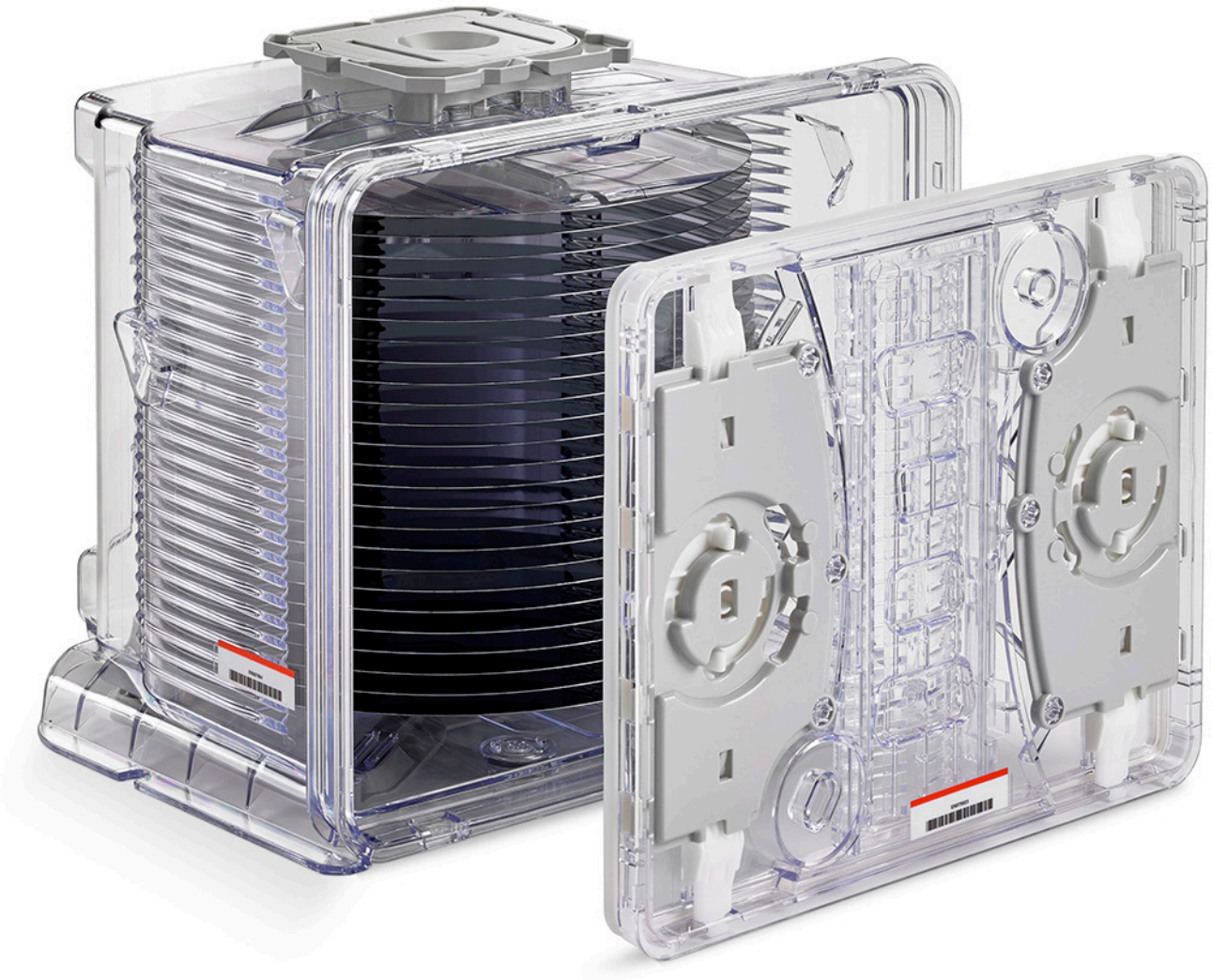
SB300 FOSB for 300 mm Wafers

User manual



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INTRODUCTION

The SB300 front opening shipping box (FOSB) is an innovative 300 mm shipper that offers the benefits of manual and front-opening interface mechanical standard (FIMS)-compatible automation handling. The dual-functionality of the door allows users to easily move from manual operation to FIMS.

