

AUTOMATED WAFER BONDING PLATFORM

SUSS XBC300 Gen2 D2W/W2W

Unique hybrid bonding allrounder – combined W2W and D2W platform

in cooperation with **set** 
Smart Equipment Technology

 **SUSS**



AUTOMATED WAFER BONDING PLATFORM

SUSS XBC300 Gen2 D2W/W2W Hybrid bonding allrounder

The novel cluster XBC300 Gen2 D2W/W2W represents a milestone in hybrid bonding. As the only platform worldwide it integrates all existing hybrid bonding processes in one single tool: W2W, collective D2W, and sequential D2W. Both, D2W and W2W hybrid bonding, have constantly grown in importance for 3D integration in order to tackle the slowing of two-dimensional scaling associated with Moore's Law.

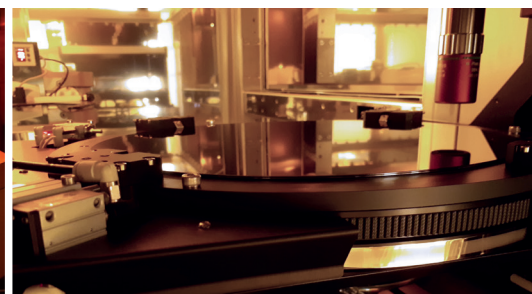
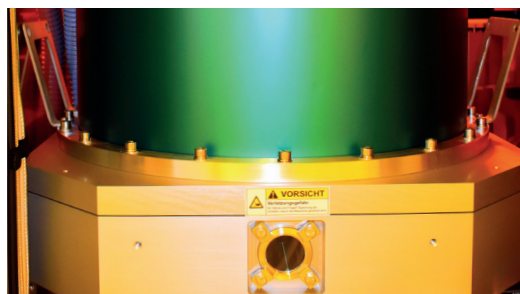
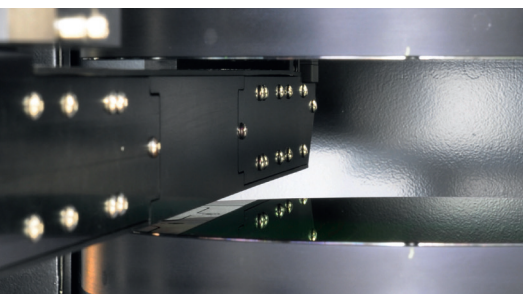
Hybrid bonding as an extension of conventional fusion bonding is a key technology enabler for the future heterogeneous integration market with respect to advanced 3D device stacking, e.g. for next-generation memory or demanding SoC (System on Chip) applications such as backside-illuminated CMOS image sensors.

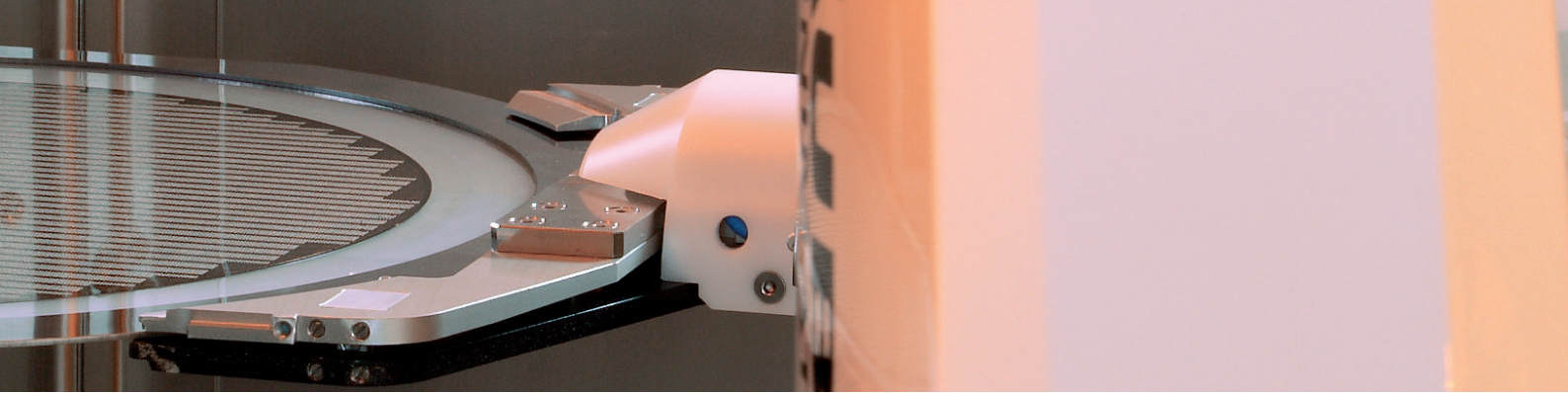
Combining W2W and D2W hybrid bonding processes for the first time, the XBC300 Gen2 D2W/W2W offers a significantly reduced footprint compared to traditional W2W and D2W stand-alone clusters. Investment costs are considerably lower as process modules, which are redundant in separate individual systems, can now cover all process flows. The XBC300 Gen2 D2W/W2W is specifically tailored to the needs of R&D lines or RTOs (research and technology organizations), who initially want to focus on one process first, but would like the option of developing further hybrid bonding processes in parallel or in the future. All process modules share the same core technology with dedicated stand-alone systems for D2W and W2W. This allows easy transfer from R&D to low and high volume manufacturing.



