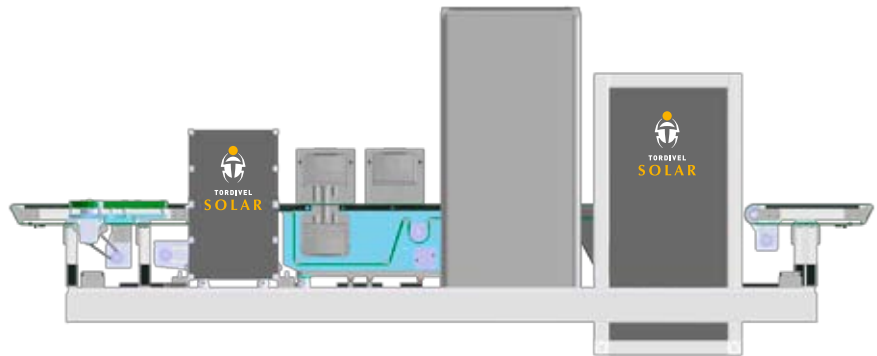




# PRODUCT PORTFOLIO

Tordivel Solar markets a complete range of measurement instruments, system and software for the two first process steps in photovoltaic industry:  
3D measurements of ingots and blocks and inline wafer inspection.



## PRODUCT PORTFOLIO

### SURFACE MEASUREMENT

- Chipping, both sides of wafer
- Edge defects
- Glue residue
- Microcrystals
- Contamination

### TOPOLOGY MEASUREMENT

- Two-sided wafer sawmarks
- Wafer geometry; dimension and corner chamfer measurements

### BOW MEASUREMENT

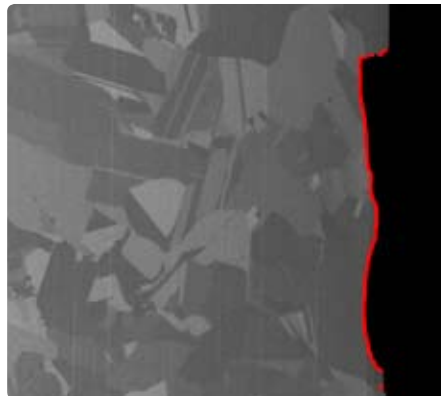
- Wafer bowing

### 3D MODELLING

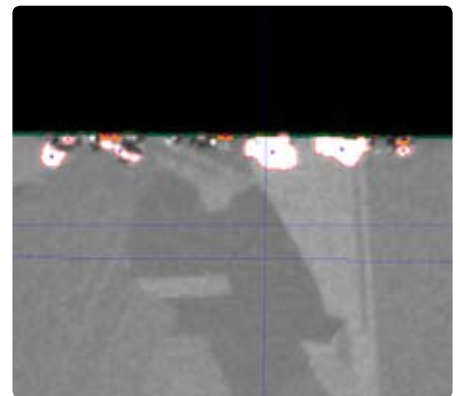
- Modelling of ingots and blocks

## SURFACE MEASUREMENT

The solar cell wafer surface measurement system is a complete system for surface quality control. The wafers are checked for chipping, edge defects, corner shape, glue residues, microcrystals and contamination.



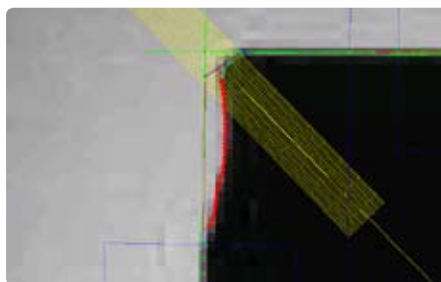
Edge defect



Chipping

EDGE DEFECTS are visible from both sides of the wafer.

CHIPPING is missing material visible from one side of the wafer. The system is able to distinguish between shiny marks and chipping. The size of the chipping is measured.



Corner shape



Glue residue

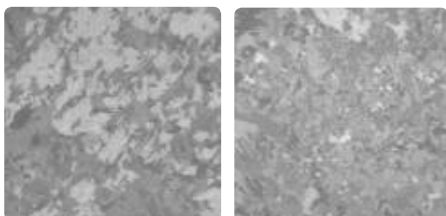
## ABOUT TORDIVEL SOLAR AS

Tordivel Solar AS is a complete supplier of inline and offline inspection and measurement systems for wafer production.

Our systems are based on long experience in wafer inspection applications.



