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# SEMICONDUCTOR WAFER AUTOMATIC TRANSFER SYSTEM TOTAL SOLUTIDN


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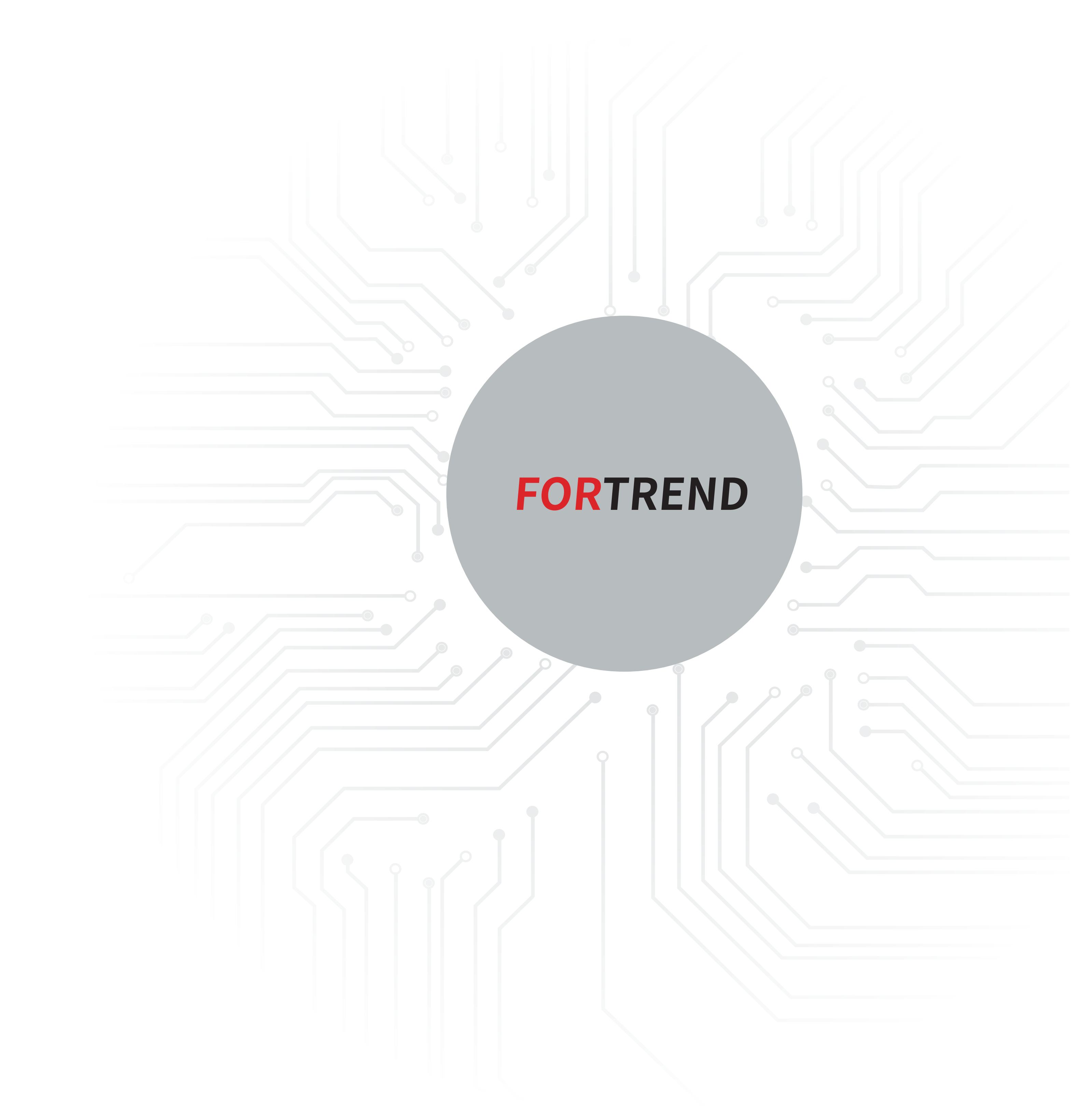
FORTREND

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## ABOUT FORTREND

Founded in 1979 in Silicon Valley, USA, Fortrend has always been the top leader in batchwafer transfer technologies, Standard Mechanical Interface (SMIF) technologies, ultra-cleanautomation solutions, and wafer surface curing processes for the semiconductor and PV industries. Fortrend SMIF products have become the crucial automation connections between process equipment and the factory delivery system and between different processing equipment.

