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Thermal Sensors

# SR20-D2

## Digital Class A pyranometer with Modbus RTU and 4-20 mA output

*SR20-D2 is a solar radiation sensor of the highest category in the ISO 9060 classification system: spectrally flat Class A. SR20-D2 is designed for the solar PV industry, offering two types of commonly used irradiance outputs: digital via Modbus RTU over RS-485 and analogue 4-20 mA (current loop). Pyranometer users prefer Hukseflux pyranometers for their unsurpassed measurement accuracy and their lowest total cost of ownership.*

**Figure 1** *SR20-D2 digital spectrally flat Class A pyranometer.*


*Figure 2 To reduce total cost of ownership: make use of the worldwide Hukseflux calibration organisation.*

## Introduction

SR20-D2 measures the solar radiation received by a plane surface, in W/m2, from a 180o field of view angle. It is employed where the highest measurement accuracy is required. SR20-D2 offers two types of outputs commonly used in the solar PV industry: digital via Modbus RTU over RS-485 and analogue 4-20 mA (current loop). These industry standards allow for easy data acquisition, easy read-out and error-free instrument exchange when using SR20-D2.

## SR20-D2 benefits

- digital output: easy implementation & servicing
- best-in-class temperature response < ± 0.4 % (-30 to +50 °C), best “zero offset a” and best calibration uncertainty
- test certificates for temperature- and directional response included

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## Lowest total cost of ownership

Customers prefer Hukseflux pyranometers for their unsurpassed measurement accuracy and their lowest total cost of ownership. Total costs are mainly determined by costs of installation, on-site inspections, servicing and calibration:

Pyranometers must be calibrated every 2 years. Such recalibration is considered good practice for any measuring instrument and is required by ISO, IEC and WMO standards covering PV system performance – and meteorological monitoring. Cost of recalibration however can be high. Hukseflux' worldwide calibration network will help you reduce these costs. Learn more about Hukseflux pyranometer calibration services.

## Improved measurement accuracy

In order to improve overall measurement accuracy, Hukseflux effectively targeted three major sources of measurement uncertainty: calibration, "zero offset a" and temperature response.
The initial calibration uncertainty is reduced to less than 1.2 %. The "zero offset a" specification of SR20 is < 5 W/m2 unventilated. Ventilated (with VU01) it is just 2.5 W/m2.
SR20-D2 has a negligible temperature response. The temperature response of every individual instrument is tested and corrected onboard by the instrument electronics, using a second degree polynomial.

## Demanding applications

SR20-D2's low temperature response makes it the ideal candidate for use under very cold and very hot conditions.

## SR20-D2 design

SR20-D2 pyranometer employs a state-of-the-art thermopile sensor with black coated surface, two domes and an anodised aluminium body. The connector,
desiccant holder and sun screen fixation are very robust and designed for long term industrial use. All parts are specified for use across SR20-D2's entire rated operating temperature range. SR20-D2 offers two types of outputs commonly used in the solar PV industry: digital output via Modbus RTU

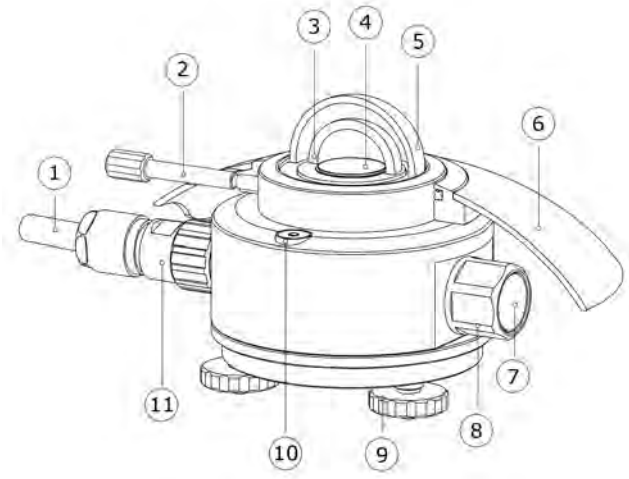


**Figure 3** *Overview of SR20-D2:*
*(1) cable, (2) fixation of sun screen,*
*(3) inner dome, (4) thermal sensor with black coating, (5) outer dome, (6) sun screen,*
*(7) humidity indicator, (8) desiccant holder,*
*(9) levelling feet, (10) bubble level,*
*(11) connector.*

## Standards

Applicable instrument classification standards are ISO 9060 and WMO-No. 8.

## Choosing the right instrument

Pyranometers are subject to classification in three classes according to ISO 9060. From Class C to Class B and from Class B to Class A, 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.

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**Figure 4** *SR20-D2 Class A pyranometers with digital output for GHI (Global Horizontal Irradiance) and POA (Plane of Array) measurements.*

## Hukseflux Sensor Manager software

For communication between a PC and SR20-D2, the Hukseflux Sensor Manager software can be used. It allows the user to plot and export data, and change the SR20-D2 Modbus address and its communication settings.

