

# Model GEO-SR20

## SECONDARY STANDARD PYRANOMETER WITH HEATER

GEO-SR20 is a solar radiation sensor of the highest category in the ISO 9060 classification system: "secondary standard". GEO-SR20 should be used where highest measurement accuracy is required.



Figure 1 GEO-SR20 'secondary standard' pyranometer

### Introduction

GEO-SR20 measures the solar radiation received by a plane surface, in  $W/m^2$ , from a  $180^\circ$  field of view angle. We recommend to use GEO-SR20 in particular in applications where highest accuracy is necessary. Specifications of GEO-SR20 are very good.

Directional response is also tested individually for each sensor and reported.

The "zero-offset A" specification of GEO-SR20 is significantly improved by using dome that is significantly smaller than that of earlier designs. Heating reduces sensitivity to fouling and reduces measurement errors caused by early-morning dew deposition.

### Demanding applications

GEO-SR20's low temperature-dependence makes it an ideal candidate for use under very cold and very hot conditions.

The temperature dependence of every individual instrument is tested and supplied as a second degree polynomial. This information can be used for further reduction of temperature dependence during post-processing. The incorporated heater reduces measurement errors caused by early-morning dew deposition.

GEO-SR20's connector is truly specified for use in its entire rated operating condition.

### Uncertainty evaluation

The uncertainty of a measurement (according to the "Guide to Expression of Uncertainty in Measurement" or GUM) with a pyranometer under outdoor conditions depends on many factors. In our manuals you can find guidelines for uncertainty evaluation. We also provide spreadsheets to assist our users in this process. At the same time we wish to stress that measurement accuracy not only depends on instrument properties, but also on measurement conditions. A potentially very accurate instrument like GEO-SR20 will quickly underperform without a regular schedule of instrument maintenance and cleaning.

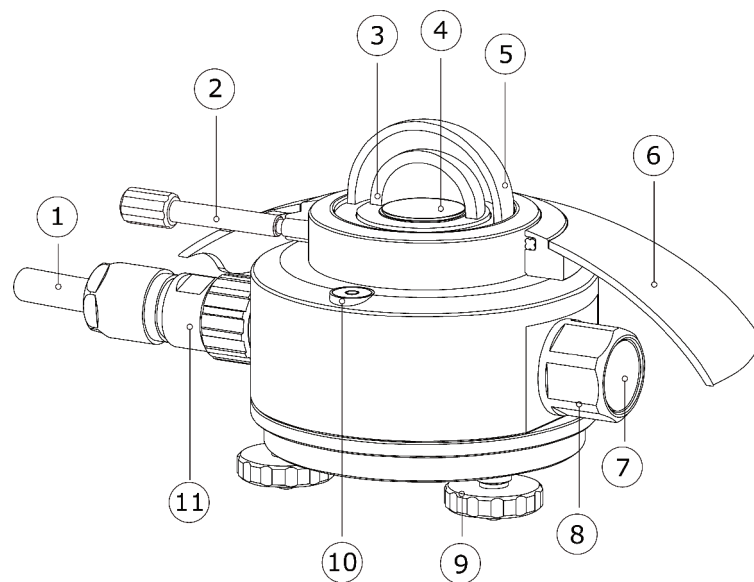


Figure 2 Overview of GEO-SR20 pyranometer:

- (1) cable, (2) fixation of sun screen, (3) inner dome, (4) thermal sensor with black coating, (5) outer dome, (6) sun screen, (7) humidity indicator, (8) desiccant holder, (9) levelling feet, (10) bubble level, (11) connector

### NEW: use as sunshine duration sensor

WMO has recently approved of the "pyranometric method" to estimate sunshine duration from pyranometer measurements (Chapter 8 of the WMO Guide to Instruments and observation, 2008). This implies that GEO-SR20 may be used, in combination with appropriate software, to estimate sunshine duration (SD measurement included when using datalogger)

### Suggested use

- PV monitoring and testing
- Reference instrument for comparison
- Extreme climates (arctic / desert)

### Standards

Applicable instrument-classification standards are ISO 9060 and WMO-No.-8; "Guide to Meteorological Instruments and Methods of Observation". The calibration is according to ISO 9847. PV-related standards are ASTM E2848 and IEC 61724.

### See also

- Alternative sensor: LP02 for lower accuracy measurements
- SR12 first class pyranometer for solar energy testing application.
- View our complete product range of solar sensors

### Options

- Additional cable length in multiples of 5 m (add to the standard 5m)

### MORE INFORMATION

Datalogger Model **METEODATA**



**METEODATA**  
Datalogger with Integrated Comms  
(3G / GPRS, Modbus, Line, Radio or Satellite)

### GEO-SR20 SPECIFICATIONS

- **ISO classification** Secondary standard pyranometer
- **WMO performance level (WMO-No.8, 7th edition)** High quality pyranometer
- **Sensor type** Thermopile
- **Dome type / material** Double dome / High quality glass, Schott N-BK7 or similar
- **Spectral range** 285 to 3000 nm
- **Sensitivity** 7-25  $\mu\text{V}/(\text{W}/\text{m}^2)$
- **Sensitivity (nominal)** 15  $\mu\text{V}/(\text{W}/\text{m}^2)$
- **Temperature range** -40° to +80°C
- **Humidity range** 0 to 100%
- **Irradiance range** 0 to 4000  $\text{W}/\text{m}^2$
- **Temperature dependence** <  $\pm 1\%$  (-10° to +40°C)  
<  $\pm 0.4\%$  (-30° to +50°C)  
with automatic temperature correction made by the METEODATA Datalogger, and based on the signal provided by the temperature sensor inside the pyranometer.
- **Calibration traceability** to WRR
- **Calibration uncertainty** < 1.2% (k=2)
- **Temperature sensor** 10 k $\Omega$  thermistor or Pt100
- **Heater** 12 VDC, 1.5 W
- **Response time** 3 s (95% response)  
1 s (63% response)
- **Non linearity** <  $\pm 0.2\%$  (100 to 1000  $\text{W}/\text{m}^2$ )
- **Non stability**  $\leq \pm 0.5\%$  per year
- **Directional response**  $\leq \pm 10 \text{ W}/\text{m}^2$  at any zenith and azimuthal angles at direct beam of 1000 $\text{W}/\text{m}^2$
- **Tilt error** <  $\pm 0.2\%$  (0° to 90° at 1000 $\text{W}/\text{m}^2$ )
- **Zero offset: response to 200  $\text{W}/\text{m}^2$  net thermal radiation** < 5  $\text{W}/\text{m}^2$  unventilated  
< 2.5  $\text{W}/\text{m}^2$  ventilated with VU01
- **Zero offset: response 5 deg C/hr change in ambient temperature** <  $\pm 2 \text{ W}/\text{m}^2$
- **Resolution**  $\pm 1 \text{ W}/\text{m}^2$  or better
- **Output signal** Analogue voltage 0 to 60 mV
- **Cable** Standard 5 m cable with connector
- **Calibration certificate** Individual WRR traceable calibration certificate.  
With certificates for individual testing of directional response and temperature response.
- **Sensor resistance range** 100 to 200  $\Omega$