

QuickSun®

550CE

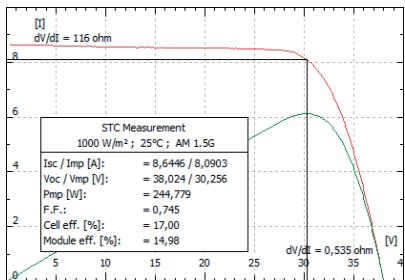
Module Testing Station

Unique combination of automation and top quality module characterization tools

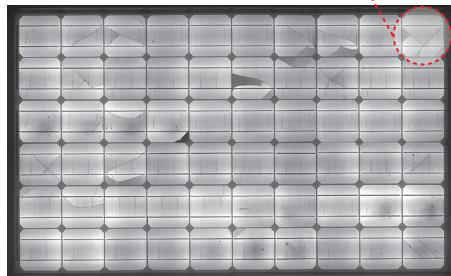


IEC 60904-9
Regular
Surveillance

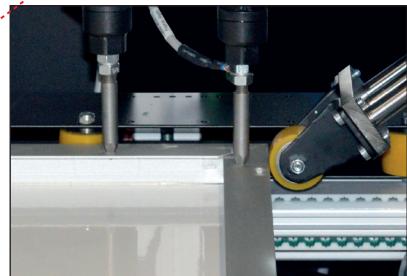
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IV measurement



EL imaging



Electrical safety



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QuickSun 550CE Testing Station is a fully automated solar simulator for qualifying of PV modules with dimensions up to $105 \times 205 \text{ cm}^2$. High resolution EL imaging, Electrical Safety measurement tools are integrated in the same system. Throughput of 60–150 modules per hour is achieved depending on the applied EL and Electrical Safety testing parameters.

QuickSun 550CE is certified by TÜV Rheinland and a detailed test report is included with every simulator proving Class A+A+A+ performance with respect to spectrum, irradiance non-uniformity and short term instability (STI). Long term instability (LTI) is also within Class A+ tolerances during the 40 ms long flash pulse. IV characteristics are recorded with an electronic load and proprietary electronics unit which measures voltage, current and irradiance signals when module is swept from short circuit to open circuit or vice versa. Accurate measurement of PERC and other high-efficiency modules is guaranteed by optimizing the slope of voltage and applying both forward and backward IV sweeps. This has effectively the same effect as applying even 450 ms long flash pulse.

Automation

After reading the serial number either with a barcode scanner or through an industrial data bus like e.g. Profi-Bus 550CE loads the modules at ordinary conveyor line height and moves them to the testing position. 4-wire contacting probes are pushed automatically to the junction box contact pads or to the pads on the contact adapter plate. Frame contact probes are pushed to drainage holes. Automated switching unit contacts the module sequentially to IV, EL and Electrical Safety measurement instruments. Once all the tests have been completed the module is lowered down to conveyor line height for out feeding.

Irradiance non-uniformity is measured and adjusted automatically with a laminated c-Si cell which is moved over the test area by an internal X-Y stage. Number and location of test points can be selected freely.

Optional reference module loading unit enables automatic monitor cell gain adjustment and intensity level calibration. Omron PLC is used for automation control and nominal module infeed and out feed speed is 300–450 mm/sec.

EL Imaging

EL-images having 200 μm pixel resolution can be recorded with six 8.3 Mpixel NIR ccd cameras. This ena-

bles software based automatic image analysis in order to identify and categorize small faults like microcracks and finger interruptions. If this accurate automatic analysis is not required cost effective 500 μm resolution EL picture can be recorded with two corresponding ccd cameras. 850 W power source source can be controlled to provide up to 14 A even to 72 cell modules. Typical exposure times vary between 5–20 seconds depending on the desired image quality.

Electrical Safety

QuickSun 550CE has the capability to perform insulation resistance, dielectric withstand and ground continuity tests as stipulated in the applicable UL and IEC standards.

Actual leakage current of PV modules is a few hundred nano amperes with a typical 4 KV test voltage while the ordinary dielectric withstand test acceptance criteria is 50 μA . QuickSun 550CE surpasses this minimum requirement and measures true insulation resistance and leakage currents accurately with sensitive enough instruments. This enables run time diagnosis of both contacting reliability and real module leakage characteristics.

IV measurement characteristics

Contacting	J-Box / contact adapter; 4-wire / Kelvin	Frame; conical/pyramid pins to drainage holes
Load	feedback controlled MOSFET	adjustable bias 0–4.5 V
Voltage sweep	linear and double slope alternatives	$I_{sc} \rightarrow V_{oc}$, $V_{oc} \rightarrow I_{sc}$; average of both
Voltage measurement	1–100 V (other scales on request)	accuracy 0.2 % / 512 samples
Current measurement	0.5–25 A (other scales on request)	accuracy 0.2 % / 512 samples
Irradiance control	200–1200 W/m^2	resolution 1 W/m^2 / 512 samples
Module temperature (IR)	0–75 °C	accuracy 1 °C
Monitor cell temperature	0–75 °C	accuracy 1 °C
Pmp repeatability	< 0.1 % ($1\sigma / P_{MP_{ave}}$)	
Average flash tube life time	300 000 flashes	
Operation temperature	15–35 °C	
Mains utilities	3~, 400 Vac, 3 x 16 A, 50–60 Hz	CDA 4–6 bar
Total dimensions, weight	370 x 190 x 215 cm	1300 kg