FEATURES

TERMINOLOGY

- FIMS is the specification characterizing the automated interface between a FOSB and related equipment, as defined by SEMI® E62
- FOSB is a wafer shipping box with a front-opening interface, as defined by SEMI M31

FIMS COMPATIBILITY

- Provides FIMS automation benefits
- Reduces labor costs associated with manual door operation
- Allows maximum 300 mm loadport interoperability
- Ensures accurate equipment interaction

SECURE WAFER PROTECTION

- Automated operation minimizes potential contamination from human interaction
- Wafer plane accuracy
- Ultrapure, low outgassing materials provide superior protection for wafer shipment
- Protects wafers during 1.5 m drop tests
- All-plastic assembly prevents metallic contamination and corrosion

ERGONOMIC MANUAL HANDLING

- Door design allows safe and easy opening and closing in manual mode

IDENTIFICATION

- Innovative insert-molded barcode ensures lifetime identification and traceability
- Clear polycarbonate door and shell allow visual observation of wafers
- Info pads to detect FOSB differences
- Built-in horizontal RFID holder in KC plate
- Vertical RFID holder optional

CLEANABILITY

- Designed for liquid flow-through and drying
- Complete door assembly can be cleaned without disassembly

COMPONENTS AND MATERIALS

DOOR

Number	Component	Material	Quantity
1	Wafer cushion	Polycarbonate (PC)	1
2	Gasket	Thermoplastic elastomer	1
3	Corner guides	Catalogue (POM)	4
4	Door housing	Polycarbonate (PC)	1
5	Lift arms	PTFE-filled polycarbonate (white)	4
6	Latch arms	Acetal (POM)	4
7	Latch cams	PTFE-filled polycarbonate (white)	2
8	Latch cover	Polycarbonate (PC)	2

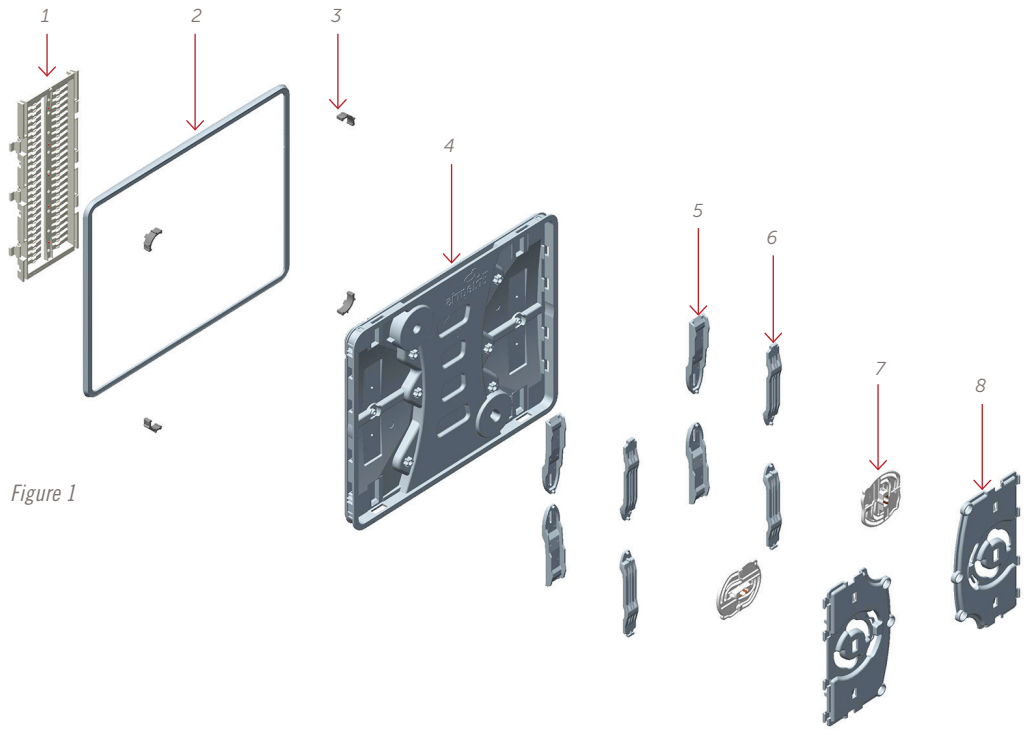

Figure 1

SHELL

Number	Component	Material	Qty
1	Shell housing	Polycarbonate (PC)	1
2	Rear retainer	Polybutylene terephthalate (PBT)	1
3	KC plate	Polycarbonate (PC)	1
4	Filter housing	Polycarbonate (PC)	1
5	O-ring	Viton®	1
6	Filter media	Electrostatic media	1
7	Auto flange	Polycarbonate (PC)	1
8	Info pads (optional)	Black polycarbonate (PC)	4

