

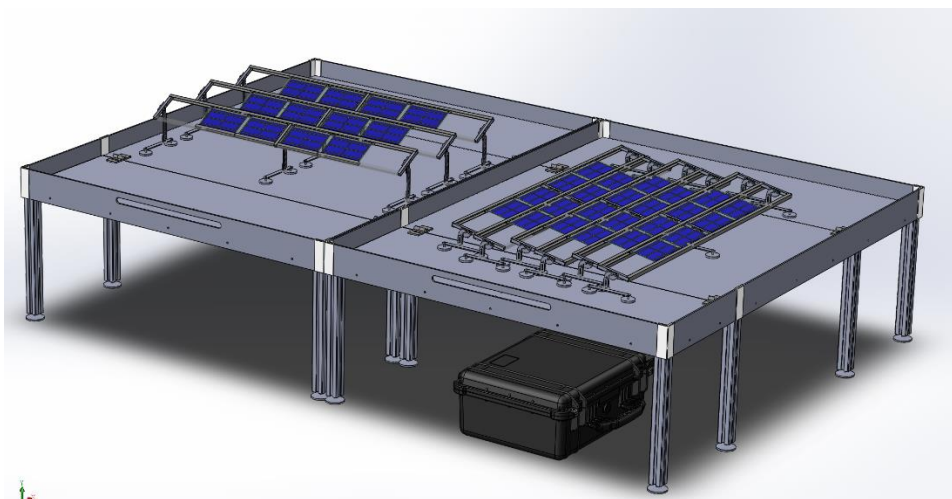
PVPO: PV Plant Power Optimizer and test rig for long term studies of R&D mini-modules

- **Easy to configurate miniaturized PV plant for comparative energy yield measurements and long-term studies of test modules**
- **Optimizing the layout of PV power plants by design tuning in combination with comparative measurements of different PV designs with various undergrounds**
- **Comparison of energy yields of PV power plants by a highly flexible test rig including variation of tilt angle, azimuth, ground cover ratio, underground, fixed/HSAT, bifacial/monofacial**
- **On-site energy yield measurements for validation of energy yield simulation data.**
- **Comparative long-term studies of small sized test modules using a test rig with high precision loads, enabling statements about degradation or specific sensitivity effects (e.g. Perovskite or tandem cells)**

The energy yield of PV systems in the field is decisive for the economic success of a solar system. Small deviations in the percentage range have a significant impact on the economics.

The energy yield of a PV System is depending on the location and the installation design. Especially bifacial systems have a pronounced sensitivity to variations of installation height, ground characteristic, tilt angle, ground cover ratio and other factors.

The University of Applied Science in Zurich (CH) has developed a test rig with miniaturized PV modules together with Solarc offering a complete replication of real PV systems in the field.



PVPO

- Test your PV System design for maximum energy yield and lowest costs in comparative measurements
- Test of R&D PV mini-modules at outdoor-conditions using appropriate and tested Hard- and Software and compare to references
- Demonstrate PV system technology in education

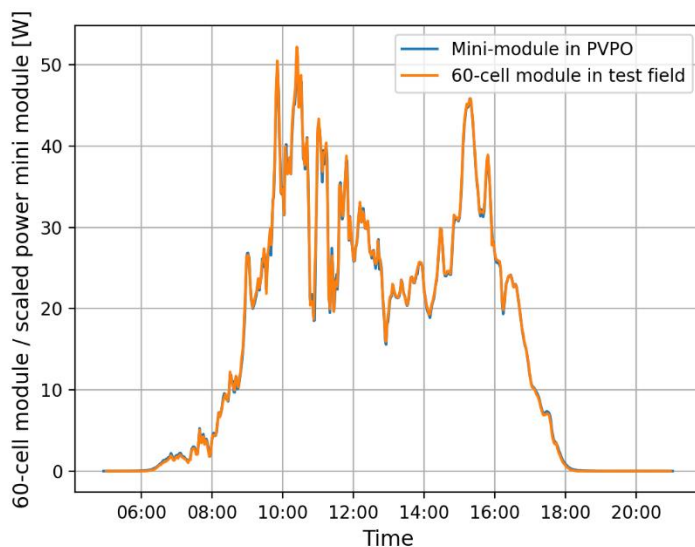
The test system has proven to scale with large real systems considering also shading effects of neighboring rows of solar panels (see Fig. 2). The test rig can be configured with two or more systems to be measured in parallel. Due to the relative measurements of different designs at the same time very small differences in the energy yield can be monitored precisely.

Novel PV modules based on advanced absorber materials or cell layouts, such as perovskite or tandem modules are developed world-wide. The PVPO test rig can be used for comparative long-term measurements of small sized PV modules at outdoor conditions. This enables the analysis of degradation or specific sensitivity effects.

It can be configured to use different test small sized test modules with different electrical parameters using one approved hard- and software tool.

The test rig features are:

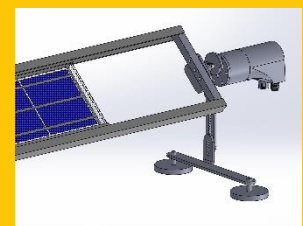
- Flexible model kit to replicate different PV systems
- HSAT systems (optional)
- PV modules mono and bifacial (optional)
- Software for data acquisition and analysis
- Special designed mounting plate
- Special designed module holder und sub-construction (optional)
- Data acquisition hardware
- PC (optional)
- Data transfer system via GSM (optional)
- Power supply
- Power supply off grid (optional)



PV_Array_Multiplexer



Bifacial array with HSAT



Tracker