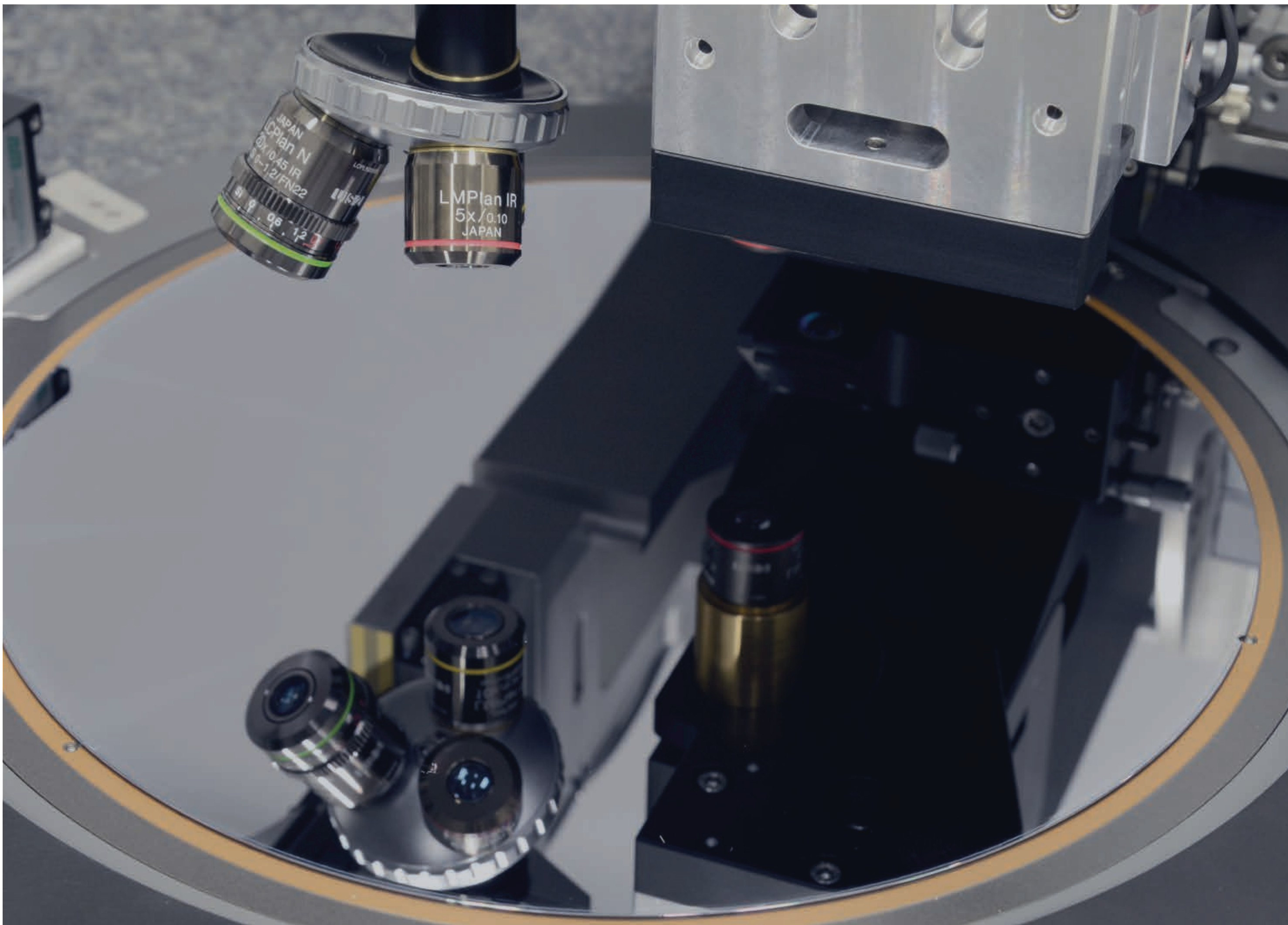
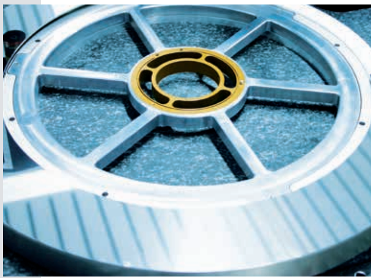
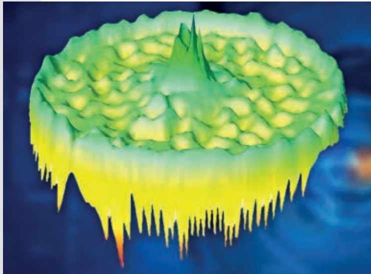
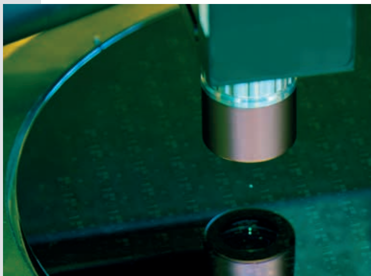
EV GROUP® | **Products** // Metrology

