Hukseflux
Thermal Sensors

SR20: The making of

A spectrally flat Class A (secondary standard) pyranometer setting new standards

Hukseflux invested more than 10 man-years in developing the infrastructure to manufacture, test and calibrate a spectrally flat Class A pyranometer. These efforts resulted in the SR20 Class A pyranometer, released February 2013.

Figure 1 *SR20 spectrally flat Class A pyranometer*

Figure 2 *Directional response testing at Hukseflux*

Objective

The main objective for the SR20 design team was to develop the highest accuracy pyranometer at the most attractive price level. The results are extraordinary.

Result: accuracy

To improve accuracy Hukseflux focused on:

- reduction of "zero offset a"
- reduction of initial calibration uncertainty

"Zero offset a" reduction is achieved by designing a new detector, using state of the art technology. The "zero offset a" specification of SR20 is 5 W/m^2 unventilated. Competing models state 12 W/m^2 unventilated and 7 W/m^2 ventilated.

The calibration uncertainty was reduced in cooperation with PMOD World Radiation Center in Davos, Switzerland. The initial calibration uncertainty is reduced to less than 1.2 %, an improvement of 15 % relative to competing models.

Result: infrastructure for efficiency

Hukseflux developed state-of-the-art facilities for calibration and for conformity assessment. The equipment and procedures were designed and successfully implemented, allowing fast and accurate work. As a result instruments are produced efficiently and can be offered at the most attractive price level.

Comparative testing

SR20 prototypes and product models were tested outdoor and indoor against competing Class A instruments.

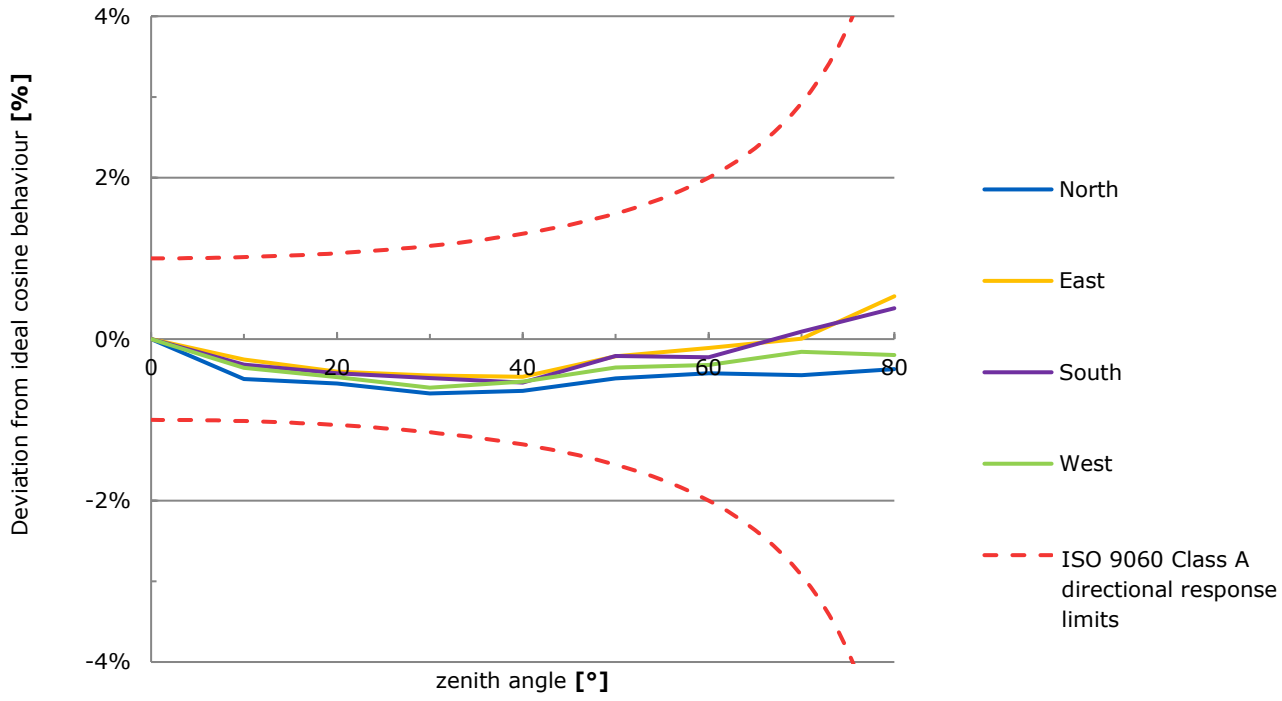

Figure 3 *Directional response of a SR20 pyranometer of 4 azimuth angles, compared to Class A limits*

Individual testing of every instrument

In order to be classified as Class A, every pyranometer needs to be tested individually for all critical specifications. As an example, Figure 3 shows directional response test results of a SR20 pyranometer. Each SR20 is supplied with a product certificate, reporting directional response, temperature response and response time (95 %).

Reference calibration at PMOD

Hukseflux' internal working standard, the reference for our SR20 calibration, has been calibrated at PMOD World Radiation Center in Davos, as shown in Figure 4.

