------ Draft 1 of 3 -------

E152 Standard Revision: EUV-Pod Reticle Carrier

EUV Reticle Handling TF

Outline

- **Background**
- **Five Revisions**
  1. Add purge ports
  2. Add door bottom sensor pad/ring
  3. Weight changes
  4. Pod (info pad) configuration standardization
  5. Editorial correction to E142
- **Plans**

Background

- **E152 (EUV pod standard) was published in July 2009.**
- **A total of seven possible changes have been raised since.**
- **Five of them have been agreed for revision by TF and NA PIC Standard Committee at July 2010 meetings, in conjunction with SEMICON West.**

E152 Refresher

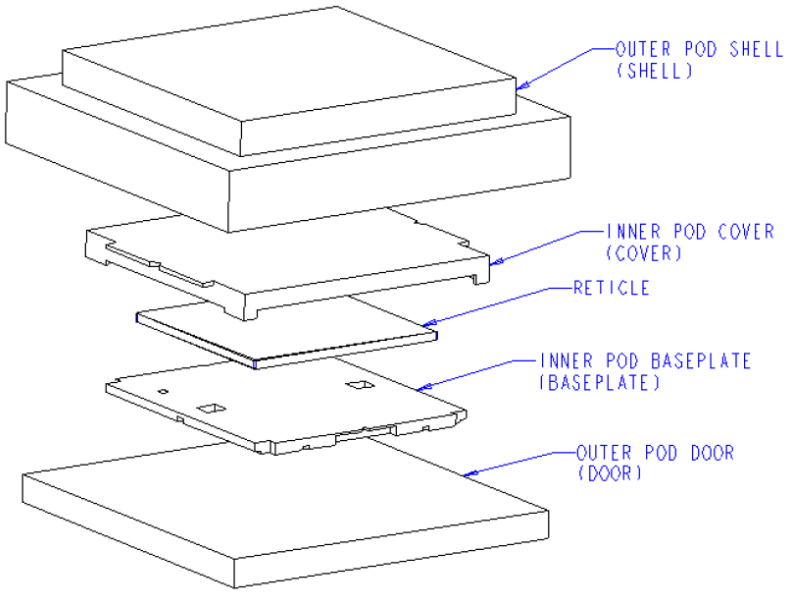


Figure 1
Exploded View of EUV Pod

SEMI E152-0709
MECHANICAL SPECIFICATION OF EUV POD FOR 150 mm EUVL RETICLES

This standard was technically approved by the global Physical Interfaces & Carriers Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 13, 2009. It was available at www.semi.org in June 2009 and on CD-ROM in July 2009.

1 Purpose

1.1 This standard specifies EUV Pod for the 150 mm Extreme Ultraviolet Lithography (EUVL) reticle, used to ship, transport and store a 6-inch reticle. The EUV Pod consists of an outer pod and a protective inner pod. The EUV Pod is to be used when a conventional reticle carrier does not meet the requirements of EUVL.

2 Scope

2.1 This standard is intended to set an appropriate level of specification that places minimal limits on innovation while ensuring modularity and their inter-changeability at all mechanical interfaces. Many requirements given in this specification are in the form of maximum or minimum dimensions with very few required surfaces. No material requirements or micro-contamination limits are given in this specification.

2.2 Because of high attenuation feature of EUV light, a conventional pellicle film cannot be placed in front of EUVL reticles. The inner pod is to protect reticles from particle contamination.

2.3 The EUV Pod has the following components and sub-components. The baseplate of inner pod has two possible configurations depending on the intended usage. They are designated Type A and Type B. Detail configuration requirements for each are shown in Table 2.

