

DR03

Compact fast response first class pyrheliometer

DR03 is a high accuracy direct (normal incidence) solar radiation sensor with a short response time and a relatively small size. The scientific name of this instrument is pyrheliometer. DR03 complies with the first class specifications of the ISO 9060 standard and the WMO Guide. Its fast response time makes DR03 very suitable for PV-related applications. This pyrheliometer has a heated window and is used in tracker-mounted operation. DR03's compact size improves compatibility with small sized trackers.



Figure 1 DR03 compact fast response first class pyrheliometer

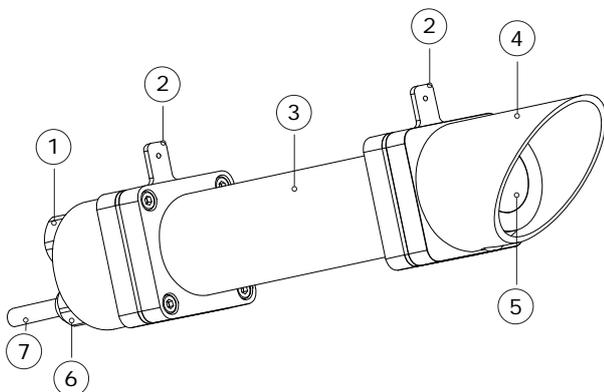


Figure 2 overview of DR03:
 (1) humidity indicator, (2) sights, (3) aperture tube, (4) protection cap, (5) window assembly with heater, (6) cable gland, (7) cable

Introduction

DR03 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 DNI (direct normal irradiance). Pyrheliometers like DR03 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, DR03 is ideally suited for concentrated PV or concentrated thermal applications, where it will match the response time of the panel or receiver. Typical DR03 applications include 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, DR03 offers two more distinguishing features with benefits:

- DR03 window assembly is equipped with a heater to increase data availability, for instance by reducing measurement errors caused by (early-morning) dew deposition
- its compact size improves compatibility with small sized trackers

DR03 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 DR03 on its product certificate. DR03 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.

DR03 design

The pyrheliometer features a precision ground and polished quartz window, a compact sized collimated tube and a thermopile sensor with black coated surface. DR03 also features a thermally isolated low power heater in the window assembly.



Figure 3 DR03 pyrheliometer side view

Suggested use

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

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.



Figure 3 DR03 pyrheliometer with small size tracker

DR03 specifications

Measurand	direct solar radiation
ISO classification	first class pyrheliometer
Response time (95 %)	2 s (nominal)
Total sensor length including cap	286×10^{-3} m
Full field of view angle	5 °
Slope angle	1 °
Calibration uncertainty	< 1.2 % (k = 2)
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
Window assembly with 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 , cable lengths above 20 m in multiples of 10 m
- internal temperature sensor
- temperature dependence characterisation

See also

- [DR02](#) fast response first class pyrheliometer
- view our complete [product 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. 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 9001:2008 certified. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

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