JDA 日煬科技有限公司
JD Auspice Co., Ltd

Standard Precision Pyranometer

MODEL

JDA-SPP / GPP / PSP

A pyranometer is used to measure the total energy from the sun. When leveled in the horizontal plane, this is called the Global Shortwave Irradiance (GLOBAL) and when positioned in a plane of a PV Array, it is called the Total Irradiance in the Plane of Array (TPA). Inverted, a pyranometer is used to measure the Reflected or Albedo Irradiance (ALBEDO). A pyranometer can also be shaded from the direct beam of the sun to measure the Diffuse Shortwave Irradiance (DIFFUSE).

Based on the design of the distinguished PSP Pyranometer, the SPP was developed with a faster response time, a reduced thermal offset, improved cosine response and an improved temperature dependence making it ideal for Global Solar Measurements in High Quality Networks such as GAW, BSRN and ARM, calibration of other Pyranometers or for PV/CSP Performance Testing and Evaluation.

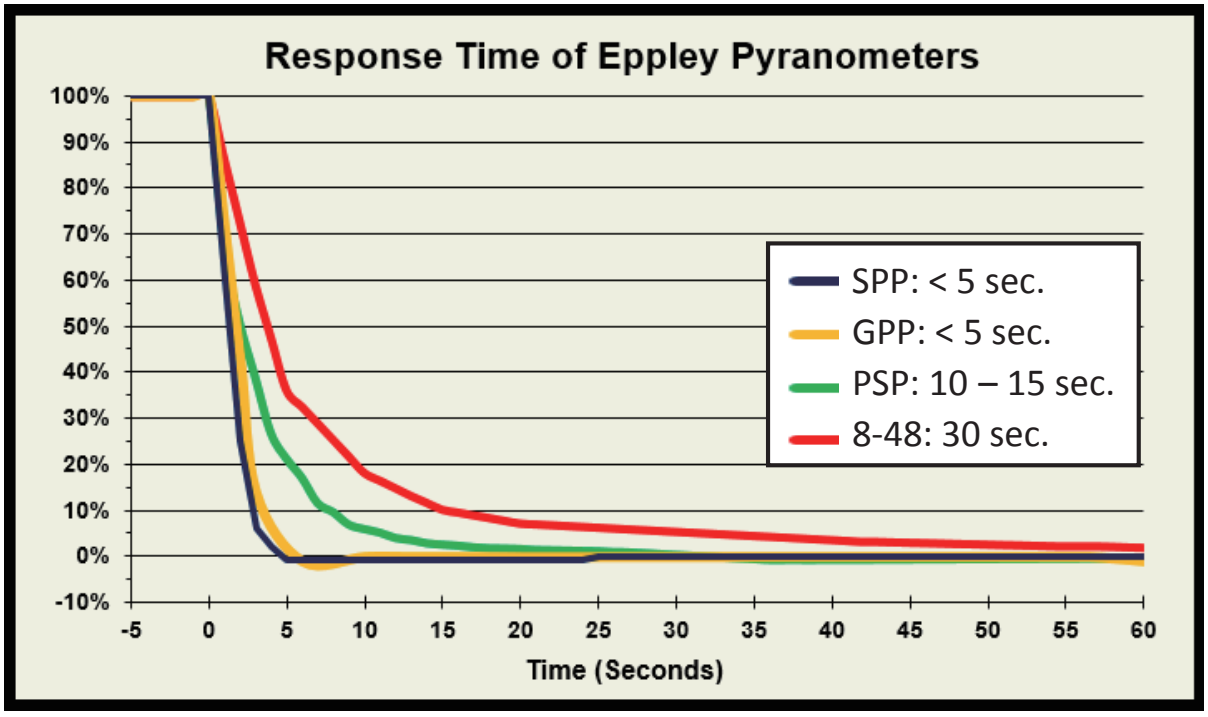
SPECIFICATIONS	
Application	Network Measurements (Global)
Classification	Secondary Standard / High Quality
Traceability	World Radiation Reference (WRR)
Spectral Range	295-2800 nm
Output	0-10 mV analog
Sensitivity	approx. 8 µV / Wm^{-2}
Impedance	approx. 700Ω
95% Response Time	5 seconds
Zero Offset a)	5 Wm^{-2}
Zero Offset b)	2 Wm^{-2}
Non-Stability	0.5%
Non-Linearity	0.5%
Directional Response	10 Wm^{-2}
Operating Temperature	-50°C to +80°C
Temperature Response	0.5% (-30°C to +50°C)
Tilt Response	0.5%
Calibration Uncertainty*	< 1%
Measurement Uncertainty*	
Single Point	< 10 Wm^{-2}
Hourly Average	approx. 2%
Daily Average	approx. 1%

* Recently, there has been much discussion on “uncertainty” and how it pertains to solar measurements. The RSS of the 9060 Secondary Standard specifications results in an uncertainty of approximately 3.5%. The typical uncertainty of Eppley’s factory calibrations are less than 1%. The stated uncertainty of the WRR is 0.4%. Evidence from comparisons of SPP measurements to component sum derived values (using an AHF and 8-48) show the SPP is capable of hourly averages better than 2% and daily averages better than 1%.

