LIGHT/COLOR/UV SENSOR W32

USER GUIDE

cma-science.nl

Short description

CMA Wireless Light/Color/UV sensor W32 combines three sensors for measurements of:

- light intensity in the range of 0 to 188 000 Lux,
- contributions of red, green, and blue colors in light in the range of 0 .. 65,535 counts,
- UV index in the range between 0 and 11.

The power button located on the top of the sensor allows you to turn the sensor on and off. The sensor is equipped with an OLED color display which shows some sensor information and the measured by the sensor values. This makes the sensor suitable to use as an independent measuring instrument.

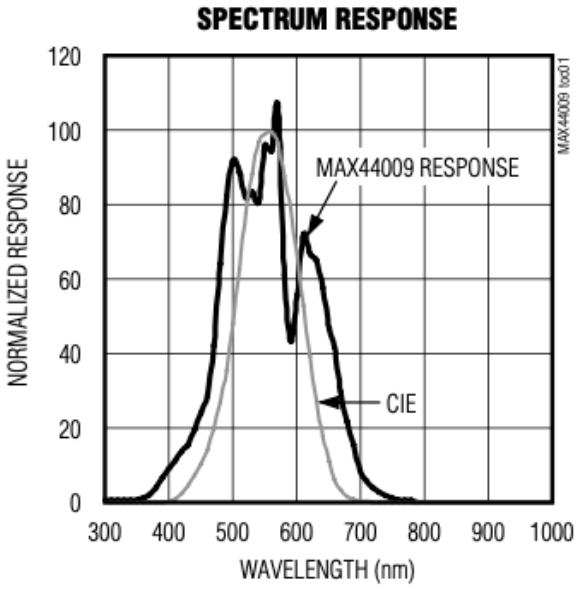
Briefly press the power button to browse through the values measured by each sensor. For correct sensor detection in the Coach software first select the desired sensor and then connect the sensor.

The Light/Color/UV sensor can be used wireless via Bluetooth or wired via USB. The sensor is equipped with an OLED color display which shows information about the sensor and the current measured values. The power button located in the middle of the sensor allows it to turn on/off the sensor and to change its measurement range.

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.

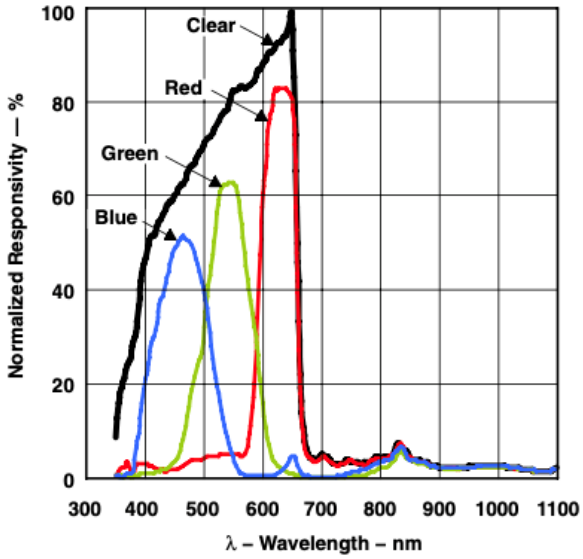
The spectral sensitivity of the photodiode and the human eye (CIE curve) are shown in the figure to the right. As can be seen, the human eye has its peak sensitivity at 555nm (green), while that of blue (~470nm) and red (~630nm) is much lower. The human eye also is blind to infrared (> 700nm) and ultraviolet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

Calibration

The Light/Color/UV sensor W32 converts measured Light/Color/UV values to digital values. The sensor is supplied with factory calibrations in lux/RGB counts/UV index. When working with the Coach program the pre-defined calibration can be shifted by using the **Set to Value** option.

Software

You can use the Light/Color/UV W32 with Coach 7 or Coach 7 Lite (free) program on computers (Windows and Mac) or Coach 7 and Coach 7 Lite (free) app on mobile devices (Android and iOS). For Chromebooks, we offer a special Android app. The support for wireless sensors is added starting from Coach version 7.10.

Check the CMA website for the latest installations. https://cma-science.nl/downloads_en

Collecting data without software connection

- Turn the Light/Color/UV sensor on by pressing its power button.
- The sensor briefly displays its Bluetooth identification code. This ID code is also printed on the sticker located on the bottom side of the sensor box.
- Then the display shows:
  - the Bluetooth mode, 'Mobile' or 'PC'.
    Mobile indicates Bluetooth Low Energy mode which should be used when working with mobile devices (Android, iOS), Chromebook and Apple computers.
    PC indicates Bluetooth Classic which should be used for Windows computers.
  - the battery level, and
  - the current measured value.
- Now you can use the sensor as an independent measuring instrument.
- Press the power button to toggle between the values measured by the Light, Color (RGB) and UV sensor.
- For correct sensor detection in the Coach software first select the desired sensor, the Light, Color (RGB) or UV sensor and then connect the sensor.
- To turn off the sensor press and hold its power button for 3 sec. To save its battery the sensor automatically turns off after a few minutes of inactivity (no connection to power, no communication).

Collecting data via the Bluetooth connection

Note: The Light, Color, and UV sensors cannot be used simultaneously. To use a different then the connected sensor, first disconnect the currently connected sensor, select the desired sensor using its power button, and then reconnect it in Coach.

