Weather stations to comply with IEC-61724-1

PES brings you the latest exciting news from EKO. With the constant increase of PV projects globally and new standards in place, there is an increasing requirement for a compliant and cost-effective solution to monitor plant performance.

Last year was another successful year for the Photovoltaic (PV) market, with approximately 96 GW of PV installed globally. Following this trend, 2018 is set to surpass 2017 with nearly 105 GW of PV projects forecasted, an increase of 10%. This substantial increase would have been even higher, were it not for the sanctions on new solar projects by Chinese government entities.

Worldwide PV investment and development is set to maintain its stellar performance for the foreseeable future – for example, the European market, after several years of stagnation, is now entering a period of rapid development and investment, with a forecasted 14GW of PV installed per year by 2022.

With this growing increase in PV investment and development, the industry is becoming more aware of the importance of performance monitoring. Optimal energy output of a PV plant is essential to ensure an adequate return on investment, and this can only be assured with continuous performance monitoring of the yield and efficiency of PV plants. In addition, scheduling ongoing maintenance can be more appropriately planned with effective monitoring.

This performance monitoring concerns the area with the greatest impact, i.e. Solar Irradiance, however there are other metrological parameters which could impact on PV performance, such as ambient temperature, wind and rainfall –

Figure 1 - PVmet 500 M1 with MS-80

these should also be monitored. Continuously monitoring on-site metrological data will reveal certain conditions that could have a negative effect on the efficiency of the PV plant i.e. shadowing, soling and panel temperature.

To ensure the industry is able optimize future PV performance, the International Electrotechnical Commission (IEC) released a new standard in 2017: Photovoltaic system performance - Part 1: Monitoring (61724-1). This standard details the minimum requirements to achieve a specific classification of the accuracy of the Solar plant monitoring.

The new IEC 61724-1: 2017 standard includes:

- 3 different accuracy classes, A, B, and C, for monitoring systems (for non-concentrating photovoltaics)
- Accuracy requirements for monitoring equipment (Solar irradiation sensors and other meteorological sensors)
- Necessary quality checks (i.e. calibration and cleaning)
- Recommended minimum number of measurement stations/instruments required for a specific sized PV plant

With a new range of weather stations compatible with EKO pyranometers, EKO instruments are well placed to ensure that our clients are able to monitor their PV plants accurately and comply with the new standard.

PVmet 500

EKO has teamed up with RainWise to provide the first multi-functional component-based professional weather station, explicitly designed for monitoring PV performance, the PVmet 500 - the latest PV weather station from the PVmet family.

In compliance with IEC-61724-1, the PVmet 500 is a cost-effective, durable weather station capable of measuring wind speed & direction, ambient temperature, relative humidity, rainfall, photovoltaic panel temperature and irradiance in real-time, transmitting sensor measurements to a data logger or data center.

The PVmet-500 is ideal for monitoring the efficiency and performance of a PV plant. Data from the PVmet 500 can be used to obtain vital information concerning the operation of a PV plant and insights on where improvements can be made to increase the PV plant output.

Data on wind speed is imperative from the PV plant safety standpoint as high wind speeds at a site could potentially cause damage to PV modules. By having accurate wind speed and direction sensors on site, the necessary steps can be made to prevent any damage in the future.

Air temperature, relative humidity, wind and PV module temperature can have a significant effect on the efficiency of the PV modules. Furthermore, the degradation rate of PV modules is temperature and humidity dependent, knowledge of these parameters provides insight on the variance in performance of the modules.

The PVmet 500 series is compatible with all EKO ISO9060 Secondary standard, First Class, and Second Class pyranometers. Also, the EKO ventilation and heater unit, MV-01, can be used to comply with Class A monitoring according to the IEC-61724-1. The MV-01 provides heat and sufficient ventilation to keep the pyranometer sensor free of dew, ice and snow.

