



SEMI E19.4-94

200 mm STANDARD MECHANICAL INTERFACE (SMIF)

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1 Introduction

1.1 *Scope* — This specification describes one approach to interfacing a clean cassette transport box to a clean environmental housing on a piece of semiconductor processing equipment or to other clean environments. The system concept involves mating a door on a cassette container to a door on an equipment enclosure and transferring the cassette into, and out of, the equipment without exposing the cassette and wafers to outside contamination.

1.2 *Purpose* — A standard interface is required for containers intended to control the transport environment of cassettes containing wafers. The interface must address the proper container orientation for material transfer and maintain continuity between the container and equipment environment in order to control particulate matter.

1.3 *Impact* — The incorporation of this standard may require equipment designers to include the features of the interface into the tool design. Spacing between open cassette ports must be considered when incorporating this interface. Designers are directed to the recommendations made in SEMI E15 in this regard.

1.4 *Limitations* — This standard is specific to the size of the designated wafer and references the appropriate SEMI cassette and wafer diameter. A single numerical suffix is assigned to this base standard number or to each wafer diameter. This specification focuses on applications in which the interface port is positioned horizontally. The standard is focused exclusively on the box-to-canopy interface. Other considerations of box and equipment design are purposely excluded.

NOTE: Hewlett Packard has patent coverage for this concept and is offering non-exclusive licenses on an

equal basis to any company. Companies intending to manufacture products to this standard should be aware of Hewlett Packard's position.

2 Applicable Documents

2.1 SEMI Specifications

SEMI E15 — Specification, Inter-Equipment Material Transport Interface

SEMI E1.7 — SEMI Specification, 200 mm Plastic and Metal Wafer Carriers, General Usage (Proposed)

3 Definitions

(See Figure 1 for a pictorial depiction of most terms.)

3.1 *Box* — An environmentally controlled enclosure for a cassette containing wafers. For purposes of this standard, a box has features that conform to the specified interface. A box includes a box door and box latches. (A box is also referred to as a *container*.)

3.2 *Box Door* — A removable bottom for the box that contains a means for properly positioning the wafer cassette.

3.3 *Box Latch* — A mechanical latch that holds the box door to the box until activated by the latch mechanism pins. Upon activation, the box door is released from the box.

3.4 *Guide Rail* — A component of a port plate that provides coarse location for placing the box on the port assembly.

3.5 *Hold-Down Latch* — A mechanism for locking the box to the port plate.

3.6 *Latch Pins* — Pins that engage the box door latch and accomplish the box door lock/unlock functions. Latch pins are carried by the port door.

3.7 *Port Assembly* — An assembly of the port plate and port door that includes the guide rails, registration pins, latch pins, and box hold-down latches.

3.8 *Port Door* — A door for the port plate opening that provides a mating surface for the bottom of the box door when the box is in place on the port plate. The port door contains the registration pins and the box door latch pins.



3.9 Port Plate — A horizontal mating surface for the base of the box that provides a seal surface for the bottom surface of the box perimeter. The port plate contains the guide rails and the box hold-down latches.

3.10 Registration Holes — Holes in the bottom of the box door that fit over registration pins in the top of the port door when the box is placed on the port door.

3.11 Registration Pins — Pins that provide fixed position and orientation between the port door and box door and assist in the final positioning of the box on the port assembly. The registration pins fit into the registration holes in the bottom of the box door.

4 Requirements

(See Table 1 for 200 mm (8 inch) Port Dimensions.)

4.1 Cassette Sizes — The requirements and dimensions for the design of mechanical interface standard ports and boxes are given in this section. All dimensions of the interface between box and port are specified in reference to the following port dimensions and cassette size:

200 mm (8 inch) per SEMI E1.7 (200 mm Plastic and Metal Wafer Carriers)

4.2 Port Design Requirements — The general design of the port is shown in Figures 2 and 3. Specific dimensions for the different cassette sizes are given in SEMI E1.7. Design requirements for the interface components are provided in Sections 4.2.1 through 4.2.5.

4.2.1 Port Door — Dimensions A1 through A3 specify the port door top view. The gap between port door and port plate is not specified, but should be kept to a minimum distance to restrict particle movement.

4.2.2 Box Guide — The inside distance of the corner guides of the port is specified by B1 and B2. The length of the corner is specified by B12. The corner guides may be connected by guide rails if desired.

4.2.3 Latch Pins — Two latch pins are located around the port door center. For location of the pins, see C1, C2, and C3.

4.2.4 Registration Pins — The three registration pins on the port door are located asymmetrically, and spaced by dimensions D1 through D4. The size of the pins is specified by D5 through D7.

4.2.5 The Box — The bottom surfaces of the box body and box door shall conform to the specified port dimen-

sions. The upper part of the box body and top surface of the box door must fit and hold in place the wafer cassette specified by SEMI Standards for 200 mm (8 inch) cassettes. (See SEMI E1.7.) Although the box dimensions are not explicitly specified by this standard, the following requirements apply:

4.2.5.1 The bottom surfaces of the box door at its perimeter shall match the dimensions of the port door top (A1 through A3). The tolerances shall be chosen so that the box door does not extend over the port door in any instance, even when the port door is built to its minimal acceptable dimensions and potential variance between registration pins and holes is considered. This is to ensure an interference-free passage of the box door through the port opening.

4.2.5.2 The base of the box body shall fit freely but with close tolerance between the guide rails (B1, B2, and B9), which not only hold the box in place while the port is open, but also provide proper alignment for closure of the box at the end of the open/shut cycle.

4.2.5.3 The bottom surface of the box requires three registration holes to engage with the registration pins on the port. The registration pins shall be positioned in the door bottom so that the registration pins prevent seating of the box with the port in the event that the box is improperly rotated by 180 degrees from the correct orientation. The correct orientation is illustrated in Figure 2.

4.2.5.4 The perimeter of the bottom surface of the box body shall be continuous and shall be positioned against the port surface. This positioning assures the activation of an optional limit switch, placed in an unspecified location along the port perimeter, for the sensing of proper box placement.

4.2.5.5 The center of the cassette crossbar shall coincide with the center of the box door, with the cassette oriented as shown in Figure 2. The top surface of the box door requires the registration bars that hold the cassette in place. The horizontal cassette movement is limited by the tolerances G2. The vertical position of the cassette while located on the box door is specified by the distance G1 between the top of the port surface and the bottom surface of the cassette.

4.2.5.6 The external top of the box shall not exceed the top of the cassette by more than two inches. This is to prevent possible interference between the box and the equipment.