

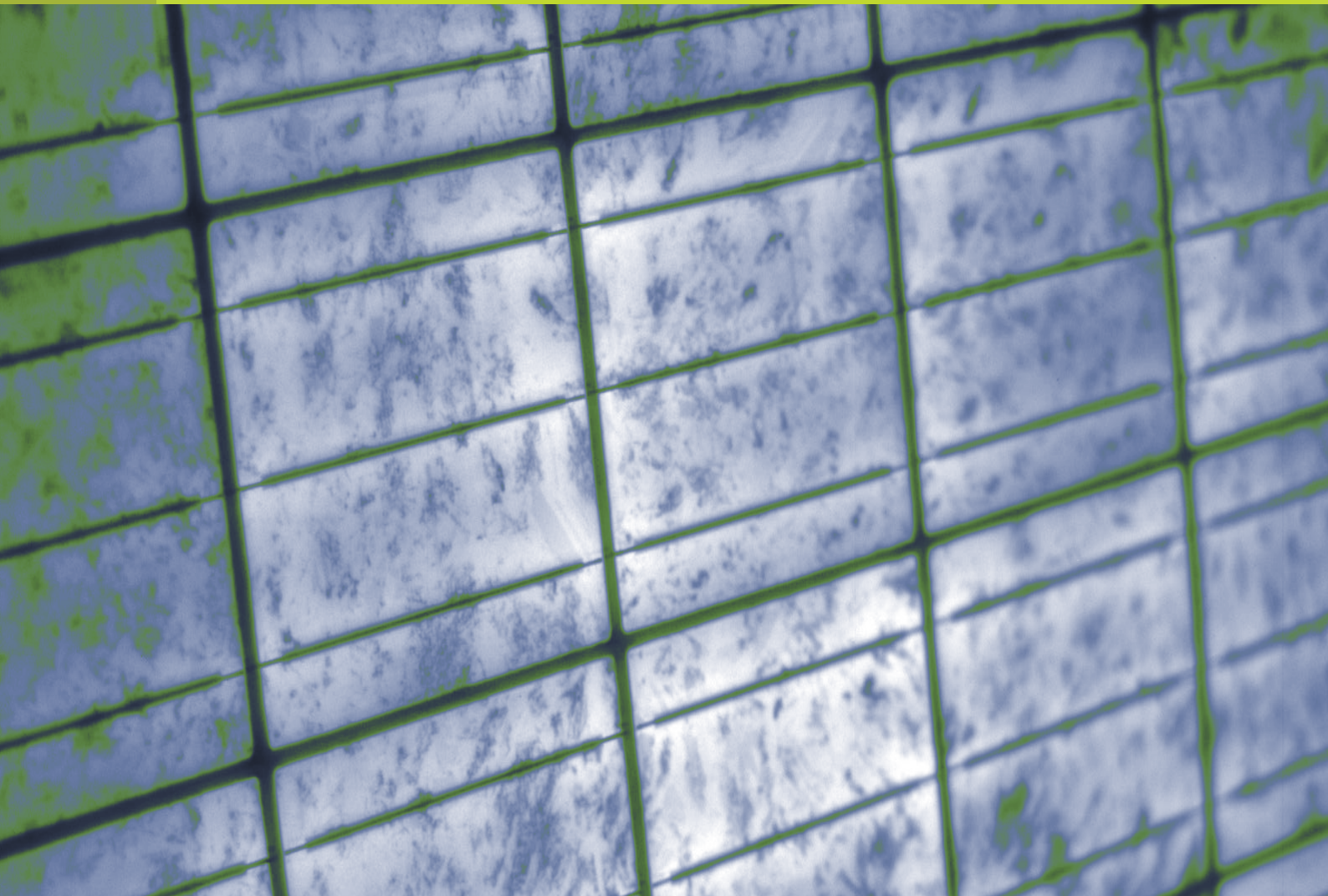
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LumiSolarMobile System

