HukseFluxUSA

SR05-D1A3-PV

Digital second class pyranometer – alternative for PV reference cell

SR05 series is the most affordable range of pyranometers meeting ISO 9060 requirements. These sensors are ideal for general solar radiation measurements and popular for monitoring PV systems. Model SR05-D1A3–PV is made as a perfect alternative to PV reference cells. It offers the same Modbus interface as the most common PV reference cell model for easy compatibility. Relative to PV reference cells, SR05-D1A3-PV has the advantage of higher stability, independence of the PV cell type or anti-reflection coating, and better availability and price of recalibration.

Figure 1 *SR05-D1A3-PV pyranometer*

Figure 2 *SR05's, one in PoA, replacing PV reference cells*

Introduction

SR05 series is an economical range of ISO 9060 second class pyranometers for measurement of solar radiation received by a plane surface, in W/m^2, from a 180 ° field of view angle. SR05 is perfect for predicting generated power and monitoring the overall efficiency of PV power plants. Different mounting options are available, allowing SR05 to be mounted in virtually any situation. The combination of easy installation and its low cost makes SR05 the preferred solution for commercial scale PV systems.

Model SR05-D1A3-PV has a digital output that is identical to the most commonly used photovoltaic reference cell with Modbus over RS-485 output. This allows for easy installation in existing PV monitoring systems, without the need to make major modifications to data logging software, instrument libraries and infrastructure.

Compared to silicon reference cells, pyranometers offer several advantages such as a perfect (cosine) directional response and a flat spectral response over a wide range. Pyranometers therefore measure *the maximum available resource* and are suitable to act as a reference for all types (for example amorphous, crystalline or thin-film) of photovoltaic cells both with and without anti-reflection coating. See also our Application note *"pyranometers versus PV reference cells"*. Moreover, since the working principle of a pyranometer is different from a solar cell, the pyranometer offers a truly independent measurement of the irradiance.

Compliant with IEC 61724-1, class C

IEC 61724-1: Photovoltaic System Performance Monitoring - Guidelines for Measurement, Data Exchange and Analysis – suggests to use pyranometers for PV monitoring; SR05 complies with IEC 61724-1 class C system requirements.

Features and benefits

- higher stability than PV reference cells
- independent of PV cell type
- affordable calibration
- register structure and content identical to most common reference cells for easy exchangeability
- easy implementation and servicing
- easy mounting and levelling
- pricing: affordable second class pyranometers

SR05-D1A3-PV design

SR05 pyranometers employ a thermopile sensor with black coated surface, one dome and an anodised aluminium body with visible bubble level. Optionally the sensor can be delivered with a unique ball levelling mechanism and tube mount or dedicated mounting fixture, for easy installation. SR05-D1A3-PV has an industry standard digital output: Modbus RTU over half-duplex RS-485, that allows multiple sensors to be installed on a single network. In addition, SR05-D1A3-PV has analogue 0-1 V output.

Figure 3 *'Exploded view' of SR05-D1A3-PV. The optional ball levelling and tube mount allow for easy installations. The cable (standard 3 m) has an M12-A connector.*

SR05-D1A3-PV specifications

Measurand	global irradiance (hemispherical solar radiation)
ISO classification	second class pyranometer spectrally flat class C pyranometer (2018)
IEC 61724-1 compliance	meets class C PV monitoring system requirements
Calibration uncertainty	<1.8% (k=2)
Calibration traceability	to WRR
Spectral range (wavelength)	285 to 3000 $\times 10^{-3}$ m
Rated operating temperature range	-40 to +80 °C
Standard cable length	3 m
Rated operating voltage	5 to 30 VDC
Levelling	ball levelling, optional with / without tube mount
Digital output:	
Communication protocol	Modbus over 2-wire RS-485
Transmission mode	RTU
Baud rates	1200, 2400, 9600, 19200, 38400 and 115200
Compatibility	IMT-Solar Si-RS485TC-T-MB other cells upon request
Analogue output:	
Voltage output	0 to 1 V