2.3.1 Key:

Required feature: ▪

Optional feature: ◊

Outer pod shell

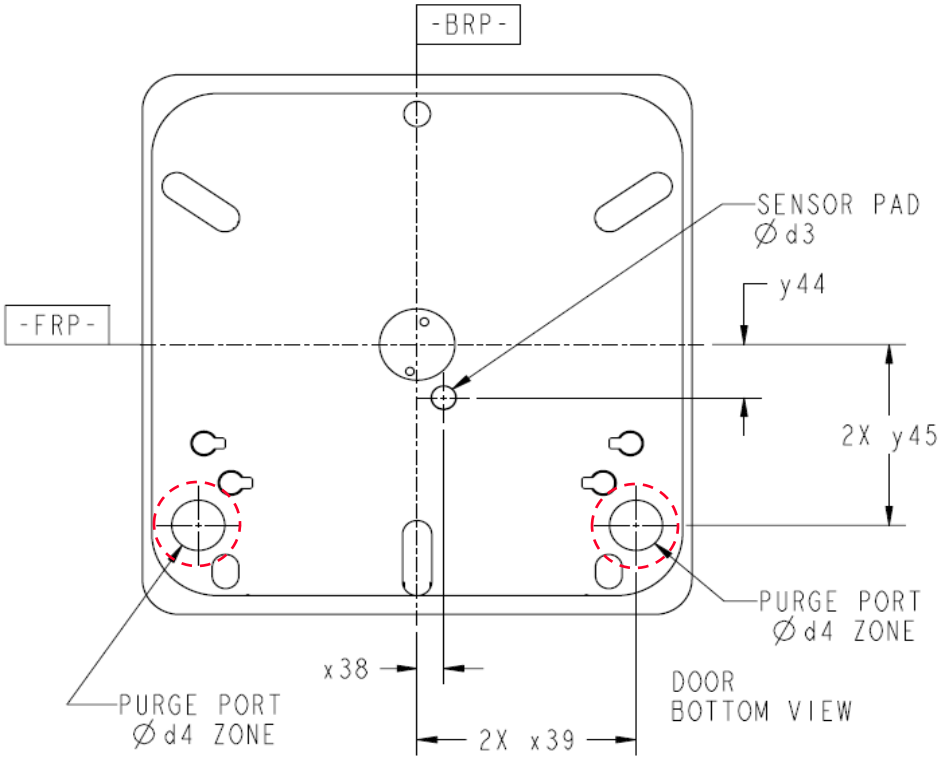
- ▪ One (1) EUV pod ID placement volume
- ◊ Top robotic handling flange
- ◊ Two (2) side robotic handling flanges

Outer pod door

- ▪ Four (4) door sensing pads
- ▪ Four (4) info pads

Purging Ports (1)

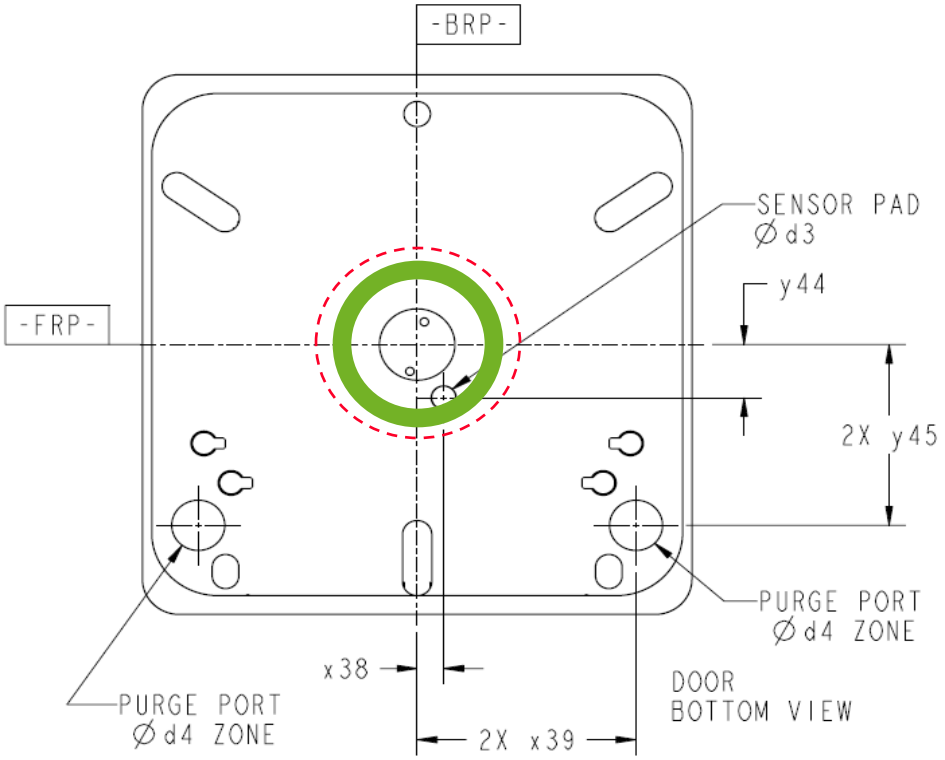
- **Proposing to include purging ports to E152:**
  - **Needs to address: Reticle storage**
  - Tentatively, two purging ports and their general locations are proposed.
  - TF is evaluating possible needs for four ports.



