

## TESTLAB PV MODULES

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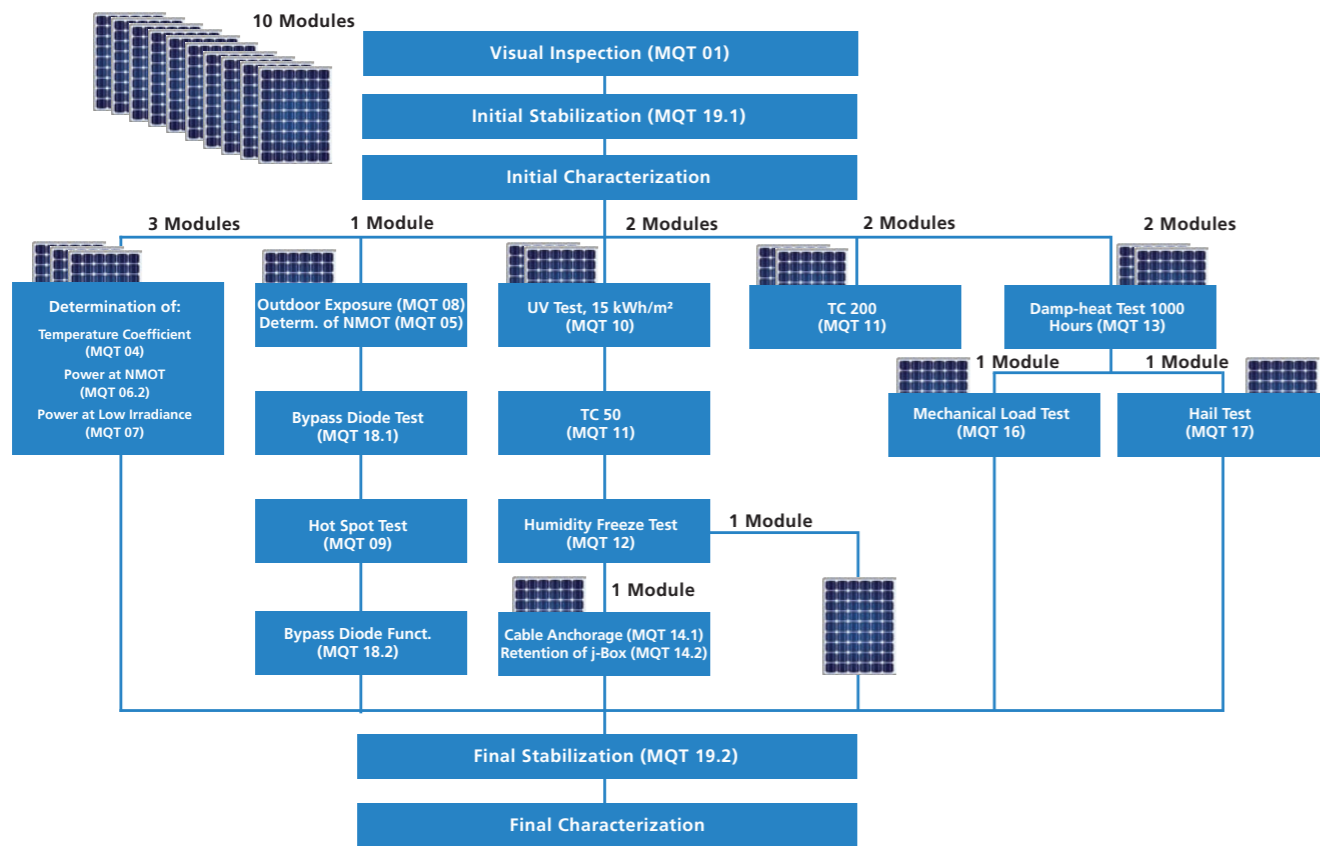
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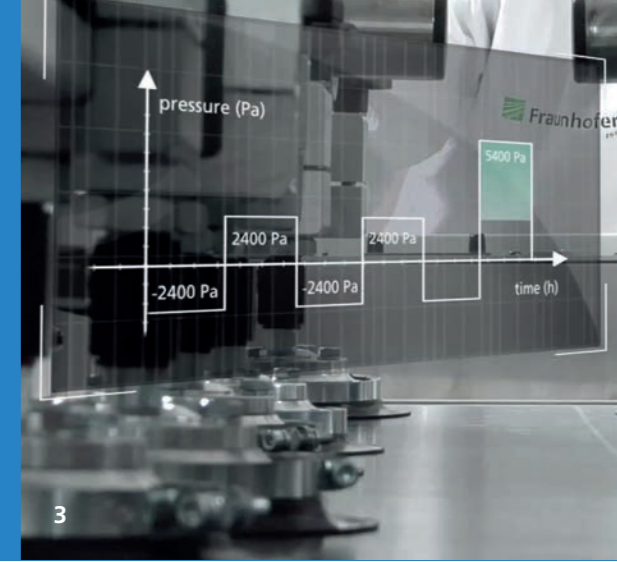
# CERTIFICATION, RELIABILITY, QUALITY CONTROL

