

SEMI E1-1110

SPECIFICATION FOR OPEN PLASTIC AND METAL WAFER CARRIERS

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1 Purpose

1.1 This Specification provides the dimensional requirements for plastic and metal wafer carriers used for the processing and handling of 3 inch, 100 mm, 125 mm, and 150 mm diameter wafers. It also includes some related information on, but not a specification for, 200 mm diameter wafer carriers.

2 Scope

2.1 The specification has two classifications: General Usage and Auto Transport Usage.

2.1.1 General Usage is a basic guideline that covers 3 inch, 100 mm, 125 mm, and 150 mm wafer sizes.

2.1.2 Auto Transport Usage is intended to meet the in-use requirements for the interface of wafer carriers with automated wafer processing equipment. Auto Transport Usage covers the 125 mm wafer size.

2.1.3 There is some related information (of historical interest, but not part of the requirements) on the 200 mm wafer size.

2.2 To meet these specifications, carriers must be manufactured within the dimensional limits and be dimensionally stable within the specification when used in accordance with manufacturers' recommendations.

NOTE 1: Recommended usage should be agreed to between user and supplier, since wafer carriers are manufactured from a number of different materials by several manufacturing methods.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Terminology

3.1 Definitions

3.1.1 *bar* — see crossbar.

3.1.2 *bar end* — the end surface of the carrier that has only one crossbar.

3.1.3 *bar radius* — the radius nearest the bar end of the carrier on the crossbar. (See Figure 1, D5b, Type II.)

3.1.4 *bar web* — the mass of material for structural support which may or may not be present on the crossbar. (See Figure 1, D5a, Type II.)

3.1.5 *bar width* — the distance or thickness of the bar when measured perpendicular to the top face. (See Figure 1, D5b.)

3.1.6 *cassette* — see wafer carrier.

3.1.7 *crossbar* — the mass of material connecting the two sides of the carrier at the bar end of the carrier.

3.1.8 *edge perimeter distance* — the distance from the edge of the wafer to the top face of the carrier. (See Figure 1, D7.)

3.1.9 *end wall* — the wall of the carrier opposite the bar end of the carrier.

3.1.10 *flange* — mass of material on the exterior and perpendicular to the side walls.

3.1.11 *hole* — the area for the pin on another carrier to enter for transferring wafers. (See Figure 1, C8.)

- 3.1.12 *parallelism tolerance* — the minimum and maximum dimension allowance for the opposite pockets to vary in relation to their distance from the crossbar end of the carrier. (See Figure 1, D1.)
- 3.1.13 *pin* — the mass of material which enters the hole or slot of another carrier for transferring wafer. (See Figure 1, C7.)
- 3.1.14 *pin and hole center distance from pocket centerline* — the distance from centerline of either the pin or hole to the closest pocket centerline. (See Figure 1, C9.)
- 3.1.15 *pocket* — the area in which the wafer is located in the carrier.
- 3.1.16 *pocket centerline* — the imaginary line which bisects each pocket.
- 3.1.17 *pocket depth* — the distance from the pocket flat to its own pocket nose, not to the opposite pocket. (See Figure 1, C2.)
- 3.1.18 *pocket flat* — the width of the pocket along the vertical walls at its narrowest distance. (See Figure 1, C3.)
- 3.1.19 *pocket nose* — the top of the mass of material between adjacent pockets.
- 3.1.20 *pocket nose radius* — the radius on the pocket nose.
- 3.1.21 *pocket size* — the distance between opposite pocket flats. (See Figure 1, C4.)
- 3.1.22 *pocket spacing* — the distance between pocket centerlines. (See Figure 1, B2.)
- 3.1.23 *pocket width* — the width of the pocket at its widest distance. (See Figure 1, C1.)
- 3.1.24 *slot* — see hole.
- 3.1.25 *top face* — the plane or surface of the carrier from which side wafers enter into or out of the carrier.
- 3.1.26 *track clearance* — the unobstructed area between the two carrier sides on the bar end. (See Figure 1, D6; Figure 2, D6a.)
- 3.1.27 *wafer carrier* — any cassette, box, pod, or boat that contains wafers.
- 3.1.28 *wafer tilt* — the possible unparallel position of the wafer in relation to the bar end of the carrier when the carrier is resting on the bar end. (Not shown in Figure 1.)
- 3.1.29 *wafer transfer* — the act of relocating wafers from one carrier into another. This can be accomplished by several methods.

4 Requirements

4.1 *Wafer Compatibility* — Due to the tolerances present in the carrier dimensions, as well in a standardized wafer, not every possible SEMI Standards wafer carrier may be compatible with every possible SEMI Standard wafer. Please verify the compatibility of your specific wafer and carrier with the respective vendors.

