# Solar Cell Wafer Sawmarks Measurement System

The Solar Cell Wafer Sawmarks Measurement System measures wafers with low noise, high sensitivity, high repeatability and high resolution. Unique shadow measurement techniques, cancelling the effects of the crystal pattern, and Scorpion Vision Software® are used to find the wafer sawmarks.

The system is based on the third generation 100% automatic quality control systems running at REC Wafer's plants in Glomfjord and at Herøya, Norway, since 2001.

Application Areas

Semiautomatic quality control of sawmarks on Solar Cell Wafers.
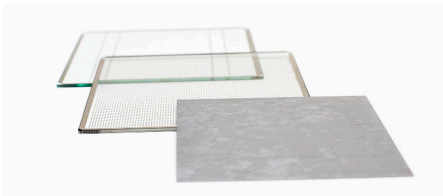
The cabinet contains a complete wafer inspection system with desktop robot, cameras, illumination, wafer fixture and computer running Scorpion Vision Software.

Specification

- Sawmarks are measured with a profile resolution of 45 micron. This means that narrow marks with a width of 140 micron are measured.
- The maximum sawmarks detected with a 1 mm window is measured from 2 - 120 microns with 1 micron repeatability.
- Wafer sizes from 100 to 300 mm
- Measurement time is 5 seconds
- Classifies wafer in A, B and Recycle categories with user defined limits
- Scanning with user defined output

Automatic Wafer Measurement

Automatic wafer measurement is perfect for sampling tests and for learning wafer characteristics.

The measuring procedure is in short as follows:
- Choose the wafer size
- Place the wafer in the fixture
- Press Start
- Wafer is positioned under the camera
- The maximum sawmark is calculated from two profiles typically 10 mm from the wafer edge on both sides. (The distance is configurable on-line.)
- The largest sawmark is indicated on the wafer.
- The wafer moves in unload position.

The wafer measurement system can easily adapt to be part of a production line system.

Place the wafer in the fixture and the desktop robot positions the wafer under the cameras and grid.
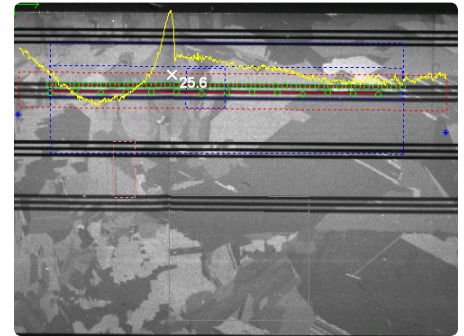
Screen image showing typical sawmark changes across a solar cell wafer. A 25.6 µm sawmark is found.

Manual Wafer Scanning

In interactive mode the operator can verify how the sawmarks develop over the wafer. Large sawmarks will often have a large gradient towards the edge of the wafer.

The manual measurement procedure is like this:

- Load wafer
- Select where on the wafer to look for sawmarks
- Press Start
- The maximum sawmark is calculated from two profiles the selected distance from the wafer edge on both sides.

To verify online measurements, the operator can easily measure and quantify the largest sawmark on the wafer.
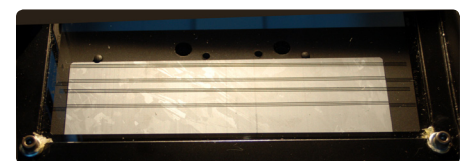

Wafer sawmarks measurement.

Results

For each measurement these values are given:
- Maximum Sawmark
  - Height 1 mm Window - [micron]
  - Height 2 mm Window - [micron]
  - Height 3 mm Window - [micron]

The width of the window is configurable. The gradient is given in micron/mm. This is useful when comparing sawmarks of different heights.

The operator can also interactivly zoom in and measure the profile on the sawmark curve in the image.
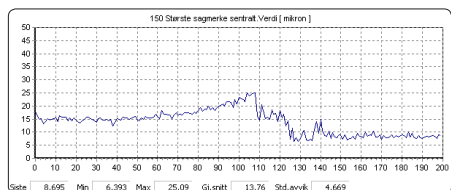
Curve on largest sawmark.
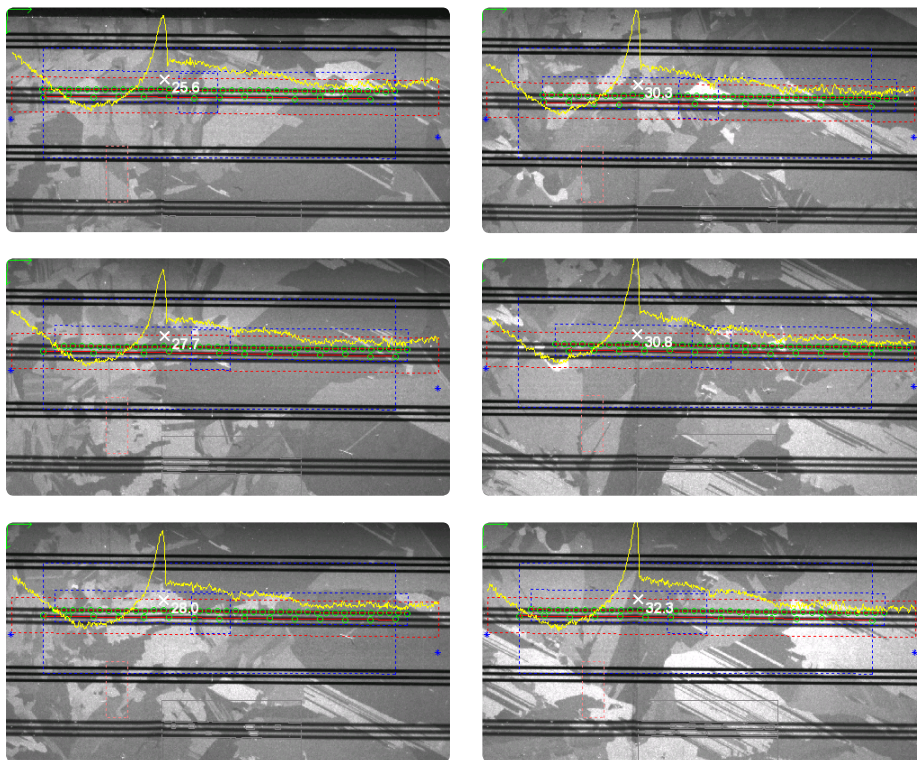
Screen images showing sawmark changes from 25.6 to 32.3 µm across a solar cell wafer. The sawmarks are measured 10, 20 and 30 mm from the edge (left column images) and 40, 50 and 60 mm from the edge (right column images).

Technical Data

Computer System
- 19" Sony TFT 1280 x 1024
- Industrial IPC, P4 3.0 GHz
- 2 Gbyte memory
- Raid 1 - Dual SATA 160 Gbyte HD

Software
- Windows XP SP2
- Scorpion Vision Software® with Sawmarks module
- Solar cell wafer Profile

Cabinet
- Height 116 cm
- Width 55 cm
- Depth 60 cm

Robot system
- Sony Robokid
- High precision shadow grid
- Mechanics

Camera system
- 3-6 pc Sony XCD-910
- 3-6 pc 35 mm Fujinon lenses
- Trigger unit for image synchronization
- One halogen illuminator

Language Support
- English and Norwegian

For more information:

Tordivel AS
Phone +47 2315 8700
Fax +47 2315 8701
office@tordivel.com
www.scorpionvision.com

Specifications might change without any notification.

Scorpion Vision Software® is a registered trademark of Tordivel AS.