IMT Si sensor on a roof top PV generator

Quality, quality, quality

Dirk Tegtmeyer, co-founder of Ingenieurbüro Mencke & Tegtmeyer GmbH is an old friend of ours at PES. He tells us about the development of the PV industry and the importance of quality through the whole value chain. During the pandemic IMT made small changes to their work routines, which allowed them to carry on developing and producing their temperature sensors.

PES: Welcome back to PES Solar/PV, Dirk, it's great to have this opportunity to catch up with you. For the benefit of our new readers would you like to begin by giving us a brief overview of IMT?

Dirk Tegtmeyer: We started in July 1993 as the first spin-off of Institut für Solarenergieforschung (ISFH, Institute for Solar Energy Research) the founders were Detlef Mencke and myself. We wanted to bring our master thesis to the market, silicon irradiance sensor with internal irradiance signal temperature compensation, steady-state sun simulators and I-V curve analyzers for PV.

IMT first started to expand in 1999, with first employee, Nikolai Maris, who is also now an associate. Until 2011 our expansion was continual. It slowed a little in 2012 and 2013 because of the German politics on renewables. Since then we have increased our export quota massively and therefore stabilized and got back to the size we were in 2011.

We produce our own temperature sensors for ambient and module temperature measurement and optimized the uncertainty of our Si sensors to better than double before. All big monitoring companies worldwide use our silicon irradiance sensors.

We also install complete measuring systems for research institutes and industry. Our I-V curve analyser PV-KLA is used in laboratories, as well as in automatically driven multiplexing systems, where up to 32 PV modules can be measured outdoor in real weather conditions to get a comparison of their real yield.

PES: Would you say the solar/PV market is currently expanding even during the current difficult global situation?

DT: Of course, the PV market worldwide is increasing and therefore it is also a growing for IMT. It is a very nice feeling that renewable energies can compete with the old energy monopoly, and hopefully can make the world a better place. Renewable energies, not the components, are mostly produced locally, so that the people have the advantage directly within their region.

We at IMT therefore love the rise PV solar systems for achieving more renewable energy and so more independence from oil and gas. And at least we have a part in all the PV systems being built with monitoring systems, by delivering our irradiance and temperature sensors.

The actual global situation does not affect PV installations too much, because all workers on PV systems are outdoors, where the restrictions can be met a lot easier than indoors.

PES: We would be interested to hear about the current status of irradiance sensors worldwide?

DT: As the PV market expands worldwide, the monitoring units are needed to constantly check the systems. The best way of doing this is to use silicon irradiance sensors, because these sensors behave the same way as the PV modules being monitored. PV installations are sizing up globally, even in Germany the number of large systems is increasing. Many utilities require the operator to monitor the PV plant, thus creating a higher demand for irradiance sensors in Germany.

PES: What makes your solutions stand out from the competition, what are the benefits to the end user?

DT: We work hard to get satisfy all our clients in every project. This gives us a better reputation in the industry and in turn brings us more customers through word of mouth. We've had this policy since we started and it is integral to our success.

I think, many successful international companies have had the same experience, and it is not an outstanding mark exclusive to IMT, but it helps a lot. For instance, temperature compensated silicon irradiance sensors are a unique feature of IMT.

We are not quality certified by any international standard, but we have our own quality processes. For example, our silicon irradiance sensors get a complete quality management from the PV cell laminate: electroluminescence tests for every laminate, the housing: every part of every case, the calibration and the final test before packaging.

All these quality steps are carried out by different workers, so every time there is a four-eye principle established. We recalibrate all of our production and reference equipment every year by DaKKs certified labs like PTB or ISFH. This all brings us the security to ensure our high uncertainty level for our sensors over the complete temperature range of -40 to 85°C.

PES: Can you tell us about any particularly interesting projects you have in the pipeline?

DT: I think, first and most important for investors and operation and maintenance teams for PV plants, will be our new silicon irradiance sensor on the base of WPVS. The sensor exists as a reference sensor in WPVS format (WPVS: World Photovoltaic Scale) and a mechanically detachable case extension with measurement electronics. The electronic measurement provides the irradiance as temperature-compensated and calibrated to 10 V or 20 mA signal respectively, via a RS485/MODBUS interface.

This makes the sensor compatible with almost all common PV monitoring systems and it conforms to the international standard IEC 61724-1:2017. It is entirely designed to be used in outdoor conditions according IEC 61215-2:2016.