Fortrend's standard 200mm and 300mm front end automation modules are readily integrated into processing tools reliably and cost effectively. Fortrend's 3DIC thermal curing tools set the industrial standards for wafer surface curing processes. Fortrend offers not only standard automation and thermal curing modules, but also custom solutions allowing us to meet custom challenges and difficult configuration requirements quickly with a minimum of expenses. Contact Fortrend and experience our engineering excellence first hand.

| 45+ | 100+ | 100+ | 100+ | 20000+ | 1800+ |
|---|---|---|---|---|---|
| years experience | patents worldwide | researchers | after-sales supporters | square meters factory space | equipment installed/year |

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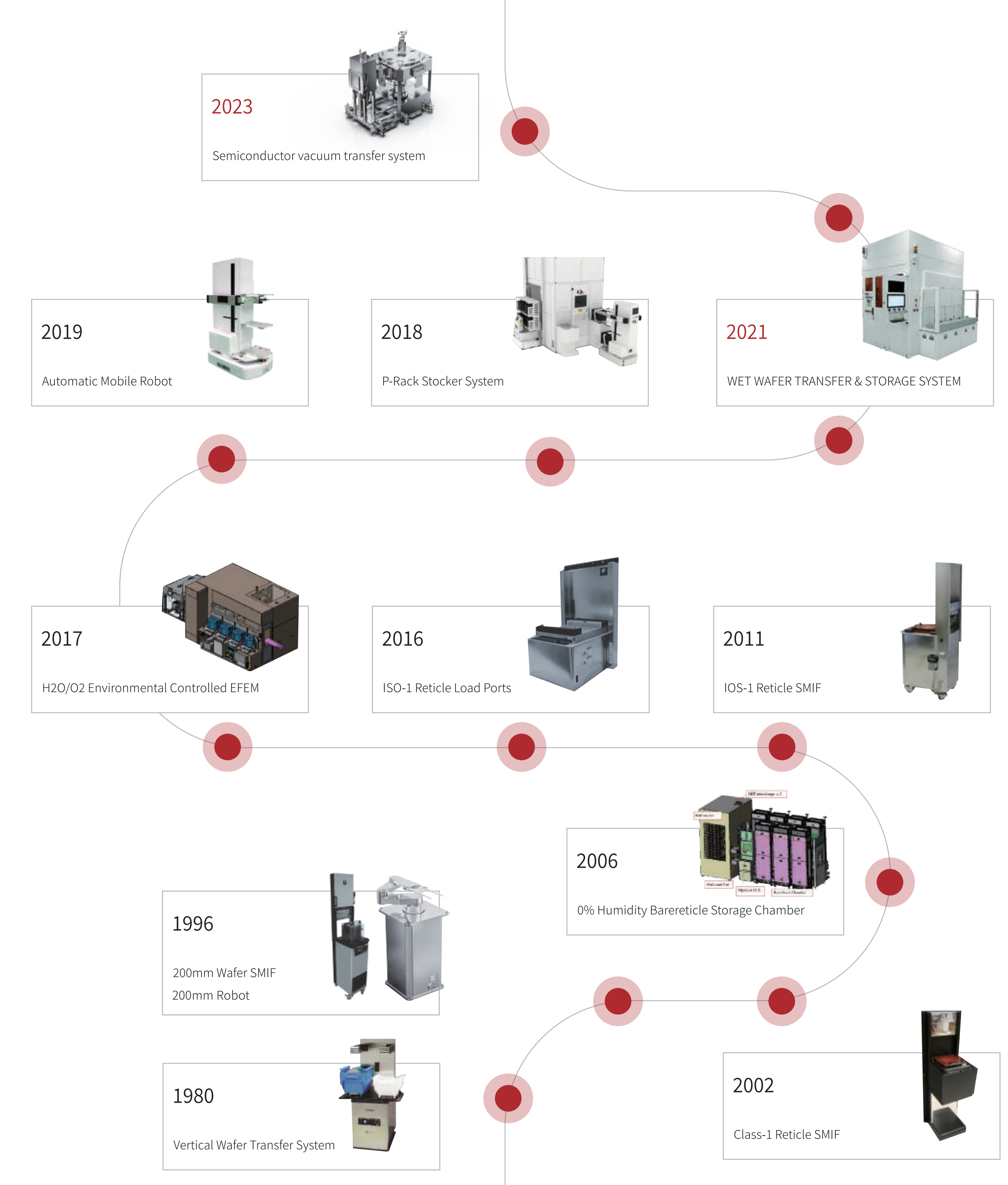
## FORTREND MILESTONE



