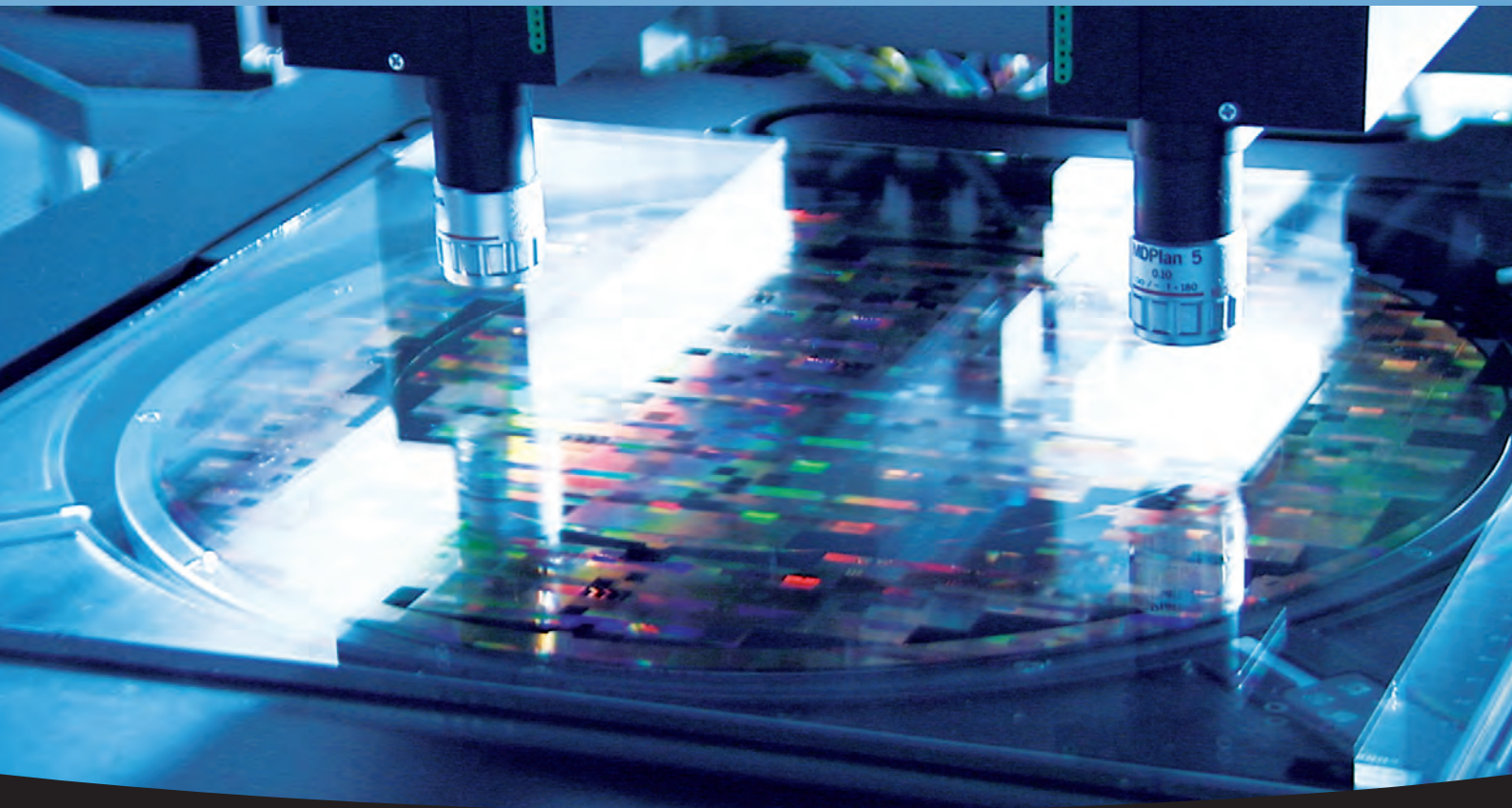


EV Group

Mask Alignment Systems



Introduction

EVG inventions such as the world's first double-sided alignment system in 1985 have pioneered and set the industry standards in double-side lithography and aligned wafer bonding.

EVG maintains the lead in these areas by the continuous introduction of new mask alignment system generations providing the most advanced lithography technology. Accommodating wafers and substrates up to 300mm, varying in size, shape and thickness, the EVG mask alignment system target MEMS, wafer bumping, chip scale packaging as well as all applications in compound semiconductors, power devices, LED and photovoltaic. Automated mask alignment systems are optimized for highest throughput, highest mean time between failures and most reliable print gap settings.

