



// Mechanical load test

Evaluation of performance, quality and reliability of PV modules

- // Testing according to IEC 61215, 61730 and beyond
- // Stress by temperature, humidity and light in climate chambers
- // Potential-induced degradation (PID)
- // STC-Performance measurements with A+ flasher
- // Mechanical load, electroluminescence (EL), thermography
- // Isolation test, wet leakage test
- // Light-induced degradation (LID, LeTID)
- // Risk assessment for backsheets



// Outdoor testing facility Widderstall near Merklingen

Outdoor testing facilities for PV modules and PV systems and BIPV

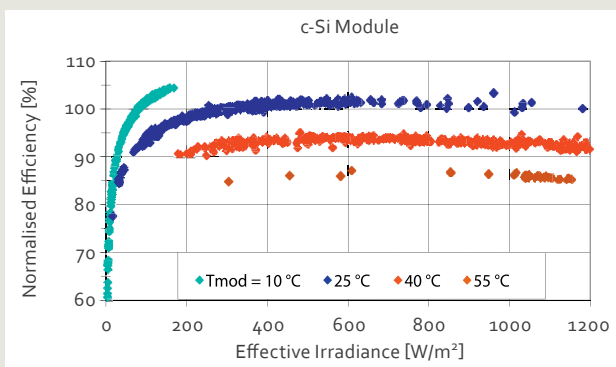
- // Since 1988 in Widderstall, Southern Germany
- // Highly resolved meteorological data: irradiance (global, direct, diffuse, plane of modules), temp, wind, humidity, spectrum
- // Test beds with individual iv-curve monitoring
- // Energy yield and performance ratio
- // Real module power in outdoor operation
- // Temperature coefficients, operation temperature
- // Outdoor exposure and operating testing
- // Comparative outdoor field testing
- // Short- and long-term stability
- // Light induced degradation (LID)
- // Light soaking effect (CIGS, CdTe)
- // Outdoor PID testing, monitoring of leakage currents
- // Accelerated outdoor stress with 3x concentrated light (Sahara test)
- // Test beds for PV systems with continuous monitoring
- // Operation behaviour of PV systems under shaded conditions
- // Performance test of micro inverters, optimizers and smart modules
- // Operation and testing of BIPV systems



// Infrared thermography inspection

Contact

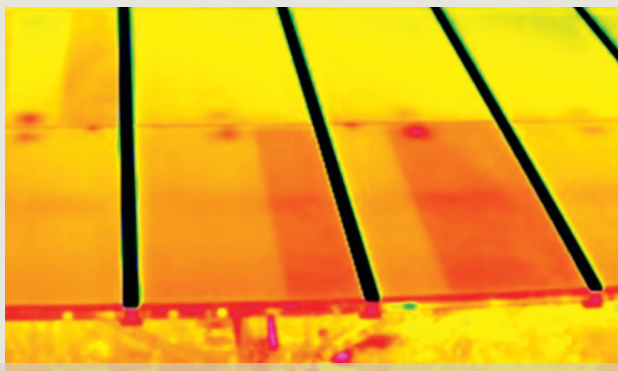
Claudia Brusdeylins
+49 711 7870-278
claudia.brusdeylins@zsw-bw.de



// Influence of irradiance and module temperature on module efficiency



// Evaluation of PV storage system at the connection point with the grid



// Infrared image of defective PV modules installed in a generator

Development and application of testing methods

- // Precise performance and operation measurements of PV modules and systems
- // Long-term stability of modules
- // Accelerated ageing and test-to-failure
- // Correlation of laboratory and outdoor measurements
- // Input for standardisation procedures

PV storage systems and grid integration of PV plants

- // Characterisation and control of PV storage systems
- // Interaction of PV storage systems, heat-pumps and charging stations for e-mobility
- // Forecasts and predictive control to minimize grid loading and energy costs
- // State-of-the-art protocols and strategies to implement smart grids

Consulting for manufacturers, investors, banks and project developers

- // System measurements and acceptance tests
- // Yield estimates and site appraisals
- // Technical due diligence
- // Factory inspections
- // Troubleshooting

Contact

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