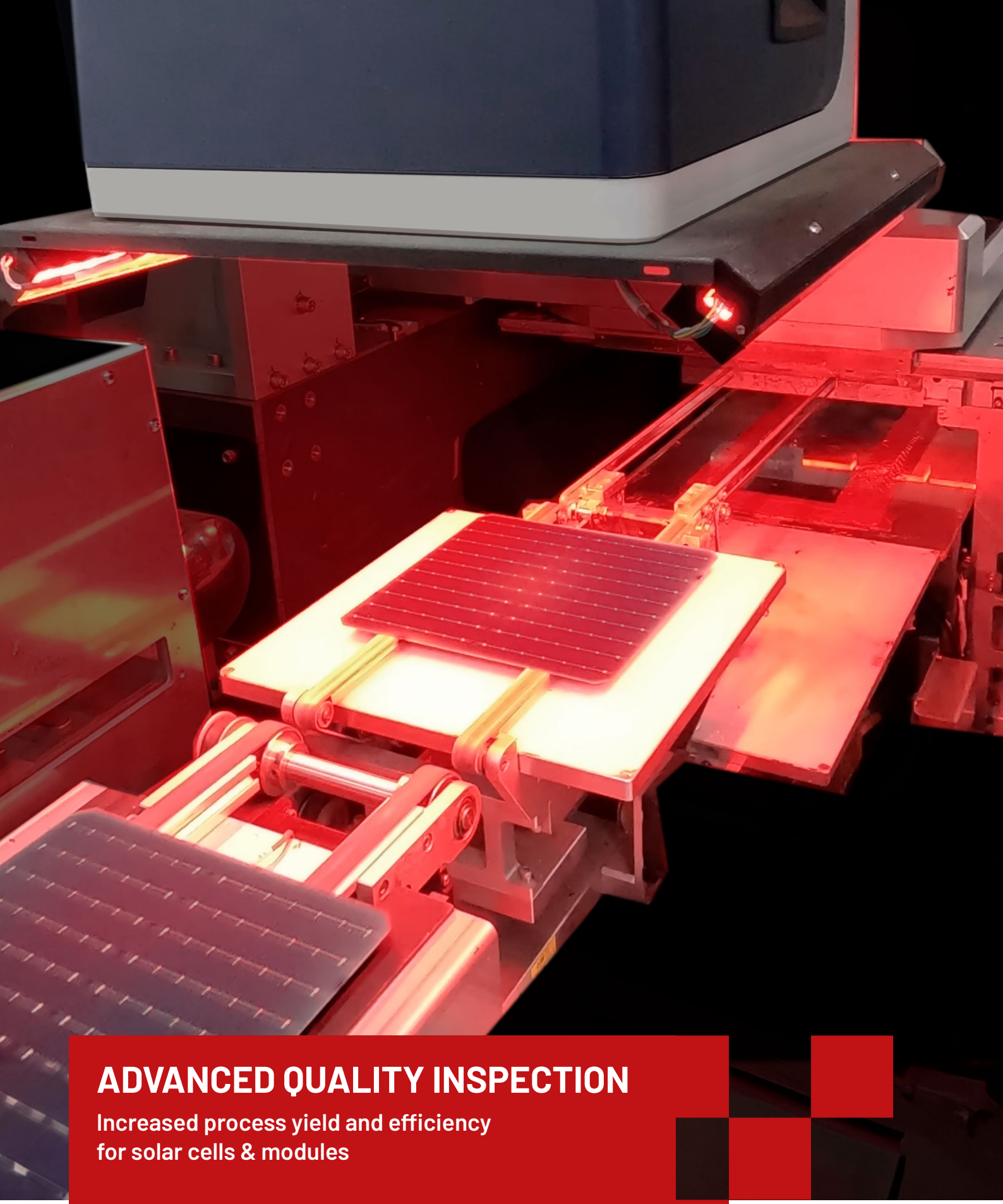


# ADVANCED QUALITY INSPECTION

**Increased process yield and efficiency for solar cells & modules**

Powered by GPsolar

ISRA VISION

Part of Atlas Copco Group

# Quality Inspection & Data Analytics
## for solar cell manufacturing

**ISRA VISION / GP Solar is a leading expert in quality inspection and process monitoring solutions for the entire PV manufacturing chain.**