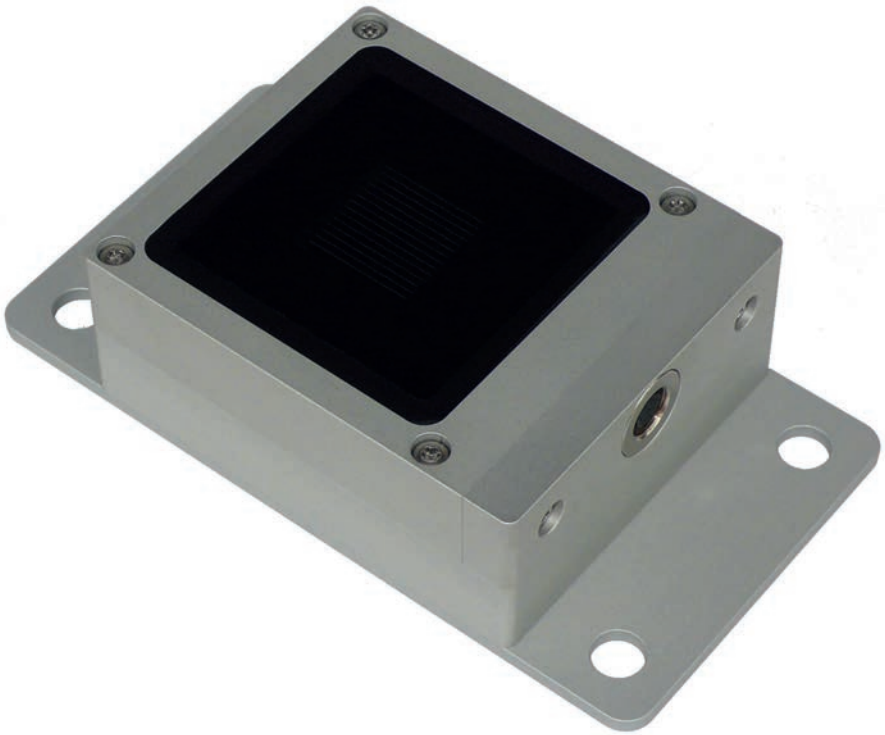
Also, all requirements of IEC standards 60904-2, -3 and -10 are implemented. The sensor is classified as class A for a maximum measurement uncertainty (k=2) of 3 % for irradiances between 100 W/m² and 1500 W/m² for a high precision PV irradiance sensor.

The tests during development show, that the maximum measuring uncertainty according the standard of 3.0 % of measurement value is considerably undershot for irradiances from 100 W/m² to 1500 W/m² and the complete operating temperature range of –40°C to +80°C with 1.2 % to maximum 2.55 %.

The new reference irradiance sensor can be calibrated by the producer: factory calibration certificate, or within the calibration laboratory ISFH-CalTeC using an

audited measuring procedure (DAkkS calibration certificate) from the German Accreditation Body (DAkkS).

