

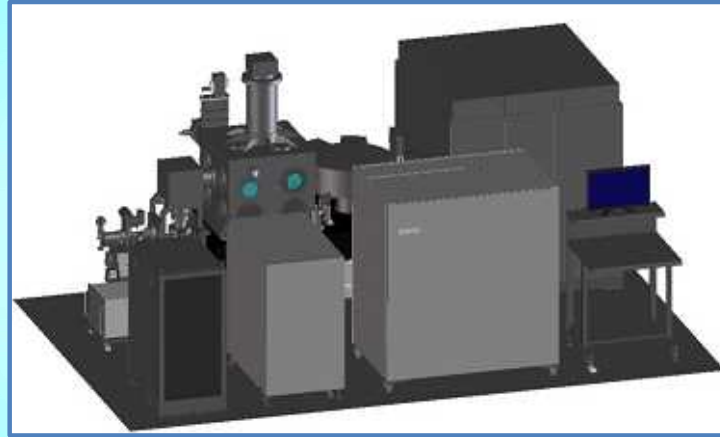
EUV Carrier implementation to the mask tool

October 16th 2011

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Lasertec

Lasertec tool capability of EUV carrier handling



Actinic Blank Inspection



MAGICS

Mask blank inspection tool



MATRICES

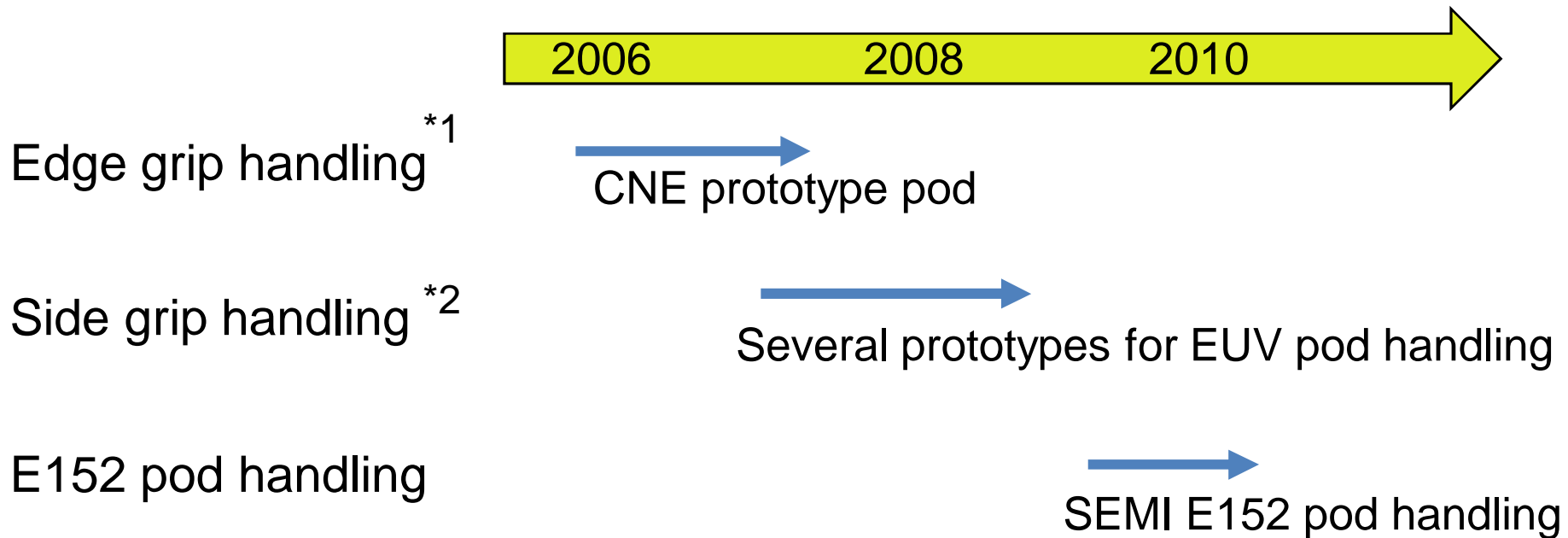
Mask pattern inspection tool



DP200

Dual Pod Handling tool

Development of an EUV carrier handling

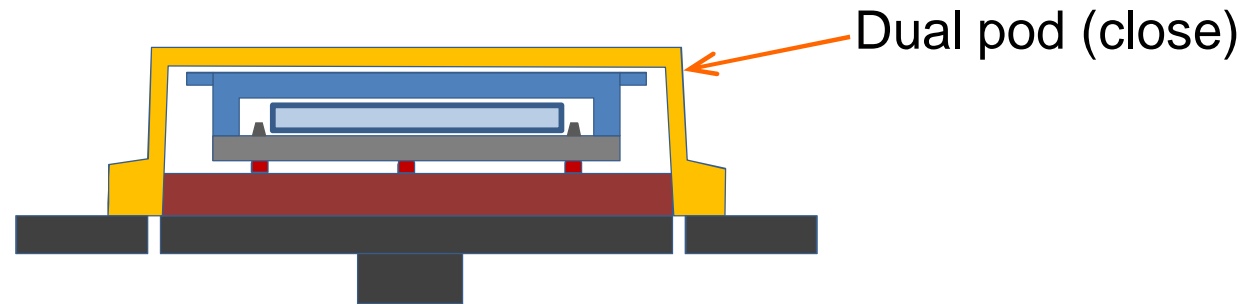


- *1) Edge grip handling development (2006)