Electroluminescence (EL) Inspection Equipment for
Solar Cells/Modules

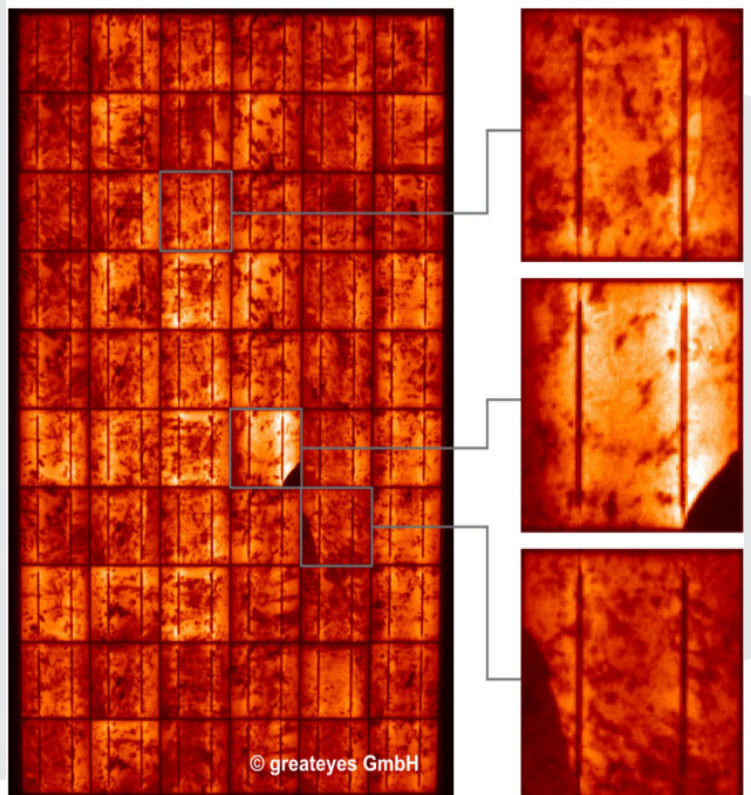


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LumiSolarMobile Electroluminescence
Camera

Electroluminescence Image of a Single Module



The LumiSolarMobile system utilizes the electroluminescence phenomena to image micro-cracks, cell failures and inhomogenities of photovoltaic devices which are not revealed by other inspection methods. The equipment enables the user to perform detailed quality control of single cells as well as medium scale solar modules. It was developed for research and off-line industrial inspection. The mobile version can be transported and set up quickly.

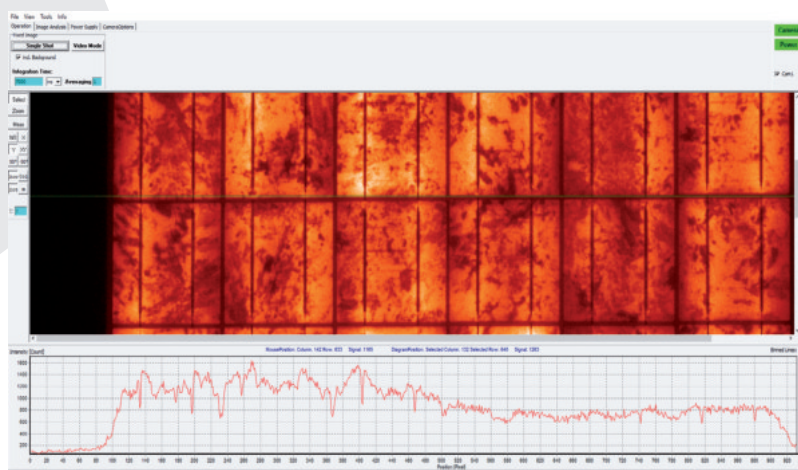
The system consists of a scientific grade CCD-Camera with NIR objective, remotely controlled power supply and accessories. The focal length of the objective is selected depending on the type of application. It is a fully plug & play system. The camera has an USB 2.0 interface and can be connected to a laptop or PC easily.

Key Specification LumiSolarMobile

Application	Flexible EL inspection of cells and modules Identification/Replacement of defective cells Improvement of general production efficiency Research and development Characterization and qualification
Image size	1024 × 1024 pixel, 16 bit 2048 × 2048 pixel, 16 bit
Module types	mono-Si, poly-Si, a-Si, HIT, CIS, CIGS, CdTe
Method of inspection	Electroluminescence
Measurement time	0.2 - 2 sec for c-Si solar modules
System components	greateyes PV Camera Objective - enhanced NIR transmission LumiSolarMobile software Synchronization module for automated image capture Power supply including tripod
Detection capability	Micro-cracks identification Shunt detection Finger defects Dead cells Broken cells Inhomogenities and impurities Partially hot spots

LumiSolarMobile Software Suite

The LumiSolar software controls the camera and visualizes the data sets. Intensity profiles of the 16-bit high dynamic range image data can be displayed in addition to basic image manipulation procedures. Moreover dimension measurements of artefacts are possible following calibration.



Software Functions

- Save, quicksave, load images
- Supported file formats: BMP, JPEG, TXT, and raw data
- Single image mode, video mode
- Automatic background subtraction
- False-colour-representation of images
- Intensity slices in x,y direction
- Linear/logarithmic scaling
- Zoom functions/Image viewer
- Remote control of power supply

Features of the LumiSolarMobile System

System components	USB 2.0 CCD camera: GE 1024 1024 PV camera GE 2048 2048 PV camera Objective with enhanced NIR transmission LumiSolarMobile Software Suite
Power supply	Standard ~230V, 50/60 Hz
Size of the case	320 mm x 230 mm x 150 mm
Total weight	12 kg
Optional accessories	Precision power supply (750 W, 1500 W or 2.4 kW) for solar cells/modules on request Various objectives with different focal lengths
Advantages of the system	Excellent sensitivity and high dynamic EL image quality (16 bit) Quick measurements (~2 sec for c-Si solar modules) No dark box or cover needed Flexible transport solution
Successfully tested on various solar cell/module types	Monocrystalline silicon (mono-Si) Polycrystalline silicon (poly-Si) Amorphous silicon (a-Si) Copper indium sulfide (CIS) Copper indium gallium selenide (CIGS) Cadmium telluride (CdTe) Heterojunction with intrinsic thin layer (HIT)

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