

# Silicon Pyranometer

## Owners Manual

Model: PYR-P  
PYR-S

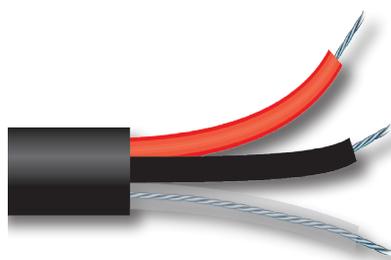


US Patent No. D519,860

## Pyranometer Sensor

This sensor is calibrated to measure total shortwave radiation. The evaporation of water from soil and the transpiration of water from plant leaves are partly determined by the intensity of shortwave radiation, which is measured in Joules  $m^{-2} s^{-1}$  or Watts  $m^{-2}$ .

## Setup Instructions



**Red:** positive (signal from sensor)

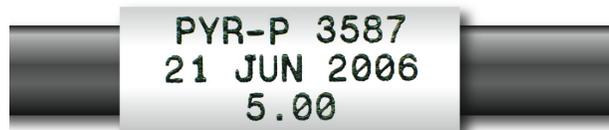
**Black:** negative (signal from sensor)

**Clear:** shield/ground

**Never attach a power source to the sensor**

Attach the sensor to a meter or datalogger capable of displaying or recording a mV output.

The model, serial number, production date, and conversion factor are located on the sensor cable.



## Mounting the PYR-S and PYR-P



Bolt: 10-32x5/8



Model LEV

Each sensor is equipped with a mounting bolt. Mount the sensor as level as possible. Small changes in level can cause measurement errors. We recommend using our leveling plate (model LEV) for the most accurate measurements. The sensor should be mounted with the cable pointing toward the nearest magnetic pole to minimize azimuth error.



Orientation

## Calibration

Model PYR-P and PYR-S sensors have a standard calibration of exactly:

**5.00 W m<sup>-2</sup> per mV**



Full Sunlight  
(1100 W m<sup>-2</sup>)



Sensor Output  
(220 mV)

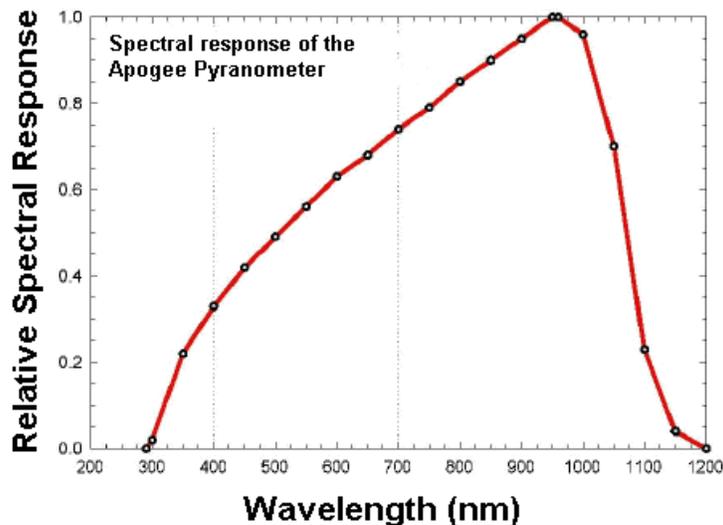
Use the conversion factor (5.00 W m<sup>-2</sup> per mV) to convert the mV signal from the sensor to shortwave radiation in Watts m<sup>-2</sup> (multiply the mV output by the conversion factor to yield shortwave radiation in W m<sup>-2</sup>).

$$\text{solar radiation} = \text{sensor output} \times \text{conversion factor}$$

$$= 220 \text{ mV} \times 5.00 \text{ W m}^{-2} \text{ per mV} = 1100 \text{ W m}^{-2}$$

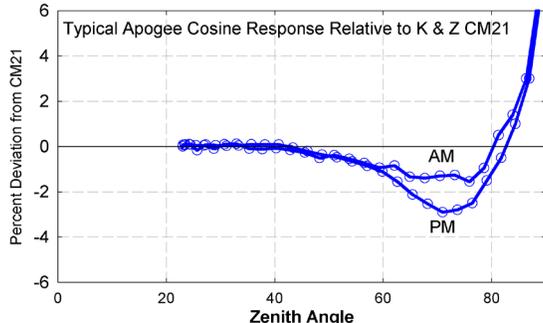
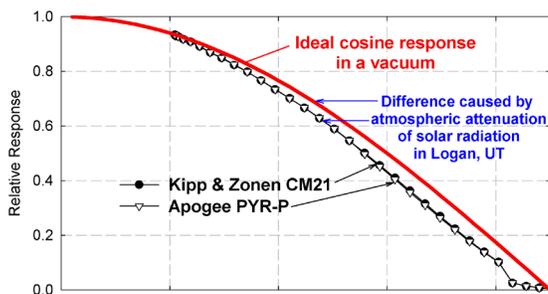
## Spectral Response and Calibration

An ideal pyranometer measures the entire solar spectrum, 280 to 2800 nm. However, about 90% of sunlight energy is between 300 to 1100 nm. Models PYR-P and PYR-S are calibrated to estimate all of the shortwave energy from sunlight. Apogee pyranometers are calibrated under sunlight over a multiple day period to a heated and ventilated Kipp & Zonen model CM21 precision reference radiometer.



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## Cosine Response



### Temperature response

The temperature response is less than 0.1% per degree Celsius. This temperature error is not significant in most applications.

### Long-term stability

Our research indicates that the average output increases about 1% per year because of changes in the optical transparency of the diffusion disk. We recommend returning the sensor for recalibration every 2 years.

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## Specifications

		Precision (PYR-P)	Standard (PYR-S)
Cosine response	45° zenith angle	± 1 %	± 4 %
	75° zenith angle	± 4 %	± 10 %
Absolute accuracy		± 5 %	± 8 %
Uniformity		± 3 %	± 5 %
Repeatability		± 1 %	± 2 %
Output	Responsivity	0.200 mV per W m <sup>-2</sup>	
	In full sunlight	220 mV (1,100 W m <sup>-2</sup> )	
	Linear range	0 - 350 mV (0 - 1,750 W m <sup>-2</sup> ); 1.75 x full sun	
Sensitivity		Custom calibrated to exactly 5.00 W m <sup>-2</sup> per mV	
Input power		None, self-powered	
Operating environment		- 40 to 55 °C; 0 to 100% relative humidity.	
		Designed for continuous outdoor use. Can be submerged under water.	
Materials		Anodized aluminum with acrylic lens	
Cable		3 meters of shielded, twisted-pair wire with Santoprene casing, ending in pigtail leads. Additional cable \$1.95/meter.	
Dimensions		2.4 cm diameter, 2.75 cm high	
Mass		70 g (with 3 m lead wire)	
Warranty		1 year parts and labor	



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