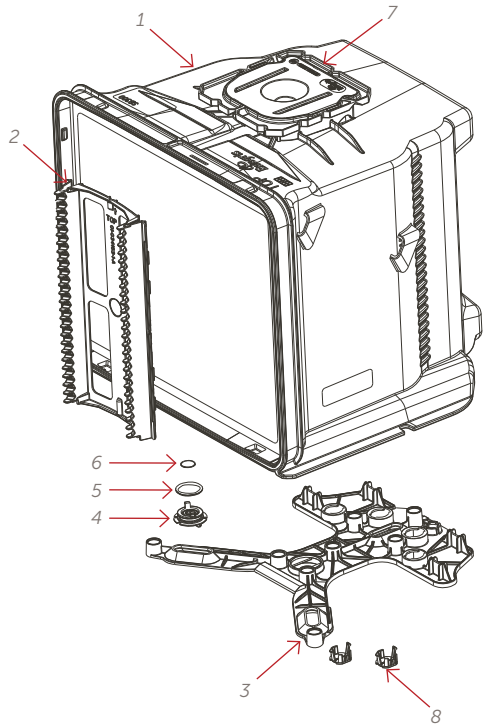

Figure 2

SECONDARY PACKAGING

STANDARD TWO-PACK

The SB300 FOSB standard package for delivery from our factory to the customer with unattached accessories is shown in Figure 3. All parts are single bagged.

Outer Box

Entegris part number FLA-054-01

Dimensions: 680 mm L × 415 mm W × 365 mm H (26.77" L × 16.34" W × 14.37" H)

Corrugated pad

Entegris part number FLA-052-03

Dimensions: 393.7 mm L × 337.82 mm W (15.5" L × 13.3" W)

This package was designed to fit a standard pallet size of 1100 mm × 1100 mm without overhang.

Pallet layers contain eight units, maximizing utilization of pallet space.

NOTE: This secondary packaging is not designed to ship the SB300 FOSB with wafers.

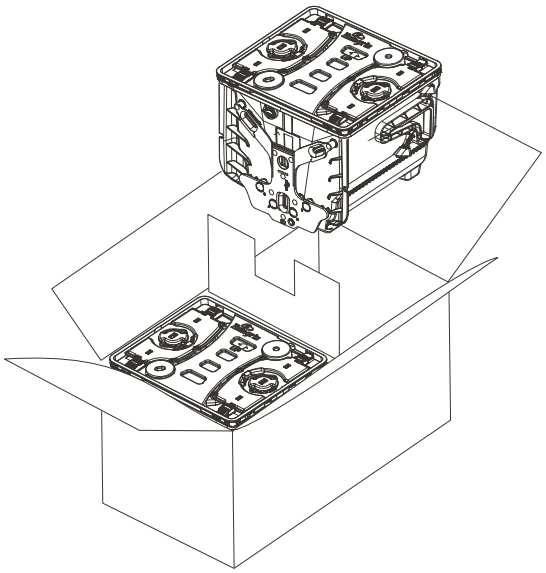

Figure 3

ASSEMBLY INSTRUCTIONS

SB300 FOSB OPTIONS

Side Handles

INSTALLING 30-DEGREE HANDLES:

1. Locate the snap detail on the side handle, part number SP300-0900.
2. Place the side handle so both the snap detail and the leading tab of the handle are under the shell support loops.
3. While supporting the front of the SB300 FOSB, push the handle further into the shell support loops until the snap detail has locked into position.

INSTALLING 90-DEGREE HANDLES (FIGURE 4):

1. Locate the snap detail on the side handle.
2. Place the side handle against the SB300 FOSB so that the snap detail at the base of the handle is under the lower (KC plate side) support loop.
3. Move the handle downward so that the snap detail at the top of the handle is under the upper support loop.
4. Move the handle upward until the snap detail at both top and bottom of the handle are locked into position.

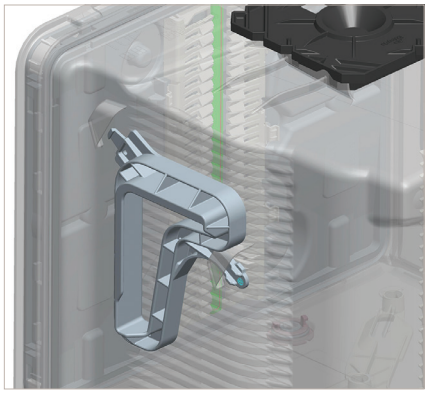

Figure 4. 90° handle

Info Pad

INSTALLING THE INFO PADS (FIGURE 5):

1. Locate the "flat" side of the info pad, part number 01-031822.
2. Align the flat portion of the info pad with the flat portion on the KC plate info pad hole.
3. Place the snap features into the desired info pad hole and push the info pad into position until an audible "snap" is heard. The info pad will sit flush with the surface of the KC plate after installation.