Unique Features / System Configuration

EVG®610 / 620 / 6200° Mask Alignment System

- Wafer sizes up to 150mm / 200mm
- High resolution top and bottom side splitfield microscopes for double-side alignment
- Handling of multiple wafer sizes with quick change-over time less than 5 minutes
- Soft-, hard-, vacuum contact and proximity exposure
- Unique wedge compensation system
- Windows® based user interface
- Field upgradeable from manual to automated version
- High degree of automation (multiple send/receive cassettes)
- NT system configuration for improved alignment performance
- Insitu Alignment Verification Software feature

According to the degree of automation, EVG620/6200 can be either equipped with manual or motorized high resolution micrometer spindles for manual, semi-automated or automated alignment mode.

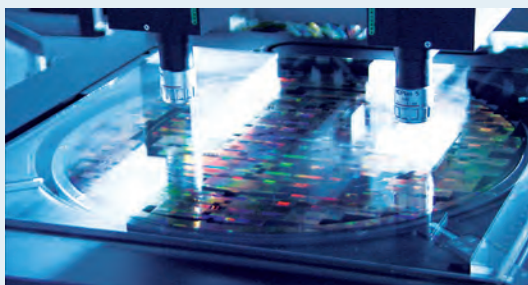
In addition, the lately introduced GEN II system configuration combines lowest footprint and highest throughput for optimized cost of ownership.

IQ Aligner® Mask Alignment System

- Wafer size up to 300mm
- High resolution top and bottom side splitfield microscopes for double-side alignment
- 100% contactless proximity processing capability
- Mask top loading
- Minimized footprint
- Manual or automated substrate loading capability
- Field upgradeable from manual to automated version
- Automated mask handling
- Windows® based user interface



EVG®620HBL Gen II Fully Automated Mask Alignment System



IQ Aligner® Topside mask alignment



EVG®620NT Manual Mask/
Bond Alignment System



IQ Aligner® External wafer thickness
measurement station



EVG®620 Mask Alignment System tooling with universal wafer chuck for manual operation

Special benefits of EVG Mask Alignment Systems

- Ultimate mask protection and precise print gap control with the use of chuck-integrated proximity spacers
- NanoAlign package for enhanced process capabilities
- Insitu Alignment Verification software for increased alignment performance on manual operated systems (accuracy and repeatability)
- Quick and easy conversion for the use as bond alignment system
- Platform for UV-Nanoimprint Lithography applications
- Fast conversion between different substrate sizes
- Solutions for non-SEMI standard substrate handling (warp, bow, thickness...)
- Temperature controlled tooling for runout compensation on IQ Aligner platform
- Multi language user interface



EVG®620 Wafer Handling Module with 5 cassette stations



EVG®610/620/6200™ Platform Insitu Alignment Verification Software

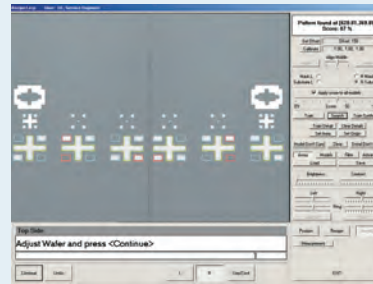
Superior Design

Following the concept of a very open and flexible system platform, the huge variety of EVG mask alignment system configurations provides multiple advantages over conventional mask aligners and projection systems, including:

- Fully motorized splitfield microscopes (autoposition function)
- Motorized exposure and alignment gap control
- Recipe controlled microscope illumination spectrum for optimum pattern contrast
- Unique central pivot wedge compensation unit
- Adjustable contact force for wedge compensation and exposure mode
- Optimum exposure results even with sticky resist, thin and fragile materials such as compound semiconductors (InP, GaAs, SiC)
- High performance lamp house for thin and thick resist processing
- Vector based pattern recognition including EVG proprietary key identification feature, synthetic pattern editor and live image training capability
- Wafer-to-wafer alignment for silicon direct, anodic and thermo compression bonding
- Interchangeable bond chucks for mask and bond alignment systems
- Manual substrate loading capability on fully automated systems
- Various wafer chuck designs for optimum substrate fixing (e.g. for warped, bowed, thinned wafers)



EVG®6200[®] With proximity wafer chuck for square substrates



EVG® Proprietary key identification alignment feature

Automation Option

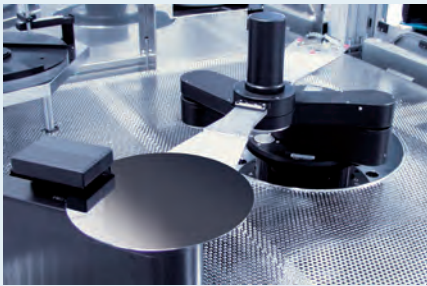
The EVG Mask Alignment Systems can be equipped with a cassette-to-cassette handling system. Together with EVG's autoalign option, these mask aligners become automated alignment systems without disabling the open access for manual operation.

