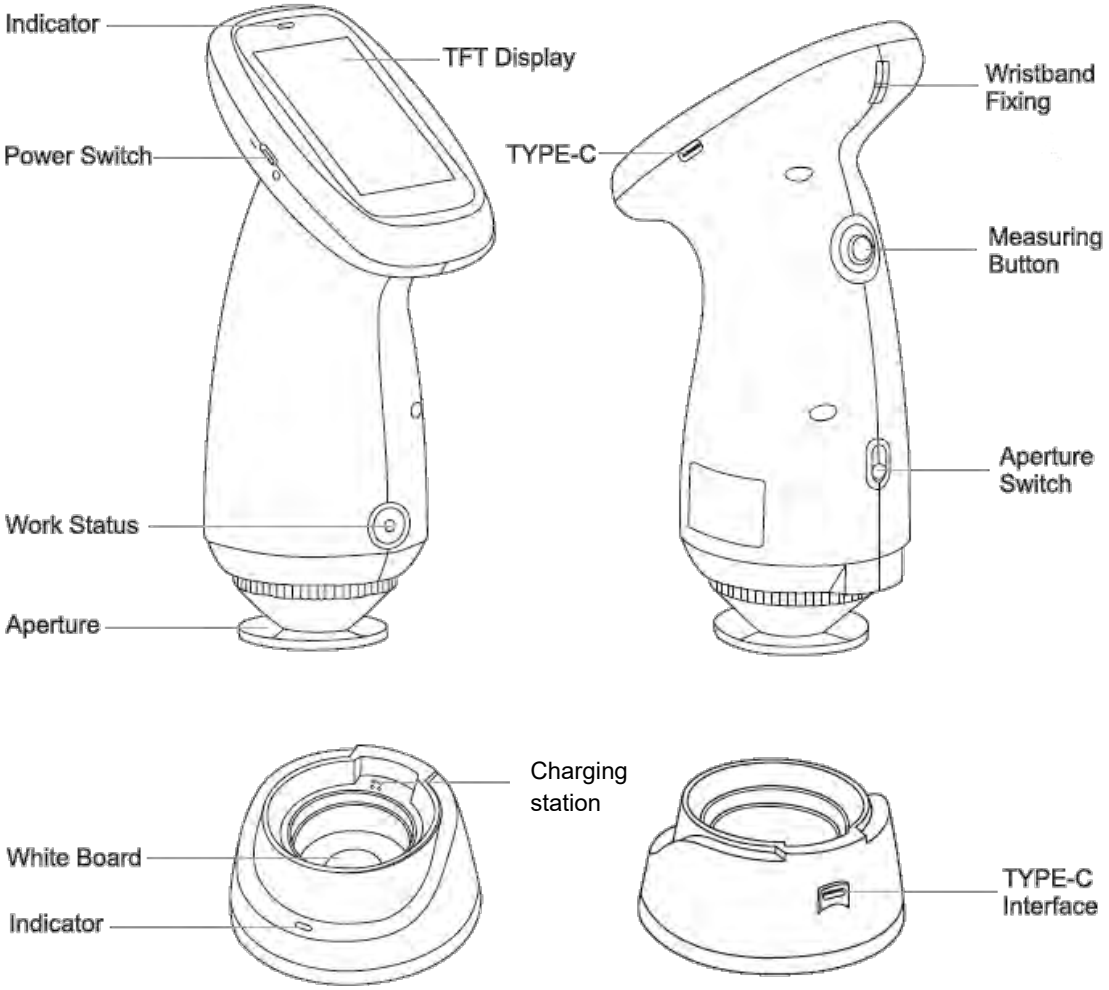
3.1 Scope of delivery

- Mains adapter
- USB cable
- Operating instructions
- SQCX PC software (download from the SAUTER website)
- App (download from the SAUTER website)
- Charging station with white and black calibration plate
- Protective cover
- Hand strap
- Fascia panels:

  JCT 100:
  MAV: Φ8mm/Φ10mm
  SAV: Φ4mm/Φ5mm
  LAV: 1x3mm

  JCT 200:
  MAV: Φ8mm/Φ10m
  SAV: Φ4mm/Φ5mm

3.2 Components



Description of the	Function
Power switch (mains switch)	Switch on/switch off
TYPE C interface (interface)	Communication with the PC and charging of the internal battery (5V/2A).
Measuring button	Starts the measurement
Aperture switch	Switching from SAV (4 mm lens diameter) to MAV (8 mm lens diameter)
Indicator (LED display)	➔ Red: Charge level low, below 20% ➔ Green: Charge level over 20% ➔ Yellow: Device docked in the charging station
Wristband fixing (wristband holder)	Option for attaching the wristband
Charging station	For charging the device, with integrated white board (white calibration plate)

4 Basic information (general)

4.1 General information on warning notices

Warnings are used in these operating instructions to warn you of possible personal injury or damage to property in certain situations.

Signal word	Description of the
DANGER	Failure to observe the instructions will lead directly to serious injury, permanent impairment (e.g. loss of a limb) or death of the user or third parties
WARNING	Failure to observe the instructions may result in serious injury, permanent impairment (e.g. loss of a limb) or death of the user or third parties
CAUTION	Failure to observe the instructions may result in minor injuries or temporary damage to the user or third parties (e.g. minor cuts)
NOTE	Failure to observe the instructions may result in damage to property

Symbols in warning notices:

Symbol	Meaning
Warning signs	Warning signs warn you of dangers that may lead to personal injury. The symbol indicates the type of hazard.
	Indicates general hazards or a danger point
	Warning of electrical voltage
	Warning of flammable substances
	Warning of explosive substances
	Warning of electrostatically sensitive assemblies

4.2 Intended use

Only use the precision measuring device to determine colour spectra and wavelengths. In order to use the device as intended, drastic changes in the external environment of the device should be avoided during the measurement, e.g. flickering of the ambient light and rapid temperature fluctuations. During the measurement, the device should

be kept stable, the measurement port should be close to the measurement object, and vibration and displacement should be avoided. Keep the instrument clean and tidy.
After use, place the appliance and its accessories in the appliance box and store it properly. The device should be stored in a dry and cool environment.
If you have any questions, please contact SAUTER or visit our website www.sauter.eu.