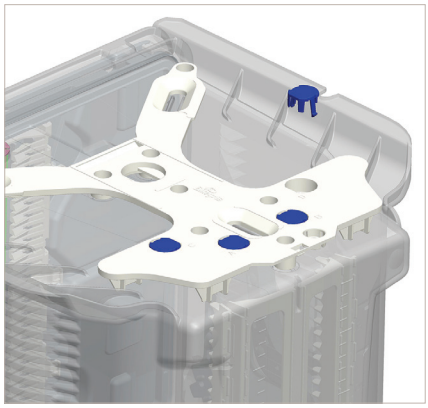

Figure 5. Info pads

DATUM ORIENTATION

HORIZONTAL DATUM

The horizontal datum is located near the bottom of the carrier (Figure 6). Frame location for the purpose of automated transfer in and out of the cassette is defined in the Z direction relative to this datum.

FACIAL DATUM

The facial datum is a vertical plane centered on the film frame and oriented left to right. It is used as a reference for front to back Y dimensions.

BILATERAL DATUM

The bilateral datum is a vertical plane centered on the wafers and oriented front to back. It is used as a reference for left to right X dimensions.

X, Y, AND Z DIMENSIONS

X dimensions are horizontal left to right. Y dimensions are horizontal front to back. Z dimensions are vertical.

STRUCTURE

Datum Orientation Relative to the First Wafer

All 300 mm wafers, when fully seated in the shipper, are nominally centered on the vertical line formed by the intersection of the bilateral datum and the facial datum (Figure 7). The botom of the first wafer, located in the lowest pocket of the FOSB, is located nominally at 44 mm above the horizontal datum.

Wafer Spacing

Each wafer above the first wafer is located nominally at 10 mm spacing. The tolerance for vertical wafer location is ±0.5 mm for each wafer (Figure 8). The tolerance is non-accumulative.

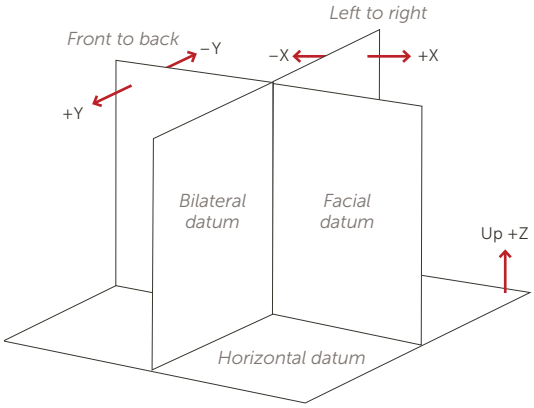

Figure 6. Datum orientation

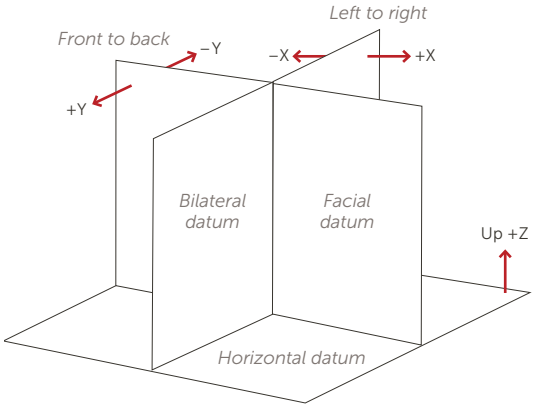

Figure 7. Datum structure

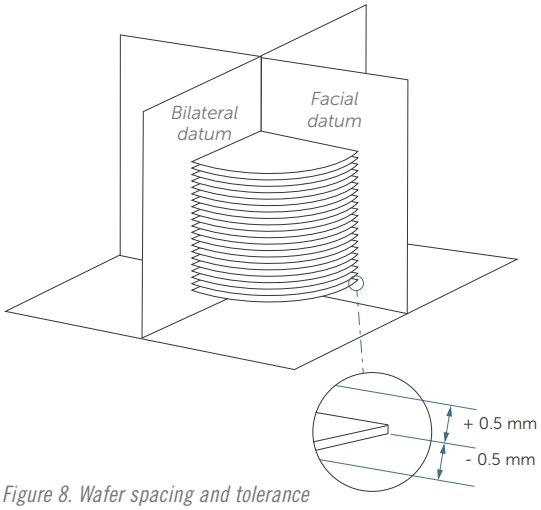

Figure 8. Wafer spacing and tolerance

Kinematic Coupling Pins Relative to All Datum

The horizontal datum is defined by the kinematic coupling (Figure 9). The machine side of the kinematic coupling consists of three pins of a specified shape in a specified pattern relative to the bilateral datum and facial datum. The kinematic coupling pins protrude through the horizontal datum. A FOSB cannot be effectively opened, closed, loaded, or unloaded unless it is properly positioned on a kinematic coupling.

