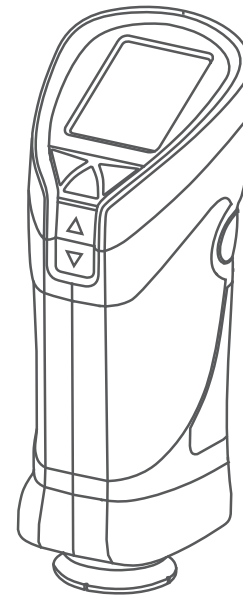




Spectral Colorimeter
INSTRUCTION MANUAL
CS-280/280+/286/288



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Terms for use

1. The subject instrument of this manual is referred to as “Spectral colorimeter” in this manual.
2. This “black cavity” and “white board” mentioned in this manual is matching with instrument, used for calibration.
3. Keep away from the electromagnetic radiation when the instrument is working.
4. The L、A、B、C、H mentioned in this manual is L*, a*, b*, C*, h.

Notes

1. The color reader is a precise instrument, cannot afford to collisions in drop. Please place it at a smooth plane.
2. This instrument is not moisture proof or water resistance, it may be damaged if liquid splashed into it.
3. The screen of this instrument is made of glass; it is easily damaged by outside force.
4. Use the original power adapter.
5. Please do not place or use this instrument in a cold or hot environment, not place this instrument in a humid or direct sun light environment, or not use this instrument in strong vibration or other harsh environment.
6. In order to ensure the accuracy of test, please check batteries carefully first.
7. The color reader is a precise instrument. Please keep away from the electromagnetic radiation when the instrument is working.
8. Avoid testing on uneven surfaces.
9. Keep the instrument balance when working.
10. The instrument should be put closely on the sample surface.
11. Please put the instrument into the soft bag after using.
12. The information contained in this document is subject to change without notice.

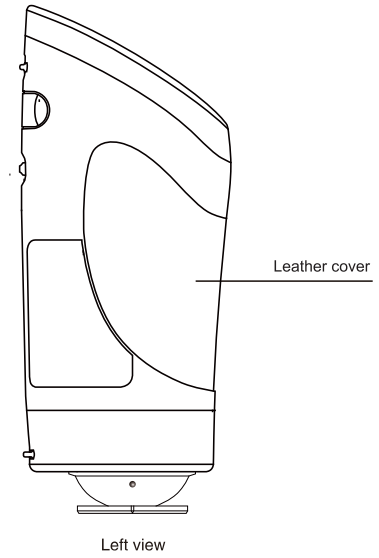
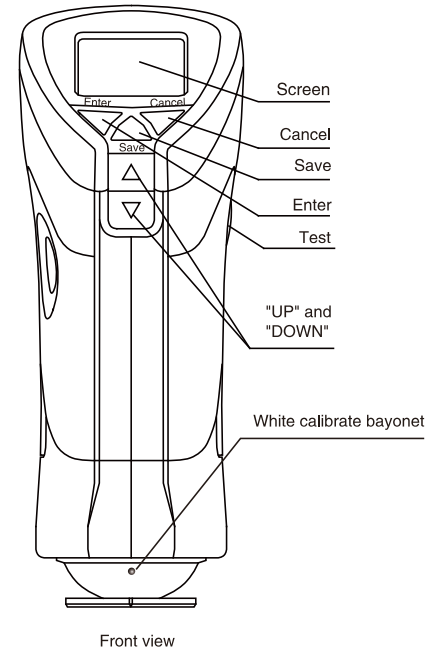
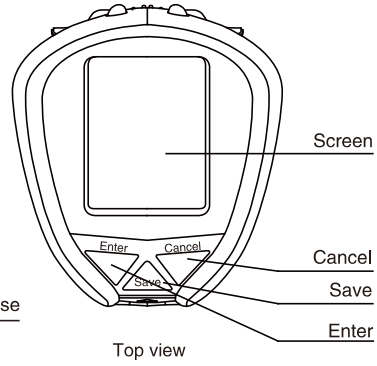
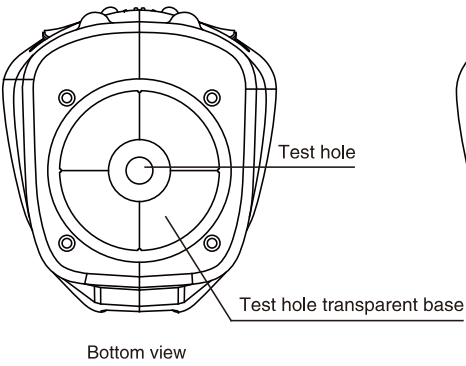
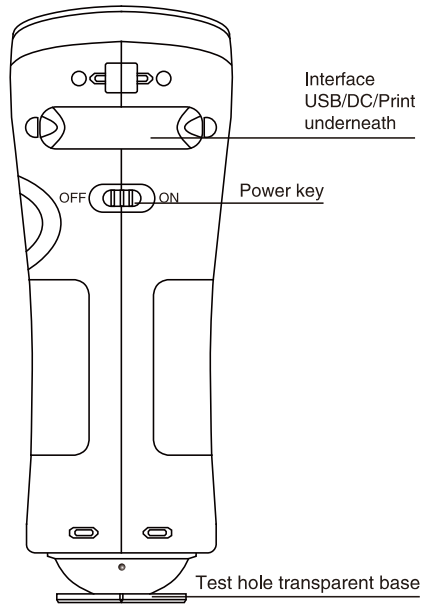
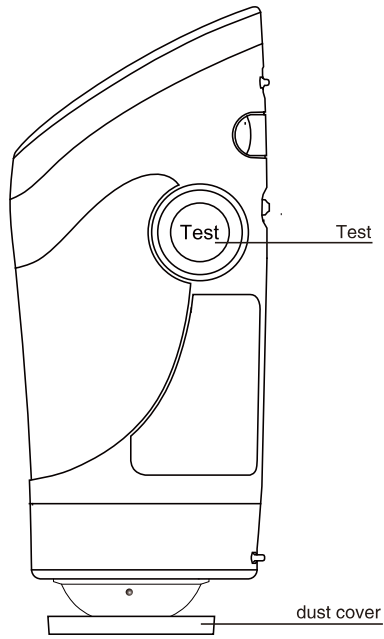
Instrument functions

