

Pyranometer

The Solar Radiation Sensor, or solar pyranometer, measures global irradiance, the amount of solar energy per unit area per unit time incident on a surface of specific orientation. The global irradiance includes direct sunlight and diffuse sunlight. Pyranometer is to be located far from any kind of obstruction, which might reflect sunlight (or sun shadow) onto the pyranometer itself. The sunlight sensor must be installed at the same azimuth and tilt angle than the PV array.

Key Features of Pyranometer offered by Logics PowerAMR

- Measures hemispherical solar radiation according to the latest standards
- Pyranometer tilted in the plane of array (POA) of solar panels provides critical input data to the calculation of performance ratio and efficiencies in photovoltaic energy installations
- Has all range of pyranometers starting from low cost routine/ standard sensors, Class 2 pyranometers to secondary standard Pyranometers, all makes and models
- Offers the best measurement accuracy in its class for Solar PV monitoring
- Offers analogue voltage/ 4-20 m amp output and / or digital (Modbus over RS-485) output
- Compatible with any data logger including that of PowerAMR

Range of Pyranometers offered by Logics PowerAMR-

1) Silicon Solar Radiation Sensor Pyra 300V



Pyra 300 V is low cost routine/ standard pyranometer suited for small solar project capacity. The sensor's transducer, which converts incident radiation to electrical current, is a silicon photodiode with wide spectral response. From the sensor's output voltage, the console calculates and displays solar irradiance. It also integrates the irradiance values and displays total incident energy over a set period of time.

Key Specifications

- Operating Temperature : -40° to +65° C
- Storage Temperature : -45° to +70°C
- Transducer : Silicon photodiode
- Spectral Response : 400 to 1100 nanometers Cosine Response
- Percent of Reading : ±3% (0° to ±70°), ±10% (±70° to ±85°)
- Percent of Full Scale : ±2% (0° to ±90°)
- Temperature Coefficient : + 0.12% per °C
- Reference temperature : 25°C
- Housing Material : UV-resistant PVC plastic
- Weight : 250 g
- Range : 0 to 1800 W/m²
- Accuracy : ±5% of full scale
- Drift : up to ±2% per year
- Output : 0 to 5 VDC (0- 1800 w/m²)
- Power supply : 7- 24 VDC 1mA (typical)

2) Solar Cell Based Solar Radiation Sensor- German Make Nes Soz- 03



Nes Soz is a low cost Pyranometer with high accuracy and suited for small to medium sized solar projects. The SOZ-03 pyranometer consists of a mono-crystalline silicon cell (50 x 50 mm²) with special solar glass. The pyranometer is laminated, hence high UV-resistance and long-term stability.

Accuracy of NES Radiation Sensor Type SOZ-03 is better than 3% (from measuring value) in the range of 150-1200 W/m² when the solar rays are perpendicular to the surface of the sensor and the spectrum corresponds to AM 1,5.

For all other central European conditions and installations with an inclination of 45° ($\pm 20^\circ$) directed to the south ($\pm 45^\circ$) the accuracy of the monthly sums of the solar radiation is better than +5% compared to a world class 1 pyrometer (W.M.O. first class , ISO 9060) (e.g Kipp&Zonen CMP11).

Key Features:

- Accuracy of monthly sums compared to a W.M.O. class 1 Pyranometer (e.g. CMP 11) according to ISO 9060: better $\pm 5\%$
- Very small drift of <0.3 / year (experience since 1989)
- Advanced weatherproof junction box made of UV resistant material with cable gland and screw-less terminal for the connection of the measuring cable
- High precision shunt resistor directly soldered to the terminals of the cell
- Linear output signal in the range 0...1500 W/m²

Specifications

- Mono crystalline or poly crystalline Silicon Solar Cell (50x 50 mm²)
- Housing Material : UV-resistant PVC plastic
- Storage Temperature : -45° to +70°C
- Range : 0 to 1500 W/m²
- Output 4-20 ma
- Power supply : 7...30 VDC / max. 5 mA
- Drift : Small drift of <0.3 / year