4.2 Carrier Dimensions

4.2.1 Table 1 contains a list of the carrier dimensions used in the following tables and figures.

4.2.2 Tables 2 through 6 contain values for the specific wafer carriers according to wafer dimension and carrier type.

4.2.3 Dimension Notations

4.2.3.1 Overall dimensions are indicated as 'Ax.'

4.2.3.2 Capacity dimensions are indicated as 'Bx.'

4.2.3.2.1 25 wafer capacities are specified for all wafer sizes, 20 wafer carriers are also specified for 125 mm wafers.

4.2.3.3 Detail dimensions are indicated as 'Cx.'

4.2.3.4 Machine fit specifications are indicated as 'Dx.'

4.3 Handling Slots — Slots intended to be used as points for engaging the carrier and picking it up in both manual and automated systems. Handling slots are located on the bar end and the opposite endwall of some carriers, with two slots on each end.

4.4 Pickup Flanges — Flanges intended to be used for engaging the carrier and picking it up in both manual and automated systems. Pickup flanges are located on the endwall of some carriers only and are not present on the bar end. There are two flanges on the endwall.

4.5 Center Alignment Feature — This feature is used in conjunction with wafer transfer machines and pick and place equipment and is located on the bottom sidewalls of some carriers. The center alignment feature is used to find the location of the first pocket and is intended to be used while the carrier is resting on its bottom.

5 Dimensions

Table 1 Reference Symbols and Descriptions

Reference	Description	Reference	Description
A1	Length	D4a	From the bottom of the carrier to the center of the crossbar, measured at the bar end of the carrier. Applicable only to full-depth wafer carriers (i.e., the wafer sits below the top of the carrier).
A2	Width (with/without flange)		
A3	Height (excluding pin)		
B1	Pockets per carrier		
B2	Pocket spacing	D4b	Center point of a nominal size wafer relative to a carrier reference. The actual reference line depends on wafer size, see the appropriate figure.
B3	Center distance from the 1st to last pocket		
C1	Pocket width	D5a	Bar web width which is the mass of material which may be present on the crossbar and is measured perpendicular to the top surface. Bar web width on type II crossbar, or width of the type III crossbar.
C2	Pocket depth		
C3	Pocket flat	D5b	Bar width measured perpendicular to the top surface.
C4	Pocket size	D6/D6a	Track clearance
C5	Pin and hole location (width)	D6b	On the bar end surface, the distance between the two struts perpendicular to the crossbar.
C6	Pin and hole location (length)	D6c	On the bar end surface, the thickness of each of the two struts perpendicular to the crossbar.
C7	Pin diameter and height	D6d	On the bar end surface, the length of each of the two struts perpendicular to and extending above the crossbar.
C8	Hole or slot	D6e	On the bar end surface, the length of each of the two struts perpendicular to and extending below the crossbar.
C9	Pin and hole center distance from pocket center line.	D6f	Radius allowed on the crossbar.
D1/D1a	From the outside of the bar end to the center line of the 1st pocket.	D6g	The overall width at the bottom of the carrier measured within 3/8 in. from the bottom.
D1b	Parallelism inclusive of all pockets.	D7	Edge perimeter distance.
D2/D2a	From the center line of the 1st pocket to the closest point on the crossbar or web.	D7a-d	Handling slots – Refer to the appropriate Figure for details.
D2b	From the center of the 25th pocket to the closest point on the endwall.	D8a-f	Pickup flanges – Refer to the appropriate Figure for details.
D3	From the bar end of the carrier to the start of the crossbar.		
D3a	The step from the bar end of the carrier to the crossbar (the tolerance indicates allowable bow).		
D3b	The step from the bar end of the carrier to the crossbar (the tolerance indicates the allowable deviation measured at a maximum distance of ½ in. from the crossbar/sidewall junction).		

Reference	Description	Reference	Description
D4	Center of the crossbar to the top face of the carrier.	D9a-c	Center alignment feature – Refer to the appropriate Figure for details.

#1 The above descriptions for D6b and D6c do not apply to 125 mm General Usage cassettes, for these refer to Figure 2.