The PVmet 500 is delivered ready for installation and use; only requiring the installer to mechanically mount the system on a user-supplied mast, connect to a

	PV met 500 M0	PV met 500 M1	PV met 500 M2	PV met 500 M3	PV met 500 M4
Ambient Air Temperature Sensor	●	●	●	●	●
Barometric Pressure	●	●	●	●	●
Relative Humidity	●	●	●	●	●
Wind speed & Direction (Mini-Aervane)		●	●		
Wind speed & Direction (Ultra-Sonic Anemometer)				●	●
Precipitation (Rain Gauge)			●		●
PV panel temp sensor* (BPT-01)	●	●	●	●	●
Global Horizontal Irradiance (GHI)**	○	○	○	○	○
Plane of Array (POA)**	○	○	○	○	○

* Up to 3 back of panel temperature sensors can be fitted
** At least one EKO pyranometer (MS-80, MS-60 or MS-40) is required to complete the system

Table 1 - PVmet 500 configurations

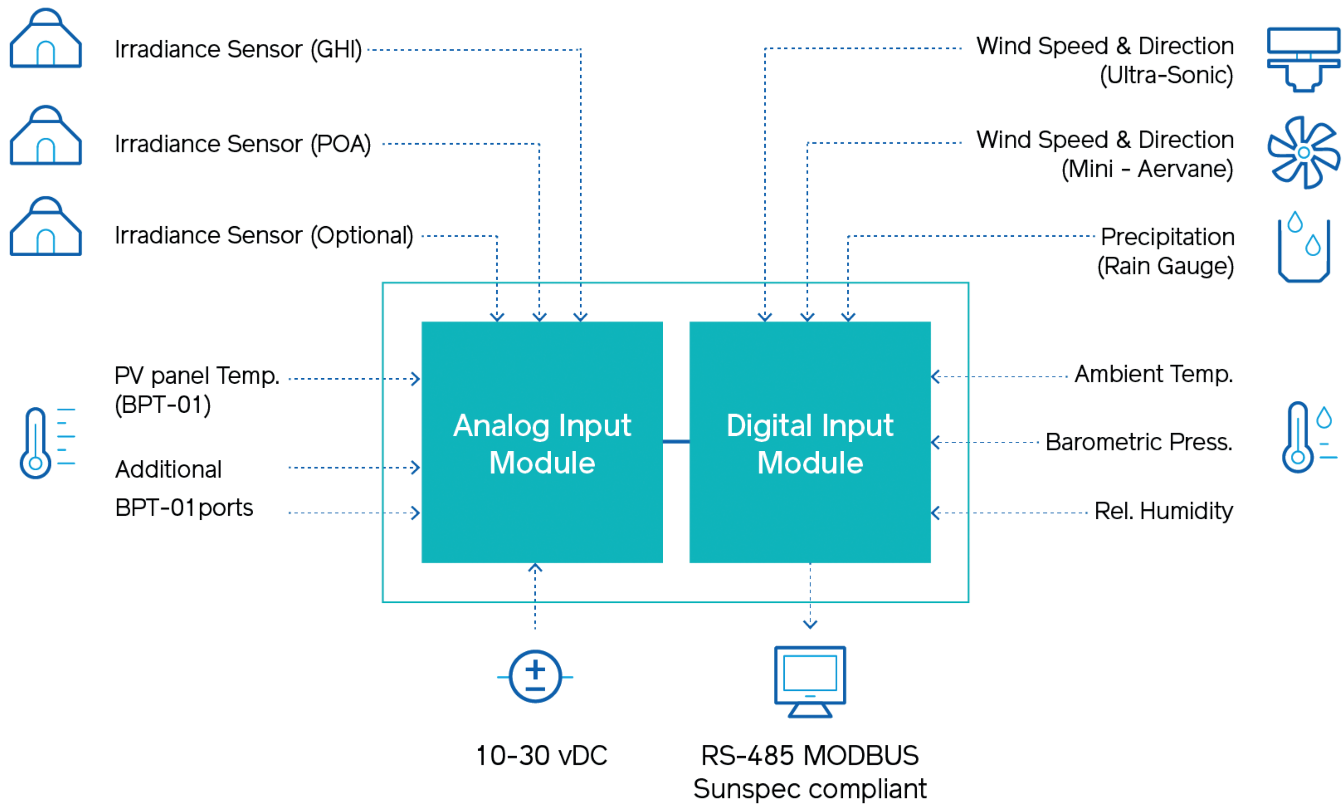

Table 2 - PVmet 500 connection diagram

power source and to configure the system accordingly. No special tools, software, or on-site calibration is required.

