EV Group Product Range
Our highly qualified employees are part of a worldwide network.
Commitment Without Borders
EVG Subsidiaries
EVG Japan
EVG Taiwan
EVG North America
EVG Korea
Corporate Headquarters
EVG China
The key to your success
With state-of-the-art application labs based at its headquarters in Austria, as well as in the U.S. and Japan, EV Group (EVG) is focused on delivering superior process expertise to its growing global customer base - from the initial development until the final integration at the customer’s site. Featuring state-of-the-art cleanrooms and a highly experienced staff of process and application engineers, the company’s process development business unit works hand in hand with customers on a number of areas.

The company’s application labs provide demonstrations of its various products for potential customers looking to leverage EV Group’s extensive lineup of advanced wafer processing solutions for the semiconductor, MEMS and nanotechnology markets. Furthermore, EV Group’s labs provide process development support for custom applications to address customers’ unique and challenging requirements - at any stage of the development process.

These advanced process development and application labs are designed to accommodate independent research work to explore and develop baseline processes that will open up new market opportunities. This includes working closely with key partners to develop and optimize new processes and capabilities. For example, EV Group’s ongoing relationships with material suppliers has enabled the development of temporary wafer bonding capabilities for a wide range of backside processes.

EV Group’s process development team works with customers needing “demonstrator” parts for their respective customer-specific requirements. As a result, EV Group’s multiple application labs are equipped to conduct small-volume pilot line runs to simulate an actual production line process, when necessary. This is very advantageous, especially for those customers with extremely complex demands - ensuring seamless process capability that suits all parties ahead of time and ultimately puts EV Group’s customers a step ahead of the competition. In all, these advanced labs provide customized tooling capabilities - enabling EV Group’s customers to effectively compete in today’s ever-changing, fast-paced environment by enabling a shorter time to market, easing integration headaches and eliminating the risk to schedule across multiple industries and applications.

This is the passion and commitment that makes EV Group a value-added partner, and why companies demanding nothing less than the best continue to turn to EV Group for its unparalleled world-class process and technology expertise.
Solutions for
PERMANENT WAFER BONDING

The introduction of EV Group’s wafer-bonding approach, which separates the bond alignment from the bonding step, immediately revolutionized the market.

Utilizing high-contact forces under elevated temperatures and a controlled atmosphere, this novel approach is today’s process standard, with EV Group holding the dominant market share for both semi- and automated wafer bonding systems and a growing install base of more than 1200 bond chambers. EV Group also leads the market for systems applying low-contact forces under room temperature at utmost clean conditions.

EV Group’s wafer bonding systems offer manufacturers numerous benefits, including optimal total cost of ownership (TCO), as well as a real wafer-wedge compensation unit to maximize the bonding yield. Their bond alignment systems can be integrated into GEMINI Automated Production Bonding System. These systems, such as the patented (U.S. Pat.: 6,214,692 B1) SmartView face-to-face bond aligner, support sub-micron alignment accuracies even with non-infrared (IR) transparent wafers.

Following the success in revolutionizing the MEMS manufacturing processes, the company is now leveraging its technology strengths to accelerate the success of 3D wafer stacking with its industry-benchmark GEMINI FB Automated Production Fusion Bonding System. In further support of this technology transfer, EV Group developed chip-to-wafer bonding tools for high-yield heterogeneous 3D integration schemes and was the first to market with 300 mm wafer bonding systems.

Addressing new market challenges in "beyond CMOS" applications, power devices, silicon photonics and high-vacuum MEMS packaging, EVG has introduced the automated high-vacuum wafer bonding system EVG ComBond. The ComBond technology enables covalent and conductive wafer bonding processes at room temperature or low temperatures. This process facilitates the direct integration of heterogeneous materials, including III-V compound semiconductor materials like gallium nitride (GaN), gallium arsenide (GaAs) and indium phosphide (InP) on silicon substrates, GaAs on germanium (Ge), crystalline silicon carbide (cSiC) on SiC or on silicon, and lithium tantalate (LiTaO₃) on silicon. Key markets and applications include engineered substrates, high efficiency solar cells and MEMS devices.

Solutions for
TEMPORARY WAFER BONDING

Building on its success in permanent wafer bonding, EV Group introduced automated temporary bonding and debonding technology to address compound semiconductor and 3D IC manufacturers’ immediate need for high-yield processing of ultra-thin and fragile wafers.

The EV Group technology temporarily mounts a wafer onto a carrier by applying thermal or laser release intermediates (e.g., spin-on polymers, waxes, resists and dry-film laminates), providing manufacturers with several key benefits. These include optimal design-process flexibility, high yield (via the rigid carrier support), ease of integration into an existing fabrication infrastructure, and a highly reliable debonding step following complete front and backside processing.