The systems feature remote diagnostics with access to machine functions and provide troubleshooting and system monitoring through network or internet connection.

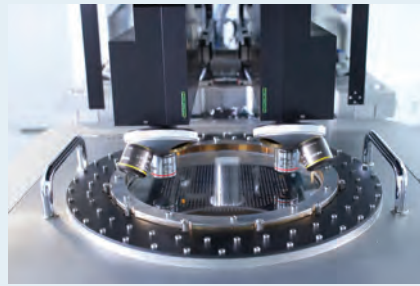
- Automatic alignment (live, offset, large gap, darkfield, infrared)
- 125 wafer-autonomy option for minimized operator assist time
- 100% edge handling capability
- Special robot end effector design for various sizes and materials including ultra thin, bowed, warped and fragile substrates
- Wafer ID reading and cassette mapping for optimum substrate traceability



IQ Aligner® Automated Mask Alignment System configured with 200 mm SMIF Load Ports



IQ Aligner® Automated wafer handling






IQ Aligner® Tooled for micro lens molding for Wafer Level Optics (WLO) applications

Software

Systems are easy to operate with intuitive Windows® based software. An unlimited number of process recipes can be easily managed and stored including basic and enhanced process parameters like microscope configuration and position. The available SECS / GEM II interface allows for fab automation integration.

Special software packages are available for thick resist processing up to several 100 μm and for wafers mounted on carrier systems. Furthermore multi-layer alignment keys can be fully supported with EVG's proprietary key identification feature which additionally focuses on alignment key details.

Technical Data

			EVG®610	EVG®620	EVG®6200 [∞]
					
Substrate/Wafer parameters	Size	2", 3", 100 mm, 150 mm Pieces - 200 mm	2", 3", 100 mm, 150 mm Pieces - 150 x 150 mm	3", 100 mm, 150 mm, 200 mm up to 200 x 200 mm	
	Thickness	0.1 - 10 mm	0.1 - 10 mm (for topside configuration only)		
Mask parameters	Size	max. 9" x 9"	max. 7" x 7"	max. 9" x 9"	
	Thickness	< 7 mm			
General system configuration	Desktop System	Standard			
	System Rack	-	Option		
	Vibration Isolation	Passive	Passive (NT : active)		
Align-ment	Accuracy*	Automatic Alignment	-	Option	
		Top Side Alignment	± 1.0 µm (R&D: ± 0.5 µm)	± 1.0 µm (NT : ± 0.5 µm)	
		Bottom Side Alignment	Option	Option / ± 1.25 µm (NT : ± 1.0 µm)	
		Transmissive IR Alignment	Option/ substrate depending		
		Reflective IR Alignment	-		
		Large Gap Alignment	Option	Option / ± 1.5 µm (NT : ± 1.25 µm)	
		Bond Alignment	Option		
		NanoAlign®	Standard		
	Stage	In situ Alignment Verification	Option		
		Precision Micrometers	Manual	Manual, motorized (option)	
		Wedge Compensation	Automatic, adjustable 5 - 80 N contact force	Automatic, adjustable 5 - 40 N contact force, proximity spacers (option)	
Exposure*	Resolution	Vacuum + Hard Contact ≤ 0.8 µm Hard Contact ≤ 1.5 µm Soft Contact ≤ 2.0 µm Proximity ≥ 2.5 µm			
	Wave Length	200 - 240 nm / 240 - 280 nm / 280 - 350 nm / 350 - 450 nm, filters (option)			
	Mercury Arc Lamp	350 / 500 W	350 / 500 / 1000 W	500 / 1000 / 2000 W	
	Nanoimprint Lithography	Optional tools available for UV-Nanoimprint Lithography and micro contact printing to			
Automation*	Handling System	-	3 cassette stations (5 stations as option) HBL, GEN II: 2 cassette stations field upgradable		
	First Print Throughput	-	up to 130 wph (HBL, GEN II: 220 wph)		
	Automatic Mask Loading	-			
	SECS/GEM II	Option			
Lithography Track System	HERCULES®	-			up to 200 mm

* results achieved with EVG standard process and materials

Options

- Optical Bond Alignment
- Nanoimprint Lithography (NIL)
- Microcontact Printing (µCP)
- Manual / automatic filter changing unit
- Transmissive and reflective IR alignment
- Mini-environment
- Shadow mask alignment
- Simulation software for mask alignment systems exposure process (LayoutLAB from Genlsys)

Process Results

IQ Aligner®



150 mm, 200 mm, 300 mm

0.1 - 15 mm

max. 14" x 14"

< 13 mm

-

Standard

Active

$\pm 0.5 \mu\text{m}$

Option / $\pm 1.0 \mu\text{m}$

Option/ substrate depending

Option / $\pm 1 \mu\text{m}$

-

Motorized

Automatic, adjustable 5 - 100 N contact force,
proximity spacers (option),
100% contactless (option)

