

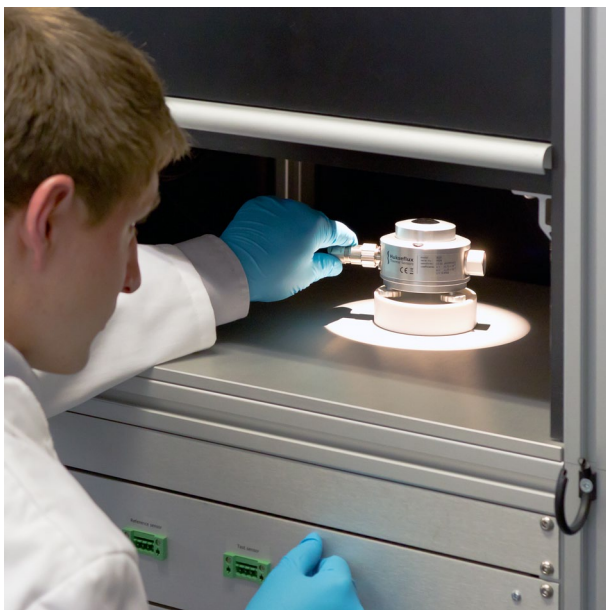
# IR20: The making of

A research grade pyrgeometer setting new standards

*Hukseflux invested heavily in developing the infrastructure to manufacture, test and calibrate research-grade pyrgeometers. These efforts resulted in the IR20 & IR20WS pyrgeometers, released April 2013.*



**Figure 1** IR20 & IR20WS research grade pyrgeometers



**Figure 2** Pyrgeometer during conformity assessment at Hukseflux

## Objective

The main objective for the IR20 design team was to develop the highest accuracy pyrgeometer to be sold at a significantly lower price level than competing models of the same performance level.

## Result: accuracy

To improve accuracy Hukseflux mainly focused on reduction of temperature dependence. This has been achieved by a novel approach: first the temperature dependence of the thermopile sensor is accurately determined. As a second step the temperature dependence is entered into the measurement equation.

The resulting specification, better than  $\pm 0.4\%$  across a temperature range of  $-30$  to  $+50\text{ }^{\circ}\text{C}$ , eliminates a major contribution to the measurement uncertainty.

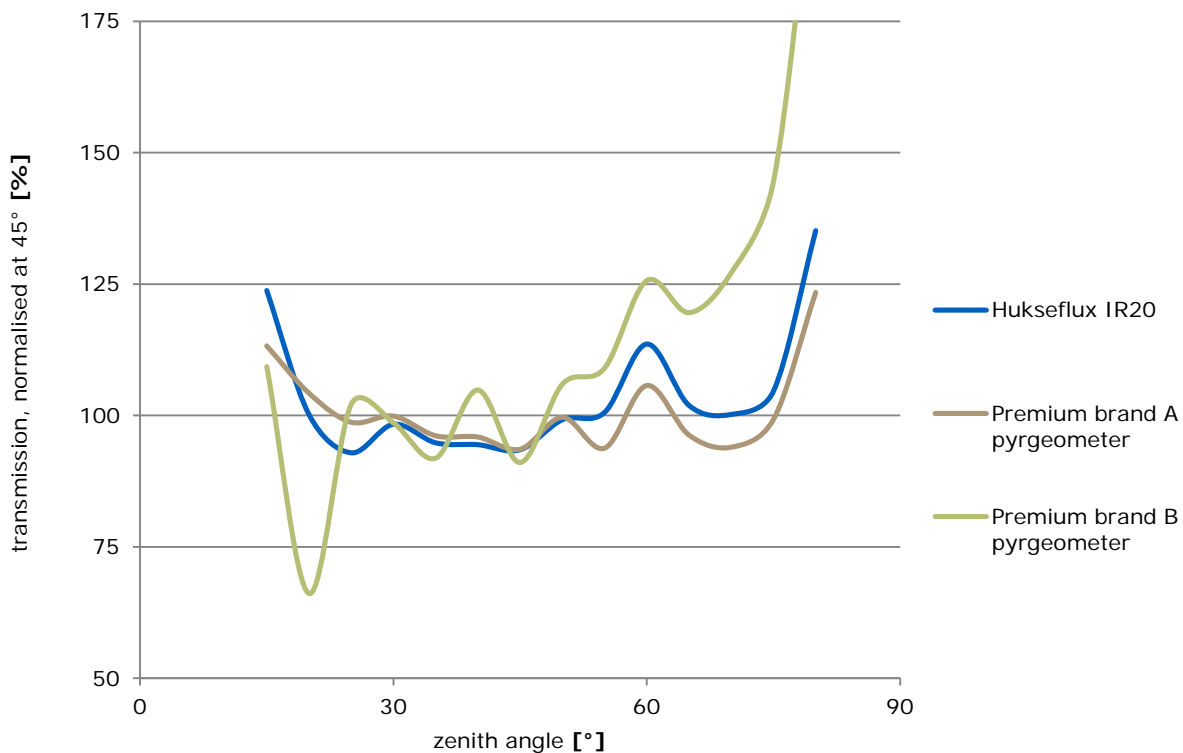
The international scientific community is now studying the last few percents of measurement uncertainty. Here the influence of atmospheric moisture content on the spectral properties of the calibration source enter the discussion. To facilitate scientific investigations, each IR20 is supplied with a product certificate, reporting for the individual instrument its filter cut-on ( $5\%$ ) and two  $50\%$  transmission points.

