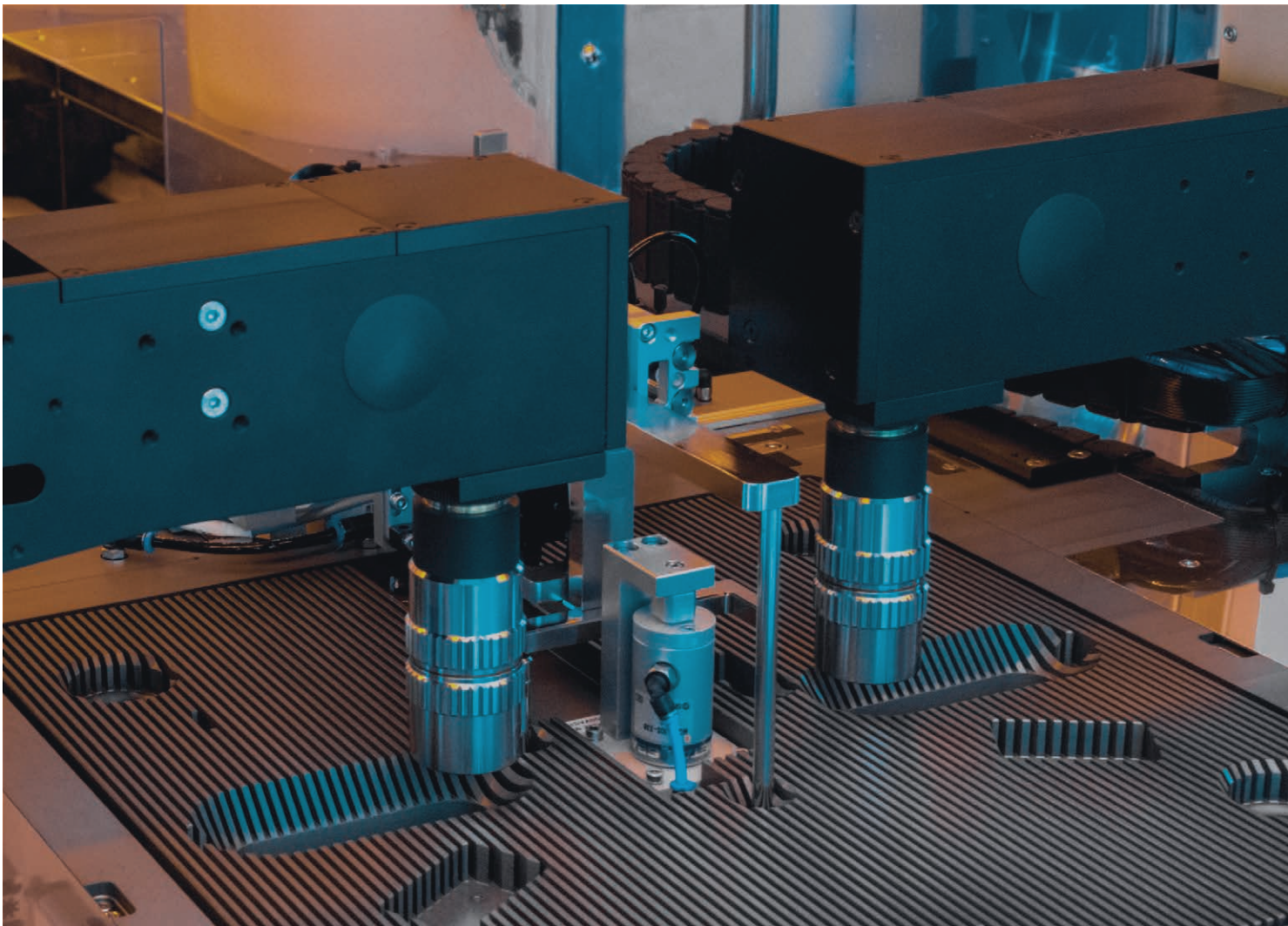
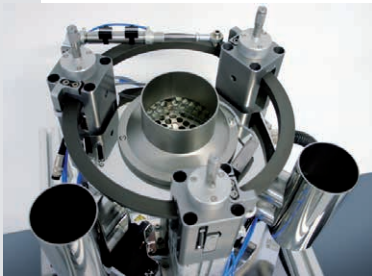
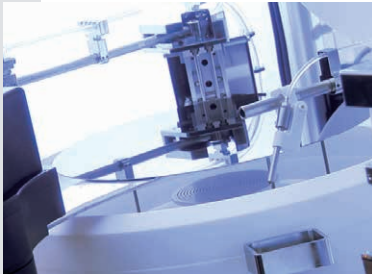


