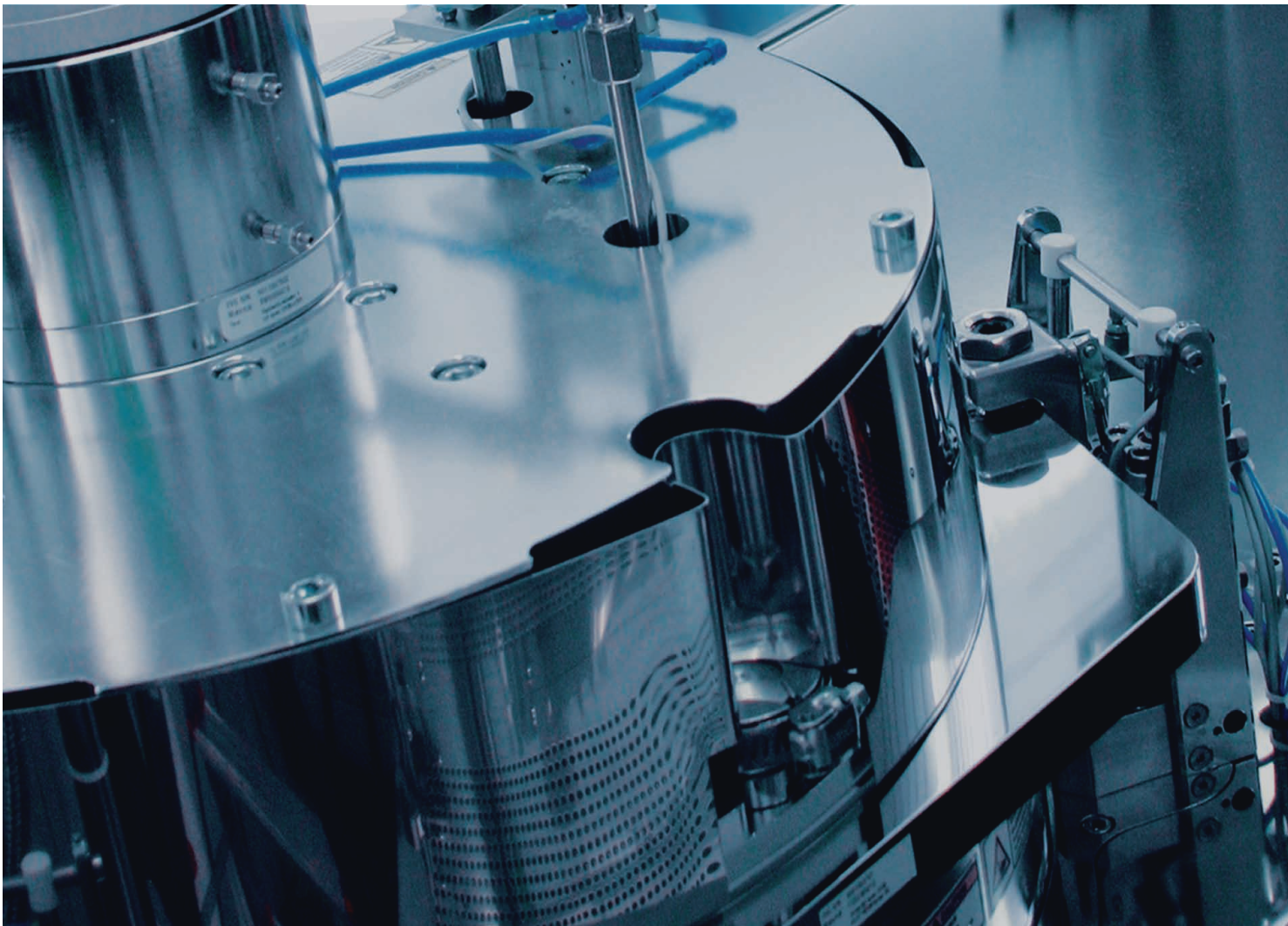
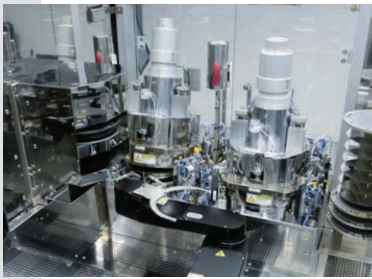




EV GROUP® | Products // Bonding // Permanent Bonding Systems

EVG® 500 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. The EVG500 series can be configured to perform all of these processes.

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.

The EVG500 series can be tooled for single die and wafers from 50 mm to 300 mm depending on the model and heater size. The flexibility of these tools is ideal for R&D through medium volume production, with a simple path to high volume production, due to bonding recipes which can be transferred to an EVG GEMINI high-volume production system.

