2012-04-25

Product Information

SCHMID's Metrology Sorter Becomes the Key Equipment for Process Control in Wafer Manufacturing

- SCHMID has managed to catch up with the market leaders and excels with customer specific solutions and excellent service availability.
- Diamond wire compatibility and mono-like grading enriches latest machine concept.
- Optional analyzer software is a competitive advantage for wafer manufacturers.

Fig. 1: Wafer Metrology Sorter System

The trend in wafer production goes right from the final inspection to the process control. There is nothing more important in the long process of crystallization and cutting as the prompt recognition of the effects on the wafer quality, to identify the origin of different defects such as µCracks or chipping and to control the causally related processes. For this purpose SCHMID's analyzer software compiles the measurement data of the finished wafers in a three dimensional brick, which establishes the basic information for the specific intervention in the upstream production steps.

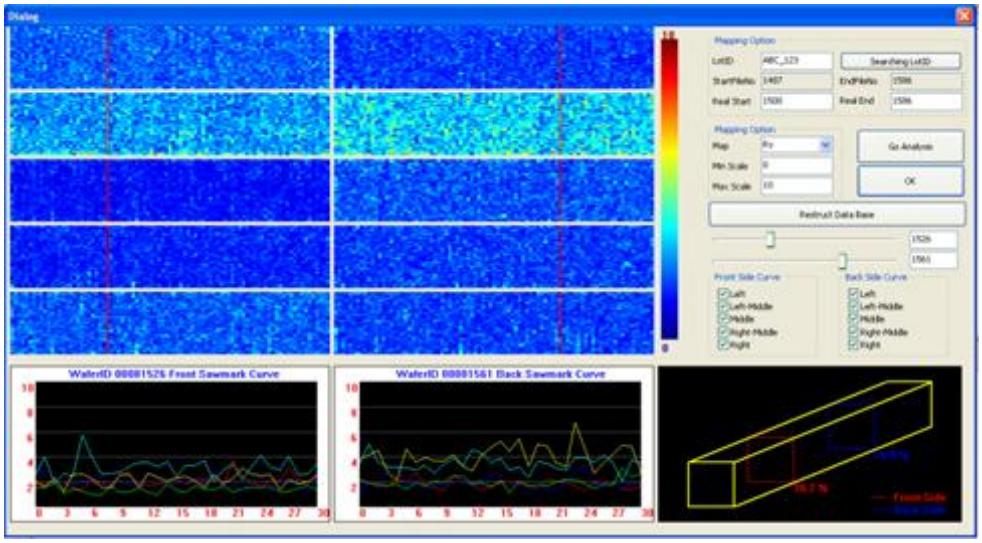

Fig. 2: User friendly brick analysis with the Wafer Production Analyzer

SCHMID's Metrology Sorter has only been available for a short time with its own developed Wafer Production Analyzer Software for thickness, TTV and roughness. The display of chipping, stains and µCracks in the brick is currently being developed.
In cooperation with a wire cut manufacturer the analyzer software was first put into operation in the middle of last year in an Asian technology center and has since then been used for the further development of the diamond wire cut. The visual display of the surface roughness distribution on a wafer as well as the distribution on all the wafers in the entire brick allows important conclusions to be drawn about the cutting parameters. The optical preparation of a multitude of measurement data is therefore always clearly arranged and the software operation proves to be intuitive.

Upon request the machine can be inspected and tested. Otherwise the Metrology Sorter can be seen at the SNEC 2012 in Shanghai.

SCHMID offers complete Turnkey solutions for the entire wafer production process from crystal growing to inspection and sorting. The Metrology Sorter is the on-the-fly inspection in the SCHMID Wafer Backend, which also includes upstream machines like *Precleaning + Degluing, Singulation* and *Horizontal Wafer Cleaning* and the necessary handling machines and covers all processes after the cutting with SCHMID's own equipment. The advantages of the Inline package solution are the excellent cleaning results, low breakage rates, higher machine output of up to 3600 wafers per hour and the possibility of single wafer tracking with the help of software and easy organizational measures. Reliable wafer tracking is required for the retraceability of the wafer position in the brick as well as in the production process throughout the different machines.

All machines in the Backend are available for multi-crystalline and mono-crystalline wafers and are also successfully used in wafer work with the diamond wire cut process with installed equipment of 700 MWp.

