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V2.0

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MK350S PREMIUM

手持式分光光譜計 • Spectrometer • ハンディタイプ分光光度計

使 用 說 明 書
User Manual
簡易取扱説明書

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1.1   Features

MK350S Premium handheld Spectrometer keeps the excellent designs and multi-functional user friendly operation mode. Besides, it enhances the abilibty of LUX dynamic range from 100k lx to 150k lx. Auto dark calibration is embedded to reduce the noise interference from each temperature and lighting environment changes. Also, Cosine receiving surface is optimized to conform with both JIS AA and DIN B Illuminance Meter class. Overall, it's the professional instrument with the certificated accuracy and measuring speed.

Light source measuring functions supersede the last generation model (MK350S) with outstanding performance. Users can choose from more than 40 light measurement units (CCT, LUX, CRI, CIE1976, CIE1931, PPFD & PFD, CQS, Duv, Lambda P, S/P ratio, TLCI, GAI and others) to create their customized list. For further analysis and research, MK350S Premium Spectrometer added "Flicker and Blue light Hazard" assessment functions which can make you measure light more productively.

1.2   Packing Contents

Please ensure the following are included in package of this product: In case of any flaw and or loss please call the dealer or this Company for help.

Case

MK350S Premium
Spectrometer

Lithium Battery
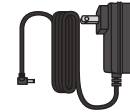
Power Adaptor

USB Cable
(It is used to connect with
PC software uSPECTRUM/ uFLICKER.)

Neck Strap

Protection Bag

Cap Strap

Screen Wiper

SD Card

Tripod / Stand Bracket

User Manual

Warranty Card

WiFi Wing
wireless remote control card
(It is used to connect with APP.)

1.3 Appearance Introduction

Optical Sensor

Flicker Sensor

Video Cam Lens

Power button

Strap Hole

4.3" touch panel

SD Card Slot

Reset Key

Battery Recharge LED

Power On LED

Mini USB

Measure Key

Power Jack

UPRtek

Battery Cover

1. If the system crashes, please press the power key for 3 seconds to turn off the system.
2. If the problem still can't be fixed, please use a pin to press the reset key to turn off the system.

1.4 Annual Product Calibration

As the product is a high-precision instrument, please use it cautiously. To ensure the accuracy of measurements, annual calibration is recommended. Please consult the agent or the customer service department for the calibration service.

1.5　Product Notes and Precautions

1. MK350S Premium Spectrometer is a high-precision instrument. Please unpack with care. Any vibration or collision may cause instrument damage. If the product doesn't work normally or needs repair, please don't attempt any repairs. All repairs must be performed by the authorized customer service agent.
2. Most LCD screens have a very small and inconsequential defective pixel rate (usually less than 0.1%). This results in occasional pinpoints of white or other colors but will not affect the accuracy of measurements.

⚠ Precautions / Warnings

Please read the following precautions to avoid fire, excessive heat, chemical leakage and explosion :

- Do not disassemble or modify the battery.
- Do not expose the battery to heat (fire) or water/moisture.
- When disposing used/old batteries, wrap with insulation tape to shield the battery from electrical contact with metallic objects, which might ignite a fire or explosion.
- If the unit is plugged into the power adapter and the battery seems to be overheating, or if there is smoke or peculiar odors emanating from the unit, unplug immediately to avoid the possibility of fire.
- However, do not touch the cables if there is heat emanating from near the cables as melted or deformed cables could expose wiring and result in burns or electric shock.
- Do not use cloth or anything to wrap or cover the equipment while charging – this could cause the unit to overheat, melting the casing or causing fire.
- If the unit is accidently immersed in water, or if moisture has seeped inside, or metal objects have dropped into the casing, immediately remove the battery to avoid fire or electric shock.
- Do not operate or store the battery in high-temperature environments-it will cause battery leakage and/or shorten the life of the battery .
- Do not use paint thinner, benzene or other organic solvents to clean the equipment – this may damage the exterior finish or touch screen, and may even ignite fire.

2.1　Preparing Before Use

Battery installation

1 Remove the back cover from underneath the MK350S Premium by inserting your fingernail into the notch, located below the end of the cover, and sliding your nail along the underside of the edge to unhinge one side - do the same for the other side.

2 Install the battery as shown with the correct orientation. The battery will install in only one direction – do not force the battery in.

3 Replace the back cover.

1. Charge the battery full for 6 hours before using it for the first time.
2. To prevent power outage during using this product, please check whether the red light has turned off (fully charged) according to instructions given in next page item1. Once this product is enabled keep an eye on indicator of balance of battery charge at upper right corner of screen.
3. In case a battery goes exhausted soon after fully charged then its life cycle has ended. Please call your dealer for replacement with new one.
4. Time span your battery can last varies with its life cycle. Newly shipped battery after full charge may last around 5 hours.

Battery charging

Connect charger to charging port of this product to start charging its battery.

1. Product in off mode: The Battery Recharge LED lights red during battery charging and turns off after it is fully charged.

2. Product in on mode: A flash symbol displays at upper right corner of screen of this product during charging and disappears after it is fully charged.
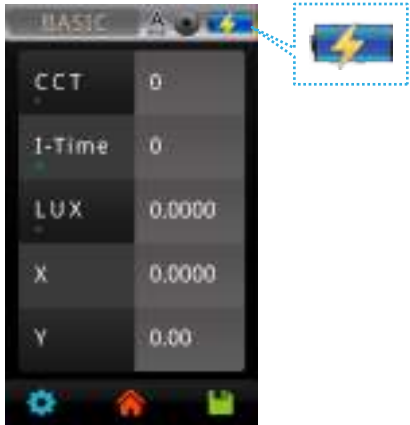
Install SD card

You may save measurement data in file of Excel (xls) format and image data (spectrum and chromaticity coordinates diagram) in format of (JPG) in SD card with capacity at 1GB or more.

※ Insert SD card in direction as indicated　　　※ Press to remove SD card

Strap installation

Step1. Unscrew the strap.
Step2. Tie the strap to the strap hole of MK350S Premium.
Step3. Tie the strap to the sensor cover.
Step4. Screw the strap.

1. The SD card features a card latch design to prevent it from loosening You may feel that the SD card is stuck when it is inserted in or removed. In case it is like this, pull or push it a little harder to get it in place or removed. To remove SD card: Press it as shown in step ①, pull it out after it ejecting a little as shown in step ②.

Power on

Press the Power button for 1 second and then release it.

> When the power is on, the Power On LED will light the green indicator.
> When the power is off, the green indicator will be off.

Dark calibration

MK350S Premium will display splash screen and then the screen prompts with message for dark calibration.

① "Do you want to do dark calibration?" Please select "Yes" .

② After the sensor cover is put on, please select "OK".

③ When the screen shows "Dark calibration finish.", please press "OK" to enter the main page.

> 1. Press and hold power key for 1 second to power on this product.
> 2. Press and hold power key for 3 seconds to power it off.
> 3. Please run dark calibration after each power on of this product.

Set up date and time

Set up date and time before taking any measurement.

①

②

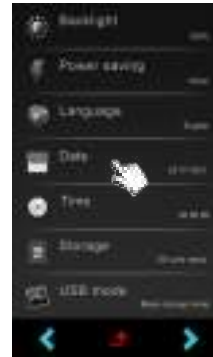③

Tap the "Flip Page" corner to enter the next page.

Tap the "Flip Page" corner to enter the next page.

Click "Option" icon.

④

⑤

⑥

Press"Date"and"Time" for its settings.

Once date is set, press Yes to exit to setup option page.
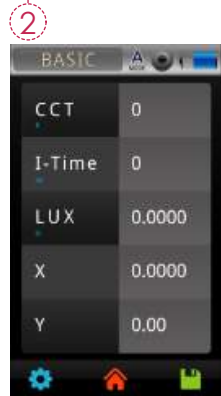
Once time is set, press Yes to exit to setup option page.

Measurement

Click "BASIC" mode to enter measurement page.

① Point optical sensor to light source to be tested.

②
③
④

Beep sound while measuring

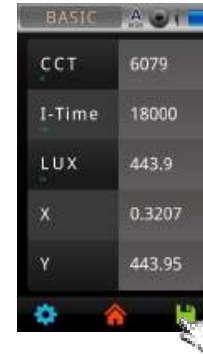Press the "Measure" button on the left side (marked with an M).

A viewport will display on the screen with a "cross hair" mark in the middle.
Press the "Measure" button on the left side at appropriate distance.

This product beeps once after measurement is done and displays results on screen.

Save measurement data

① Press Save key on the lower right of the screen.
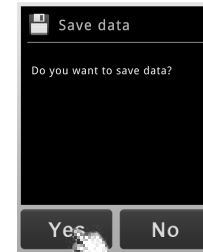
② select "Yes" key.
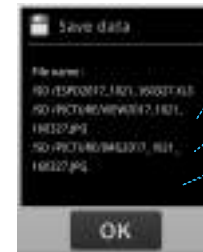
③ Measurement data is now saved in SD card. You may note down file name if necessary.

EXCEL file name :
ESPDY Y Y Y _ M M D D _ H H M M S S
.xls   regular (year)   (month)(day) (hour/min/seconds)
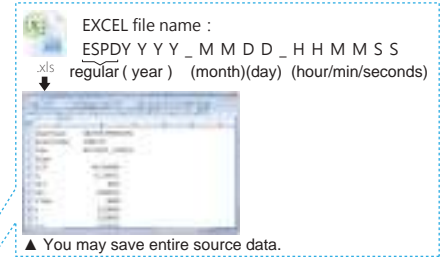
▲ You may save entire source data.