500 / 1000 / 2000 / 5000 W

achieve sub 100 nm features

3 open cassette stations (up to 200 mm)

2 SMIF load ports (up to 200 mm)

2 FOUP load ports (300 mm)

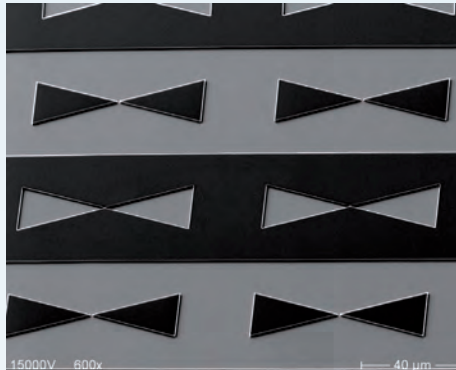
up to 110 wph / 200 mm

up to 100 wph / 300 mm

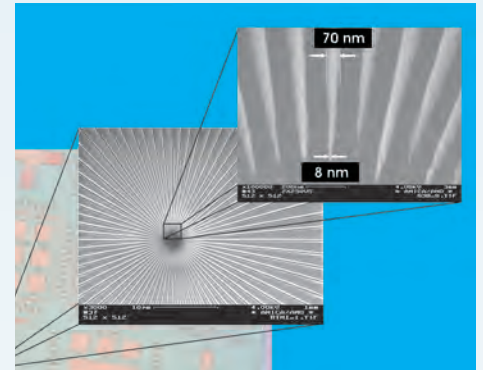
Option

Standard

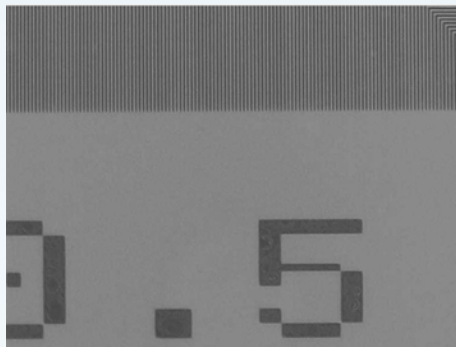
up to 300 mm



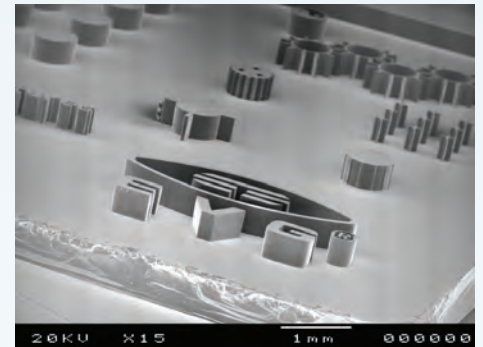
10µm thick positive resist structures
exposed on EVG®620 Mask Alignment System



UV-Nanoimprinting in vacuum
Courtesy of AMO GmbH



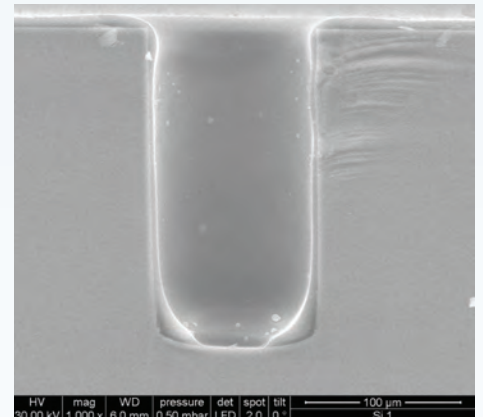
0.5µm line and space exposed with DUV light source



EVG Logo in 400µm SU-8 on 6" Wafer



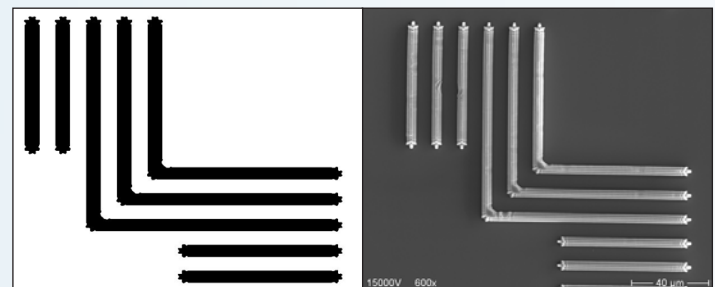
Microlens structures for WLO modules fabricated
utilizing UV-NIL



Via Bottom exposure - 100µm wide, 200µm deep



HERCULES® Lithography Track System
with coat/expose/develop configuration



GenISys Comparison of simulated and real exposed line and space

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