What sets the PVmet 500 apart from other metrological stations in the market is its multiple communications protocols. It features a Modbus RTU interface and is SunSpec certified, making it an ideal station for inverter companies. All of the measurement values communicate via a single configurable digital interface to a data logger or SCADA system.

SunSpec

The SunSpec Alliance was formed to address the issue of interoperability between various instrumentation in a PV plant. Historically, a single solar plant may incorporate components from multiple vendors and manufacturers, often using different communication protocols. Getting the various instrumentation on a solar plant to communicate effectively can be challenging and time-consuming.

Nowadays, Modbus is the commonly accepted method of communications protocol, with the majority of instrumentation in commercial PV applications supporting it. Modbus works on the principle of a single master working with numerous slaves; theoretically, a Modbus master can communicate with any Modbus slave as long as the master is individually configured to each one. The programming of each master to the separate slaves is usually a time-consuming and costly operation.

SunSpec has solved this issue by outlining a set of communication standards relating to the Modbus data structure that allows the master to identify, read and control the slave automatically. When instruments are SunSpec certified, the requirement to manually configure the master to read individual slaves is removed, providing significant cost savings and time.

Available systems

Wind speed and direction, ambient temperature, air pressure, and humidity are all measured within one unit; external rain gauge and irradiance sensors are connected to the PVmet 500 but mounted separately.

EKO pyranometers are known for their precision and reliability. Up to 3 EKO pyranometers can be connected to the PVmet 500, enabling monitoring of Global Horizontal Irradiance (GHI), Plane of Array (POA) and Diffuse Horizontal Irradiance (DHI) – tracker or shading ring required.

Which system to select?

The standard details out the class of pyranometer, frequency of calibration and cleaning required for each monitoring accuracy class (A, B or C). Class A monitoring is the only class in the standard where onsite monitoring is mandatory, Class B and C may be estimated based on local or regional meteorological data or satellite data, rather than measured on site.

For class A – High accuracy monitoring, a Secondary standard thermopile pyranometer as per ISO 9060 or High quality per WMO Guide No. 8 is required. Ventilation is required for the thermopile pyranometers to comply with class A monitoring, while heating is only a requirement in locations where condensation and/or precipitation would influence the measurements for more than 7 days per year.

	Class C	Class B	Class A
Irradiance Sensor	MS-40 (second class)	MS-60 (secondary standard) & MV-01 ventilation/Heating unit	MS-80 (secondary standard) & MV-01 ventilation/Heating unit
Meteorological Station		PVmet 500 M3 or M4	PVmet 500 M3 or M4

Table 3 - Monitoring accuracy classes.

Figure 2 - PVmet 500 M3 with MS-80

In addition, class A monitoring system requires the monitoring of the following parameters: ambient temperature, PV module temperature, wind speed and direction and rainfall (estimation of soiling losses). As the wind direction sensor must have an accuracy of 5° ultra-sonic wind and direction sensors are required to comply with Class A monitoring (PVmet- M3 or M4).

Selecting an MS-80 secondary standard pyranometer with MV-01 and PVmet 500 M3/ M4, achieves compliance with Class A monitoring. With the PVmet 500 M4 the user will have the added precipitation measurements for estimating soiling losses. With these cost-effective solutions, measurement accuracy and compliance with the standards can be easily achieved, allowing projects in the solar industry to leap forward.

With these cost-effective solutions, measurement accuracy and compliance with the standards can be easily achieved, allowing projects in the solar industry to leap forward.

www.eko-eu.com