EV GROUP® | Products // Metrology

Solutions for Metrology
Metrology is essential to control, optimize and ensure the highest yield in semiconductor manufacturing processes. Advanced packaging, MEMS and photonic applications are gaining importance, very often lacking suitable metrology solutions for essential processing steps. Furthermore, overall performance of the device is determined by packaging and back-end-of-line processes; hence, process requirements are getting tighter and need further metrology.

EVG’s metrology solutions for wafer inspection and evaluation are optimized for lithography and all types of bonding applications. As one example, metrology prior to non-reworkable processes like wafer thinning after temporary bonding directly leads to increased yield and process security, where an integrated feedback loop results in a reduction of high-cost wafer scrap.

EVG’s metrology solutions can be integrated in two ways in order to improve production yield:

- Integrated metrology in fully automated production systems for direct feedback and immediate correction of process parameters
- Stand-alone metrology systems with automated pass/fail criteria based on customer specifications and host-controlled feedback loop to all relevant upstream process steps

### EVG Metrology Benefits

#### Adaptiveness
- Multi-sensor measurement mount for highest metrology flexibility
- Sensor set available for multiple measurement ranges and materials
- Self-calibration of measurement units for minimal service and maintenance
- Stand-alone tool or integrated in production systems

#### Handling
- Handling and metrology of various substrate materials, shapes, stress, bow or warp
- Bridge capability for different substrate sizes and carrier-mounted wafers
- Available with multiple load port options and combinations

#### Control
- Feedback loop for correction of process parameters
- Customized pass/fail criteria for automated processing decisions
- Fully integrated SECS/GEM interface

### EVG Metrology Capabilities

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<th>Description</th>
<th>Methodology</th>
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<td>Thickness and TTV of stacks</td>
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<td>Thickness of air gaps (e.g., void detection)</td>
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<td>Thickness and TTV of IR transparent layer</td>
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EVG®20 IR Inspection System (stand-alone tool)
Infrared Inspection Station (integrated module)
- Fast inspection method (especially for fusion bonded wafers)
- Perfect match for fusion bonding processes
- Live imaging
- One-shot inspection of the entire wafer
- Fully automated bond strength measurement
- Optional bond pin for live visualization of direct bonding
- Maszara test compatible
- Void size detection down to 0.5 mm radius

Supported Measurement Options:

EVG®40 NT Automated Measurement System (fully automated stand-alone tool)
Alignment Verification Module (AVM) (HVM-integrated module)
- Versatile measurement options for lithography and bonding metrology
  - Alignment verification for bonding and lithography applications
  - Critical dimension (CD) measurement
  - Die-to-die alignment verification
  - Multi-layer thickness measurement
- High measurement accuracy in vertical and lateral direction
- High throughput due to specialized calibration routine
- Possibility to verify compliance to tight process specifications
- Optimization of integrated process parameters
- Suitable for alignment verification measurements and 3D applications
- PC-based measurement and pattern recognition software for highest reliability
- Optimized version for wafer-level-optics manufacturing available

Supported Measurement Options EVG®40 NT & AVM:

Additional Measurement Options EVG®40 NT:

EVG®50 Automated Metrology System (fully automated stand-alone tool)
Inline Metrology Module (IMM) (HVM-integrated module)
- Highly accurate measurements at high speed
- Utilizing different measurement methods for a large number of applications
- Industry-leading throughput and resolution multi-layer metrology
  - Multi-layer thickness mapping
  - Bond interface inspection
- Low-contact edge handling
  - Particle free
  - Full-area accessible front and back side
- Self-calibrating for better system reproducibility and more productive time
- Various output formats
- 100% production inspection for film thickness and thickness variation
- Meets the most demanding requirements of the yield-driven semiconductor industry

Supported Measurement Options:
EVG Metrology Solutions

Process Control

Direct feedback loop for bond parameter correction - AVM

Feedback loop for temporary bonding before non-reworkable thinning - IMM

Software and Support

The Windows-based, graphical user interface is designed with a strong focus on user-friendliness, and easily navigates the operator through each process step. Multi-language support, individual user account settings and integrated error logging / reporting and recovery can simplify the user’s daily operation. All EVG systems can also communicate remotely. Thus, our service includes field-proven, real-time remote diagnostics and troubleshooting via secured connection, phone or email. EVG’s experienced process engineers are ready to support you anytime thanks to our de-centralized worldwide support structure, including cleanroom space on three different continents: Europe (HQ), Asia (Japan) and North America (USA).
EVG®50 / IMM - Key Features

- Bonded Wafers w/ IR transparent interlayer
  - Total stack measurements:
    - Thickness / TTV / Bow and warp
    - Voids and dimples in bond interface
  - Bond adhesive measurements:
    - Thickness / TTV

- Coated Wafer
  - Coating thickness measurement
  - TTV measurement of coated layer
  - Edge bead removal and edge trim measurement
  (Coating: lithography resist, temporary bonding adhesive, etc.)

EVG®40 NT / AVM - Key Features

- Bonded Wafers w/ IR transparent interlayer
  - Bond alignment verification
  - Intermediate layer measurements:
    - Thickness and TTV
    - Voids and dimples in bond interface

- Top Side Patterned Wafer
  - CD measurement
  - Top side alignment verification:
    - Overlay / Box in box
  - Thickness measurement
  - Die-to-die alignment verification

- Top and Bottom Side Patterned Wafer
  - Top-to-bottom alignment verification
  - Critical dimension (CD) measurement
  - Die-to-die alignment verification

EVG®20 - Key Features

- Bonded Wafers w/ IR transparent interlayer
  - Voids and dimples in bond interface

- Fusion Bonded Wafers
  - Bond strength measurement
  - Live bond wave inspection

- Coated Wafer
  - Coating thickness measurement
  - TTV measurement of coated layer
  - Edge bead removal and edge trim measurement
  (Coating: lithography resist, temporary bonding adhesive, etc.)

Application Examples

- Void detection – EVG®20
- Overlay measurement – EVG®40 NT
- CD measurement – EVG®40 NT
- Post Bond adhesive interlayer
  - TTV measurement – EVG®50
- Radial histogram – EVG®50
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