1. Display color values by Lab, XYZ, RGB, $\Delta L^*a^*b^*$ 、 ΔL^*C^*h , display the difference values of sample and tested item by ΔE^*ab 、 ΔL^* 、 Δa^* 、 Δb^* 、 ΔC^* 、 Δh , browse Yxy color space figure and display Yellow and White values.
2. Use humanized design, friendly graphical user interface.
3. 20000 test records storage, data storage structure: 100 samples, and 200 data groups for each sample.
4. Data browse.
5. Signs for low battery and full memory.
6. USB communication.
7. Connecting with micro printer.

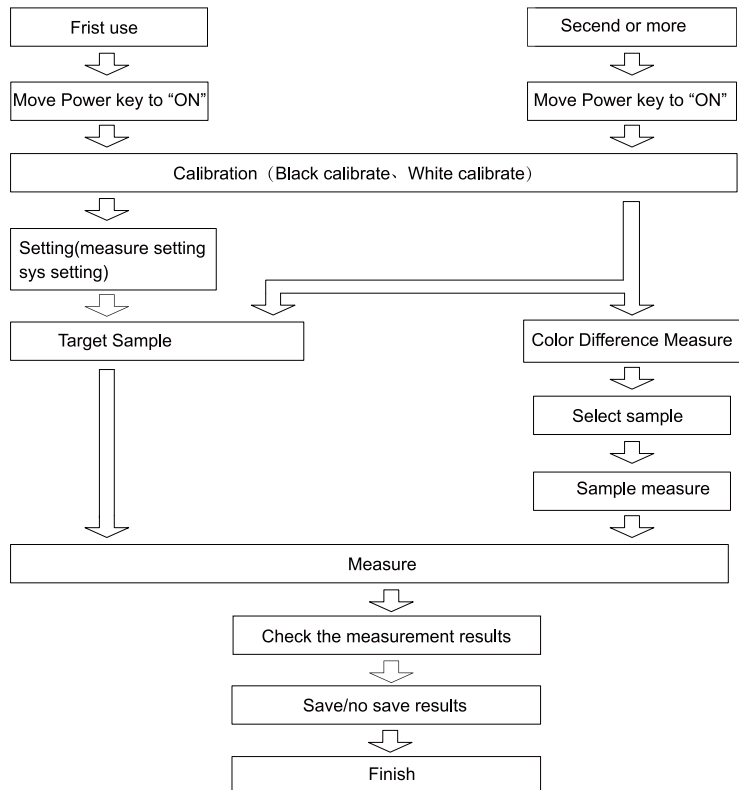
Technical Parameters

Type	CS-280	CS-280+	CS-286	CS-288
Optical System	di/8(Diffused lighting, 8 degrees observe angle) (conform to CIE No.15、ISO 7724/1、ASTM E1164、DIN 5033 Teil7、JIS Z8722 Condition c standards)			
Light Source	CLED			
Sensor	Sensor array			
Spectral resolution	10nm, Spectral range (400~700nm)			
Measurement time	2s			
Measurement caliber	11mm, Optional:4mm、6mm、15mm			
Repeatability	$\Delta E^*ab \leq 0.08$ (when a white calibrate plate is measured 30xat 10-second intervals after white calibration)			
Language	Chinese and English			
Interface	USB2.0			
Observation angle	2° /10°			
Measurement light source	A,C,D50,D65		A,C,D50,D55,D65,D75,F1,F2,F3,F4,F5,F6,F7,F8,F9,F10,F11,F12,DLF,TL83,TL84,NBF,U30,CWF,U35	
Display Mode	Chromaticity value ($L^*a^*b^*$, L^*C^*h) , delta E value,pass/fail,color tendency,average, generate test report,spectrum reflectance figure with camera with camera,spectrum reflectance data, manually input target sample			
Color differences	ΔE^*ab , ΔE^*CH		ΔE^*ab , ΔE^*CH , ΔE^*uv , $\Delta E^*cmc(2:1)$, $\Delta E^*cmc(1:1)$, ΔE^*94 , ΔE^*00	
Color Spaces	$CIE-L^*a^*b^*$, L^*C^*h	$CIE-L^*a^*b^*$, L^*C^*h ,XYZ,Yxy	$CIE-L^*a^*b^*$, L^*C^*h ,XYZ,Yxy,Reflectance	
Other Index	Staining fastness, color fastness	WI(ASTM E313-10,ASTM E313-73,CIE/ISO,AATCC,Hunter, Taube Berger, Ganz, Stensby) YI(ASTM D1925, ASTM E313-00, ASTM E313-73)Tint(CIE,ASTM E313,Ganz)	metameric index Milm, staining fastness, color fastness	
Data storage	20000 test results			
Other functions	camera,electricity pantone color chart		camera,electricity pantone color chart, Mobile Phone APP	
Work temperature range	5~45°C, relative humidity 80% or below(at 35° C),no condensation			
Storage temperature range	-25°C to 55°C,relative humidity 80% or below (at 35° C) ,no condensation			
Power source	Rechargeable lithium 8.4V/2000mAh, adaptor DC12V			
Size	77 × 86 × 210mm			
Weight	550g			
Color Matching System	not matching			
UV Light Source	excluded			

