



ALIGNER WAFER BONDERS

AML - AWB PLATFORM

The AWB systems offer the versatility to perform in-situ aligned bonding of 2" to 8" wafers using a wide range of techniques:

Anodic, Eutectic, Direct (High & Low Temperature), Adhesive, Solder, Thermo-compression, Glass frit and 'iCAB' in-situ chemistry align & bond.

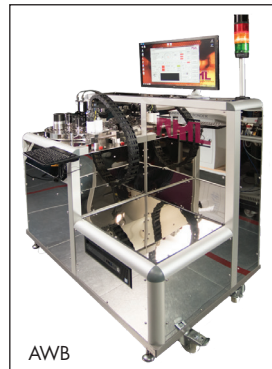
In-situ Chemistry: AML's unique in-situ alignment and process capabilities enable chemical preparation (for example, oxide removal in Cu-Cu bonding) or activation of the bonding surfaces immediately before alignment and wafer contact, without exposure to air between stages.

INTEGRATED SYSTEM FOR ALIGNMENT AND BONDING:

- In-situ alignment: 1 micron accuracy
- Wafer sizes from 2" to 8" & chip bonding
- Pressure: 10-6 mbar vacuum to 2 bar process gas (UHV option also available)
- Voltage: up to 2.5kV
- Temperatures: up to 560°C - Wafers can be held at different temperatures
- Contact force: up to 40kN
- In-situ UV cure
- Market-leading short cycle times: fast-bonding/high throughput



ROCK Platform



AWB

APPLICATIONS:

Wafer bonding has found many applications in the field of MEMS, III-Vs and ICs, and AML machines are widely used in the following:

- High-accuracy aligned adhesive bonding; acknowledged as 'best tool'
- MEMs devices – pressure sensors, accelerometers, microfluidics
- Vacuum encapsulation; acclaimed 'best system on the market'.
- Wafer Scale Packaging – for MEMS & IC
- III-V bonding - new high performance LEDs
- 3D Interconnects & TSV
- Advanced bonded substrates; for example silicon on glass (SOG)
- Smart cut - Layer transfer

LONG EXPERIENCE AND BONDING EXPERTISE

AML has over 25 years of experience in Aligned Wafer Bonding and MEMS fabrication. A pioneer in the design and fabrication of devices, AML now focuses solely on wafer bonding equipment.

BENEFITS – AML WAFER BONDERS:

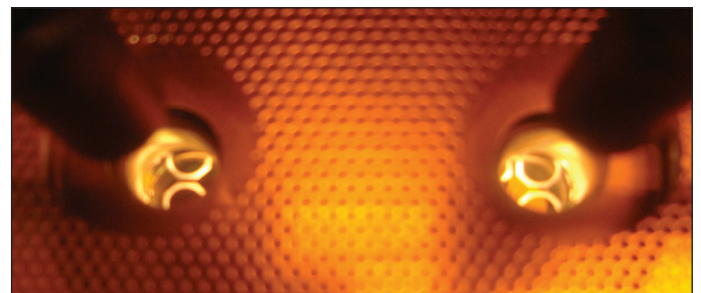
TECHNICAL BENEFITS

- In-situ alignment *at temperature* offers more reliable and accurate post-bond alignment – live view allows adjustment in real time
- See bond formation via in-situ optics. Confirm alignment immediately before bonding, resulting in fewer misalignments and higher yields
- No contact or contamination of bond surfaces - no transfer jig or flags required
- High throughput – simultaneous alignment with vacuum pump-down and heating; < 20-minute cycle times possible
- Controlled heating and cooling to minimise stresses
- Large wafer separation up to 30mm enables:
 - Differential wafer temperatures for Getter processes, up to 350°C
 - In-situ surface preparation (for example, oxide removal)
 - Faster outgassing and pump-down to high vacuum
 - Bonding of Wafer stacks up to 30mm thickness
- Alignment of wafers at room temperature or at higher bonding temperatures
- Current-limited Anodic Bonding for improved process control, device reproducibility and reduced stress
- Flexible platform: AWB systems can be configured to suit customer requirements for bonding techniques, wafer sizes, chips and in-situ chemistry
- AML offers in-house support, from process feasibility to qualification - uniquely, AML has extensive experience in device design and bonding processes and is able to offer expertise in process development

COMMERCIAL BENEFITS

- Lowest cost per bond and ownership of any align/bonding system available
- Proven, market-leading systems offer high reliability with minimal servicing
- Integrated systems for alignment and bonding - no separate Mask or Bond-aligner required
- Economic, high-volume production – manual and automated-load systems available
- Small footprint with high throughput
- Easy to install: only Power, Nitrogen, Compressed Air and Process gas requirements
- Excellent technical process support
- Worldwide customer base: AWB systems in operation across Europe, USA and Asia

Align immediately prior to Bonding:



**In-situ alignment = high throughput
In-situ = more possibilities**

ALIGN and BOND – ONE SYSTEM DOES IT ALL!