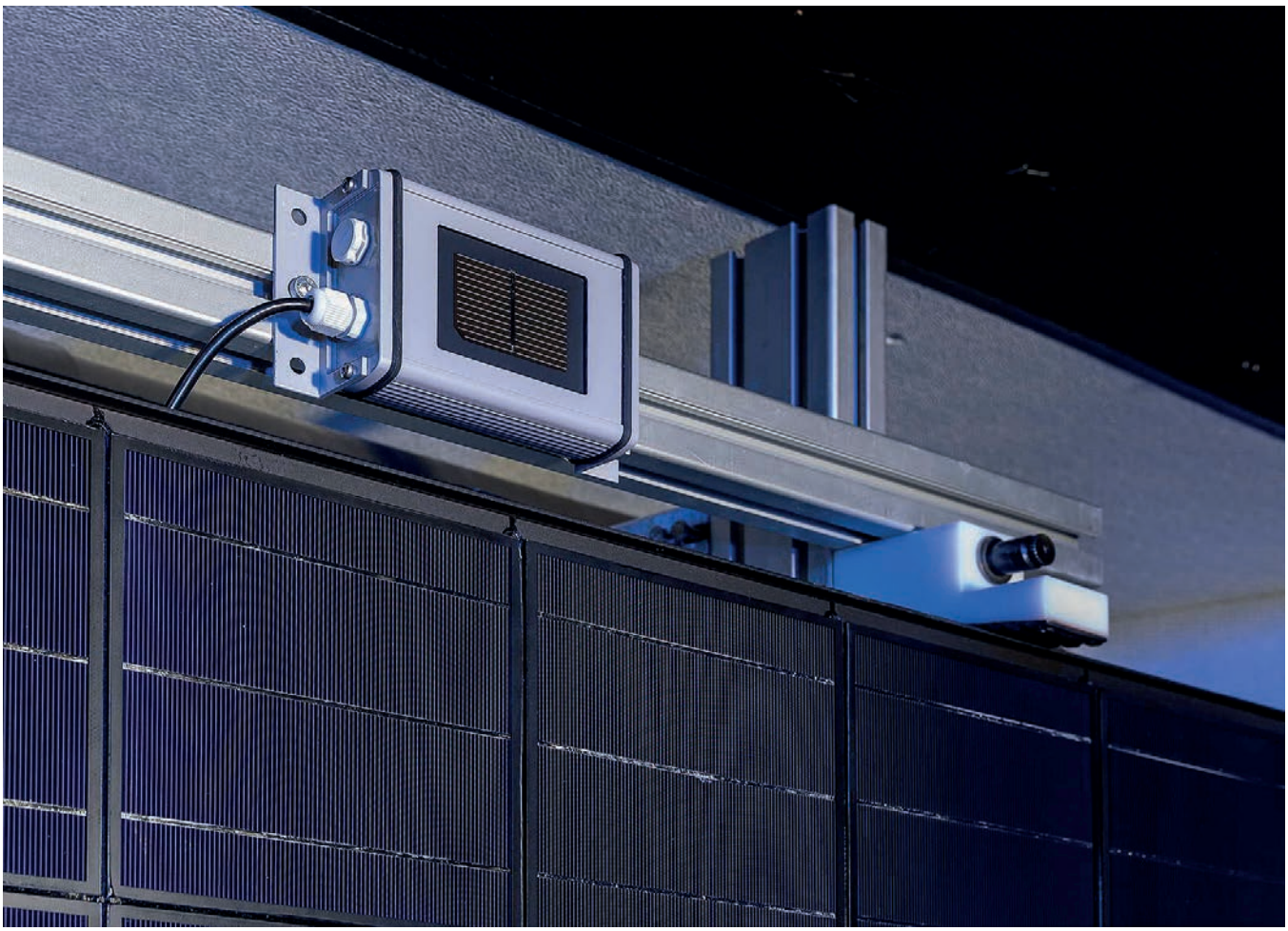
On the other hand, we have developed a robust and durable full-size reference cell implemented into an aluminium housing. The main area of application will be as reference cell in a sun simulator setup. It can be calibrated by any laboratory in the world, because it can be mounted or fixed onto a thermal block under steady-state sun simulators.



PES: How has the current coronavirus situation impacted on your business and how you run it? What changes have you had to make? How do you see this developing over the next 6-12 months?

DT: Our business has not really been impacted by the coronavirus. We had some failed deliveries to India and within Europe, despite asking our customers whether their offices would be open. But everything normalized in May, so we are able deliver around the globe as well as last year.

We had some internal adjustments to make, in order to meet the requirements of our administration, concerning the behavior of



Detail of the 60 cell UniformSun homogeneity measurement module. *Credit: ISFH*

Automatic I-V curve measuring system for up to 12 PV modules (IMT)

people in buildings and groups of workers. To optimize distances between our employees of 1.5 m or more we realized, that our building was not big enough. So, we had to organize our rooms a little bit differently, we also had restrictions of people being in one room at the same time. We were unable to arrange meetings with more than three people inside the building.

Therefore, we held the meetings outside the building in the sunlight and this also was a great experience. We had to learn to wear masks, when we could not avoid having to look at the same screen for a few seconds, but it all worked well and our employees were very disciplined.

During the school closures we changed our basic work to two shifts a day, so that our employees could decide to work before or after noon. There was always an overlap in work, but that was important to have a hand over from one shift to the other. But today we are back to one shift a day and working from Monday to Friday. And of course, we all hope, that we can return to our normal working practices during the coming months.

PES: What do you think will be the greatest opportunities and the greatest challenges, for solar/PV in general and IMT in particular, over the next few years, and where do you see yourselves in 5 years' time?

DT: The global PV family now has many years of experience, starting in Germany in the 1990s with the thousand roofs program and many following like feed-in tariffs. We saw operating systems which worked well. This gave stable yields over more than 20 years. This was very good and only could be attained by high quality components used within the systems.

Therefore, quality assurance has been the most important part for the planning and operation of PV modules, research, development, construction, cabling and inverters. But we also had experiences that showed many issues in production and installation of PV systems. Poor quality in cabling and installation can also lead to bad yields, as can faulty inverters or modules. Experiences with new cell technologies led to some problems in yield stability, like potential induced degradation (PID). All these issues show, that the most important thing in PV solar industry is quality assurance over the whole value chain.

We, as IMT, will help PV solar industry and all customers to increase their quality and stability of energy yields for their PV components and systems over the years. We will take care of them and improve our products to the highest possible level.

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