LIGHT SENSOR BT50i

USER'S GUIDE

CENTRE FOR MICROCOMPUTER APPLICATIONS

http://www.cma-science.nl

Short description

The CMA Light sensor BT50i measures light intensities in three ranges:

- 0 .. 1500 lux
- 0 .. 15000 lux, and
- 0 .. 150000 lux.

The desired range can be selected by pressing a switch located on the top of the sensor box. A green diode indicates the actual selected range.

The 0 - 1500 lux range is the most sensitive range, it is suitable for low levels of illumination. The 0 - 15000 lux is a good general-purpose range for indoor light levels. The 0 - 150000 lux range is suitable for measurements in daylight. Full sun illumination is within the range of the sensor. The sensor can also be used as a light gate.

A photodiode (BPW21), which is located at the end of the plastic tube, converts light intensity in an output voltage adjusted to a range of 0 to 5V, which can be measured by an interface. The photodiode is equipped with a flat glass window with built in color correction filter, giving an approximation to the spectral response of the human eye.

The Light sensor can be directly connected to analog BT inputs of CMA interfaces. The sensor cable BT - IEEE1394 needed to connect the sensor to an interface is not supplied with the sensor and has to be purchased separately (Order Code BTsc_1).

Sensor recognition

The Light sensor has a memory chip (EEPROM) with information about the sensor: its name, measured quantity, unit and calibration. Through a simple protocol this information is read by the CMA interfaces and the sensor is automatically recognized when it is connected to these interfaces.

Notice that for the Light sensor each of its measurement ranges has its own EEPROM information. The selected sensor range, indicated by a green LED, determines which information is used. This sensor range is detected automatically.

If your Light sensor is not automatically detected by an interface you have to manually set up your sensor by selecting it from the Coach Sensor Library.

Calibration

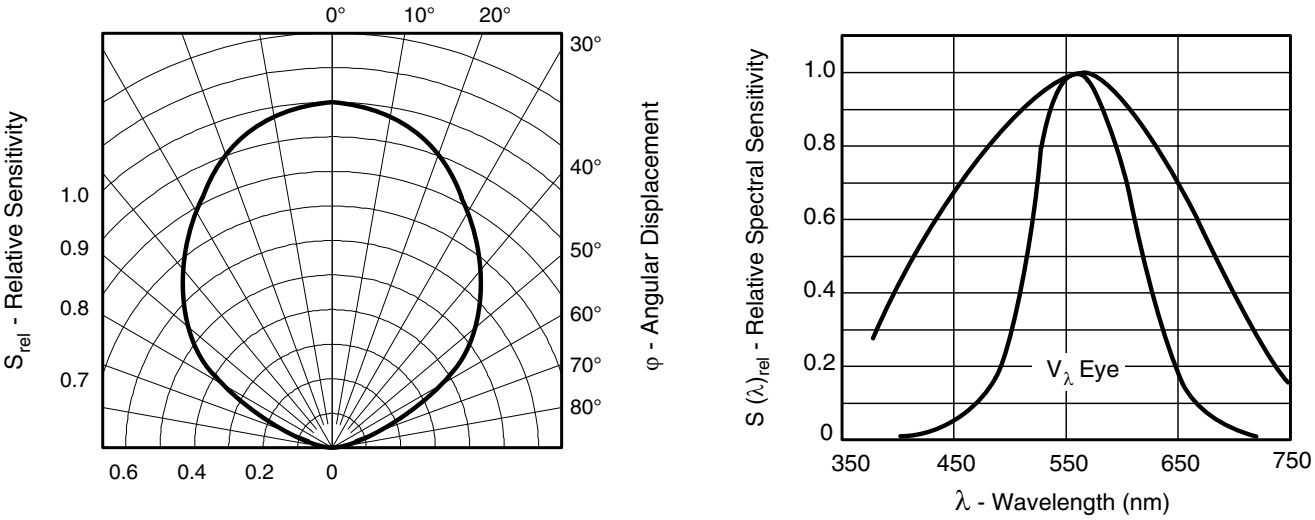
The CMA Light sensor BT50i is supplied calibrated. The output of the Light sensor is linear with respect to light intensity. Each of its measurement ranges has own calibration. The supplied calibration functions are:

- Measurement range 0 .. 1500 lx: $I\ (klx) = 0.30864 * V_{out}(V)$
- Measurement range 0 .. 15000 lx: $I\ (klx) = 3.0864 * V_{out}(V)$
- Measurement range 0 .. 150000 lx: $I\ (klx) = 30.864 * V_{out}(V)$

The CMA Coach program allows selecting between the calibration supplied by the sensor memory (EEPROM) or the calibration stored in the Coach Sensor Library.

Spectral sensitivity of the light sensor

The spectral sensitivity of the Light sensor approximates the spectral sensitivity of the human eye. The maximum sensitivity is at 565 nm.



Light sensor characteristics.
Left: Relative radiant sensitivity vs. angular displacement.
Right: relative spectral sensitivity vs. wavelength in nm (black line).
The sensitivity of the human eye is included for reference (grey line).

Suggested experiments

The Light sensor can be used in a variety of experiments in biology, chemistry, physics or environmental science, such as:

- verifying inverse square law
- observing darkening of a solution caused by a chemical reaction,
- investigating reflection and absorption light,
- studying weather - monitoring sunrise and sunset times,
- studying solar energy,

and digital applications (as a light gate) such as:

- measuring the acceleration due to gravity,
- measuring the speed of a moving cart.

Technical Specifications

Sensor kind	Analog, generates an output voltage between 0 and 5 V
Measuring ranges *Low* *Medium* *High*	 0 to 1500 lx 0 to 15000 lx 0 to 150000 lx
Resolution using *12- bits 5V AD converter* *Low* *Medium* *High*	 0.37 lux 3.7 lux 37 lux
Calibration functions *Low* *Medium* *High*	 I (klx) = 0.30864 * V_{out}(V) I (klx) = 3.0864 * V_{out}(V) I (klx) = 30.864 * V_{out}(V)
Sensitivity	9 nA/lx
Angle of half sensitivity	± 50°
Wavelength of peak sensitivity	565 nm
Range of spectral bandwidth	420 nm - 675 nm
Rise time	3.1 µs
Supplied current	10 mA
Connection	IEEE1394 connector for BT-IEEE1394 sensor cable. Sensor cable not delivered with the sensor.

Warranty:

The Light sensor BT50i is warranted to be free from defects in materials and workmanship for a period of 12 months 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.

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

Rev. 04/10/2016