HIGHLIGHTS

- + Fully automated wafer bonder for sequential and collective D2W and W2W applications on 200mm and 300mm wafers in a single platform
- + High-accuracy alignment option for most demanding pitch applications
 - W2W: < +/- 50 nm alignment accuracy
 - D2W: < +/- 100 nm alignment accuracy
- + Allowing for both wafer and tape-frame substrate loading
- + Integrated metrology option (overlay measurement, void detection) allowing for multipoint measurement at highest accuracy





Process modules for flexible configuration possibilities

XBA BOND ALIGNER

The XBA bond aligner delivers consistent submicron alignment accuracy for transparent or non-transparent wafers by using the SUSS proprietary Inter-Substrate Alignment (ISA) technology. Built-in optical fixed reference, global calibration and overlay verification ensure optimum repeatability. In order to address current and future needs for pitch scaling of interconnects the XBA bond aligner offers $< \pm 50$ nm alignment accuracy and multiple SUSS-unique features.

DIE BONDER

The NEO HB from SET Corporation SA is a state-of-the-art flip-chip die bonding platform covering a wide range of die geometries. Industry-leading cleanliness and alignment performance ensure high-yielding D2W transfer operation at high speed. Extremely low inter-die-spacing (down to $40\mu\text{m}$) allows for high die densities on target substrates when needed. SUSS MicroTec and SET work hand in hand to optimize system performance and provide customers with a flexible system solution to meet future needs.

AQUEOUS CLEANER MODULES

Aqueous cleaner modules for full wafers and tape-frames offer various dispense system options including megasonic. The modules also allow for optional backside rinse and N_2 -assisted spin-drying. Diluted cleaning chemistry such as $< 2\%$ NH_4OH or citric acid is possible in the basic configuration. Organic removal functionality using SC1 is available on request.

METROLOGY STATION

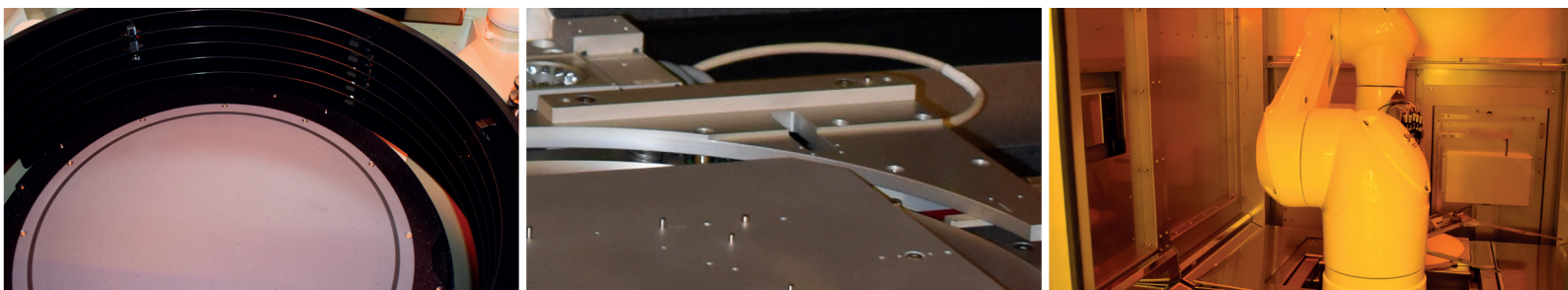
Integrated in-situ metrology functionality allows for fast process feedback. Overlay verification is key for increased process control and yield improvement. The metrology module offers full-field IR void inspection and/or IR overlay measurement featuring multi-site capability at maximized throughput. Industry-leading precision and accuracy combined with closed-loop feedback enables optimized bonding performances.