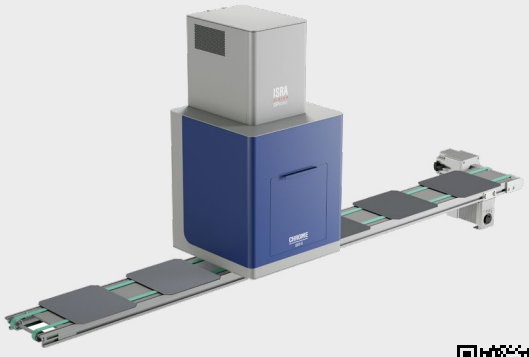
Inspection applications for every process step – from wafer to finished cell – in combination with central process control and global quality monitoring are the core competencies of ISRA VISION's solar division.

High-efficiency solar cell production lines such as PERC, IBC, HJT with extremely thin contact fingers, and new wire contacting designs benefit from high-speed and high-precision optical inspection performance to optimize production and reduce yield loss.

With cloud-based process monitoring and global service, systems from ISRA VISION / GP Solar optimize photovoltaic production sites around the world.

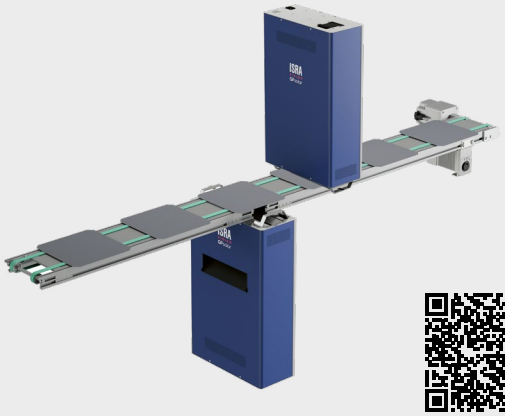
### Geometry & Contour

- Geometric irregularities
- Edge distortions
- Applicable for wafer and cell manufacturing



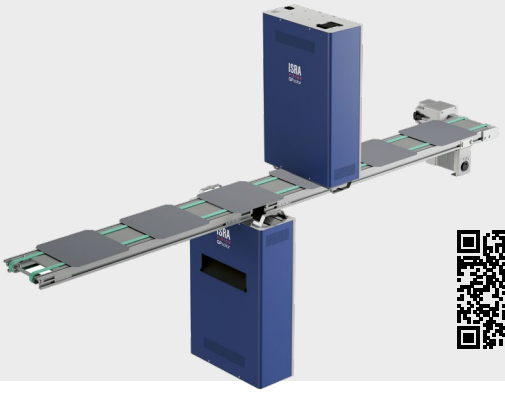
### Surface Inspection

- Low contrast visual defects
- Stains, fingerprints, chips
- Applicable for wafer and cell manufacturing
- Automatic classification



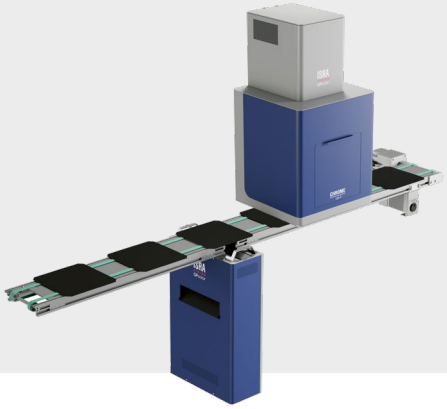
### Texturing Monitoring

- Check for contaminations and defects, long-term drifts, over-etching of grain boundaries
- Check for homogeneity and reflectivity
- Connected PV Boat View: Heat map of the entire boat, i.e., defect visualization with respect to each wafer position in the process.



