

Automated EUV Tools for HVM

- Pellicle Mounter/Demounter, Pellicle & Pod Inspection System

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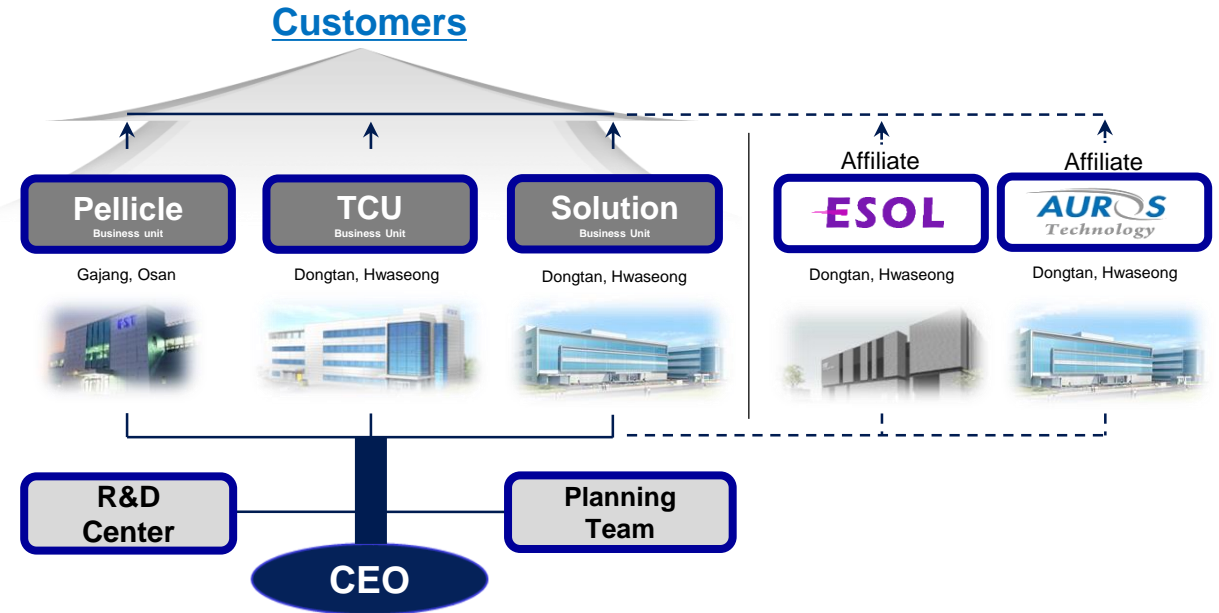
1-1. Company Overview

Global Semiconductor / Display Materials and Equipment Provider

Founded in	1987
CEO	JD You
Listed	Public (KOSDAQ: 036810)
Headquarter	Hwaseong-si, Gyeonggi-do, Korea
Manufacturing/ R&D Facilities	Osan (Pellicle) / Hwaseong (TCU, R&D)
Overseas Branches	China (Xi'an, Wuxi), Japan (Tokyo)
Employees	556 (As of July 2021)
Products	Pellicle, Chiller, EUV Source, Metrology & Inspection, Laser-based solutions, etc.
Revenue	162.7b KRW (~140M USD) in 2020
Certification	ISO-9001, ISO-14001, OHSAS-18001, ISO-27000



Organization Chart



FST History

- Establishment
- Established R&D Center
- Developed DUV Pellicle (KrF, ArF)
- Developed Thermo-electric Chiller

The Early Stages (1990's)

- Listed on public
- Developed LCD pellicle
- Cooperate named changed (FST Inc. → FINE SEMITECH Corp.)

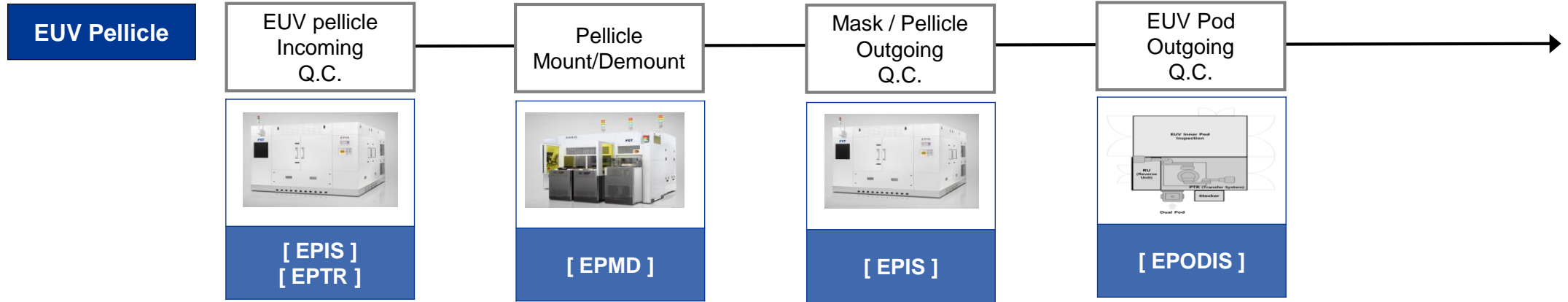
Growth & Leap (2000's)

