Owens Design
Capital Equipment Design & Manufacturing

SOLUTION SETS

SEMICONDUCTOR INDUSTRY

Wafer Transfer Mechanisms

Four Axis Wafer Mechanism with Edge Grip for Optical Review Station

As the semiconductor industry drives to ever decreasing line widths and increasing automation, wafer handling solutions must continually be reinvented. Current needs include decreasing both front side and backside particle and metals contamination, increasing throughputs, and improved integration to factory automation systems.

Unique or challenging wafer handling requirements often cannot be met with off-the-shelf solutions. Owens Design has created a family of custom wafer handling mechanisms for these special situations. We provide a fully tested, turnkey sub-system that is easily integrated into your tool.

Our designs encompass solutions for all wafer sizes, for challenging environments (wet, high temperature, vacuum), low contamination platens, and custom end effectors.

We achieve state of the art solutions through careful upfront analysis of reliability, airflow, throughput, and vibration requirements. Careful selection of materials, CFD modeling, and attention to design details allow us to meet stringent cleanliness targets. Owens Design's solutions reflect a long history of developing mature designs that are simple and rugged. Reliability goals are proven through highly accelerated life testing (HALT) to identify problems before reaching the field.

All of our designs meet regulatory requirements (CE, SEMI, and ergonomic) and are carefully evaluated for serviceability.

Vertical Edge Grip for Wafer Cleaning Chamber

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Wafer Transfer Mechanisms (cont'd)

Typical Specifications

- Wafer Sizes: 50 - 200mm, 300mm
- Substrate Types: Si, GaAs, Quartz
- Placement Repeatability: +/- 50 micron
- Environments: Atmospheric, low and high vacuum, and corrosive (gas and liquid phases)
- Vertical, horizontal, and front-to-back flipping orientations

Cleanliness

- Front side: < 0.2 particles @ 0.1 µm, PWP
- Backside: < 1,400 particles @ 0.2 µm, PWP
- Metals (TXRF/VPD) measurements :
- Heavy (Fe, Cr, Ni, Cu, Zn) < 1E10 atoms/cm2 per element
- Alkali (Na, Mg, Ca, K) < 1E10 - 5E10 atoms/cm2 per element
- Light (Al) < 1E10 - 4E10 atoms/cm2
- Airborne: No degradation to ISO Class 2 environment

Reliability

- MTBF > 5000hrs
- MTBS > 6-months
- MTBI > 1000hrs
- MTTR < 4hrs

Wafer Handling End Effectors

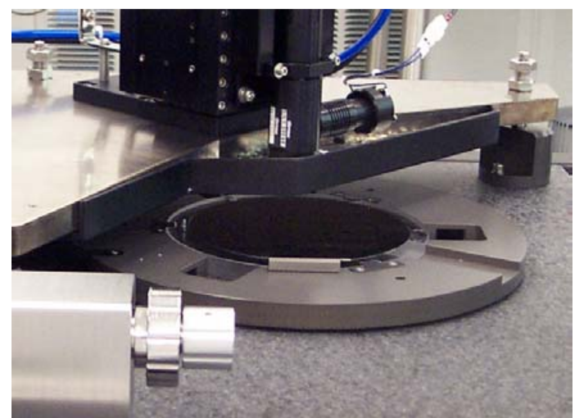
- Orientation: Fixed vertical, fixed horizontal, Variable: wafer flipping
- Contact type: Vacuum end-effector, Edge Grip end-effector
- High temperature: Handle wafer temperatures up to - 450°C

Regulatory Compliance

- SEMI
  - Equipment Automation Hardware Standards
  - Equipment Automation Software Standards
  - Facility Standards and Safety Guidelines
- CE
  - Essential Health and Safety
  - Harmonized Standard
- Local Jurisdictional
  - NFPA, UL, FMRC

200mm Vacuum Robot Incorporates Ferrofluidic Coupling

Owens Design's Mechanism Receives Industry Recognition



Custom Air Bearing Wafer Stage Meets Tight Tilt Requirements

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