EV GROUP® | Products // Bonding // Permanent Bonding

GEMINI® Series





Introduction

Aligned wafer bonding is an enabling technology for wafer level capping, wafer level packaging, the manufacture of engineered substrates, 3D integration at the wafer level and wafer thinning. In turn, these processes have enabled the amazing growth of MEMS devices, RF filters, and BSI (back side illuminated) CIS (CMOS Image Sensors). Also these processes have enabled the manufacture of engineered substrates such as SOI (Silicon on Insulator).

The mainstream bonding processes are: adhesive, anodic, direct / fusion, glass frit, solder (including eutectic and transient liquid phase) and metal diffusion / thermocompression. Which bonding process is appropriate will depend on the application.

EVG has over 25 years of experience building wafer bonders, has a combined 2,000 man years of wafer bonding experience, and the GEMINI is the industry standard for HVM using wafer bonding.

GEMINI FB (Fusion Bond) performs aligned direct bonding at room temperature and ambient pressure conditions. Because the initial bond is formed when the wafers are brought into contact in the aligner, there is no need for bond chambers. High throughput, best alignment accuracy and small footprint, combined with multiple pre-processing chambers, ensures best performance.

Unique Features

- SmartView® Face-to-Face alignment (Patent No.: US 6.214.692)
- Transparent, backside and IR alignment capability
- Center-to-Center alignment option
- Dedicated high throughput configurations for SiO₂ fusion, Cu-Cu metal diffusion bonding and polymer bonding
- Temporary bonding capability for wafer thinning
- Modular design with swap-in modules
- Flexible development configuration for all Wafer-to-Wafer (W2W) and Chip-to-Wafer (C2W) bonding technologies
- Up to 100 kN bond force available
- Easy cleaning and maintenance through fast access to bond chambers
- ISO 3 (according to ISO 14644) mini-environment, separate pre- and post-bond handling systems

Bond chucks

Bond chucks are used to safely and securely transport aligned wafer pairs to the bond chamber and to remove the bonded wafer pair from the bond chamber. Highly flexible bond chuck designs and materials enable optimization for the chosen bonding process or system customization for special applications.

Software

- Multi-recipe bonding allows the definition of individual wafer paths through the system (recipes, bond chamber, pre-bonding processing steps, bondchucks etc.).
- Multiple module functionality allows the installation of modules with different functionality and specifications for maximum flexibility.
- The GEMINI system is capable of tracking every processing variable for all wafers. For example: which wafer was bonded to which wafer and what bond tool and bond chamber were used.

GEMINI is operated with Windows® based intuitive software. Different login levels with password control access for different users (operator, engineer, development engineer, administrator) are provided. The process of wafer loading, alignment, bonding and unloading of bonded wafers is fully programmable. Bond process control is assured by real time monitoring and data acquisition as well as easy drag and drop recipe editing. Images can be stored, together with the wafer IDs, for later reference.



GEMINI® Automated Production Wafer Bonding System

- Wafer sizes up to 300 mm
- Fully automated and integrated platform for wafer-to-wafer alignment and wafer bonding
- Configuration options for bottom-side or SmartView alignment
- Multiple bonding chambers
- Wafer handling system is separated from bond chuck handling system
- Modular design with swap-in modules
- Combines all benefits from EVG's precision aligners and EVG®500 series systems
- Minimized footprint compared to stand-alone systems
- Optional process modules:
 - LowTemp™ plasma activation
 - Wafer cleaning
 - Coat module
 - UV bond module
 - Bake/chill modules
 - Alignment verification module



GEMINI® FB Automated Production Wafer Bonding System

- Wafer sizes up to 300 mm
- New SmartView® NT3 face-to-face bond aligner with sub 50 nm wafer-to-wafer alignment accuracy
- Up to six pre-processing modules like
 - Clean module
 - LowTemp™ plasma activation module
 - Alignment verification module
 - Debond module
- Optional features:
 - Debond module
 - Thermocompression bond module



