



Wireless Light/RGB(Color)/UV (P4512-LU) User manual



Rev. WL112LC-12-2023

This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

The wireless Light/RGB/UV sensor measures the intensity of various wavelengths from visible light to ultraviolet light.

The wireless Light/RGB/UV sensors is a sensor that can conduct experiments related to optics by measuring wavelengths from the visible light range to the ultraviolet range. Ultraviolet index (UVI), RGB, and illuminance can be easily changed using buttons. Additionally, the sensor has a display window so you can immediately check the measured values, and measurements can be made by remotely connecting to a smart device or PC wirelessly or wired without an interface.

Suggested experiments

- Light intensity depending on distance.
- The brightness of the bulb depends on the battery.
- Light synthesis experiment.
- UV protection principle experiment

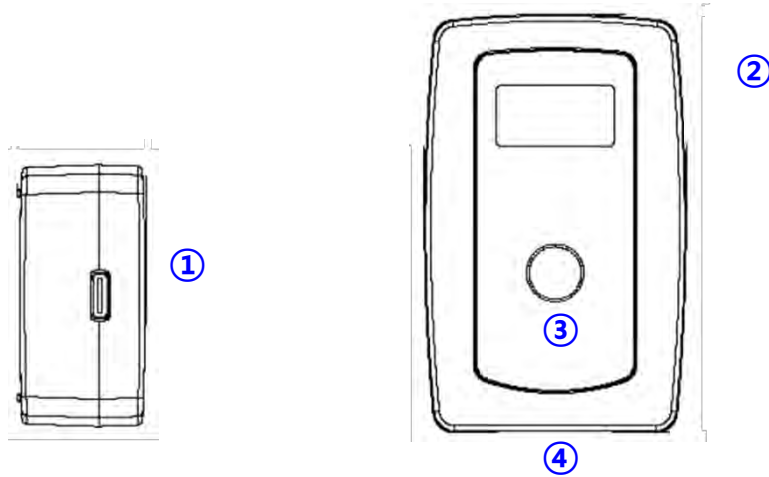
Composition

The wireless Light/RGB/UV sensor consists of the following.

- Wireless Light/RGB(Color)/UV sensor (P4512-LU)
- USB-A/C cable
- Booklet

Function of wireless sensor

Structure



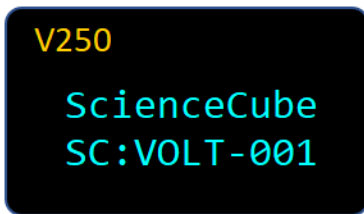
- ① USB port : Connect the sensor to a PC and use it for experiments or charging.
- ② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.
- ③ Power/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.
- ④ Sensing part : A place to measure ultraviolet rays (UV), RGB, and illuminance.

Caution : Do not use the sensor near fire or explosive gases. Chemical vapors can block the polymer layer used for capacitance, causing permanent damage to the sensor.

Power/Function Button

| Status | Turn | Action | Description |
|-----------------------|------------|--------|---|
| When the power is off | Click once | ■ | A short press turns the sensor on. |
| | Long click | ■ | A long press changes the mode and turns on the sensor. |
| When it's on | Click once | ■ | Change sensor type or range. (Multi-sensor or range sensor only) |
| | Long click | ■ | Turns off. |

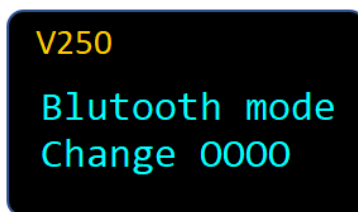
Start screen



V250 : Displays the sensor's firmware version.

SC:0000-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

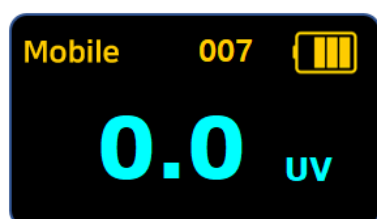
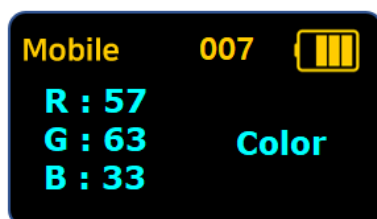
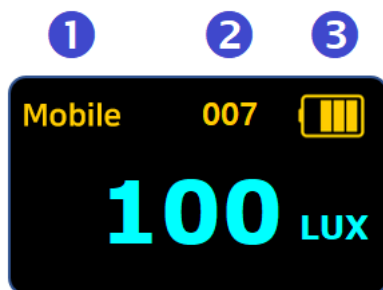
Mode change




When you press and hold the power button and turn it on, the Bluetooth connection mode changes to **Mobile** or **PC** with the following message.

