Analog Sensors • Class I Pyranometer

PMA1145

Measures the Total Radiant Power of Incident Radiation from 310 to 2800nm

Applications

- Meteorology
- Agriculture
- Solar Power Research and Testing
- Heating and Air Conditioning
- Lighting
- Physics and Optical Laboratories

Features and Benefits

- Very Wide and Flat Spectral Response
- Excellent Long-Term Stability
- Cosine Corrected
- NIST Traceable Calibration
- ISO Classified
- Low Cost
- Weatherproof

The PMA1145 is an ISO-classified first class pyranometer. It is based on the thermopile technology assuring very broad spectral sensitivity with exceptional flatness and very good long term stability. The sensor is provided to Solar Light Co. by Kipp & Zonen.

The precision optical glass dome acts as a filter, with the spectral bandpass that permits the full solar spectrum to pass through to the sensor. The glass dome also protects the sensor from the elements.

The sensor is a high quality blackened thermopile. Heating of the sensor by incoming solar radiation produces a signal in the microvolt range. Each pyranometer has its own calibration factor which along with the processing algorithm is programmed into a memory chip embedded into the sensor. Upon connection to the PMA2100 the processing algorithm is loaded into the meter and correct reading is immediately displayed on the LCD.

Thermopile type radiation sensors exhibit the widest and most uniform spectral response. It is limited mostly by the spectral transmission of the dome. They are useful to monitor the total radiant power or solar radiation as well as artificial sources. The sensitivity of this type of sensors is somewhat limited and measurements of radiant flux below $10W/m^2$ are difficult.

Due to almost ideal flatness of the spectral response the pyranometer is often used with a set of low wavelength blocking filters in order to measure radiant power distribution in various bands. The difference between the total power and the power measured with the filter is the radiant power in the band blocked by the filter. A correction that accounts for energy reflected from the filter's surface is necessary.

In solar radiation studies the diffuse component of the total radiant flux can be measured by using a shadow-band casting a shadow on the pyranometer's entrance. The difference between the total power and the diffuse power measured with shadow-band is the direct component. For better accuracy a correction should be made for the part of diffuse radiation obstructed by the shadow-band itself.

SOLAR® LIGHT

Calibration

The PMA1145 is factory-calibrated by transfer from a working standard first class pyranometer.

The pyranometer measures the radiation flux by sensing the temperature differential between ambient and a black body exposed to the radiation. The temperature differential is proportional to the thermal resistance between ambient and the black body and to the radiant flux. This simple principle makes the instrument inherently stable so re-calibrations are necessary every 2 years.

The reading of the PMA1145 is affected by a rapid change in the ambient temperature (dynamic temperature coefficient) so the measurement should be performed after reaching thermal equilibrium.

Specifications

Spectral Response	310-2800nm Figure 1
Angular Response	2% for angles <70°, Figure 2
Range	2000 [W/m2] , 200 [mW/ cm^2]
Display Resolution	1[W/m2], 0.1 [mW/cm^2]
Operating Environment	40 to 175 °F (-40 to +80 °C), Outdoors
Temperature Coefficient	<2% (-10 to +40°C)
Cable	33ft, 10m (Fixed)
Diameter	5.9" (150 mm) (with Sunscreen)
Height	3.6" (92.5mm)
Weight	30 oz. (850 grams)
Irradiance from Typical Sources	Solar Radiation, 30°. SZA, 3mm Ozone, Clear Sky: Approx. 4 mW/cm^2
150W Xenon Lamp at 8"	Approx. 0.5 mW/cm^2
Solar Simulator Model 16S	50 mW/cm^2

Ordering Information

PMA1145	Class II Pyranometer
PMA1145	Class II Pyranometer, Analog Output

References

[1] McKinlay A.F. and B.L. Diffey, "A reference action spectrum for ultraviolet induced erythema in human skin", CIE Journal, 6, 17-22, 1987
[2] Morys M., D. Berger, "Accurate measurements of biologically effective ultraviolet radiation" SPIE Proc. 2049, pp. 152-161, 1993.

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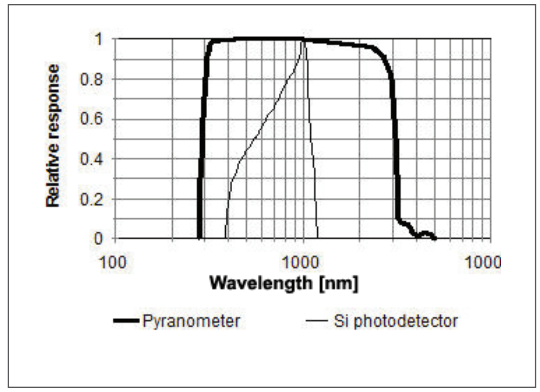

Fig. 1. PMA1145 Spectral Response vs Response of a Si photodiodee

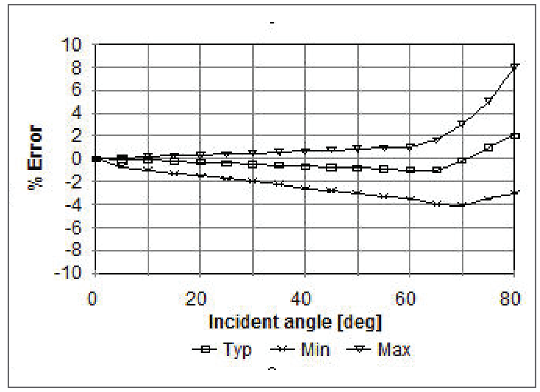

Fig. 2. PMA1145 Angular Response

Maintenance

The outer dome must be cleaned and inspected regularly along with leveling of the detector and a visually inspection of the desiccant. This maintenance should be performed routinely. Clean the dome with water or alcohol. Level the detector by adjusting the two leveling feet. Change the desiccant if it becomes clear. It is normal that you have to use two hands to open and close the metal spring that retains the drying cartridge. The rubber ring is normally coated with a silicon grease to make the seal better. If the o-ring looks dry apply some grease to it (Vaseline will work).