JPG file name :
VIEWY Y Y Y _ M M D D _ H H M M S S
JPG   regular (year)   (month)(day) (hour/min/seconds)
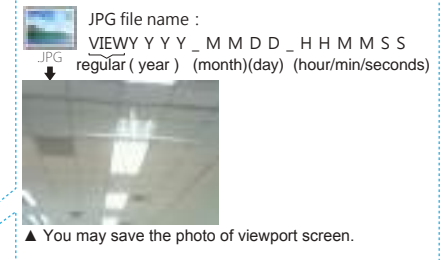
▲ You may save the photo of viewport screen.

JPG file name :
IMGY Y Y Y _ M M D D _ H H M M S S
JPG   regular (year)   (month)(day) (hour/min/seconds)
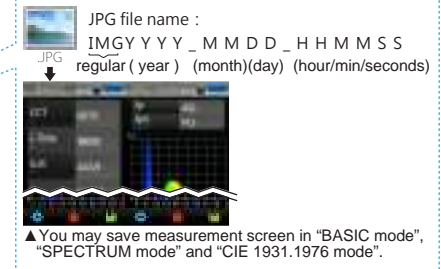
▲ You may save measurement screen in "BASIC mode", "SPECTRUM mode" and "CIE 1931.1976 mode".

Click OPTION icon in main screen to set up this product.

No SD card：
System can't read the SD card or no SD card inside.

SD card ready：
User can storage function.

Previous page　　Back to main menu　　Next page

1 Backlight

+
100 %
-

Yes　No

2 Power saving

+
10 min
-

Yes　No

3 Language

+
English
-

Yes　No

4 Date

+　+　+
2017　10　21
-　-　-

Yes　No

Remaining power displayed

The Battery Status indicator appears on most screens at the very top right corner. The status shows remaining charge in blue[a].

When charging with the AC adapter, a lightning bolt[b] icon will appear – it will disappear when fully charged[c]. If the battery cannot maintain a charge, you need to purchase a new battery.

a

b

c

5 Time

+　+　+
10　00　00
-　-　-

Yes　No

6 Storage

Free space: 29 GB
Total space: 32 GB

OK

7 USB mode

Mass storage mode
PC connection mode

Yes　No

8 Version

HW NO.: 1.0.1CEAWS_B
FW NO.: 1.1.0.B21
Opt. NO.: XXXX9999

OK

1.You cannot set up battery. The screen remains intact after you tap it.

3 Home Screen（Page 1）

The interface of the product is touch screen operation. By touching the screen with your figure, you may select the target menu or option. The sub menus of each measurement mode are as shown on the right.

3.1 BASIC

3.2 SPECTRUM

3.3 CIE

3.4 CRI

3.5 TM-30

3.6 COMPARE

You can access the Home Screen Page 2 by tapping the "Flip Page" icon in the lower right corner on Page 1.

3.7 FLICKER
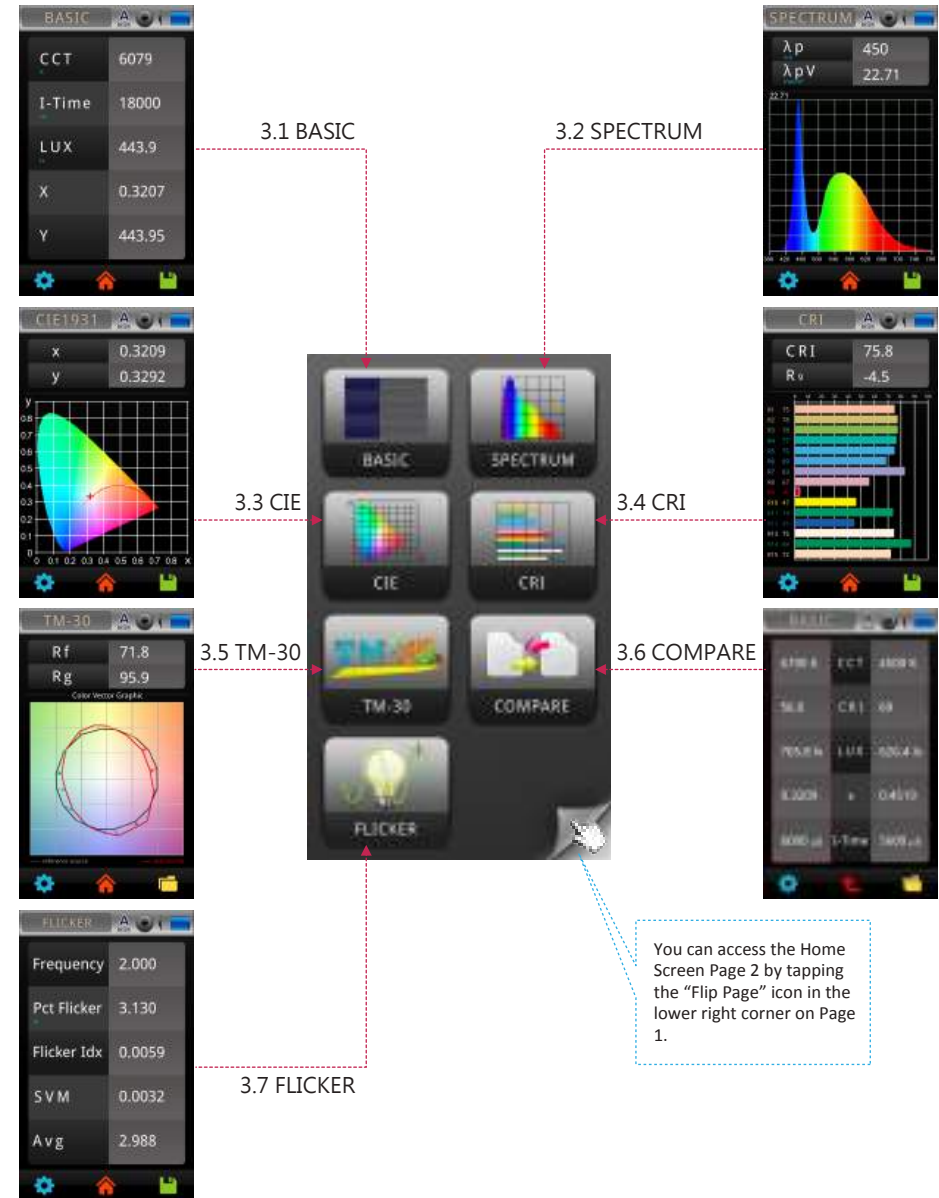
This screen shows a list of light measurements recorded after pressing the "Measure" button as demonstrated.

Integration mode

$\underset{\text{MODE}}{A}$: Auto

$\underset{\text{MODE}}{M}$: Manual

Capture function

: one time

: Continuous

: Continuous measurement in progress

Charge left

: Charging

: Charge left indicator

: Low charge indicator

BASIC	
CCT	6079
I-Time	18000
LUX	443.9
X	0.3207
Y	443.95

Customize the five measurement items in BASIC mode.

The 5 items on the Basic list can be customized with different units of measure according to your preference.

① Click the item to be changed.

② List of available items displays, click down arrow key "**>**" to scroll down to next page.

③ Click items to be shown in position ①. Click "⅃" key at bottom of screen to back to last page without selecting any item.
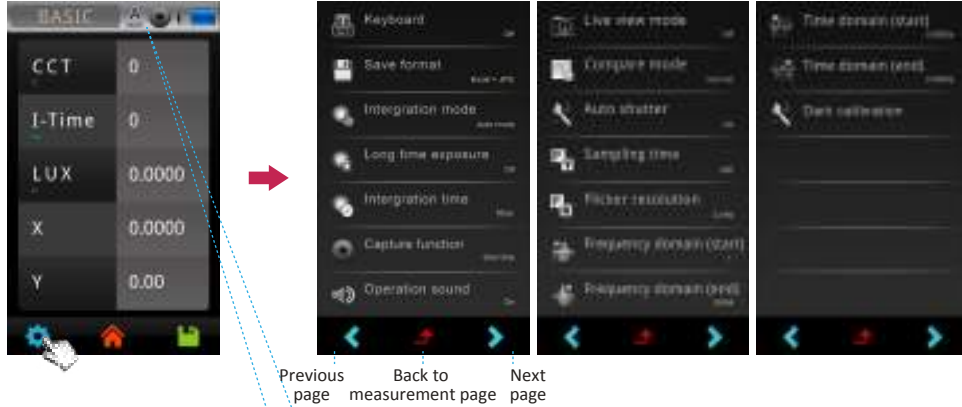

④ Default item changed. Follow the same steps to change other default items.

Measurement setting

Please go to measurement page to do measurement settings. There is a "Tools" icon in the lower left cornera. Note that this icon is the Measurement Tools Icon as opposed to the System Tools icon on the Home Screen.

Previous page   Back to measurement page   Next page

I-Time Setup	A MODE	AL MODE	M MODE	ML MODE
a	Auto	Auto	Manual	Manual
b	Off	On	Off	On
c	60μs ~500ms	60μs ~5000ms	60μs ~500ms	60μs ~5000ms

A -Automatic   AL -Automatic+Long Time Exposure
M -Manual   ML -Manual+Long Time Exposure

a
b
c

The system will prompt you to do Dark calibration after you turn on/off "Long exposure time". This procedure will take you around 1min and 15 secs. We strongly recommend that you to execute Dark Calibration every time you on/off "Long time exposure" setup.