- Open new facilities in Osan
- Open new facilities in Dongtan
- Established China Xian Cooperation
- Selected 100 billion venture company
- Completed Osan F Line

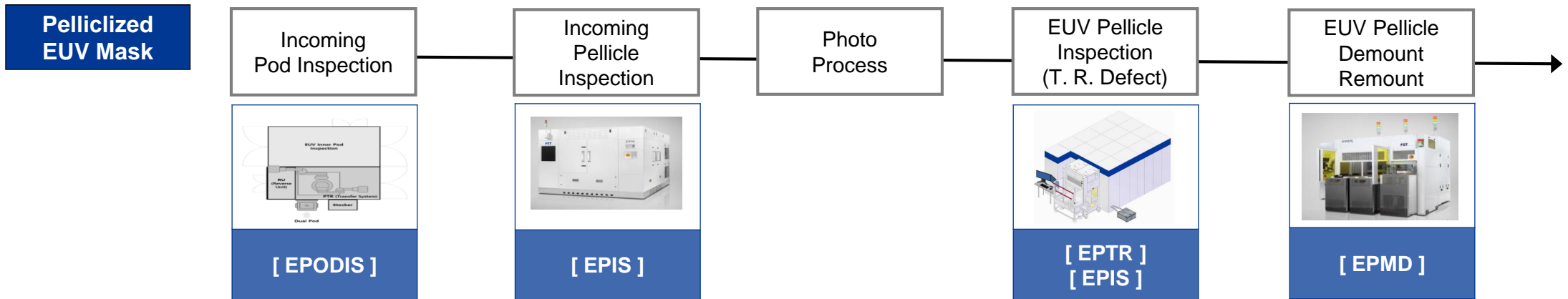
Change & Innovation (2011~ today)

1-2. Tools for Maskshops and Wafer Fab

Mask shops



Wafer Fab



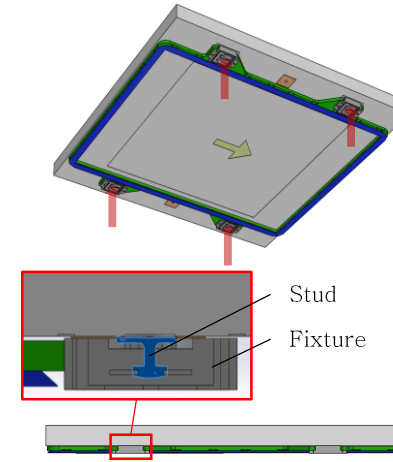
2-1. EUV Pellicle Mounter/Demounter (EPMD™): Overview

Application

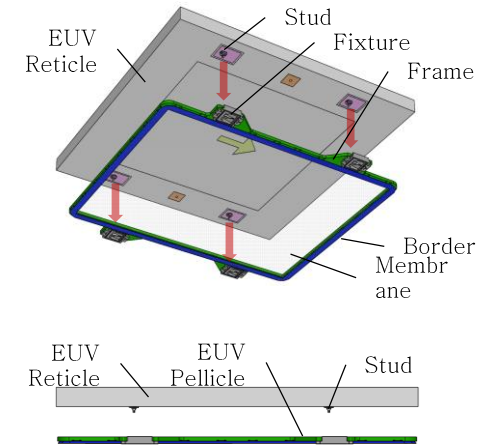
- Mounting & Demounting system for EUV pellicle

Key Features

- Automatic Mounting/Demounting EUV Pellicle on/from Reticle
- Vision system for glue control: precise dispensing & volume inspection
- Improved production stability & reproducibility compared to manual system
- 40% improvement of production time compared to manual system
- OHT support (OHT : Over Head Transmission)
- Controlled environment to prevent pellicle contamination (ISO class 1)



[EUV Pellicle Mounting]

