

DR20-A1 & DR15-A1

带加热功能的A、B级模拟输出平坦光谱直接辐射表

DR20和DR15是高精度的垂直入射太阳辐射传感器。DR20符合ISO 9060:2018标准的A级规范，DR15符合ISO 9060:2018标准的B级规范。这两类仪器适用于安装在跟踪器上的操作，并提供模拟毫伏输出。都有优越的窗口加热，从而提高了数据可用性。



Figure 1 DR20 Class A / DR15 Class B 直接辐射表：外壳相同。



Figure 2 加热的重要性：安装在跟踪器上的加热型DR15-A1和DR20-A1直接辐射表的操作，这里安装的是加热型SR15-A1直接辐射表。由于朝露和霜冻的影响，几乎所有环境中非加热仪器的数据可用性都受到影响。

简介

Hukseflux DR15型太阳热量计是一种ISO 9060光谱平坦B级（旧ISO分类为“一级”）仪器。它完全替换了DR01、DR02和DR03型。DR20是一种新型的A类仪器。它比DR15有更好的温度响应。这两种仪器具有最高精度和最高的数据可用性，在低偏移量情况下，具有窗口加热功能。在相同的加热功率下，加热系数提高了4倍，偏移量降低了4倍！

DR20和DR15用于高精度测量从5°全视场角度接收的太阳辐射。单位 (W/m²)

“直接”太阳辐射或DNI（直接正常辐照度）。使用双轴跟踪器，必须使仪器垂直指向太阳。

窗口加热提高数据可用性

通过加热前窗可获得高数据可用性。这样可以以非常低的功耗抑制结露和结霜：DR20/DR15只需要1 W的功率就可以使其窗口免受结露和结霜的影响。

责任范围：测试证书

根据ISO 9060 A级分类的要求，每个DR20都提供了单独仪器的测试结果：

- 灵敏度
- 响应时间
- 温度响应

DR15 证书包含灵敏度和响应时间

DR20 和 DR15 的应用

直接辐射表用于安装在跟踪器上的操作。DR20-A1和DR15-A1可以直接连接到常用的数据记录系统。它们提供毫伏范围的模拟输出。

DR20 and DR15 设计原理

直接辐射表的特点是有一个精密研磨和抛光的石英窗口，一个紧凑尺寸的准直管和一个表面涂有黑色涂层的热电堆传感器。

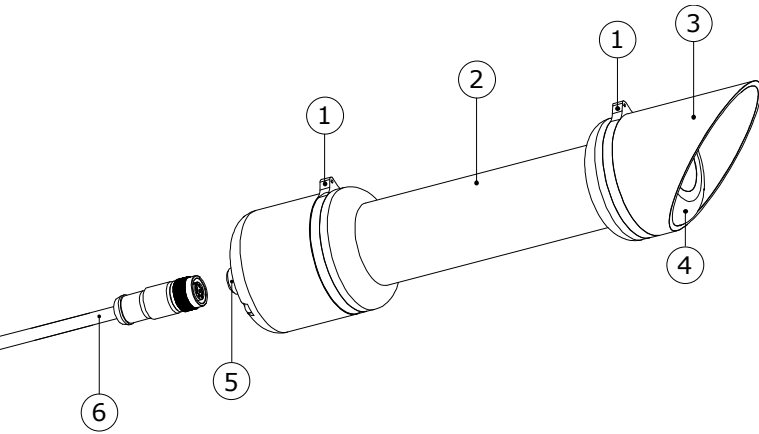


Figure 3 overview of DR20 / DR15:
(1) sights, (2) aperture tube, (3) protection cap, (4) window assembly with heater, (5) connector, (6) cable

Suggested use

- solar energy surveys
- solar resource assessments
- meteorological networks
- sites with dew and frost problems

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 4 DR20 / DR15 pyrheliometer side view

DR20 DR15 技术参数

测量参数	垂直太阳辐照度
ISO 分类等级	DR20: Class A
	DR15: Class B
校准不确定度	< 1.2 % (k = 2)
加热功能	内置
Heater 功耗	1 W at 12 VDC
响应时间 (95 %)	4 s
视场角	5 °
倾角	1 °
零点漂移	< ± 1 W/m ²
校准溯源	to WRR
模拟输出	millivolt
光谱范围	200 to 4000 x 10 ⁻⁹ m
额定工作温度	-40 to +80 °C

温度响应 Temperature response	DR20:
	< ± 0.5 % (-10 to +40 °C)
	with correction in data processing:
	< ± 0.4 % (-30 to +50 °C)
	DR15:
	< ± 1 % (-10 to +40 °C)
Calibration certificate	included
Temperature response test of individual instrument	DR20: report included
	DR15: no report
Cable length	5 m

See also

- [DR30-D1 digital pyrheliometer](#) with heating, internal tilt sensor and humidity measurement
- [view our complete product range of sensors](#)



Figure 5 DR20 / DR15 pyrheliometer front view

DR20 and DR15 user benefits

Using DR20 / DR15 pyrheliometers offer significant benefits over the use of competing models. The pyrheliometers offer the highest accuracy and highest data availability, featuring heating at low offsets. The advantages of having a heater are demonstrated in the following graphs:

