

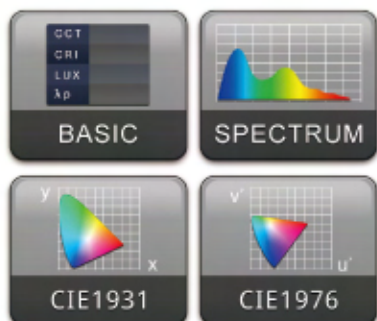


UPRtek
United Power Research Technology Corporation

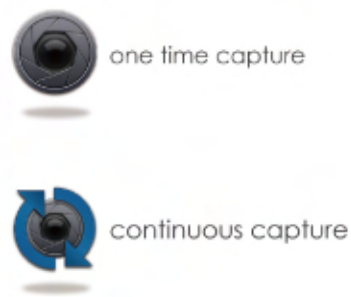
MK350N
LED METER



Measuring Modes



Capture Function



Save Data Format



COMPANY PROFILE

UPRtek

United Power Research Technology Corporation (UPRtek), established in June 2010, belongs to the Phison Group, the world leader in NAND Flash Controller. UPRtek focuses on green, power-saving products and smart applications. The design concept is to provide customers with a green, smart and quality life.

UPRtek focuses and devotes its resources on two categories: LED lighting and Smart device applications. The company is committed to developing these two industries together with its partner and the customers.