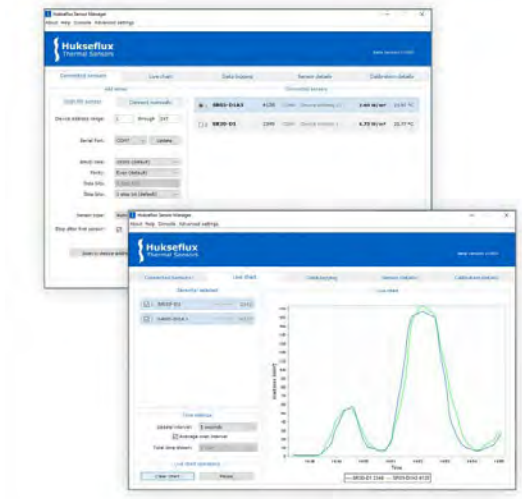

**Figure 5** User interface of the Hukseflux Sensor Manager.

## Suggested use

- PV system performance monitoring
- all networks with regular instrument exchange

**Figure 6** *SR20-D2 side view.*

## See also

- SR30 digital spectrally flat Class A pyranometer with heating and tilt sensor
- SR20 analogue Class A pyranometer with millivolt output
- alternative instruments: SR15 and SR05 for lower accuracy measurements
- PMF01 and PMF02 pyranometer mounting fixtures, also for POA (Plane of Array)
- the making of SR20 documented
- view our complete product range of solar sensors

**Figure 7** *VU01 ventilation unit with SR20 pyranometer.*

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**Figure 8** *Installation of AMF02 albedometer mounting kit and two SR20 pyranometers, mounted with ALF01 level-ling fixture on a crossarm with crossarm bracket CMF01.*

## Levelling mounts

There are several mounting options available for SR20. They allow for simplified mounting, levelling and instrument exchange on a flat surface or a tube.

## Options

- longer cable, in multiples of 5 metres
- adapted transmitted range for 4-20 mA output
- ventilated with VU01 ventilation unit
- PMF series mounting fixtures
- AMF albedo mouting fixture

## About Hukseflux

Hukseflux is the leading expert in measurement of energy transfer. We design and manufacture sensors and measuring systems that support the energy transition. We are market leaders in solar radiation- and heat flux measurement. Customers are served through the main office in the Netherlands, and locally owned representations in the USA, Brazil, India, China, Southeast Asia and Japan.

## SR20-D2 specifications

| | |
|---|---|
| Measurand | hemispherical solar radiation |
| ISO 9060:2018 | spectrally flat Class A pyranometer |
| ISO 9060:1990 | secondary standard pyranometer |
| WMO performance level | high quality pyranometer |
| IEC 61724-1 compliance | with VU01: meets Class A PV monitoring system requirements |
| Calibration uncertainty | < 1.2 % (k = 2) |
| Zero offset a | 5 W/m$^2$ unventilated<br>2.5 W/m$^2$ ventilated |
| Calibration traceability | to WRR |
| Spectral range | 285 to 3000 x 10$^{-9}$ m |
| Rated operating temperature range | -40 to +80 °C |
| Temperature response | < ± 0.4 % (-30 to +50 °C) |
| Heater | no heating |
| Temperature response test of individual instrument | report included |
| Directional response test of individual instrument | report included to 95° |
| Standard cable lengt | 5 m |
| Rated operating voltage range | 5 to 30 VDC |
| Power consumption | < 75 x 10$^{-3}$ W at 12 VDC |

## Digital communication

| | |
|---|---|
| Digital output | - irradiance in W/m $^2$<br>- instrument body temperature in °C |
| Communication protocol | Modbus |
| Hardware interface | 2-wire (half duplex) RS-485 |
| Transmission mode | RTU |

## 4-20 mA output

| | |
|---|---|
| Output | irradiance in W/m$_2$ |
| Transmitted range of 4-20 mA output | 0 to 1600 W/m$^2$ |
| Rated operating voltage range of 4-20 mA output | 5.5 to 40 VDC |
| Power consumption | |
| - main supply | < 75 x 10$^{-3}$ W at 12 VDC |
| - 4-20 mA current loop | < 40 x 10$^{-3}$ W at 12 VDC, with recommended 100 Ω shunt resistor |

# SR20-D2 digital Class A pyranometer

This overview summarises the main features and benefits of SR20-D2. Customers prefer Hukseflux pyranometers for their unsurpassed measurement accuracy and their lowest total cost of ownership.

**Best measurement accuracy**
- spectraly flat
- low zero offsets
- low calibration uncertainty
- best temperature response

**Lowest total cost of ownership**
- efficient worldwide calibration support
- ISO/IEC 17025 calibration available
- fast servicing organisation

**Best connector**
- interchangeable cables
- IP67 grade
- for industrial use

**Best desiccant cartridge**
- visible indicator of instrument health
- rugged aluminium design
- serviceable by user


**Best digital interface**
- industry standard output types
- Modbus RTU over 2-wire RS-485
- 4-20 mA (current loop)
- registers for re-calibration accessible to users

**Best humidity protection**
- wrench-operated
- o-ring compressed to spec
- desiccant service interval > 2 years