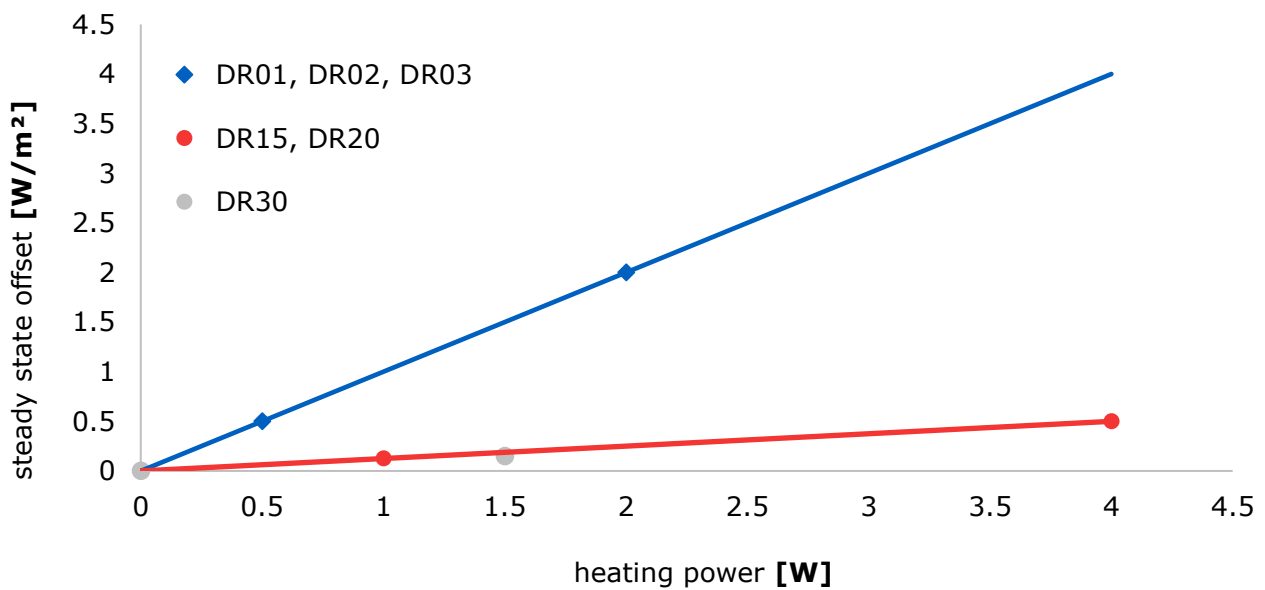


Figure 6 the offset of the latest models DR20, DR15 (and also the digital DR30) when heating, is much improved relative to the older DR01, DR02 and DR03 models. DR20 and DR15 have a 12 VDC, 1 W heater which produces a negligible offset. The older models had offsets of the order of 1 W/m² at the same heating level. In addition, the temperature of the front window of DR20 and DR15 is 4 times higher than that of the older models, at the same heating power.

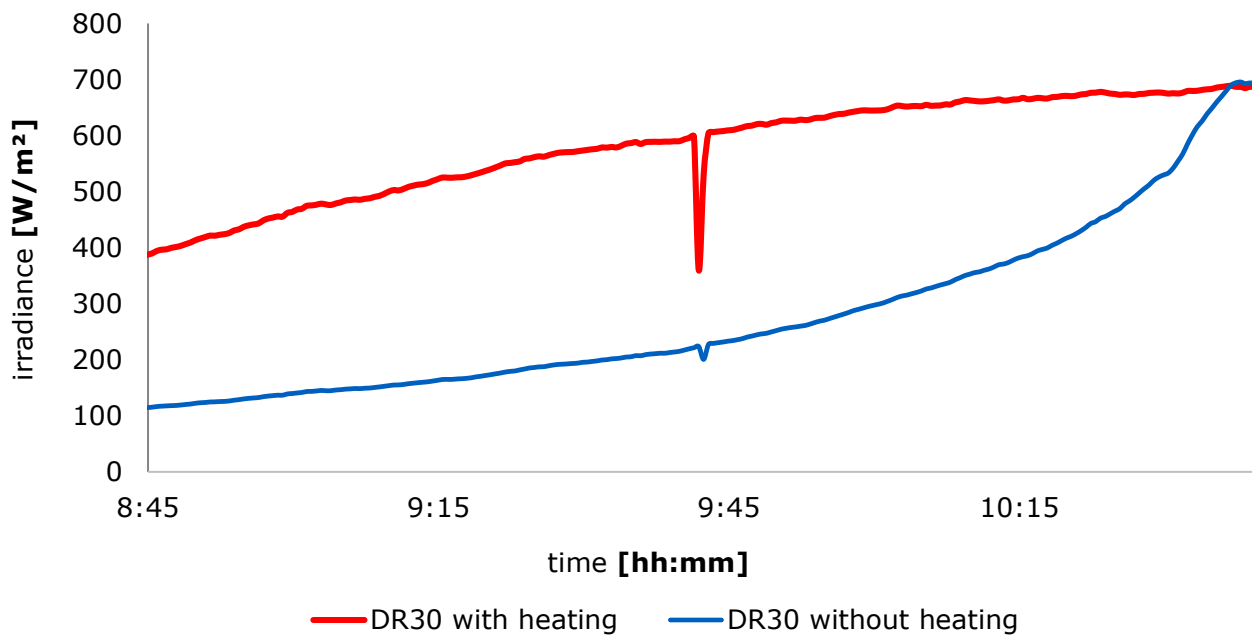


Figure 7 comparison of the measured data with and without heating on a typical winter morning, using model DR30 which has the same heating as DR20 and DR15. The unheated DR30 has dew on its front window and strongly underestimates the incoming irradiance. At around 10:30 the dew evaporates. Real measured data from Delft, the Netherlands.

About Hukseflux

Hukseflux Thermal Sensors offers measurement solutions for the most challenging applications. Hukseflux sensors, systems and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

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