## Result: significantly lower price

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. Thanks to Hukseflux' technological innovations and improvements as these, instruments are produced efficiently and can be offered at the most attractive price level.

## Comparative testing

IR20 prototypes and product models were tested outdoor and indoor against competing pyrgeometers. An example of a directional response comparison is shown in Figure 3.



**Figure 3** Directional response of IR20 in comparison to the directional response of two competing premium brand pyrometers

### Reference calibration at PMOD

Hukseflux' internal working standard, the reference for our IR20 calibration, has been calibrated at PMOD World Radiation Center in Davos against WISG (World Infrared Standard Group). See Figure 4.

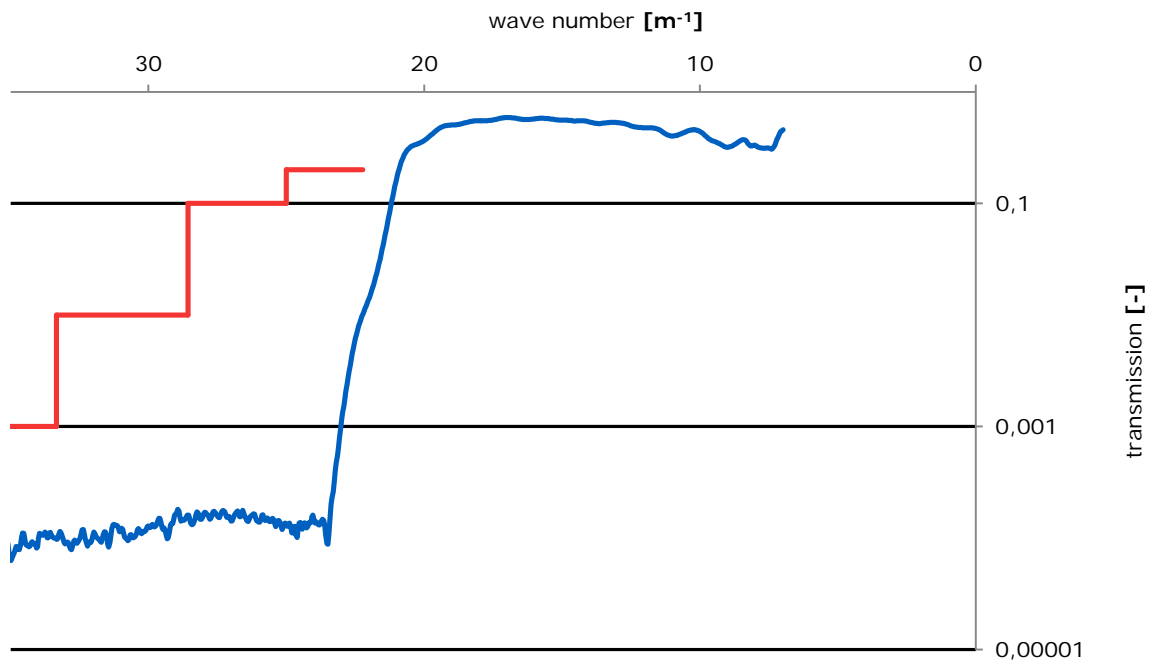
Pyrometers are not subject to a classification standard. Calibration of pyrometers is usually traceable to the World Infrared Standard Group. This calibration takes into account the spectral properties of downward longwave radiation. As an IR20 option, calibration can be made traceable to a blackbody and the International Temperature Scale of 1990 (ITS-90).

### Special: IR20WS wide spectrum model

The spectral range of longwave radiation is not standardised. IR20 has a dome with a solar blind filter with a cut-on at  $4.5 \times 10^{-6}$  m, making it suitable for day- and night observations. Model IR20WS has a wide spectral range with a cut-on at  $1.0 \times 10^{-6}$  m. It offers a superior accuracy during night-time, when solar radiation is absent. IR20WS is suitable as well for uncertainty assessments and as a calibration reference.



**Figure 4** PMOD certificate of IR20



**Figure 5** Filter blocking test: Spectral transmission versus wave number of a typical IR20 filter. Measured transmission in blue and the design specification in red. The result: well within specifications.

### Worldwide support

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

- Europe
- United States of America
- China
- Japan

For contact details, please visit [www.hukseflux.com](http://www.hukseflux.com)



**Figure 6** IR20 research grade pyrgometer

### See also

- [IR20 brochure](#)
- view our complete [product range of solar sensors](#)

### About Hukseflux

Hukseflux Thermal Sensors, founded in 1993, aims to advance thermal measurement. We offer a complete range of sensors and systems for measuring heat flux, solar radiation and thermal conductivity. We also provide consultancy and services such as performing measurements and designing instrumentation according to customer requirements. Customers are served through the main office in Delft in the Netherlands, and locally owned representations in the USA, China and Japan.

Interested in this product?  
E-mail us at: [info@hukseflux.com](mailto:info@hukseflux.com)