1. Continuous capture function allows users to take consecutive measurements and review results quickly without bothering with buttons - however, it does NOT allow you to save data to the SD Card. (see the LOG function for continuous captures with data-save to an SD Card).
2. Live view mode only for BASIC, SPECTRUM, CIE1931, CIE1976, CRI measurements.

1

This option is turned on can be file naming when you saving measured data.

2

When saving data (e.g. from the BASIC screen), you can choose to save to an Excel file, or Excel & JPG files (screen shots).

3

Integration time can be automatically set by the MK350S Premium (Auto Mode) or Manually (Manual Mode). If Manual Mode is chosen, you must set "Integration time"

4

This option is turned on in low light conditions (LUX ≤ 50). It allows you to set the Integration time (exposure time) higher.

5
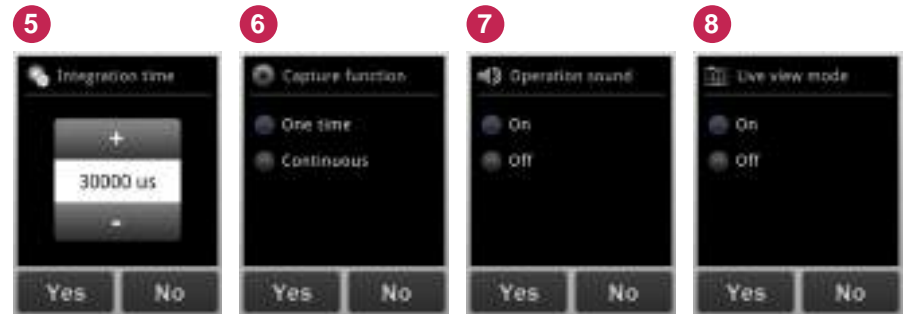
The length of time, in μs, that the MK350S Premium captures light data in one measurement (like exposure time).

6

You can set the MK350S Premium to take snapshots continuously (Continuous capture). As soon as you press the "Measure" button, the unit will begin to capture at 3 second intervals. Press "Measure" again to stop capturing.

7

This turns on and off the audible beep that occurs when you take a measurement - it takes up to 3 seconds take a measurement – the unit beeps when it is done.

8

This item gives you the option of reviewing the viewport before you take a measurement with the "Measure" button.
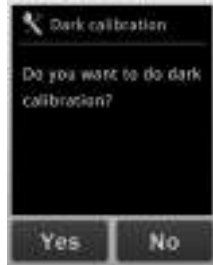
3.1 BASIC

9

10

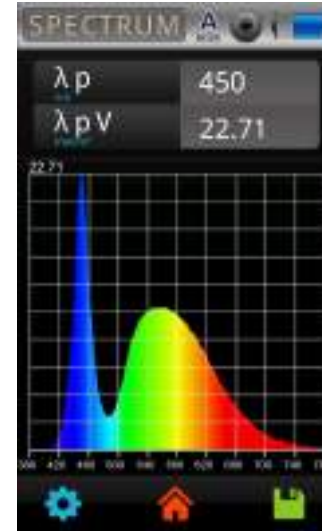MK350S Premium do a Dark calibration automatically when you press the "Measure" button.

You are always prompted to do a Dark calibration when you turn on the unit. However, you can perform a dark calibration anytime with this option.
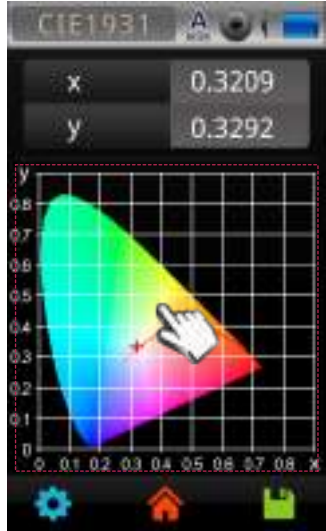
3.2 SPECTRUM

Light Spectrum of the latest measurement taken.

3.3 CIE

The CIE1931 chromaticity x, y values of the latest measurement taken. Click CIE1931 chromaticity coordinates chart switch to CIE1976 mode. The CIE1976 chromaticity u', v' values of the latest measurement taken.

Touch the graph to switch the table between
CIE1931 chromaticity and
CIE1976 chromaticity .
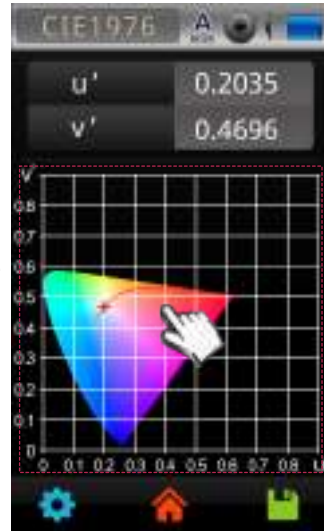
3.4 CRI

The CRI R1-R15 values of the latest measurement taken.

Click one of the bars R1~R15 and its index displays in second row at top right of screen.

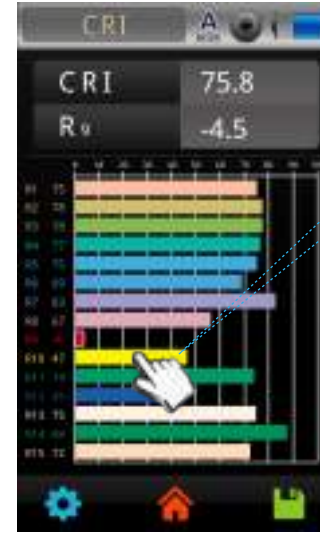## 3.5 TM-30

TM-30 provides equations and direction for calculating Rf and Rg, including the spectral reflectance functions for the 99 CES. The IES (Illuminating Engineering Society of North America) TM-30 color rendition method was developed by representatives of the manufacturing, specification, and research segments of the lighting industry.

Touch the graph to switch the table between Color Vector Graphic and Rf-Rg Plot.
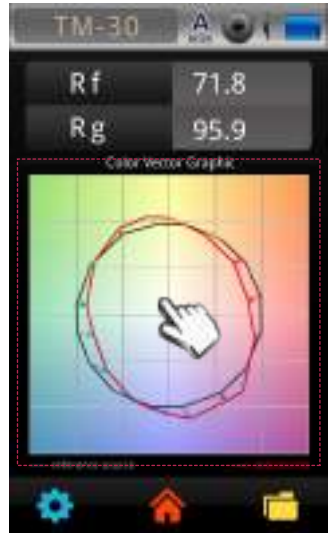
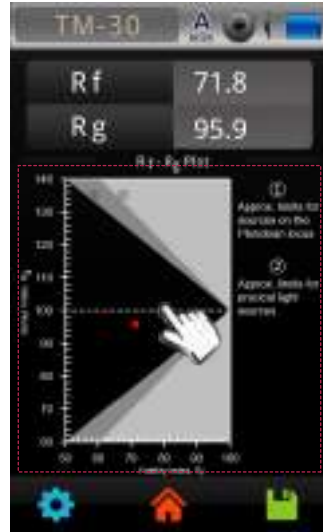gray line ▬▬   red line ▬▬
reference source   test source

Color Vector Graphic：one of the outputs of TM-30.
This graph can tell us how, on average, various colors are distorted.
1. outward arrows mean more saturated colors
2. inward arrows mean duller colors
3. sideways arrows mean a hue shift
4. no arrow means that the color isn't distorted

Rf：Fidelity Index
Rf takes a maximum value of 100. If Rf is 100, it is a match to the reference source (true to the "real color", similar to CRI Ra 100). If color shifts occur, the arrows get longer and Rf decreases (to a minimum value of zero).

Rg：Gamut Index
Rg=100 means that the test light source doesn't change the hue or saturation of the CES compared to the reference source.
Rg>100 indicates that the test light source increases the saturation of the CES producing colors that are more vivid.
Rg<100 indicates that the test light source decreases the saturation of the CES producing colors that are less saturated.

①Dark gray area

②Light gray area

Rf-Rg Plot: location analysis diagram
For comparing different light source

Rf range: 50~100
Similarity of individual standard colors with reference to when exposed to test light source.

Rg range: 60~140
Change in saturation of individual standard colors with the reference to when exposed to test light source.

3.6 COMPARE

The Compare item allows you to compare two measurements side by side. You can compare two consecutive measurements or compare a measurement against historical data (SD card).

BASIC   SPECTRUM

CIE1931   CIE1976

CRI
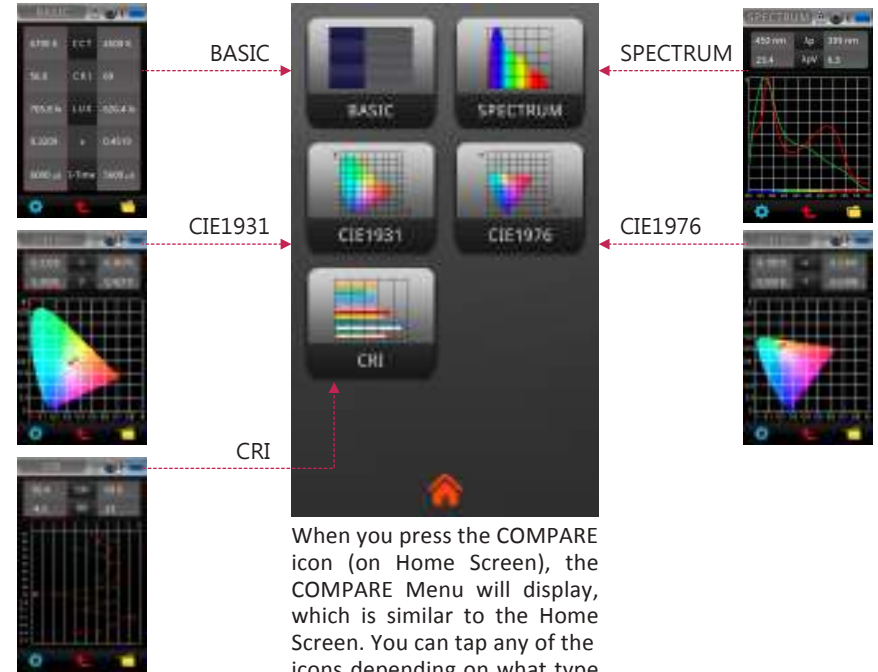
When you press the COMPARE icon (on Home Screen), the COMPARE Menu will display, which is similar to the Home Screen. You can tap any of the icons depending on what type of data you want to compare.