## WAFER STANDARD MECHANICAL INTERFACE

- Unique dust-free chamber, internal circulation can reach Class 1 level of cleanliness, prevent the lid opening process contamination of the wafer.
- The modular design, combined with a variety of custom options, can be adapted to different devices without frame modifications.
- Flexible PIO connection with self-developed software and macro instructions, more convenient operation, easy to use.
- AMHS communication mode is optional to meet diverse transfer needs.

**Obtained Chinese patent in 2010** **Long-term market validation**

## Specification parameter

| Models | PLUS500S / PLUS500R / PLUS500Sx / PLUS500Cx / PLUS500F / PLUS500Ux / PLUS500Sd |
|---|---|
| Applicable carrier types | 200mm SMIF Pod (SEMI) |
| Carrier Load Height | 900 mm (tailor to fit specific needs) |
| Cleanliness | Class 1 (ISO-Class 3) |
| Comm Mode | Parallel I/0 (SEMI E23-96) 8 in / outputs or EIA-RS232(SECS I/II) |
| Cycle Time | < 90 sec (with tilt and lateral movements) |
| Lot ID Reader | Smart tag / RFID tag |

| Axis - Gripper positioning accuracy | ± 0.1 mm |
|---|---|
| Axis - Arm Elevator positioning accuracy | ± 0.1 mm |
| Axis - Arm Extent positioning accuracy | ± 0.1 mm |
| Axis - Tilt positioning accuracy | ± 0.1 mm |
| Axis - Wrist positioning accuracy | ± 0.1 mm |
| MTBF | > 2000 Hours |
| Up time | ⩾ 99.5 % |

## WAFER SORTER

- Down-sizing design, reduce the floor space and ensure high internal cleanliness and high productivity,reduce cost and increase efficiency

- A variety of handling methods and LP combinations,a variety of custom options, can meet the needs of various working conditions.

### Specification parameter

| | |
|---|---|
| Rated voltage | Single Phase AC 220V 50/60 Hz |
| Rated power | 3.52kW (Decide by config) |
| Body material | Painted SPCC (RAL 9003) |
| Comm interface | RJ45 |
| Comm protocol | HSMS&SECS II |
| Software | Fortrend custom configuration software |
| Cleanliness | Class 1 (ISO-Class 3) |
| End-effector | Vacuum blade / edge grip / Bernoulli / custom |
| Load Port | 2 ~ 4 Ports (optional compatible open cassette ) |
| Applicable carrier types | cassette、SMIF Pod、FOUP/FOSB (SEMI) |
| Gas pressure supply | VAC : - 70 ~ - 90 kPa, >10LPM (Ø6 air tube) CDA : 0.4 ~ 0.6 MPa, >10LPM (Ø6 air tube) |

| | |
|---|---|
| Applicable wafer materials | Si、SiC etc. (Decide by config) |
| Applicable specif. types | Dia. 100 ~ 300 mm (4 inch ~ 12 inch) |
| Robot repeatability | ± 0.1 mm |
| Aligner initial offset | Max 6 mm |
| Aligner centering | ± 0.1 mm (Decide by config) |
| Aligner angular offse | ± 0.1 ° (Decide by config) |
| Aligner notch finding time | < 5 sec / pcs |
| MTBR | < 2 Hours |
| MTBF | > 4000 Hours |
| MTBM | > 6 Months |
| Wafer breakage rate | < 1 Per 100,000 Wafer |
| Up time | ⩾ 98 % |

## EFEM(EQUIPMENT FRONT END MODOLE)

- It can be connected to a variety of different types of process equipment, and can be customized for process requirements.
- A variety of handling methods and LP combinations,a variety of custom options,can meet the needs of various working conditions