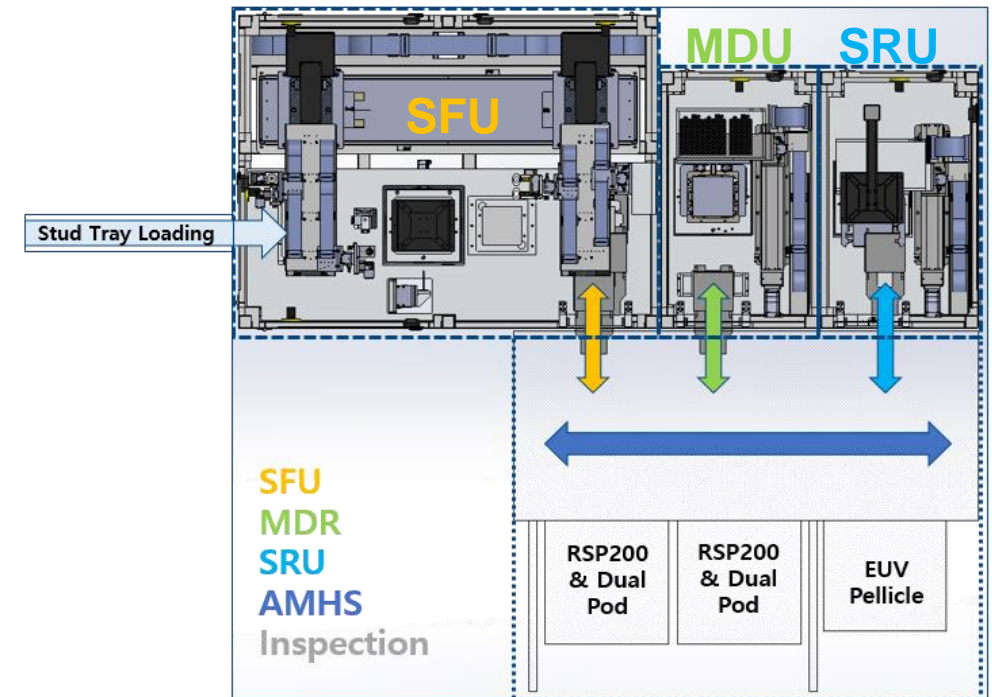
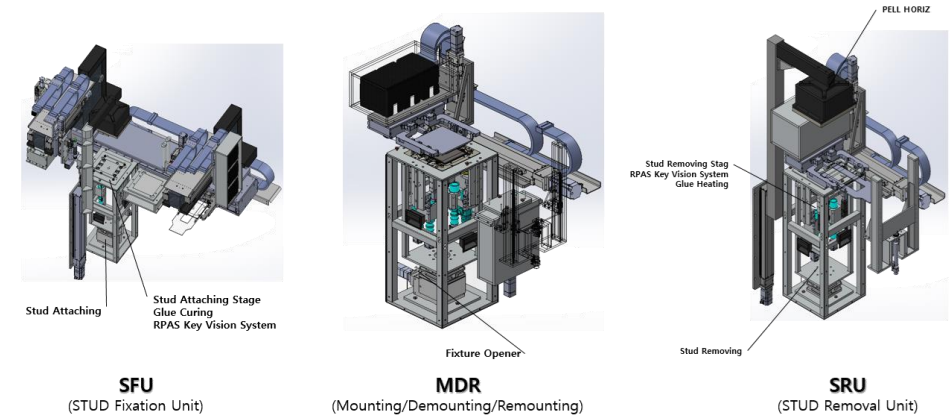


[EUV Pellicle Demounting]



2-2. EPMD™ : Hardware Configuration

- **Dimension:** 3510 / 2860 / 2670 (mm)
- **Major units**
 - SFU (Stud Fixation Unit)
 - MDU (Mounter & Demounter Unit)
 - SRU (Stud Removal Unit)
- **AMHS(Auto Loader)**
 - Pellicle Load Port – 1set
 - Mask Load Port – 2sets. Support dual Pod & RSP200
 - Transfer Robot(Dual Arm)
 - Pellicle Stock & Retrieve (Option) – Max. 20ea
 - Pellicle Case Auto Opener (Option)



3-1. EUV Pellicle Inspection System (EPIS™): Overview

Application

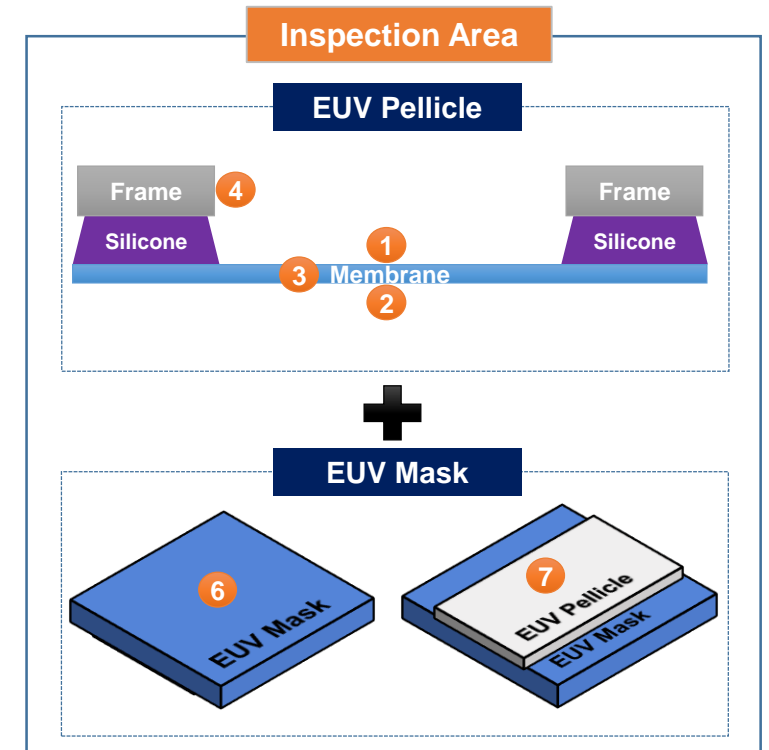
- Defect inspection for EUV pellicle membrane, frame and EUV mask backside

