Sensors • Photopic Illumination Detector

PMA2130

Measures Illumination According to Photopic Luminous Efficiency Curve

Applications

- Environmental Monitoring
- Industrial and Laboratory Safety
- Industrial and Residential Lighting
- Art and Museum Maintenance
- Photography and Film Studios

Features and Benefits

- High Sensitivity
- Wide Dynamic Range
- Excellent Long-term Stability
- Cosine Corrected
- NIST Traceable Calibration

The PMA2130 is a portable illumination detector (Lux detector) with spectral response following the CIE photopic action spectrum. This detector is designed to have a spectral response like that of the human eye's visual response in the photopic region.

The human eye has three distinctive regions of response. The first region is the response of the eye under typical lighting conditions (photopic) defined as intensities greater than about 0.1 Lux. The second region is a transitional region known as the Purkinje region defined as intensities between about 0.01 and 0.1 Lux. The third region is the dark adapted region of the human eye (scotopic) defined as intensities between about 0.01 and 0.0001 Lux. Intensities less than 0.0001 Lux are undetectable with the human eye. These three region are distinctive in that the human eye has different spectral response for each region of intensity. The photopic spectral luminous efficiency curve peaks at 555nm and it is normalized to 1 at that wavelength.

The power-like unit of brightness-sensation-producing ability of light is Lumen [lm]. The relationship between effective Watts and Lumen has changed several times during 20th century and it is now assumed to be 683lm/W. For example, 555nm monochromatic radiation flux of 1W would carry the luminous flux of 1lm. Please note, that scotopic spectral luminous efficiency as well as the conversion factor between watts and scotopic lumens differ from their photopic counterparts.

The illumination (illuminance) is measured in luminous flux per unit area. The following units are commonly used:

- 1 lumen/cm^2 = 1 phot
- 1 lumen/ft^2 = 1 footcandle (ft-cd)
- 1 lumen/m^2 = 1 lux with ft-cd and lux dominating in the field

The PMA2130 detector has a Teflon diffuser assuring an angular response close to the cosine function (Lambertian response). It is of particular importance when measuring radiation flux from extended sources or from sources positioned at an angle to the axis of the detector.

SOLAR® LIGHT

Calibration

TThe PMA2130 detector is calibrated by transfer from a NIST traceable quartz-halogen standard lamp. The spectral irradiance from the lamp, at the nominal distance of 50 cm, is cross-multiplied by the photopic luminous efficiency function and the effective power of the radiation is converted to lm/m2 (lux) using a conversion factor of 683 lm/W. The PMA2130 detector is then exposed to this radiation and adjusted accordingly.

The basic radiometric uncertainty of this calibration is under 5%. The detector requires yearly re-calibration.

Specifications	
Spectral Response	Follows CIE Photopic Spectral Luminous Efficiency Curve (400-700nm) Figure 1
Angular Response	5% for Angles <60°, Figure 2
Range PMA2130	PMA2130 • 150,000 Lux
	PMA2130L • 1,500 Lux
	PMA2130H • 1,500,000 Lux
Display Resolution	PMA2130 • 1 Lux
	PMA2130L• 0.01 Lux
	PMA2130H • 10Lux
Operating Environment	32 to 120 °F (0 to +50 °C) No Precipitation
Cable	1 ft. Retractable to 5 ft. (0.3m/1.5m)
Diameter	1.6" (40.6mm)
Height	1.8" (45.8mm)
Weight	7.1 oz. (200 grams)
Irradiance from Typical Sources	Solar Radiation, 30°. SZA, 3mm Ozone Clear Sky: 100,000 Lux
150W Quartz Halogen Lamp at 50cm	Approx. 1900 Lux
Typical Workplace Illumination	500 Lux

Ordering Information	
PMA2130	Photopic Illumination Detector
PMA2130L	w/ 0.01 Lux Resolution (See Spec.)
PMA2130H	w/ Extended Range (See Spec.)
See list of accessories for mounting hardware available. For scotopic (dark adapted vision) see the PMA2131 detector.	

References

[1] "American National Standards: Nomenclature and Definitions for Illuminating Engineering" (1981) Illuminating Engineering Society, New York
[2] Smith, Warren J. "Modern Optical Engineering", McGraw-Hill, New York (1966)

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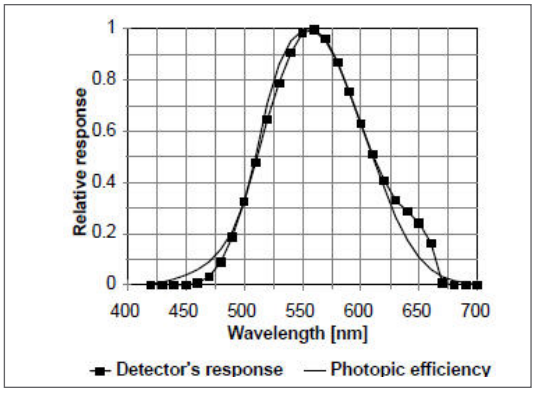

Fig. 1. PMA2130 Spectral Response

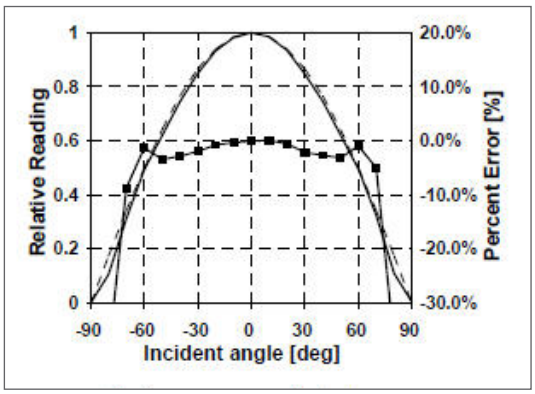

Fig. 2. PMA2130 Solar Simulator Spectral Output