
New from Hukseflux: The SRD100 industrial diffusometer, in a typical installation side by side with a pyranometer, used in PV system performance monitoring

# Advancing solar monitoring: the future of diffuse radiation measurement

Hukseflux Thermal Sensors has established itself as the market leader in solar radiation measurement. PV power plant owners and asset managers favour its solar radiation sensors due to their exceptional measurement accuracy and emphasis on minimising the total cost of ownership. Recently, the company launched a new sensor for measuring diffuse solar radiation: the SRD100 diffusometer. PES spoke to Product Development Engineer Jelle Algra to learn more.

**PES: It's great to speak to you today Jelle. Perhaps I can start by asking, what prompted the development of the SRD100 diffusometer?**

**Jelle Algra:** The primary reason we have introduced a diffusometer is that adding diffuse measurements to horizontal and Plane of Array solar measurements enhances the accuracy of models estimating the performance indicators of PV power plants.

Our product development team analysed the key measurement needs for PV system performance monitoring. The top three factors identified were solar irradiance, module temperature and soiling. Hukseflux already addresses solar irradiance with its pyranometers and module temperature with a dedicated PV module temperature sensor. The next priority is diffuse solar radiation, which we chose to focus on by developing an entirely new type of sensor.

As the market leader in pyranometers, it made sense for us to expand into diffusometers. A sensor like our newly designed SRD100 is always used alongside a pyranometer, which is already an integral part of all measurement systems for global horizontal solar irradiance. This development is a natural progression, as combining data from both instruments, along with date, location and time, allows for precise calculations of global, diffuse and direct solar irradiance.

**PES: Who are the key users of this new sensor and how will it benefit their applications?**

**JA:** The primary application for this sensor is in utility-scale solar projects, where it supports continuous performance monitoring during operation and resource assessment before construction. The IEC 61724-1 standards for PV system performance monitoring recommend diffuse solar radiation measurements, particularly for bifacial solar systems, which now account for approximately 20 to 30% of newly installed utility-scale capacity. Hence, we expect strong demand from this sector.

Additionally, diffuse solar radiation is a valuable parameter in pre-construction solar resource assessments. In both cases, improving measurement accuracy translates to financial benefits. For PV projects under development, more precise data can reduce perceived investment risks. Once operational, higher accuracy in performance assessments can enhance asset valuations.

Beyond the solar industry, the diffusometer also has potential applications in other fields, such as building performance studies.

**PES: Can you outline the primary requirements that shaped the development of the SRD100 diffusometer?**

**JA:** We spent a lot of time asking users about their specific requirements. There are systems on the market already that measure diffuse irradiance. The bottom line is that these solutions are rarely applied, due to severe shortcomings. They may require daily maintenance, need data post-processing and may be vulnerable. Additionally, they often include moving parts, are frequently inaccurate and, in some cases, cannot be easily re-calibrated. These are major obstacles and most systems suffer from multiple issues.

In short, these solutions seem perfect on paper, but in the industrial environment of a PV power plant, they do not deliver the required results. The main requirement from our customers was 'no moving parts'. Product developers always seem to underestimate the conditions that exist in the field. During our research, we observed many instruments that were no longer operational. For example, broken solar trackers and 'rotating shadow bands' that were no longer rotating. Locally restoring these instruments to working condition is almost impossible.

The SRD100 is designed with reliability as a top priority, ensuring consistent operation and easily analysable data. Its placement alongside a pyranometer enhances redundancy, allowing for predictable and verifiable measurement patterns, especially during partly cloudy or overcast conditions.

We also focused on minimising installation costs. With its compact size and lightweight design, the SRD100 reduces the need for excessive mounting materials. Tubing can remain light, making it a cost effective and practical solution.


The new SRD100 industrial diffusometer for measuring diffuse solar radiation

Jelle Algra

**PES: Tell us about the functionality behind the diffusometer and how it delivers precise measurements.**

**JA:** The SRD100 features a robust metal body with a glass dome, a half sphere, a shadow mask and a sensor array. The shadow mask, positioned beneath the glass dome, boasts a unique Fibonacci lattice hole pattern. At the dome's center, the sensor array is placed in the horizontal plane. When the sun shines, if there's a direct beam hitting the instrument, the shadow mask ensures that at least one sensor remains in the shade. This shaded sensor then estimates the diffuse solar irradiance.

The standout feature of this design is that the shaded sensors capture a uniform view of the sky, with light entering through the holes in the shadow mask. This design innovation significantly enhances measurement accuracy, providing more reliable and consistent data.