Appearance and structure



Measuring flow chart



Put the instrument on the white board properly. Through the "Up", "Down" to choose "White calibrate", Press "Enter" to do "White calibrate", hear Short song "drip" then finish the white calibration. Press "Cancel" to exit the calibration page and enter the main page.

Annotation: In order to guarantee the stability of instrument, it is recommended that the "Black calibrate" and "White calibrate" must be completed when everytime turn it on.

Main page

A-1/1 Main page:

- ①title bar: display the main function information of the current page
- ②working area: display The main functions of the subordinate submenu or the testing data
- ③status bar: Guide the current operating situation

Basic operation method:

Through the "Up" and "Down" to choose function button, Press "Enter" button to

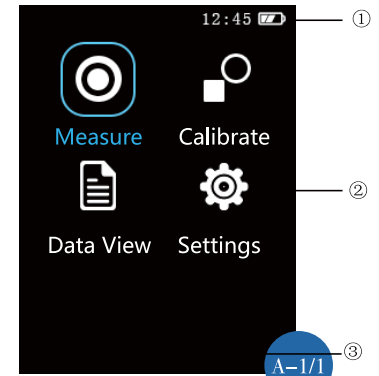
Enter choose function interface to operation. press "Cancel" button to return to the last step, Press "Save" button to Save the result of the test or the state setting.

Measurement: Users can measure sample each color parameters, complete samples and color difference between sample tests, and view the saved test records

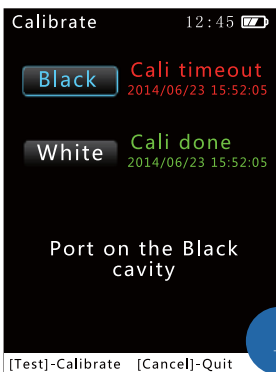
Calibrate: Users can before using the instrument for black and white calibration
Data view: In the page the user can view the saved data under the same sample of each. And could choose to save, delete or name edit the sample.

Parameter: select the sample of the operations such as delete, edit name
Settings: The user can select various parameters of instrument measuring conditions and Settings

USB communication: The user can through the USB interface with PC connection for data transmission, as well as for PC operation.



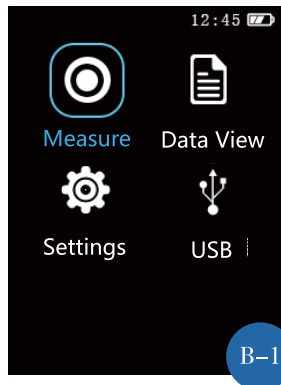
Calibration page



A Make sure the instrument works and move Power key to "ON". The instrument shows the starting page and transfers to calibrate page, Under this page, calibrate the instrument on the black and white calibration board.

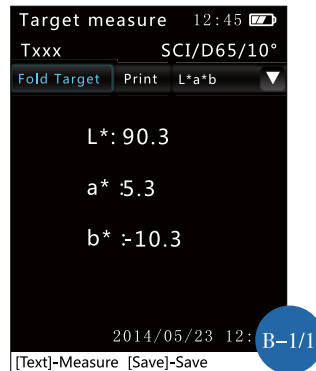
Pick off the dust cover and black cavity cover, put the bottom of instrument into black cavity and place evenly, Through the "Up", "Down" to choose "black calibration", press "Enter", hear Short song "drip", it shows "Black calibrate complete" in status bar.

Measure



- B-1 The main page, Through the "Up" and "Down" to choose "Measure", press "Enter" into the "target measure" page. Under the page, Users can measure the target of color space, the chromaticity parameters, view the target of the information.

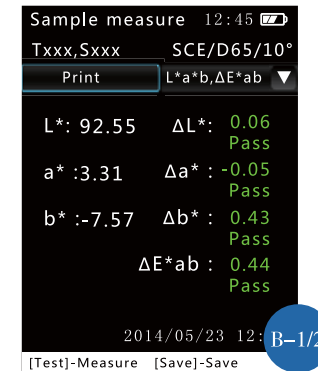
Target measure



- B-1/1 put instrument test port on the surface of the sample, press "test", when hear "beep", the measurement finished, can view test result, it shows the name of the sample and the test conditions in title bar. The target sample not saved, the name of target sample will be displayed as "Txxx". user can press "save" to rename and save the target sample. Test condition format: measuring condition /light/observer. Through the "Up" and "Down" to choose "Fold target", "print" and display content (include "L*a*b*", "L*C*h", "X,Y,Z", "Y,x,y", "R,G,B"). "Fold target": enter "sample measure" page, at the current test data as sample, and sample test results contrast color difference measurement. "print": print the result of the test data.