Schematics of outer pod door bottom view

Door Sensor Pad (2)

- **Proposing to include Door Sensor Pad to E152:**
  - **Needs to address: Automation**
  - TF is evaluating the option to have raised donut ring to accommodate all automation suppliers



Schematics of outer pod door bottom view

Pod Weight Increase (3)

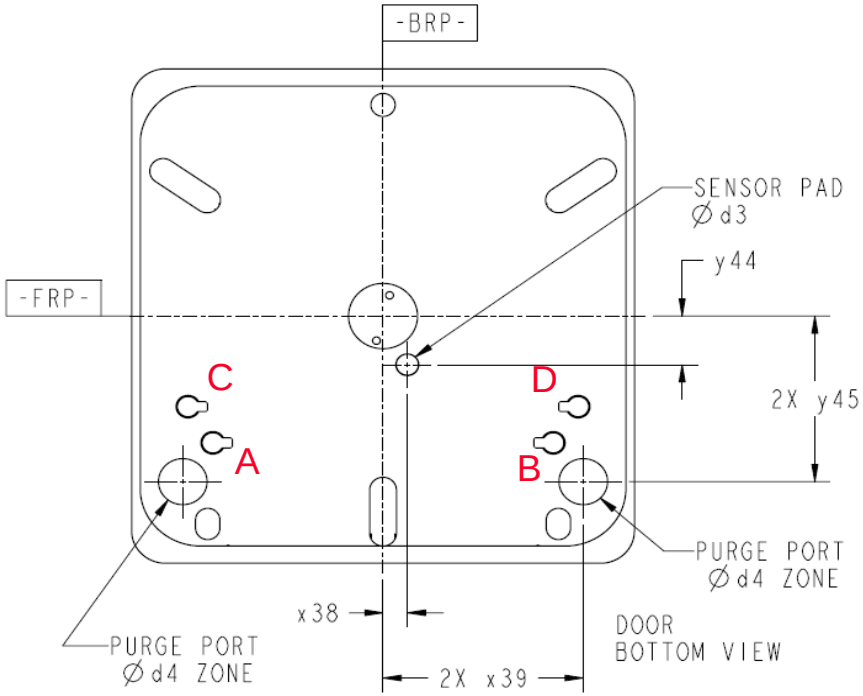
- **Needs to address: Allow improvements while maintaining structural integrities**
- Final weight specification will still be compliant with SEMI ergonomic standard (E???).

Symbol	***Value***		
	Current	***Proposed***	***% change***
M1 (Base Plate Mass)	200 g Minimum 625 g Maximum	200 g Minimum 675 g Maximum	No change 8%
M2 (Inner Pod Mass)	400 g Minimum 1,100 g Maximum	400 g Minimum 1,200 g Maximum	No change 9%
M3 (Outer Pod Mass)	1,000 g Minimum 2,000 g Maximum	1,000 g Minimum 2,500 g Maximum	No change 25%

The proposed changes amount to a 17% increase in total maximum weight.

Info Pad Configuration Standardization (4)

- **Need: Streamline pod config. for carrier management**
- TF recommend to associate info pad config. with RFID.
- Must not be conflicting with E100/RSP200 standard



Configuration	A	B	C	D
1	o	o	o	o
2	●	o	o	o
3	o	●	o	o
4	o	o	●	o
5	o	o	o	●
6	●	●	o	o
7	●	o	●	o
8	●	o	o	●
9	o	●	●	o
10	o	●	o	●
11	o	o	●	●
12	●	●	●	o
13	o	●	●	●
14	●	●	o	●
15	●	o	●	●
16	●	●	●	●

o: info pad open

●: info pad blocked

For Type-B, x4 Does Not Apply (Background)

Feature above this line not allowed for Type B

For Type-B where y38 is set to "0." So x4 will not apply!