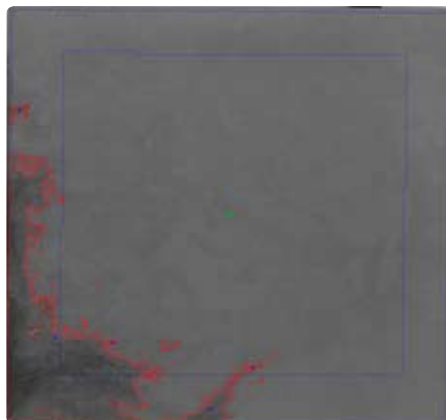
**MICRO CRYSTALS** are detected if a minimum number of crystals are present within a certain area anywhere on the wafer. The wafers are classified using an advanced Scorpion Vision Software® texture matcher tool.



*Wafers with microcrystal*

**CONTAMINATION AND  
MICRO CRACK MEASUREMENT**

We are scanning the wafer for **CONTAMINATION AND MICRO CRACKS**. Special purpose lighting removes crystals in the image and the contamination and cracks are clearly visible on the wafer image. The contamination coverage in % is measured.



*Wafer with contamination area*

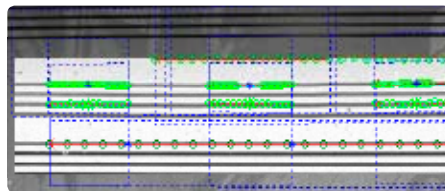
**FOR MORE INFORMATION:**

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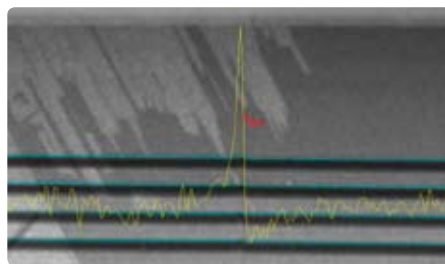
**TOPOLOGY MEASUREMENT**

The solar cell wafer topology measurement system is a complete system for geometry and two-sided sawmarks measurements.

**SAWMARKS** are measured using a patent pending and unique shadow measurement technique, cancelling the effects of the crystal pattern.

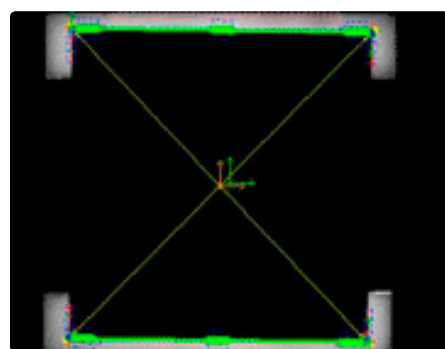


*Advanced image processing algorithms work on the shadow images and find sawmarks with high accuracy.*



*Wafer sawmark*

The wafer **GEOMETRY** is found based on the distance between parallel edges measured in two planes, the length of each edge and the length of the diagonals. In case of a broken wafer, the largest usable rectangle is calculated. The resolution is better than 0,01 mm on all length measurements.

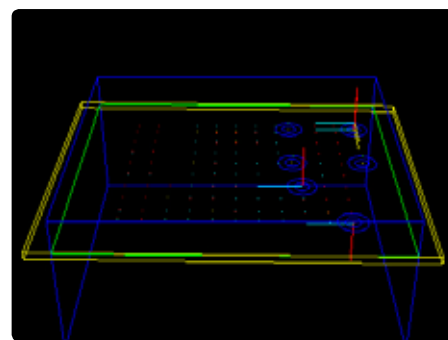


*Wafer geometry*

**BOW MEASUREMENT**

The 3D solar cell bow measurement system performs automatic measurement of the surface bow of solar cells and wafers.

Measurement is performed using a three dimensional technology based on a multi line laser, one camera and advanced signal processing algorithms for 3D measurements. From the 3D model a height map and the maximum bow is calculated.

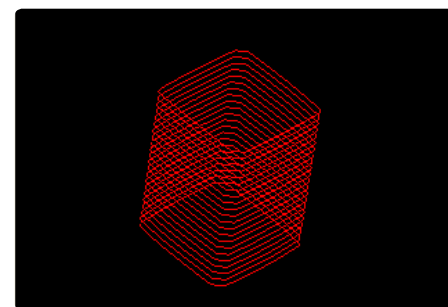


*3D model of wafer bowing*

**3D MODELLING**

Our 3D Scanner, makes accurate 3D **MODELS** of wafer blocks and ingots, measuring and finding defects with a resolution down to 0.01 mm. On wafer blocks, the system is measuring side parallelism, width, height, angles and side flatness.

The 3D scanner is based on multiple laser triangulation profiles working in a common 3D coordinate system with the highest accuracy. The 3D model can be exported to CAD systems for further manipulation.



*3D model of wafer block*