Hukseflux
Thermal Sensors

DR02

Fast response first class pyrheliometer

DR02 is a high accuracy direct (normal incidence) solar radiation sensor with a short response time. The scientific name of this instrument is pyrheliometer. DR02 complies with the first class specifications of the ISO 9060 standard and the WMO Guide. Its fast response makes it very suitable for PV (photovoltaics)-related applications. DR02 pyrheliometer has a heated window and is used in tracker-mounted operation.

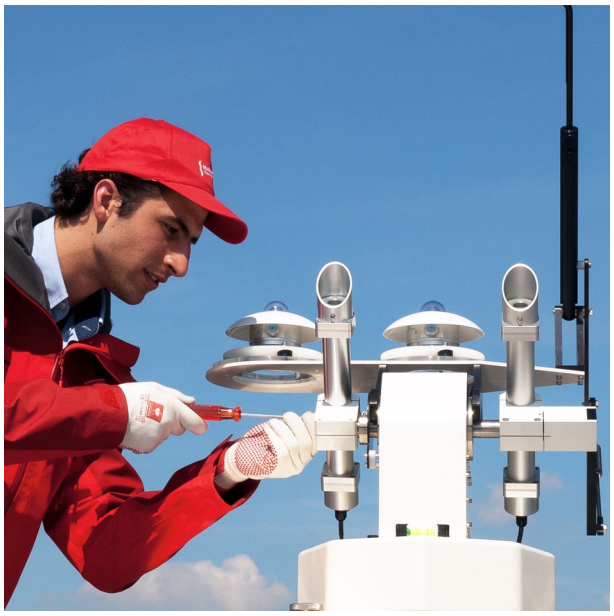

Figure 1 *pyrheliometers and pyranometers on a tracker*

Figure 2 *DR02 fast response first class pyrheliometer showing its polished quartz window assembly with heater*

Introduction

DR02 is a solar radiation sensor that is applied in high accuracy measurement of the solar radiation received by a plane surface from a 5 ° full field of view angle. This quantity, expressed in W/m^2 , is called “direct” solar radiation or direct normal irradiance (DNI). Pyrheliometers like DR02 are generally employed outdoors under the sun. It is necessary to keep the instrument pointed at the sun by using a two-axis tracker.

Due to its short response time, DR02 is ideally suited for concentrated PV or concentrated thermal applications, where it will match the response time of the panel or receiver.
Typical DR02 applications are solar energy resource assessment and system performance monitoring (in particular for concentrated solar energy), scientific solar climate observations and outdoor material testing.

Benefits and operation

Besides its short response time, DR02 offers more advantages over competing models:
DR02 window assembly is equipped with a heater which reduces measurement errors caused by (early-morning) dew deposition. DR02 can be connected directly to commonly used data logging systems. The irradiance in W/m^2 is calculated by dividing the instrument output, a small voltage, by the sensitivity. This sensitivity is provided with DR02 on its product certificate. DR02 pyrheliometer is optionally equipped with a temperature sensor and is optionally characterised for its temperature dependence. This can be used to increase the accuracy of the measurement.

Standards

Applicable instrument classification standards are ISO 9060 and WMO-No. 8. Calibration is traceable to WRR (World Radiometric Reference)

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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" or GUM) can be found in our manuals. We provide spreadsheets to assist in the process of uncertainty evaluation of your measurement.

DR02 design

The pyrheliometer features a precision ground and polished quartz window, a collimated tube and a thermopile sensor with black coated surface. DR02 also features a thermally isolated low power heater in the window assembly.

Figure 3 *DR02 fast response pyrheliometer side view*

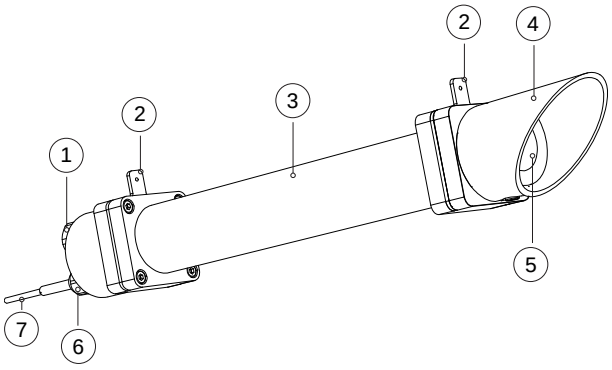

Figure 4 *overview of DR02:*
(1) humidity indicator, (2) sights, (3) aperture tube, (4) protection cap, (5) window with heater, (6) cable gland, (7) cable

Suggested use

- outdoor PV / CPV and CSP system performance monitoring
- solar energy surveys
- solar resource assessments
- meteorological networks

DR02 specifications

Measurand	direct solar radiation
ISO classification	first class pyrheliometer
DR02 response time (95 %)	2 s
Full field of view angle	5 °
Slope angle	1 °
Calibration uncertainty	< 1.3 % (k = 2)
Calibration traceability	to WRR
Measurement range	0 to 4000 W/m^2
Spectral range (50 % transmission points)	200 to 4000 x 10^{-9} m
Sensitivity (nominal)	10 x 10^{-6} V/(W/m^2)
Rated operating temperature range	-40 to +80 °C
Temperature response	< ± 1 % (-10 to +40 °C)
Temperature response *	< ± 0.4 % (-30 to +50 °C) with correction in data processing
Heater	12 VDC, 0.5 W
Standard cable length	5 m (see options)

** if opted for internal temperature sensor + temperature dependence characterisation (see options)*

Options

- longer cable, in multiples of 5 m
- internal temperature sensor
- temperature dependence characterisation

See also

- DR01 first class pyrheliometer
- view our complete product range of solar sensors

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