Feature below this line not allowed for Type B

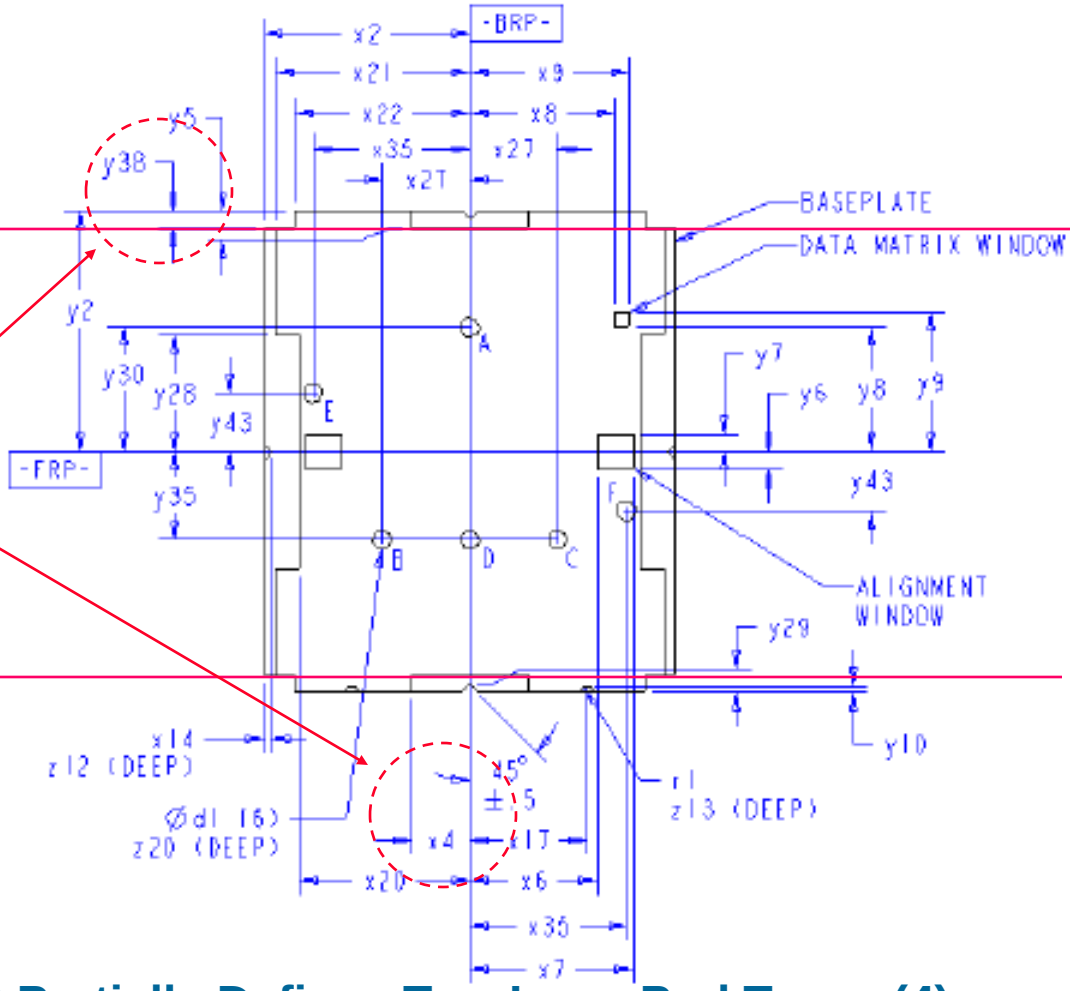
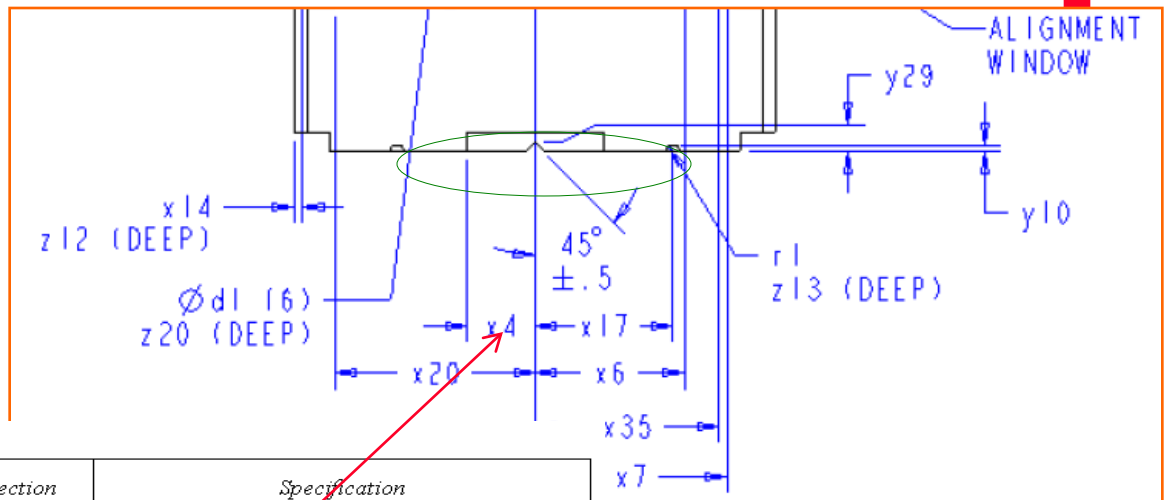