Solutions for Metrology





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

	EVG®20	AVM	EVG®40 NT	EVG®40 NT2	EVG®50
Front-to-back alignment (BSA)			x		
Top side alignment (TSA) Overlay or box-in-box		x	x	x	
Critical dimension (CD)			x	x	
Alignment to bond interface (via IR inspection)			x	x	
Bond alignment with visible light		x	x	x	
Bond alignment with transmitted IR		x	x	x	
Bond alignment with reflected IR		x	x	x	
Thickness and TTV of IR transparent layer			x		x
Thickness and TTV of stacks					x
Thickness of air gaps (e.g., void detection)	x		x		x
Topography			x		x
Bow and warp					x
Bond strength measurement	x				
Die-to-wafer and die-to-die alignment verification			x	x	
Edge bead removal and edge trim measurement					x
Stacked Die alignment verification				x	

EVG®20 IR Inspection System (stand-alone tool)
Infrared Inspection Station (integrated module)

- Full wafer IR inspection module combining yield, bond wave dynamics and bond strength measurement
- One-shot inspection of the entire wafer
- Fully automated bond strength measurement (Maszara test)
- Optional bond pin for live visualization of bond wave propagation
- Void size detection down to 500 µm radius

EVG®40 NT Automated Measurement System Series
(fully automated stand-alone tool)
Alignment Verification Module (AVM) (HVM-integrated module)

- Metrology tools with high measurement accuracy in lateral and vertical resolution
- Versatile measurement options for lithography and bonding metrology
  - Alignment verification for bonding and lithography applications
  - Critical dimension (CD) measurement
  - Die-to-Wafer and Die-to-Die alignment verification
  - Multi-layer thickness measurement
- High throughput

AVM: Integrated Alignment Verification for quick process parameter optimization feedback for fusion and hybrid bonding.

EVG®40 NT: Alignment and CD measurements for Lithography and Bonding where alignment down to 100 nm can verified.
An optimized version for wafer-level-optics manufacturing is available.

EVG®40 NT2: Alignment measurement especially for die to die; die to wafer and wafer to wafer bonding all with enhanced throughput. Metrology and integrated feedback capability for die-to-wafer placement accuracy for collective die-to-wafer as well as direct placement die-to-wafer bonding. Industry leading IR metrology for wafer-to-wafer bonding down to 20 nm alignment.