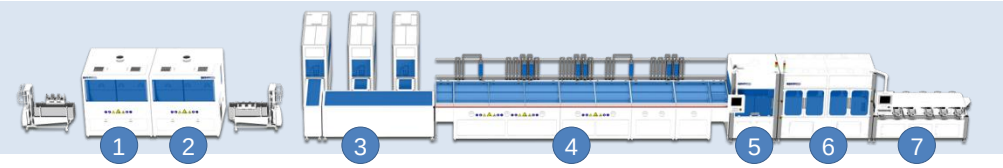

Figure 1: The SCHMID Wafer Backend is designed for all crystalline wafer types, shines with excellent cleaning results and has a low cost of ownership. 1 Precleaning |2 Degluing | 3 Singulation | 4 Final Cleaning |5 Pick+Place | 6 Metrology |7 Sorter | Packing Unit (in development)

The operator can carry out the adjustment from the mono to the multi-wafer with a simple software recipe change without having to do any mechanical modifications. Merely an adjustment of the illumination system is required when switching from slurry cut wafers to diamond wire cut wafers to ensure the inspection performance.
The inspection system also proves to be flexible and user friendly: SCHMID makes a point of considering customer specific quality criteria and process challenges with the composition and the configuration of the measuring instruments and methods, as the Product Manager Manfred Schmitter confirms this. The response to special customer requirements is one of the most important strengths in the quality and process control. The automation which is also normally offered by SCHMID as the Pick+Place Robot for the Inline System, can also be designed for a single machine as a loader for the wafer stack or the customer specific cassettes.

The SCHMID Group member combines competent knowledge in measuring techniques from the PCB area with photovoltaic process experience and solid machine construction from Germany. The Taiwan's location has been selected as the central starting point for the Asian region to stay close to the market in the future.

Summary of the Measuring Stations

Geometry

The geometry station measures all the lengths and angles precisely with the top light procedure. An upgrade for measuring the bow with a laser is also available. For manufacturers of quasi-mono wafers (mono-like wafers) an optional inspection is developed, that optically determines the mono-like surface percentage and assigns the wafer to a pre-defined class.