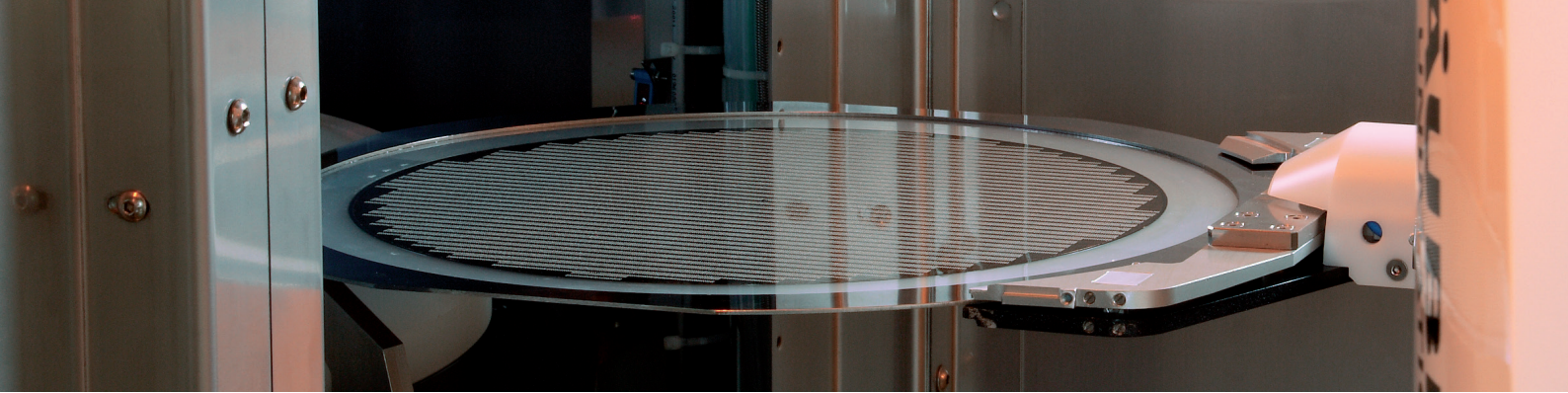
SURFACE ACTIVATION

The PL300 offers highest process flexibility and repeatability for plasma-based wafer surface activation. Various process gases such as Ar, O_2 , N_2 etc. can be used and are controlled via mass flow controllers (MFCs). The gate-valve loading PL300 allows for full CMOS compatibility and can also be used for plasma cleaning of polymer residues. The vacuum plasma chamber is designed for both target wafer and tape-frame processing.

MATERIAL HANDLING UNIT

The highly modular XBC300 Gen2 D2W/W2W platform can be equipped with up to four I/Os (for wafers and tape-frames) and up to nine process modules. A high-precision and high-throughput 6-axis robot handles single wafers and bonded wafer stacks. All handling activities inside the machine are monitored via a fully customizable camera configuration.





SUSS XBC300 Gen2 D2W/W2W

Technical data

GENERAL	
Substrate Size	200 / 300 mm wafers + 400 mm tape-frames
Dimensions (WxDxH)	3980 mm x 5840 mm x 2790 mm
Load Port	2 x fully automatic FOUP load ports and cassette adapter options 2 x tape-frame cassette stations
Wafer Handling System	6-axis robot with integrated wafer flipping, special handlers (e.g. for warped wafers) on request
Tape-Release	UV flood exposure for die release on UV sensitive tapes
Pre-aligner and ID readers	Camera-based pre-aligner and optional wafer ID Reader
User Interface	Microsoft Windows 10 based operating system with SUSS MMC software
Substrate Processing	Fully programmable cluster tool with factory automation options Drag and drop sequence editor with cyclic scheduler and automated throughput optimization
Options	SECS/GEM and different data logging/analyzing tools are available Filter fan units Ionizer bars
XBA - BOND ALIGNER	
General	Vibration isolated alignment stage with contactless linear motors and air bearings for x, y, z and theta axes Active wedge error compensation function and active isolated granite base structure Filter fan unit
Alignment Method	Inter-Substrate Alignment (ISA) with integrated fixed reference targets, built-in global calibration and overlay verification Reflective IR alignment functionality available on request Closed-loop feedback functionality from MM300 to ensure highest overlay accuracy
Alignment Accuracy	< +/- 50 nm

PLASMA MODULE

General	Vacuum plasma chamber for effective wafer surface activation for high-bond strength fusion bonding Ambient plasma surface activation at atmospheric pressure can be offered optionally
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SET NEO HB DIE-BONDER

Die-handling	Flip-chip (standard feature) Die-attach functionality (optional)
Substrate Sizes (Target Wafer)	200 and 300 mm
Die Feeding Unit	Waffle trays, 200 mm & 300 mm wafers, 400 mm Tape-Frame
Maximum Die Size	22 x 22 mm ²
Minimum Die Size	1 x 1 mm ²
Min. Die Thickness	Down to 30 µm
Bond Force	Up to 300 N
Alignment Accuracy	< +/- 100 nm

AC300 - AQUEOUS CLEANER

General	Single wafer cleaner with puddle and megasonic DIW rinsing Allows for diluted chemistry operation
Options	Back-side rinse N ₂ -assisted spin-dry SC1 chemistry compatibility Citric acid

MM300 - METROLOGY MODULE

General	Throughput- and footprint-optimized metrology station for high-accuracy overlay measurement and optional void detection Field-upgradable
Options	Overlay inspection, and void detection
IR Overlay Measurement	Reflective or transmissive mode
IR Void Detection	> 500 µm, automatic classification
Closed-loop	Enables automated offset-correction of bonding parameters
Measurement Flexibility	No restriction on location or amount of measurement sites on wafer

Data, design and specification depend on individual process conditions and can vary according to equipment configurations. Not all specifications may be valid simultaneously. Illustrations, photos and specifications in this brochure are not legally binding. SUSS MicroTec reserves the right to change machine specifications without prior notice.



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