

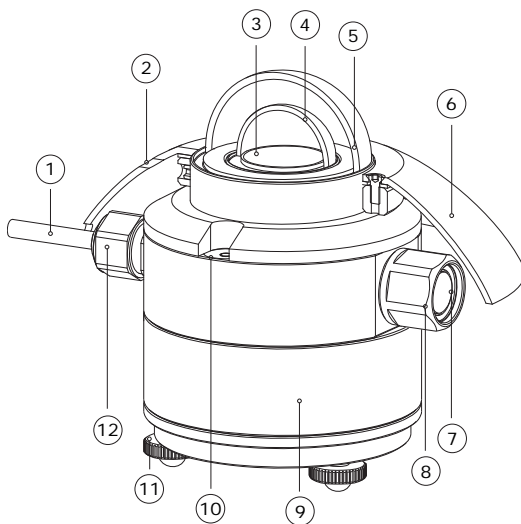
# SR12-TR

First class pyranometer for solar energy test applications  
with 4-20 mA transmitter

*SR12-TR is a high accuracy solar radiation sensor that meets and exceeds the ISO 9060 standard performance mandate for a first class pyranometer for "solar energy test applications". It is the preferred instrument for PV system performance monitoring and is supplied with a temperature sensor and a heater. SR12-TR houses a 4-20 mA transmitter for easy read-out by dataloggers commonly used in the industry.*



**Figure 1** SR12-TR first class pyranometer for solar energy test applications with 4-20 mA transmitter



**Figure 2** overview of SR12-TR:

(1) cable, (2) opening for fixation of sun screen, (3) thermal sensor with black coating, (4,5) glass domes, (6) sun screen, (7) humidity indicator, (8) desiccant holder, (9) transmitter housing, (10) bubble level, (11) levelling feet, (12) cable gland

## Introduction

SR12-TR is a solar radiation sensor that is applied in high accuracy observations. It measures the solar radiation received by a plane surface from a 180° field of view angle. This quantity, expressed in  $W/m^2$ , is called "hemispherical" solar radiation. SR12-TR has two unique features: a heater and a temperature sensor for additional quality assurance. The incorporated heater reduces measurement errors caused by early-morning dew deposition. Finally, all sensors have individually been tested on directional response; a report is included with the calibration certificate.

## Operation

Using SR12-TR is easy. The pyranometer can be connected directly to commonly used data logging systems. The irradiance in  $W/m^2$  is calculated by using the transmitter's output. In SR12-TR's standard configuration, the 4 to 20 mA output corresponds to a transmitted range of 0 to 1600  $W/m^2$ . This range can be adjusted at the factory upon request.

## PV system performance monitoring

The ASTM E2848 "Standard Test Method for Reporting Photovoltaic Non-Concentrator System Performance" (issued end 2011) confirms that a pyranometer is the preferred instrument for outdoor PV testing. SR12-TR pyranometer complies with the requirements of this standard. SR12-TR is also the first pyranometer of its kind meeting the ISO 9060 first class mandate for "solar energy test applications".

## Standards

Applicable instrument classification standards are ISO 9060 and WMO-No. 8. Calibration is according to ISO 9847. PV related standards are ASTM E2848 and IEC 61724

## SR12-TR design

SR12-TR pyranometer employs a thermal sensor with black coating, two glass domes and an anodised aluminium body, which also houses the transmitter.



**Figure 3** SR12-TR with its sun screen removed

## Uncertainty evaluation

The uncertainty of a measurement under outdoor conditions depends on many factors. Guidelines for uncertainty evaluation according to the “Guide to Expression of Uncertainty in Measurement” (GUM) can be found in our manuals. We provide spreadsheets to assist in the process of uncertainty evaluation of your measurement.

## Suggested use

- outdoor PV system performance monitoring
- indoor simulated solar testing
- general solar resource monitoring

## Choosing the right instrument

Pyranometers are subject to classification in three classes according to ISO 9060. From second class to first class and from first class to secondary standard, the achievable accuracy improves by a factor 2. Measurement accuracy does not only depend on instrument properties, but also on measurement conditions. A very accurate instrument will quickly underperform without a regular schedule of maintenance. Our pyranometer [selection guide](#) assists you in choosing the right instrument. Whatever your application is: Hukseflux offers the highest accuracy in every class at the most attractive price level.

## SR12-TR specifications

Measurand	hemispherical solar radiation
ISO classification	first class pyranometer for solar energy test applications
Directional response	report included
Calibration uncertainty	< 1.8 % (k = 2)
Calibration traceability	to WRR
Spectral range	285 to 3000 x 10 <sup>-9</sup> m
Transmitted range	0 to 1600 W/m <sup>2</sup>
Rated operating temperature range	-40 to +80 °C
Temperature response	< ± 2 % (-10 to +40 °C)
Temperature sensor	Pt100 or 10 kΩ thermistor
Standard cable length	5 m
Heater	1.5 W at 12 VDC

## Options

- longer cable, in multiples of 5 metres
- adapted transmitted range

## See also

- sensor with linear millivolt output [SR12](#)
- [SR11](#) first class pyranometer
- alternative instrument: [SR20](#) for higher accuracy measurements
- view our complete [product range of solar sensors](#)

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## About Hukseflux

Hukseflux Thermal Sensors, founded in 1993, aims to advance thermal measurement. We offer a complete range of sensors and systems for measuring heat flux, solar radiation and thermal conductivity. We also provide consultancy and services such as performing measurements and designing instrumentation according to customer requirements. Customers are served through the main office in Delft in the Netherlands, and locally owned representations in the USA, China and Japan.

Interested in this product?  
E-mail us at: [info@hukseflux.com](mailto:info@hukseflux.com)