## Specification parameter

| | |
|---|---|
| Rated voltage | Single Phase AC 220V 50/60 Hz |
| Rated power | 3.52kW (Decide by config) |
| Body material | Painted SPCC (RAL 9003) |
| Comm interface | RJ45 |
| Comm protocol | HSMS&SECS II |
| Software | Fortrend custom configuration software |
| Cleanliness | Class 1 (ISO-Class 3) |
| End-effector | Vacuum blade / edge grip / Bernoulli / custom |
| Load Port | 2 ~ 4 Ports (optional compatible open cassette ) |
| Applicable carrier types | cassette、SMIF Pod、FOUP/FOSB (SEMI) |
| Gas pressure supply | VAC： - 70 ~ - 90 kPa, >10LPM (Ø6 air tube) CDA： 0.4 ~ 0.6 MPa, >10LPM (Ø6 air tube) |

| | |
|---|---|
| Applicable wafer materials | Si、SiC etc. (Decide by config) |
| Applicable specif. types | Dia. 100 ~ 300 mm (4 inch ~ 12 inch) |
| Robot repeatability | ± 0.1 mm |
| Aligner initial offset | Max 6 mm |
| Aligner centering | ± 0.1 mm (Decide by config) |
| Aligner angular offse | ± 0.1 ° (Decide by config) |
| Aligner notch finding time | < 5 sec / pcs |
| MTBR | < 2 Hours |
| MTBF | > 4000 Hours |
| MTBM | > 6 Months |
| Wafer breakage rate | < 1 Per 100,000 Wafer |
| Up time | ≥ 98 % |

# WET WAFER TRANSFER&STORAGE SYSTEM

- The integration of EFEM and storage stations,combined with the control system developed by Fortrend, can solve the problems of wafer storage and throughput difficulties in complex processes such as Wet bench cleaner, furnace, and implanter.

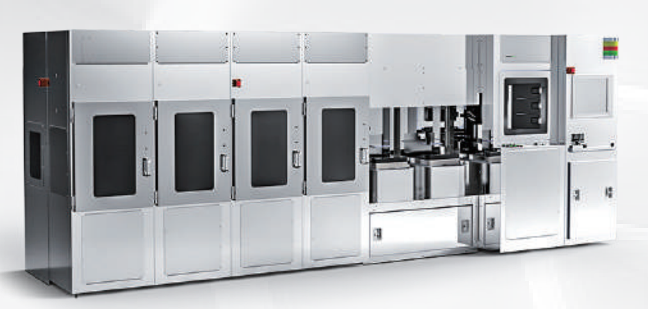
- Built-in multi-mapping function can detect stacked and inclined chips in multiple sections to eliminate the chip collision problem in wafer transfer.

## Specification parameter

| | |
|---|---|
| Equipment dimension | L 2600* W 2100* H 3080 mm |
| Equipment weight | 4500kg (Decide by config) |
| Rated voltage | Single Phase AC 220V 50 Hz |
| Rated power | 9.9KW |
| Body material | Painted SPCC (RAL 9003) |
| Comm interface | RJ 45 |
| Comm protocol | HEX |
| Gas pressure supply | VAC： - 80 kPa，>10LPM(Ø8 air tube)  CDA：0.5 ~ 0.7 MPa，>10LPM(Ø16 air tube) |
| Wafer contact material | PEEK / PTFE<br>Different modoules have different contact materials |

| | |
|---|---|
| Applicable carrier types | 300mm FOUP（SEMI） |
| Applicable wafer materials | Si |
| Applicable specif types | Dia. 300 mm / Thick. 775 µm ± 25 µm |
| MTTR | < 4H |
| MTBF | > 1500H |
| MTBI | > 6 Months |
| Wafer breakage rate | < 1 Per 100,000 Wafer |
| Up time | ≥ 98 % |
| Softwear | Fortrend Standard configuration software |
| Aligner notch finding time | Class 1 @ 0.1µm<br>*Only the wafer transfer area shares the same cleanliness level as cleanroom grade within the Fab. |

## FULL AUTOMATIC RETICLE HANDLING SYSTEM



- Customized manipulators with mask end effectors for a variety of complex mask handling applications.
- A variety of shipping boxes (Hoya, ShinEtsu, Nikon, Cannno, etc.) and fully automatic robotic RSP pod are available.
- Selectable component selection and PDS subsystem.