See last page for more information.

Measurement screen



| | |
|--------------------------|--|
| <p>① Connection mode</p> | <p>Mobile : Connecting Android or iOS PC : Connecting to Windows PC  : Connected via USB cable ※ A long press changes the mode and turns on the sensor.</p> |
| <p>② Sensor-ID</p> | <p>This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.</p> |
| <p>③ Battery</p> | <p>Check the battery status, and when charging via USB, the display will change to charging.</p> |
| <p>④ Value</p> | <p>1) Displays sensor measurement values and units in real time. 2) For sensors with multiple ranges, the current range is displayed. 3) For multiple sensors, the values for each sensor type are displayed.</p> |

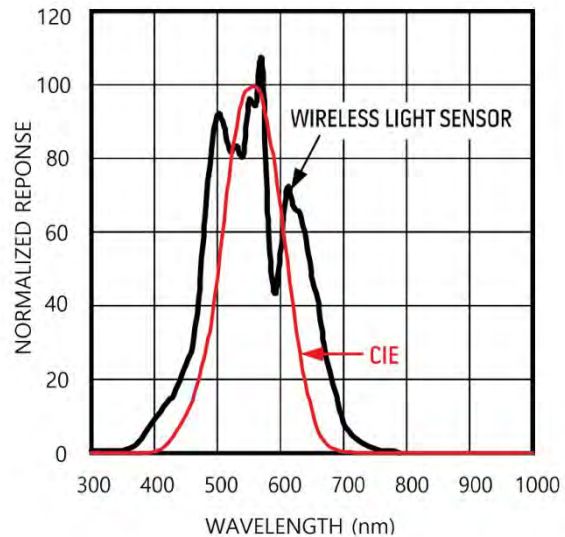
How it Works

The Light sensor for measurements of:

Light Sensor

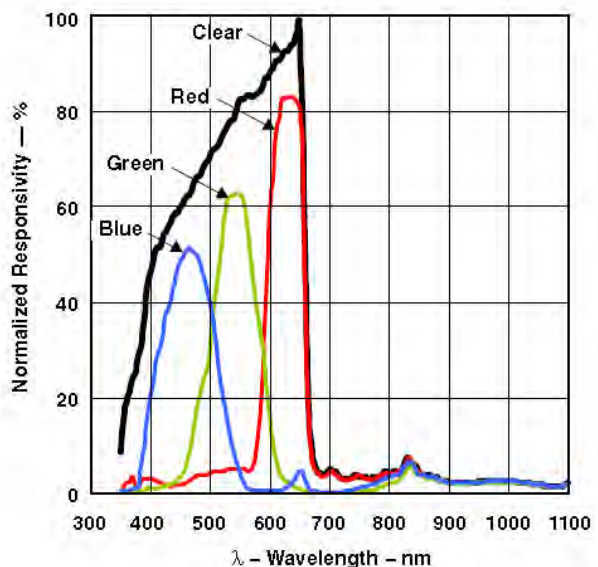
The Light sensor is an ambient light sensor with an integrated photodiode. It uses a photodiode whose spectral response is optimized to mimic the human eye's perception of ambient light and incorporates IR and UV blocking capability. The adaptive gain block automatically selects the correct lux range to optimize the counts/lux.

The spectral sensitivity of the photodiode and the human eye (CIE curve) are shown in the figure to the right. As can be seen, the human eye has its peak sensitivity at 555nm (green), while that of blue (~470nm) and red (~630nm) is much lower. The human eye also is blind to infrared (> 700nm) and ultraviolet (< 400nm) radiation.



Color Sensor

The digital color sensor is designed to accurately derive the color chromaticity and illuminance (intensity) of ambient light and provide a digital output with 16 bits of resolution. The device includes an 8 x 2 array of filtered photodiodes, 4 analogue-to-digital converters, and control functions on a single monolithic CMOS integrated circuit.



Of the 16 photodiodes, 4 have red filters, 4 have green filters, 4 have blue filters, and 4 have no filter (clear). The figure below shows the spectral responsivity of the sensor. Note that spectral responsivity is normalized at 655 nm.

UV Sensor

The UV Index is a number linearly related to the intensity of sunlight reaching the earth. The UV Index has been standardized by the World Health Organization in the way shown in the table below. The higher the UVI, the greater the potential for damage to the skin and eye, and the less time it takes for harm to occur.

| | | |
|-------|---------------------|---------------------------|
| 11+ | Extreme high | Extra protection required |
| 8-10 | Very high | |
| 6- 7 | High | Protection required |
| 3 – 5 | Moderate | |
| 1-2 | Low | No protection required |

Using the Sensor


The measuring section (below the sensor) measures light intensity, RGB, and ultraviolet rays. There are a total of three sensors: illuminance, RGB, and ultraviolet rays, and the sensor conversion method changes each time you press the power button while the sensor is turned on. Changes are displayed on the LCD screen.