4.3 Improper use

The measuring device is not to be used for medical purposes.
Do not use the device in potentially explosive atmospheres or for measurements in liquids or on live parts. This device is not waterproof and cannot be used in environments with high humidity or water mist. Avoid the ingress of liquids, powders or solid foreign bodies such as water and dust into the measuring opening and the housing.
Unauthorised structural changes, additions or conversions to the device are prohibited. Unauthorised modifications may impair the accuracy of the device or even cause irreversible damage to the device.

4.4 Warranty

Warranty expires with

- Non-compliance with our specifications in the operating instructions
- Use outside the described applications
- Modifying or opening the device
- Mechanical damage and damage caused by media, liquids, natural wear and tear
- Improper set-up or electrical installation
- Improper assembly or electrical installation

5 Basic warnings and safety instructions

5.1 Observe the notes in the operating instructions

Read the operating instructions carefully before commissioning/using the appliance, even if you already have experience with SAUTER appliances. Always keep the instructions in the immediate vicinity of the appliance.

5.2 Staff training

The appliance may only be used by persons who have read and understood the operating instructions, in particular the chapter on safety.

5.3 Security

⚠ WARNING	
	**Read all safety information and instructions.** Failure to observe the safety information and instructions may result in electric shock, fire and/or serious injury. **Keep all safety information and instructions for future reference.** ● Make sure that there are never people or objects under the load, as they could be injured or damaged! ● The design of the measuring device must not be modified. This can lead to incorrect measurement results, safety-related defects and the destruction of the measuring device ● Do not operate the appliance in potentially explosive rooms or areas and do not install it there. ● Do not operate the device in an aggressive atmosphere. ● Do not immerse the appliance in water. Do not allow any liquids to penetrate the inside of the appliance. ● The device may only be used in a dry environment and under no circumstances in rain or at a relative humidity above the operating conditions. ● Protect the device from permanent direct sunlight. ● Do not expose the appliance to strong vibrations. ● Do not remove any safety signs, stickers or labels from the appliance. Keep all safety signs, stickers and labels in a legible condition ● Do not open the device

⚠ WARNING	
	**Risk of injury from electric shock!** ● There is a risk of short circuit due to liquids penetrating the housing! ● Do not immerse the appliance and accessories in water. Ensure that no water or other liquids get into the housing. ● Work on electrical components may only be carried out by an authorised specialist company!

⚠ WARNING

Choking hazard!
Do not leave the packaging material lying around carelessly. It could become a dangerous toy for children.
● The appliance is not a toy and does not belong in the hands of children.
● This appliance can be dangerous if it is used improperly or not as intended by untrained persons! Observe the personnel qualifications!

⚠ WARNING

Electrostatic sensitive device!
● The device can be destroyed by electrostatic discharge. Connectors for HF signals are particularly at risk.
● Please observe the handling instructions for electrostatically sensitive components.

⚠ WARNING

Improper use of rechargeable or non-rechargeable batteries can cause them to catch fire, explode, emit toxic vapours or release corrosive liquids. The following therefore applies to rechargeable and non-rechargeable batteries:
● Protect from fire and heat.
● Never expose to high pressure or microwaves.
● Do not bring into contact with liquids or chemicals.
● Never bring the electrical contacts of rechargeable batteries and batteries into contact with metal objects or short-circuit them.
● Never modify rechargeable batteries, batteries and chargers.
● Batteries must never be charged.
● Never use or charge a defective, damaged or deformed battery.
● Do not use any other power supply units that do not comply with the technical specifications. Doing so may shorten the battery life or even cause an electric shock, which may damage the appliance or cause a fire.
● If the appliance is not used for an extended period of time, the external power supply should be disconnected to prevent the appliance from burning and causing a fire.
● If you do not use the device for a long time, you should charge it every fortnight, otherwise the internal battery is easily damaged, making it impossible to use the device again

CAUTION

● Keep a sufficient distance from heat sources.
● Do not use the device in environments with high humidity or water mist.

NOTE

● To prevent damage to the device, do not expose it to extreme temperatures, extreme humidity or moisture.
● Do not use harsh cleaning agents, abrasive cleaners or solvents to clean the appliance.

6 Transport and storage

Note

If you store or transport the device improperly, the device may be damaged. Observe the information on transporting and storing the appliance.

Transport

When transporting the appliance, use the transport case included in the scope of delivery to protect the appliance from external influences.

Storage

Observe the following storage conditions when the appliance is not in use:

- dry and protected from frost and heat
- protected from dust ingress in the transport case
- the storage temperature corresponds to the technical data

Packaging/return transport

Returns are only possible within the limits of the general terms and conditions Keep all parts of the original packaging for any necessary return transport.

- Only the original packaging is to be used for return transport.
- Disconnect all connected cables and loose/movable parts before despatch.
- Refit any transport locks provided.
- Secure all parts against slipping and damage.

7 Unpacking and commissioning

7.1 Unpacking

In the event of a return, please observe the instructions in the chapter "Packaging/return transport

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On receipt of the appliance, you should first check that no damage has occurred during transport, that the outer packaging, the housing, other parts or even the appliance itself have not been damaged. If any damage is evident, please notify SAUTER GmbH immediately.