AML ALIGNER WAFER BONDER – AWB SYSTEM: TECHNICAL SPECIFICATION

- The AWB systems offer fully-automated bonding processes, with manual intervention only required for loading of the wafers. The AML ROCK system provides for auto-wafer loading requirements.
- All bonding parameters and process recipes are controlled and stored.
- The system can also be networked and remotely interrogated, or controlled by AML via an internet connection.

Wafer sizes: 2", 3", 4", 6" & 8"

Also chips & odd-shaped substrates <3" (but without optical alignment).

Alignment: Manual and Auto-alignment capability. In-situ alignment offers a multitude of advantages over other bonders (where alignment is made outside the bond chamber). Image capture is available for deeper structures with widely spaced alignment marks. Alignment accuracy: 1 µm.

In-situ system: Enables visual confirmation immediately before the bonding process that the desired alignment is still being achieved.

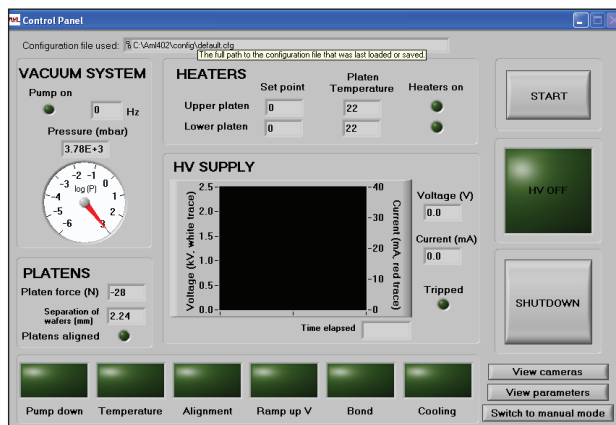
Alignment can be carried out hot or cold: This facility eliminates alignment inaccuracies due to thermal expansion and any mismatch between wafers, machine parts and platens.

Platen Manipulator:

- Enables in-situ alignment of wafers under vacuum & at elevated temperatures
- Contact Force: up to 40kN provided via motorised active force control
- Precise wafer parallelism adjustment

AML ALSO OFFERS AN APPLICATIONS DEVELOPMENT SERVICE:

- The BOND CENTRE offers bonding of customer-supplied test / demonstration wafers
- Development of customer-specific bonding processes
- Technology transfer of characterised processes



AML offers a complete package – integrated aligner bonding systems, with bonding process know-how & support from our **BOND CENTRE** application lab

Optics: Twin Microscope–Camera system with through-the-lens illumination. Two CCD cameras provide side-by-side display of images with Visible, IR or NIR capabilities for through-wafer vision and alignment.

Bonding Environment: Vacuum, Process gas or Vapour. Fully-automated dry turbo pumping system. 10-6 mbar to 2 bar absolute pressure (UHV option also available).

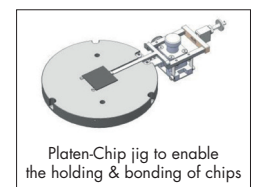
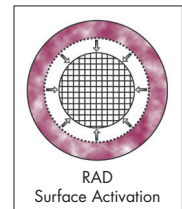
Temperature: Both Upper and Lower Platens independently controlled in 1°C steps. Heating & Cooling rates are programmable. Max Temperature: 560°C. Wafers can be held at different temperatures with ΔT 350°C.

Anodic Bonding: Full-size platen electrodes for improved bond uniformity. Constant-current or voltage operation, for improved process control and reduced stress. 0-2.5 kV DC, up to 40 mA.

Motorised Platen movement: X, Y, Θ and Z.

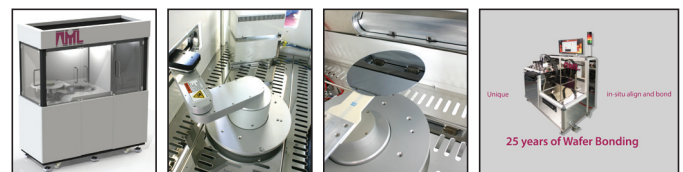
Additional Options:

- Auto-alignment
- RAD tool for activated, low temperature bonding
- NIR imaging (for heavily doped wafers or alignment at higher temperatures)
- Water and formic acid Vapour Delivery system
- Triple-stack bonding tool
- In-situ UV adhesive curing



Platform – Models:

- **AWB-04:** 2" to 6" bonding. Fully auto-process, with manual wafer loading
- **AWB-08:** 6" to 8" bonding. Fully auto-process, with manual wafer loading
- **ROCK** platform for higher volume production, auto-loading etc



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