

SR25: diffuse solar radiation reference

Outperforms quartz dome instruments, and is more affordable

Diffuse solar radiation is usually measured using shaded pyranometers. The dominant measurement error is the zero offset a . SR25, equipped with a high thermal conductivity sapphire dome, has very low offsets. SR25 outperforms the traditional quartz dome instruments used for this purpose, at a much lower cost level. SR25 has been tested* at NREL National Renewable Energy Laboratory of Golden USA, and has been adopted* by NREL as its diffuse radiation reference sensor.

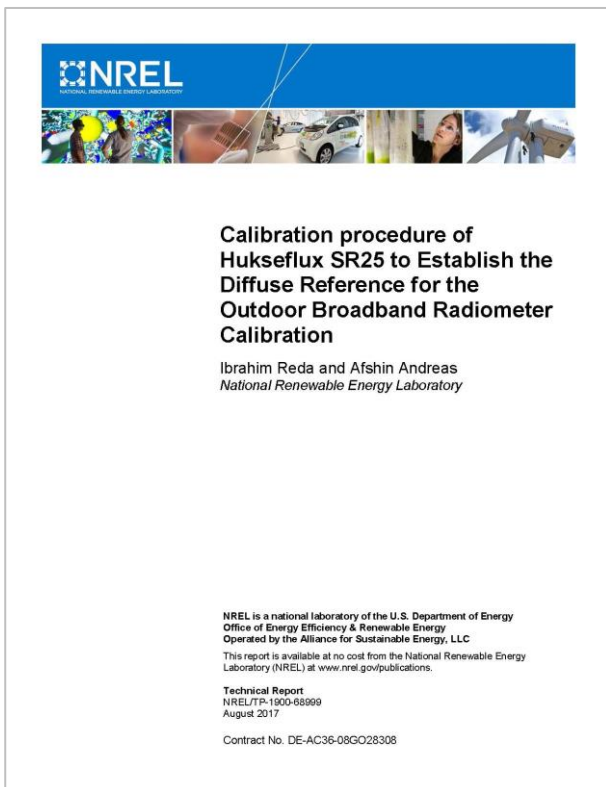


Figure 1 NREL test report of SR25: also available online

Next level measurement

SR25 pyranometer measures the solar radiation received by a plane surface, in W/m^2 , from a 180° field of view angle. SR25 offers the best measurement accuracy: the specification limits of two major sources of measurement uncertainty have been greatly improved over competing pyranometers: “zero offset a ” and temperature response.

Low zero offset

Using a sapphire outer dome, SR25 has negligible zero offsets. Zero offset a is caused by a temperature difference between domes and detector. The high thermal conductivity of SR25’s sapphire outer dome ensures excellent thermal coupling between body and domes. This results in a nighttime offset of $< 1 W/m^2$, unheated, unmatched by any pyranometer.

Independent testing

SR25 prototypes and product models were tested outdoor and indoor against competing spectrally flat Class A (secondary standard) instruments.

SR25’s excellent performance was recently confirmed in an independent test* at NREL: Ibrahim Reda, A. Andreas, 2017, *Technical Report NREL/TP-1900-68999, Calibration procedure of Hukseflux SR25 to Establish the Diffuse Reference for the Outdoor Broadband Radiometer Calibration*. In this calibration experiment, the NREL lab attributed a $0.5 W/m^2$ zero offset to the unheated SR25, and was able to determine its sensitivity with an accuracy of around 0.9 %. Using this SR25 to measure Diffuse Horizontal Irradiance, NREL estimates the contribution of the SR25 to the uncertainty of the Global Horizontal Irradiance as $\pm (0.09 \% + 0.5 W/m^2)$.

* NOTE: the fact that a sensor is used or tested does not constitute a formal endorsement by the user or test institute.



Figure 2 SR25 pyranometer with sapphire outer dome

Comparison to quartz dome instruments

The same NREL lab assumes in its BORCAL testing that a double quartz-dome instrument has around 1.5 W/m² zero offset (at 200 W/m² net irradiance) while double glass-dome pyranometers are typically no better than 5 W/m².