Feature

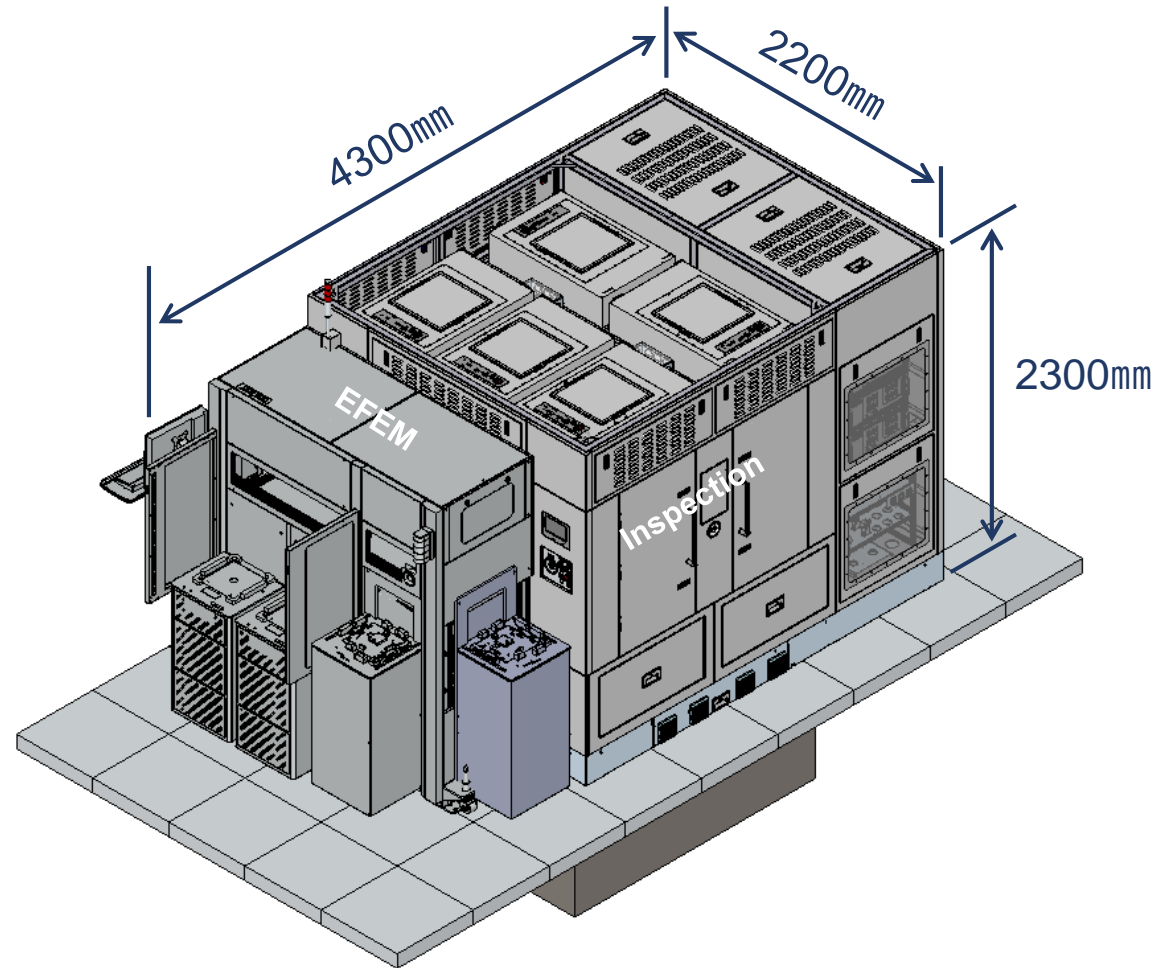
- 1um PSL equivalent particle detectability
- Auto defect review (A.D.R)
 - Verify particle location: membrane front & backside
 - Classify particle or hole
- Inspection throughput : 15mins /pellicle, 16mins/pelliclized EUV mask

Inspection Area

- EUV Pellicle Membrane Frontside/Backside/Holes : ①②③
- EUV Pellicle Frame Inner-Wall : ④
- EUV Mask Backside : ⑥
- EUV Pellicle Membrane Frontside : ⑦

