



# Pyranometers with the lowest total cost of ownership

Hukseflux Thermal Sensors has grown to become the market leader in solar radiation measurement. More and more PV power plant owners and asset managers prefer using its pyranometers, not only because of their phenomenal measurement accuracy, but also because of their lowest total cost of ownership. With the recent launch of its industrial series of pyranometers, the company is taking another step forward. PES is curious to know the secret behind this success and interviews director and co-founder Kees van den Bos.

**PES:** Hukseflux recently celebrated its 30th birthday, but introduced its first Class A pyranometer just 11 years ago. In this short period of time, you have become the market leader in solar radiation measurement for utility scale PV system performance monitoring. How did you achieve this?

**Kees van den Bos:** This took a lot of effort. Back in 2013, nobody actually believed that we were able to manufacture Class A pyranometers. Yet our first model, SR20, already outperformed competition, but not by much.

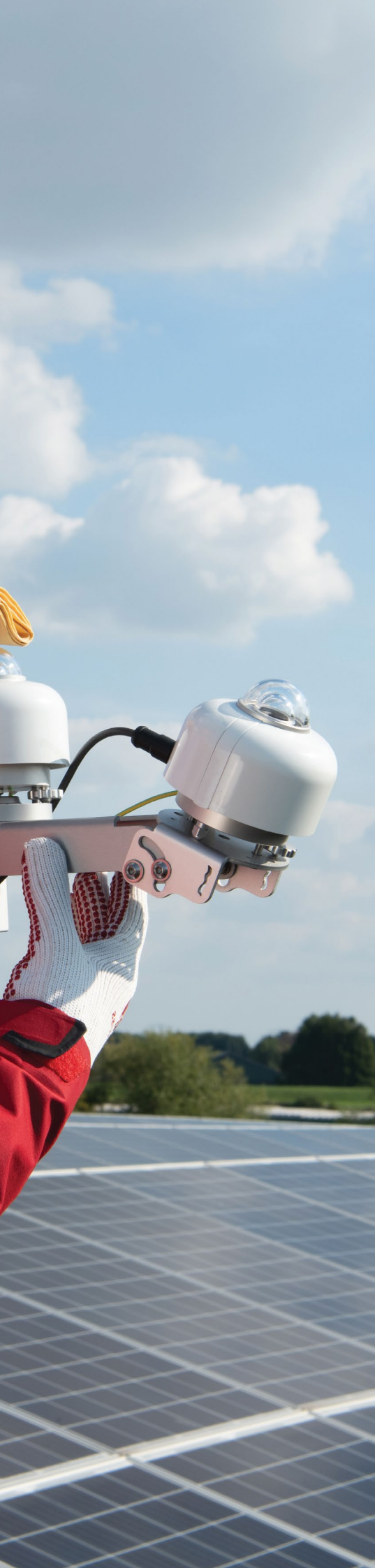
Our second generation Class A instrument, model SR30, was introduced in 2017. It made us the leader in technology and measurement accuracy. SR30 was the first

heated and fully digital pyranometer, and the first with a tilt sensor. It produced much more accurate measurements than other instruments on the market. Not only because dew and frost are mitigated by the heating system, but also because other error sources, such as zero offsets, are reduced.

In retrospect, we can say that SR30 set a new standard in terms of measurement quality and also brought us market leadership in numbers sold.

**PES:** Your company claims to be the first choice for PV power plant owners and asset managers when it comes to pyranometers. Can you explain how?

**KvdB:** Whereas constructors and EPCs often have a limited time horizon of around



two years, PV power plant owners and asset managers look at solar monitoring over a longer period of time. For asset management, it is super relevant that the measurement accuracy of pyranometers is high, because it contributes to a lower risk profile and thereby increases the value of the PV power plant.

Also, if you look at the total costs over a more than 10-year instrument lifetime, rather than looking at initial purchase costs, we clearly outperform competition. PV power plant owners and asset managers who take a long-term view, tend to specify Hukseflux as a preferred supplier.

**PES: How exactly do you outperform competition in terms of total cost of ownership?**

**KvdB:** Together with some of our big customers, we analysed the use of solar radiation instruments. Our conclusion is that for a perfectly functioning instrument, employed at a location with a nearby possibility to calibrate, the costs are roughly 50% initial purchase, and 50% recalibration. Recalibration should be done every two years. This is our recommendation, but it is also a requirement of the standards for PV monitoring.

Calibration is basically a verification that your measurements in the past two years have been reliable and creates trust that

the instrument will continue to work well in the years to come. For calibration at the required level of accuracy for utility scale PV performance monitoring, it should be done at a specialised laboratory, but this is always costly.

