Solar Measure

I-V CURVE TRACER

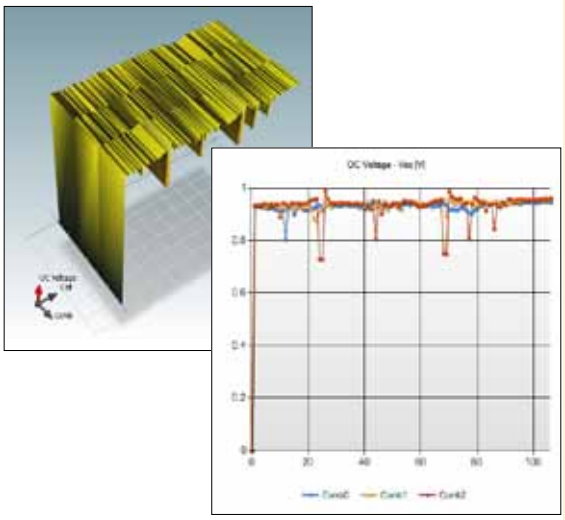
High-Speed I-V Curve Tracer for 100% Surface Mapping of Thin-Film Solar Modules

The Dr. Schenk I-V Curve Tracer is the ideal solution for high-speed, non-destructive measurement of I-V curves of thin-film modules prior to the lamination step. It can evaluate the electrical characteristics of every individual cell on the complete thin-film panel and detect local variations. These measurements can be taken in-line and the results serve as a GO/NO-GO test of whether a panel should be processed further.

This innovative solution provides numerous measurements simultaneously and is a reliable process control tool for previous production steps.

The measurements of the I-V Curve Tracer can be correlated with preceding optical inspection data (e.g. local defects, layer thickness, haze, etc.) to characterize and improve processes.

The I-V Curve Tracer offers stable and homogenous measurements without light power fluctuations across the measurement plane. The system features a three quadrant measurement for optimized determination of the serial and parallel resistance.



In addition to the 2D display of I-V curves per measurement point, the analysis software offers intuitive 3D charts of the results - cell by cell or for a row of cells.

The I-V Curve Tracer from Dr. Schenk

Dr. Schenk GmbH is currently the only "total-solution provider" of metrology systems for PV thin-film modules worldwide.

More than 60 systems are installed in operating thin-film production lines around the world. This demonstrates that the company's specialized solutions for virtually every process step along the line are unmatched in the industry.

KEY FEATURES

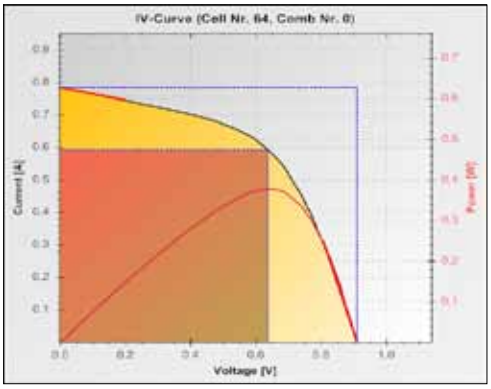
- Fast & non-destructive
- Electrical characterization of every cell
- Configurable for all substrate sizes and any number of cells
- Long-life, high-performance LED units
- Multiple measurement parameters: Voc, Isc, Pmax, FF, Rserial, Rparallel
- Integrated data storage functions
- In-line option

PROCESS CONTROL BY COMBINING OPTICAL AND ELECTRICAL TESTS

Indirect metrology tests, e.g. the measurement of pinhole density, layer thickness or haze monitoring, performed with Dr. Schenk's SolarInspect and SolarMeasure enable manufacturers to evaluate both the product quality and the production process. These indirect measurements alone cannot predict a solar panel's final electrical efficiency though.

Dr. Schenk's I-V Curve Tracer complements flashers and meets the challenges they cannot overcome. Unique electrical characterization is achieved through:

- Space-resolved measurements
- Wavelength-resolved measurements
- Irradiance-resolved measurements



The I-V Curve Tracer tests the electrical parameters of every individual module cell prior to lamination

KEY BENEFITS

- Locate exact positions of irregularities, report inhomogeneities and judge module quality early on
- Match results with data from indirect measurements of the SolarInspect and SolarMeasure systems and correlate local defects with panel performance
- Identify process instabilities and correlate single process improvements with module quality improvements
- Define and optimize process criteria and quality rules for each production step
- Take corrective actions at the earliest possible time
- Improve module quality and performance
- Exclude faulty modules prior to cost-intensive steps
- Reduce overall production costs and increase line yield

CHALLENGES FOR REGULAR FLASHERS

- A flasher test can only deliver a single result for the entire panel's electrical parameters. Since it cannot address individual cells it cannot identify those with reduced performance.
- It is not possible to balance an individual cell's performance against the average module score.
- When flashers are installed at the end of the production line the back end operates blindly. No prior measurement data was obtained and therefore the process could not be controlled.
- Installing flashers before the lamination step would represent an investment that does not return sufficient process information.

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