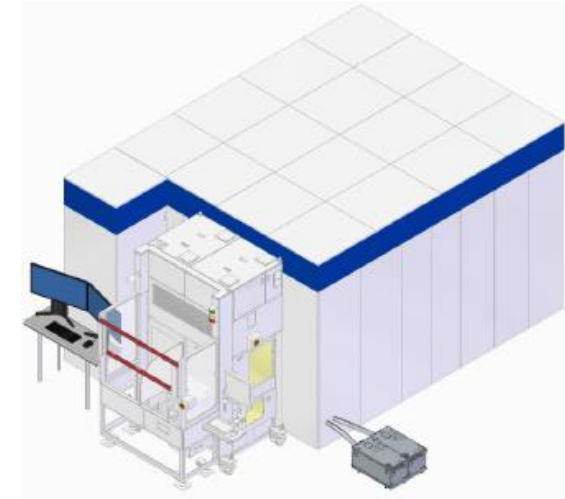


- **Dimension:** 2200 / 4300 / 2300 (mm)
- **Inspection**
 - Linear stage(x, y, t, z)
 - Membrane Inspection and Review(Dual Sided)
 - Frame Inspection and Review
- **EFEM(Auto Loader)**
 - Pellicle Load Port – 1set
 - Dual Pod & RSP200 Load Port – 2set
 - Transfer Robot(Dual Arm) – 1set
 - (optional) Pellicle Case Stocker – 1set
 - (optional) Pellicle Case Auto Opener – 1set



▪ EPTR Development Background & Purpose

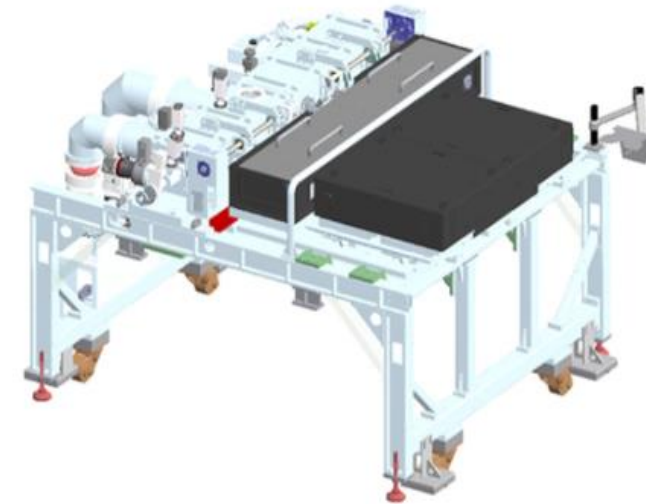
- EPTR: EUV Pellicle Transmittance Reflectance Measurement Tool
- Developed with FST HHG EUV source
- Quick & accurate measurement
- Tool environment is controlled clean



EPTR Design

▪ Introduction of HHG Source

- High Order Harmonic Generation EUV Source
- High Coherence
- Support automated beam align
- No debris for optic contamination
- Field proved in various customer sites