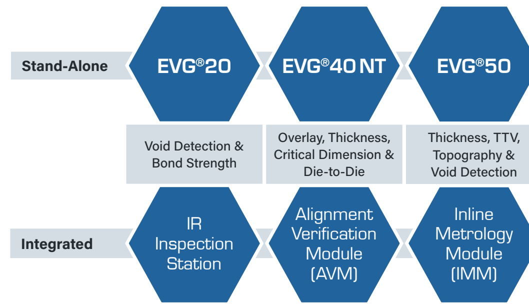
EVG®50 Automated Metrology System
(fully automated stand-alone tool)
Inline Metrology Module (IMM) (HVM-integrated module)

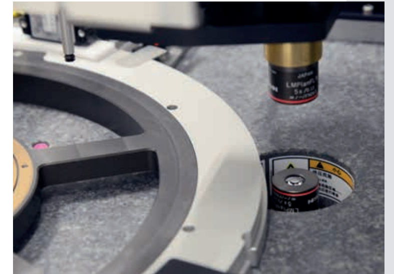
- Highly accurate measurements at high speed
- Utilizing different measurement methods for a large number of applications
- Industry-leading throughput and resolution multi-layer metrology
  - Multi-layer thickness mapping
  - Bond interface inspection
- Low-contact edge handling
  - Particle free
  - 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

EVG Metrology Solutions

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

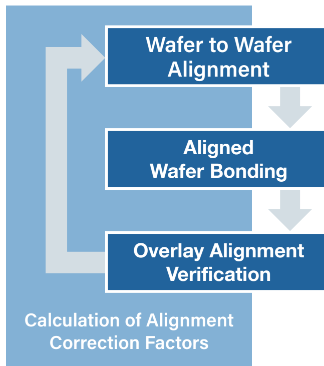
- Stand-alone metrology systems with automated pass/fail criteria based on customer specifications and host-controlled feedback loop to all relevant upstream process steps
- Integrated metrology in fully automated production systems for direct feedback and immediate correction of process parameters



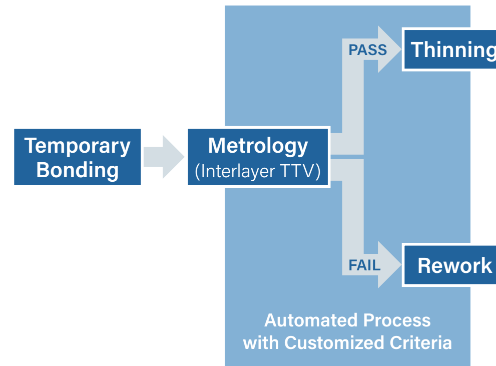


Process Control

Direct feedback loop for bond parameter correction - AVM

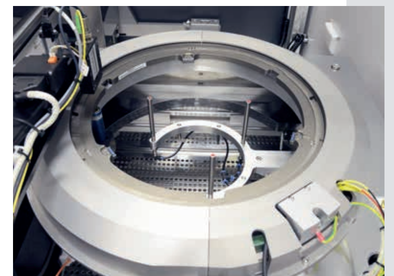


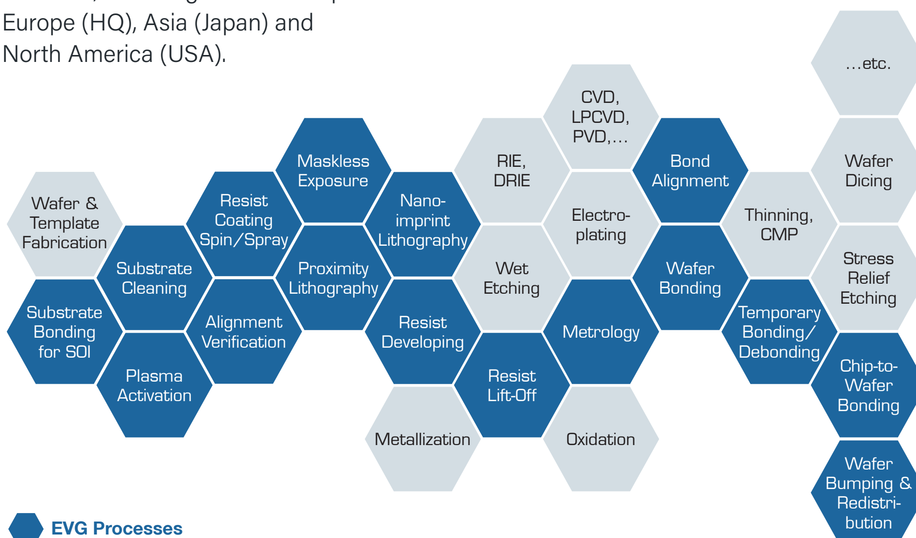
Feedback loop for temporary bonding before non-reworkable thinning – IMM



