

SEMI E117-1104 (Reapproved 0710)

SPECIFICATION FOR RETICLE LOAD PORT

This standard was technically approved by the global Physical Interfaces & Carriers Committee. This edition was approved for publication by the global Audits & Reviews Subcommittee on April 30, 2010. Initially available at www.semi.org in June 2010. Originally published November 2002; previously published November 2004.

1 Purpose

1.1 This specification defines dimensional requirements and options of reticle load ports on reticle stockers, lithography exposure equipment, and reticle inspection equipment. It is intended to promote a uniform physical interface between equipment and the factory, to facilitate the use of automated RSP transport systems, and/or to meet ergonomic requirements for manually loaded equipment.

2 Scope

2.1 This standard covers only load ports for reticle SMIF pods (RSPs) as specified in SEMI E100, SEMI E111, and SEMI E112. Similar requirements and options covering load ports for wafers are covered in SEMI E15 (for 200 mm wafers and smaller) and in SEMI E15.1 (for 300 mm wafers).

NOTICE: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 SEMI Standards

SEMI E15 — Specification for Tool Load Port

SEMI E15.1 — Specification for 300 mm Tool Load Port

SEMI E19.3 — Standard Mechanical Interface (SMIF), Specification for 150 mm (6 inch) Port

SEMI E19.4 — 200 mm Standard Mechanical Interface (SMIF)

SEMI E72 — Specification and Guide for 300 mm Equipment Footprint, Height, and Weight

SEMI E100 — Specification for a Reticle SMIF Pod (RSP) Used to Transport and Store 6 inch or 230 mm Reticles

SEMI E111 — Mechanical Specification for a 150mm Reticle SMIF Pod (RSP150) Used to Transport and Store a 6 Inch Reticle

SEMI E112 — Mechanical Specification for a 150 mm Multiple Reticle SMIF Pod (MRSP150) Used to Transport and Store 6 Inch Reticles

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Terminology

4.1 Definitions

4.1.1 *150 mm Multiple Reticle SMIF Pod (MRSP150)* — a minienvironment compatible carrier (as defined in SEMI E112) that is capable of holding six 6 inch reticles in a horizontal orientation during transport and storage and is compatible with a Standard Mechanical Interface (SMIF) per SEMI E19.3.

4.1.2 *150 mm Reticle SMIF Pod (RSP150)* — a minienvironment compatible carrier (as defined in SEMI E111) that is capable of holding one 6 inch reticle in a horizontal orientation during transport and storage and is compatible with a Standard Mechanical Interface (SMIF) per SEMI E19.3.

4.1.3 *200 mm Reticle SMIF Pod (RSP200)* — a minienvironment compatible carrier (as defined in SEMI E100) that is capable of holding one 6 inch reticle or one 230 mm reticle in a horizontal orientation during transport and storage and is compatible with a Standard Mechanical Interface (SMIF) per SEMI E19.4.

4.1.4 *Reticle SMIF Pod (RSP)* — a minienvironment compatible carrier that is capable of holding either one or six reticles in a horizontal orientation during transport and storage and is compatible with a Standard Mechanical Interface (SMIF) per SEMI E19.3 or SEMI E19.4.

NOTE 1: All other terminology from SEMI E100, SEMI E111, SEMI E112 and SEMI E15 also apply (except that in SEMI E15, the substrate must be assumed to be a reticle and not a wafer).

5 Ordering Information

5.1 The user must specify which RSPs will be used: RSP200, RSP150, MRSP150, or both RSP150 and MRSP150.

6 Requirements

6.1 *Figures and Tables* — The dimensional requirements for a reticle load port (and for the placement of an RSP on that load port) are given in Table 1 with reference to the figures in this document. Although the carrier transport systems shown in these figures represent an overhead transport system using an OHT delivery vehicle, they are intended to represent all types of transport systems (AGV, PGV, conveyor, overhead track, etc.).

6.2 *Orientation* — The reticles are to be oriented horizontally (chrome down) with zero nominal tilt when the RSP is placed on the load port. The tolerance in the horizontal plane is determined by the registration and alignment feature between the RSP and the load port, as specified in SEMI E19.3 or SEMI E19.4. The RSP shall be loaded and unloaded with its front (where reticles are inserted and extracted after the SMIF pod is opened) parallel to and away from the load face plane (see Figure 2).

6.3 *Side Clearances* — Clearances C1 and C2 are defined with respect to the maximum dimensions of the footprint of the RSP (as specified in SEMI E19.3 or SEMI E19.4), not to the rectangular carrier envelope (defined in SEMI E15). Note that C1 is lateral clearance to the left and right of the RSP, but C2 is a radial clearance from the nearest point of the RSP.