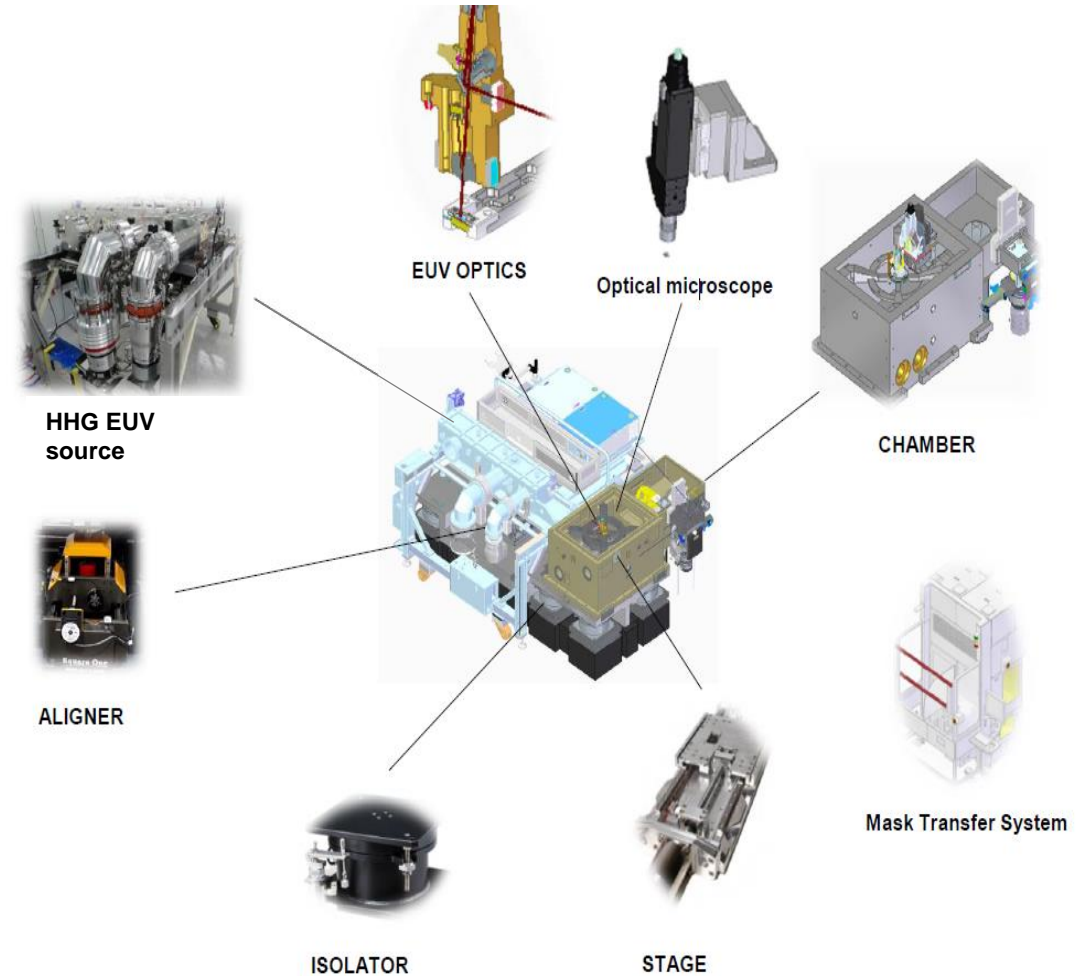
HHG EUV source

■ Main Features

- High Accuracy & repeatability
- Point to point measuring
- Full size data mapping
- No debris & clean chamber

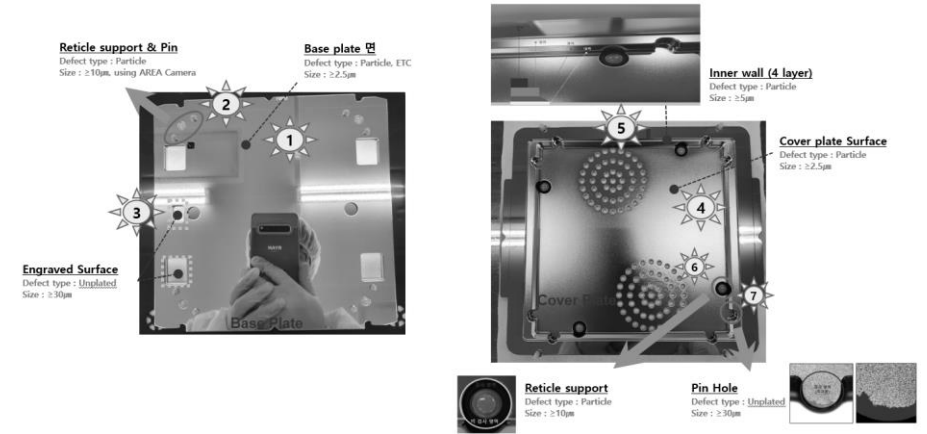
■ Configuration

- EUV source (HHG type)
- EUV optics & sensing
- Vacuum Chamber
- Precision Stage system
- Pellicle & Mask Transfer system



■ Inspection Functions for EUV Inner Pod

- Inner pod cover & base plate: dark field & bright field inspection
- Inspect diverse altitudes(layers) in the inner Pod
- Mask support pin, square/round holes, inner wall
- Inspect incomplete plating by comparing golden images

