

# ~~BONDLESS~~ PRECISION WAFER STACKING

## ENABLING FRAGILE WAFER MID-END PROCESSING

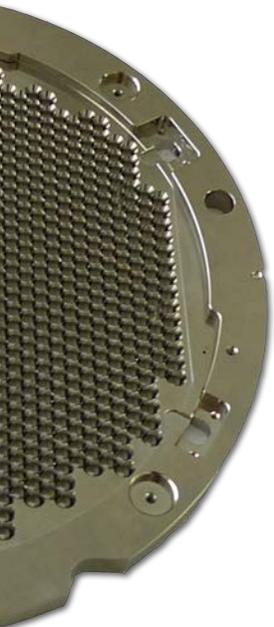
As the complexity of Mid-End processes for MEMS devices has increased along with the difficulty of handling the very thin wafers required by some, temporary wafer bonding has become very important.

For some MEMS devices, traditional bonding methodology often has a significant impact on product yields resulting from damage to the mechanical structures. Quartet Mechanics has developed a purely mechanical means to support and manipulate MEMS wafers in and effort to improve yields and lower handling costs.

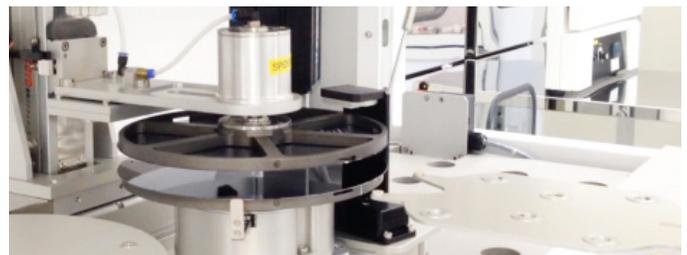
This novel mechanical-based wafer stacking methodology utilizes automation components designed to maintain the alignment and transfer of wafers down to 50  $\mu\text{m}$ .

It also allows for options to fix the position of the device wafer with the use of clips or fixturing.

Quartet Mechanics offers these tools as a subsystem that can be integrated into a process tool or used as a stand alone tool for cassette to cassette operations prior to transfer to process equipment.



*Mask Fixture*



*Loading device wafer into the alignment station*



*A perforated device wafer inserted in a fixture*

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## HIGH PRECISION WAFER FIXTURING

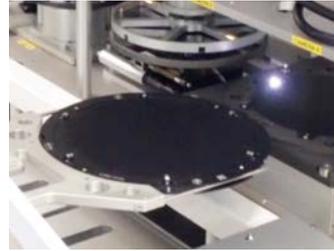
Fully automated wafer alignment and insertion of wafer or wafer stacks in fixturing for paste dispensing, low temperature bake, deposition processes and wafer dicing.



Device wafer is initially transferred to station for prealignment and ID capture.



Device wafer is then moved to precision alignment stage.



Fixture is transferred to assembly station.



Device wafer is transferred to assembly station (placement of  $\pm 5 \mu\text{m}$  precision)

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## HANDLE WAFER STACKING

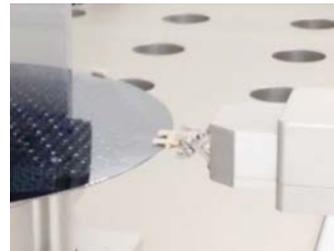
While fixturing is not useful for all Mid-End processes specialized robotic end effectors, while maintaining alignment, load wafer stacks to quartz boats for bake or etch operations.



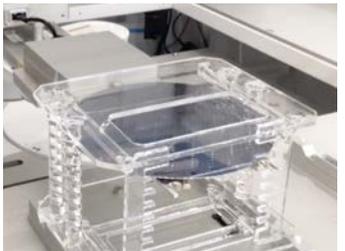
Device and handle wafers are individually aligned & stacked; both ID's captured



A clip applicator, for placing and retrieving, is companion to wafer robot arm end tooling



Same robot can be used to transfer, to clip and to unclip the wafer



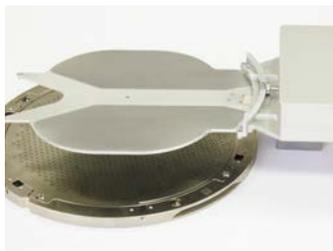
The wafer stacks are transferred to protrusion-proof quartz cassettes for processing

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## MAJOR COMPONENTS



High pay-load SCARA robot equipped with tools for handling wafers, fixtures, and clips



Vortex edge gripping end effector with SoffTouch mechanism damage free handling of fragile wafers



Multifunctional tool for prealignment, ID capture, and wafer stacking



Base fixturing tool may be configured to process requirements



### QUARTET MECHANICS INC.

email: [inquiry@quartetmechanics.com](mailto:inquiry@quartetmechanics.com)

P +1.408.200.8345 / 408.200.8346 F +1.408.200.8341

2343 Bering Drive, San Jose, CA 95131, USA