## Specification parameter

| Material | Mask, Reticle, EUV |
|---|---|
| Carrier | RSP150, RSP200, Dual EUV Pod, Various Shipping Boxes |
| Read ID Position | Mask and Pellicle |
| Cleanness Level | Better than ISO Class1 |
| 3rd Party particle inspection Station | Measure particles ≥1μm (PDS) |

| Optional Bright Light Inspection Station | 0° to 360°turn flip and Bright Light Review |
|---|---|
| | N2 or XCDA Blow off Gun |
| | Mask 1D & 2D Bar Code Reader |
| | Pellicle ID Reader and Measurement Camera |
| | Mask Chamfer Identification |
| Mask Thickness Measurement | Repeatability ≦ 0.2μm (integrated with measurement module) |

## AUTOMATED STORAGE SYSTEM(STOCKER)

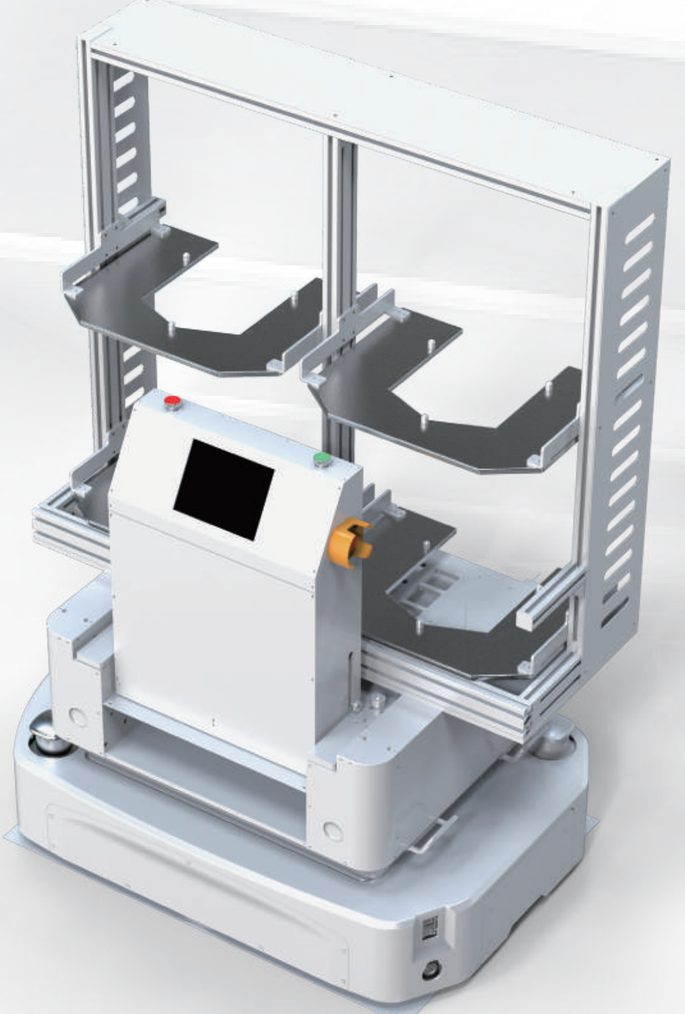
- Modular design, faster assembly and adjustment, and can be customized according to demand to meet the needs of various working conditions.
- Provides docking interfaces to the existing OHT and AGV in the Fab, complementing the existing AMHS system.
- It can be interconnected with the vehicle handling/portable shelf AGV launched together to quickly handle multiple wafer boxes for higher efficiency.

## Specification parameter

| | |
|---|---|
| Equipment dimension | L 5800* W 1600* H 4620 mm(Decide by config) |
| Applicable carrier types | SMIF Pod、Reticle Box、FOUP/FOSB |
| Load Port | 2 Ports (Optional P-rack Port) |
| Carrier Load Height | 900 ± 10 mm |
| Comm protocol | HSMS or SECS Ⅰ / SECS Ⅱ |
| Rated voltage | Single Phase AC 220V 50 Hz |
| Cleanliness | Class 100（Optional FFU) |
| Quakeproof Level | 0.3G (M-S >7.0) |
| Storage Capacity | 146+6 carriers (Decide by config) |

| | |
|---|---|
| Max. carrier arm Load | 20 kg |
| Single Continuous Pod In/Out | < 6 sec |
| Max. moving speed of the carrier arm | 2m / s (non-line motion) |
| Max. rotating speed of carrier arm | 90°/sec |
| Carrier arm repeat positioning accuracy | ± 0.2mm |
| MTTR | < 4 Hours |
| MTBF | > 2000 Hours |
| MTBI | > 6 Months |
| Up time | ⩾ 98 % |

# P-RACK AUTOMATED GUIDED VEHICLE



SLAM laser navigation design and custom map navigation system, to achieve trackless free navigation, easy to cope with a variety of complex road conditions, more convenient, more flexible.