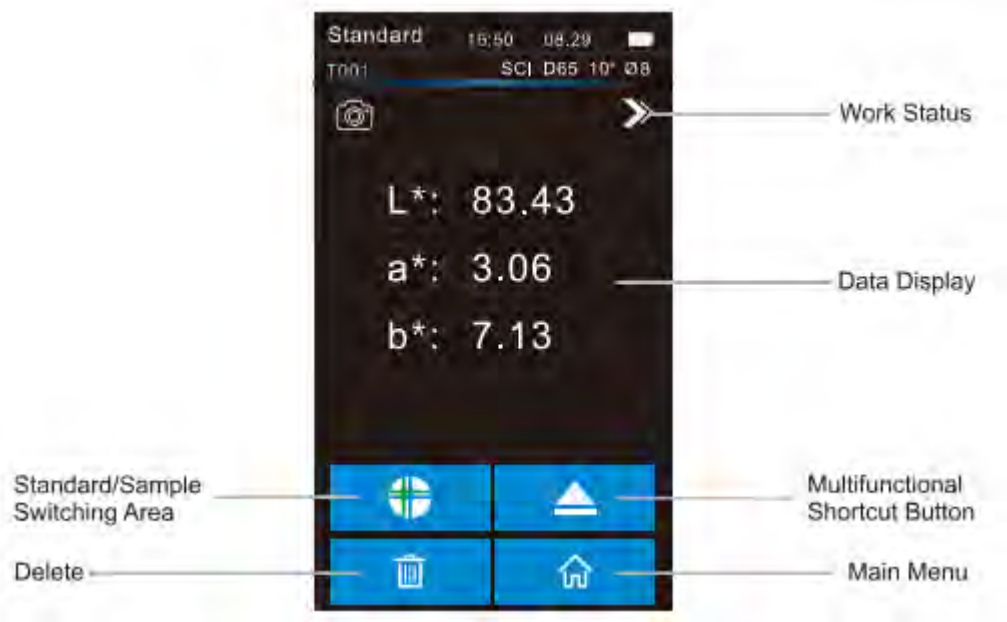
7.2 Initial commissioning

To ensure the function of the measuring device, it must be fully charged in the charging station using the mains adapter supplied before use.

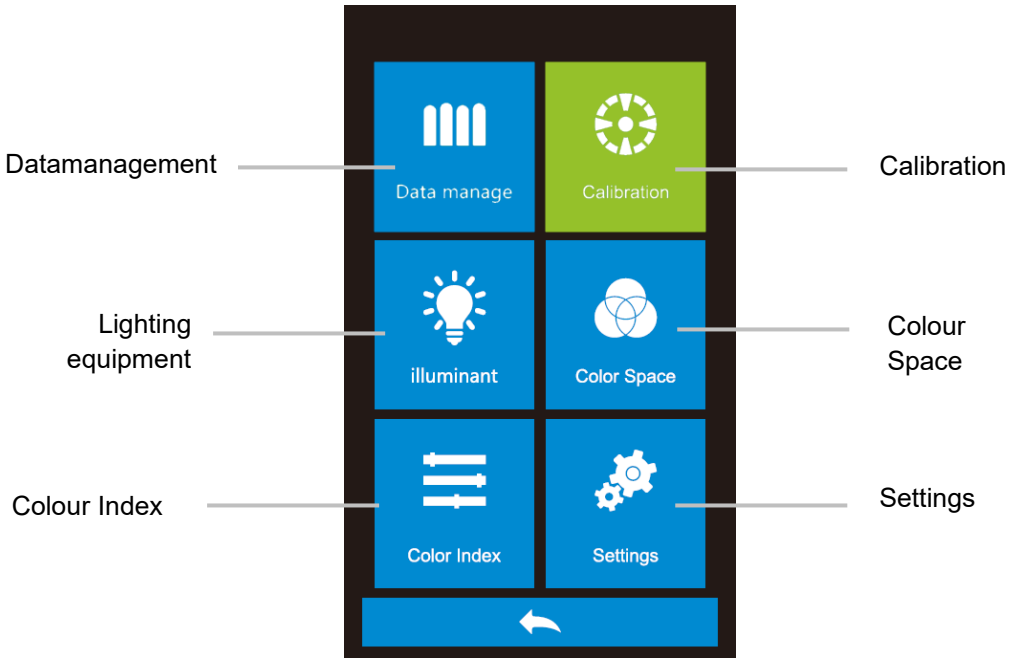
8 Menu

8.1 Navigation in the menu

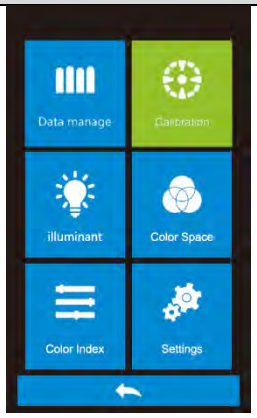
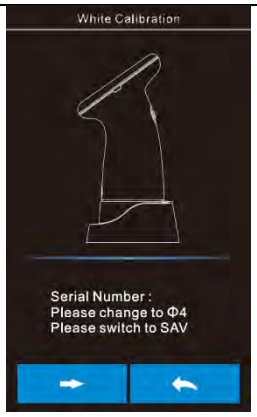
After switching on the device, the start screen is displayed and leads to the measurement screen:



To open the main menu, click on the button. You can access the other menus via the main menu:



9 Black/White Calibration

Black/White Calibration	
Click Calibration in the main menu to open the black and white calibration menu	
The number of the whiteboard and the aperture used are shown in the user interface is displayed. Align the measuring aperture with the panel and press it firmly. Once you have set the number of the panel and the measuring aperture correctly, press the ➡ button or the "Measure" button to start the white calibration.	
The message "On calibrating, please waiting" appears on the user interface and the display turns yellow. When the white calibration has been completed correctly, the system automatically switches to the black calibration menu. If there are any problems with the white calibration, a corresponding display window will appear. Click on the ➡ button or press the "Measure" button to perform the black calibration of the device, whereupon the words "On calibrating, please waiting" appear on the screen and the display turns yellow. If the black calibration is correct, the device automatically switches to the main menu. If problems occur during black calibration, a corresponding display window will appear.	 