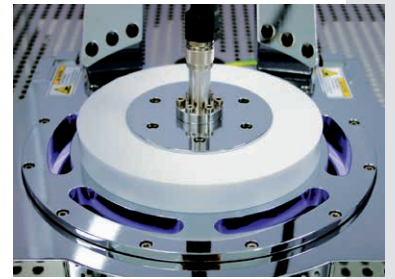
GEMINI® FB XT Automated Production Wafer Bonding System

- EVG's GEMINI FB XT integrated fusion bonding system extends current standards and combines higher productivity with improved alignment and overlay accuracy for applications such as memory stacking, 3D systems on chip (SoC), backside illuminated CMOS image sensor stacking, and die partitioning. The system features the new SmartView NT3 bond aligner, developed specifically for fusion and hybrid wafer bonding alignment requirements of < 50 nm.

Modules

Spin Coat Module

available for GEMINI and GEMINI FB
For application of adhesive layers prior to wafer bonding.



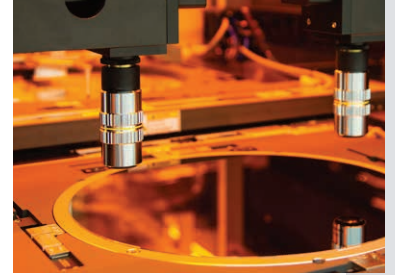
Bake/Chill Module

available for GEMINI
For processing adhesive layers after coating and before bonding.



LowTemp™ Plasma Activation Module

available for GEMINI and GEMINI FB
Plasma activation for PAWB (Plasma Activated Wafer Bonding).



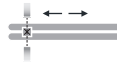
Cleaning Module

available for GEMINI and GEMINI FB
Particle removal with DI water and mild chemical cleans.



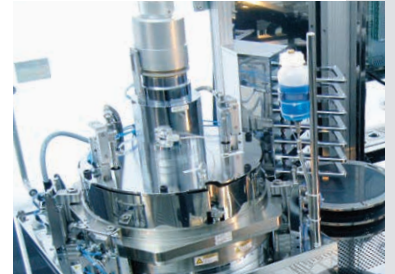
SmartView® NT

available for GEMINI and GEMINI FB
Wafer to wafer aligning prior to wafer bonding.



EVG®500 Series UV-Bond Module

available for GEMINI
Supports UV initiated adhesive bonding.



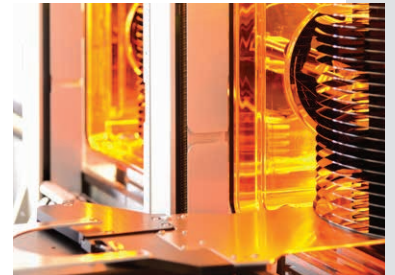
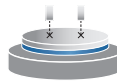
EVG®500 Series Bond Module

available for GEMINI
Supports all mainstream bonding processes other than UV cured adhesive.