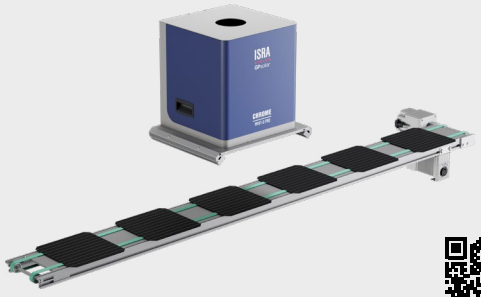
### Color and Coating Monitoring

- Check for homogeneity and color value
- Check for coating defects: Color deviations, color defects, stains, local deviations in coating thickness
- Connected PV Boat View: A map generated through the assignment of defects to the respective wafer position during the coating process visualizes the spatial distribution of defective or conspicuous cells.



## Print / Plating / Pattern & Structure Inspection

- Evaluation of the print process in terms of positioning and print quality
- Check for print defects such as finger interruptions, thickenings, paste stains, smearing
- Alignment control of the laser and print pattern



## Microcrack Inspection

- Non-contact microcrack detection
- Check for contour defects and bulk material inhomogeneities
- Applicable for incoming wafer inspection and all following processes
- Cumulative defect overlay for identification of systematic faults (handling/processing)

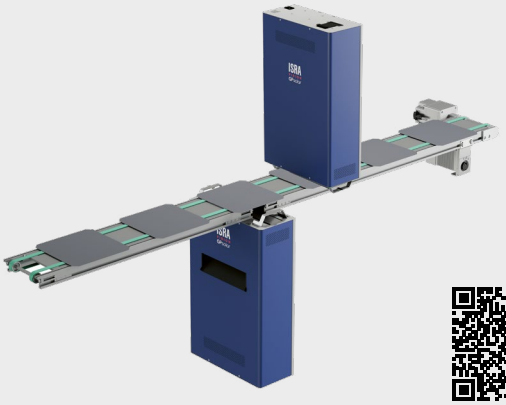
## Inspection & Classification

- Inspection of arbitrary print patterns for front, rear, dual, double, bifacial, IBC, or plating
- Inspection of single and multi-layer coatings for color impression and coating defects of print, coating, and cell surface
- Alignment control of the laser and print pattern

## PL Cell

Laser-free, patent pending!

- Easy to integrate into new or existing production lines and at various process steps (post-coating, final inspection)
- Trace back and correct defect causes



## PL String Inspection

- Easy to integrate into new or existing production lines and at various process steps
- Trace back and correct defect causes

## Connected Photovoltaics 4.0

To be an industry leader in the production of photovoltaic cells, companies must offer more than flawless product quality: Perfectly coordinated processes across systems, production lines, and factories form the basis for maximum profitability, safety from failures, and short downtimes.

To achieve this goal, we have developed **Connected Photovoltaics 4.0.**

The cloud-based software solution connects inspection systems and enables consistent quality settings in all production plants. It creates transparency, improves process control, and increases the profitability of PV production.

With its multiple software modules, Connected PV 4.0 meets the main challenges in PV manufacturing.