Bond Chamber

The bond chamber is equipped with a universal bond cover that allows fast evacuation and rapid heating and cooling. Control of temperature, force, time and atmosphere allow most bonding processes to be performed. Anodic bonding can be performed with the addition of a power supply. For UV cured adhesives an optional bond chamber lid has a UV source. Bonding can be performed under vacuum or controlled atmosphere conditions. Independent temperature control of the top and bottom wafer compensates for different thermal expansion coefficients, resulting in stress-free bonding and excellent temperature uniformity. SOI/SDB pre-bonding under vacuum can be performed without hardware reconfiguration.

Bond Chucks

The bond chucks carry the aligned wafer stacks from the aligner to perform the subsequent bonding procedure. Various wafer sizes and bond applications can be handled with a dedicated chuck that fits into each universal bond chamber.

Bonding

EVG®501 / EVG®510 / EVG®520 IS Bonders for R&D

Wafer Bonding

- Anodic
- Adhesive
- Eutectic
- Transient liquid phase
- Thermo-compression

Features

- Substrates up to 200 mm
- Forces up to 100 kN
- Temperatures up to 550°C
- Vacuum down to 1·10⁻⁶ mbar
- Other options: anodic, UV curing, 650°C heaters

Process Services

Wafer processing services on any EVG equipment, including special processes such as

- Plasma activated direct bonding
- ComBond® - conductive bonding of Si and compound semiconductors
- High-vacuum aligned bonding
- Temporary bonding and thermal, mechanical or laser debonding
- Hybrid bonding
- Adhesive bonding
- Collective D2W bonding



EVG®501 Wafer Bonding System

- Optimum total cost of ownership (TCO) for R&D and pilot line production
- Real and low-force wafer wedge compensation system for highest yield
- Unmatched pressure and temperature uniformity
- Automated bond process execution and data logging
- High-vacuum capable bond chamber (down to 10^{-5} mbar with turbo molecular pump)
- Open chamber design for fast conversion and maintenance
- Windows® based control software and operation interface
- Smallest footprint for a 200 mm bonding system: 0.88 m²



EVG®510 Wafer Bonding System

- All of the features of the EVG®501
- Single chamber system for up to 150 mm and 200 mm wafers
- Lowest cost-of-ownership for R&D and pilot-line production
- Unmatched pressure and temperature uniformity
- High yield through automatic wedge compensation
- Recipe compatible to EVG HVM bonding systems
- High throughput with fast heating and pumping specifications



EVG®520 IS Wafer Bonding System

- All of the features of the EVG®501 and EVG®510
- Single or double chamber automated system up to 200 mm
- Automated bond process execution and bond cover movements
- Integrated cooling station for high throughput



EVG®540 Automated Wafer Bonding System

- Single chamber bonder up to 300 mm
- Automatic handling of up to four bond chucks
- Modular bond chamber design
- Active bottom side cooling



EVG®560 Automated Wafer Bonding System

- Up to four bond chambers for various bonding processes
- Automatic loading and unloading of bond chambers and cooling station
- Remote online diagnostics
- Automated robotic handling system for automated cassette-to-cassette wafer bonding with mechanical alignment
- Station layout accepts a wide range of equipment configurations for all bonding processes



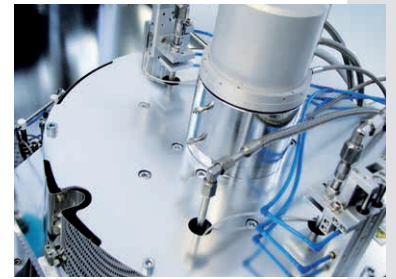
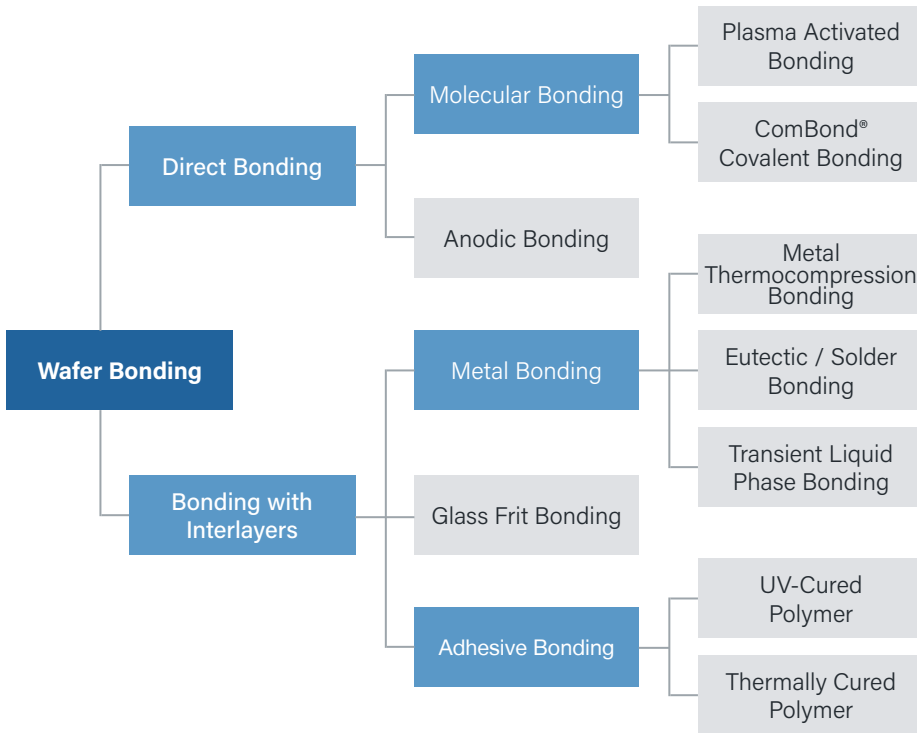
EVG® GEMINI® Automated Production Wafer Bonding System

