THE TECHNOLOGY LEADER IN PV INSPECTION EQUIPMENT

ALL NEW PRODUCT RANGE

Protected by 17 patent families with global coverage

PL IMAGING OF SILICON

FIRST INVENTED at the University of NSW in 2005 by the founders of BT Imaging. PROTECTED BY MULTIPLE PATENTS

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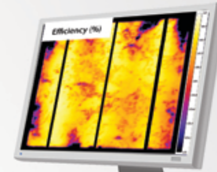
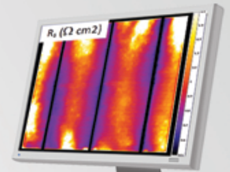
INNOVATE. CONTROL. YIELD.

THE LIS-R2-Plus & LIS-R3

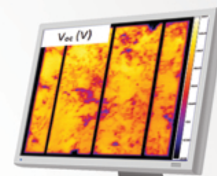
Quantitative PL imaging Examples



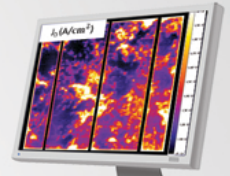
Efficiency Image



Series Resistance Image



V_{oc} Image



J_0 Image

PL on wafer

Processing issues

High mag image

LIS-R2 Plus & LIS-R3 – The premier laboratory tools for silicon bricks, ingots, wafers, cells and mini-modules. A summary of measurement applications:

	Bricks & Ingots	As-Cut Wafers	In-Process Solar Cells	Completed Solar Cells	Mini-Modules
Photoluminescence Imaging	LIS-R2-Plus (Option) LIS-R3 (Option)	LIS-R2-Plus LIS-R3	LIS-R2-Plus LIS-R3	LIS-R2-Plus LIS-R3	LIS-R2-Plus (Option) LIS-R3 (Option)
Electroluminescence Imaging				LIS-R2-Plus (Option) LIS-R3 (Option)	LIS-R2-Plus (Option) LIS-R3 (Option)
Electrically Biased PL Imaging				LIS-R2-Plus (Option) LIS-R3 (Option)	LIS-R2-Plus (Option) LIS-R3 (Option)
Injection Level Dependent Lifetime (QSS-Photoconductance)		LIS-R2-Plus (Option) LIS-R3 (Option)	LIS-R2-Plus (Option) LIS-R3 (Option)		
Calibrated Lifetime Imaging		LIS-R2-Plus (Option) LIS-R3 (Option)	LIS-R2-Plus (Option) LIS-R3 (Option)		
Series Resistance Imaging				LIS-R2-Plus (Option) LIS-R3 (Option)	LIS-R2-Plus (Option) LIS-R3 (Option)
Dark & Light IV, Suns-V_{oc} Curves				LIS-R3 (Option)	
Advanced Cell Measurement Package J_{sc}, V_{oc}, J_{mpp}, J_0 and Efficiency Imaging				LIS-R3 (Option)	
Front and Bulk Analysis				LIS-R3 (Option)	
Multi-crystalline Silicon Defects & Impurities	LIS-R3 (Option)	LIS-R3 (Option)	LIS-R3 (Option)	LIS-R3 (Option)	
Mono-crystalline Silicon Defects & Impurities	LIS-R3 (Option)	LIS-R3 (Option)	LIS-R3 (Option)	LIS-R3 (Option)	
Thick Mono Wafer Slug Analysis Package	LIS-R3 (Option)				

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THE iLS-C3 & iLS-W3

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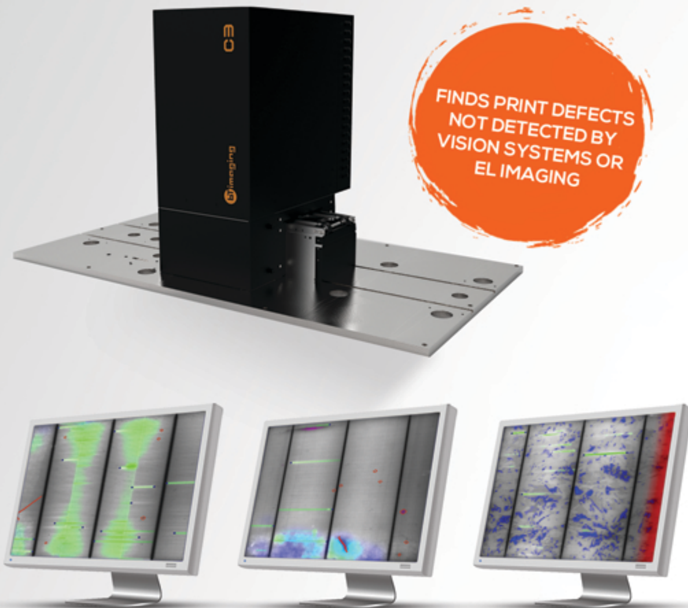
iLS-C3 Non-Contact & Non-Stop Inline Scanning PL Imaging Inspection of Solar Cells



Data reported by iLS-C3

Type of Sample	Multi-Crystalline Solar Cells	Mono-Crystalline Solar Cells
Stage of Sampling	> After the diffusion step through to completed cells	> After the diffusion step through to completed cells
Wafer Defects Reported	> Impurities > Dislocations	> Dark Spots > Dark Corners > Dark Middles > Dark Areas
Other Efficiency Limiting Defects Reported	N/A	> Cracks > Dark PL Features
Series Resistance Defects Reported	> Broken Fingers > Bright Areas	> Broken Fingers > Bright Areas
PL Counts Reported	> Images, Histograms and Statistical Data	> Images, Histograms and Statistical Data
Statistical Data	> Based on all PL Data	> Based on all PL Data
Persistence Measurement	> Available for all Overlay Defects	> Available for all Overlay Defects
Real Time Export of Metrics	> Yes	> Yes

iLS-W3 Non-Contact & Non-Stop Inline Scanning PL Imaging Inspection of Solar Wafers