- LUX : illuminance sensor
- Color : color sensor
- UV : ultraviolet rays

Experiment sample – Intensity of light according to distance

- ① Prepare a 30cm ruler and a flashlight.
- ② Run Science# and connect the illuminance chromaticity sensor via Bluetooth.
- ③ Set the experiment settings as **[Manual collection]-[Line chart]-[Number input]-[x-axis title: *Distance*]**.



- ④ Press **[Start]**, press Start Experiment, turn on the flashlight, and  press to measure the illuminance from a distance of 1cm.
- ⑤ Move the illuminance sensor further away from the bulb's filament at 1cm intervals to collect illuminance data for each distance.
- ⑥ Finally, measure the illuminance at a point 30cm away and click End experiment to complete data collection.
- ⑦ Click **[End]** to end data collection.
- ⑧ Look at the graph and check the relationship between light intensity and distance.

Specifications

| Item | Description |
|----------------------------|---|
| Range | Light intensity : 0 to 90,000 Lux (Max. 188,000 lux) Color : RGB in the range 0 – 65,535 count UV : 0 ~ 11 UV index |
| Resolution | Light intensity : vary exponentially Color : 1 count UV : 0.1 index |
| Sampling Time | Max. 100Hz |
| Condition | -20 ~ 60°C, ~85%RH |
| Wireless Connection | Bluetooth 5.0 or Classic 2.1 |
| Wired Connection | USB-C |
| Battery | 700mAh Li-Polymer rechargeable |
| Charging Time | within 2 hours |
| Operating Time | Approximately 12 hours after full charge (depending on usage conditions) |
| EMC | CE : EN 61326-1, EN 55011, EN 55032, EN 301 |

CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.

How to install Science#

● Install Windows PC version

Online installation file (approximately 39MB)

<http://www.koreadigital.com/url/updates/sciencesharppc/setup.exe>

* Internet connection is required during installation

Offline installation file (approximately 340MB)

http://www.koreadigital.com/url/updates/sciencesharppc/setup_full.exe

* Installation does not require an Internet connection, but contains large content

● Install from a mobile smart device (Smartphone or Tablet PC)

1. Download Science# to your smart device (Refer to QR codes below)
2. Connect using Bluetooth (See Science# documentation or refer to next page)
3. Run Science#
4. When you connect the sensor, the measurement is displayed on the Science# screen




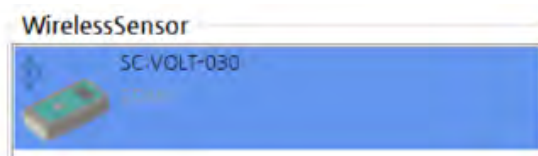
Features

- Up to four wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices but also desktop and laptop PCs to conduct experiments using the Science# application.
- It can be connected to a PC through a USB port and experiments can be performed using the Science# program.


How to connect Wireless Sensor to Science# program

● Windows PC

1. Install and run Science# (Refer to previous page for installation method)
2. Power on the sensor
3. Click the  [Connect] icon and select [Bluetooth Interface] from [Select Interface]
4. [Add Bluetooth or other device] → [Bluetooth] → Add sensor number after checking the number on the backside of sensor
5. When you see like the picture, click on Wireless Sensor and connect



● Android or iOS (Smartphone or Tablet PC)

1. Install and run Science# (Refer to previous page for installation method)
2. Power on the sensor
3. Click the  [Connect] icon and select [Bluetooth Interface]
4. After selecting the device search, check the sensor number on the backside and connect



If you experience any connection issues, check Bluetooth mode on the sensor. Please refer to the next page for instructions on how to change it.

How to switch to Bluetooth mode for Android and iOS

For mobile devices (Android, iOS) Bluetooth Low Energy technology is used for wireless communication. For these devices do not pair the sensor just use it directly in the software.

Turn off the sensor. Then press and hold the power button until the text 'Bluetooth mode Change Mobile' is shown, then release the button. The mode is set to 'Mobile', meaning that Bluetooth Low Energy is used.

How to switch to Bluetooth mode for Windows

For Windows computers, Bluetooth Classic technology is used for wireless communication. Before you start to use the sensor for measurement you have to pair it. If you are asked for a PIN, enter either "1234" or "0000".

Turn off the sensor. Then press and hold the power button until the text 'Bluetooth mode Change PC' is shown, then release the button. The mode is set to 'PC', meaning Bluetooth Classic is used.

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