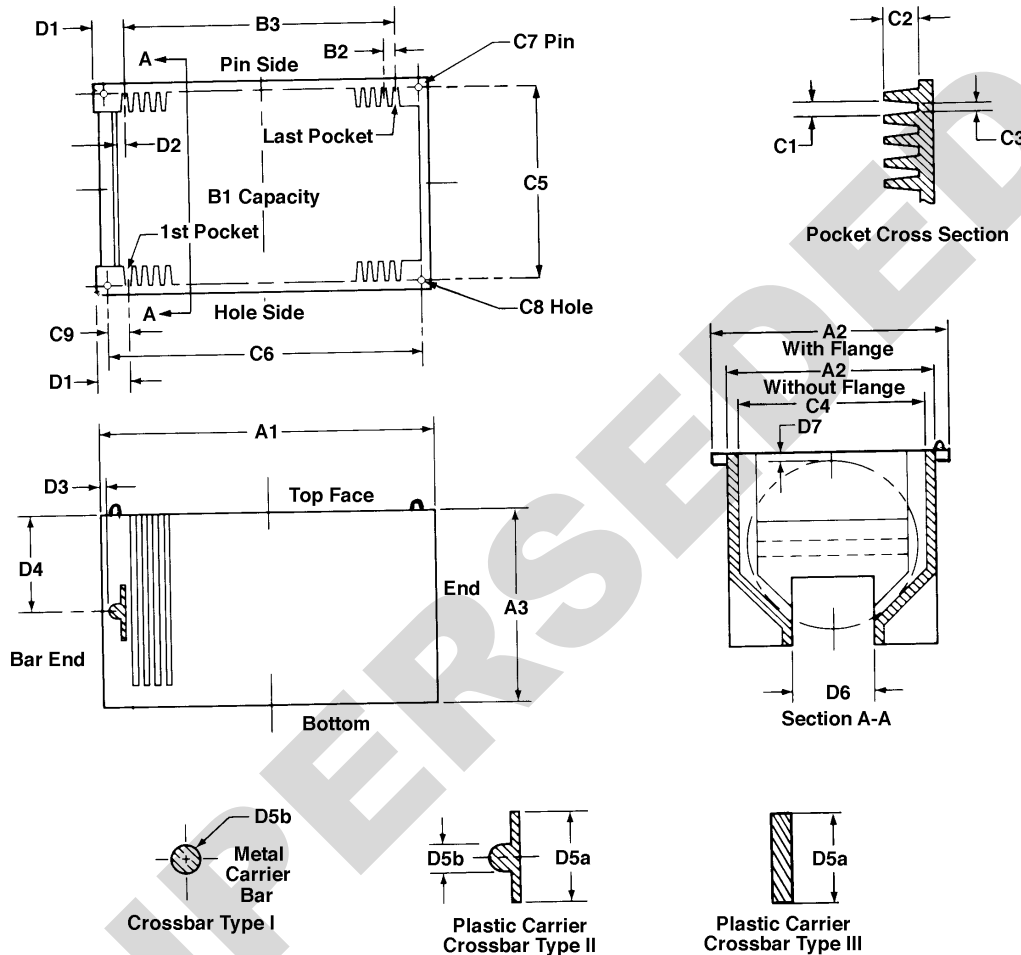


Figure 1
General Usage Carrier Outline for 3 inch and 100 mm Wafers

Table 2 Dimensions for 3 Inch General Usage Wafer Carriers (Reference Figure 1)

Figure 1 Reference		Metal Carrier with Type I Crossbar	Plastic Carrier with Type II or III Crossbar
	Overall Dimensions		
A1	144.02 mm (5.670 in.) max.	X	X
A2	93.73 mm (3.690 in.) max.	X	X
A3	95.25 mm (3.750 in.) max.	X	X
	Capacity		
B1	25	X	X