1.The examples in the following pages only describe how to compare data in the BASIC and SPECTRUM screens, - comparing CRI, CIE 1976, CIE 1931 data are similar.

Compare two consecutive measurements
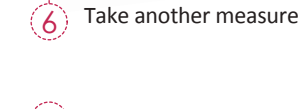
①

Select the BASIC icon. The left column and right column will represent the data you are comparing.

②

First, tap the left column. A red border will appear around the right column.

③ Point the MK350S Premium to a light source and take a measurement.

⑥ Take another measurement.

④

The measurement data will fill the left column.

⑤

Next, tap the left column. A green border will appear.

⑦

The new data will fill the right column. You can now compare the two measurements.

- 27 -

Compare against historical data

①

②

③ A file browser appears showing the files on the SD card. Select one of the Excel files.

④ The data will appear in the column you selected.

Folder icon

To compare against historical data (saved on SD Card), first tap either the left or right column[1], and then tap the "Folder"[2] icon in the lower right corner.

1. The list items in the COMPARE screen (e.g. CCT, CRI, LUX etc.) is the same list configured for the BASIC Screen. If you change the list items on the BASIC screen, it will also change on the COMPARE screen.

- 28 -

Spectrum data comparison

①

Select the SPECTRUM icon. You will get a screen with a similar left/right column format, similar to the BASIC List comparison.

②

You can tap one of the columns.
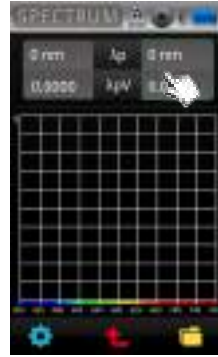
③

Take a measurements or access historical data. (do the same for the other column)

④

The spectrum data will fill the chart with the data in the form of a red graph line and a green graph line, representing the left and right columns respectively.

It is also possible to see the relative difference between the spectrum data between the first measurement and the second measurement.

①

Press the Tools icon on the bottom left bottom corner.

②

Click down arrow key "> " to scroll down to next page.

③
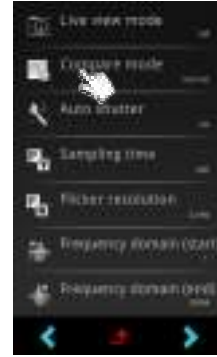
Press the "Compare mode" item.

④

Select the "Absolute" radial button and tap "Yes".

3.7 FLICKER

Flickers are caused by electrical currents, especially with conflicting AC current of the power supply and DC current of the lamp design. In most cases these light source induced effects are hard to be detected by human eyes. Yet they weaken sight and impose damage to personal health, including visual fatigue and migraine headaches. Users may identify these by checking the flicker measurement index of the light source.

Customize the five measurement items in FLICKER mode.

The 5 items on the Flicker list can be customized with different units of measure according to your preference.
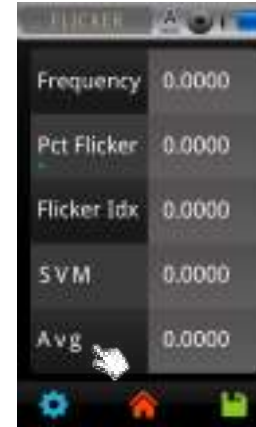
① Click the item to be changed.
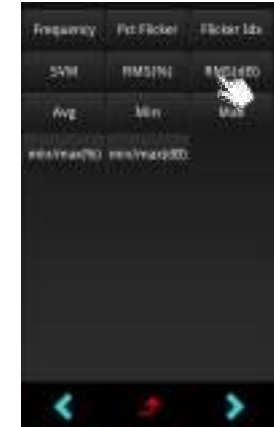
② Click items to be shown in position ①. Click "⤴" key at bottom of screen to back to last page without selecting any item.
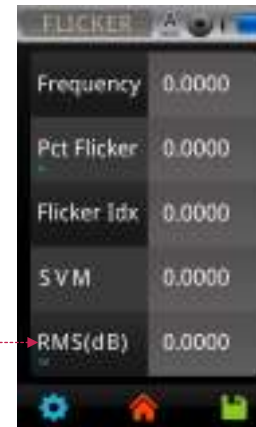
③ Default item changed. Follow the same steps to change other default items.

4 Home Screen（Page 2）

You can access the Home Screen Page 2 by tapping the "Flip Page" icon in the lower right corner on Page 1. The interface of the product is touch screen operation. By touching the screen with your figure, you may select the target menu or option. The sub menus of each measurement mode are as shown on the right.

4.1 FREQUENCY

4.2 FLICKER RISK

4.3 BLUE HAZARD

4.4 HCL

4.5 TRANSMIT

4.6 LUX · G

4.7 LOG

You can access the Home Screen Page 3 by tapping the "Flip Page" icon in the lower right corner on Page 2.

Flickers are subject to periodic fluctuations and may be analyzed by frequency or time domain.

Touch the graph to switch the table between Flicker Frequency-domain Graphic and Flicker Time-domain Graphic.

Sampling rate measurement settings

①

Press the Tools icon on the bottom left bottom corner.

②
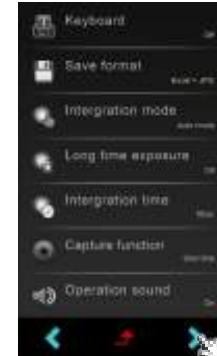
Click down arrow key "> " to scroll down to next page.

③
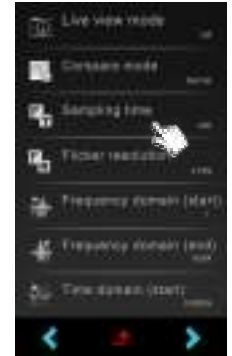
Press "Sampling time" and "Flicker resolution " for its settings.

④
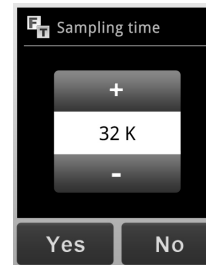
Once Sampling time is set, press Yes to exit to setup setting page.

⑤
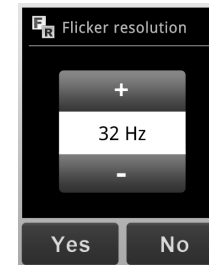
Once Flicker resolution is set, press Yes to exit to setup setting page.

Set up frequency domain

①

Press the Tools icon on the bottom left bottom corner.

②
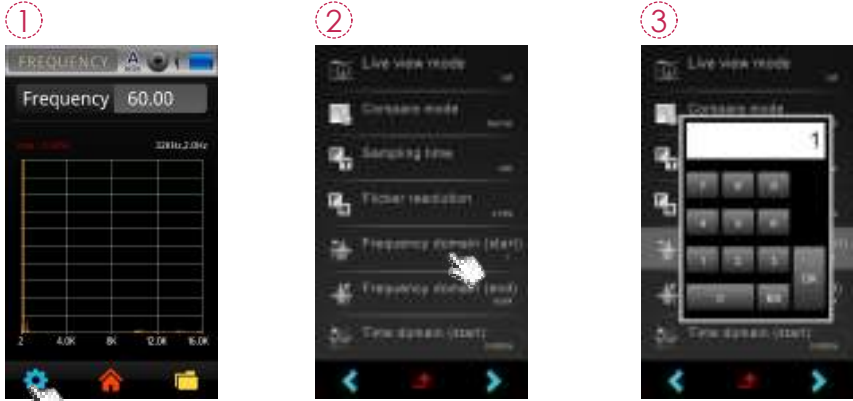
Click "Frequency domain (start)" and "Frequency domain (end)" to set up.

③

Use keyboard to set the values. Press OK to save the setting.

④

Frequency domain display range changed.

Set up time domain

①

Press the Tools icon on the bottom left bottom corner.

②
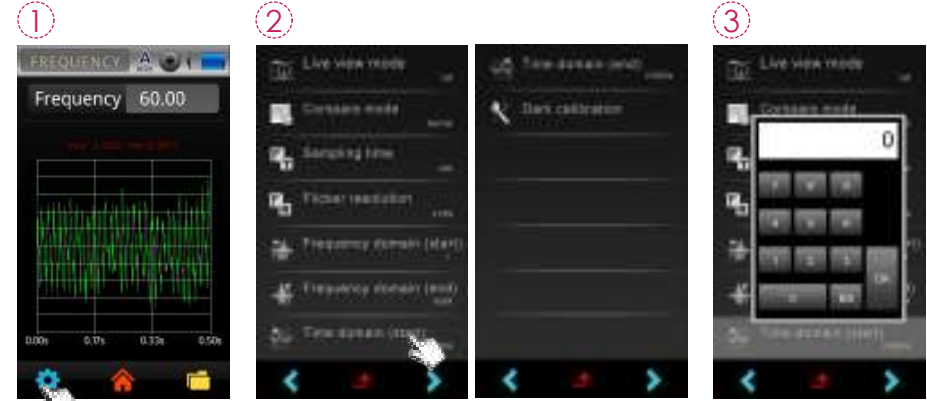
Click "Time domain (start)" and "Time domain (end)" to set up.