Leveraging highest-accuracy EVG SmartView NT technology, the top of the line GEMINI high-volume production system combines automated optical alignment and bonding operations at a minimum footprint area.

Please refer to our GEMINI brochure for further details.

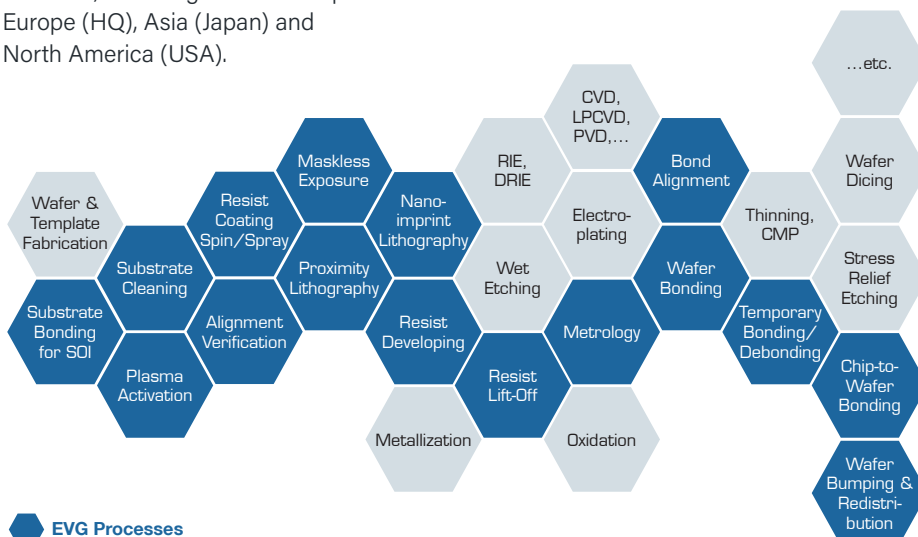
Wafer Bonding Processes on EVG Wafer Bonders

The complete support of the full range of wafer bonding processes is essential for today's and tomorrow's device manufacturing requirements. A general classification of bonding processes is done in terms of bonding with or without interlayer. While for interlayer free bonding the material and surface properties facilitate bonding, for bonding with interlayer the deposition and composition of the bond material determine the properties of the bond line.



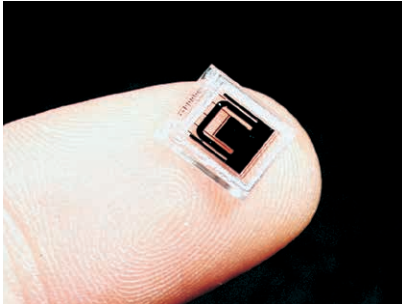
Software and Support

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).