Choose display content: press "enter" into the page, through "Up" and "Down" to choose show different color parameters, include "L*a*b*", "L*C*h", "X,Y,Z", "Y,x,y", "R,G,B".

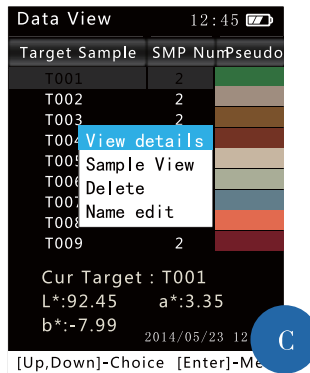
Sample measure



- B-1/2 After the measuring and saving the data, choose "Fold target", press "Enter" enter the page "sample measure". In this page, user can measure the unknown sample to evaluate the color difference between the sample and the target by press button "Test". The name of the unknown sample displayed on the screen is "Sxxx" before saved. Users can do the measurement in the page "Data View". Through the "Up", "Down" to choose the existing target sample, press "Enter" enter the options menu, choose "view details", view the selected sample data, in the page "Look at the target", choose "Fold target", enter "sample measure" under this selected target sample. Press "test" to measure, when heard "beep", the color difference measurement is finished. Press the "Test" again to the new color difference measurement. Attention: Color tolerance should be set before color difference measurement. (Please refer to Setting → Meas Setup → tolerance). In the page of "sample measure", through the "Up", "Down", user can print the color difference measurement results. Choose the display content include "L*a*b", "ΔE*ab", "L*C*h", "ΔEch", "X,Y,Z", "Y,x,y", "R,G,B". Through "Up" and "Down" to select to view the content including color space parameters, chrominance indicators, pass/reject judgments, colour cast evaluation between the samples with the target sample.

Data View

In the main page, Through the "Up", "Down" to choose the "Data View", press "Enter" to enter the page of "Data View". In this page, User can view the saved information of the target sample, samples and color simulation and so on.



- C** Through the "Up", "Down" to choose the view of target sample, press "Enter" to popup menu window, through "Up" and "Down" to choose view detail, check the sample name, delete, edit, and so on.
- View detail: look at all the detailed data for the selected sample color difference test records. Press "enter" to choose "fold target", user can measure the samples under the target sample, a new color difference can be tested.
- View sample: view all the sample under the selected sample test records. Press "Enter" to popup menu window, through "Up" and "Down" to choose view detail, delete, delete all, edit, and so on.
- Delete: deletes all the color difference test records of the sample and the target sample.
- Rename: change the name of the selected samples.

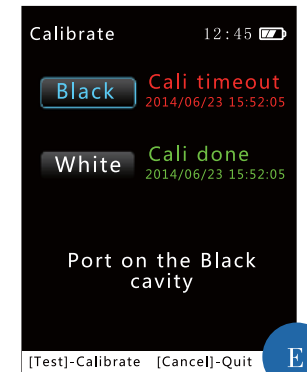
Setting

- D** On the main page, Through the "Up", "Down" to choose "Settings", press "Enter" to enter the settings page, include calibrate, meas setup, set time, power, reset all and language.

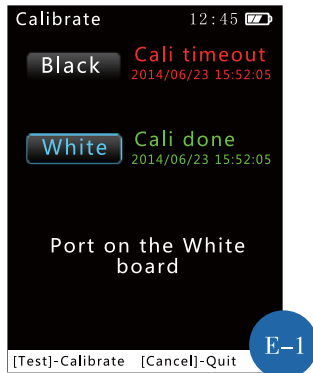


Calibration

- E** In the main page, Through the "Up", "Down" to choose the "calibrate", press "Enter" to enter the page of "calibrate" in this page, user can be "Black calibrate" and "White calibrate".



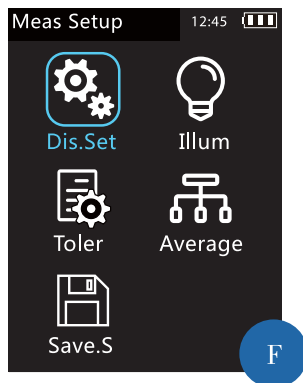
Pick off the dust cover and black cavity cover, put the bottom of instrument into black cavity and place evenly, Through the "Up", "Down" to choose "black calibration", press "Enter", hear "beep", it shows "Black calibrate complete" in status bar.



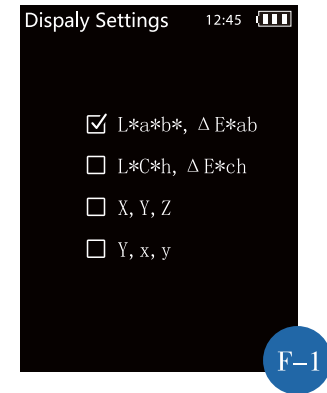
E-1 White calibrate :Force instrument to white board properly. Through the "Up", "Down" to choose " White calibrate ", Press "Enter"to "White calibrate", hear "beep", then finished the white calibration,it shows "Black calibrate complete".

