TESTING OF SOLAR MODULES AND COMPONENTS

In order to make assessments with regards to quality and reliability PV modules are exposed to artificial aging in laboratory. The aim of this exposure is the reproduction of field loads and typical defects. Indoor testing is carried out in different climate chambers, which expose modules to certain environmental conditions such as humidity, temperature or irradiation. For type approval testing the quantitative test conditions and exposure times are defined in testing standards IEC 61215 (crystalline silicon) or IEC 61646 (thin film). However, these standards do not test for lifetime but infant mortality, which approves the functionality of PV modules and that they can be operated for a longer period in temperate climates. For extreme environmental conditions (desert or tropical regions) different conditions and exposure times have to be defined – as well as individual testing procedures for lifetime testing. For this type of tests Fraunhofer CSP offers both – equipment and consultancy.

**Competencies**

- Test and characterization of PV modules (IEC 61215, IEC 61646, IEC 61853, etc.)
- Assessment of the electrical and physical condition of PV modules
- Mechanical analysis by means of finite-element analysis (e.g. design and optimization of sub-structure, fracture analysis, fluid dynamic simulation)

**Equipment**

- Several climate chamber with test bench size from (950 x 1450 x 600) mm³ to (3500 x 3800 x 3500) mm³
- Temperature range from -60 to +180 °C
- Humidity range from +10 % to +95 % rel.
- Combined irradiation with sun-like spectrum or increased UV-dose (max. 220 W/m² UVA/B)
- In situ strain measurements during temperature cycling by means of grey-scale correlation technique

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1. Discoloration »snail trails« and corresponding crack in solar cells.
2. Detection of PID by means of electroluminescence with different levels of current.

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Climate chamber for temperature cycling and with combined irradiation.

3-cabinet damp heat chamber for individual condition in each cabinet.

Light soaking unit for PV modules.

Climate chamber for temperature cycling with combined UV-irradiation.

Climate chamber for temperature cycling and in-situ strain measurements.

UV exposure unit for PV-modules.