### Central Recipe Management

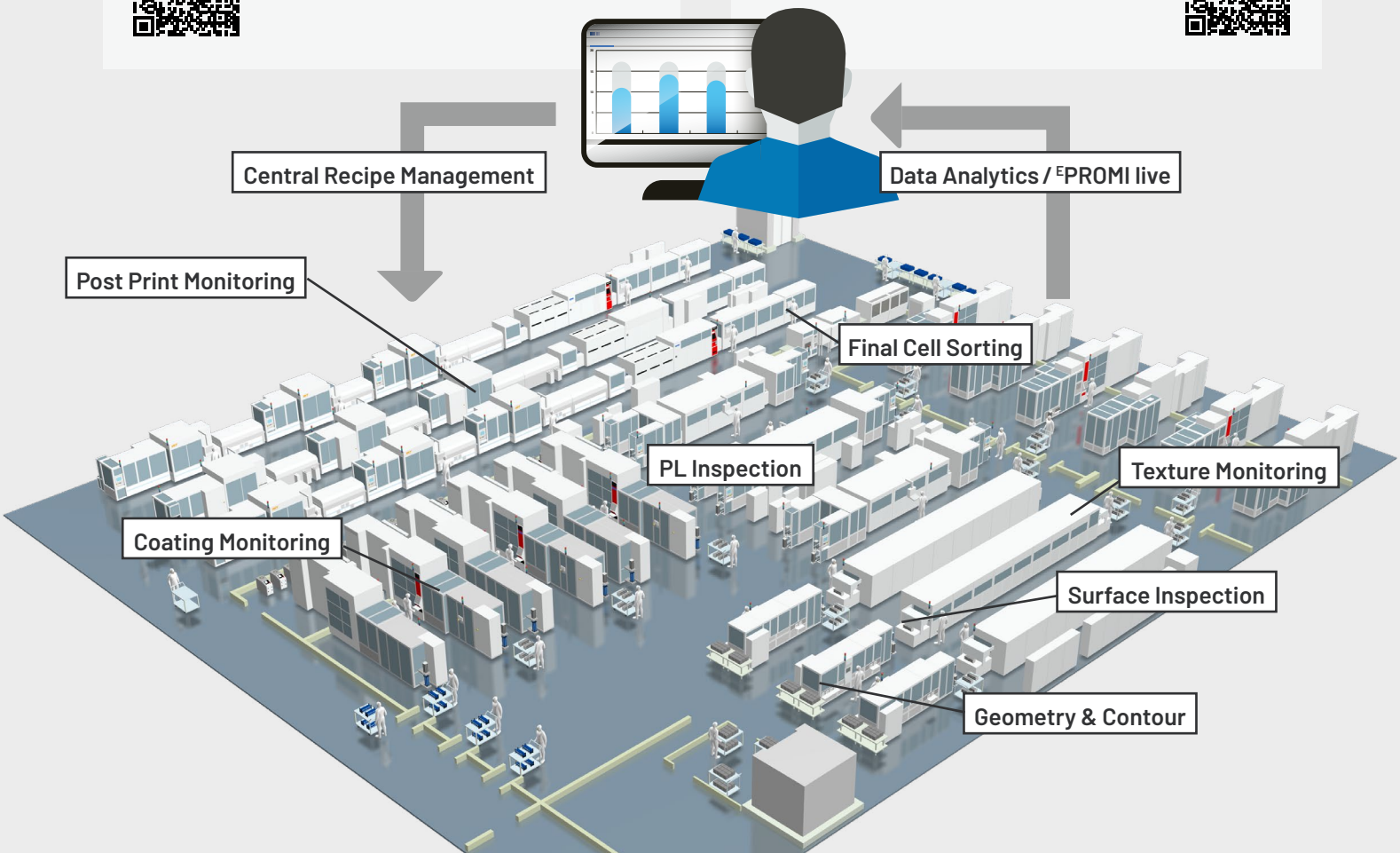
The **Central Recipe Tool** centrally implements recipe adjustments, including version control and releases.

- Central editing of recipes and rollout by a mouse click
- Uniform quality settings on each system for comparable production performance
- Higher productivity with reduced engineering time per line and system
- Fast recipe roll out in new lines during ramp up; less time, less effort, lower costs
- Higher quality and reliability: Avoid mistakes doing redundant work

### EPROMI live

**EPROMI live** makes data analysis much more intuitive, and flexibly adaptable to your needs. With **EPROMI live**, you browse your production data the way you want and wherever you want: with maximum depth of detail and comprehensive data differentiation or just with a quick overview, always independent of device and location. Individually configured dashboards provide the desired information at a glance and ensure 100 % production and quality transparency for PV manufacturers.