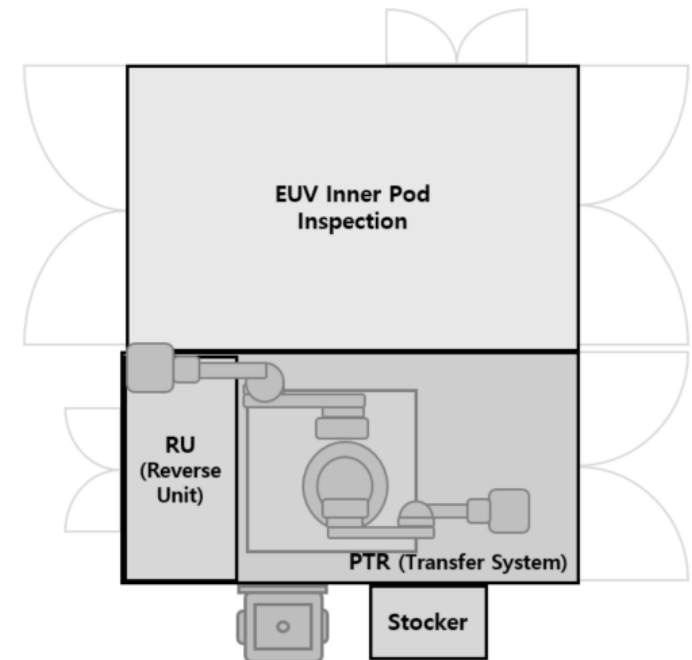


■ Measurement Functions

- Measure Pod's parallelism, pin to pin pitch for four support pins in the Pod

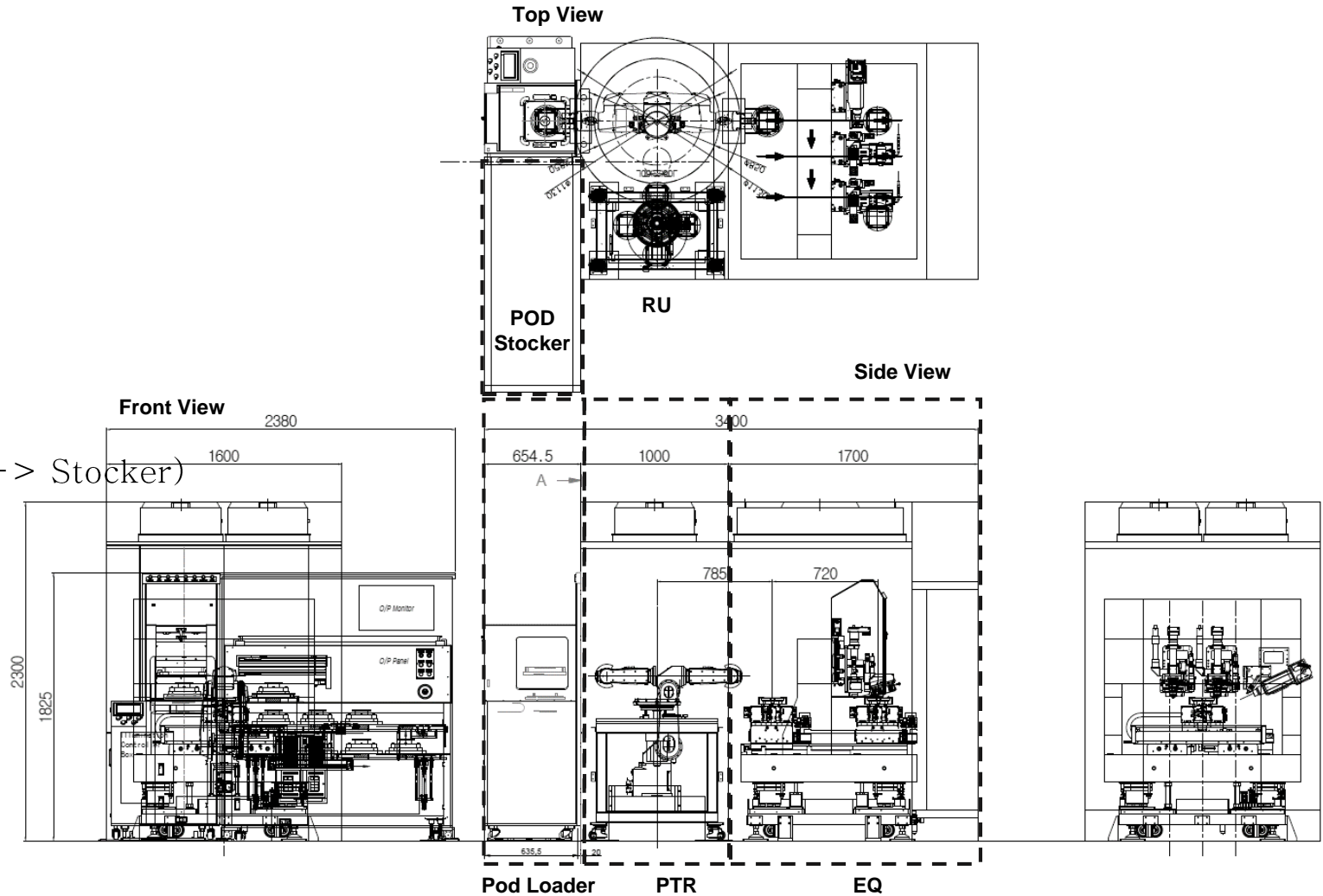
■ Additional Functions

- N2 blowing & suction: To remove particles
- Pod stock is available up to eight Pods
- Database management to monitor Pod's status



5-2. EPODIS™: Hardware Configuration

- Dimension: 2380 / 3400 / 2300 (mm)
- Inspection
 - Linear stage (x, y, t)
 - Inspection optics (z axis: 3)
- EFEM (Auto Loader)
 - Loader
 - Dual Pod Stocker
 - Dual Pod Opener
 - Dual Pod Transfer Unit (Opener \leftrightarrow Stocker)
 - PTR (Pod Transfer Robot)
 - Inner Pod loading/unloading
 - Inner Pod Flip
 - RU (Reverse Unit)
 - Dual Pod Loader
 - Cover Flip



5-3. EPODIS™: Inspection Areas

Reticle support & Pin (4 pairs)