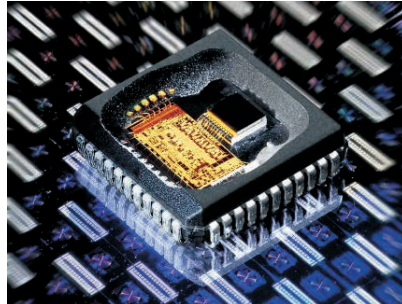


Process Results

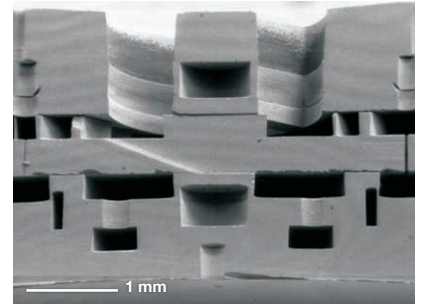
Besides supporting wafer level and advanced packaging, 3D interconnects and MEMS fabrication, the EVG500 series wafer bonding systems can be configured for R&D, pilot-line or volume production. They accommodate the most demanding applications by bonding under high vacuum, precisely controlled fine vacuum, temperature or high pressure conditions. Multiple bonding methods including anodic, thermo compression, glass-frit, epoxy, UV and fusion bonding are covered. Based on a unique modular bond chamber design the EVG500 series allow for an easy technology transfer from R&D to high volume production.



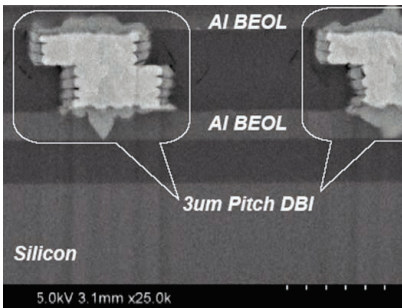
Coriolis effect sensor combining MEMS and microfluidics
Courtesy of ISSYS



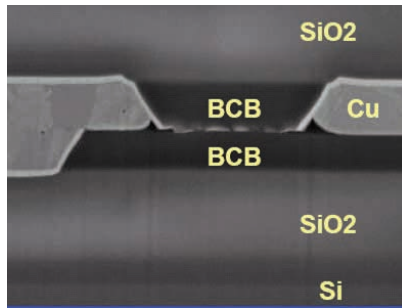
MEMS gyroscope
Courtesy of Robert Bosch GmbH



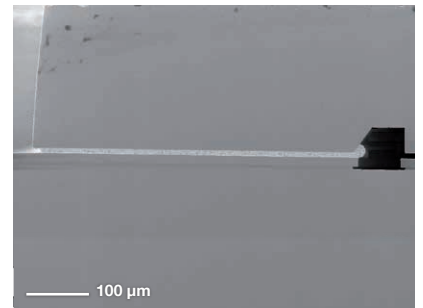
1 μm thick resist with a resolution below 5 μm with a large proximity gap of 50 μm exposed on EVG® IQ Aligner®, REO setup Source: EVG



Ziptronix direct bond interface
Courtesy of Ziptronix



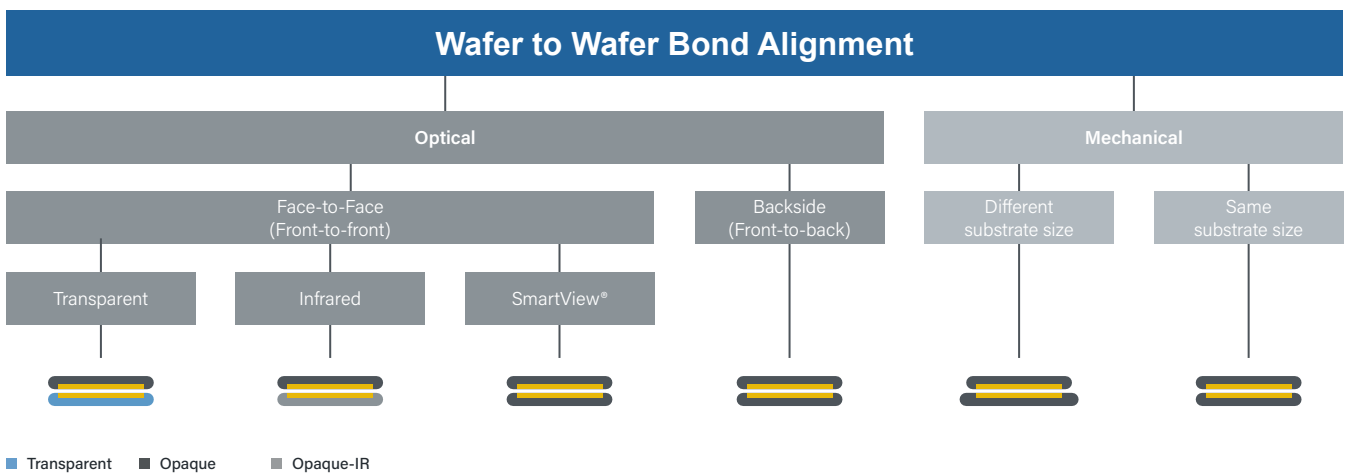
Metal/Adhesive via-first 3D bonding interface
Courtesy of RPI



Glass-frit bond interface
Courtesy of ST Microelectronics

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

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