



SEMICONDUCTOR INDUSTRY

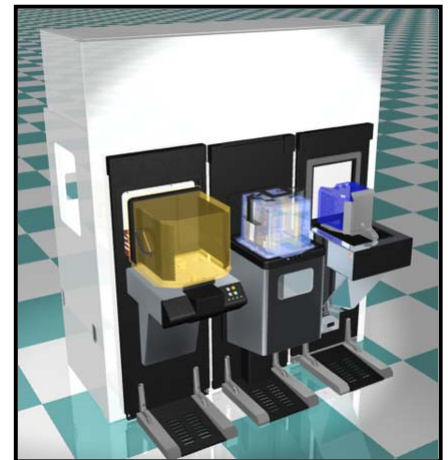
BOLTS SEMI STANDARD INTERFACE

Virtually all equipment front end modules (EFEMs) conform to the SEMI standards E15 and E63 (also known as BOLTS). These standards define the load port interface and allowable volumes. Due to its wide availability, the BOLTS interface is used to mount add-on modules for process control, metrology, and other optional modules.

Owens Design has utilized the BOLTS interface in many designs and is expert in maximizing the useable space. We have reference designs for the mounting interface, internal load doors, alignment mechanisms, and even the installation cart.

Designing within the BOLTS footprint requires careful airflow and vibration analysis to avoid disturbing the EFEM environment. Owens Design has repeatedly met these requirements through innovative design techniques. Airflow has been managed with CFD modeling and provided by the EFEM or through the addition of a separate mini-ULPA.

Owens Design understands the unique serviceability requirements of BOLTS units. We have designs that are easy to remove during service and that are so repeatable that no robot reteaching is required.



*Standard EFEM – BOLTS Interface
(Image courtesy of Brooks Automation)*



The BOLTS Form Factor is Ideal for Metrology and Process Options.

SEMI Standards

- E15.1 Specification for 300mm Load Port
- E63 Mechanical Specification for BOLTS Interface
- E131 Specification for Integrated Measurement Module Interface Packaging



BOLTS SEMI STANDARD INTERFACE (CONT'D)

Typical Applications

- Metrology
- Wafer Inspection
- Process Options
- Wafer Sizes: 200 - 300 mm

Cleanliness

- Front side: $< 0.2 @ 0.1 \mu\text{m}$, PWP
- Backside: $< 1,400 @ 0.2 \mu\text{m}$, PWP
- Metals: Ca, Cr, Fe, K, Mn, Na, Ni, Pb, Zn, Cu, Co, Mo, Ti, W and Al $< 1E10/\text{cm}^2$
- Metals: Fe $< 5E09/\text{cm}^2$
- Airborne: No degradation to ISO Class 2 environment

Interface

- Integrated controller on board
- AC Power - Universal
- CDA / Vacuum as required
- Communications (ethernet, RS-232, DeviceNet, custom)

EFEM Integration

- Alignment and tooling provided for single person installation
- Repeatable docking allows removal without reteaching robot
- No impact to tool mini-environment airflow
- Vibration isolation (both from fab floor and to-from tool)

Regulatory

- SEMI Equipment Automation Hardware and Software
- SEMI Facilities Standards and Safety Guidelines
- CE Harmonized Standards
- NFPA, UL, FMRC



BOLTS Compatible Wafer Inspection



Internal View Showing Load Doors



*Effective Volume Use
Requires Innovative Packaging Techniques*