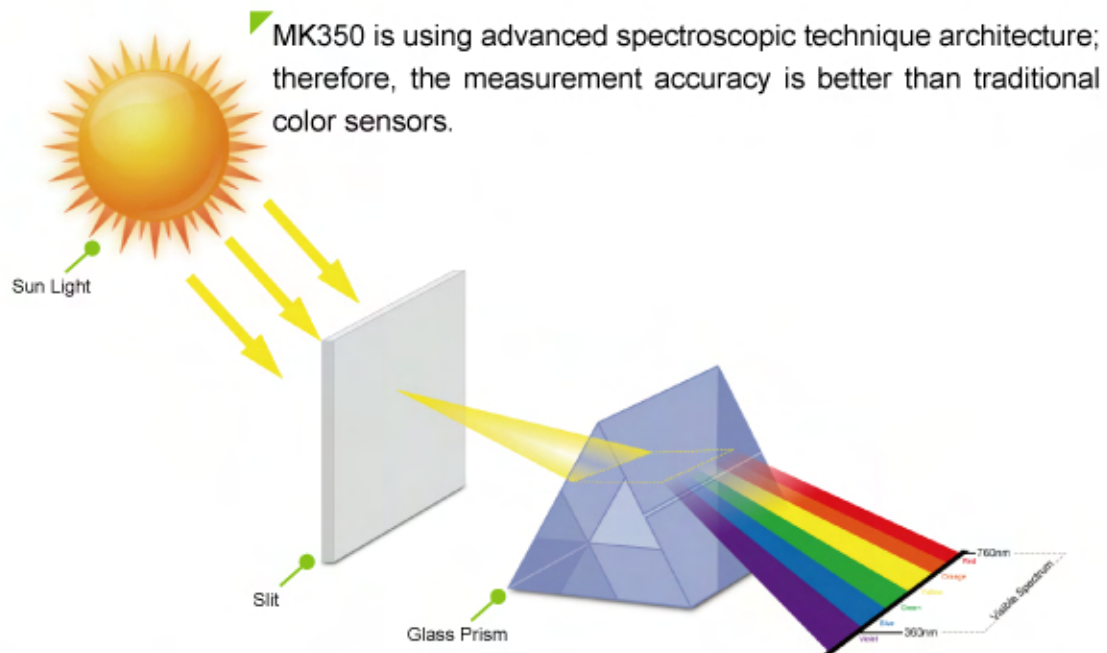


LED Lighting and Smart Device Application



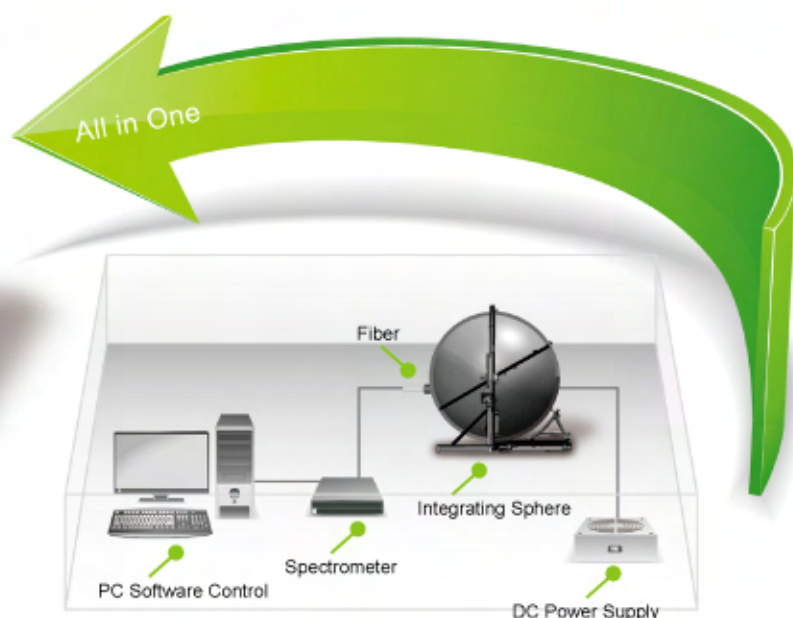
HW&SW Integration





MK350 is using advanced spectroscopic technique architecture; therefore, the measurement accuracy is better than traditional color sensors.

Traditional spectrometer needs to use a PC or notebook for data analysis, UPRtek combines all functions into MK350 to let users process data analysis operation easily.



MK350 is a cost-effective LED Meter which provides CRI, CCT, LUX, λ_p , Spectrum, CIE x,y 6 major functions.

The lightweight design and the measurement data which appears instantly without computer connection solutions both enhance the usage experience in the place where people live and work. It is the perfect measurement equipment that aids the LED industry and customers greatly.



The 3.5-inch colored touch screen and simple interface keep up with the times. Measuring is made easy like never before. SD card storage is an essential function that proves itself useful after one does environmental measurements for the entire day.

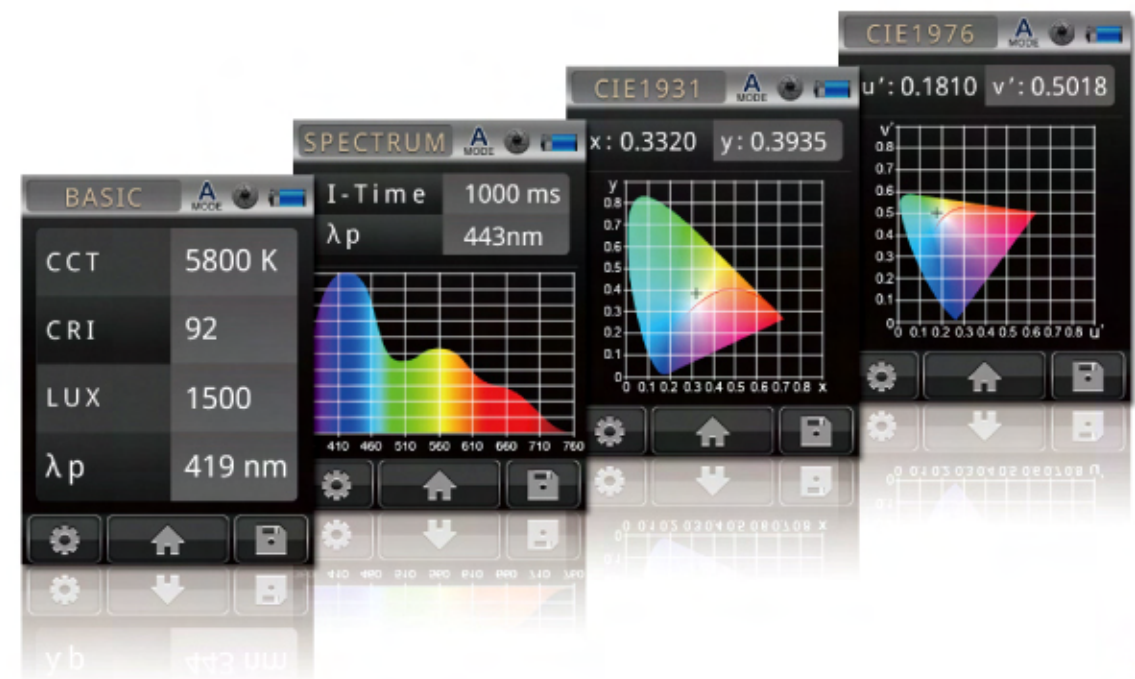
The additional Excel file and BMP file data saving selection are just wonderful for data analysis.

FEATURES & FUNCTIONS



- 250g Only, Light and Easy to Carry
- Measure at Any Time, High Mobility
- 3.5" Color Touch Screen
- Simple Interface, Easy to Use
- SD Card Storage, Easy to Transfer Data

■ CCT ■ CRI ■ LUX ■ λ_p ■ Spectrum ■ CIE 1931 ■ CIE 1976



BASIC MODE APPLICATION

LUX
Illuminance
MK350 Value : 70~70000

The LUX (symbol: lx) is the SI (English: International System of Units ; French: Système international d'unités) unit of illuminance and luminous emittance, measuring luminous flux per unit area.
Formula: $1 \text{ lx} = 1 \text{ lm/m}^2$

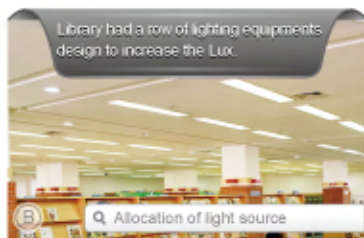
In the old days, lighting intensity illumination was often ignored, especially in offices and retail shops. People only started to care about the application of illumination to life after the interior design industry boom.