BSRN requirements

The SR25 measurement accuracy is sufficient to meet the requirements of the BRSN network for diffuse radiation measurement, which is the larger of 2 % or 3 W/m². Bruce McArthur, 2005, *BSRN Operations Manual Version 2.1, WCRP-121 WMO/TD-No. 1274*

Accuracy

Example: as one of the comparative tests performed at Hukseflux, during a 26 day period the nighttime offset of various pyranometer configurations was monitored. Looking at nighttime offsets, the performance of both the heated and the unheated SR25 is better than that of all other measured pyranometer configurations.

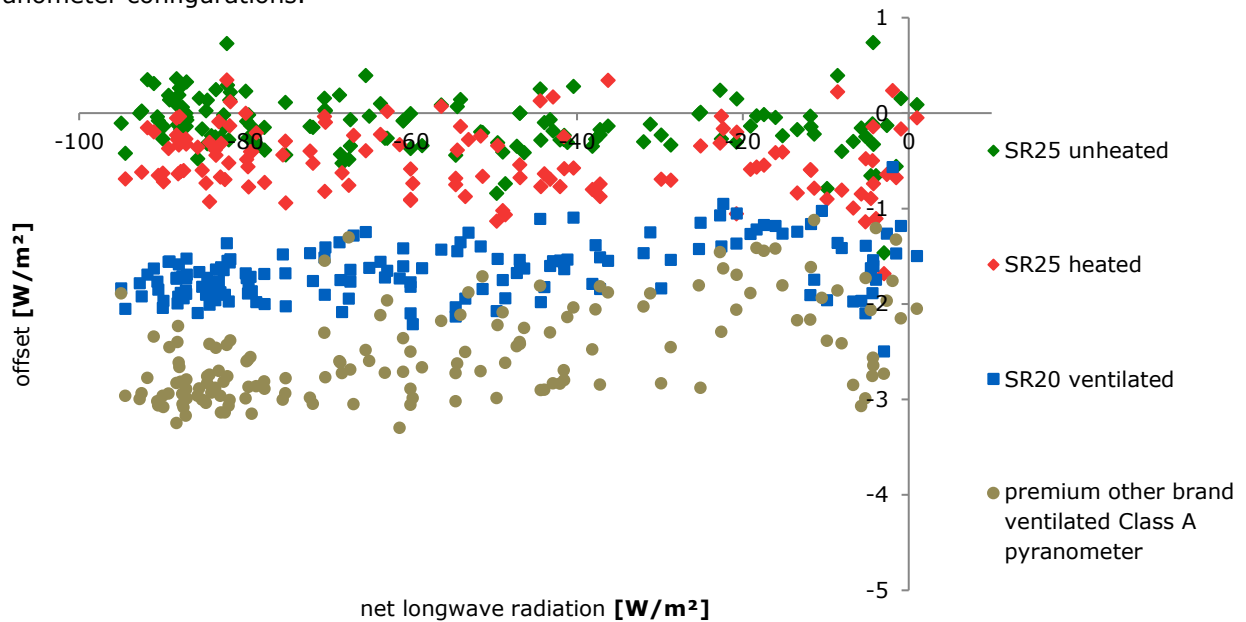


Figure 3 results at Hukseflux: nighttime offsets of ventilated pyranometers and SR25 versus net longwave radiation. SR25 has lower nighttime offset than the ventilated Class A pyranometers both when unheated and when heated

Individual testing of every instrument

In order to be classified as spectrally flat Class A, every pyranometer needs to be tested individually for all critical specifications. Each SR25 is supplied with a product certificate, reporting directional response, temperature response and response time (95 %).

See also

- [SR25 brochure](#)
- view our complete [product range of solar sensors](#)

Figure 4 extensive testing of sensors, here indoors at Hukseflux and outdoors on a frosty morning: clear difference between SR25 (left), versus an unheated pyranometer without sapphire dome (right)



Worldwide support

Hukseflux has pyranometer calibration equipment and servicing facilities in the following regions:

- Europe
- United States of America
- China
- Japan
- India
- Brasil



Figure 5 worldwide calibration and service facilities

About Hukseflux

Hukseflux Thermal Sensors makes sensors and measuring systems. Our aim is to let our customers work with the best possible data. Many of our products are used in support of energy transition and efficient use of energy. We also provide services: calibration and material characterisation. 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 certified. Hukseflux products and services are offered worldwide via our office in Delft, the Netherlands and local distributors.

Interested in this product?
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