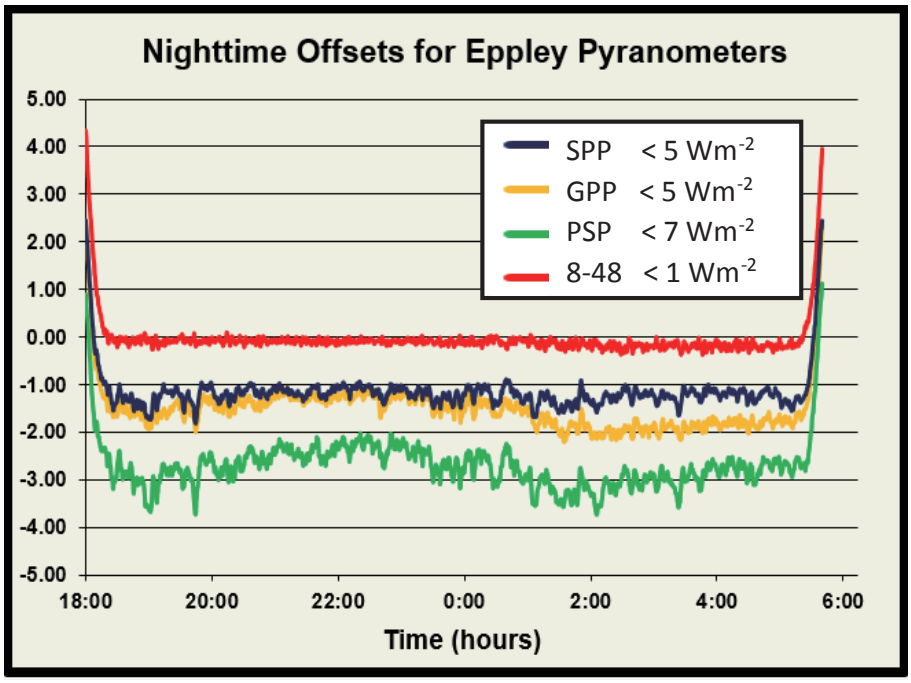
ISO 9060 Pyranometer Classification

	SECONDARY STANDARD	FIRST CLASS	SECOND CLASS
Response time	< 15s	< 30s	< 60s
Zero Offset -A	+ 7 Wm^{-2}	+ 7 Wm^{-2}	+ 7 Wm^{-2}
Zero Offset -B	± 2 Wm^{-2}	± 2 Wm^{-2}	± 2 Wm^{-2}
Non-stability	± 0.8%	± 1.5%	± 3%
Non-linearity	± 0.5%	± 1%	± 3%
Directional Response	± 10 Wm^{-2}	± 20 Wm^{-2}	± 20 Wm^{-2}
Spectral selectivity	± 3%	± 5%	± 10%
Temperature response	± 2%	± 4%	± 8%
Tilt response	± 0.5%	± 2%	± 5%

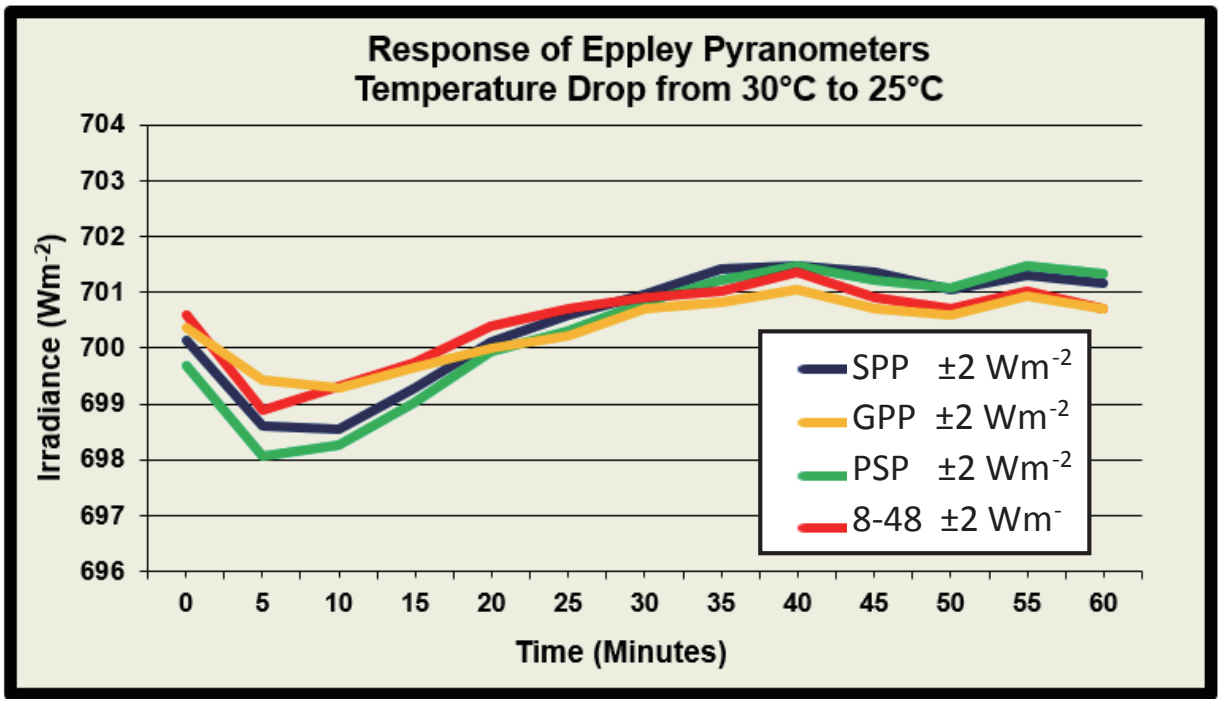
Response Time: Characterized by the time during which the instrument reaches 95% of the final value. Eppley performs this test by capping the instrument in full sun and timing the drop to zero.