Providing correct illumination and light color at different environments and occasions are very important. On the other hand, providing over-illumination might not only be a waste of energy but also have an effect on health and psychological well-being.

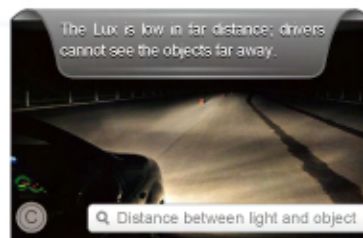
What kinds of factors might change Lux?



The light is stronger the Lux is higher.



The lights are more concentrated the Lux is higher.



The object is more close to light, the Lux is higher

Have you ever been confused about how much light is need when decorating?

First of all, you may follow the international recommended standards for lighting design (see Illuminance Levels for Different Areas of Activity Table given below) to choose a correct illuminance level and then further to the lighting quality CRI.

category	Illuminance Level (lux)	typical areas of application
General Lighting for rooms and areas not frequently used and /or used for casual or simple visual tasks	20	Minimum service illuminance in exterior circulation areas, outdoor stores, stockyards
	50	Exterior walkways and platforms
	70	Boiler house
	100	Transformer yards, furnace room etc.
	150	Circulation areas in industry, stores and stock rooms.
General lighting for interiors	200	Minmum service illuminance on the task
	300	Medium bench & machine work, general process in chemical and food industries, casual reading and filing activities.
	450	Hangers, inspection, drawing offices, fine bench and machine assembly, color work, critical drawing tasks.
	1500	Very fine bench and machine work, instrument & small precision mechanism assembly; electronic components, gauging & inspection of small intricate parts (may be partly provided by local task lighting)
Additional localized lighting for visually exacting tasks	3000	Minutely detailed and precise work, e.g very small parts of instruments, watch making, engraving.

BASIC MODE APPLICATION

CRI (Ra)
Color Rendering Index
MK350 Value : 0~100

The color rendering index (CRI) is a quantitative measure of the ability of an artificial light source to reproduce the colors of various objects faithfully in comparison with natural sunlight. Sunlight was defined as an ideal light source and having a CRI of 100.

When making the CRI comparison for any kind of light sources, suggest choosing the same color for the lights being compared, so it will be easier to determine the results.

SAMPLE >>

When displaying raw meat, yellow light makes meat look fresh and delicious, but how can I know which yellow light's CRI is the best?



A and B light: The color of the object looks better when under B light.

B and C light: Both of them are fine but with different feeling.

How can I apply the CRI when decorating a different environment? What CRI suits it?

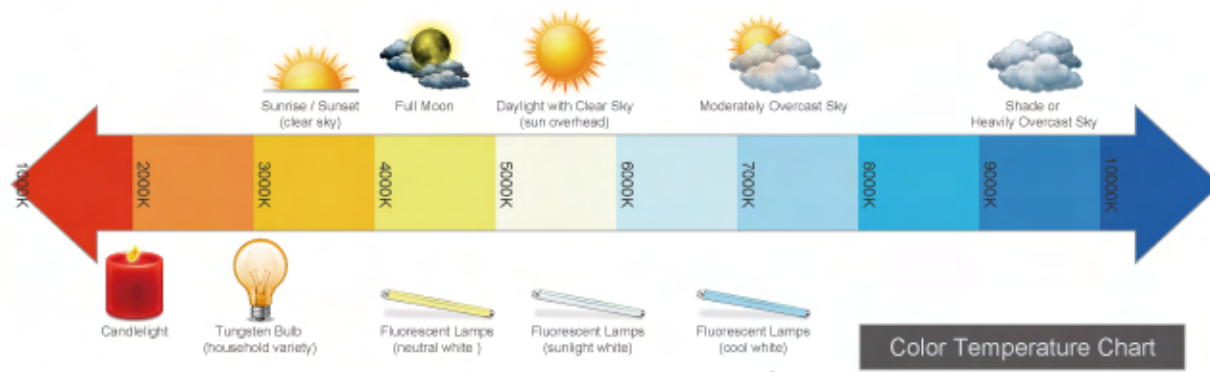
Please refer to the list below for the Ra value and application areas that are provided by CIE.

stage	index Ra	typical areas of application
1A	>90	paint sampling, art galleries
1B	90> RA >80	living accommodation, hotels, restaurants, offices, schools, hospitals, printing and textile industry
2A 2B	80> RA >70 70> RA >60	industrial
3	60> RA >40	industrial and other areas with low demands for colour rendering
4	40> RA >20	industrial and other areas with low demands for colour rendering

BASIC MODE APPLICATION

CCT
Correlated Color Temperature
MK350 Value : 2500~10000

CCT value represents the color of different kinds of light source; standard unit for color temperature is Kelvin (K). You can see the color of yellow stays between 3000~4000K and color white between 5000~6000K.