**SUPPORTED WAFER BONDING STEPS**

- Permanent wafer bonding and chip-to-wafer bonding
- Thermal and UV cured bonding interfaces
- Anodic, glass-frit, metal-diffusion, eutectic, silicon-direct, polymer bonding, and LowTemp™ plasma activated bonding
- Face-to-face SmartView®, backside, IR and transparent bond alignment
- Temporary bonding to carrier substrates with spin-on polymers or dry-film laminates
- Debonding of thin wafers from carrier substrates
- Void and alignment inspection
- ComBond® technology: room temperature bonding, oxide-free conductive interface
- High vacuum encapsulation
Today, the company holds the dominant market share in key lithography technologies. Other important advancements by EV Group in the lithography space include the company’s special resist coating technologies. All of EV Group’s lithography equipment platforms are 300 mm ready, can be fully integrated into its HERCULES lithography platform.

Since introducing the industry’s first backside-alignment microscope on a proximity mask alignment system more than two decades ago, the company has continued to expand its product line.

EV Group’s solutions enable a broad range of applications that are key in the manufacture of today’s leading edge electronics products.
Application Examples

The different drivers for employing wafer bonding, as well as the applications served by EV Group bonding technology, are as diversified as the markets from which these applications originate.

Cross-section of temporary bond utilizing Brewer Science™’s HT series adhesive Source: EVG

8-layer direct bond cross-section Courtesy of MIT

SOI wafers produced utilizing SmartCut® technology Courtesy of Soltec

Glass-frit bond interface Courtesy of ST Microelectronics

Ziptronix direct bond Interconnect Courtesy of Ziptronix

Metal/Adhesive via first 3D bonding Interface Courtesy of RPI

200 mm chip-to-wafer bond Courtesy of Datacon

Sub 0.5 µm aligned, bonded color filter Courtesy of MicroEmissive Displays (MED)

Cross-section SEM image of an InP/GaAs wafer pair bonded using a Au:Sn eutectic wafer bonding process Source: EVG

Scanning Acoustic Microscope (SAM) image of an InP/GaAs wafer pair bonded using a Au:Sn eutectic wafer bonding process Source: EVG

EVG® ComBond®: Oxide-free, conductive interface silicon/silicon Source: EVG

EVG® ComBond®: Particle- and void-free bond Source: EVG

Markets

The key below denotes each systems’ market applicability.

- [ ] MEMS
- [ ] Advanced Packaging & 3D Interconnect
- [ ] SOI & Engineered Substrates
- [ ] Compound Semiconductor
- [ ] Nanotechnology
Since introducing the industry's first backside-alignment microscope on a proximity mask alignment system more than two decades ago, EV Group has been committed to pioneering advances in lithography for semiconductor and MEMS manufacturing.

The company’s key competencies in lithographic technology lie in the high-throughput contact and proximity exposure capabilities of its mask alignment systems (EVG600, EVG6000 and IQ Aligner series) and in its highly integrated coating platform (EVG100 series). All of EV Group’s lithography equipment platforms are 300 mm ready, can be fully integrated into its HERCULES lithography track systems, and are complemented by its metrology tools for top-to-bottom side alignment verification.

Other important advancements by EV Group in the lithography space include the company’s special resist coating technologies - OmniSpray and the revolutionary NanoSpray. Not only do these unique technologies allow for extremely conformal coatings over high-topography structures - for example, through-silicon-via (TSV) structures with an aspect ratio of 1:5 (W:H) - but, ultimately, they enable customers to realize significantly reduced fabrication costs.

Through its commitment to continued innovation and customer collaboration, EV Group has consistently raised the bar for cost-effective, nanometer-scale lithography processing. This future-focused approach enabled the accelerated introduction of its nanoimprint lithography (NIL) systems.

EVG’s SmartNIL technology has demonstrated high-volume manufacturing suitability for diverse applications. In particular, it enables novel product requirements for various photonic and biomedical devices. To support the diversified needs of the photonics market, EVG established the NIL Photonics Competence Center, a flexible cooperation model that leverages the company’s equipment and process know-how.

Today, the company holds the dominant market share in key lithography technologies.