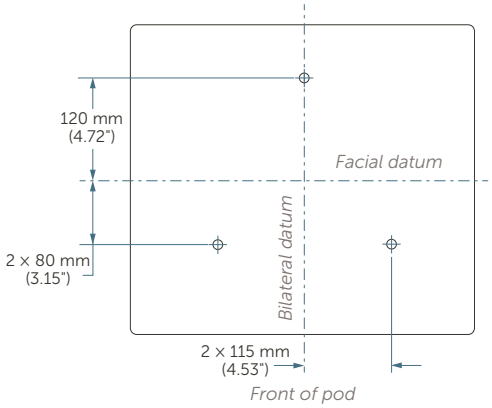

Figure 9. Top view of kinematic coupling

Datum Orientation Relative to an SB300 FOSB

The base of the SB300 FOSB is located slightly above the horizontal datum (Figure 10). The bilateral datum and facial datum intersect the the FOSB vertically.

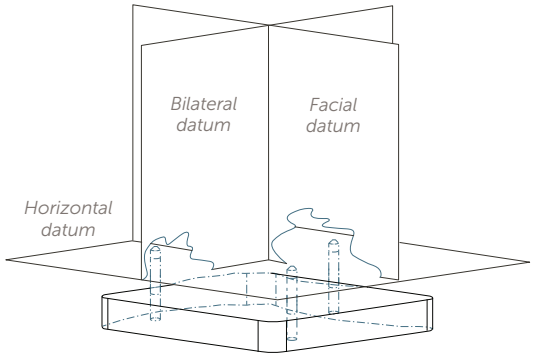

Figure 10. Datums and kinematic coupling

SEMI STANDARDS

Provided below is a brief description of each applicable SEMI standard and how it applies to the SB300 FOSB. Please contact your local Entegris representative for information on specific SEMI standard compliance issues.

SEMI E62

Provisional specification for 300 mm FIMS

SEMI E62 describes the features and basic function of the FOSB door opening mechanism. E62 is a very specific standard for the configuration of the equipment, including registration pins, seal zones, and latch key shape, position, motion, and torque. The 300 mm FOSB must function with these features but the precise mating feature size, position, and design are up to the carrier maker. The features of the FOSB that mate with an E62 FOSB door opener are defined by the Entegris design specification. In general, this compatibility involves proper clearance around and location relative to the E62 FOSB door opener features.

Since the force required to attach the door to the shell is greater than the door closure force designated by SEMI E62, the SB300 FOSB is designated as "FIMS-compatible."

SEMI M31-0999

Provisional Mechanical Specification for FOSB used to Transport and Ship 300 mm Wafers

SEMI M31-0999 is a standard that partially specifies the FOSB used to ship 300 mm wafers from wafer suppliers to their customers (typically IC manufacturers). In this standard only the physical interfaces for the FOSB are specified; no material requirements or microcontamination limits are given. This standard assumes that the FOSB is used in the last process in wafer manufacturing, in acceptance and inspection, and in transferring the wafers from a FOSB to a front opening unified pod (FOUP) or open cassette inside an IC manufacturing process. The FOSB is not intended to be used in IC manufacturing processes.

SEMI E106

Provisional Overview Guide for Physical Interfaces and Carriers for 300 mm Wafers

SEMI E106 describes the complex interdependencies among SEMI standards for 300 mm physical interfaces and carriers, and explains how standards apply to specific products.

SEMI E47.1

Provisional Mechanical Specification for Boxes and Pods used to Transport and Store 300 mm Wafers

SEMI E47.1 is a standard that applies to various types of 300 mm pods. The outside shape and overall pod size are limited by this standard. Equipment automation and human interface features are also defined by the standard.

SEMI E57

Provisional Mechanical Specification for Kinematic Couplings used to Align and Support 300 mm Wafer Carriers

SEMI E57 describes the equipment side of the kinematic coupling that is the universal equipment interface for all types of 300 mm wafer carriers.

This standard describes very specifically the shape and position of three pins. The 300 mm carrier must have features, which register with these pins, but the shape of these features is up to the carrier maker to design. The test of a wafer carrier's compliance to E57 can only be made by placing that carrier on a fixture that is compliant to SEMI E57 and measuring the locations of features relative to the resulting datum structure.