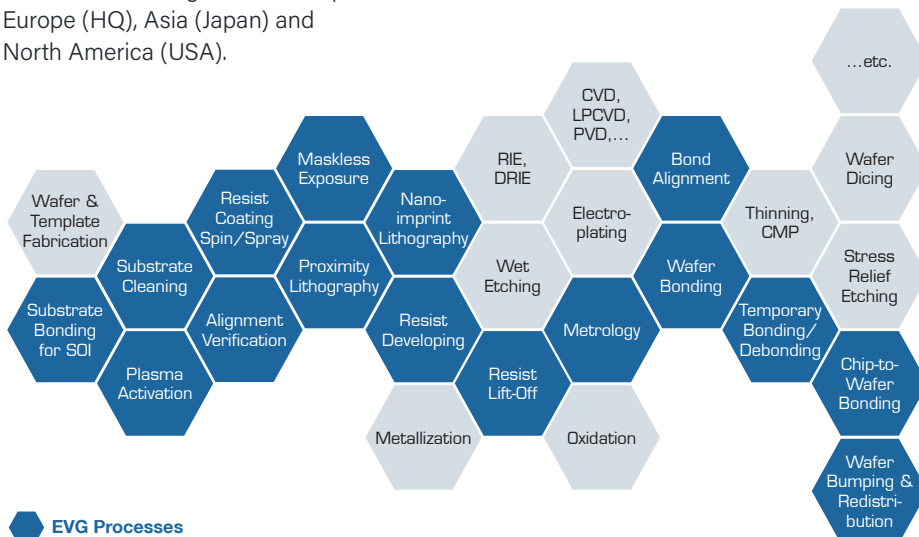
Alignment Verification Module

available for GEMINI, GEMINI FB and EVG560
For verification of correct wafer alignment before and/or after a permanent bond in a bond chamber or equivalent modules (fusion bonding).



Software and Support

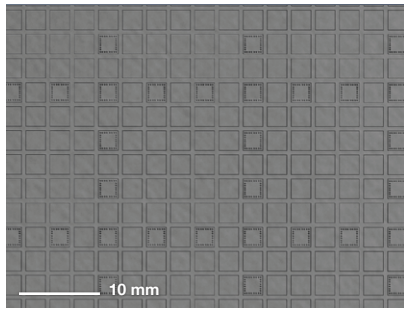
The Windows-based, graphical user interface is designed with a strong focus on user-friendliness, and easily navigates the operator through each process step. Multi-language support, individual user account settings and integrated error logging / reporting and recovery can simplify the user's daily operation. 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).



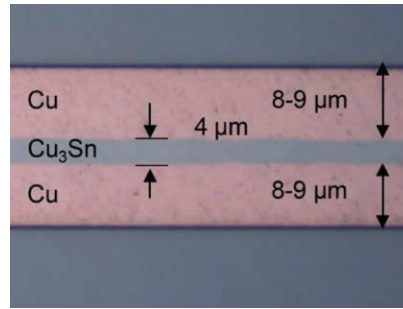
 EVG Processes

Process Results

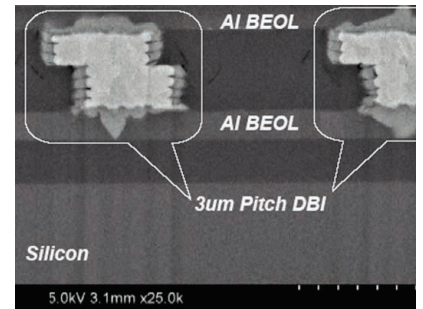
EVG offers fully integrated and highly automated production systems for wafer bonding processes. A maximum level of automation and process integration opens the door to large-scale manufacturing and guarantees a proven transition of processes from R&D stage to production.



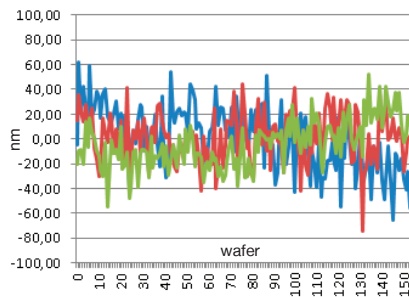
Scanning Acoustic Microscope image of a patterned wafer pair.
Source: Cooperation between EVG and Fraunhofer ENAS



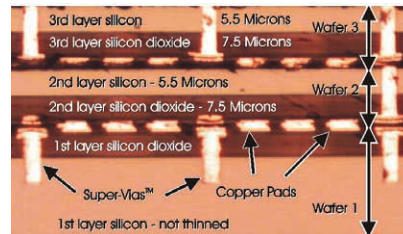
Cross section of a Cu:Sn bonding layer.
Courtesy of Siemens



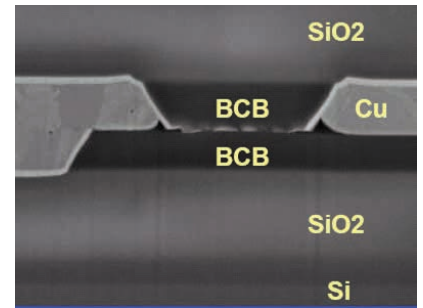
Ziptronix direct bond interface
Courtesy of Ziptronix



Alignment results from marathon tests on EVG SmartView® NT2 aligner demonstrates all wafers aligned at < 100 nm accuracy.