Suggested use

- replacement of PV reference cells
- measuring global tilted irradiance (GTI) in the Plane of Array (PoA) of solar panels
- measuring global horizontal irradiance (GHI)

Standards

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

Options & accessories

- cable lengths: 10, 20 m
- extension cable with connector pair: 10, 20 m
- with ball levelling
- with ball levelling and tube mount (for tube diameters 25 – 40 mm)
- PMF01 mounting fixture for Plane of Array installation

Compatibility

SR05-D1A3-PV's Modbus interface is exchangeable with IMT-Solar Si-RS485TC-T-MB PV reference cell's interface. Other reference cells upon request.

Hukseflux Sensor Manager software

For communication between a PC and SR05-D1A3-PV('s), the Hukseflux Sensor Manager software can be used. It is available for download on our website. The software allows the user to quickly configure SR05-D1A3-PV Modbus address and serial communication settings (baud rate, parity and stopbits) and to plot and export data. Also, the digital outputs may be viewed for sensor diagnostics.

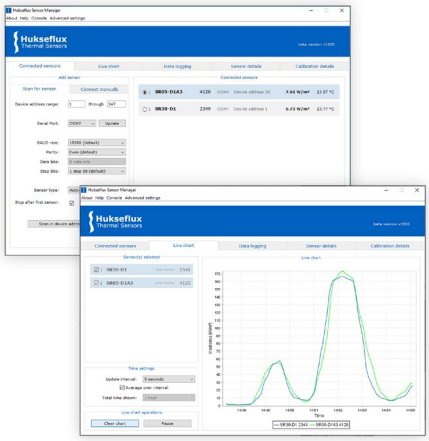

Figure 4 *user interface of Hukseflux Sensor Manager*

Figure 5 *PMF01 mounting fixture accessory: practical, small footprint, and allowing horizontal and plane of array installations on various platforms*

Other SR05 versions

Besides SR05-D1A3-PV, SR05 series offers several other versions with industry standard outputs, both digital and analogue. Each version offers multiple mounting options and various cable lengths:

- SR05-D1A3 digital second class pyranometer, with Modbus over RS-485 and 0-1 V output[1]
- SR05-D2A2 digital second class pyranometer, with Modbus over TTL and 4-20 mA output
- SR05-A1 analogue second class pyranometer with millivolt output

[1] This is our standard Modbus model which is not directly exchangeable with the commonly used PV reference cells.

For an overview of all versions and options, and how to order, please take a look at Table 1 on the next page.

See also

- view our complete range of solar sensors

About Hukseflux

Hukseflux Thermal Sensors offers measurement solutions for the most challenging applications. We design and supply sensors as well as test & measuring systems, and offer related services such as engineering and consultancy. With our laboratory facilities, we provide testing services including material characterisation and calibration. Our main area of expertise is measurement of heat transfer and thermal quantities such as solar radiation, heat flux and thermal conductivity. Hukseflux is ISO 9001 certified. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

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Table 1 *Ordering codes for SR05*

VERSIONS OF SR05 (part numbers), without cable	
SR05-D1A3-PV	digital second class pyranometer, with Modbus over RS-485 output, alternative for PV reference cell
SR05-D1A3	digital second class pyranometer, with Modbus over RS-485 and 0-1 V output
SR05-D2A2	digital second class pyranometer, with Modbus over TTL and 4-20 mA output
SR05-A1	analogue second class pyranometer, with millivolt output
CABLE FOR SR05, with female M12-A connector at sensor end, non-stripped on other end	
'-03' after SR05 part number	standard cable length: 3 m
'-10' after SR05 part number	cable length: 10 m
'-20' after SR05 part number	cable length: 20 m
CABLE EXTENSION FOR SR05, with male and female M12-A connectors	
C06E-10	cable length: 10 m
C06E-20	cable length: 20 m
LEVELLING OPTIONS FOR SR05	
BL01	ball levelling, for levelling of SR05
TMBL01	tube mount with ball levelling, for mounting SR05 on a tube

SR05

SR05 with BL01

SR05 with TMBL01