**PES: Are there any additional advantages or unique features of the SRD100 that stand out?**

**JA:** Another positive aspect is reducing unexpected costs related to incidents that cause irreversible damage to the instruments. We copied that from our experience with pyranometers. We saw one major contributor: toasted electronic circuit boards. We help our customers prevent such accidents.

**PES: How can damage like this be prevented?**

**JA:** The most destructive damage typically comes from surges or high-impulse voltages, often caused by nearby lightning strikes. Certain regions are particularly vulnerable to lightning and PV plant owners in these areas are well aware of the risks and high costs associated with lightning damage to both the plant and its electrical instruments. To prevent this, we design our instruments with superior, industrial-level surge protection.

However, the protection level also depends on the overall electrical system design. System designers focus on key aspects like grounding, shielding and integrating additional protective components such as Surge Protection Devices (SPDs). We work closely with our customers and their engineers to ensure the system is well-protected, resulting in an improved 'mean time between failures' and reducing the risk of damage over time.

**PES: Which aspect of the SRD100 product development did you find most rewarding?**

**JA:** The most rewarding part of the SRD100 development was tackling the various challenges that arose throughout the process. Each issue we faced made the work even more engaging. One major challenge was selecting the sensor array. There were several options, but the perfect solution simply didn't exist, so finding a good compromise was essential.

This choice was closely tied to the design of the shading mask, which involved collaboration across our physics, mechanical engineering and electronics teams. The construction of the mask, the design of the hole pattern and the layout of the sensor array all required intense teamwork.

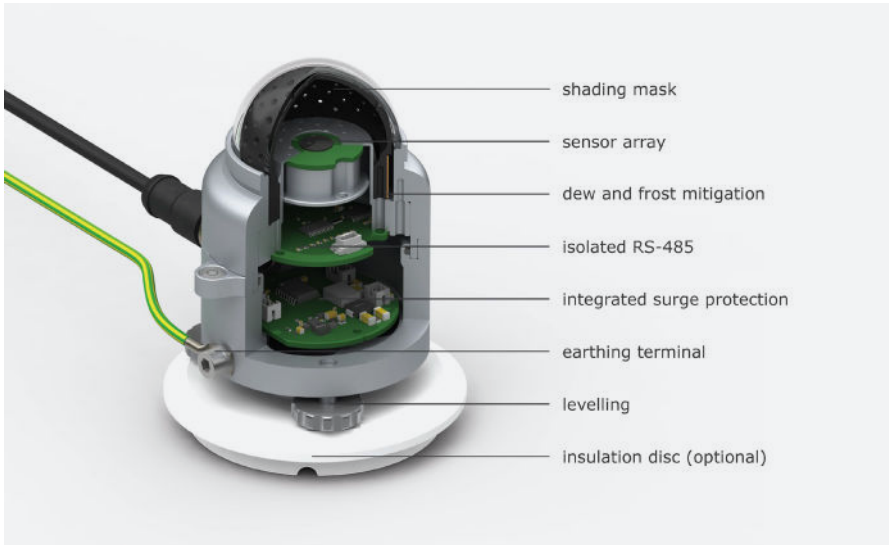
Another key challenge was designing the dome with precisely sized holes and a pitch-black coating, which turned into a project on its own. We're particularly proud that we've created a product that's not only easy to manufacture but also straightforward to service.

Lastly, calibration was another complex hurdle. Reproducing a homogeneous diffuse sky is no easy feat, but we've worked hard to automate and streamline the process to ensure it's both safe and efficient. Ultimately, the manufacturing and calibration processes are now incredibly reliable and fast, and that's something we're all proud of.

The new Hukseflux company building, in operation since January 2025

**PES: Are you able to share any details of new products currently in development and how they build on the success of the SRD100?**

**JA:** At Hukseflux, we believe there is still a lot to do in PV system performance monitoring; to improve measurement, calibration and reliability. We just opened our new building and have plenty of ideas to fill the space!




SRD100 industrial diffusometer cut-through showing the most important components

**About Hukseflux**

Hukseflux, founded in 1993 in the Netherlands, has established itself as a leading innovator in the field of sensor and measurement systems, specifically designed to support the global energy transition.

Renowned as the market leader in solar radiation and heat flux measurement, it has earned a reputation for precision and reliability.

The company serves a diverse global clientele through its headquarters in the Netherlands and a network of locally operated sales offices in key regions, including the US, Brazil, India, China, Southeast Asia and Japan. This international presence ensures that Hukseflux remains at the forefront of advancing renewable energy measurement technologies worldwide.

**Curious about Hukseflux's new instruments?**

Visit them at Intersolar Europe from May 7th to 9th in Messe München, Germany. Booth B4.209, Hall 4.

www.hukseflux.com