 - Added to the Mask blanks inspection tool M3350
- *2) Side grip handling development (2007)
 - A stand alone mask handling tool DP200

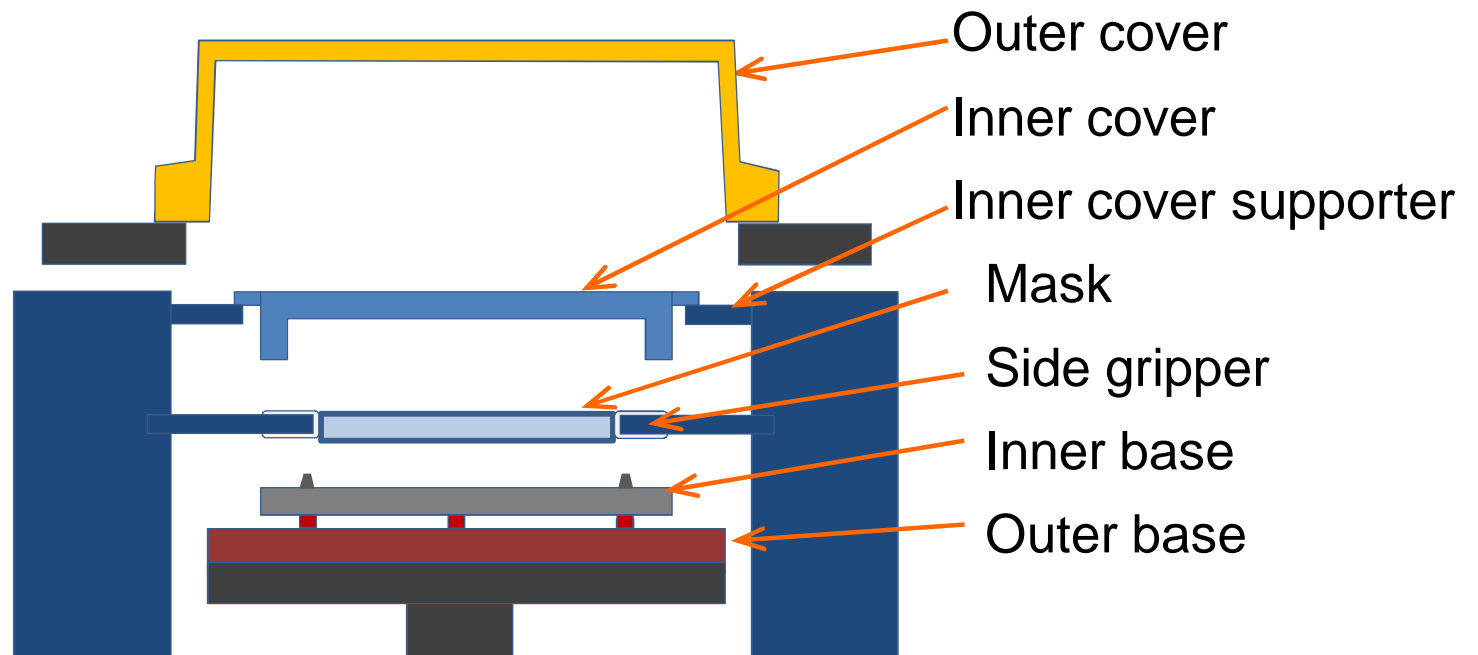
Lasertec achieved < 0.01 particles adder/cycle for EUV carrier handling.

Handling method of EUV carrier

EUV carrier Close



EUV carrier Open



Mask transfer requirements for inspection tools

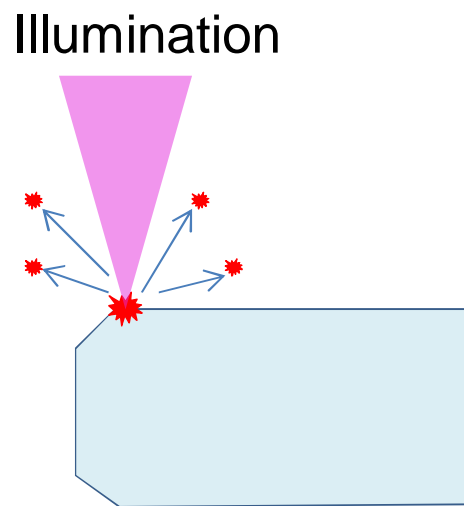
1. Face up transfer

Lasertec mask inspection tools require the face up transfer to the inspection stage.