6.4 *Overhead Clearances* — All load ports intended for automated overhead access must be open from above to facilitate automatic RSP delivery. The open volume required for automated overhead delivery is defined by a projection of the load port area, including the area required for C1 and C2 clearances, projected upward to the top of the equipment. To allow space for overhead delivery above H2, D1 also defines the open volume. Note that this condition need only be met when the equipment is being loaded or unloaded. For example, the load port may be formed by a surface that extends outward during loading to provide overhead access.

6.5 *Easement for Overhead Transport* — As shown in Figure 1 and Figure 2, to add clearance for overhead RSP transport, no part of the equipment may be higher than H2 above the floor along an easement between the load ports of adjacent equipment down the bay. On a reticle stocker, on inspection equipment, and on lithography exposure equipment that has the load ports on the far end from the litho track, this easement is between the load face plane and a plane parallel to it that is D1 beyond the facial reference plane. On lithography exposure equipment that has the load ports on a side adjacent to the litho track, this easement is between two planes parallel to the bilateral reference plane at the furthest reach of clearance C1 to the left and right of the set of load ports. Such tools must also have an additional easement above H6 between the load face plane and a plane parallel to it that is D1 beyond the facial reference plane. It is recommended that transport equipment using these easements have extra clearance to avoid contacting any equipment boundaries.

6.6 *Loading Obstructions* — As shown in Figure 3, the maximum allowable height of an obstruction on the load port over which the RSP must be lifted (before being set down on the SMIF interface) is H1. Examples of such obstructions include alignment devices and identification tag readers (as well as the SMIF port itself). In the volume between the horizontal reference plane and H1 above it, clearances C1 and C2 no longer apply.

6.7 *Load Port Lead In* — The load port must provide a lead-in capability (in addition to that required on the SMIF port) that corrects an RSP misalignment distance of R in any horizontal direction.

6.8 *Adjacent Load Ports* — All reticle load ports for automated access must be on the same side of the equipment. All equipment must have at least one load port with access for automated overhead delivery. At least two of these load ports are recommended to support equipment throughput. Auxiliary load ports intended for manual delivery may be located on a different side of the equipment. On each piece of equipment, reticle load ports are numbered in increasing order (beginning with 1) from left to right (as seen by a person facing the load face plane) beginning with

reticle load ports in the lowest level and then continuing (from left to right) with any reticle load ports at higher levels. Dimension S specifies the spacing between adjacent reticle load ports.

6.9 As shown in Figure 4, reticle load ports must conform to one of the following configuration options. If no option is specified, Option 1 is assumed.

6.9.1 In Option 1, the load port must nominally be at H, and it must be open from above to facilitate automatic carrier delivery from an overhead transport system. The open volume required for vertical delivery is defined by a projection of the tool load port area, including the area required for C1 and C2 clearances, projected upward to the top of the tool. Note that this condition need only be met when the tool is being loaded. For example, the load port may be formed by a surface that extends outward during loading to provide overhead access.

6.9.2 In Option 2 (which allows faster automatic carrier delivery from an overhead transport system), the top of the carrier must be $\leq H_2$ (2900 for exposure equipment), and it must be open from above to facilitate automatic carrier delivery from an overhead transport system.

6.9.3 In Option 3 (with no allowance for automatic carrier deliver from an overhead transport system), the top of the carrier must be $\leq H_2$ (2900 for exposure equipment), clearance above the reticle must be C3.

6.9.4 Additional load ports used for manual loading/unloading can be located below the primary load port in each of the three options.

6.9.5 Equipment suppliers and users should note that SEMI S8 requirements might restrict such implementations of manual load ports.

Table 1 Dimensional Requirements for Reticle Load Ports

<i>Dimension</i>	<i>Application</i>	<i>Value, mm (in.)</i>	<i>Notes</i>
C1	minimum	75 (3.0)	Clearance to left and right of RSP.
C2	minimum	50 (2.0)	Radial clearance around RSP.
C3	minimum	150 (5.91)	
D	maximum	250 (9.8)	Load face plane to facial reference plane.
D1	minimum	196 (7.72)	Facial reference plane to OHT easement.
H	range	minimum 890 (35.0) maximum 2690 (106)	Port height: lithography exposure equipment.
		925 $\pm$ 35 (36.4 $\pm$ 1.4)	Reticle stockers and inspection equipment.
H1	maximum	60 (2.36)	Loading obstruction height at load port.
H2	maximum	2900 (114.2)	OHT easement height: exposure equipment.
		2600 (102.4)	Reticle stockers and inspection equipment (recommended for exposure equipment).
H6	maximum	3200 (126)	Side OHT easement height (see Figure 2b).
R	minimum	10 (0.4) required 15 (0.6) recommended for ergonomic reasons	Load port lead-in capability (correction of RSP misalignment in any horizontal direction).
S	minimum	290 (11.4) [358 (14.1)]	Spacing of adjacent load ports.

#1 In Table 1 and in the figures of this document, numbers in [square brackets] are specific to the RSP200 (if different from the RSP150 and MRSP150).