Measure settings

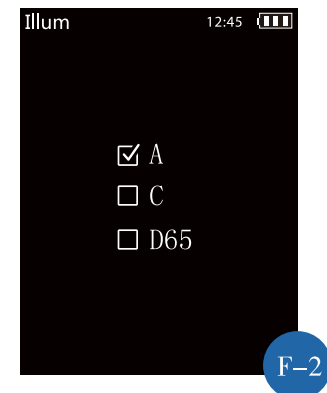
F Use "Up" and "Down" to select; press "Enter" to enter measurement setup page.



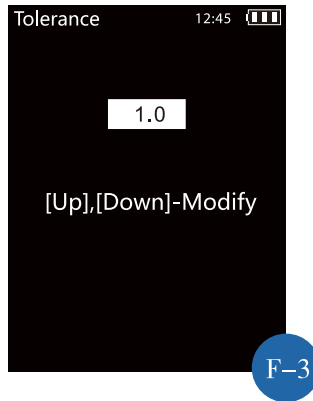
F-1 Display settings: "Up"/ "Down" to select; "Enter" to enter display settings page. Press "Up" and "Down", select the color space, color values or indices you need, and confirm with "Enter" button. Then, the measurement page would show the values you need.



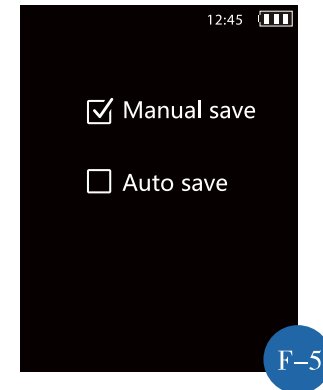
F-2 Light source: Use "Up" and "Down" to select; press "Enter" to enter light source selection page. Under this page, you can toggle any light source that you wish to appear in the testing page, including A, C, D65 light sources. Use "Up", "Down" and "Enter" to toggle them.



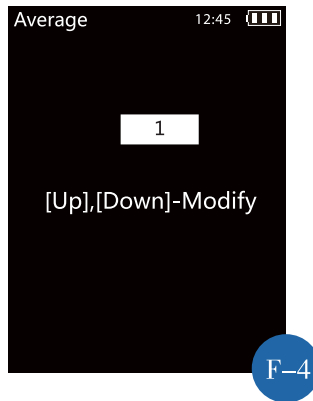
F-3 Tolerance settings: Use “Up” and “Down” to select; press “Enter” to enter tolerance settings page. Use “Up” and “Down” to set the values and press “Enter” to confirm.



F-5 Save setting: Use “Up” and “Down” to select; press “Enter” to enter “Save.S” page. Use “Up” and “Down” to select “Manual saving” or “Auto saving”, press “Enter” to confirm.
Auto saving: the target and sample measurement will be automatically saved and named every time (T040、S001).
Manual saving: the target and sample measurement will be saved and named by you (such as Txxx、Sxxx).

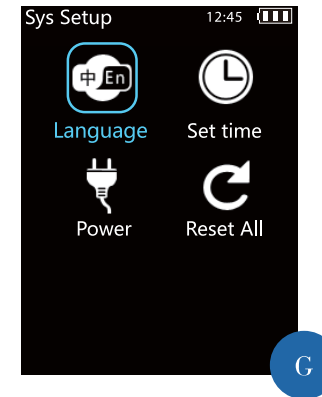


F-4 Average settings: Use “Up” and “Down” to select; press “Enter” to enter average settings page. In this page, you set how many measurements does the “average test” makes before averaging to get the result. Use “Up” and “Down” to set the values and press “Enter” to confirm.



System setup

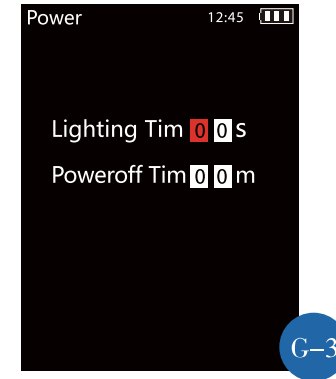
G Use “Up” and “Down” to select; press “Enter” to enter system settings page. In the system settings page, you can enter these sub-pages: settings for language, time, power management, reset all and view version.



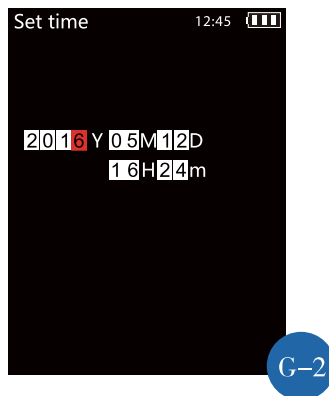
- G-1 Language selection: Use “Up” and “Down” to select; press “Enter” to enter language selection page. Use “Up” and “Down” to choose from the two languages this instrument supports: Chinese and English.



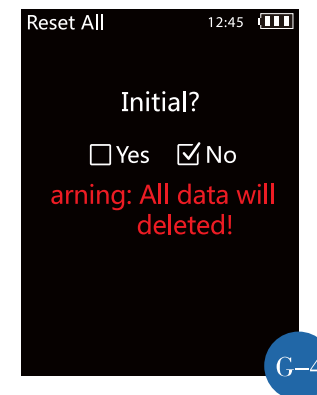
- G-3 Power management: Use “Up” and “Down” to select; press “Enter” to enter power management settings page. Use “Up” and “Down” to set backlight time and time for the instrument to automatically turn off. Use “Up” and “Down” to select the value you want to change and press “Enter”; then use “Up” and “Down” to set the value, press “Enter” to confirm. Finally, press “Cancel” to save the values or exit time setting.