Figure 5
Baseplate – Bottom View

In E152 Figure 5, y38 Partially Defines Two Inner Pod Types (4)

For Type-B, Change x4 to “Prohibited” (5)

- **Need: To correct typo in existing E152**
- When y38 =0, x4 = 0 or “prohibited.”



re 5
Bottom View

Table 2 Type A/B Inner Pod Baseplate Specification

Feature	*Symbol Used*	*Figure*	*Section*	*Specification*	
				Type A	*Type B*
Reticle Location Tolerance	x1	6	5.5	±0.55 mm	±0.25 mm
Reticle Location Tolerance	y1	7	5.5	±0.55 mm	±0.25 mm
Front Edge Grip Exclusion Volumes		3	5.2	Required	Not Required
Baseplate Windows		5, 8	5.9	Required	Not Required
Baseplate Corner Notch	x22	5, 8	5.8	72.00 ± 0.20 mm	Prohibited
Baseplate Corner Notch	y38	5		3.00 ± 0.25 mm	Prohibited
Secondary Baseplate Exclusion Volume	y5	5	5.7.1	3.00 ± 0.25 mm	Prohibited
Secondary Baseplate Exclusion Volume	z3	7	5.7.1	6.00 ± 0.25 mm	Prohibited
Baseplate Notch	y29	5	5.7.1	3.00 ± 0.25 mm	Prohibited
Cover Edge Limit (above base plate, along x22)	z17	7		5.00 mm, Minimum	Prohibited
Baseplate Exclusion Volume	y28	5, 8	5.7.1	50.00 ± 0.25 mm	40.00 ± 0.25 mm
Baseplate Exclusion Volume	x4	5	5.7.1	25.00 ± 0.25 mm	20.00 ± 0.25 mm
Baseplate Registration Hole Assignments		5, 8	5.14	A, B, C, D, E, F	A, B, C

Summary Plans

- **EUV Reticle Handling TF has been working for the 5 changes as discussed.**
  - There is a broad support for the standard revision.
  - Purging ports and outer pod door sensor need more discussions for consensus.
- **TF next step plans**
  - Resubmit SNARF to scope for those 5 changes
  - Target for yellow ballot submission in Jan. 2011

Backup

E152 Allows Carrier Dedication

Carrier dedications called for in two fronts: (1) two inner pod types and (2) un-specified optical properties of baseplate windows for Type A.

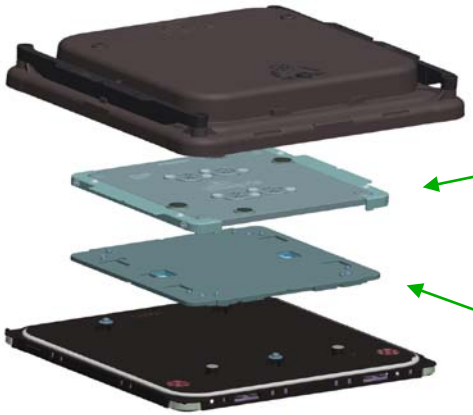
Examples:

Table 2 Type A/B Inner Pod Baseplate Specification

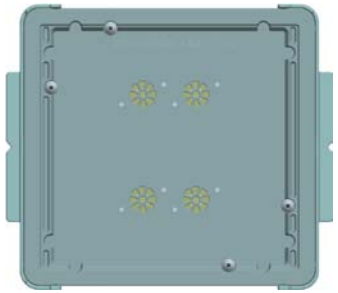
Feature	*Symbol Used*	*Figure*	*Section*	*Specification*	
				Type A	*Type B*
Reticle Location Tolerance	x1	6	5.5	±0.55 mm	±0.25 mm
Reticle Location Tolerance	y1	7	5.5	±0.55 mm	±0.25 mm
Front Edge Grip Exclusion Volumes		3	5.2	Required	Not Required
Baseplate Windows		5,8	5.9	Required	Not Required
Baseplate Corner Notch	x22	5,8	5.8	72.00 ± 0.20 mm	Prohibited
Baseplate Corner Notch	y38	5		3.00 ± 0.25 mm	Prohibited
Secondary Baseplate Exclusion Volume	y5	5	5.7.1	3.00 ± 0.25 mm	Prohibited
Secondary Baseplate Exclusion Volume	z3	7	5.7.1	6.00 ± 0.25 mm	Prohibited
Baseplate Notch	y29	5	5.7.1	3.00 ± 0.25 mm	Prohibited
Cover Edge Limit (above base plate, along x22)	z17	7		5.00 mm, Minimum	Prohibited
Baseplate Exclusion Volume	y28	5,8	5.7.1	50.00 ± 0.25 mm	40.00 ± 0.25 mm
Baseplate Exclusion Volume	x4	5	5.7.1	25.00 ± 0.25 mm	20.00 ± 0.25 mm
Baseplate Registration Hole Assignments		5,8	5.14	A, B, C, D, E, F	A, B, C

5.9 *Baseplate Features for Reticle Alignment and Data Matrix* — The baseplate must allow for optical alignment and identification of the SEMI T16 data matrix symbol on the quality surface of the reticle (see Table 2 for application). Alignment window locations are defined by x6, x7, y6 and y7 in Figure 5 and Table 1. The data matrix symbol window is defined by x8, x9, y8, y9 in Figure 5 and Table 1. This standard does not cover optical specifications for windows which can vary if different wavelengths were used for alignment and data matrix reading in different exposure tools.

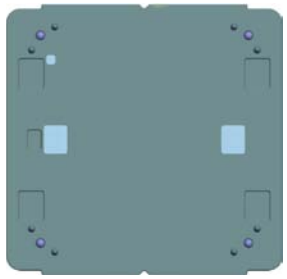
SEMI-E152 Pod Dedication



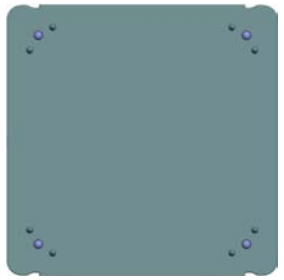
EUV-pod: a single type outer pod; two types of inner pod, major differences are on the baseplate



Inner pod cover



Inner pod Type-A for scanners



Inner pod baseplate

Type-B for uses other than by scanners

- **E152 specifies 1 outer pod, 2 inner pod types (A and B).**
- **Additional sensing features built to Type-A for positive identification by scanners**

  (Type-A: optical windows, more access to mask, relaxed spec, etc...)
- **Type-A is allowed to be supplier-specific.**
- **All tools other than scanners required to be *"type-blind,"* i.e., only to use identical interfaces available to both types.**

Use for \ Pod Type	Type B	Type A		
		Suppl-1	Suppl-2	Suppl-3
Suppl-1 scanner	×	✓	×	?
Suppl-2 scanner	×	×	✓	?
Suppl-3 scanner	×	?	?	✓
Non-scanners	✓	✓	✓	✓

A likely inner pod dedication scheme: green indicating compatible, red incompatible, gray unknown

How to Minimize/Eliminate Carrier Dedication?

- **Type A: standardize window optical properties to eliminate carrier dedication to specific tool set.**
  - Roadblock: suppliers have already developed reticle alignment technology at specific (different) wavelengths.
  - How to remove the roadblock as an industry?
- **Ideal to drop Type B option, but**
  - No data exists to date to show if either types meeting defect-free requirement.

    (The needed inspection capability is yet to be developed.)
    - Theoretically, at least, Type B represents the maximal protection due to full frontside coverage and tight mask positioning specification. So serves as a performance benchmark.
    - Before eliminating Type-A dedication among tool sets, Type B is necessary for cost effective implementation.

      (Type B itself is cheaper to build for less material and labor.)