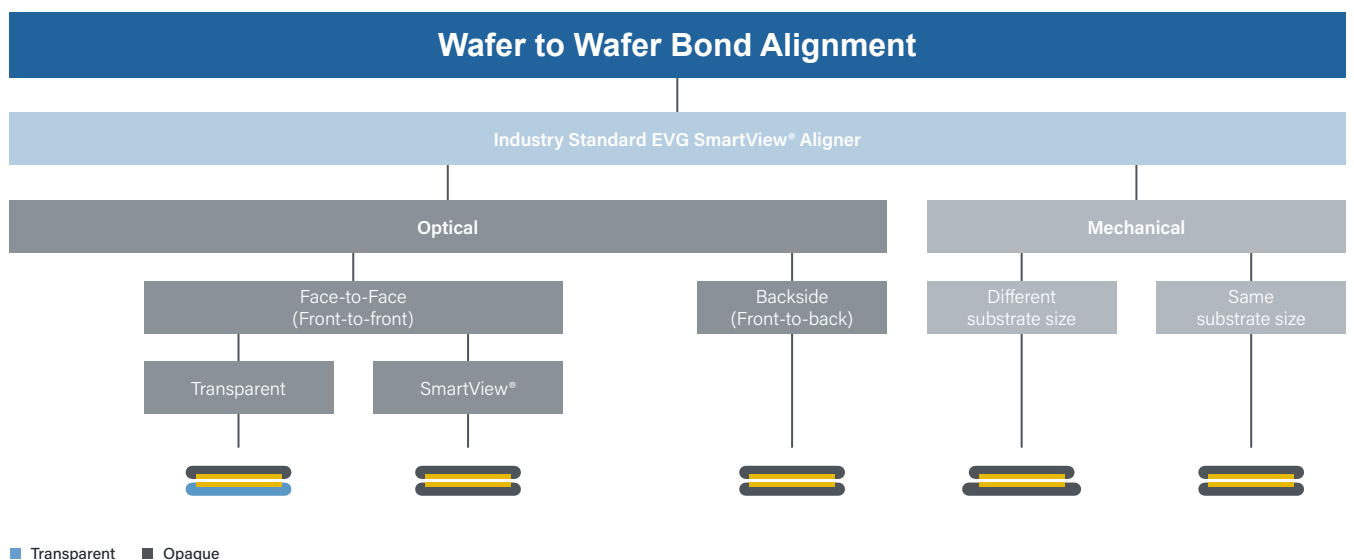
Copper-to-copper thermo-compression bonding
Courtesy of Tezzaron



Metal/Adhesive via-first 3D bonding interface
Courtesy of RPI

Modular Design

The huge variety of bond alignment system configurations provide multiple advantages for various MEMS and IC applications. A large number of different alignment techniques can be supported by either using direct (live) or indirect alignment methods.





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/bonding/permanent-bonding-systems/gemini

The information contained in this document is provided "as is" and without warranty of any kind, express or implied. Any express or implied warranties including, but not limited to, any implied warranty of merchantability, fitness for a particular purpose, and patent infringement or other violation of any intellectual property rights are hereby expressly disclaimed. EVG makes no representation that the use or implementation of the information contained in this document will not infringe or violate any copyright, patent, trademark, trade secret or other right. In no event shall EVG be liable for any claim, damages or other liability, including any general, special, indirect, incidental, or consequential damages, whether in an action of contract, tort infringement, misappropriation or otherwise, arising from, out of or relating to the use or inability to use the information. Acceptance and/or any use of the information contained in this document shall be deemed consent to, and acceptance of, this disclaimer.

Data, design and specifications may not simultaneously apply; or may depend on individual equipment configuration, process conditions and materials and vary accordingly. EVG reserves the right to change data, design and specifications without prior notice.

All logos, company names and acronyms or any combinations thereof, including, but not limited to, EV Group®, EVG® and the Triple i logo, equipment and technology names and acronyms such as GEMINI®, HERCULES®, BONDSCALE®, SmartView®, SmartNIL® and many others, as well as website addresses, are registered trademarks and/or the property of EV Group. For a complete list of EVG trademarks visit www.EVGroup.com/Imprint. Other product and company names may be trademarks of their respective owners.

Printed on paper from sustainable sources

© EV Group (EVG). All rights reserved. V21/01



www.EVGroup.com