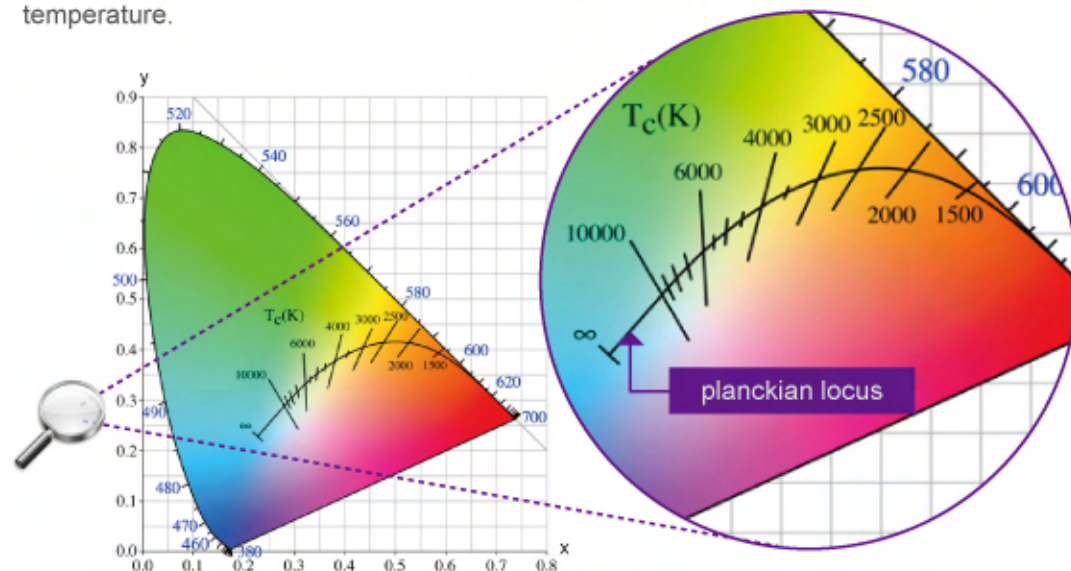


In the color theory, Planckian Locus (Black Body Locus) is the path that the color of a black body would take in a particular color space as the blackbody temperature changes.

The color of the locus on CIE1931 color space called Planckian Locus is shown below. Each point of the locus on the chromaticity diagram represents blackbody radiators at various temperatures.

The CIE 1931 x,y chromaticity space is showing the Planckian locus and lines of constant correlated color temperature.

When spectrum of the light source is distributed closely to the black body but does not match the black body, choose the closest temperature to the black body radiator called correlated color temperature.



BASIC MODE APPLICATION

How can I apply the CCT to the light sources we use in our daily lives?

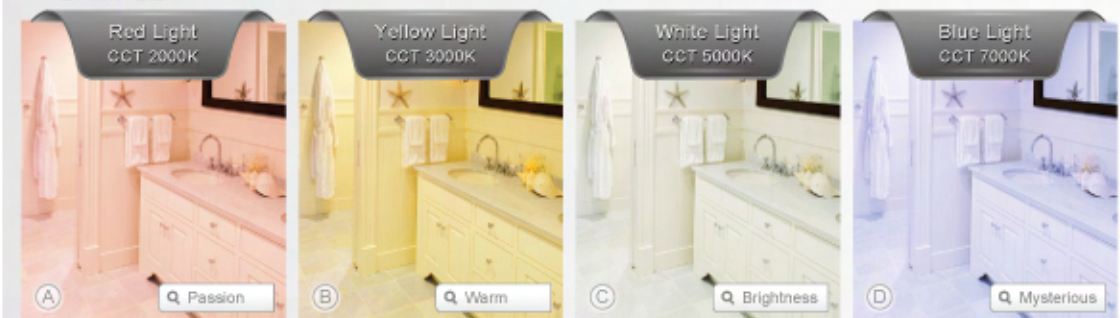
Color temperature is a characteristic of visible light that has important applications in lighting, photography, publishing, manufacturing and other fields.

Here is an example on its application in photography. If you take a photo of a white flower under different kinds of color temperature light sources such as sunlight, tungsten or fluorescent, the results also vary: the white flower is white under sunlight, yellow under tungsten, cool toned under fluorescent.