3) Irradiation Sensors Class 2 Pyranometer- Delta Ohm LP Pyra 03



Delta Ohm manufactures First Class LP PYRA 02 and LP PYRA 12 and Second Class LP PYRA 03 pyranometers which fully comply with ISO 9060 standards, and meet the requirements defined by the World Meteorological Organization (WMO). These are strong and reliable ground-based instruments, especially designed to be used under all weather conditions. They are suitable for installation on the field. Every pyranometer is calibrated separately and is supplied standard with a WRR (World Radiometric Reference) Report of Calibration.

Pyranometers LP PYRA 02 and LP PYRA 03 are well suited for the measurement of incoming global solar radiation ($0.3 \mu\text{m} \div 3 \mu\text{m}$ spectral range). LP PYRA 12 shadow ring is designed to shield the instrument sensor from direct radiation; by that, an exact measurement of the diffuse sky radiation is possible.

Specifications

Technical Specification	LP PYRA 02 / LP PYRA 12*	LP PYRA 03
Typical sensitivity	10 $\mu\text{V}/(\text{W}/\text{m}^2)$	
Impedance	33 $\Omega \div 45 \Omega$	
Measuring range	0 \div 2000 W/m^2	
Viewing field	2 π sr	
Spectral field	305 nm \div 2800 nm W/m^2 (50%)	
Operating temperature	-40 $^{\circ}\text{C} \div$ 80 $^{\circ}\text{C}$	
Weight	0.90 Kg	0.45 Kg
ISO 9060 Specifications		
Response time 95%	< 28 sec	< 30sec
Zero Off-set		
a) Response to thermal radiation (200 W/m^2)	15 W/m^2	25 W/m^2
b) Response to temperature change 5K/h	< \pm 4 W/m^2	< \pm 6 W/m^2
3a) Non stability over 1 year	< \pm 1.51%	< \pm 2.51%
3b) Non linearity	< \pm 11%	< \pm 21%
3c) Cosine response	< \pm 18 W/m^2	< \pm 22 W/m^2
3d) Spectral selectivity	< \pm 51%	< \pm 71%
3e) Response with regard to temperature	< 4 %	< 8 %
3f) Tilt response	< \pm 21%	< \pm 41%
Shadow ring for LP PYRA 12		
Weight	5.90 Kg	
Diameter	570 mm	
Height	54 mm	
Basis diameter	300 mm	

4) Kipp n Zonen Pyranometers – SP Lite2, RT1, SMP3, SMP10



Kipp n Zonen Pyranometers are known around the world for their high quality, durability and accuracy. The top level pyranometers have individually optimised temperature compensation and individually measured directional response, with the test results provided. These important features ensure the highest accuracy measurements.

Key Features:

- The widest range of high quality, reliable pyranometers available
- ISO 9060:2018 Spectrally Flat, from Class C to beyond the requirements of Class A
- Accurate and independent data for performance ratio calculations
- 5 year worldwide manufacturer warranty

SP Lite2 Pyranometer



SP Lite2 is designed for routine measurement of solar radiation. It is especially designed for Photovoltaic / solar energy module monitoring. SP Lite2 uses a photodiode detector, which creates a voltage output that is proportional to the incoming radiation. Also due to the unique design of the diffuser, its sensitivity is proportional to the cosine of the angle of incidence of the incoming radiation, allowing for accurate and consistent measurements. SP Lite2 is easy to use. It can be directly connected to voltmeter or data logger. Direct readout in Watts per square meter (W/m^2) can be derived from the measured voltage divided by the calibration coefficient. It is fitted with the Kipp & Zonen high quality yellow cable.