10 Basic operation

10.1 Standard measurement

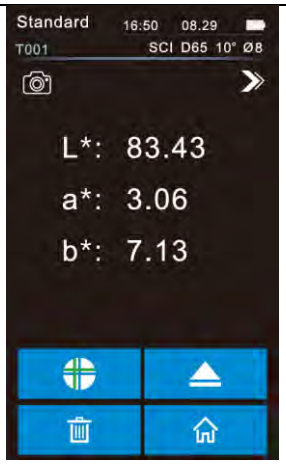
The measurement is divided into standard measurement and sample measurement. The standard measurement is generally used to measure the chromaticity data of the target sample, while the sample measurement is used to measure the colour difference or contrast chromaticity data between the sample and the target sample.

After the device is turned on and the black and white calibration is correct, the measurement can be performed (customers can set the corresponding light source, colour space and colour index in the main menu interface as required).

If you are not in the measurement interface, you can click the button on the interface to return to the measurement interface.

Note: The standard colour space of the system is CIE lab, the colour difference formula is ΔE*ab, and the colour index is CIE1976

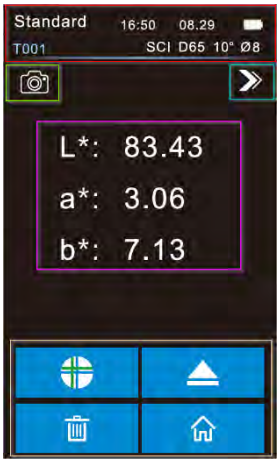
Point the sample to be measured at the measuring opening of the device and press firmly. Press the measurement button lightly, the LED display changes from yellow to green, indicating that the measurement is complete.

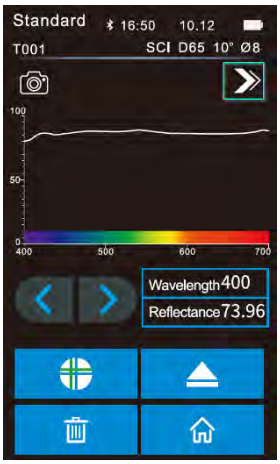
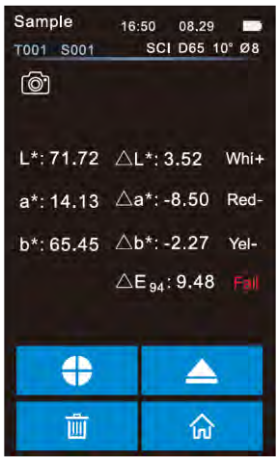
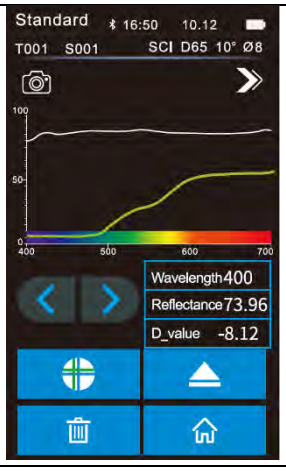


In the areas marked in red you will find information about:

- Standard or sample measuring mode
- Bluetooth status
- Clock
- Month/day
- Battery status
- Sample number, starting with "T000".
- Measurement mode
- Lighting equipment
- Observer angle
- Size of the aperture

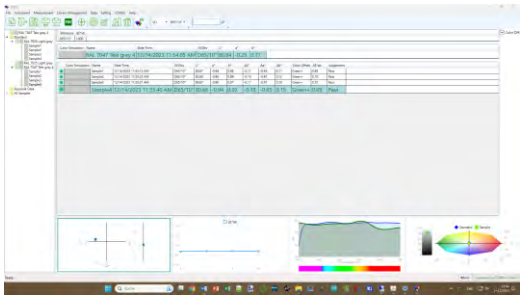
Green-marked area:
Taking pictures



Pink-marked area: Display of the measured chroma data according to the selected colour space	
Orange-marked area: • Multifunctional shortcut button • Main menu • Delete Standard/pattern switching range	
Area marked in light blue: Switch the display to the reflectivity display. You can use the wavelength change button to move the measuring point, click on the button  , and the reflectance of the currently measured sample and the wavelength of the light are changed at intervals of 10nm	
Sample measurement screen interface, including the sample name (SXXX), chroma value of the sample, colour difference value, colour deviation and measurement result	
Reflectance: Difference between the measurement sample and the selected standard. You can use the wavelength change button to move the measuring point, click on the button  , and the reflectance of the currently measured sample and the wavelength of the light are changed at intervals of 10 nm	

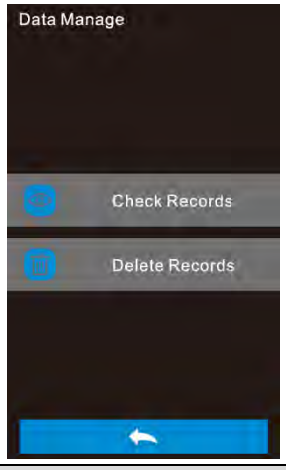
10.2 PC communication

USB or Bluetooth:
If the client program is installed on the PC, the connection between the device and the PC via USB data cable is automatically recognised. If the connection is successful, the end device can be fully controlled via the software and the corresponding samples can be tested and analysed.
If the APP is installed on the mobile phone, switch on the "Bluetooth" option in the "System settings" of the device and connect the APP to the device. After successful synchronisation, the APP uses the Bluetooth connection mode and the Bluetooth connection is successful. The software takes over the overall control of the end device, tests and analyses the corresponding samples.