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®20 - Key Features

Bonded Wafers w/ IR transparent interlayer

- Transparent layer measurements:
  - Voids and dimples in bond interface

Fusion Bonded Wafers

- Voids and dimples in bond interface
- Bond strength measurement
- Live bond wave inspection

EVG®40 NT Series / AVM - Key Features

Bonded Wafers w/ IR transparent interlayer

- Bond alignment verification
- Intermediate layer measurements:
  - Thickness and TTV
  - Voids and dimples in bond interface

Fusion Bonded Wafers

- Bond alignment verification
- Thickness
- 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

Wafer with dies / stacked dies

- Die to die alignment
- Die to wafer alignment
- Die mapping / Die shift mapping

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

Fusion Bonded Wafers

- Total stack measurements:
  - Thickness
  - TTV
  - Bow and warp
- Voids and dimples in bond interface

Coated Wafer

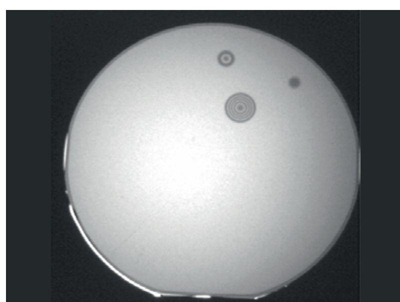
- Coating thickness measurement
- TTV measurement of coated layer
- Edge bead removal and edge trim measurement

(Coating: lithography resist, temporary bonding adhesive, etc.)

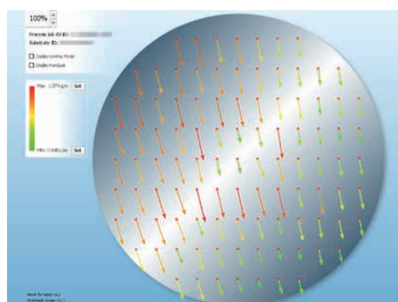
Single wafer

- Thickness measurement
- Total thickness variation (TTV) measurement
- Bow and warp measurement

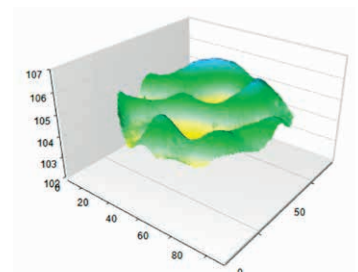
Application Examples



Void detection – EVG®20



Overlay measurement – EVG®40 NT



Post Bond adhesive interlayer
TTV measurement – EVG®50

Headquarters

EV Group Europe & Asia/Pacific GmbH
DI Erich Thallner Strasse 1
4782 St. Florian am Inn
Austria
+43 7712 5311 0
Sales@EVGroup.com
TechSupportEurope@EVGroup.com

EVG Subsidiaries

North America
EV Group Inc.
+1 480 305 2400
SalesNorthAmerica@EVGroup.com
TechSupportNorthAmerica@EVGroup.com

China
EV Group China Ltd.
+86 21 3899 4888
Sales@EVGroup.cn
TechSupportChina@EVGroup.com

Japan
EV Group Japan KK
+81 45 348 0665
Sales@EVGroup.jp
TechSupportJapan@EVGroup.com

Taiwan
EVG-JOINTECH CORP.
+886 3 516 3389
Sales@EVG-Jointech.com.tw
TechSupportTaiwan@EVGroup.com

Korea
EV Group Korea Ltd.
+82 2 3218 4400
Sales@EVGroup.co.kr
TechSupportKorea@EVGroup.com

Get in touch:

Contact@EVGroup.com

www.EVGroup.com/products/metrology

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