Figure 1 Reference		Metal Carrier with Type I Crossbar	Plastic Carrier with Type II or III Crossbar
B2	4.76 mm $\pm$ 0.25 mm (0.1875 in. $\pm$ 0.010 in.)	X	X
B3	114.30 mm $\pm$ 0.25 mm (4.500 in. $\pm$ 0.010 in.)	X	X
	Detail Dimensions		
C1	(C3) + 0.50 mm (0.020 in.) min.	X	X
C2	9.53 mm (0.375 in.) max./7.87 mm (0.310 in.) min.	X	X
C3	2.03 mm (0.080 in.) max./1.40 mm (0.055 in.) min.	X	X
C4	79.76 mm (3.140 in.) max./77.22 mm (3.040 in.) min.	X	X
C5	81.89 mm $\pm$ 0.25 mm (3.224 in. $\pm$ 0.010 in.)	X	X
C6	134.52 mm $\pm$ 0.25 mm (5.296 in. $\pm$ 0.010 in.)	X	X
C7	2.54 mm + 0.00 mm/- 0.25 mm (0.100 in. + 0.000 in./- 0.010 in.) by 3.43 mm $\pm$ 0.38 mm (0.135 in. $\pm$ 0.015 in.)	X	X
C8	2.79 mm + 0.51 mm/- 0.00 mm (0.110 in. + 0.020 in./- 0.000 in.)	X	X
C9	10.11 mm $\pm$ 0.25 mm (0.398 in. $\pm$ 0.010 in.)	X	X
D1	14.55 mm $\pm$ 0.25 mm (0.573 in. $\pm$ 0.010 in.) or	X	N/A
	13.97 mm $\pm$ 0.25 mm (0.550 in. $\pm$ 0.010 in.)	N/A	X
	Parallelism inclusive of all pockets $\pm$ 0.25 mm (0.10 in.)	X	X
D2	3.18 mm (0.125 in.)	X	X
D3	1.57 mm (0.062 in.) max.	X	X
D4	47.63 mm $\pm$ 0.25 mm (1.875 in. $\pm$ 0.010 in.)	X	X
	or 41.28 mm $\pm$ 0.25 mm (1.625 in. $\pm$ 0.010 in.)	N/A	X
D5	Crossbar specifications		
D5a	22.23 mm (0.875 in.) max.	N/A	X
D5b	6.35 mm + 0.00 mm/- 0.38 mm (0.250 in. + 0.000 in./- 0.015 in.)	X	X
D6	38.10 mm (1.500 in.) min.	X	X
D7	1.57 mm (0.062 in.) min.	X	X
Wafer Tilt	0.45 mm (0.018 in.) max.	X	X

Table 3 Dimensions for 100 mm General Usage Wafer Carriers (Reference Figure 1)

Figure 1 Reference		Metal Carrier with Type I Crossbar	Plastic Carrier with Type II or III Crossbar
	Overall Dimensions		
A1	144.02 mm (5.670 in.) max.	X	X
A2	125.48 mm (4.940 in.) max.	X	X
A3	114.30 mm (4.500 in.) max.	X	X
	Capacity		
B1	25	X	X
B2	4.76 mm $\pm$ 0.25 mm (0.1875 in. $\pm$ 0.010 in.)	X	X
B3	114.30 mm $\pm$ 0.25 mm (4.500 in. $\pm$ 0.010 in.)	X	X
	Detail Dimensions		
C1	(C3) + 0.51 mm (0.020 in.) min.	X	X
C2	11.18 mm (0.440 in.) max./7.92 mm (0.312 in.) min.	X	X
C3	2.67 mm (0.105 in.) max./1.40 mm (0.055 in.) min. or	X	N/A
	2.03 mm (0.080 in.) max./1.40 mm (0.055 in.) min.	N/A	X

<i>Figure 1 Reference</i>		<i>Metal Carrier with Type I Crossbar</i>	<i>Plastic Carrier with Type II or III Crossbar</i>
C4	104.65 mm (4.120 in.) max./102.62 mm (4.040 in.) min.	X	X
C5	107.29 mm $\pm$ 0.25 mm (4.224 in. $\pm$ 0.010 in.)	X	X
C6	134.52 mm $\pm$ 0.25 mm (5.296 in. $\pm$ 0.010 in.)	X	X
C7	2.54 mm + 0.00 mm/- 0.25 mm (0.100 in. + 0.000 in./- 0.010 in.) by 3.43 mm $\pm$ 0.38 mm (0.135 in. $\pm$ 0.015 in.)	X	X
C8	3.05 mm + 0.25 mm/- 0.00 mm (0.120 in. + 0.010 in./- 0.000 in.)	X	X
C9	10.11 mm $\pm$ 0.25 mm (0.398 in. $\pm$ 0.010 in.)	X	X
D1	14.55 mm $\pm$ 0.25 mm (0.573 in. $\pm$ 0.010 in.) or	X	X
	13.97 mm $\pm$ 0.25 mm (0.550 in. $\pm$ 0.010 in.)	N/A	X
	Parallelism $\pm$ 0.25 mm (0.010 in.) inclusive of all pockets	X	X
D2	4.78 mm (0.188 in.)	X	X
D3	1.57 mm (0.062 in.) max.	X	X
D4	53.98 mm $\pm$ 0.25 mm (2.125 in. $\pm$ 0.10 in.)	X	X
D5	Crossbar specifications		
D5a	25.40 mm (1.000 in.) max.	N/A	X
D5b	6.35 mm + 0.00 mm/- 0.38 mm (0.250 in. + 0.000 in./- 0.015 in.)	X	X
D6	60.33 mm (2.375 in.) min.	X	X
D7	1.57 mm (0.062 in.) min.	X	X
Wafer Tilt	0.51 mm (0.020 in.) max.	X	X