Zero Off-Set A: Test (a) is for cases when the net thermal radiant flux density is 200Wm-2 such as when the instrument is at 30°C and the sky is temperature -10°C. Eppley performs this test in our Blackbody Calibration System and by monitoring Nighttime Offsets.



Zero Off-Set B: Test (b) is the result of a 5 degree change in temperature over one hour and is performed in Eppley's temperature chamber.



Non-Stability: The change in sensitivity per year is primarily due to UV degradation of the Black Optical Lacquer on the thermopile. The simplest method of determining this is through observational data.

SPP	average 0.2% per year (since 2012)
GPP	average 0.2% per year (since 2013 – limited sample)
PSP	average less than 1% per year
8-48	less than 0.5% per year

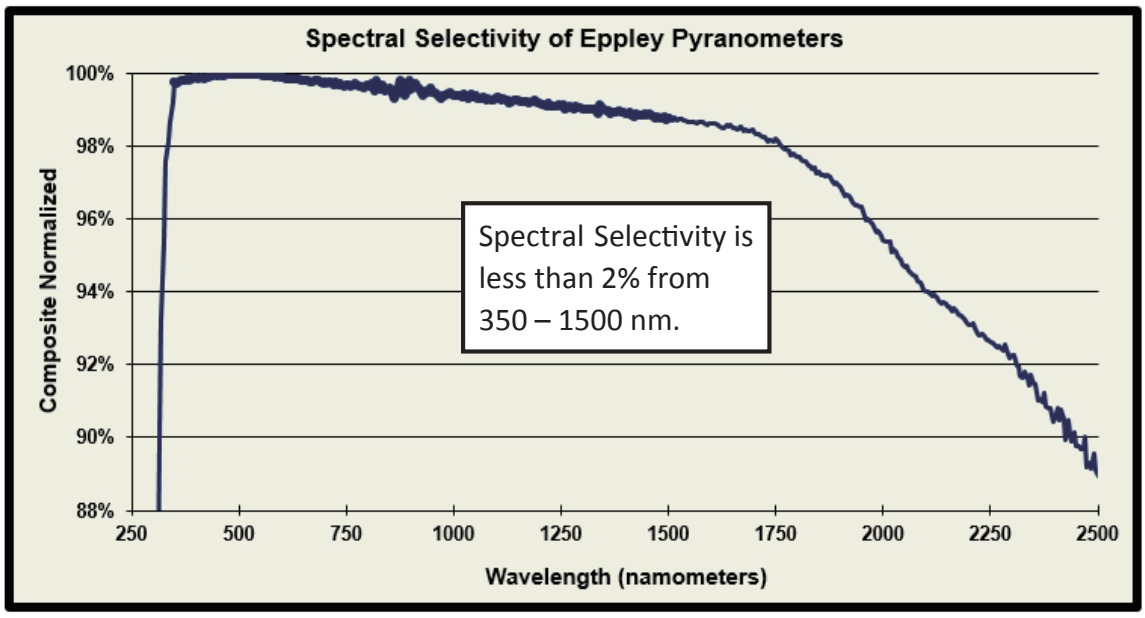
Non-Linearity: Deviation of sensitivity from low (100 Wm-2) to high (1000 Wm-2) Intensity is tested on Eppley High Intensity Lamp Bench.

SPP	± 0.5%
GPP	± 0.5%
PSP	± 0.5%
8-48	± 1.0%

Directional: The cosine response of the Pyranometers is also tested on the High Intensity Lamp Bench at Eppley.

SPP	± 10 Wm^{-2}
GPP	± 10 Wm^{-2}
PSP	± 10 Wm^{-2}
8-48	± 30 Wm^{-2}

Spectral: Eppley has independently tested the Schott Glass WG295 hemispheres as well as the Black Optical Lacquer to assure uniform spectral transmittance from 0.3 to 2.8 microns.



Temperature: Temperature Dependence Tests are performed in Eppley's Temperature Chambers. Note that while the tests are often -30°C to +50°C, these are not the operational limits of the instruments. These instruments can be used in hotter (or colder) climates but you may wish to contact Eppley for a special temperature dependence test in these extreme climate areas.