The share of photovoltaics in global energy supply is increasing rapidly. The dynamic PV module market is driven by high cost pressure and short innovation cycles. A large number of cell manufacturers and material suppliers for backsheets, encapsulants and others offer increasingly efficient and decreasingly expensive products. The assurance of module quality is becoming outstandingly important for investors and manufacturers.

Based on many years of experience in the area of service life analysis, TestLab PV Modules was founded at Fraunhofer ISE in 2006 and accredited in accordance with ISO/IEC 17025. High-grade and innovative testing facilities enable a comprehensive range of services and meet highest quality demands. In addition, customers profit from the embedded TestLab PV Modules in the scientific environment of Fraunhofer ISE.



1 For certification, modules are tested regarding reliability, quality and safety. The graphic shows the test sequence according to IEC 61215:2016.



## Quality and Safety Certification of PV Modules

For the certification of PV modules we work closely with our experienced cooperation partner, the VDE Testing and Certification Institute in Offenbach, Germany. Our TestLab PV Modules is accredited for the following standards:

- IEC 61215:2016, Crystalline Silicon Terrestrial Photovoltaic Modules – Design Qualification and Type Approval
- IEC 61646:2008, Thin-Film Terrestrial Photovoltaic Modules – Design Qualification and Type Approval
- IEC 61730:2016, Photovoltaic Module Safety Qualification – Part 2: Requirements for Testing

To ensure a safe and reliable operation of PV modules, we offer various services going beyond certification. Our experienced technicians and engineers consult our customers individually on purposeful and cost-efficient solutions.

## Enhanced Quality and Reliability Tests

We adapt test conditions to specific climate requirements and thus reduce the risk of failures:

- enhanced mechanical load test (pressure load up to 10 kPa, temperatures down to -40 °C; maximum frequency of 0.2 Hz)
- enhanced hail test (hail grain Ø: 25 mm, 35 mm, 45 mm)
- salt mist corrosion test

Moreover, we perform specific tests for degradation effects not included in the PV module certification. For example:

- PID (Potential Induced Degradation): In a PID test the module's sensitivity towards electrical potential differences between cell and frame / glass is tested.
- enhanced UV test: Since certain failure mechanisms are caused by UV irradiance, enhanced UV tests can help to detect if the module is sensitive to UV degradation.
- climate chambers with integrated solar simulator and with integrated UV source, considering the combination of climatic loads under real conditions

2 In the climate chamber with steady state solar simulator hot spot tests according to IEC 61215 are performed. The test facility is also suitable for customized testing, e.g. enhanced module characterization and BIPV applications.

3 The mechanical load test facility allows the automated performance of IEC-compliant tests as well as of tests going beyond standards (maximum pressure and suction 10 kPa, maximum frequency 0.2 Hz).

## Evaluation and Analysis of Failures

With access to a variety of analytical tools and platforms within the Institute, we purposefully examine damage or failures:

- detection of root cause for damage
- long-term degradation progress
- development of accelerated test procedures to minimize future risks

## Quality Assurance, Quality Control, Bankability

Frequently, manufacturers, investors and installers need special tests or test sequences which increase the trust in module reliability or allow a meaningful comparison between different module types. We provide advisory assistance with the definition of such test sequences and the evaluation of results.

## Reliability of New Materials and Module Designs

We support our customers on reliability of new module developments or the introduction of new components like bifacial modules, modules with integrated optimizers or micro-inverters. In this way we can contribute to recognize possible failure causes at an early stage.