③

Use keyboard to set the values. Press OK to save the setting.

④

Time domain display range changed.

4.2 FLICKER RISK

The flicker risk model, based on IEEE PAR 1789-2015 flicker safety specification standard, provides users with more intuitive, simpler ways to assess risks of target light source.
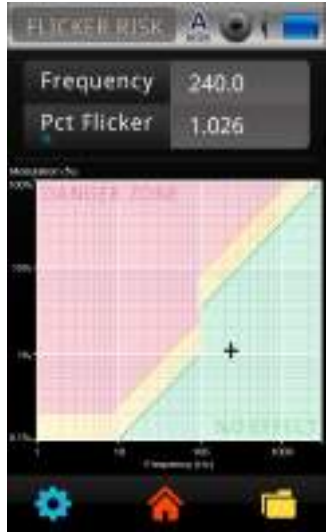
■ Red colored area：DANGER ZONE
■ Yellow colored area：LOW RISK
■ Green colored area：NO EFFECT

Area without impact: border of upper limit of green colored area
Frequency above 90Hz ▶Modulation (%)< 0.0333×Frequency

Low risk area: border of upper limit of yellow colored area
Frequency below 90Hz ▶Modulation (%)< 0.025×Frequency
Frequency above 90Hz ▶Modulation (%)< 0.08×Frequency

4.3 BLUE HAZARD

Addressing blue light measurement requirements: employ IEC TR 62778 and apply IEC 62471 to assess hazards of blue light by LEDs and lamps and help users in preventing blue light hazards (BLH) effectively. Blue light: light of wavelength in range of 400-500nm.
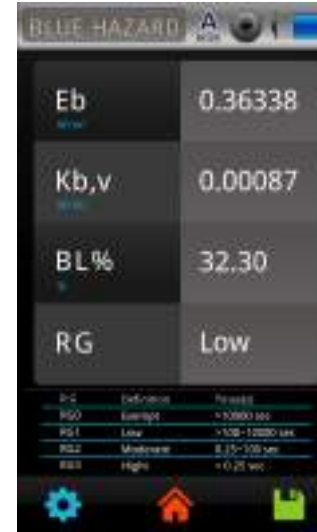
Blue light hazard spectral weighting function : B(λ)
Spetral Radiance : E(λ)
Blue light weighted irradiance (EB) = B(λ) * E(λ)
Blue light hazard efficacy of luminous radiation (Kbv) = EB / Y (Lux)
Ratio of blue light with respect to blue light damage (BL%)
BLH Risk Group (RG)

Blue light injury risks are defined in four grades

	Grade	blue-light radiance	Maximum exposure time in seconds	Recommendation
RG 0	Exempt	0-100	Without definition	
RG 1	Low	100-10,000	100-10,000	Better not look at light source for long time
RG 2	Moderate	10,000-4,000,000	0.25-100	DO NOT look at light source
RG 3	High	>4,000,000	<0.25 (Dislike reaction)	Direct gazing at light source briefly may still hurt.

HCL (Human Centric Lighting), which is a human-centered concept, provides people with right lighting for living, working and other occasions, creating a more comfortable and healthy lighting environment.

Customize the five measurement items in HCL mode.

The 5 items on the Flicker list can be customized with different units of measure according to your preference.
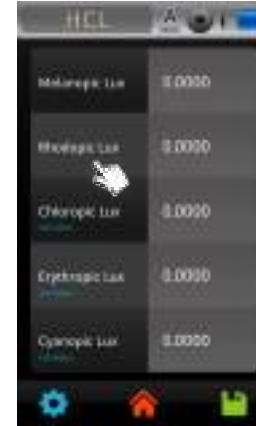
① Click the item to be changed.
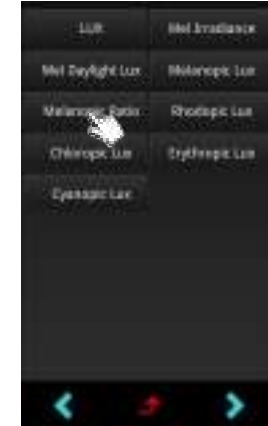
② Click items to be shown in position ①. Click "⊥" key at bottom of screen to back to last page without selecting any item.
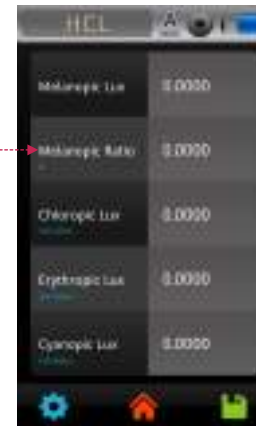
③ Default item changed. Follow the same steps to change other default items.

Transmit measuring mode with user-friendly to measure the transmittance of various color film and provide penetrating light spectrum.

①

First, tap the A column. A red border will appear around the column.

②

Measuring with the MK350S Premium.

③

The content A will turn into red when measuring completed.

④

Next, tap the B column. A green border will appear around the column.

⑤

Put the filter or sample on the light sensor and then processing the second measurement.

The content B will turn into green when measuring completed. The transmittance data will be displayed on the right column of the screen.

Setting the ranges

①

To set the ranges, tap the "Tool" icon in the lower left corner.

②

User can check the transmittance of the specific wave band.

③

Input lower limits with keyboard, press "OK" to save settings and exit to measurement setup page.

④

Input upper limits with keyboard, press "OK" to save settings and exit to measurement setup page.
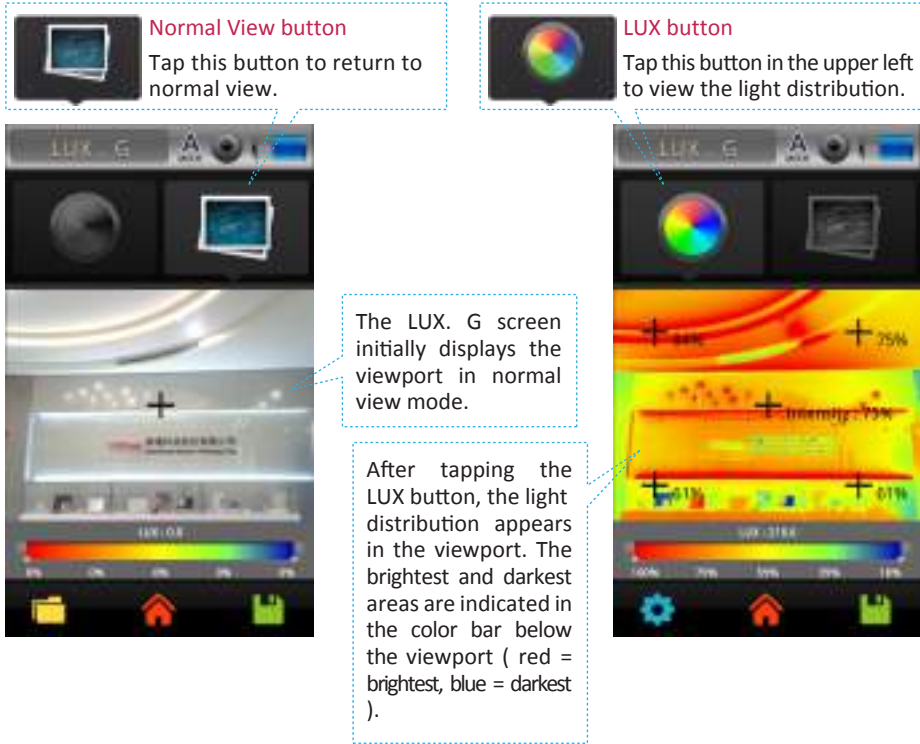
⑤
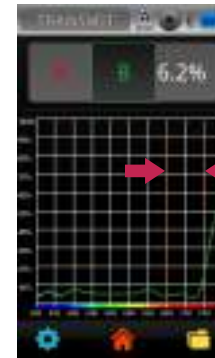
Get transmit rate from specified wavelength range. The spectrum graph will display two orange dotted lines.

4.6 LUX · G

The LUX. G item is a unique feature important for interior designers and lighting professionals. It gives a visual representation of light distribution in a scene, giving you a reference for environment light design (homes, libraries, offices, museums etc.).

Normal View button
Tap this button to return to normal view.

LUX button
Tap this button in the upper left to view the light distribution.

The LUX. G screen initially displays the viewport in normal view mode.

After tapping the LUX button, the light distribution appears in the viewport. The brightest and darkest areas are indicated in the color bar below the viewport (red = brightest, blue = darkest).

4.7 LOG

The LOG function is used to continuously capture several measurements in sequence. It is similar to the "Capture" function in the Measurement Tools. However, with Logging, the data will capture AND save to the SD Card.

①
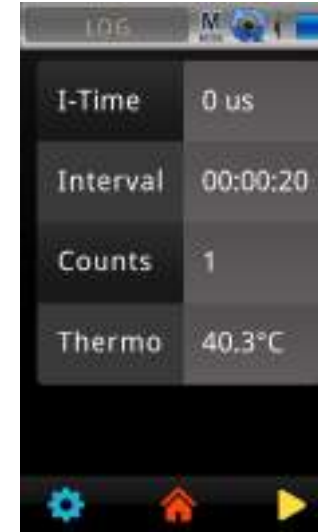
Configure the settings by pressing the "Tool" button at the lower left corner.