10.3 Data Manage

Click on Data manage in the main menu. Data management is mainly used to check and operate the measured data records.

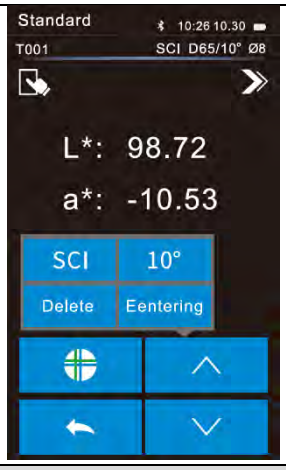


10.4 Check Records

Click on Check Records in the data management to enter the standard record. Note: The device displays two decimal places when the chromaticity value of the standard record is checked.

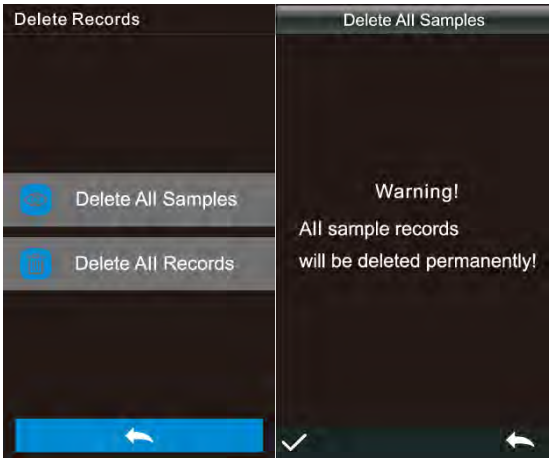
Click on to check the next data record and on to check the previous data record.

Click on to perform operations: SCI, 10, delete data records and import standard samples.



10.5 Delete Records

Click Delete Records in the data management interface. Delete Records is divided into Delete All Records and Delete All Samples. Click on the corresponding option, then the warning message for deletion will appear, now click on " " to delete all corresponding data records. To cancel the process, click on " ".



10.6 Lighting equipment

Click on "Lighting" in the main menu to open the light setting interface.

The user sets the corresponding light source according to the actual measurement conditions. In the lighting interface, you can set the standard observation angle, the standard light source type and the UV light source (different device types have different configurations) of the system. Click on the observer angle to switch between 10 and 2 (°). Here, 10 corresponds to the CIE1964 standard and 2 to the CIE1931 standard. Click on the UV light source to switch on the UV light source. It is recommended to switch on the UV light source if you are testing fluorescent samples and to switch off the UV light source if you are testing normal samples.	
Click on the light source, the following options are available here: D65, D50, A, C, D55, D75, F1, F2(CWF), F3, F4, F5, F6, F7(DLF), F8, F9, F10(TPL5), F11(TL84), F12 (TL83).	

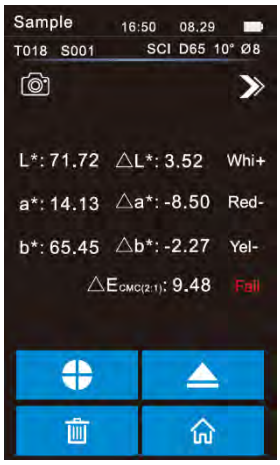
10.7 Colour Space

Click on "Colour space" in the main menu. Select the appropriate colour space to complete the colour space setting. The colour options include CIE LAB, XYZ, Yxy, LCh, CIE LUV, s-RGB, HunterLab, etc. The selection depends on the model options.

10.8 Colour Index

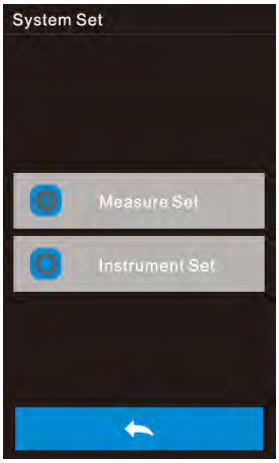
Click on "Colour index" in the main menu to open the colour index window. Let's take the setting of the "Colour difference formula" as ΔE*00 as an example for a detailed explanation.
Colour index interface, colour difference formula options are: ΔE * ab, ΔE * UV, ΔE * 94, ΔE * CMC (2: 1), ΔE * CMC (1: 1), ΔE * 00, ΔE (Hunter).

Calculation of the colour difference with ΔE CMC (2:1)



10.9 System Set

Click System Set in the main menu. These include the measurement settings and the device settings.

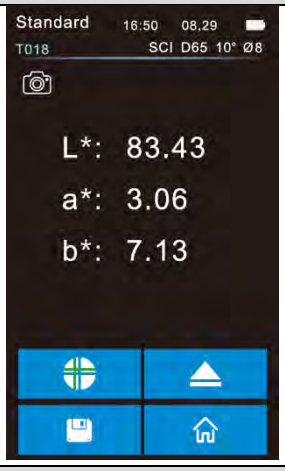


10.10 Measure Set

Click "Measure Set" in the system settings to open the measurement settings interface. The settings include automatic measurement storage, aperture selection, Bluetooth, simple mode, measurement mode, display setting, tolerance setting, average measurement, pressure setting and other options. You can check and select various setting options

10.11 Save action

If the automatic storage of measured values is switched on, each test sample is automatically stored in the device; otherwise the data set is not automatically saved after the test of the sample is completed, but only after manually clicking on the save icon 



10.12 Orifice plate

This device series is equipped with a Ø 8mm orifice plate and a Ø 4mm orifice plate, and different Ø 1*3 orifice plate models are equipped with different orifice plates. When the measured surface area of the sample is large and uniform, it

is recommended to use the Ø 8mm orifice plate, and when the measured surface area of the sample is small, it is recommended to use the Ø 4mm or Ø 1*3 orifice plate. Switching the orifice plate (Ø8mm/Ø4mm/Ø1x3) must be done in three steps:

Step 1:

Insert the orifice plate, turn the orifice plate anti-clockwise and remove the original orifice plate. Align the orifice plate to be installed with the mounting hole of the integrating sphere and turn it clockwise. If a "click" is heard, this means that the orifice plate is well aligned with the buckle position of the integrating sphere, i.e. the orifice plate to be installed is in place.