However, we invest in helping our customers to keep costs under control by offering nearby calibration. The trick here is to avoid long-distance transport and, in particular, cross-border shipments that require lots of paperwork to pass customs. We invested heavily in hardware to equip our international calibration network. Calibration is now available from our main office in the Netherlands, and also in the USA, China, Japan, Brazil, India, Singapore and Australia. We also arrange support in Thailand and South Africa.

One issue here is that many long-term O&M contracts still do not have a budget for pyranometer calibration. So, in some cases, the costs may still be perceived as unexpected and high. Nevertheless, we have many customers purchasing our instruments, because they appreciate the long-term savings.

Another aspect is the reduction of unexpected costs related to accidents. We saw two major contributors: toasted electronic circuit boards and scratched or broken glass domes. We help our customers to prevent such accidents from happening.



Kees van den Bos

**PES: In what way can such accidents be reduced?**

**KvdB:** Surges or other high-impulse voltages and currents on PV power plants may have all kinds of causes, but the main one is related to lightning. There are several regions on this planet in which there is very high exposure, often seasonal, to lightning. Owners of PV power plants in those regions are familiar with the damage lightning can do, not only to pyranometers but to the entire plant. Costs of repair tend to be extremely high. We design our instruments to have a good level of protection against surges.

This not only depends on the instrument, but also on the design of the total electrical system. System designers pay great attention to grounding, shielding, and may also implement additional protective components like Surge Protection Devices (SPDs). Our biggest customers often work together with our engineers to design a well-protected system. Together with our customers, we have realised ever better 'mean time between failure'.

**PES: You also mentioned scratched or broken glass domes as unexpected costs related to accidents. We can imagine that this can be a major issue.**

**KvdB:** It is. In fact, it is the second major category of accidents. The glass dome of a pyranometer is vulnerable. On the other hand, if treated in a gentle way, there is no reason why it should break or get scratched. Yet, we often see damaged domes.

A scratch basically leads to a permanent reduction of the sensitivity of the pyranometer; it casts a shadow on the detector, so the instrument is no longer working as it should; in essence, the measurement uncertainty gets larger than



Hukseflux pyranometers are heated. Heating counters frost and dew deposition. The image shows a clear difference between a non-heated pyranometer at the back and a heated Hukseflux pyranometer at the front

expected. What causes scratches? We think most of them are related to transport, handling during initial installation, removal to get calibrated, and installation after calibration. Our solution: a dome protector. This is basically a protective cap that you can easily click on the instrument. It protects the dome during installation, removal and transport.

So, besides reducing costs of calibration, surge protection and dome protection are examples of our efforts to reduce total cost of ownership.

**PES:** Hukseflux recently launched its new industrial series of pyranometers. How do these pyranometers provide better protection against surges?

**KvdB:** Our newest series of class A and B industrial pyranometers are called SR300, SR200 and SR100. We have been working on these sensors for more than three years. With these sensors, we take surge protection to the next level. We call them industrial pyranometers, because they comply with formal requirements for surge protection of instruments used in outdoor environments in industry.

Moreover, we designed dedicated SPDs capable of attaining an even higher protection classification, also when very long cables are used. For some of our users, stronger protection in the instrument will also lead to lower expenses outside the instrument to reach the required level of protection.

**PES:** What other products are in the pipeline?

**KvdB:** At the time of publication of this interview we will have introduced a new PV module temperature sensor, model PVMT01. If you talk about critical measurements for PV system performance monitoring, the panel temperature



New from Hukseflux: the SR300 industrial pyranometer with heating, tilt sensor and status LED. With integrated surge protection, this is designed to withstand the extreme conditions encountered on PV power plants

measurement ranks second, after solar radiation measurement. We noticed that there are many sensors on the market that measure inaccurately.

If you take into account that every 1 degree Celsius error in module temperature produces around 0.3 % error in the performance assessment, the importance of accuracy is very clear. Additionally, we observed that overtime many sensors from competitors came off the module.

We have significantly improved this with our PVMT01.

We believe there is still a lot to do in PV system performance monitoring; to improve measurement, calibration and reliability.

We just celebrated our 30<sup>th</sup> anniversary as a company and have many great ideas to keep us busy for the next 30 years!

[www.hukseflux.com](http://www.hukseflux.com)



The new PVMT01 sensor from Hukseflux installed on the rear side of a PV module. PV module temperature measurement is critical to PV system performance assessment

#### About the company

Hukseflux is a Dutch company founded in 1993, specialising in manufacturing sensors and measuring systems that support the energy transition.

It is the market leader in solar radiation and heat flux measurement.

Customers are served through the headquarters in the Netherlands, and locally owned representative sales offices in the USA, Brazil, India, China, Southeast Asia and Japan.

Curious about Hukseflux's new instruments?

Visit them at Intersolar Europe from June 19<sup>th</sup> to 21<sup>st</sup> in Messe München, Germany. Booth B4.309, Hall 4.