②

Setup the logging parameters.

③

You can begin a Log session by tapping the play icon in the lower right corner.

④

You can stop the logging by tapping the stop icon.

⑤

The Count option will reset to its default settings after measurement is done.

1 **2** **3** **4** **5**

1 2 3 Refer P26 for I-Time Setup chart.

4 The range of Interval is 00:00:20~24:00:00.

5 Range of measurement frequency: 1~9999999. You may set it to "INF" to keep on saving measurements until the SD card gets full.

1.I-Time is the "Integration Time" or the amount of time that the MK350S captures light information (similar to exposure time). The Log function allows you to setup Integration Time criteria during the Logging session.

2.It's recommended to execute Dark Calibration after you turn on/off the "Long time exposure" item.

5 Home Screen（Page 3）

You can access the Home Screen Page 3 by tapping the "Flip Page" icon in the lower right corner on Page 2. The interface of the product is touch screen operation. By touching the screen with your figure, you may select the target menu or option. The sub menus of each measurement mode are as shown on the right.

5.1 CHECKER

5.2 BIN

5.3 BROWSER

You can access the Home Screen Page 1 by tapping the "Flip Page" icon in the lower right corner on Page 3.

The Checker function allows you to see if the values of an LED measurement fall within an acceptable range of values.

Setting the Ranges

①

②

③

To set the ranges, tap the "Tool" icon in the lower left corner.

Set the maximum and minimum ranges for each of the items in the CHECKER screen.

Use keyboard to set the minimum values. Press OK to save the setting.
± : plus and minus
BS : backspace

④

⑤

⑥

Use keyboard to set the maximum values. Press OK to save the setting.
± : plus and minus
BS : backspace

You can take a reading by pressing the Measure button.

The measurement values will display and the numbers will be compared against preset ranges and display an " ✔ " (ok) or an " ✖ " (out of range), indicating if the ranges fall within acceptable ranges.

1. The list in the Checker screen (e.g. CCT, CRI, LUX etc.) is the same list configured for the BASIC Screen (see P18 Customizing the Basic List). If you change the list on the BASIC screen, it will also change in the CHECKER screen.

The BIN function serves to assist LED manufacturers and buyers in measuring and then classifying LEDs for "Bins" as defined by classifications according to USA Energy Star ANSI C78.377.

When you take a measurement for an LED from this screen, a bin number displays next to the "BIN" label indicating which BIN that LED belongs to based on USA Energy Star ANSI C78.377 standards.

BIN ranking can also be customized by loading a modified BIN chart, using a PC and the uSPECTRUM software (see Note below).

1.Please make sure you go to the UPRtek website to register licence and download the PC software, uSPECTRUM.

Mode switch set up

①

To set the ranges, tap the "Tool" icon in the lower left corner.

②
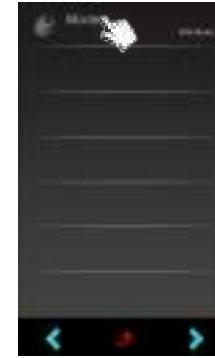
Press the "Mode" item.

③

You may toggle switch between SDCM or BIN modes.

④

Screen display changed to "SDCM".

5.2 BIN

To use a modified BIN chart, you must download the new BIN chart, which you create using the uSpectrum PC software.

① Use a USB cable to connect the MK350S Premium to a PC. Click the uSpectrum icon on the PC.

② Tap the BIN icon on the left side and then tap "Load BIN to Device" at the top of the screen.

5.2 BIN

③ Browse to your modified BIN Chart and press OK to load the new BIN chart. (Note: Modifying the BIN chart is covered in the uSpectrum PC Software section)

Load BIN to Device Successful.

OK

④ Your modified BIN chart is now uploaded and ready to use.
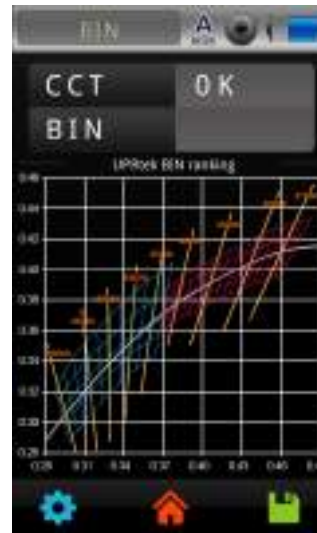
5.3 BROWSER

The Browser (on Home Screen) allows you to review historical data that was previously saved to the SD card.

①

②

③

When you press the "Browser" icon, a file browser will display showing the files on the SD card.

 Previous page

 Back to main menu

 Return to the previous folder

 Next page

If you select an excel file, a review menu will display, similar to the Home Screen. You will have access to all the data and charts that were available when the measurement was taken. Press any of the icons to review the data.

Displaying the data of excel file.

 Previous file

 Back to main menu

 Next file

6.1 Bracket

You can attach an optional accessory bracket to the MK350S Premium that will allow you to use a stand or tripod for hands free LED measurements.

①

②

6.2　SD Card

This unit can write measurement data onto an SD Card (only support for above 1GB ~ up to 32GB). Simply insert the card into the card reader slot. Data is written as excel files (.xls) or jpg image files (for light spectrums and color gamuts).

Mode	Excel File	JPG File	Naming Rule
BASIC	✔	✔	Excel File：
SPECTRUM	✔	✔	ESPD_YYYY_MMDD_HHMMSS
CIE1931	✔	✔	JPG File：
CIE1976	✔	✔	IMG_YYYY_MMDD_HHMMSS
CRI	✔	✔	JPG File：
TM-30	✔	✔	VIEW_YYYY_MMDD_HHMMSS
FLICKER	✔	✔	Excel File：FLICKER_YYYY_MMDD_HHMMSS
FREQUENCY	✔	✔	JPG File：FLICKER_YYYY_MMDD_HHMMSS
FLICKER RISK	✔	✔	Excel File：FLKRISK_YYYY_MMDD_HHMMSS JPG File：FLKRISK_YYYY_MMDD_HHMMSS
HCL	✔	✔	Excel File：HCL_YYYY_MMDD_HHMMSS JPG File：IMG_YYYY_MMDD_HHMMSS
BULE HAZARD		✔	IMG_YYYY_MMDD_HHMMSS
TRANSMIT	✔	✔	TRANSMIT_YYYY_MMDD_HHMMSS
LUX‧G		✔	Normal View：LUX_YYYY_MMDD_HHMMSS LUX View：LUXG_YYYY_MMDD_HHMMSS
LOG	✔		LOG_YYYY_MMDD_HHMMSS
CHECKER	✔		CHK_YYYY_MMDD_MMSS
BIN		✔	BIN_YYYY_MMDD_HHMMSS

6.3　Connecting with Mobile APP

WiFi Wing wireless remote control card

Insert WiFi Wing card to the system. At IOS or Android platform, download MK350S Premium APP and install it on your mobile. Then you can connectit with system for the measurement of wireless control.

WiFi Wing
wireless remote control card
(It is used to connect with APP.)

※ For more operation, please refer to Wing user manual. Please visit UPRtek official site, http://www.uprtek.com

Install APP

Download and install the uSpectumX APP on your Mobile.

❶ uSpectumX

❷ Select WiFi UPRtek_Wing.

Measure

UPRtek_Wing

WiFi connection

Install uSPECTRUM PC software

Please visit UPRtek official site, http://www.uprtek.com, Download and install uSpectrum software on the PC. Then you can connect it with the system for USB control of measurement.

uSPECTRUM
Install file

Set USB PC connection mode

You may connect this product to a Windows PC with USB (rather than Type-C USB) cable.
Note: Please select PC connection in USB mode in items of OPTION mode.

Mass storage：	**PC connection：**
Save measurement data in SD card of MK350S Premium.	Connection MK350S Premium to PC via USB cable for measurement use with uSpectrum .
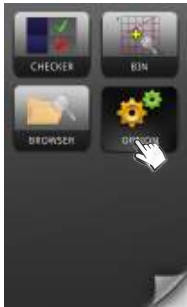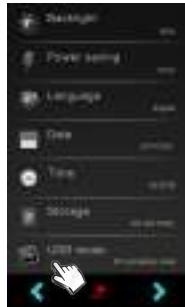
❶ Select "Option".　　　❷ Select "USB mode".　　　❸ Select "PC connection" and press Yes.

Measure

After connection, the MK350S Premium screen will display as shown.

USB connection

uSPECTRUM PC software
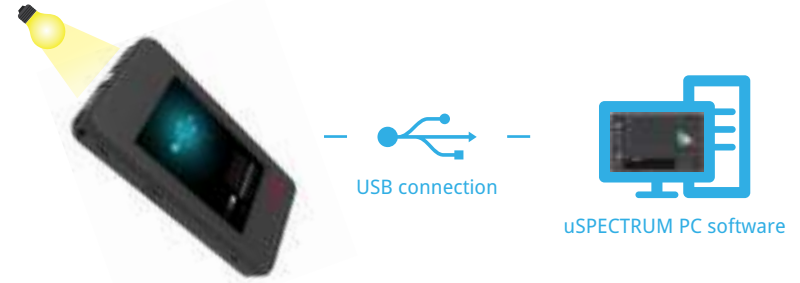
Install uFLICKER PC software

Please visit UPRtek official site, http://www.uprtek.com, Download and install uFLICKER software on the PC. Then you can connect it with the system for USB control of measurement.

uFLICKER
Install file

Set USB PC connection mode

❶ Select "Option".
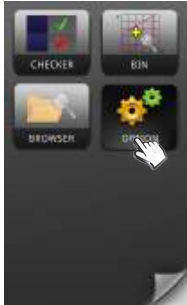
❷ Select "USB mode".