The self-developed FTC and MCS dispatching and traffic control systems have better algorithms, which can quickly complete the AGV transportation planning of the whole plant.

## Specification parameter

| Parameter | Value |
|---|---|
| Equipment dimension | L 1000* W 700* H 1180 mm |
| Equipment weight | 300 Kg (Decide by config) |
| Battery Type | Ternary lithium battery |
| Battery Capacity | 48V, 52Ah |
| Battery runtime | > 8 h |
| Charging Time | 0-80%, 2h;0-100%, 3h |
| Battery Life | Full discharge>500 times; Battery attenuation ratio of 85%, charging and discharging frequency>1500 times |
| Charging Mode | Manual/Automatic/Quick change |
| Single shipment | 4 pcs (300mm FOUP) (Decide by config) |
| Applicable carrier types | SMIF Pod、Reticle Box、FOUP/FOSB |

| Parameter | Value |
|---|---|
| Control method | Computer wireless control & touch screen control |
| Navigation method | SLAM by laser navigation |
| Comm method | 2.4G / 5G WIFI( AMR to AMR server) & HSMS / SECS II (AMR sever to MCS/MES) |
| Max. moveing speed | 1m / s |
| Min. Miss Distance | 2m |
| Min. Passage Width | 1m |
| Positioning Accuracy | ±10mm, ±1° |
| Up time | ⩾ 98% |
| MTTR | < 4 Hours |
| MTBF | > 2000 Hours |

## FRONT LOAD AUTOMATED MOBILE ROBOT(AMR)

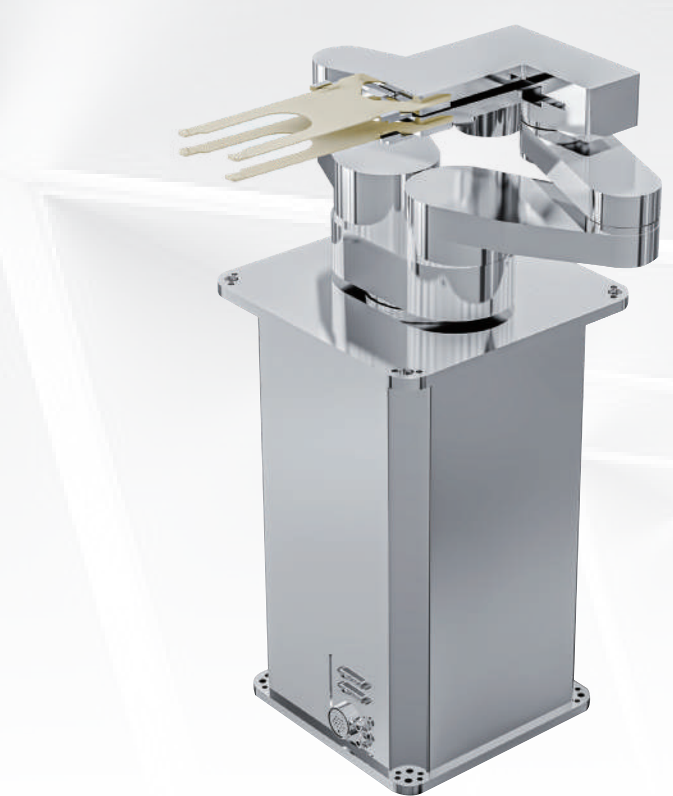
- SLAM laser navigation design and custom map navigation system, to achieve trackless free navigation, easy to cope with a variety of complex road conditions, more convenient, more flexible.
- The self-developed FTC and MCS dispatching and traffic control systems have better algorithms, which can quickly complete the AGV transportation planning of the whole plant.

