



# ALIGNER WAFER BONDER

## AML - AWB PLATFORM

The AWB has the versatility to perform aligned:

Anodic, Eutectic, Direct (High & Low Temperature) Glass frit, Adhesive, Solder, iCAB, Thermo-compression, Temporary wafer bonding.

**In-situ chemistry:** Unique process capability in that the wafer surfaces can be chemically treated e.g. Oxide removal in situ before wafer contact. eg. Cu-Cu and AlGe bonding for 3D and TSV applications.

### ALIGNMENT & BONDING IN ONE MACHINE

- In-situ alignment 1 micron accuracy.
- $10^{-6}$  mbar Vacuum to 2bar process gas.
- Voltage up to 2.5kV.
- Temperature up to 560 °C
- Forces up to 25kN.
- Market-leading, fast-bonding cycle times/high throughput.
- Wafer sizes 2"-8" (12" FAB 12).
- In-situ UV cure.



### APPLICATIONS

Water bonding has found many applications in the field of MEMS, III-Vs & ICs, and AML machines can be used in the following applications:

- High accuracy aligned adhesive bonding "best tool".
- MEMs devices – pressure sensors, accelerometers, microfluidics.
- Vacuum encapsulation – 'best tool on the market'.
- Wafer Scale Packaging – MEMS & IC.
- III-V bonding e.g. new high performance LEDs.
- 3D Interconnects & TSV.
- Temporary bonds for handle wafers e.g. TSVs
- Advanced bonded substrates e.g. silicon on glass (SOG).
- Smart cut - Layer transfer.

### MADE BY PEOPLE THAT KNOW ABOUT BONDING

Over 25 years machine & process experience in bonding – 'first Aligned Wafer Bonder in 1985', including the design and fabrication of many micro-devices using the technology.

## BENEFITS – AML WAFER BONDER:

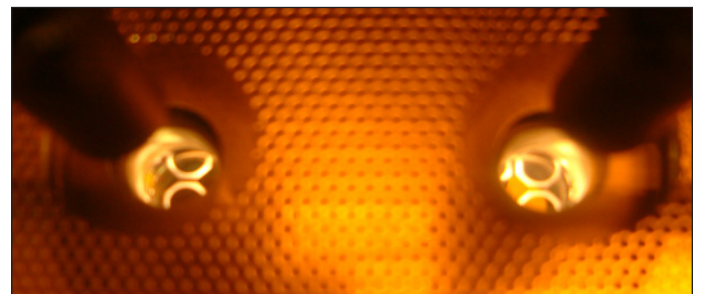
### TECHNICAL BENEFITS

- In-situ alignment at temperature offers more reliable & accurate post-bond alignment – what you see is what you get!
- Very fast throughput – simultaneous alignment with heating & pumping down < 20-minute cycles.
- No flags, transfer jig, or any contact on bond surfaces.
- See bond formation via in-situ optics, confirm alignment just before bonding – fewer misalignments – higher yield.
- Controlled heating & cooling to minimise stress.
- Large wafer separation enables differential wafer temperature for Getter process or in-situ surface preparation e.g. oxide removal.
- Align with single or double-sided polished wafers.
- No flags to stick!
- Align cold or hot!
- No alignment shift on removing flags!
- Current limited Anodic Bonding for better process control, device reproducibility and reduced stress.
- Flexible platform e.g. all bond types & wafer sizes, chips, & polymer embossing, & in-situ chemistry.
- Fast changeover between wafer sizes e.g. 10 minutes for 4" to 6".
- Multi-stack bonding facility.
- Wafer stacks up to 8mm or 30mm thickness can be bonded.
- In-house support from process feasibility to qualification – as uniquely AML come from a design & processing background! AML will help develop your process & customise machines to suit YOU.
- Fast pump down to high vacuums.

### COMMERCIAL BENEFITS

- Lowest cost per bond & ownership of any machine available.
- Easy to install; only N2, Compressed Air, Water & Process gas if required.
- Small footprint and fast throughput.
- Market leading, proven, high reliability, minimal servicing.
- Does not take up time (operational or set up) on your mask aligner.
- Excellent technical process support – fast response.
- Economic high-volume production via multiple manual load machines or automated wafer handling via FAB 12.
- Complete systems – We don't tie you into buying other equipment.
- Worldwide Machine base UK, Europe, USA & Far East.

## What you see is what you get!



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

**ALIGN & BOND – ONE MACHINE DOES IT ALL!**

Fully automated bonding process is available. Only manual intervention required is to load the wafers. See FAB12 for auto-wafer loading. All bonding parameters are able to be controlled & stored, including process recipes. Machines can also be networked & remotely interrogated or controlled by AML via an internet connection.