Step 2:

Switch the position of the optical lens. If the mounted Ø8mm aperture is used to measure the aperture, you must set the aperture switch to the MAV position; if it is a Ø4mm measuring aperture, set the aperture switch to the SAV position; if the mounted Ø1*3 aperture is used, you must set the aperture switch to the SAV position.

Step 3:

Switch the aperture setting in the device software and set the aperture manually. Corresponding Ø8mm l Ø4mm l Ø3 orifice plate.

Note: The size of the measuring aperture, the position of the optical lens and the aperture setting of the software must match to ensure accurate test results. Ø1x3 aperture, the corresponding position of the optical lens is SAV, and the software indicates that it is 1*3; Ø4mm diameter, the corresponding position of the optical lens is SAV, and the software indicates Ø4mm; Ø8mm aperture, the corresponding position of the optical lens is MAV, and the software indicates Ø8; There is a corresponding indicator in the status bar of the test interface.

Note: After switching the measuring aperture, the black/white calibration must be carried out again before a new data test can be performed.

10.13 Bluetooth

For products equipped with Bluetooth, you can choose whether you want to communicate with the PC software via Bluetooth.
When Bluetooth is switched on, the Bluetooth symbol is displayed in the status bar. If the client programme is installed on the PC, switch Bluetooth on in the "System settings" of the device and connect the computer to Bluetooth. After successful synchronisation, the software will use Bluetooth connection mode to establish a connection and a message will appear in the bottom right corner of the software indicating that the connection via Bluetooth is successful.

10.14 Simple mode

After the simple mode has been switched on, go back to the measurement page for the standard measurement. After the standard measurement, the device automatically switches to sample measurement mode.

10.15 Measuring mode

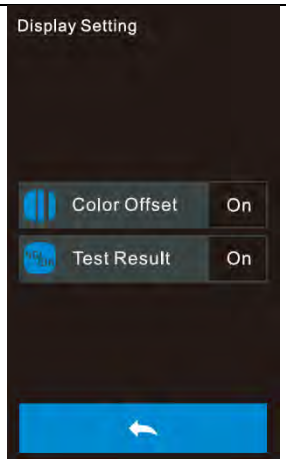
SCI includes the specular reflection measurement mode, SCE excludes the specular reflection measurement mode. In this device, the SCI/SCE test mode is switched by the traditional way of setting mechanical optical traps. In SCI measurement mode, the motor drives the paddles to block the mechanical optical traps, and in SCE measurement mode, the paddles are opened. In standard measurement, the device automatically performs SCI and SCE measurement, and the test time is about 3 seconds. When measuring the sample, the device measures according to the measurement mode set by the customer. The customer can set the measurement mode as SCI, SCE or I+E according to the needs of the measurement products, and some models only have some options. I+E is the SCI+SCE mode. The measurement time of SCI/SCE alone is about 1.5 seconds, and the simultaneous measurement of SCI+SCE takes 3.2 seconds. When the current measurement mode of the device is SCI (SCI is displayed in the working status area), the device only checks the SCI data of the sample; when the display mode is set to SCE, the corresponding chromaticity data is displayed as "-", and the spectral data and colour index are not displayed.

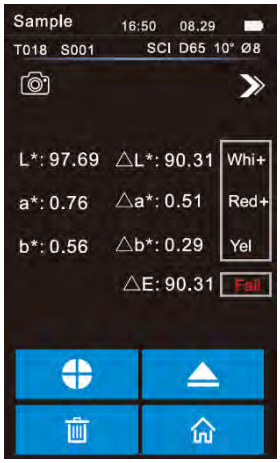
10.16 Display Setting

Click on Display Settings in the main menu. Here you can set whether the colour deviation and the display of the test results should be activated. If the colour deviation is switched on, the colour deviation of the sample	

compared to the standard is displayed when the sample is measured; if it is switched off, no display is shown.

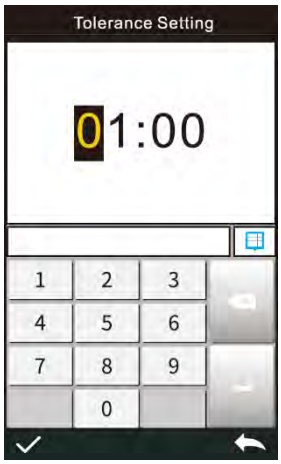
If the test result display is switched on, the message "unqualified" is displayed during the sample measurement if the test result exceeds the tolerance range defined by the standard sample; if the sample error is within the tolerance range of the standard sample, the message "qualified" is displayed.