Human eyes are clever as it can recognize that a flower is white even is color cast under different light sources with different color temperatures. But the camera is unlike human eyes. In order to adjust the color cast, photographers need to know about the color temperature of each light source or learn the white balance function of the camera.

In general, the object gives humans different kinds of feelings when using different kinds of light color on it.

SAMPLE >>

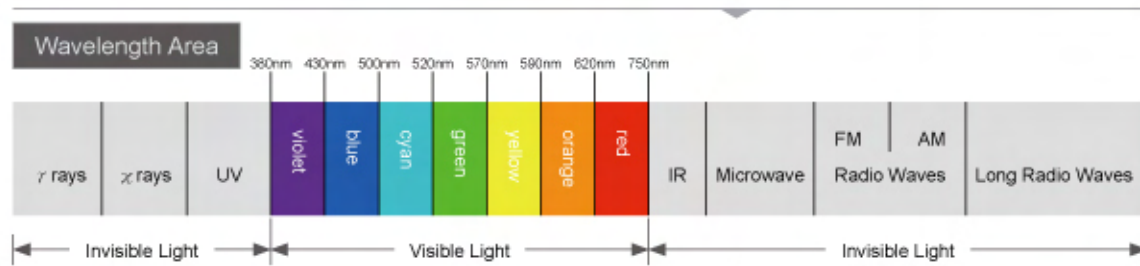


light & CCT

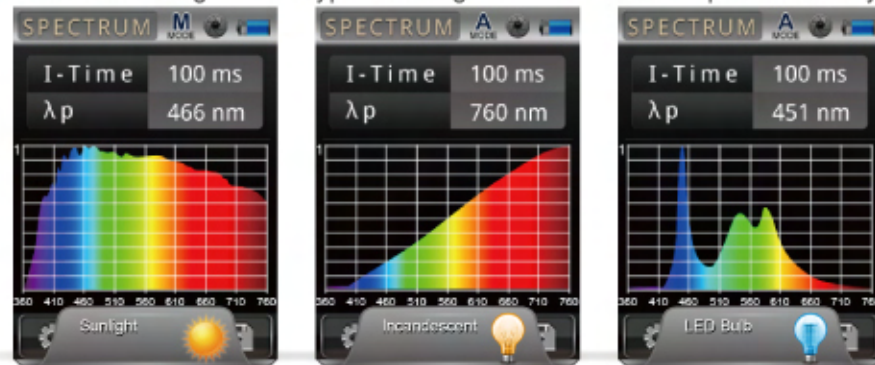
typical areas of application

Warm Light Around 3300K below		Warm light consists of red color and it gives a warm, healthy, comfortable and relaxed feeling. Applicable to residential places, hotels and places with low temperature.
Neutral Light Around 3300K to 5300K		Neutral lights are gentle and give a pleasant, comfortable and peaceful feeling. Applicable to shops, hospitals, offices, hotels, restaurants and waiting areas.
Cool Light Around 5300K above		Cool lights are close to natural light and it gives bright feelings and makes people focus on things. Applicable to offices, conference rooms, classrooms, design rooms, display shelves and libraries.

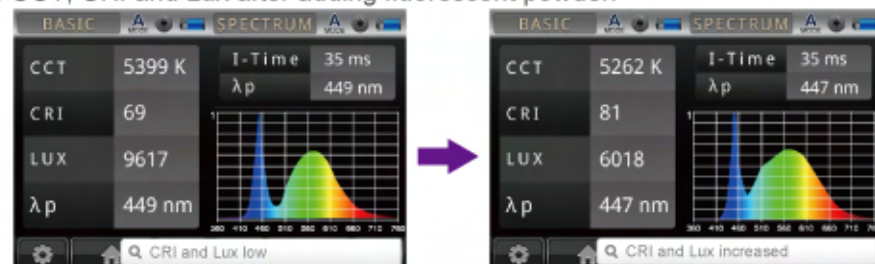
SPECTRUM MODE APPLICATION



SAMPLE >> Users can recognize the type of the light source from the Spectrum easily.



MK350 spectrum is one of the major design concepts to help LED designers observe the changes of CCT, CRI and Lux after adding fluorescent powder.



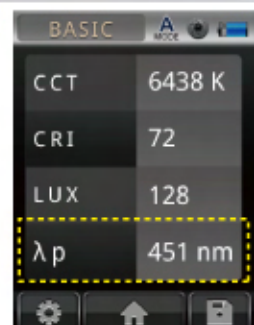
① 1st time add fluorescent powder

② After adjust the fluorescent power

λp
Peak Wavelength
MK350 Value : 360~750nm

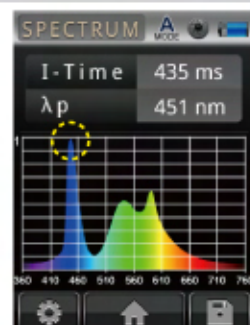
Each light source has its wavelength, the visible light in each color that is measured by MK350 and located at a different wavelength band. MK350 provides the measured peak wavelength value for further analysis.