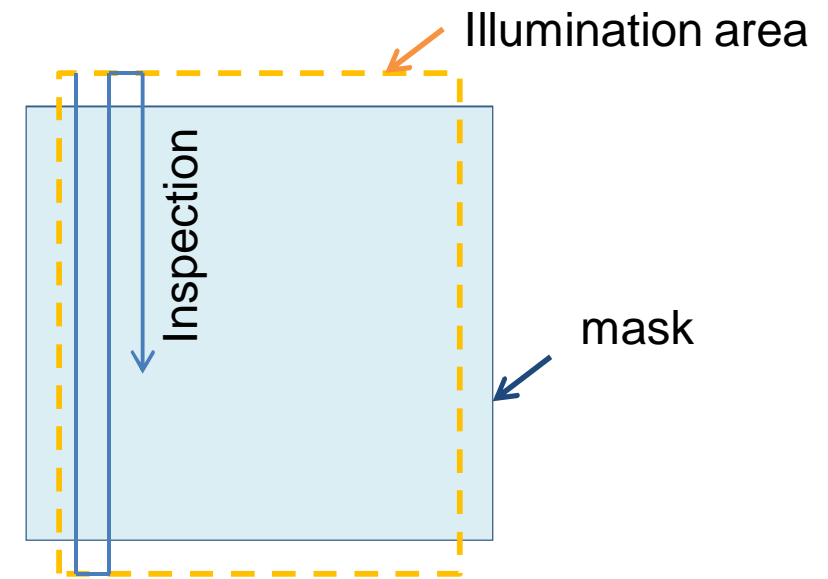
2. Front side cleanness

Large particles on the front side are blasted by the inspection laser.

-- > Large particles inside the illumination area are not allowed to exist.