Key Features:

- ISO 9060 Fast Response Class C
- For routine measurement of solar radiation
- Reliable all weather performance
- Easy to use

Specifications:

Spectral range (overall)	400 to 1100 nm
Sensitivity	60 to 100 $\mu V/W/m^2$
Response time SP Lite2 (95%)	< 500 ns
Directional response (up to 80° with 1000 W/m^2 beam)	< 10 W/m^2
Temperature response SP Lite2	< -0.15 % / °C
Operational temperature range	-40 °C to +80 °C
Maximum solar irradiance	2000 W/m^2
Field of view	180 °

RT1 Pyranometer



RT1 is a small, fully weatherproof duo-sensor that independently measures the incoming solar irradiance and the back panel temperature. Thanks to this included back panel temperature sensor you collect all the data you need to monitor the performance of your installation - all in digital Modbus® format. RT1 is Designed especially for commercial rooftop PV installations

Key Features:

- outperforms reference cells
- is very rugged, stable and reliable
- measures the real solar irradiation from dawn till dusk
- has a soiling resistant design, for low maintenance
- is extremely simple to mount on a corner of a PV panel
- can be easily removed for recalibration or service
- also fits on the side or top with a clamp-on adapter
- comes with a Kipp & Zonen calibration certificate

Specifications:

Technical specifications	
Irradiance	0 to 2000 W/m ²
Precision/resolution	1 W/m ²
Spectral range	400 to 1100 nm
Non-stability (change/year)	< 1 %
Non-linearity (0 to 1000 W/m ²)	< 1 %
PV panel temperature	-20 to +100 °C, ± 1 °C
Calibration	Against traceable reference pyranometer
Signal connections	1 - RS-485 Modbus [®] to host 2 - PV panel temperature sensor
Voltage range	5 to 30 VDC
Power consumption maximum	60 mW
Ambient operating temperature	-40 to +80 °C
Recommended calibration interval	2 years
Standard warranty	2 years

SMP3 Pyranometer



The SMP3 is a smart pyranometer with low maintenance and industry standard digital and analogue amplified outputs. The SMP is protected against over voltage, reversed polarity and short circuiting. Because all SMP's have identical sensitivity and connections exchanging instruments during recalibration is easy.

Key Features:

- ISO 9060 spectrally flat Class C
- 0 to 1 Volt or 4 to 20 mA analogue output
- No change of desiccant for 10 years
- Active temperature correction from -40°C to +80°C
- 5 year warranty

Specifications:

Spectral range (50% points)	300 to 2800 nm
Response time (63%)	< 1.5 s
Response time (95%)	< 12 s
Zero offset A	< 15 W/m ²
Zero offset B	< 5 W/m ²
Directional response (up to 80° with 1000 W/m ² beam)	20 W/m ²
Temperature dependence of sensitivity (-20 °C to +50 °C)	< 3 %

Analogue output (-V version)	0 to 1 V
Analogue output (-A version)	4 to 20 mA
Digital output	2-wire RS-485

SMP10 Pyranometer



The SMP10 is a spectrally flat Class A pyranometer and has an internal drying cartridge that will last for at least 10 years if the housing is not opened. This minimizes maintenance significantly. With standardized output and connections of every SMP10, exchanging instruments for recalibration is easy.

Key Features:

- ISO 9060 spectrally flat Class A
- No change of desiccant for 10 years
- Smart, more than just digital
- RS-485 Modbus® communication
- 5 year warranty

Specifications:

Spectral range (50% points)	285 to 2800 nm
Response time (63%)	< 0.7 s
Response time (95%)	< 2 s
Zero offset A	< 7 W/m ²

Zero offset B	< 2 W/m ²
Directional response (up to 80° with 1000 W/m ² beam)	< 10 W/m ²
Temperature dependence of sensitivity (-20 °C to +50 °C)	< 1 %
Analogue output (-V version)	0 to 1 V
Analogue output (-A version)	4 to 20 mA
Digital output	2-wire RS-485