

DR01

First class pyrheliometer

DR01 is a high-accuracy direct (normal incidence) solar radiation sensor. The scientific name of this instrument is pyrheliometer. DR01 complies with the first class specifications of the ISO 9060 standard and the WMO Guide. The pyrheliometer has a heated window to increase data availability. DR01 is used in tracker-mounted operation.



Figure 1 DR01 first class pyrheliometer side view

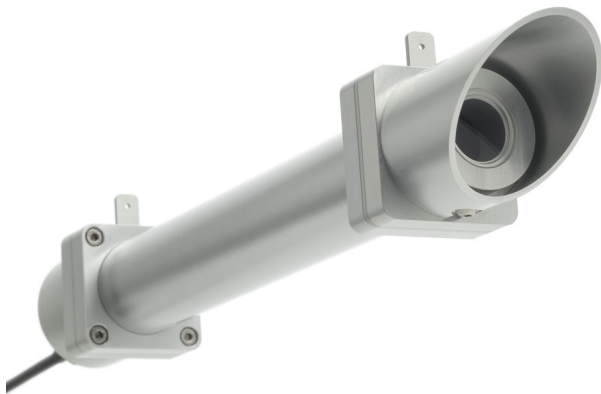


Figure 2 DR01 pyrheliometer showing its heated window



Figure 3 Two DR01s in use in tracker-mounted operation

Introduction

DR01 is a solar radiation sensor that is applied in high accuracy observations. It measures 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 are generally employed outdoors under the sun. It is necessary to keep the instrument pointed at the sun by using a two-axis tracker. Typical DR01 applications include solar energy resource assessment, system performance monitoring (in particular for concentrated solar energy) and scientific solar climate observations.

Benefits and operation

DR01 window assembly is equipped with a heater to increase data availability, for instance by reducing measurement errors caused by (early-morning) dew deposition. DR01 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 DR01 on its product certificate. DR01 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)

DR01 design

The pyrheliometer features a precision ground and polished quartz window, a collimated tube and thermopile sensor with a black coated surface. It has an anodised aluminium body. DR01 also features a thermally isolated low power heater in the window assembly.

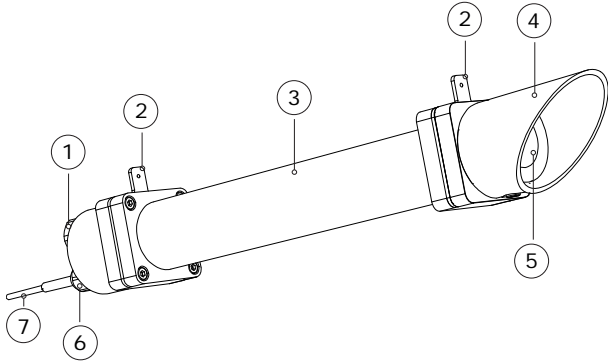


Figure 4 overview of DR01:
 (1) humidity indicator, (2) sights, (3) aperture tube, (4) protection cap, (5) window assembly with heater, (6) cable gland, (7) cable

Suggested use

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



Figure 5 DR01 first class pyrheliometer front view

See also

- **DR02** and **DR03** fast response first class pyrheliometers
- view our complete [range of pyrheliometer and pyranometer products](#)

DR01 specifications

Measurand	direct solar radiation
ISO classification	first class pyrheliometer
Response time (95 %)	12 s (nominal)
Total sensor length including cap	380×10^{-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 4000×10^{-9} m
Sensitivity (nominal)	$10 \times 10^{-6} \text{ V}/(\text{W/m}^2)$
Rated operating temperature range	-40 to $+80^\circ\text{C}$
Temperature response	$< \pm 1\%$ (-10 to $+40^\circ\text{C}$)
Temperature response *	$< \pm 0.4\%$ (-30 to $+50^\circ\text{C}$) 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

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 9001:2008 certified. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

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