Thickness, TTV, Roughness, Waviness

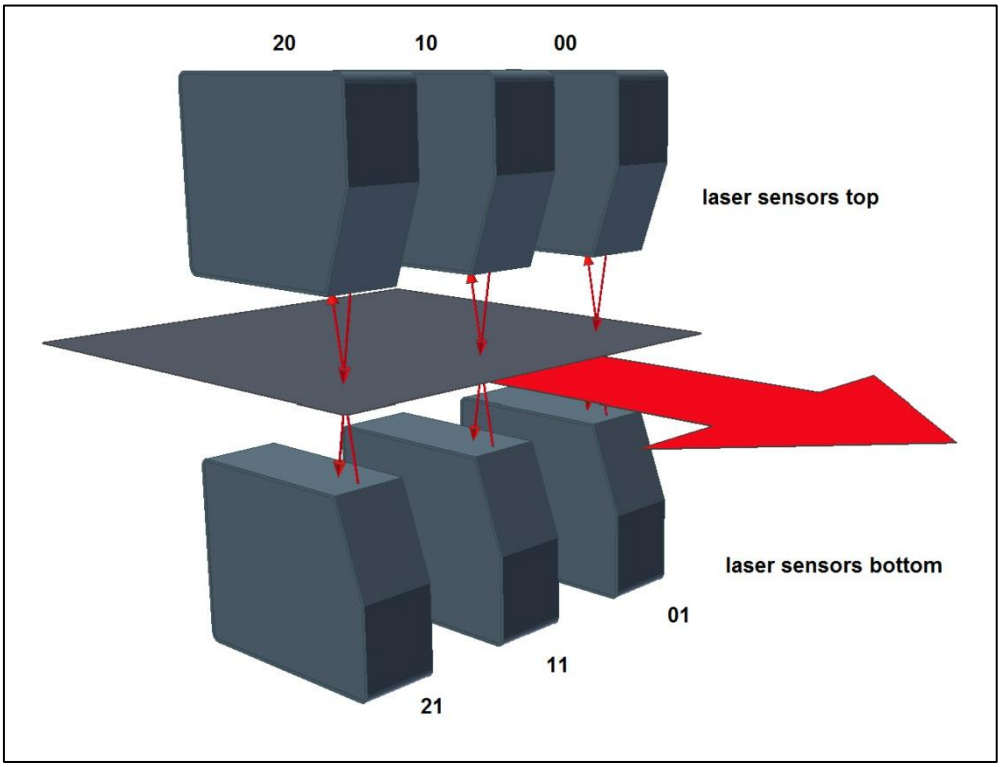

Fig. 3: Sixfold laser triangulation

To obtain a high resolution of just 10,000 data points alongside a 156mm wafer, Schmid sets up cost effective laser triangulation, which is especially qualified for the delicate surface structure of diamond wire cut wafers. Every wafer is scanned the entire length by 3 lasers on the upper and lower side. From the measurement results the four parameters thickness, TTV, roughness and waviness are calculated and visually displayed.

Lifetime & Resistivity

SCHMID optionally integrates the measurement technique of all established manufacturers for lifetime and resistivity measurement in the Metrology Sorter and includes the measurement data in the wafer sorting.

µCracks

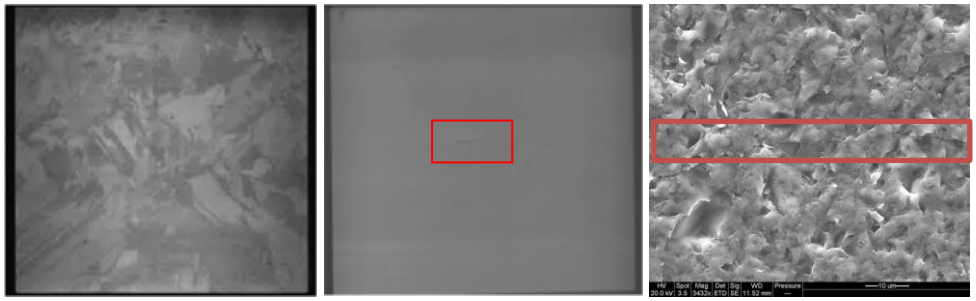

Fig. 4: Multi-crystalline Wafer (left), software removal of grain boundaries and µCrack detection (middle), verification under the electron microscope (right)

For reliable µCrack detection, the software eliminates all the grain boundaries on the multi-crystalline wafers. The reliability of the measurement method has been verified with the electronic microscope. µCracks are also guaranteed to be detected in the edge regions of the wafers.

Holes & Cracks

The Metrology Sorter is an expert in performing the holes & cracks detection using the backlight procedure. Damaged wafers with edge break-offs and pinholes (gas bubbles) are always guaranteed to be sorted out.

Surface

First of all, the measurement station for determining the surface quality checks the cleanliness of the surface. With the help of the user defined scoring system any contamination is classified. A special light source makes sure that any contamination even on the multi-crystalline or the diamond wire cut surface is always detected. Furthermore, the station checks the wafer for chippings – smallest break-offs from the brittle silicon that mainly occur on the edges of the wafers.

Sorter

In the following sorter the wafers are deposited according to the user defined sorting specifications in one of the 12 bins. An upgrade to 18 bins is possible without any difficulty. As an optional feature a barcode-reader and a label printer can be attached to the sorter, so that the wafer tracking and the quality management is made as easy as possible.
An automatic packing-unit is currently being developed to reduce the breakage rate during packaging and the transfer to the cell production line.

Result

SCHMID has managed to catch up with the market leaders with its Metrology Sorter and also excel with excellent service availability in Asia, Europe and USA, simple usability and consequently flexible system configurations for the different needs. The use of a SCHMID Wafer Backend for slurry cut and diamond wire cut wafers with a Metrology Sorter and Wafer Production Analyzer Software offers a key competitive advantage for the wafer manufacturers. A detailed understanding of the influence of the production process on the quality helps to optimize already existing processes and implement new processes as quickly as possible.

About SCHMID Group

SCHMID Group provides highly efficient system and process solutions for the entire solar wafers, cells and modules supply chain. Starting with the single machine right up to the turnkey factory, including guaranteed performance parameters, such as production capacity and degree of efficiency. Innovative process technologies are developed in own technology centers in partnership with universities and research facilities and are made ready for the market.

SCHMID welcomes you to the SNEC: 16th- 18th May 2012 in hall E5, booth 560. A Metrology Sorter and a Precleaning system from the SCHMID Wafer Backend, as well as other systems, will be presented there.

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