



## PV Modules performance assesment

Usually, the performance of a PV module is measured at the factory under the so-called Standard Test Conditions (STC), described in IEC 60904. This is a convenient test method that can be integrated in routine production procedures. However, the indoor measurement of the STC PV performance reveals the power production of the module at only one particular measurement condition.

The labeled STC performance values do not automatically reveal the real PV power production at the site-specific meteorological conditions. For example, when using the PV module at higher latitudes (with lower solar elevations) and at relatively high temperatures, the module label values might be misleading and might over-estimate the PV power production at this location.

To avoid unpleasant surprises, you can compare the outdoor performance values of several different module types and identify the best performing module type for the typical conditions at your specific location.

EKO Instruments is well aware of several standards and procedures describing the process of PV module evaluation. For example the IEC norm 61853-1 has been released and has as objective among others to define a testing and rating system, which provides the PV module power (watts) at maximum power operation for a set of defined conditions.

PV performance measurements under real outdoor conditions are done in many different ways. However, the concept of all performance investigations is to relate the input energy, which is the solar radiative flux, to the output energy, which is the electrical power produced by the PV module. The PV modules are connected to IV curve tracers (MP-160/165) that allow to measure up to 48 modules with only one main unit.

## HOW-TO Application Guide

- 1 EKO Instruments provides complete PV power plant monitoring systems. The measurement system can be defined based on the number of PV modules to be measured and its rated power (I, V, P). MP-160-S are systems which are turn-key solutions to measure the outdoor performance of PV modules.
- 2 IV measurements can be performed with a fixed time interval. In between the IV measurements the PV module is kept at open voltage conditions. The combination with the MP-303, MP-410 or  $\mu$ -inverter the PV modules will be at MPPT.
- 3 The MI-530 is used when PV modules have different position and orientation. Up to 5 pyranometers can be used to measure irradiance in plane of the PV module. The irradiance measurements of the in plane sensor are synchronized with the IV measurement.
- 4 For outdoor PV performance measurements a solar sensor is used. Based on the configuration of PV modules a reference cell, pyranometer or spectroradiometer can be used.