- Central online display and permanent status control
- **Boat view:** Machine insights with batch-based vizualisation of the cell values (heat map)
- **Yield view:** Identify process weaknesses in real-time

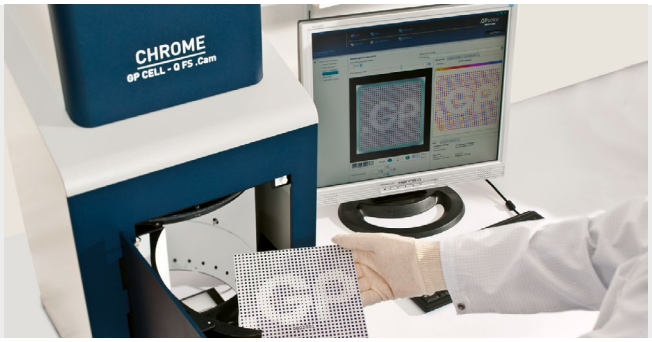


# Being PVisionary ...

... means always being up-to-date in technological terms and new requirements.

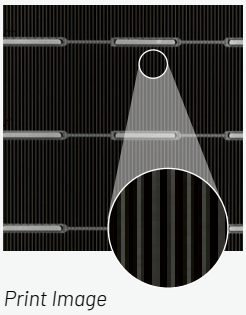
At ISRA VISION / GP Solar, we are among the pioneers of PV inspection, whose development we have decisively shaped and driven forward. Based on our expertise in the entire PV production process, we provide our customers with fast ramp-ups, valuable process analysis, and maximum performance.

In doing so, we are always anticipating new developments and thus ensuring the competitiveness of our customers. Today, our customers benefit not only from globally unique inspection solutions but also from our comprehensive process analysis and technical assets.

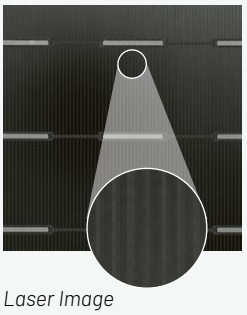



## Calibration Management

**Calibration: The basis for quality across systems**
An exact initial calibration of all systems lays the foundation for ensuring identical quality standards across different lines, plants, and locations while using globally valid settings.



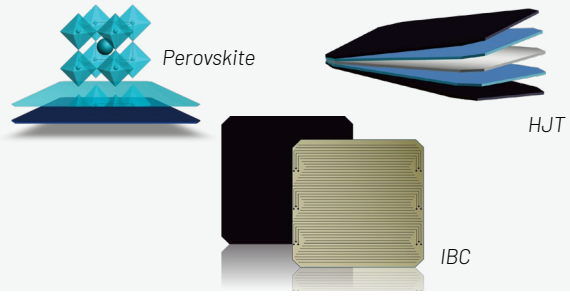
*Print Image*



*Laser Image*

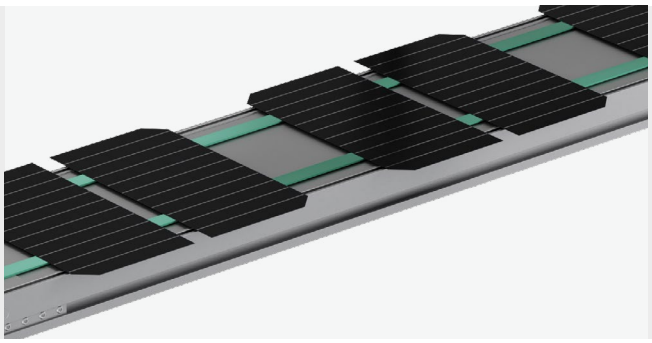
## Alignment Control

Full-surface optical inspection of the print pattern alignments increases production quality and enables highly efficient IBC designs.




## Cell Technologies

Inspection technology from ISRA VISION / GP Solar is ready for standard and advanced cell technologies like IBC, HJT, Perovskite, and TopCon. Specific illumination setups and the most comprehensive defect catalog in the market allow for minimum overkill and underkill.



## Half Cell Inspection

Whether it's half cells, triple cells, or even shingles – ISRA VISION / GP Solar provides the flexible inspection solution to inspect all kinds of sub-cells in a single image and get separate classification results.

And ISRA VISION / GP Solar also provides inspection to analyze electronic losses caused by cutting sub-cells after diffusion.

ISRA VISION

Part of Atlas Copco Group

Global contacts:

MVS_SOLAR_BR_PV Cell Inspection_EN_2024_05