SPECIFICATIONS

- Wafer size: 300 mm (11.81") diameter
- Wafer capacity: 25
- Wafer spacing: 10 mm (0.40")
- Wafer carrier type: FOSB
- Overall dimensions
  - Height from horizontal datum plane (including auto-top flange): 336.93 mm (13.265")
  - Width: 385.17 mm (15.164")
  - Width with handles: 415.369 mm (16.369")
  - Depth: 332.77 mm (13.101")

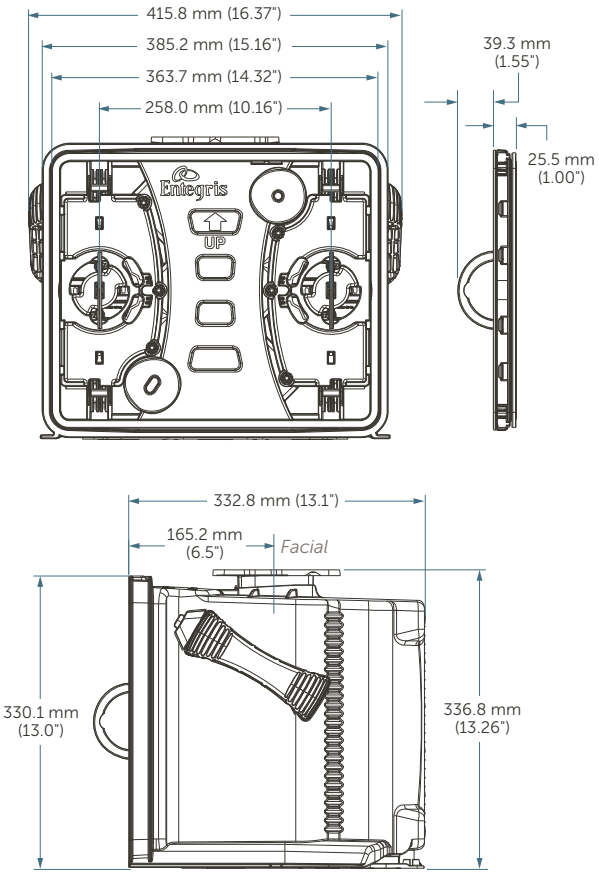

Figure 11. SB300 FOSB dimensions

EQUIPMENT INTERFACE

The SB300 FOSB provides interoperability across a variety of equipment. This section provides an overview of one of the most common interfaces – a load port – and then discusses the door interface features and interfacing recommendations.

LOAD PORT INTERFACE

A load port is a piece of equipment commonly used to provide an interface between a FOSB and a piece of process equipment.

Basic Features

Most load ports incorporate many of the same basic features (Figure 12). These features, defined in SEMI standard E15.1, include:

- Door registration pins
- Kinematic coupling pins
- Port door
- Latch keys
- Primary hold down

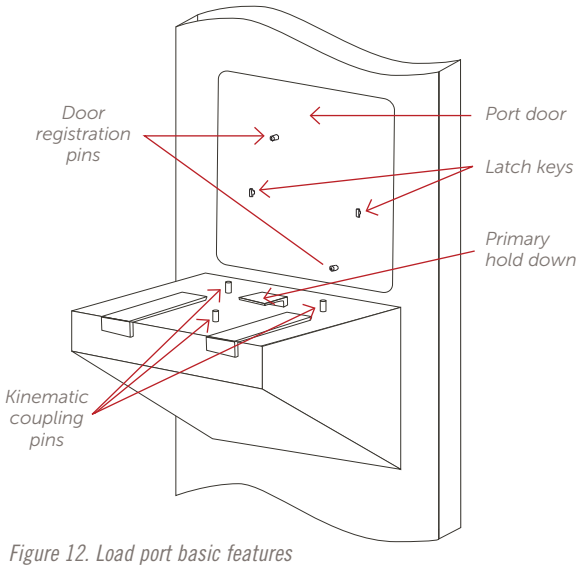

Figure 12. Load port basic features

Standard Operation

Operation of individual load port models will vary. Basic load port operation includes:

- The FOSB is placed on the load port and located by the kinematic coupling pins
- The load port advances the FOSB to the port door, engaging the primary hold down to retain the FOSB on the load port
- The door registration pins locate the FOSB door
- The latch keys turn 90° to unlatch the FOSB door
- The port door and FOSB door are removed, leaving the wafers accessible to the process tool

This basic procedure is reversed after the process tool replaces the wafers in the FOSB.

DOOR INTERFACE POINTS

Registration Hole and Slot

The registration hole and slot are used to properly locate the door. Registration pins on load ports interface with the round registration hole and angled slot to ensure correct door location.