Worldwide support

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

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

For contact details, please visit www.hukseflux.com

Physikalisch-Meteorologisches Observatorium Davos
World Radiation Center

pmod wrc

Calibration Certificate

No. 2012-C-38

Calibration Item — Pyranometer

Manufacturer: Hukseflux
Type: SR20
Serial Number: 101

Customer: Hukseflux Thermal Sensors B.V.
Elektronicaweg 25
2628 XG Delft
The Netherlands

Calibration Mark: Label 2012-C-38

Period of Calibration: 2012 July 18, 23, 24

Davos Dorf, 25 July 2012

C. Thomann
In charge of calibration

Dr. W. Finsterle
Head WRC section solar radiometry

CIPM MRA

PMOD/WRC follows the requirements for the competence of testing and calibration laboratories according to ISO/IEC 17025. PMOD/WRC is a designated institute of the Swiss Federal Office of Metrology, the Swiss signatory of the CIPM MRA (International Committee for Weights and Measures - Mutual Recognition Arrangement).

Calibration certificates without signature are not valid. This calibration certificate shall not be reproduced except in full, without the written approval of the Physikalisch-Meteorologisches Observatorium Davos and World Radiation Center.

Dorfstrasse 33, CH-7260 Davos Dorf
Phone +41 81 417 51 11, Fax +41 81 417 51 00
www.pmodwrc.ch

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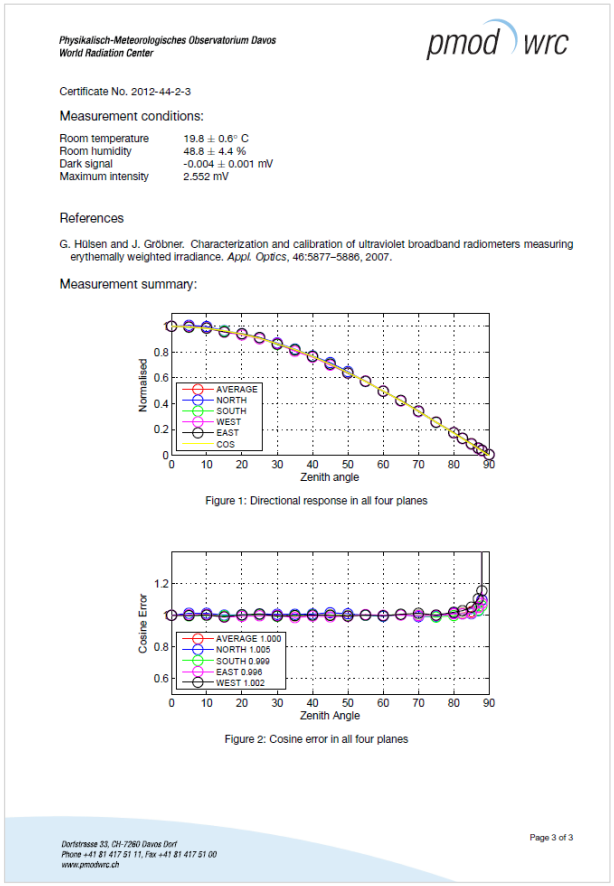
Figure 4 *PMOD certificate of SR20*



Physikalisch-Meteorologisches Observatorium Davos
World Radiation Center

pmod wrc

Certificate No. 2012-44-2-3

Measurement conditions:

Room temperature	19.8 ± 0.6° C
Room humidity	48.8 ± 4.4 %
Dark signal	-0.004 ± 0.001 mV
Maximum intensity	2.552 mV

References

G. Hülsen and J. Gröbner. Characterization and calibration of ultraviolet broadband radiometers measuring erythemally weighted irradiance. *Appl. Optics*, 46:5877–5886, 2007.

Measurement summary:

Figure 1: Directional response in all four planes

Figure 2: Cosine error in all four planes

Dorfstrasse 33, CH-7260 Davos Dorf
Phone +41 81 417 51 11, Fax +41 81 417 51 00
www.pmodwrc.ch

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Figure 5 *External testing: directional response measurements of SR20 prototypes at PMOD*

Figure 6 *Temperature response testing at Hukseflux*

Choosing the right instrument

Pyranometers are subject to classification in three classes according to ISO 9060. From Class C to Class B and from Class B to Class A, the achievable accuracy improves by a factor 2. Measurement accuracy does not only depend on instrument properties, but also on measurement conditions. A very accurate instrument will quickly underperform without a regular schedule of maintenance.
Our pyranometer selection guide assists you in choosing the right instrument.
Whatever your application is, Hukseflux offers the highest accuracy in every class at the most attractive price level.

Figure 7 *SR20 pyranometer with its sun screen removed*

See also

- SR20 brochure
- SR30-D1 digital spectrally flat Class A pyranometer with heating
- view our complete product range of solar sensors

About Hukseflux

Hukseflux Thermal Sensors makes sensors and measuring systems. 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?
E-mail us at: info@hukseflux.com