## Specification parameter

| | |
|---|---|
| Equipment dimension | 1050* W 700* H 1611 mm |
| Equipment weight | 300 Kg (Decide by config) |
| Battery Type | Ternary lithium battery |
| Battery Capacity | 48V，52Ah |
| Battery runtime | > 8 h |
| Charging Time | 0-80%，2h；0-100%，3h |
| Battery Life | Full discharge>500 times; Battery attenuation ratio of 85%, charging and discharging frequency>1500 times |
| Charging Mode | Manual/Automatic/Quick change |
| Singly shipment | 2+1 pcs (300mm FOUP)（Decide by config) |
| Applicable carrier types | SMIF Pod、Reticle Box、FOUP/FOSB |
| Max. Payload | 15kg |

| | |
|---|---|
| Drive Type | Dual wheel differential drive |
| Control method | Computer wireless control & touch screen control |
| Navigation method | SLAM by laser navigation |
| Comm method | 2.4G / 5G WIFI( AMR to AMR server) & HSMS / SECS II (AMR sever to MCS/MES) |
| Max. moveing speed | 1m / s |
| Min. Miss Distance | 0.1 m |
| Min. Passage Width | 0.9 m |
| Positioning Accuracy | ±10mm，±1° |
| Up time | ⩾ 98 % |
| MTTR | < 4 Hours |
| MTBF | > 2000 Hours |

## WAFER TRANSFER ROBOT



- Universal RS232 protocol interface, more convenient
- The design concept of SCARA arm adopts to a variety of wafer retention methods such as vacuum suction / edg gripper /non-con-tact bernoulli.
- A variety of end-effector specifications and customizable linear modules to meet a variety of working conditions.
- With Smart Move function, it can achieve the shortest distance and the best movement trajectory.

## Specification parameter

| Equipment dimension | L 340* W 340* H 931.2 mm (Decide by config) |
|---|---|
| Control box size | L 421.5* W 263.5* H 261.5 mm (Without handle) |
| Device weight | 45 ~ 60Kg (Decide by config) |
| Rated voltage | Single phase AC 220 V |
| Rated power | 1.1 kW |
| Body material | Aluminum |
| End effectors(EEF) Specif | Ceramics / Aluminum / CFRP |
| Arm qty | Single Arm / Double Arm |
| Single shipment | VAC - 70 ~ - 90 kPa / CDA 0. 1~ 0.3 MPa |
| Wafer holding Method | VaCUUM/ eDGE-GRIPPER / bERNOULLI / CLAMP TYPE FORK |
| Cleanliness | MaxClass 1 @0.1μm |

| Axis-Zmax speed: | 500 mm/S |
|---|---|
| Axis-Theta max speed | 340°/s |
| Axis-R1& R2 max speed | 750 mm/s (non-line motion) |
| Axis -θ Repeatable positioning accuracy | ±0.05° |
| Repeatable positioningaccuracy | ±0.1mm |
| Axis-Theta max Range of motion | 340° |
| R1&R2 Max stretch | 520~685.5mm(200mmWafer)/600~729.4mm(300 mm Wafer) |
| Axis-Z max Range of motion | Single Axis-Z:300/400/450/500mm Dual Axis-Z:600 mm |
| Single shipment | 2+1 piece (300mm Foup) (Decide by config) |
| Applicable carrier types | SMIF Pod、Reticle Box、FOUP/FOSB |
| Arm load | 3kg |

## 300MM LOAD PORT

- Standard Load Port Universal device, fully compliant with SEMI standards, with high versatility, high compatibility.
- Built-in original Mapping system, can be stacked, inclined chip detection, eliminate the chip collision problem in integrated wafer transfer, and can load 200/300 wafers.
- A variety of customized components can be selected to flexibly respond to different working conditions.

### Specification parameter

| | |
|---|---|
| Equipment dimension | L 586* W 472* H 1349 mm |
| Equipment weight | 66 ± 0.5kg (Decide by config) |
| Rated voltage | DC 24 V |
| Rated power | 120 W |
| Body material | Aluminum、Painted SPCC (RAL9003) |
| Applicable carrier types | 200/300 mm FOUP (SEMI) |
| Acoustic Noise | ≦ 60 dB |
| Comm interface | Serial RS-232C, Parallel I/O |
| Comm protocol | HEX |

| | |
|---|---|
| Cleanliness | Class 1 @ 0.1μm |
| Carrier Load Height | 900mm ±10mm |
| Gas pressure supply | VAC : - 80 kPa (Ø6 air tube) |
| | CDA : 0.5 ~ 0.6 MPa(Ø6 air tube) |
| | N2(Matching) : 0.1 ~ 0.2 MPa(Ø8 air tube) |
| Matching options | N2 purge function (MFC control) |
| | AMHS system communication port |
| | 200mm cassette adaptor |
| | Mechanical control / Electrical control Info Pad |