Mobile devices, Chromebooks, and Apple computers

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

- Turn on the Light/Color/UV sensor.
- Ensure your sensor is set to Mobile mode.
  If the display shows in the top-left corner 'PC' first you must set the sensor to the

Mobile mode. 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 'which means that Bluetooth Low Energy is used.

- Press the power button to select a sensor to use, Light, Color or UV sensor. The sensors cannot be used simultaneously, only one sensor can be selected for a measurement.
- Start the Coach 7 or Coach 7 Lite program/app.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.
- On opening of the Activity Coach starts searching for sensors which are turned on and in the Mobile discovery mode. The found Bluetooth sensors appear in the list.
- Select the Light/Color/UV sensor you want to connect to. If needed check the sensor's Bluetooth ID which is located on the sensor's bottom label.
- When the connection is established the Bluetooth symbol appears in the top-left corner of the sensor's display and the sensor icon(s) appears showing the measured values.
- Now you are ready to use the Light/Color/UV sensor for your measurement.

Windows computers

For Windows computers, Bluetooth Classic technology is used for wireless communication. Before you start to use the sensor for measurement in Coach you have to **pair** it.

- Turn the Light/Color/UV sensor on.
- Ensure your sensor is set to PC mode.
  If the display shows in the top-left corner 'Mobile' first you must set the sensor to the PC mode. 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.
- Pair your sensor.
  - Go to the Windows Settings **Bluetooth and other devices** and select **Add Bluetooth or other devices**. Select **Bluetooth device**.
  - Windows looks for Bluetooth devices and after a while lists discovered devices. The wireless sensors are listed with their Bluetooth IDs.
  - Select the sensor you want to connect to. If needed check the sensor's Bluetooth ID which is located on the bottom label of your sensors.
  - When the connection is successfully established Windows indicates that the sensor is paired and ready to go.
  - Click **Done** to accept it. The sensor appears in the list of paired Bluetooth devices.
- Press the power button to select the sensor you want to use, Light, Color or UV sensor. The sensors cannot be used simultaneously, only one sensor can be selected for measurement.

- Start the Coach 7 or Coach 7 Lite program.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.
- Coach starts searching and displays the list with detected sensors, even if they are not paired.
- Select the Light/Color/UV sensor you want to connect to. If needed check the sensor's Bluetooth ID which is located on the sensor's bottom label. If the sensor was not paired yet Coach will force you to pair the sensor first via Windows Settings.
- When the connection is established the Bluetooth symbol appears in the top-left corner of the sensor's display and the icon of the sensor appears showing the measured values.
- Now you are ready to use the chosen Light, Color or UV sensor for your measurement.

Collecting data via the USB connection

For computers (Windows and Mac) the Light/Color/UV sensor can also be used as a USB sensor.

- Turn the Light/Color/UV sensor on.
- Press the power button to select a sensor to use Light, Color or UV sensor. The sensors cannot be used simultaneously, only one sensor can be selected for measurement.
- Use the provided USB cable to connect the sensor to a USB port.
- Start the Coach 7 or Coach 7 Lite program.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.
- The connected USB sensor should be detected automatically, and its icon appears on the first empty sensor position in the Wireless sensors panel.
- When the connection is established the USB symbol appears in the top-left corner of the sensor's display and the sensor icon(s) shows the measured data.
- Now you are ready to use the Light/Color/UV for your measurement.

Charging a battery

An internal rechargeable battery (Li-Poly 3.7 V, 700 mAh) powers the sensor. The battery symbol located in the top-right corner of the sensor's display shows the battery level. When the battery level becomes critical, the battery gauge shows an empty battery. Use the provided cable to connect the sensor to a USB port for charging. A fully discharged battery requires up to 2 hours of charge time to become fully charged again. To prolong battery life, automatic power down turns the sensor off after 5 minutes of inactivity. To replace the battery, use **only** the approved rechargeable batteries provided by CMA.

Technical Specifications

Sensor kind	Digital, on-sensor digital conversion Light: 22-bit resolution (dynamic change) Color/UV: 16-bit resolution
Measuring ranges	Light intensity: 0 to 188,000 lux Color: RGB in the range 0 .. 65,535 counts UV: 0 .. 11 UV index
Resolution	Light intensity: vary exponentially Color: 1 count UV: 0.1 UV index
Maximal sampling rate	10 Hz
Spectral range	400 to 840 nm
Display	OLED 0.96" (128*64 px)
Battery	Li-Poly Rechargeable Battery (3,7 V 700 mAh)
Battery life after full charge	Approximately 12 hours Battery life varies by use, configuration, temperature, and many other factors; actual results will vary.
Connection	Bluetooth 5, Low Energy (Mac, Android, iOS) Bluetooth 2.1, Classic (Windows) USB 2.0 (type C)
Bluetooth ID	W32LIGH-xxx
Sensor Dimensions	80 x 50 x 25 mm

Warranty

The Light/Color/UV W32 sensor W04 is warranted to be free from defects in materials and workmanship for a period of 3 years from the date of purchase provided that it has been used under normal laboratory conditions. This warranty does not apply if the sensor has been damaged by accident or misuse.

The sensor battery is consumable and is warranted to be free from defects in materials and workmanship for a period of 36 months from the date of purchase.

Discard batteries according to local regulations.

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

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