SAMPLE >>



λp value on Basic Mode, this can help users to find out the peak wavelength value after measurement.

For beginners, they can use the Spectrum Mode to see on which color the λp is located.



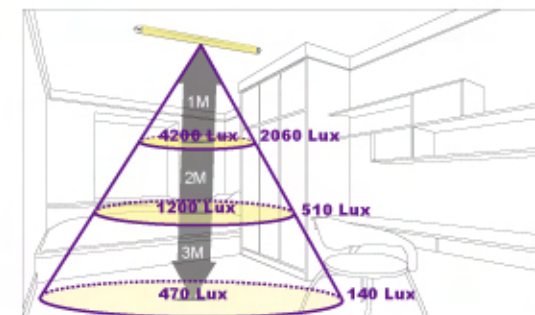
SPECTRUM MODE APPLICATION

I-Time
Integration time
MK350 Value : 8~1000ms

According to the intensity of the light source, MK350 will adjust the I-Time automatically.
MK350 also provides I-Time manual adjustment function to fulfill professional needs.

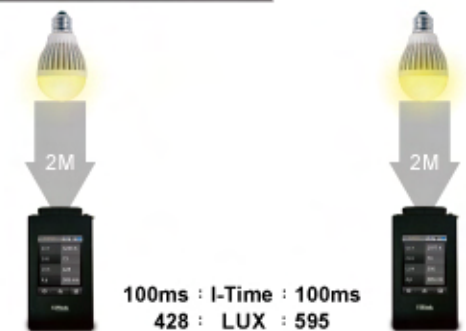
SAMPLE >>

I-Time set up : Auto



Users can adjust the distance from MK350 to light sources to see the changes of Lux. I-Time value will be adjusted by MK350 automatically.

I-Time set up : Manual



When comparing Lux of 2 lamps, users can fix the I-Time and the distance from MK350 to light source to see the changes of Lux.

LED light-emitting area is between the ranges of visible light. This characteristic provides numerous significant advantages when used in the following cases:

Reference: JECA (Japan Electrical Construction Association)

LED characteristic

typical areas of application

LED does not emit light above 780nm



The heat released from light sources will cause displayed food to rot and acidify.

LED light is a suitable light for fresh food display.

LED does not emit light less than 380nm



Displaying and preserving precious works of art away from UV is an important consideration. UV will damage paper, aging cloth materials and causes pigments to fade.

LED light is reliable for art galleries and museums.

LED does not emit below 420nm



Experiments show that insects like to gather at the light source within a 250-420nm range. Obviously, a light source that is less than 380nm entices insects.

People show higher expectations on the application of LED characteristic as having lesser chances of attracting insects.

CIE1931 & CIE1976 MODE APPLICATION

CIE1931 Chromaticity Diagram MK350 Value : x & y

The International Commission on Illumination (usually abbreviated CIE for its French name, Commission internationale de l'éclairage) is the international authority on light, illumination, color, and color spaces. It was established in 1913 as a successor to the Commission Internationale de Photométrie and is today based in Vienna, Austria.

In the study of color perception, one of the first mathematically defined color spaces is the CIE 1931 XYZ color space, created by the International Commission on Illumination (CIE) in 1931.

CIE1976 Chromaticity Diagram MK350 Value : u* & v*

The CIE 1976 (L^* , u^* , v^*) color space, commonly known by its abbreviation CIELUV, is a simple-to-compute transformation of the 1931 CIE XYZ color space.

In recent years, LED inquiries have been increasing, but are the specifications defined by the production side consistent with the needs of the purchaser? This might be a major concern.