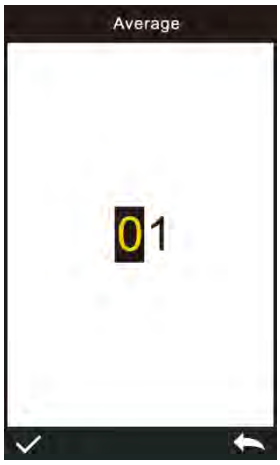




10.17 Tolerance Setting

Select "Tolerance setting" in the measurement setting to call up the setting for the tolerance query. The user can set the tolerance values in the tolerance setting according to the colour management requirements. After selecting the number to be changed, the numeric keypad will be displayed. Press the "✓" to move the cursor to the next digit. When the cursor is on the last digit, press the "✓" button to save the setting and return to the measurement setting. If you do not want to set or change the tolerance, press the "↩" button to return to the main menu. When the tolerance setting is completed, the device



automatically judges whether the total colour difference ΔE* is qualified according to the tolerance value set by the user during sample measurement. If the value of the total colour difference ΔE is less than the tolerance value, it is qualified; if it is greater than the tolerance value, it is not qualified.	
10.18 Average	
If the sample to be measured is relatively large or not very uniform, the average reflectance of multiple points can be obtained by measuring a large number of representative test points. Then the calculated chromaticity data can better represent the true chromaticity value of the sample to be measured, and the device can perform a 2-99 average measurement. Click on Average in the main menu, where you can set the average measurement times. Then enter the average number of measurements and click on "✓" to confirm. If the average number of entries is 1, measure in the conventional way; if it is greater than 1, the measurement results will be averaged according to the specified number of measurements during the standard and sample measurement.	
10.19 Print Setting	
The microprinter is not a standard accessory and must be purchased separately. Use a USB printer or a Bluetooth printer to print out the current measurement report (some models).	

The "Print setting" is switched off by default in the "System settings" of the main menu. If you need to print, you can switch on the corresponding printer.

Use USB printer:
The user can connect the microprinter to the device via USB. Once the microprinter has been connected to the device via USB, it can perform the measurement and printing process on the measurement interface. The device sends the current measurement data to the printer and the printer finishes the printing process.

Use Bluetooth printer:
Similar to the USB printer, the user can first connect the device to the microprinter and print on the measurement interface during the measurement. The device sends the data of the current measurement data set to the printer and the printer completes the printing process.

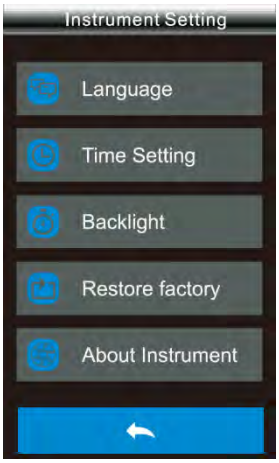
Steps for using a Bluetooth printer:

1. Start the Bluetooth printer
2. Go to the system setting Print→ Bluetooth printer setting.
3. Enter the MAC address on the back of the Bluetooth printer in BLE mac, with a fixed length of 12 characters (e.g. "4CE173C3FOOE"), and the MAC address will be saved automatically.
4. Click on Connect printer

Once the Bluetooth printer is connected, you can print during the measurement.

10.20 Instrument Setting

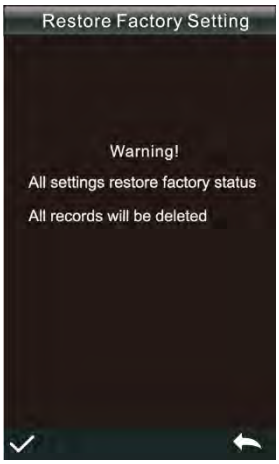
Click on "Instrument Set" in the system settings to call up the device settings.
The device settings include the language selection, the time setting, the time for the screen backlight, the factory setting and device-related options. You can check and select various setting options



10.21 Restore Factory Setting

Click on "Restore factory settings" in the system settings to call up the interface. Click on "✓". Instruments to delete all measurement records and customer settings and restore the factory settings; click on"↩" to cancel this process.

Note: The operating device deletes all data and user settings and is reset to the factory settings. All data cannot be restored. Please operate the device with caution.



11 Battery operation / power supply

⚠ WARNING

Risk of fire and explosion due to incorrect charging or defective battery

Fire or explosion can lead to serious injuries

- ⇨ Be sure to observe the notes on rechargeable batteries and batteries in the Safety chapter.
- ⇨ Observe the national and international transport regulations for devices with a permanently installed lithium-ion battery.
- ⇨ Do not replace defective batteries yourself! Contact SAUTER or a specialist dealer directly.

This device is equipped with a built-in rechargeable lithium-ion battery. Please use the original battery and do not replace any other batteries to avoid damage to the device or other failures.

- Nominal voltage 3.7 V
- Capacity 3200 mAh

The battery should be fully charged before first use. Use the mains adapter supplied for this purpose.

12 Interfaces

The device has a USB and Bluetooth® 5.0 interface.

12.1 USB-C

The device's USB-C interface is a general interface that can be used to connect and communicate with the PC, with the device automatically assessing the connection; it can also be used to connect printers.
The USB-C interface on the base is a charger that can be used to charge the device (5V===2A).

Note: Two USB-C interfaces cannot be connected to the data cable for charging at the same time!

12.2 Bluetooth®

Devices equipped with a Bluetooth module can communicate with the PC via Bluetooth.
If the client programme is installed on the PC, enable the Bluetooth option in the device's system settings and connect the computer to Bluetooth. After successful matching, the software will be connected in Bluetooth connection mode, and the Bluetooth icon will appear in the lower right corner of the software, indicating that the connection via Bluetooth is successful. Then the comprehensive control of the terminal device can be carried out through the software, and the corresponding samples can be tested and analysed.
The corresponding app can be downloaded from the SAUTER website. If the app is installed on the mobile phone, switch on the "Bluetooth" option in the "System settings" of the device and connect the app to the device. After successful synchronisation, the Bluetooth connection is successful. The software takes over the overall control of the end device, tests and analyses the corresponding samples.

13 Maintenance, servicing and disposal

Disconnect the appliance from the power supply before carrying out any maintenance, cleaning or repair work.