SUPPORTED LITHOGRAPHY PROCESS STEPS

- Top and bottom side mask alignment both near-ultraviolet (NUV) or deep-ultraviolet (DUV) in proximity and contact exposure mode
- Spin coating and resist development
- Dry-film resist lamination
- OmniSpray and NanoSpray coating
- Top-to-bottom side alignment inspection
- UV-NIL, Hot Embossing and Micro Contact Printing (µ-CP)
- Metrology tasks like CD, Box-in-Box or Overlay measurement
Nanoimprint Lithography (NIL) enables the fabrication of new, demanding applications requiring single step or step&repeat processes. It is a cost efficient manufacturing technique for sub-100 nm features and complex 3D structures. EV Group’s solutions enable a broad range of applications that are key in the manufacture of today’s leading edge electronics products.
Application Examples

Advanced Lithography
EV Group’s solutions enable a broad range of applications that are key in the manufacture of today’s leading edge electronics products.

Nanoimprint Lithography (NIL)
Nanoimprint lithography is a cost efficient manufacturing technique for sub-100 nm features and complex 3D structures. It enables the fabrication of new, demanding applications requiring single step or step-repeat processes.
Today, the company holds the dominant market share in key lithography technologies. EVG’s SmartNIL technology has demonstrated high-volume manufacturing suitability for diverse applications. In particular, it has enabled the production of complex nanostructures such as OmniSpray and the revolutionary NanoSpray. Not only do these unique technologies allow for extremely conformal coatings over large areas, but they also enable high-speed processing and precise alignment. All of EV Group’s lithography equipment platforms are 300 mm ready, can be fully integrated into its HERCULES lithography system, and support the demanding requirements of advanced semiconductor manufacturing.

The company’s key competencies in lithographic technology lie in the high-throughput contact and proximity exposure capabilities. Since introducing the industry’s first backside-alignment microscope on a proximity mask alignment system more than two decades ago, EVG has continued to lead the industry with innovative solutions. This includes the development of high-accuracy photomasks and state-of-the-art alignment tools. EVG’s extensive lineup of advanced wafer bonding technologies addresses new market challenges in “beyond CMOS” applications, power devices, silicon photonics, and high-vacuum MEMS and nanotechnology markets.

Our highly qualified employees are part of a worldwide network and react quickly and flexibly to customer requests and inquiries. We are always prepared for new challenges. Our objective is to support your business by maximizing equipment productivity and minimizing total cost of ownership (TCO). We achieve this through the implementation of EVG’s services:

### EVG Services

<table>
<thead>
<tr>
<th>Field Service On-Site Visits</th>
<th>Key Benefits</th>
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<tbody>
<tr>
<td>• Preventive maintenance and repair carried out in accordance with EV Group’s high-quality standards</td>
<td>• Certified engineers are taking care of all equipment related issues</td>
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<td>• Immediate assistance by factory trained, certified field service engineers</td>
<td>• Engineers’ long-term experience and technology expertise</td>
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<td>• On call support</td>
<td>• ISO certification ensures consistent high quality</td>
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<td>• Equipment relocation</td>
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<td>• Worldwide service through our subsidiaries and partners</td>
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<tr>
<th>Technical Support</th>
<th>Key Benefits</th>
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<tr>
<td>• Remote diagnostics and trouble shooting via secure internet line, phone and e-mail</td>
<td>• Access to Best Known Methods (BKM’s) and trouble shooting advise</td>
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<td>• Assistance with spare part number research</td>
<td>• Expert help from experienced Senior Engineers</td>
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<td></td>
<td>• Guaranteed fast response time</td>
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<th>Spare Parts</th>
<th>Key Benefits</th>
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<tr>
<td>• Recommended spare parts packages</td>
<td>• Cost optimization through parts repair, refurbishment or new parts replacement</td>
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<tr>
<td>• Guaranteed lead times</td>
<td>• Customized spare part packages</td>
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<tr>
<td>• Regional spare part stocks</td>
<td>• Short lead times due to customized spare part stocking options</td>
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<tr>
<td>• Parts repair and refurbishment services</td>
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<tr>
<td>• Consignment stock options</td>
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<th>Upgrades</th>
<th>Key Benefits</th>
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<tbody>
<tr>
<td>• Off the shelf upgrades for additional features and performance enhancement</td>
<td>• Performance enhancement based on your actual production needs</td>
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<tr>
<td>• Tailored soft- and hardware upgrades based on your requirements</td>
<td>• Customized solutions for new challenges</td>
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<tr>
<th>Product Training</th>
<th>Key Benefits</th>
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<tr>
<td>• Worldwide distributed training locations</td>
<td>• Optimum uptime and tool performance through EV Group certified operators and maintenance personnel</td>
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<tr>
<td>• Standardized modules for operation, maintenance &amp; process training from novice to expert level available on-site and at EV Group training centers.</td>
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<th>Extended Equipment Warranty</th>
<th>Key Benefits</th>
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<tbody>
<tr>
<td>• Includes spare parts and labor</td>
<td>• Set costs with priority support</td>
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