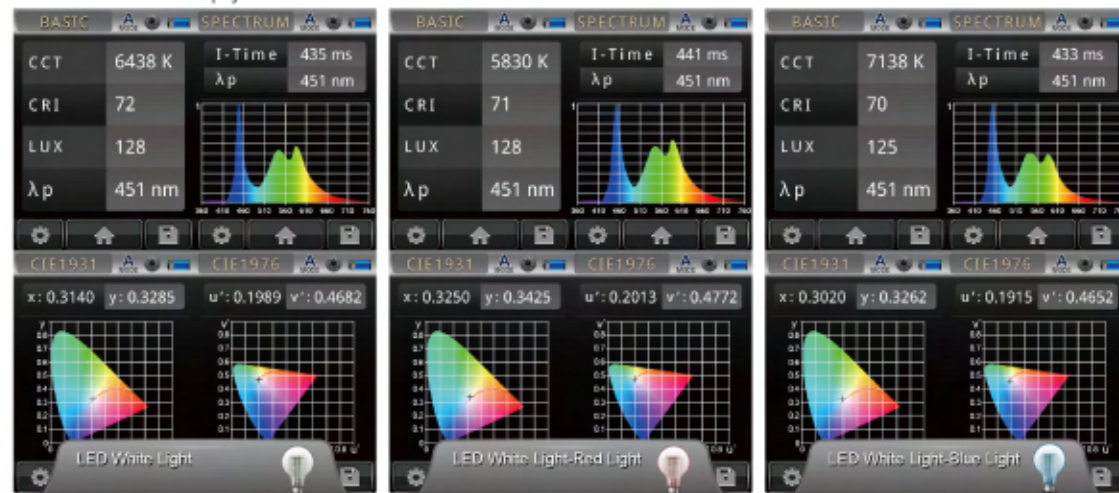
For example, in the old times, when you buy 200pcs white halogen lamps, the 200pcs halogen light color are same as white. Nowadays, the 200 pcs white lamps are changed to LED and you may discover that it is color white but some have a color cast problem of blue or red.

To solve this problem, the seller and the buyer can follow the steps below to standardize the product specification, which can solve the unequal supply and demand and product returns or replacements.



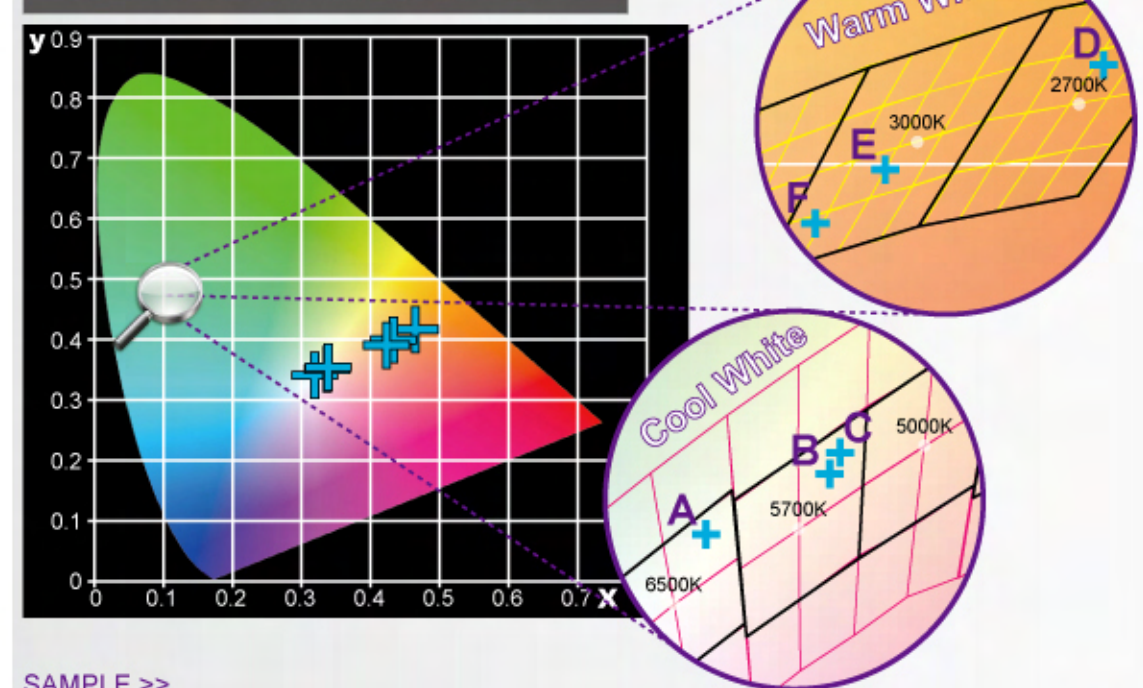
1. Measure the light with international tool CIE1931 or CIE1976 + Lux measurement.
→ To ensure the light color quantitative
2. Measurement LED CRI + Spectrum comparison
→ To ensure the Spectral

You may compare the following three white LED lamps, MK350 provides the most complete data and information will help you uncover the secrets of the LED.