- G-2 Time setting: Use “Up” and “Down” to select; press “Enter” to enter time settings page. Use “Up” and “Down” to select the value you want to change and press “Enter”; then use “Up” and “Down” to set the value, press “Enter” to confirm. Finally, press “Cancel” to save the values or exit time setting.

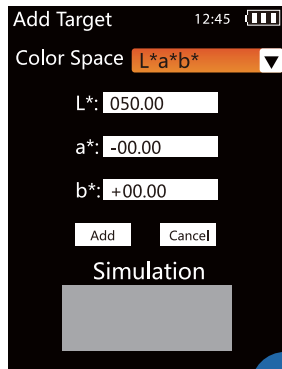


- G-4 Reset All: Use “Up” and “Down” to select; press “Enter” to enter reset all page. This action will wipe all data and restore all to default settings.



Add.T

- H Add Target : Use “Up” and “Down” to select; press “Enter” to enter “Add.T”page. Press “Up”、 “Down” and “Enter” , select the color space and enter the vale you need. Use “Up” and “Down” to choose “Add” and press “Enter” to confirm. After saving, simulation area can show the target color you added



H

Version

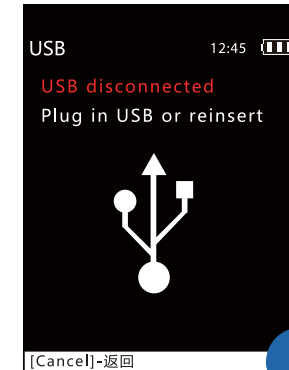
- I Version: Use “Up” and “Down” to select; press “Enter” to enter view version page. In this page you can view the instrument’s model, product serial number, software version and company name.
(Note: the software version may be subjected to change without notice)



I

USB

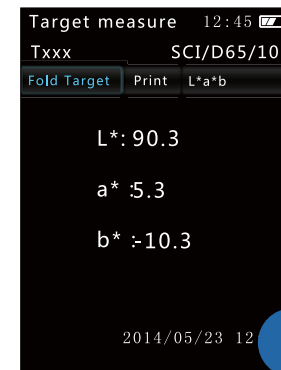
- K In the main page, Use “Up” and “Down” to select; press “Enter” to enter USB connection page.
Use the USB cable provided with the instrument to connect the instrument to PC. Install the driver program as instructed (driver program is in the CD provided with the instrument). The USB will be connected correctly after the driver program is installed, as shown in the above picture.



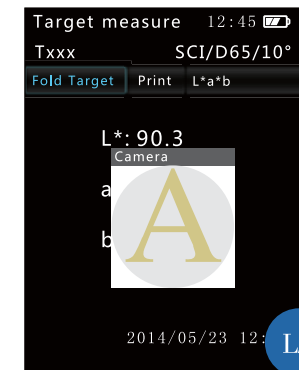
K

Camera View

- L If instrument is with camera. In the "Measure" page, the long view test position according to the "Enter" Through the observation of the camera viewfinder, mobile instrument to the desired measurement place, that can be measured for follow-up function. Press "Cancel" to cancel the view function.
- L/1 For example in the sample test, long press "Enter" to view the test position and call up the camera viewfinder.



L

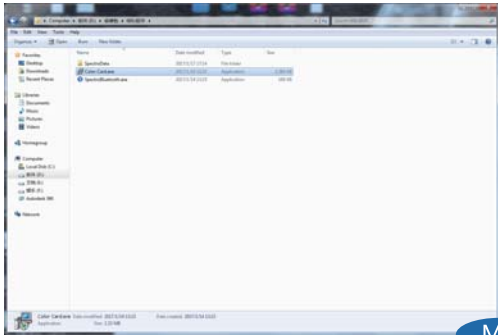


L/1

Color Card Input

M-6

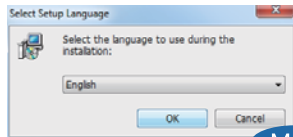
Double click the program “color card.exe”.



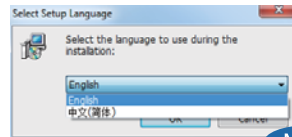
M-6

M-7

Choose the software language. Press “OK” to confirm your choice.

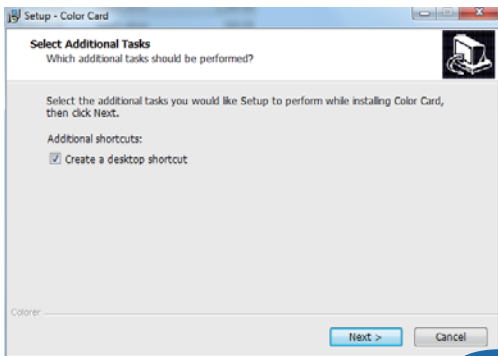


M-7/1



M-7/2

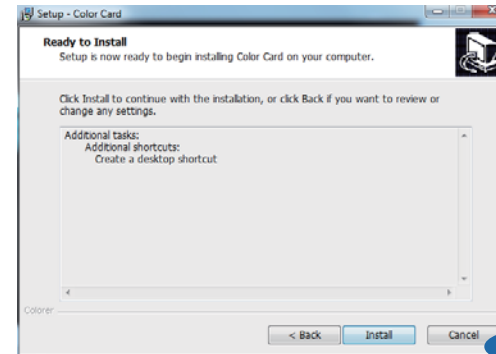
Enter into the software installation page, press “next” for installation.