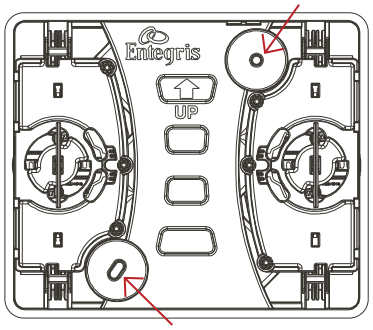

Figure 13. Registration hole and slot

The hole and slot must both be used to properly locate the door. See SEMI E62.

Automated Key Slots

Automated key slots are used for automated door latch actuation and for door retention. The key slots accommodate standard t-shaped keys. The keys are inserted into the key slot and rotated 90° counter-clockwise (as viewed from the FOSB) to unlatch the door. In this position, the keys securely hold the door for removal. When the door is replaced in position, rotating the keys 90° clockwise (as viewed from the FOSB side of the interface) engages the door latches and allows the keys to be removed.

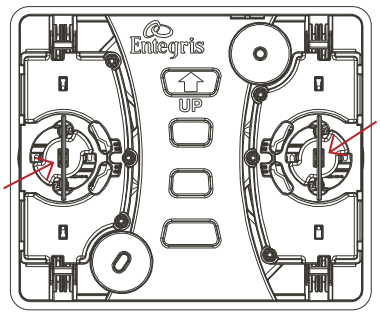

Figure 14. Automated key slots

To operate properly, the FOSB must be advanced so it is within 0.5 mm of the load port bulkhead (see SEMI E62). Torque required for key operation is 4.4 Newton meters maximum.

BOTTOM INTERFACE POINTS

Kinematic Coupling

The kinematic coupling is used to precisely locate the FOSB on equipment. It incorporates kinematic coupling grooves that accommodate both standard inner and outer kinematic coupling pins.

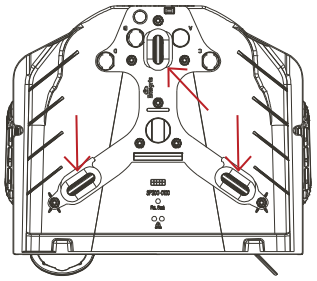

Figure 15. Kinematic coupling

Recommendations

The kinematic coupling is the only acceptable interface mechanism for FOSBs and equipment load ports. The primary outer pins increase stability and accuracy, and are therefore recommended for load port interface. The inner pins are less accurate and are recommended for use only in AMHS applications.

Related Specifications and Documents

- SEMI E57

Hold Down Features

The hold down features are used to retain the FOSB in position. Two sets of features are provided. The primary hold down feature, located on the front of the FOSB, is a passive restraint that engages when the FOSB is advanced. The secondary hold down feature is an active restraint, utilizing a keyway slot that accommodates a standard t-shaped key. The key is inserted into the keyway slot and rotated 90° in either direction to hold the FOSB in place.

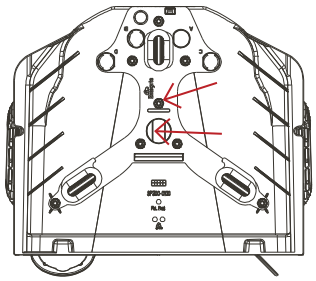

Figure 16. Hold down features

Recommendations

The primary hold down is for use in applications where the FOSB advances forward to engage the feature. The secondary hold down can be used in load port as well as AMHS applications. Use of the hold down features is recommended to ensure the FOSB cannot be removed from process equipment prior to process cycle completion, and to prevent the FOSB from falling or being knocked off of transport equipment.

Related Specifications and Documents

- SEMI E47.1

Sensor Pads

Sensor pads are used to verify FOSB presence and proper placement.

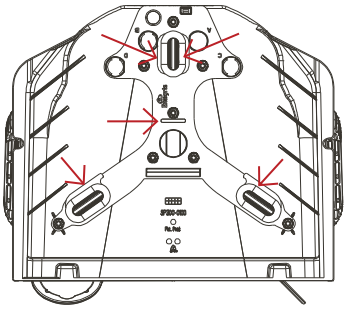

Figure 17. Sensor pads

Recommendations

For accurate operation, use only the recommended sensor pads.

Related Specifications and Documents

- SEMI E1.9, E47.1

FEOL and BEOL Pads

FEOL (front end of line) and BEOL (back end of line) pads are used to prevent FEOL pods from being processed on BEOL load ports and vice versa, which prevents wafer cross contamination.

