Solar irradiance sensor (pyranometer) calibration services, all brands, for PV system asset management

System performance monitoring nowadays requires regular pyranometer calibration

Solar radiation measurement is a cornerstone of the Performance Ratio (PR) measurement of a PV power plant. It also is the weakest link. This is why according to the latest (2017) version of the IEC 61724-1 you must perform regular pyranometer calibration. This requires sending instruments to a lab. Our worldwide calibration and servicing organisation is at your disposal.

The IEC 61724-1 standard update
The first edition of IEC 61724-1: Photovoltaic system performance monitoring – Guidelines for measurement, data exchange and analysis –, dates from 2008. The updated 2017 version of the standard is fundamentally different from the 2008 version. The new scope not only defines the measuring system components and procedures (as in the 2008 version), but it also aims to keep measurement errors within specified limits. In the new standard regular recalibration of pyranometers is a requirement.

Why calibration?
Regular calibration is part of quality management for all "mission critical" measuring instruments. Its purpose is verification that the measurement instrument is stable; and if not to correct for this. Pyranometers, due to prolonged exposure to the sun, are not perfectly stable; to attain the high accuracy necessary to monitor PV system performance and degradation you must frequently recalibrate pyranometers.

How often?
Most instrument owners use a calibration interval of 1 year for all their instruments. With pyranometers, the manufacturer’s recommendation is 2 years; it is too costly to calibrate every year. IEC recommends either to work with a 1-year interval or to follow the manufacturer’s recommendation (see Figures 2 and 3). The consensus is that a calibration interval of more than 2 years involves a significant risk. Most utility scale PV power plants employ multiple pyranometers. They may send 50 % away for calibration in year one, and the other 50 % in year two.
5.5 Documentation
Specifications of all components of the monitoring system, including sensors and signal-conditioning electronics, shall be documented.

User guides shall be provided for the monitoring system software.

All system maintenance, including cleaning of sensors, PV modules, or other soiled surfaces, shall be documented.

A log should be kept to record unusual events, component changes, sensor recalibration, changes to the data acquisition system, changes to the overall system operation, failures, faults, or accidents.

When a conformity declaration is made, documentation shall demonstrate consistency with the indicated class A, B, or C.

5.6 Inspection
For Class A and Class B the monitoring system should be inspected at least annually and preferably at more frequent intervals. Inspection should evidence of moisture or vermin enclosures, detachment of temperature sensors, entombment of attachments, and other potential problems.

For conformity with IEC you must have documented proof that instruments are (re)calibrated.

Figure 2 Text from IEC 61724-1; for IEC 61724 conformity declarations you need documented proof of calibration of instruments

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IEC 61724-1.2017 © IEC 2017


5.2 Calibration
Sensors and signal-conditioning electronics used in the monitoring system shall be calibrated prior to the start of monitoring.

Recalibration of sensors and signal-conditioning electronics is to be performed as required by the manufacturer or at more frequent intervals where specified.

It is recommended to perform periodic cross-checks of each sensor against sister sensors or reference devices in order to identify out-of-calibration sensors.

Hukseflux’ recommended 2 year interval may be used. IEC Class A recommends 1 year interval, but this is optional.

Figure 3 Text from IEC 61724-1; you may use the manufacturer’s recommendation, and not follow the IEC recommendation of a 1 year interval. There is consensus that an interval of larger than 2 years involves too much risk.

Why not on-site?
Pyranometer calibration equipment is costly, bulky and vulnerable; not easy to transport.
Also, on-site availability of the natural sun is not sufficiently reliable to use for calibration. Even if the sun shines it may not be sufficiently stable, or at angles that are too close to the horizon.
In practice, high-accuracy solar calibrations are nowadays done at specialised laboratories.
More details why you must send instruments to a laboratory.

Hukseflux
We are a leading manufacturer, both in technology and market share, of solar radiation sensors. We calibrate pyranometers of all commonly used brands. We can work more efficiently if you supply us your sensors in batches of 3 or more instruments. You may then benefit from our quantity discounts.
Why work with us

- well established and traceable calibration methods
- fast turnaround times
- quantity discounts
- calibration references for the most common brands and models
- Hukseflux has calibration facilities in the main global economies: USA, EU, China, India, Japan and Brazil
- added service at added cost: temporary replacement instruments available

Figure 4 A typical calibration system at the specialised laboratory of Hukseflux. We have 7 such systems around the globe

Figure 5 Pyranometer and pyrheliometer users are supported by the worldwide Hukseflux calibration and servicing organisation

More about compliance of pyranometers with the new IEC classification

Hukseflux is specialised in solar radiation measurement. A separate memo offers comments on consequences of the new standard concerning the selection of pyranometers.

Where can I order the IEC standard?
The standard can be purchased from the IEC Web shop.
Most popular pyranometer recalibration services

Table 1 Hukseflux’ most popular calibration services

<table>
<thead>
<tr>
<th>MOST COMMON CALIBRATION SERVICES</th>
<th>brand and model</th>
<th>calibration method</th>
<th>comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyranometers</td>
<td>Hukseflux LP, SR series</td>
<td>ISO 9847:1992 Solar energy - Calibration of field pyranometers by comparison to a reference pyranometer</td>
<td>ISO 9847 is also applied to pyrheliometers</td>
</tr>
<tr>
<td></td>
<td>Kipp &amp; Zonen CMP, SMP series</td>
<td>ASTM G207 - 11 Standard Test Method for Indoor Transfer of Calibration from Reference to Field Pyranometers</td>
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</tr>
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![Figure 7](image.jpg)

**Accurate calibration of all major brands**

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.

Would you like more information? E-mail us at: info@hukseflux.com