Quality Assurance in High-End Semiconductor Production

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PRECITEC WORLDWIDE

- Headquarter in Germany. Including R&D and production. **Both with fast-track capabilities.**
- Worldwide application, service and sales presence. **Particularly strong in Japan, Korea, Taiwan, China.**
- Industrial proven products. Robust, customized, precise, 24/7. **More than 25,000 systems in the field.**
- ~500 employees, >100 million € turnover in 2016. **Reliable family-owned partner.**
PRECITEC WORLDWIDE

PRECITEC OPTRONIK GMBH IN NEU-ISENBURG

- Location: Neu-Isenburg near Frankfurt
- Employee: 85 in Neu-Isenburg
- Turnover 2017: EUR 24 million
- Development: 10% - 20% p.a.
- Industries: Consumer electronics, Glass industry, Semiconductor industry, Medical industry, Plastics industry, Coordinate measuring machines
MARKETS

CONSUMER ELECTRONICS, SEMICONDUCTOR, GLASS, PLASTICS, CMM, AOI …
PASSION FOR PRECISION

• PRECITEC is worldwide the preferred supplier and partner of high-end standard and customized solutions for quality control in production processes of semiconductor and consumer electronics.

• Using our technology, deviations in essential steps of the manufacturing process can be detected.

• Thus, we enable not only a significant increase in the quality of subsystems and finished goods, but also a reduction of time and cost in the assembly processes.

• PRECITEC equipment is currently used in application scenarios in the semiconductors such as:
  • In-line wafer thickness measurement for process monitoring (grinding, CMP, etc…)
  • Fast warpage inspection
  • Bumps and micro-bumps inspection
  • Laser dicing groove inspection
  • In process dicing laser autofocus
  • And many others
Your Applications

PRECITEC Products

Real-time & Sub-micron

CHRocodile, CLS, FSS: Optical Measurement of Topography & Thickness

Your Benefits

Reliable Technology for Online Error Detection

… leading to …

Failure-free Components & End Products

…. allowing you to …

Cut Down on Conventional Quality Control

… finally resulting in …

Reduced Time & Costs in Production

Measurement Examples
INTERFERENCE TECHNOLOGY

- Optical coupler or beam splitter
- Signal processing and calibration
- Spectrometer
- Wave length $\lambda$
- Intensity
- Broad band light
- Both reflections
- Achromatic probe
- Optical Thickness
- $\Delta d$
WAFER TTV

TTV EXAMPLE
SMART MANUFACTURING IN CMP AND GRINDING

Save time and cost by using optical sensors for end point detection!
# FLYING SPOT SCANNER

## MAIN TECHNICAL SPECIFICATION

<table>
<thead>
<tr>
<th></th>
<th>FSS 80 mm</th>
<th>FSS 40 mm</th>
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<tbody>
<tr>
<td>Measurement / second</td>
<td>70.000</td>
<td></td>
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<tr>
<td>Working distance</td>
<td>200 mm</td>
<td>125 mm</td>
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<tr>
<td>Scan area</td>
<td>Ø 80 mm</td>
<td>Ø 40 mm</td>
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<tr>
<td>Lateral resolution</td>
<td>21 µm</td>
<td>6.5 µm</td>
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<tr>
<td>Numerical aperture</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Distance / Thickness</td>
<td>Depending on IT sensor</td>
<td></td>
</tr>
</tbody>
</table>
FLYING SPOT SCANNER – WORKING PRINCIPLE

- Additional Optics
- 2D Galvo Mirrors

movement of measurement spot

measurement sample
175,000 points in less than 3s
TECHNOLOGY

CHROMATIC CONFOCAL - HOW DOES IT WORK?

The different wavelengths are focused along the optical axis.

Chromatic probe
APPLICATION EXAMPLE

- surface of paper
  - area: 0.25 mm x 0.25 mm
  - measurements/second: 14000

- structure:
  - difficult to access

- structure:
  - high tilted surfaces
CHROMATIC LINE SENSORS

CHROCODILE CLS

• White light source for illumination
• Different wavelengths are focused along the optical axis
• Each wavelength corresponds to a certain distance
• Evaluation of reflected wavelength based on spectroscopy
• Line sensor consists of 192 distinct points
GROOVE MADE BY LASER DICING ON A COATED WAFER

OVERVIEW

Extracted profile #1
Depth = 33.97 µm

Extracted profile #2
Depth = 21.39 µm

Thickness of the coating = (33.97-21.39) x 1.5 = 18.87µm
COATED GROOVE

COMPARISON BETWEEN SEM IMAGE AND MEASURED PROFILE

Depth = 21.39 µm
GROOVE PROFILE

3D VIEW
TOPOGRAPHY OF POLISHING PADS

CHECKING THE GROOVE DEPTH IN LINE TO EVALUATE THE WEAR OF THE PADS
TOPOGRAPHY POLISHING PAD

PAD GROOVE PROFILE
WAFER EDGE DEFECT

OVERVIEW

Depth of the defect: 158.8µm
WAFER EDGE DEFECT

3D VIEW
CHROMATIC LINE SCAN CAMERA

FEATURES

- Compact and all integrated concept (no external source)
- Interchangeable chromatic objectives according to the application,
- Large depth of focus (up to 3mm as standard)
- Line camera for real-time acquisition,
- High speed: up to 100kHz (100,000 lines / sec x 2000 pixels = 200Mpixels / s)
- Sharp image on not perfectly flat objects,
- Insensitive to vibrations,
- High contrast on all types of materials,
- Integrated measuring point Z (autofocus tracking and / or profile).
WAFFER CRACK INSPECTION

CHROMATIC CAMERA IMAGE

Microscope view
CMOS DEFECT INSPECTION
Thank you - visit our booth 475 / Hall 4!

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