



PIDcon

bench top PID tester for c-Si solar cells and mini-modules

Potential Induced Degradation control (PIDcon) of solar cells and (single) module components as commercially available bench top metrology solution was developed by Freiberg Instruments in cooperation with Fraunhofer CSP in Halle, Germany.



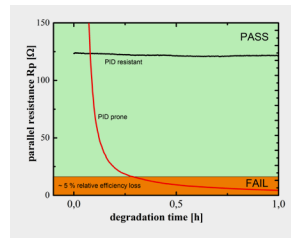
Features of PIDcon

- + According to IEC 62804-TS
- + Easy to use bench top device
- + Ability to measure c-Si solar cells and mini-modules
- + No climate chamber necessary
- + No lamination of the cells required
- + Measurement speed: hours to days
- + Measurable parameters: shunt resistance, power loss, conductivity, leakage current, humidity, temperature
- + Solar cell can be investigated by e.g. EL afterwards
- + IP based system allows remote operation and technical support from anywhere in the world

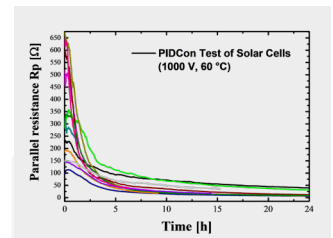
Production & Quality Control of c-Si solar cells and mini-modules

Standard test conditions

- Voltage: up to 1.5 kV
- Temperature: 85 °C
- Test duration: 4 hours (typical)
- Dry conditions, no use of water



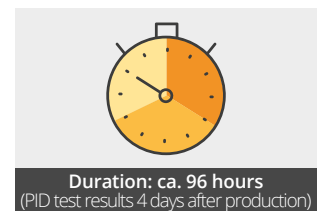
PID prone and PID resistance solar cell



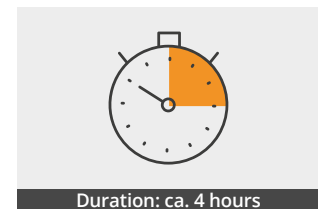
Reproducibility

Module vs. Cell level PID test

Module level



Cell level

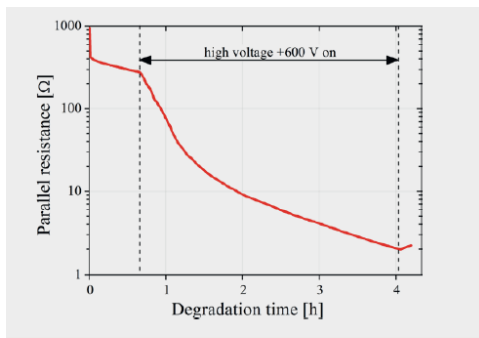


Background

Failures of crystalline silicon solar modules under the influence of high voltage have been first reported in 2010. Affected solar cells show an extreme decrease of the shunt resistance. The effect was termed Potential Induced Degradation (PID).

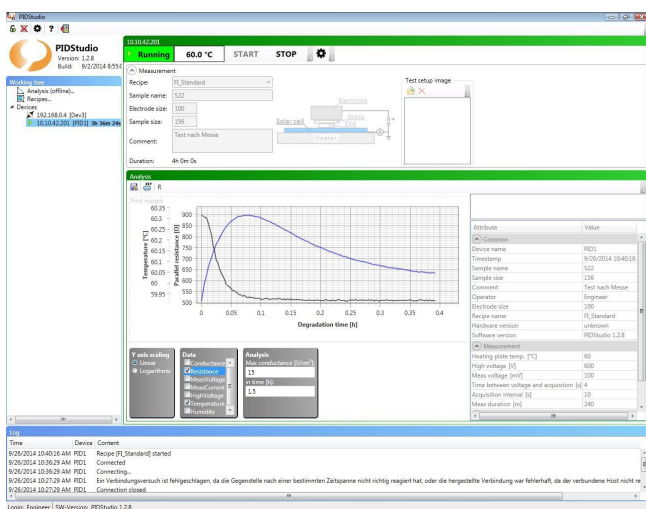
Until now PID tests are principally conducted at modules. Manufacturing of modules and climate chamber testing require considerable expenses for materials, equipment and work.

PIDcon was developed in cooperation with Fraunhofer CSP in order to combine the advantages of established test procedures: realistic PID test conditions like in module based PID tests together with low expenditure on time and costs.



PIDStudio – Operating Software

- › user structure
- › export function
- › recipes
- › pass and fail criterion
- › package of analysis functions
- › arbitrary number of devices controllable



With PIDStudio it is possible to get output and compare the following parameters for multiple measurements:

- › parallel resistance
- › conductance
- › power loss
- › leakage current
- › temperature
- › humidity
- › high voltage

Consumables

- › Reusable iron float zone glass for PID test according to DIN EN 572-2
- › Single use EVA foil for PID test
- › Contact fingers

Publications

Patent pending „Verfahren und Anordnung zur Prüfung eines Solarmoduls auf Anfälligkeit für Potentialinduzierte Degradation“, DE 10 2015 213 047 A1

V. Naumann et al., The role of stacking faults for the formation of shunts during potential induced degradation (PID) of crystalline Si solar cells, Phys. Stat. Solidi RRL 7, No. 5 (2013) 315-318

V. Naumann et al., Solar Energy Materials and Solar Cells Vol. 120 (2014), 383-389

For more publications, please visit:

<http://www.freiberginstruments.com/pid/publications.html>

Technical specifications

Sample size 156 × 156 mm, optional: 125 × 125 mm

Bus bars up to 5 bus bars

Electrode 100 × 100 mm, 0.1 to 1 kV

Temperature range up to 100 °C

PC requirements Windows 7 or latest with 2 Ethernet ports

Power requirements 110/230 V AC, 50/60 Hz

Dimensions 350 × 330 × 280 mm

Weight ca. 20 kg

Certification manufactured under ISO 9001 guidelines, CE conform

Made in Germany

Last revision: 1st March, 2018



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In cooperation with