Data reported by iLS-W3

Type of Sample	Multi-Crystalline As-Cut Wafers	Mono-Crystalline As-Cut Wafers
Wafer Defects Reported	> Impure Edges > Impure Corners > Impure Middles > Dislocations > Wafer Type	> Dark Spots > Dark Corners > Dark Middles > Dark Areas > Ring Defect Strength
Other Efficiency Limiting Defects Reported	N/A	> Cracks
PL Counts Reported	> Images, Histograms and Statistical Data	> Images, Histograms and Statistical Data
Statistical Data	> Based on all PL Data	> Based on all PL Data
Persistence Measurement	> Available for all Overlay Defects	> Available for all Overlay Defects
Real Time Export of Metrics	> Yes	> Yes

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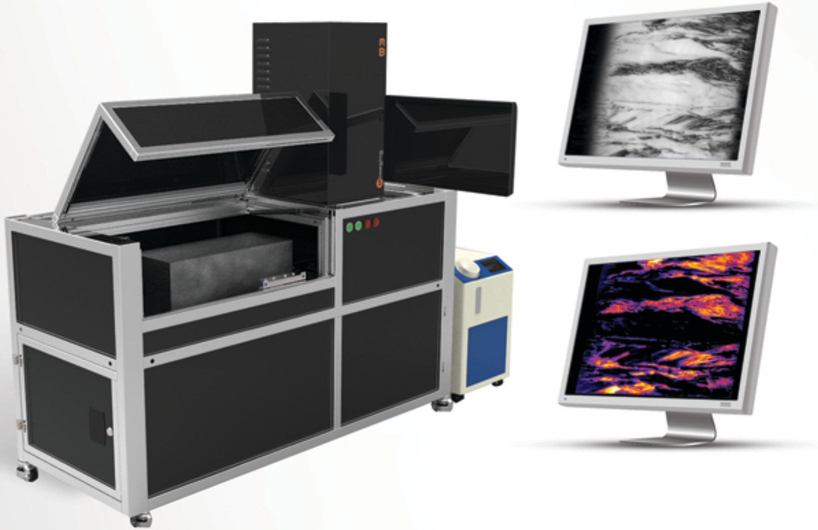
THE LIS-B3 & LIS-QC

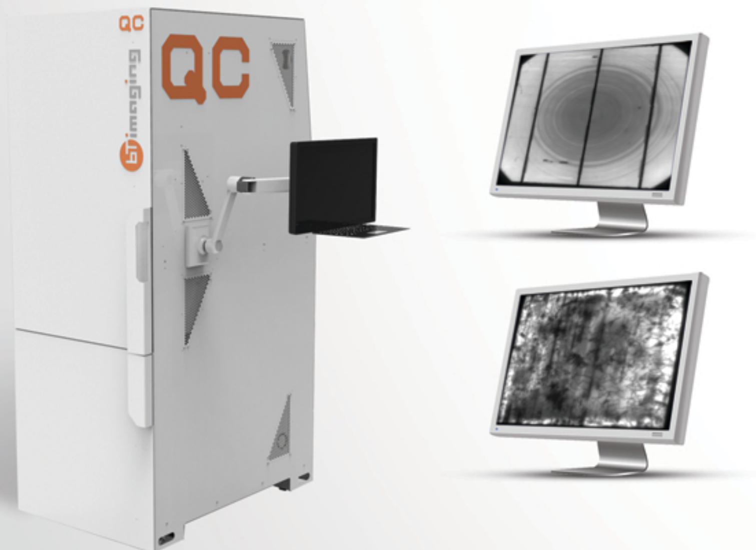
LIS-B3 is a PL Imaging inspection tool designed for quality control and process improvements in silicon bricks and ingot factories



LIS-B3 Applications, Automation Options and Reported Metrics

Sample type	Multi-Brick & Mono-Ingot
Application	> Wafer specifications based on bulk lifetime & defects > QA & QC in silicon casting > Process debug in casting > Process and product improvement in casting > Cutting guide for silicon bricks to remove low quality material with lowest loss of good quality material > R&D in casting and wafering > Option for wafer and cell defect inspection
Automation	> Manual or Factory Robot Load > Manual or Factory Robot Rotation > InkJet marking of Cutting Guides
Data	> Bulk Lifetime image resolution in µS measured at 1024 micron resolution in both x and y > PL Imaging Silicon Defects – PL images > PL Imaging Silicon Defects – proprietary metrics and overlays for (a) multi – dislocations & impure regions, (b) mono - dark line features and slip lines > Cutting Guide is based on pre-set Bulk Lifetime and defect values and reports distance from the end in mm

LIS-QC is an affordable PL Imaging tool designed for quality control in solar cell factories



LIS-QC measures and analyses PL images and reports quantitative metrics

Sample type	Wafer	In-Process Solar Cells	Solar Cells
Multi wafer	> Dislocations > Impure regions > PL count	> Dislocations > Impure regions > PL count	> Dislocations > Impure regions > PL count
Mono wafer	> Cracks > Ring defects > Corner defects > Non-uniform metrics > PL count	> Cracks > Ring defects > Corner defects > Non-uniform metrics > PL count	> Cracks > Ring defects > Corner defects > Non-uniform metrics > PL count
Other	> Other unexpected light and dark regions	> Other unexpected light and dark regions	> Other unexpected light and dark regions

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