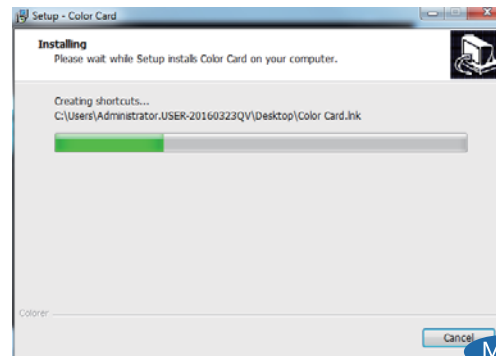
M-7/3

M-8

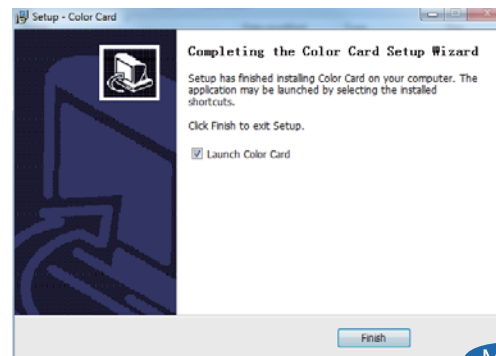
Click “install” to continue with the installation. After the installation finish, click “finish” .



M-8/1



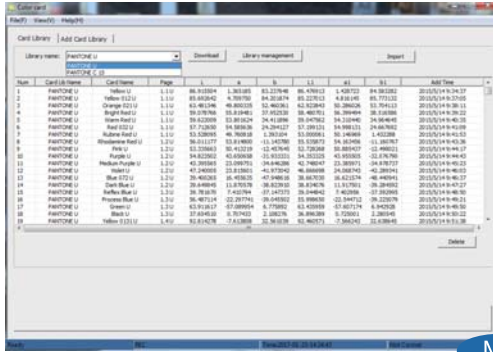
M-8/2



M-8/3

M-9

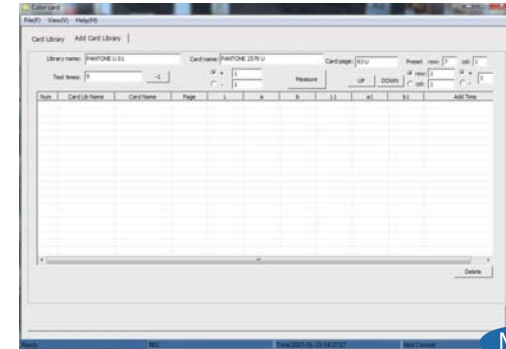
After installation, open the program "color card". The software is with "Pantone U" and "Pantone C 15".



M-9

M-11

Input the color chart information including "library name", "card name", "card page", "row", etc.



M-11

M-12

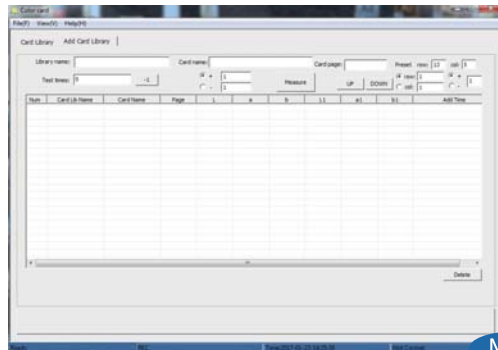
For example:
Library name : Pantone U 01, Card Name: Pantone 2570U, Card Page:93U, Row:7, Col (column):1 Put the instrument testing aperture on the color swatch, click "measure" on the software or press "test" button on instrument for color measurement.

(Note: when measurement, instrument should be under USB interface, or the instrument can not connect with PC.)

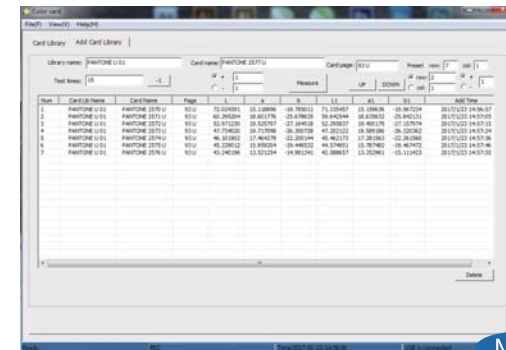
After every measurement, the "measurement time", "color card name" number, "row" number and "col" number will increase or decrease according to the setting. As show in the figure, after measure 7 times, click "up" or "down" we could set the color card page number or we could change it and other data by manual.

M-10

Connect the instrument with PC by USB cable. Click "add card library" to add color information.

