SRA30-D1

Digital Spectrally Flat Class A albedometer with heating and ventilation

SRA30-D1 Digital Spectrally Flat Class A albedometer is an instrument that measures global and reflected solar radiation and the solar albedo, or solar reflectance. SRA30-D1 is the most accurate albedometer available and heated for the best data availability. It is composed of one AMF03 albedometer mounting kit and two SR30-D1 Spectrally Flat Class A pyranometers. This pyranometer is compliant in its standard configuration with the requirements for Class A PV monitoring systems of the IEC 61724-1:2017 standard. Each pyranometer has a thermopile sensor, the upfacing one measuring global solar radiation, the downfacing one measuring reflected solar radiation. AMF03 includes one glare screen, one mounting fixture with rod, mounting hardware and tools. SRA30 complies with the latest ISO and WMO standards. The modular design facilitates maintenance and calibration.

Figure 1 *SRA30-D1 albedometer*

The best albedometer for the PV industry

SRA30-D1 is the most accurate albedometer available. Its benefits:

- Heating and ventilation included, complying with IEC 61724-1 Class A PV system requirements
- Digital outputs: 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 as required by ISO 9060
- Re-calibration registers fully accessible to users
- Modular; can be calibrated as separate pyranometers

SRA30-D1 design

SRA30-D1 consists of two identical pyranometers model SR30-D1, one facing up, one facing down. To create an SRA30-D1, the two sensors are combined with one AMF03 albedometer mounting kit. AMF03 includes a fixture with rod for mounting purposes and a glare screen. The user assembles these modular components into an SRA30 albedometer. Mounting hardware, tools and a mounting and fixation instruction are part of AMF03. The modular design of SRA30 facilitates maintenance and calibration.

Suggested use

- PV monitoring with bifacial solar modules
- high-accuracy meteorological observations
- extreme climates (tropical / polar)

Introduction

Albedo, also called solar reflectance, is defined as the ratio of the reflected to the global radiation. The solar albedo depends on the directional distribution of incoming radiation and on surface properties at ground level. Albedos of typical surfaces range from about 4 % for fresh asphalt, and 15 % for green grass to 90 % for fresh snow.

An albedometer is an instrument composed of two pyranometers, the upfacing one measuring global solar radiation, the downfacing one measuring reflected solar radiation. You can then derive the solar albedo, or solar reflectance and net solar radiation.

Using SRA30 albedometer is easy. The instrument is composed of two SR30 Spectrally Flat Class A pyranometers; the upfacing one measuring global solar radiation, the downfacing one measuring reflected solar radiation.

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When using SR30, the irradiance in W/m^2 is transmitted via the Modbus protocol over 2-wire RS-485. The working principle and specifications of the pyranometers can be found in the SR30 user manual. SRA30 can be connected directly to commonly used datalogging systems.

Demanding applications

Albedometers are used for general meteorological observations, building physics, roof reflectance studies, climate studies and solar collector testing. A common application is for outdoor solar radiation balance measurements as part of a meteorological station. Albedometers are increasingly popular in bifacial PV module performance monitoring. This application requires horizontal levelling; a bubble level and a mounting rod are included.

Heated for high data availability, featuring new RVH™ technology

High data availability is attained by heating of the outer dome using ventilation between the inner and outer dome. RVH™ - Recirculating Ventilation and Heating - technology, developed by Hukseflux, suppresses dew and frost deposition and is as effective as traditional ventilation systems, without the maintenance hassle and large footprint.

- low power consumption: SR30 requires only 2 W, compared to 10 W for traditional ventilation systems
- low maintenance: SR30 does not require filter cleaning

Figure 2 *frost and dew deposition: clear difference between a non-heated pyranometer (back) and SR30 with RVH™ technology (front)*

SRA30-D1 specifications

Included	2 x SR30-D1, 1 x AMF03
Measurand	global solar radiation and reflected solar radiation
Optional measurand	albedo or solar reflectance
Optional measurand	net solar radiation
Measurand	sensor tilt angle
IEC 61724-1 compliance	meets Class A and B PV monitoring system requirements
Calibration uncertainty	< 1.2 % (k = 2)
Heating	included
Ventilation	included
Mounting	mounting rod with 15 x 10^{-3} m diameter
Rated operating temperature range	-40 to +80 °C

SR30-D1

Included sensors	2 x identical ISO 9060 Spectrally Flat Class A pyranometer SR30-D1
Output	digital Modbus RTU over RS-485
Temperature response	< ± 0.4 % (-30 to +50 °C)
Temperature response test and directional response test	reports included
Standard cable length	5 m (see options)
Power consumption	< 2.3 W at 12 VDC

Digital output

Output	-irradiance in W/m^2 -instrument body -temperature in °C -tilt angle in ° -internal humidity in % -ventilator speed in RPM
Communication protocol	Modbus over 2-wire RS-485
Transmission mode	RTU
Rated operating voltage range	5 to 30 VDC

AMF03

(1 x) glare screen
(1 x) fixture with rod
(1 x) conical positioner
(2 x) M5x12 socket head cap screw
(1 x) M6x8 socket head cap screw
(2 x) M8x12 set screw (pre-mounted)
(1 x) mounting and fixation instruction sheet

Options

- longer cables, in multiples of 5 m, cable lengths above 20 m in multiples of 10 m

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The dome of SR30 pyranometer is heated by ventilating the area between the inner and outer dome. RVH™ is much more efficient than traditional ventilation, where most of the heat is carried away with the ventilation air. Recirculating ventilation is as effective in suppressing dew and frost deposition at 2 W as traditional ventilation is at 10 W. RVH™ technology also leads to a reduction of zero offsets.

Standards

Applicable instrument-classification standards are ISO 9060 and WMO-No. 8. Calibration is according to ISO 9847 and ASTM G207-11.

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.

ALF01

ALF01 is a levelling tool that can be used with AMF03 to easily level the instrument. The ALF01 is mounted on a 1 inch outer diameter crossarm, and can be rotated around the tube axis for 360 ° as well as tilted over ± 2 °.

Figure 3 *ALF01 albedometer levelling tool*

See also

- AMF03 albedometer mounting kit
- ALF01 albedometer levelling fixture
- CMF01 crossarm mounting fixture for albedometers
- SRA15-series Spectrally Flat Class B albedometer for lower accuracy albedo measurements
- SRA01 Spectrally Flat Class C albedometer for lower accuracy albedo measurements
- alternative instrument: NR01 for solar and longwave radiation balance

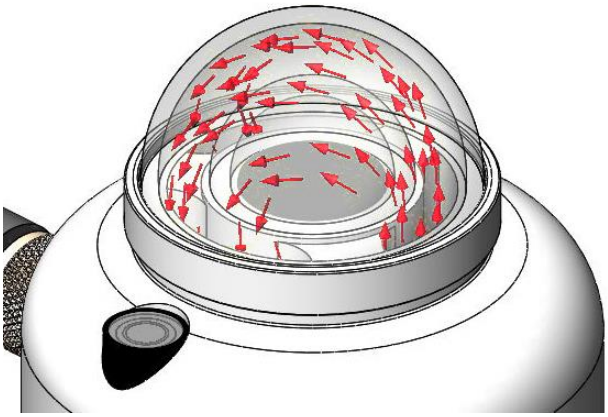

Figure 4 *how it's done: recirculating ventilation and heating between the inner- and outer dome is much more power efficient than traditional ventilation systems*

Figure 5 *using SRA30 albedometer is easy; the instrument is composed of AMF03 and two SR30-D1 pyranometers*

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. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

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