**Alignment:** Manual and auto-alignment. In-situ alignment has advantages over other bonders (where alignment is made outside the bond chamber). Image capture for widely spaced 3D alignment marks.  
Alignment accuracy 1µm

**In-situ system:** Also enables visual confirmation just before the bonding process that the desired alignment is still being achieved.

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

**Wafer sizes:** 2", 3", 4", 5", 6", 8" (12" FAB 12). Also chips & odd-shaped substrates, but without optical alignment.

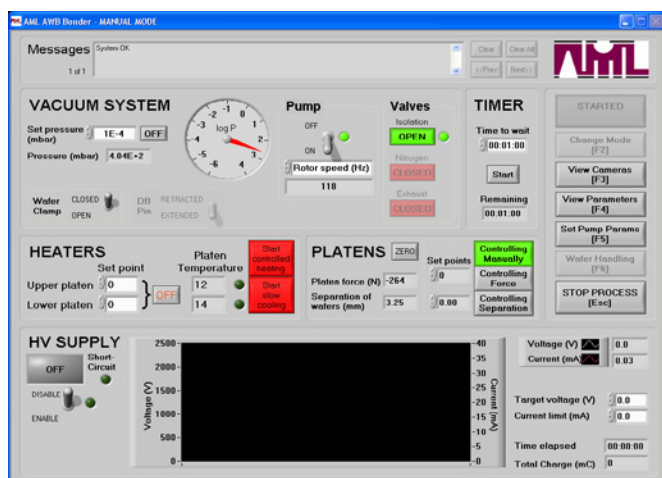
**Manipulator:** Enables in-situ alignment of wafers under vacuum and at elevated temperature.

- Contact: up to 25kN provided via manual or motorised active force control.
- Precise wafer parallelism adjustment.

## AML ALSO PROVIDES A COMMERCIAL PRODUCTION BONDING SERVICE:

- Wafer bonding of customer-supplied wafers.
- Development of customer specific bonding processes.
- Technology transfer of characterised processes.

Use BOND CENTRE for low-volume production until it is economic for you to buy a machine.



"The complete package – off-the-shelf & custom machines, bonding process know how with support from our **BOND CENTRE** application lab"

**Optics:** Twin Microscope – camera system with through-the-lens illumination. Two CCD cameras and side-by-side display of images. Including IR & NIR capability.

**Bonding Environment:** Vacuum, or process gas or vapour. Fully automated dry turbo pumping system ~ 1 x 10<sup>6</sup> mbar to 2bar absolute pressure.

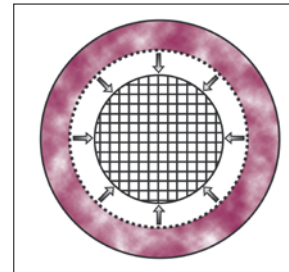
**Temperature:** Both Upper & Lower Platens independently adjustable in 1 °C steps. Heating & Cooling rates are programmable. Max Temperature is 560°C. Wafers can be held at different temperatures. Δ T > 100 °C

**Electrodes: (for Anodic Bonding)** Full size heated platens for both upper and lower electrodes for better bond uniformity. 0-2.5 kV DC up to 40 mA. Constant current or voltage operation, for improved process control & stress management.

## Additional Options:

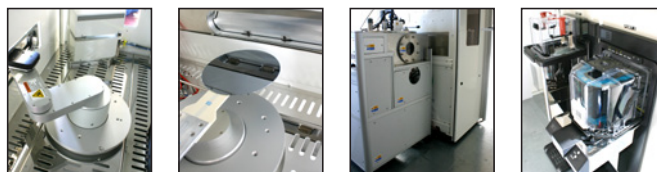
- Auto alignment.
- Triple stack bonding tool.
- Pressure control.
- RAD tool for low temperature activated bonding.
- In-situ UV Cure bonding.
- Motorised X, Y, Θ & Z movement.
- Auto alignment.
- Polymer embossing.
- NIR imaging (heavily doped wafers or alignment at high temp).
- Water & formic acid vapour delivery system.

RAD Tool



## Platform – Models:

- **AWB – 04 – 2" to 6" bonding fully auto manual wafer loading.**
- **AWB – 08 – 6" to 8" bonding fully auto manual wafer loading.**
- **'Hot Press' Bonder – no optical alignment.**
- **FAB12 fully automated robot wafer loading.**



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