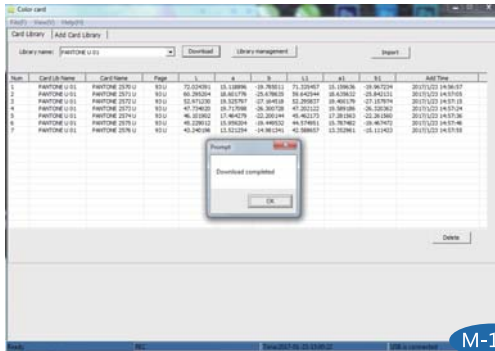


M-10

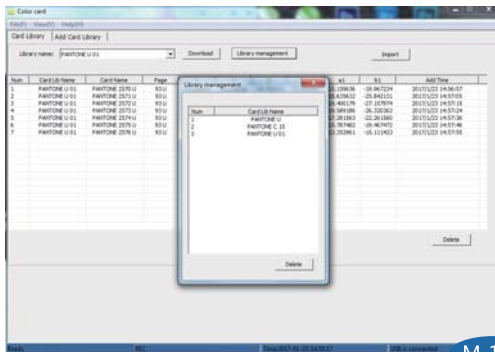


M-12

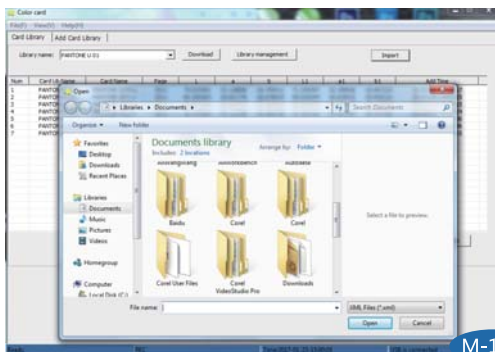
Add the card library according to the above instruction. After it is finished, we could download it into instrument. If we want to delete the card library, choose "library management", then click the card library name, at last press delete. Card library in format xml can be upload into software.



M-13-1

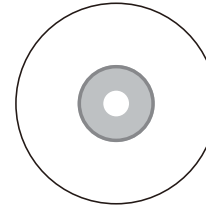


M-13-2

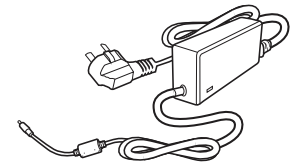


M-13-3

Accessories



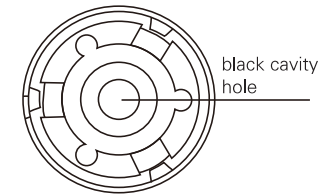
PC software CD



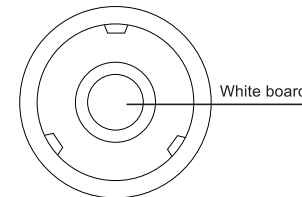
Adapter



Black cavity for calibration



Top view for black cavity



Top view for white board



USB

Accessory list	
White board	used for white calibration.
Black cavity	used for black calibration.
External power supply	AC power adapter,with 2A rated current,5V required
CD	It contains the PC software.
USB Cable	communicate with PC
Micro printer	Optional accessories.Print the test result.

Abnormal condition handling

Abnormal condition	Analysis
Unable to start instrument	1. Check instrument connects to power supply or not; 2. Check battery supply is sufficient or not.
Unable to enter main program after start	1. Check black and white calibration is done or not; 2. Check black and white calibration is correct or not.
Measurement data is wrong	Check tolerance is reasonable or not.
Measurement values abnormal	1. Check tested item is balance or not; check testing aperture force to tested surface properly or not; 2. Check tested item leak light or not; 3. Check tested item is multi-color or not.
Large difference between two measurement results	Check batteries power consumption below 40% or not.

Testing Result Analysis

▼ ΔE Color Difference Scale $\Delta E^*ab = \sqrt{(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2}$

$\Delta L+$ represents white, $\Delta L-$ represents black, $\Delta a+$ represents red, $\Delta a-$ represents green, $\Delta b+$ means yellow, $\Delta b-$ represents blue. When we use CIE $L^*a^*b^*$ to show a color, L^* is black or white. a^* is red or green, b^* is yellow or green.

▼CIE LAB

CIE LAB is color space based on the fact that a color can't be both red and green, or both blue and yellow, because these colors oppose each other. So a single data could be used to describe red/green and yellow/blue. When we use CIE $L^*a^*b^*$ to describe a color, L^* means lightness, a^* means red/green and b^* means yellow/blue.

▼CIE LCH

CIE LCH adopts same color space as $L^*a^*b^*$, but its L^* represents lightness, c^* represents saturation and h^* represents hue.

Company's statement

1. The company promises that our colorimeter offers one year of warranty after purchase date. Non-artificial damage under normal use is subjected to free warranty. The company offers repair services for artificial damage, or damage after the warranty time limit; however, the repair services would require fees relative to the damage.

2. The warranty only holds for the person, or company who purchased the instrument. Damage occurring under third party usage would not be eligible for warranty service.

3. The company is not responsible for data loss because of error, repairing, or power outages. To prevent loss of important data, please save copies of the data on your PC.

4. The copyright ownership of the instrument and its associated software belong to our company and is protected by the Copyright Laws of People's Republic of China.

5. Our company sells the instrument does not mean we transfer the copyright, or any intellectual property's ownership to the user.

6. The specifications and information in this manual are subjected to further updates without notice.