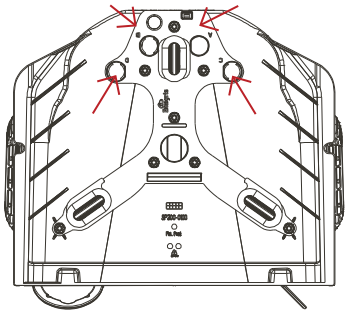

Figure 18. FEOL and BEOL pads

Recommendations

Rather than a presence pin to provide a physical obstruction in the FEOL or BEOL positions, use of a pin on equipment is recommended.

Related Specifications and Documents

SEMI E1.9, E47.1, E15.1

GENERAL USE INSTRUCTIONS

MANUAL ASSEMBLY

Proper manual assembly of the SB300 FOSB door is accomplished by aligning the door's right or left vertical edge to the shipper box opening (Figure 19).

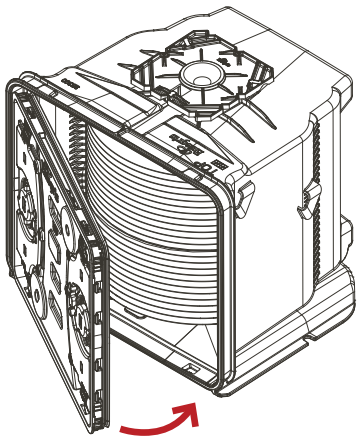

Figure 19

1. Grip the door and shipper box along the vertical edge (pivot edge) with one hand and rotate the door until the wafer cushion contacts the wafers.
2. Latch the lock on the pivot edge first by rotating the cam counterclockwise 90° using the tabs available, manual latch keys, or optional D-rings. Apply inward pressure to the opposite side of the door until it is flush to the shipper box opening and latch closed using the same procedure.

It is possible to assemble the SB300 FOSB when seated on a horizontal kinematic coupling plate. However to aid in assembly, Entegris recommends that the shipper box be placed on an angled surface of 15°–75° degrees as shown in Figure 20.

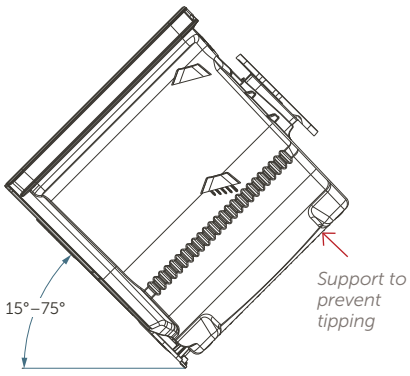

Figure 20

Both the bottom kinematic coupling surface and back surfaces of the shipper box should be supported when on the angled work surface. Selection of the most suitable angle to be used is dependent on the height of the assembly workstation.

Errors are greatly minimized using this assembly method. However, it is also required that a visual inspection be performed after each assembly to make sure the wafers are properly engaged with the door cushion. This is most easily done when viewing the wafers and cushion through the center of the door.

NOTE: Door assembly should never be attempted with the shipper box on its back and the wafers in a completely vertical position. This can cause cross slotting and wafer breakage (Figure 21).

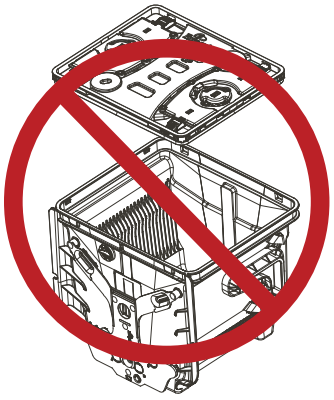

Figure 21

D-RING HANDLES

D-ring handles are used for manually disengaging the door latches and for door retention. The D-ring handles also incorporate automated key slots for automated operation. The D-rings are simply lifted and then rotated 90° clockwise to unlatch the door. In this position, the D-rings provide a secure handle for removing and replacing the door. When the door is replaced in position, rotating the D-ring keys 90° counterclockwise engages the door latches.

Recommendations

Make sure the door is properly seated before engaging the latches.

Environmental Conditions

The SB300 FOSB is packaged to meet industry accepted cleanroom protocols. This packaging can be used for storage until ready for use. Storage temperature should not exceed 70°C (158°F).

Utilize your cleanroom protocol as a guide for removing Entegris packaging material.

Product Reuse

The SB300 FOSB may be reused if it is properly handled and maintained. To maximize the number of uses, the following guidelines should be followed:

- Door and shell should be thoroughly cleaned after each use
- The door gasket and wafer cushion should be replaced after each use
- Thoroughly inspect the FOSB for damage or excess wear prior to reuse

LIMITED WARRANTY

Entegris' products are subject to the Entegris, Inc. General Limited Warranty. To view and print this information, visit entegris.com and select the Legal & Trademark Notices link in the footer. Entegris does not warrant any failure in the case of customers using unapproved foreign components.

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