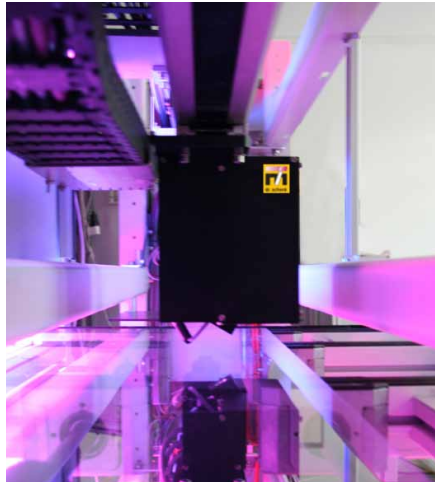


Solar Measure



Dr. Schenk TCO Tester: Quality and Process Control for Bare & TCO Coated Solar Glass



Dr. Schenk's TCO Tester is an option available under the SolarMeasure product family. It is designed to help manufacturers of bare solar glass and TCO coated solar glass to quickly identify process deviations.

Early detection of process deviations is key to producing solar glass economically. It prevents waste of material and valuable processing time and ensures optimum quality of the finished solar glass.

The TCO Tester assists manufacturers in keeping the process within the defined process parameters by measuring haze, layer thickness and layer resistivity - either in line, combined with Dr. Schenk's SolarInspect, or off-line as a stand-alone solution.

Making coating tool matching and cost reduction possible

Today's coating layers must be as transparent (= thin) as possible, while displaying optimum quality to ensure the function of the final product. As the thickness of the layers decreases, the importance of a homogeneous distribution of the coating becomes more important and unnecessarily thick coating wastes expensive coating material. Measuring coating properties consistently and early in the production process helps to reduce costs.

KEY BENEFITS - REALIZE COST SAVINGS NOW

- Increase the average module power / measurement cost

Example: 30 s tact time

Average system price / (amortisation time * modules/year) = 0.04 €/W

1 W increase or stabilizing at 70 Ct / W_p market price, 121 W_p module

Benefit: + 0.8 % = **+70 Ct / module**

- Reduce maintenance costs through predictable maintenance intervals

Example: Monitor & measurement cost 0.04 Ct / W = 4.7 Ct / module

Extend monitor & maintenance interval by 2 days (60 -> 62)

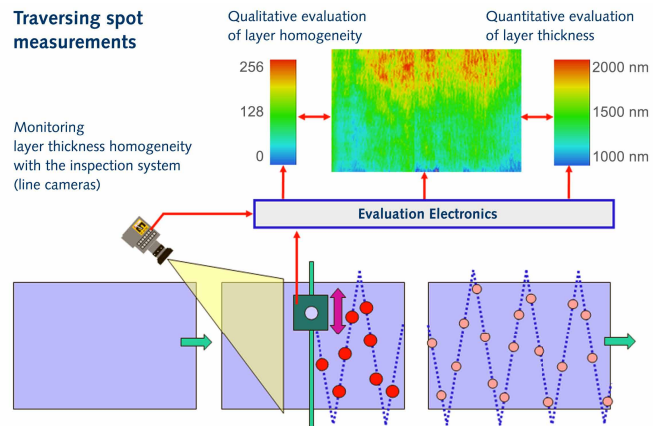
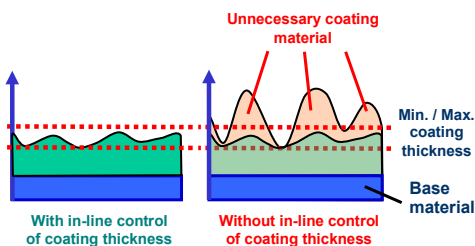
Monitor & maintenance cost reduction 2/60 = **-3,3 % for each coating tool!**

Smaller feature sizes on large areas, high process speeds and flexible base materials challenge standard inspection systems

Standard automated optical inspection and measurement systems monitor coating properties by measuring only a few spots on the material. This is generally done after its production and with a significant time delay - an unacceptable situation in part time production environments.

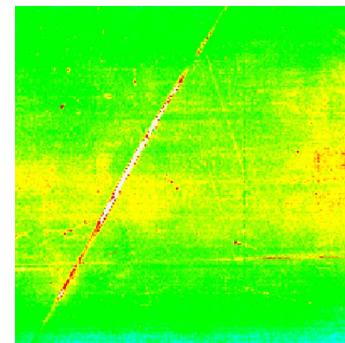
Dr. Schenk's cutting-edge automatic optical inspection & measurement systems combine evaluation of small local irregularities, e.g. pinholes, scratches, particles, with monitoring of the homogeneity of layer properties (e. g. haze, thickness, layer resistivity) for the full width of the material.

The TCO head consists of a multi-functional sensor head that traverses on a linear drive for a detailed analysis of TCO coatings. Depending on the size of the panels and on the conveyor speed, approximately 9 scans per substrate are typically performed in-line.



KEY FEATURES

- Flexibility through modular design
In-line or off-line, adaptable to any substrate size
- Maintenance-free operation
LED illumination units with light power control
No re-calibration: Intelligent closed loop & self-monitoring functions for all sensors
- Ease of use
Grayscale images of local defects for easy analysis
Drag & Drop Defect Library: Automated, fast and easy adaptation of Qualifier and Classifier



Layer thickness distribution on an OPV sheet

About Dr. Schenk

Dr. Schenk GmbH, established in 1985, is a globally active, innovative high-tech company based in Munich, Germany. For the third decade now Dr. Schenk offers comprehensive solutions for automated quality assurance and production process monitoring for the solar, flat glass, film and foil, converting, optical media and semiconductor industries.

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