❸ Select "PC connection" and press Yes.

Measure

USB connection

uFLICKER PC software

In case of system failure or stuck (screen gets locked) please press and hold the power key for 3 seconds to shut down this product. Then power it on again and see does it back to normal. In the problem persists, run steps below to reset this product.

To reset this product : Reset this product by pressing the reset key with sharpened pencil.

1.DO NOT use sharp point objects with diameter less than 1mm (e.g., paper clip and ball pen) to press the key as it may lead to board circuit induction or damage and failure to this product.
2.DO NOT use pencils with broken point to press the key as the pigment core may jam the key for reset or lead to damage and failure to this product.

Spectrum	
Sensor	CMOS Linear Image Sensor
Illuminance meter class	Directional response conforms to JIS C 1609-1:2006 for General Class AA. Directional response conforms to DIN 5032 Part 7 Class B.
Wavelength Range	380 to 780 nm
Wavelength Data Increment	1 nm
Spectral Bandwidth	Approximately 12 nm (Half Bandwidth)
Wavelength Reproducibility	± 1 nm [1]
Measurement Range	1 to 150,000 lx
Illuminance Accuracy	± 2.5%
Illuminance Repeatability (2σ)	0.2% in CIE 1931 x,y(100 to 150,000 lx) / 0.5% in CIE 1931 x,y(5 to 100 lx) / 1% in CIE 1931 x,y(1 to 5 lx)
Color Accuracy	Illuminant A @ 2,856 K at 20,000 lx [2][7] — ± 0.002 in CIE 1931 x,y(100 to 150,000 lx) / ± 0.0025 in CIE 1931 x,y(5 to 100 lx) / ±0.003 in CIE 1931 x,y(1 to 5 lx)
Color Repeatability (2σ)	0.0002 in CIE 1931 x,y(500 to 150,000 lx) / 0.0004 in CIE 1931 x,y(30 to 500 lx) / 0.001 in CIE 1931 x,y(5 to 30 lx) / 0.002 in CIE 1931 x,y(1 to 5 lx)
CCT Accuracy	± 2%
CRI Accuracy @ Ra	± 1.5%
Stray Light	-25 dB max. [3]
Integration Time Range	60us to 5,000 ms
Digital Resolution	16 bits

Flicker	
Measurement Range	1 to 150,000 lx
Sampling Rate	100k sample/sec
Frequency Range	5 to 50k Hz
Frequency Resolution	2, 4, 8, 16, 32 Hz
Flicker Accuracy	5% (5 to 30K Hz)[6]
Bandwidth	40K @ Gain 1 to Gain 3 / 20K @ Gain 4

Feature	
Capture Function	One time / Continuous
Operation Mode	Standalone Mode / WiFi Mode[4] / USB Mode (MSC Mode[5] + PC connection)
Integration Mode	Auto / Manual
Dark Calibration	Yes (Auto)
Measuring Modes	1. Basic Mode 2. Spectrum Mode 3. CIE1931 Chromaticity Mode 4. CIE1976 Chromaticity Mode 5. CRI Mode 6. TM-30-15 Mode 7. Measurement Comparison Mode 8. Flicker Mode 9. Frequency Mode 10. Flicker Risk Mode 11. Blue Light Hazard Mode 12. Transmit Mode 13. LUX Image Distribution Mode 14. Log Mode 15. Quality Control Checker Mode 16. BIN Chart Mode 17. Browser Mode 18. Option Mode
Measuring Capabilities	1. Illuminance (LUX)/Foot Candle (fc) 2. Correlated Color Temperature (CCT) 3. CIE Chromaticity Coordinates (1) CIE 1931 x,y Coordinates (2) CIE 1976 u',v' Coordinates (3) CIE 1931 XYZ Value 4. △x , △y , △u' , △v' 5. Delta uv (Duv) 6. Dominant Wavelength(λd)

Measuring Capabilities	7. Excitation Purity
	8. BIN ANSI C78.377 or Customized
	9. Standard Deviation Color Matching(SDCM)
	10. Color Rendering Index (CRI, Ra)/R1 to R15
	11. Color Quality Scale (CQS)
	12. Gamut Area Index (GAI)
	13. Television Lighting Consistency Index (TLCI)
	14. TM-30-15 (Rf, Rg, Color Vector Graphic)
	15. Flicker Frequency
	16. Percent Flicker
	17. Flicker Index
	18. Stroboscopic Effect Visibility Measure (SVM)
	19. Photosynthetically Active Radiatio (PAR)
	(1) PPFD (400 to 700nm) $\mu mol/(m^2 *s)$
	(2) PFD-UV (380 to 400nm) $\mu mol/(m^2 *s)$
	(3) PFD-B (400 to 500nm) $\mu mol/(m^2 *s)$
	(4) PFD-G (500 to 600nm) $\mu mol/(m^2 *s)$
	(5) PFD-R (600 to 700nm) $\mu mol/(m^2 *s)$
	(6) PFD-FR (700 to 780nm) $\mu mol/(m^2 *s)$
	20. Spectral Power Distribution (SPD) mW/m^2
	21. Peak Wavelength (λp)
	22. Peak Wavelength Value (λpV)
	23. Intergration Time (I-Time)
	24. Scotopic and Photopic Ratio (S/P)
	25. Transmittance (%)
	26. Flicker Risk - IEEE
	27. Blue Light Weighted Irradiance (EB)
	28. Blue Light Hazard Efficacy of Luminous Radiation (Kbv)
	29. Blue Light Hazard Risk Group (RG)
	30. Ratio of blue light with respect to blue light damage (BL%)
	31. Irradiance for Melatonin (Mel Irradiance)
	32. Daylight Illuminance for Melatonin (Mel Daylight Lux)
	33. Illuminance for Melatonin (Melanopic Lux)

Measuring Capabilities	34. Percentage of Illuminance for Melatonin (Melanopic Ratio)
	35. Illuminance for Rod Cell (Rhodopic Lux)
	36. Illuminance for M Cone Cell (Chloropic Lux)
	37. Illuminance for L Cone Cell (Erythropic Lux)
	38. Illuminance for S Cone Cell (Cyanopic Lux)

System Configurations	
Display	4.3" 800X480 Resistive Touch LCD
Max. Files	≒ 21,000 Files @ 8GB SD Card (Excel + JPG)
Battery Operation Time	≦ 4 hours / Fully Charged
Power	Adapter; 2500 mAh (3.7V Rechargeable Li-ion Battery)
Data Output Interface	SD card (SD2.0 , SDHC/up to 32G)/ Mini USB Port (USB 2.0)/ WiFi SD Card compatible with iOS and Android
Data Format	Compatible Excel/JPG
Dimensions	163 x 81 x 26.6 mm (H x W x D)
Weight (with Battery)	260 g ± 10 g
Operating Temperature/Humidity	0 to 35 ℃, relative humidity 70% or less without condensation
Storage Temperature/Humidity	-10 to 40 ℃, relative humidity 70% or less without condensation
Display languages	English/Traditional Chinese/Simplified Chinese/ Japanese/Spanish/German/French/Italian/Russian
Camera Resolution	2M pixels
PC Software	uSPECTRUM / uFLICKER

*1：Input source must be a stable light source.
*2 ：Temperature 23±2℃ and relative humidity 50% or less.
*3：Input the 550nm monochromatic light and measure the stray light ratio at 550nm ± 40nm.
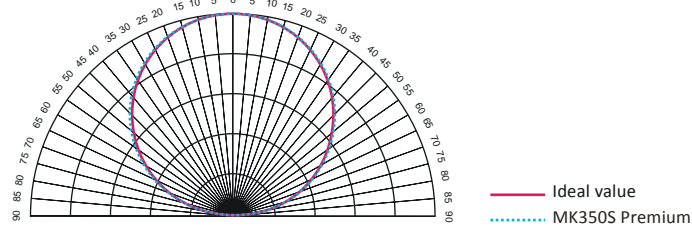*4：It can be connected to mobile phones and tablets.
*5：MSC- Mass Storage Class.
*6：Test condition is based on Lux > 300 lux of sine wave light source.
*7：Repeatability test is based on the status of shutter opening.

The company reserves the right to change product specifications at any time without prior notice.

7.1 Specification

Figure 1：Cosine Correction

Ideal value
MK350S Premium

7.2 General Attributes

Abbreviation	Full Name	Unit
CCT	▶Correlated Color Temperature	K

The color radiated by a black-body radiator under different temperatures. CCT has the color that is the closest to the ideal black-body radiator.

CRI (Ra)	▶Color Rendering Index	

The average value of R1 ~ R8, where R1 ~ R8 represent the value of eight standard colors as defined by Commission International de l'Eclairage (CIE). A CRI value of 100 indicates the best quality of light for rendering color appearance, while a value of 0 indicates the worst quality of light for rendering color appearance.

R1、R2....R15	▶Color Rendering Index Varieties	

Represents the quality of the light source with the indexes corresponding to 15 standard colors, including: R1: light grey-red; R2: dark grey-yellow; R3: saturated yellow-green; R4: middle yellow-green; R5: light yellow-green; R6: light blue; R7: light purple-blue; R8: light red-purple; R9: saturated red; R10: saturated yellow; R11: saturated green; R12: saturated blue; R13: white skin color; R14: leaf green; and R15: yellow skin color.