CIE1931 & CIE1976 MODE APPLICATION

CIE 1931 x,y Chromaticity Coordinates



SAMPLE >>



SPECIFICATION

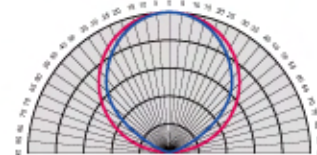


Figure 1: Cosine Correction — MK350 — Ideal Value

Sensor	CMOS Linear Image Sensor	
Spectral Bandwidth	Approximately 12 nm (half bandwidth)	
Receptor Size	$\varnothing 6.6 \pm 0.1$ mm	
Cosine Correction	Refer Figure 1.	
Measurement Range	70 ~ 70000 Lux	
Wavelength Range	360 ~ 750 nm	
Integration Time Range	8 ~ 1000 ms	
Capture Function	One time / Continuous	
Integration Mode	Auto / Manual	
Measuring Modes	1. Basic Value Mode 2. Spectrum Graph Mode 3. CIE 1931 Chromaticity Diagram Mode 4. CIE 1976 U.C.S Chromaticity Diagram Mode	
Measuring Capabilities	1. Illuminance / Lux 2. Spectral Irradiance 3. C.I.E. Chromaticity Coordinates (1) CIE 1931 x,y Coordinates (2) CIE 1976 U.C.S u',v' Coordinates 4. Peak Wavelength 5. Correlated Color Temperature; CCT (in Kelvins) 6. Color Rendering Index; Ra (Rendering Average)	
Digital Resolution	16 bits	
Dark Calibration	Yes	
Stray Light	-25 dB max. *1	
Wavelength Data Increment	1 nm	
Wavelength Reproducibility	± 1 nm *2	
Illuminance Accuracy	Illuminant A @ 2856K at 20000 Lux	$\pm 5\%$
Color Accuracy		± 0.0025 in CIE 1931 x,y
Color Repeatability		± 0.0005 in CIE 1931 x,y
CCT Accuracy		$\pm 2\%$
CRI Accuracy @ Ra		$\pm 1.5\%$
Display	3.5" LCD 320X240 Touch Panel	
Max. Files	≈ 2000 Files @ 2GB SD Card	
Battery Operation Time	≤ 5 hours / Fully Charged	
Battery	2500 mAh / Rechargeable Li-ion Battery	
Data Output Interface	SD Card / USB 2.0	
Data Format	Compatible MicroSoft Office Excel / BMP Data Format	
Dimensions	144.2 x 78 x 24 mm (H x W x D)	
Weight (with Battery)	250 g $\pm$ 20 g	
Operating Temperature Range	0 ~ 35 °C	
Storage Temperature Range	-10 ~ 40 °C	
Language Selection	English / Traditional Chinese / Simplified Chinese / Japanese / German / French / Russian	

*1: Use the input of 550nm single-frequency and measurement the range of optical ± 40 nm.

*2: Input source must be a stable light source.

The company reserves the right to change product specifications, if it has any changes will not give any notice.

Federal Communications Commission (FCC) Statement

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Warning Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation of the device.

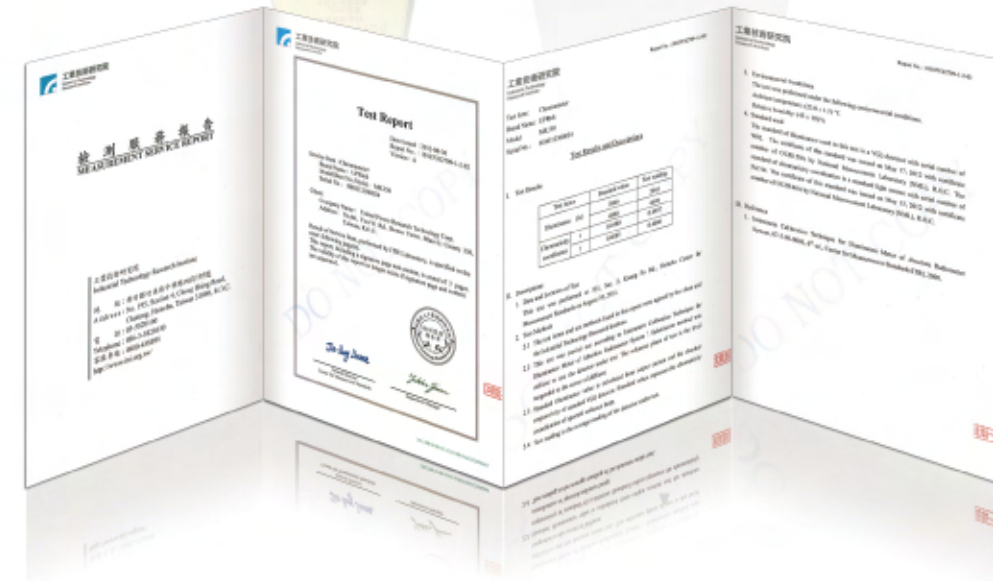
FCC RF Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

End users must follow the specific operating instructions for satisfying RF exposure compliance. The transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

CERTIFICATE & AWARDS

- CE ■ FCC ■ Industrial Technology Research Institute
- 2012 Golden Torch Award ■ 2013 LEDinside Aurora Award





step1 : point sensor head towards light source
step2 : press capture key
step3 : after 3 seconds, measurement data is displayed

Three Steps to Measurement