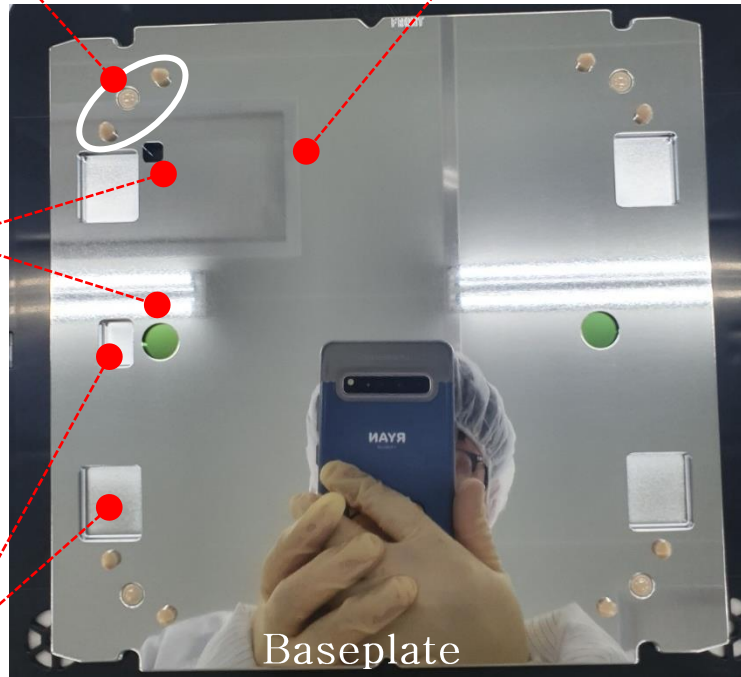
Defect type : Particle
Size : $\geq 10 \mu\text{m}$, using AREA Camera

Baseplate

Defect type : Particle, PIT (Incomplete plating)
Size : $\geq 2.5 \mu\text{m}$

Window (3ea)

Defect type : Particle
Size : $\geq 10 \mu\text{m}$



Engraved square area (5ea)

Defect type : Incomplete plating
Size : $\geq 30 \mu\text{m}$

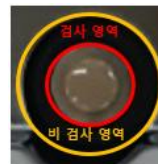
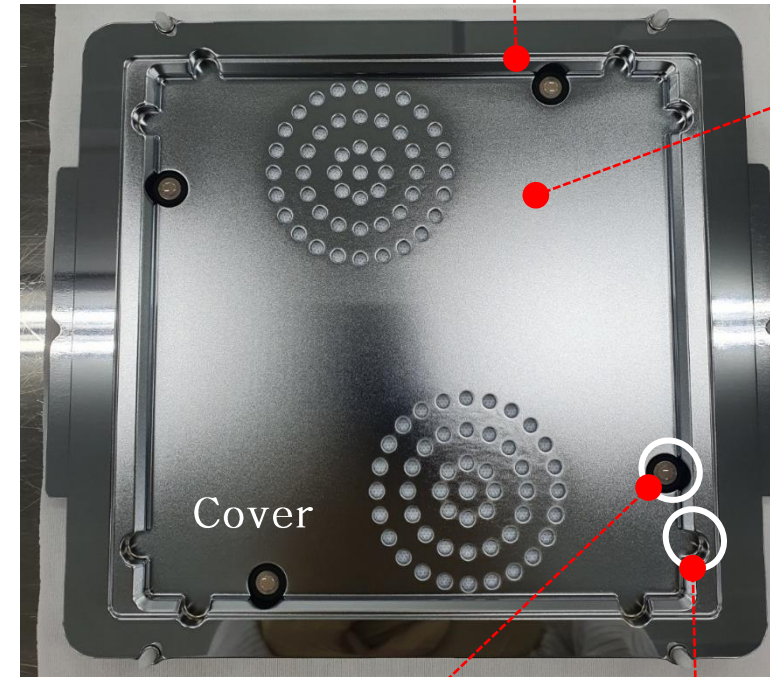


Inner wall (4 layers)

Defect type : Particle
Size : $\geq 5 \mu\text{m}$

Cover

Defect type : Particle
Size : $\geq 2.5 \mu\text{m}$

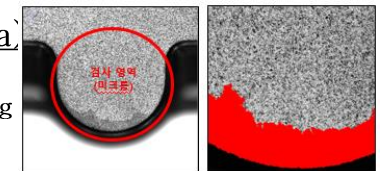


Reticle support (4ea)

Defect type : Particle
Size : $\geq 10 \mu\text{m}$

Pin Hole (8ea)

Defect type : Incomplete plating
Size : $\geq 30 \mu\text{m}$



1. FST has developed EUV infrastructure tools commercially available for customers

- EUV Pellicle Mounter & Demounter (EPMD™)
 - Demo tool installed at FST
- EUV Pellicle Inspection System (EPIS™)
 - Extended from FST's DUV pellicle inspection technology
 - Demo tool installed at FST
- EUV Pellicle Transmittance & Reflectance Measurement System (EPTR™)
 - To be delivered to FST's EUV Pellicle development Team in 4Q 2021
- EUV Pod Inspection System (EPODIS™)
 - Extended from FST's DUV pellicle inspection technology

2. For details please contact me via e-mail (choisw@fstc.co.kr)

Thank you very much !

Q & A