13.1 Cleaning

Clean the device with a damp, soft, lint-free cloth. Ensure that no moisture penetrates the housing. Do not use sprays, solvents, alcohol-based cleaners or abrasive cleaners, only clear water to moisten the cloth.

13.2 Maintenance and repair

Do not make any changes to the appliance and do not install any spare parts. Contact the manufacturer for repair or device inspection.

13.3 Waste disposal

Old appliances and accessories should not be disposed of with household waste.

The operator must dispose of the packaging and appliance in accordance with the applicable national or regional legislation at the place of use.

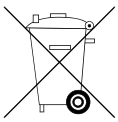
The device consists of various components and materials, such as

- Electronic components (circuit boards, electrical cables)
- Plastic (housing)
- Metal

Improper disposal of the appliance can have harmful effects on people and the environment.

Proper and environmentally friendly disposal can prevent harmful effects and recover raw materials.

Disposal of rechargeable batteries and batteries:



Rechargeable batteries and batteries do not belong in household waste.

The disposal of rechargeable batteries and batteries must be carried out by the operator in accordance with the applicable national or regional law of the place of use.

14 Battery law

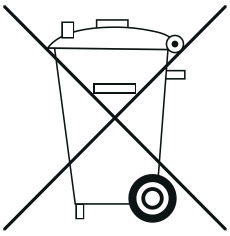
Note in accordance with the Battery Act - BattG:

INFORMATION

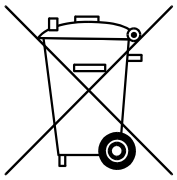
- The following information is valid for Germany.

In connection with the sale of batteries and rechargeable batteries, we are obliged as a dealer under the Battery Act to inform end users of the following:

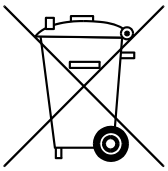
- End users are legally obliged to return used batteries and rechargeable batteries.
- After use, batteries and rechargeable batteries can be returned free of charge to municipal collection centres or retailers. The batteries/rechargeable batteries must have reached the end of their normal service life, otherwise precautions must be taken against short circuits.
- The return option is limited to batteries and rechargeable batteries of the type that we carry or have carried in our range and to the quantity that end consumers usually dispose of.
- A crossed-out wheelie bin means that you must not dispose of batteries or rechargeable batteries in household waste. Old batteries or rechargeable batteries may contain harmful substances that can damage people and the environment if not disposed of correctly.



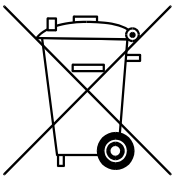
- Batteries containing harmful substances are labelled with a symbol consisting of a crossed-out dustbin and the chemical symbol (Cd = cadmium, Hg = mercury, or Pb = lead) of the heavy metal that is decisive for the classification as containing harmful substances.



Cd



Hg

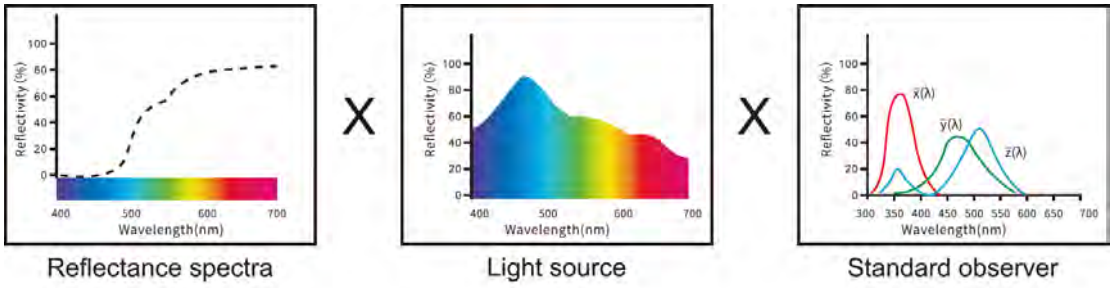


Pb

15 Appendix

15.1 Colour

When observing colours, there are three elements: light source, object and observer. Changes in one of these three elements affect the viewer's perception of colour. If the light source and the observer do not change, the object determines the observer's perception of colour. The reason why an object can influence the final colour perception is that the reflection spectrum (transmission spectrum) of the object changes the spectrum of the light source. Different objects have different reflection spectra (transmission spectra). (Spectrum) modulation to obtain different results because the observer does not change, so it presents different colours, the principle is shown in the figure below.



15.2 Colour difference formula

CIE 1976 ΔE*ab

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

$$\Delta L^{*} = L_1^{*} - L_0^{*}$$

$$\Delta a^{*} = a_1^{*} - a_0^{*}$$

$$\Delta b^{*} = b_1^{*} - b_0^{*}$$

CIE 2000 ΔE00

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

$L' = L^*$

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

$b' = b^*$

CIE 2000 ΔE00

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

$S_L = 1$

$S_C = 1+0.045\, C^*_{ab}$

$S_H = 1+0.015\, C^*_{ab}$

15.3 Colour offset assessment

- Al+ stands for whitish, Al- for blackish
- Aa+ stands for reddish, Aa- for greenish
- Al+ stands for yellowish, Al for bluish

15.4 Colour difference perception

The colour difference unit of the NBS is derived from the unit of the colour difference calculation formula established by Judd-Hunter. The colour difference of a colour is referred to as the "NBS colour difference unit" if the absolute value is 1. The new colour difference formulas developed later have often deliberately adapted the units so that they come close to the NBS units. For example, the units of colour difference formulas such as Hunter Lab and CIE LAB, CIE LUV are almost the same as the NBS units (not the same). Therefore, do not misunderstand that the colour difference units calculated by other colour difference formulas are all NBS units.