Lux	▶Illuminance	lx

Light flux received by each unit area.

λp	▶Peak Wavelength	nm

Wavelength with the highest intensity in the measured spectrum.

λpV	▶Peak Wavelength Value	mW/m^2

Intensity of the peak wavelength in the measured spectrum.

λd	▶Dominate wavelength	nm

Used to express the color of the measured light. May be hybridized by the spectrum color of the wavelength and the standard illuminant E(x, y = 0.333, 0.333).

I-Time	▶Integration time	us

Integration time measured by the spectrometer.

x,y,X,Y,Z	▶CIE1931 Chromaticity Chart Color Coordinates	

Light color with 2-dimensional plane coordinates (x, y) as defined in CIE Chromaticity Chart CIE1931.

u',v'	▶CIE1976 Color Coordinate	

Light color with 2-dimensional plane coordinates (u', v') as defined in CIE Chromaticity Chart CIE1976.

Duv	▶CIE1960 UV Color Coordinate Difference	

UV distance between CIE1960 plane coordinate(s) and Planck's blackbody radiation with the same color temperature. A value close to 0 indicates the color temperature and color are closer to that of the blackbody radiation. A positive value indicates it is above the blackbody radiation, while a negative value indicates it is below the blackbody radiation.

Abbreviation	Full Name	Unit

Δx ▶CIE1931 Color Coordinate Difference
X difference between CIE1931 plane coordinates and Planck's blackbody radiation with the same color temperature.

Δy ▶CIE1931 Color Coordinate Difference
Y difference between CIE1931 plane coordinates and Planck's blackbody radiation with the same color temperature.

Δu' ▶CIE1976 Color Coordinate Difference
U' difference between CIE1976 plane coordinates and Planck's blackbody radiation with the same color temperature.

Δv' ▶CIE1976 Color Coordinate Difference
V' difference between CIE1976 plane coordinates and Planck's blackbody radiation with the same color temperature.

fc ▶Footcandle fc
Non-SI unit of illuminance defined as lumens per square foot (lm/ft^2).

Purity ▶Color Purity %
Percent of the dominant wavelength in the standard illuminant. The closer the color purity is to 100%, the closer it is to the dominant wavelength.

PPFD ▶Photosynthetic Photon Flux Density $\mu mol/(m^2 \ast s)$
Number of photons per unit area per unit of time for photosynthetically-active radiation (400~700nm wavelength range).

PFD-R ▶PFD in Red Field $\mu mol/(m^2 \ast s)$
PFD in the 600~700 nm wavelength range.

PFD-G ▶PFD in Green Field $\mu mol/(m^2 \ast s)$
PFD in the 500~600 nm wavelength range.

PFD-B ▶PFD in Blue Field $\mu mol/(m^2 \ast s)$
PFD in the 400~500 nm wavelength range.

PFD ▶Photosynthetic Photon Flux Density $\mu mol/(m^2 \ast s)$
Number of photons in range of 380~780nm subjected by unit area in unit time.

PFD-UV ▶PFD in UV field $\mu mol/(m^2 \ast s)$
PFD in range of 380~400nm

PFD-FR ▶PFD in FR field $\mu mol/(m^2 \ast s)$
PFD in range of 700~780nm

Abbreviation	Full Name	Unit

CQS ▶Color Quality Scale
CQS is a new light source quality parameter developed by NIST for the new solid-state lighting markets. Addressing CRI, assess light source with the 15 new colors: with a scale of 0-100, scores 100 suggest the best quality and zero the worst.

GAI ▶Gamut Area Index
The Gamut Area Index is the ratio between the area of the eight standard colors (R1~R8) on CIE1976 coordinate measured by CRI and the area measured with the standard illuminant E(x,y = 0.333, 0.333). The higher the value is, the more saturated and bright the color is.

TLCI ▶Television Lighting Consistency Index
The parameter is defined by referring to European Broadcasting Union (EBU), which is used to evaluate the light source under for television lighting.

IRR ▶Irradiance W/m^2
Flux of radiant energy per unit area within the range of a specified wavelength.

S/P (SP-ratio) ▶Scotopic vision / photopic vision ratio
The sensitivity of human eyes varies with the light of different wavelength. It can get the data such as illuminance based on the brightness function. However, the brightness function is different for human eyes under high brightness and low brightness. Therefore, it defines the ratio of photopic vision under high brightness and scotopic vision under low brightness, which is called S/P ratio.

BIN
To classify the chromaticity of LED, ENERGY STAR combines with ANSI C78.377 standard to classify various classes and make uniform BIN types. So the user may distinguish the chromaticity of LED products easily.

SDCM ▶Standard Deviation Color Matching
SDCM has the same meaning with that of Macadam Ellipse. The color within Macadam Ellipse (SDCM=1) drawn on the coordinate can't be identified by human eyes.

TRANSMIT ▶Transmittance %
The transmittance is defined as (the radiant flux transmitted/the radiant flux received)x100 %, based on which the wavelength response can be obtained.

Rf / Rg ▶TM30 Rf / TM30 Rg
It is a rating method proposed by IES for the performance of light source. Different from 8 standard colors, it defines 99 standard colors to present the performance of various wavelengths. Rf represents the similarity between the target light source and the reference light source under the standard colors. The value 100 represents it is identical, while the value 0 represents great difference. Rg represents the saturation difference between the target light source and the reference light source under the standard colors. The value 100 represents the saturation is the same, while the value larger than 100 represents saturation is higher, and the value smaller than 100 represents saturation is lower. Moreover, it could identify the difference more obviously through the color vector diagram and the color tolerance diagram.

Abbreviation	Full Name	Unit

Flicker Idx ▶ Flicker index
Flicker index= Area above the mean value /area below the mean value. Higher value represents obvious flicker.

Fpercent (Pct Flicker) ▶ Flicker percent   %
Flicker percent=(Maximum value-minimum value)/ (Maximum value + minimum value). Higher value represents obvious flicker.

SVM ▶ Stroboscopic Effect visibility Measure
SVM is an index used to quantify the flicker effect. Higher value represents obvious flicker effect.

Frequency ▶ Flicker Frequency   Hz
It is the flicker rate of the measured light, or the frequency shown per second.

Twave ▶ Flicker Cycle   ms
It is the countdown of the flicker frequecny of the measured light, or the time of one flicker.

RMS(%) ▶ Flicker square root   %
Flicker RMS is the square root of the average of a set of squares of statistical data.

RMS(dB) ▶ Flicker square root   dB
Flicker RMS is the square root of the average of a set of squares of statistical data.

Avg   V
Waveform average.

Min   V
Waveform minimum.

Max   V
Waveform maximum.

min/max (%)   %
Waveform minimum / maximum.

min/max (dB)   dB
Waveform minimum / maximum.

Flicker Risk
The flicker risk model provides users with risk value of target light source according to IEEE PAR 1789-2015 flicker safety specification standards.

EB ▶ Blue light weighted irradiance   W/m^2
The IEC62471 specification has blue light damage spectral function B (λ) built in. Determine major scope of blue light damage to human eyes with this function and factor in the light source spectral irradiance to obtain blue light radiation damage irradiance.

Abbreviation	Full Name	Unit

Kbv ▶ Blue light hazard efficacy of luminous radiation   W/lm
Based on Kbv = EB/E (blue light hazard radiance, EB, and total luminance of the light source) to analyze individual light source spectrum radiation and level of blue light injury on human eyes.

RG ▶ BLH Risk Group
Define the four RG grades of blue light damage risk according to the maximum exposure time (the maximum safe time for retina under direct exposure to light source) measured by blue light radiance.

BL% ▶ Ratio of blue light with respect to blue light damage   %
Ratio index of radiant energy in blue light band (401 nm - 500 nm).

Mel Irradiance ▶ Irradiance for Melatonin   uW/cm^2
Quantitative light measurement of the stimulation level for melanoprotein in optical response to light source.

Mel Daylight Lux ▶ Daylight Illuminance for Melatonin
The indoor lighting environment which is "most suitable for sunlight" is calculated by simulating CIE D65 daylight.

Melanopic Lux ▶ Illuminance for Melatonin
Quantitative light measurement of the stimulation level for melanoprotein in optical response to light source.

Melanopic Ratio ▶ Percentage of Illuminance for Melatonin   %
Relationship between illuminance of melatonin and illuminance of photopic vision.

Rhodopic Lux ▶ Illuminance for Rod Cell
Impact on organisms is analyzed by quantifying the ambient light source through photoreceptor cells.

Chloropic Lux ▶ Illuminance for M Cone Cell
M cone cells mainly percept green color; the sensitivity range is 450 nm ~ 630 nm; the peak wavelength is about 534 nm ~ 545 nm; Impact on organisms is analyzed by quantifying the ambient light source through photore-ceptor cells.

Erythropic Lux ▶ Illuminance for L Cone Cell
L cone cells mainly percept red color; the sensitivity range is 500 nm ~ 700 nm; the peak wavelength is about 564 nm ~ 580 nm; Impact on organisms is analyzed by quantifying the ambient light source through photore-ceptor cells.

Cyanopic Lux ▶ Illuminance for S Cone Cell
S cone cells mainly percept blue color; the sensitivity range is 400 nm ~ 500 nm; the peak wavelength is about 420 nm ~ 440 nm; Impact on organisms is analyzed by quantifying the ambient light source through photore-ceptor cells.