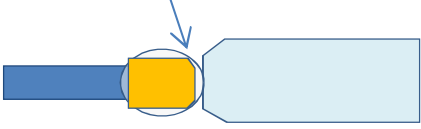



Particle blast

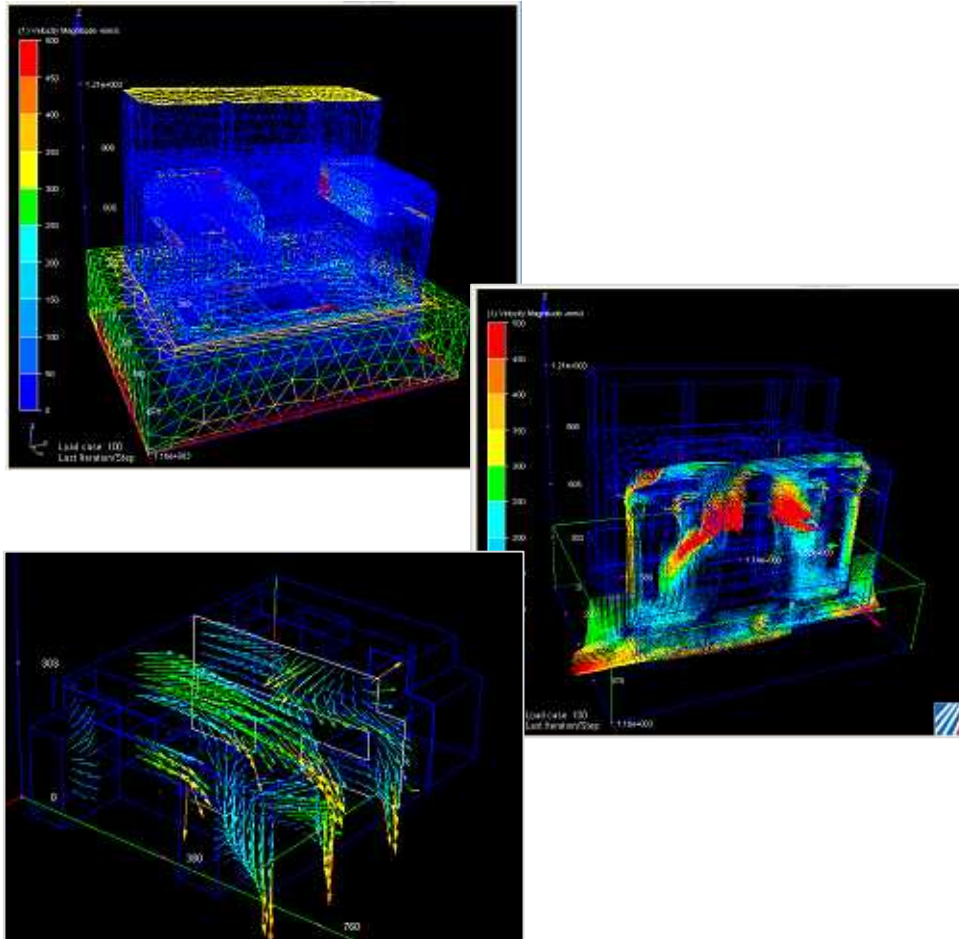


Mask blanks inspection

Comparison of Edge grip and Side grip

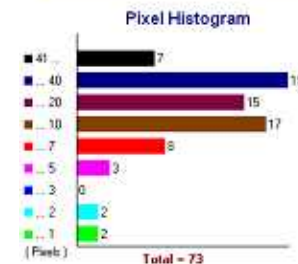
	Side Grip	Edge Grip
Applicability to Lasertec tools	O	O
Carrier Capability	SEMI E152 Type A SEMI E152 Type B	SEMI E152 Type A
Particle adder (Front 142mm)	< 0.01 Particles/cycle	< 0.01 Particles/cycle
Particle adder risk on the front edge	Minimum	Exists (Edge contact area)
Risk of mask dropping	Preventable by a soft holding mechanism and an interlock system	Preventable by a interlock system
Shape	Kalrez® etc.  mask	PEEK  mask

Clean transfer technology

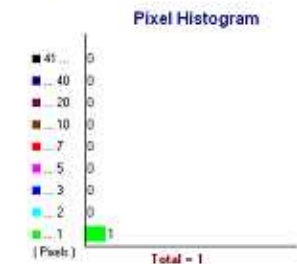


Air flow simulation

M6640 blanks
Inspection



Particle adder
evaluation



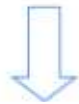
**Particle adder test by the
mask blank inspection tool**

Clean transfer is achieved by the design utilizing particle flow simulations and verification tests using an actual mask blanks inspection tool.

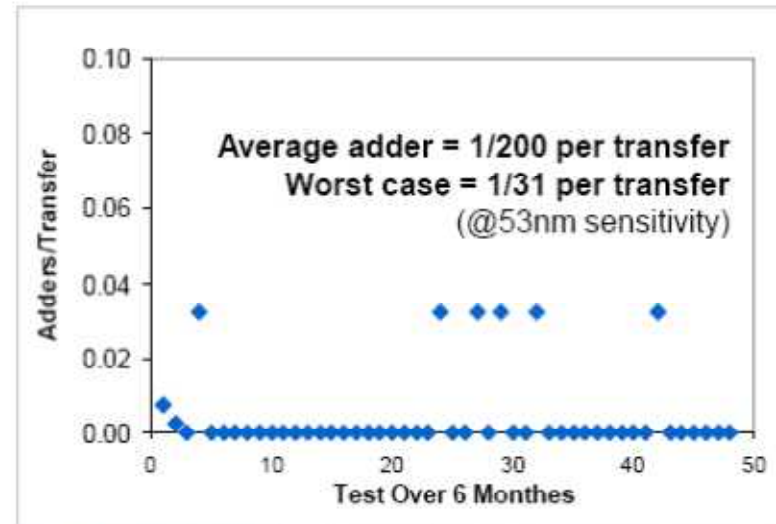
DP200 particle adder evaluation result

- **Minimal requirement:**

- Fully compliant with E152 (EUV Pod) and E100 (RSP200) standards
- Blind to all difference among EUV-pod types and all supplier-specific features.



Capability to handling both carriers on the same load-port is a must-have.



Stand-alone tool is commercially available.
Capabilities demonstrated at SEMATECH in 2007 (far above)

Quoted from SEMATECH document , by Long He, et. al

DP200 particle adder evaluation result

Particle Adder Test (DP200)

	Transfer Direction (Port1 <--> Port2)	Particle check surface	Month/Day	cycle	Particle Adders
Dual Pod Type #1 (Entegris #1 and Entegris #2)	Dual Pod (Entegris#1) <--> Dual Pod (Entegris#2)	Front Side	7/21	300	0
	Dual Pod (Entegris#1) <--> Dual Pod (Entegris#2)	Back Side	7/22	30	0
	Dual Pod (Entegris#1) <--> Dual Pod (Entegris#2)	Back Side	7/22	300	0
RSP200	RSP200 <--> RSP200	Front Side	7/23	300	1
	RSP200 <--> RSP200	Back Side	7/23	300	0

SEMATECH photomask cleaning workshop at Monterey CA · USA

Particle adder < 0.003 (Whole Mask surface / 1 transport)

Summary

1. Lasertec has a capability of both edge grip handling and side grip handling.
2. Lasertec can achieve the cleanness of <0.01 particles /cycle based on many experiences.
3. Side grip handling can reduce a particle adder risk on the front edge.