## 200MM LOAD PORT

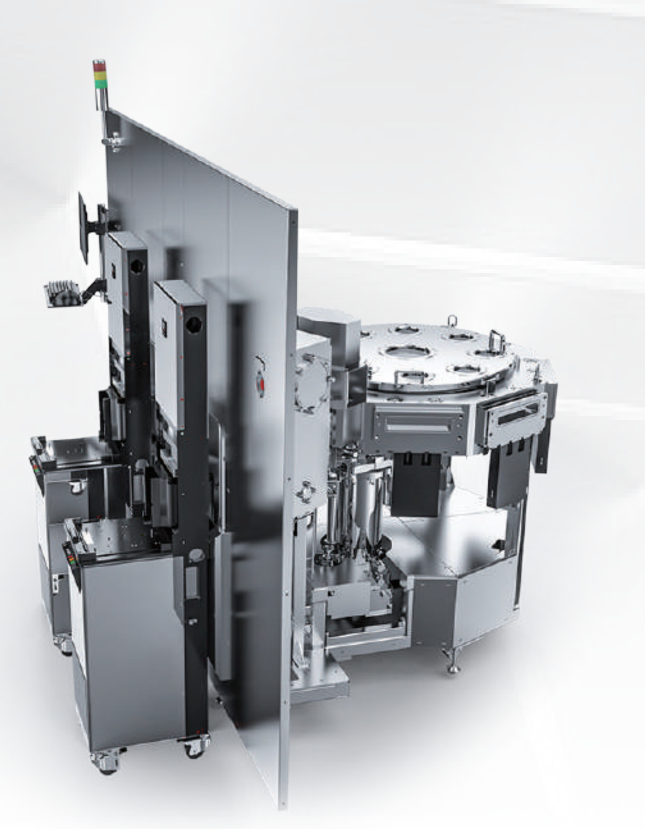
- Standard Load Port Universal device, fully compliant with SEMl standards, with high versatility, high compatibility.
- Built-in original Mapping system, can be stacked, inclined chip detection, eliminate the chip collision problem in integrated wafer transfer, and can load 120/200 wafers.
- A variety of customized components can be selected to flexibly respond to different working conditions, such as whether is connectecl with OHT.

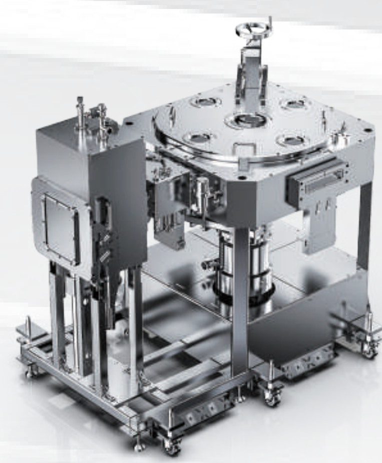
## Specification parameter

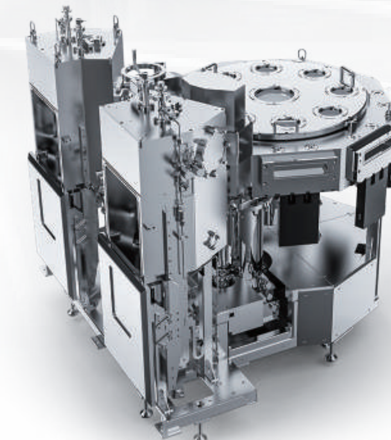
| | |
|---|---|
| Equipment dimension | L 421mm* W 364mm* H815 mm |
| Equipment weight | 40kg (Decide by config) |
| Rated voltage | DC 24 V |
| Rated voltage | 60 W |
| Body material | Aluminum、Stainless steel（SUS 304) T |
| Applicable carrier types | 150/ 200mm POD(SEMI) |
| Acoustic Noise | ≦ 60 dB |
| Comm interface | Serial EIA-RS232C,Paralle I/O |
| Comm protocol | HEX、SECS |

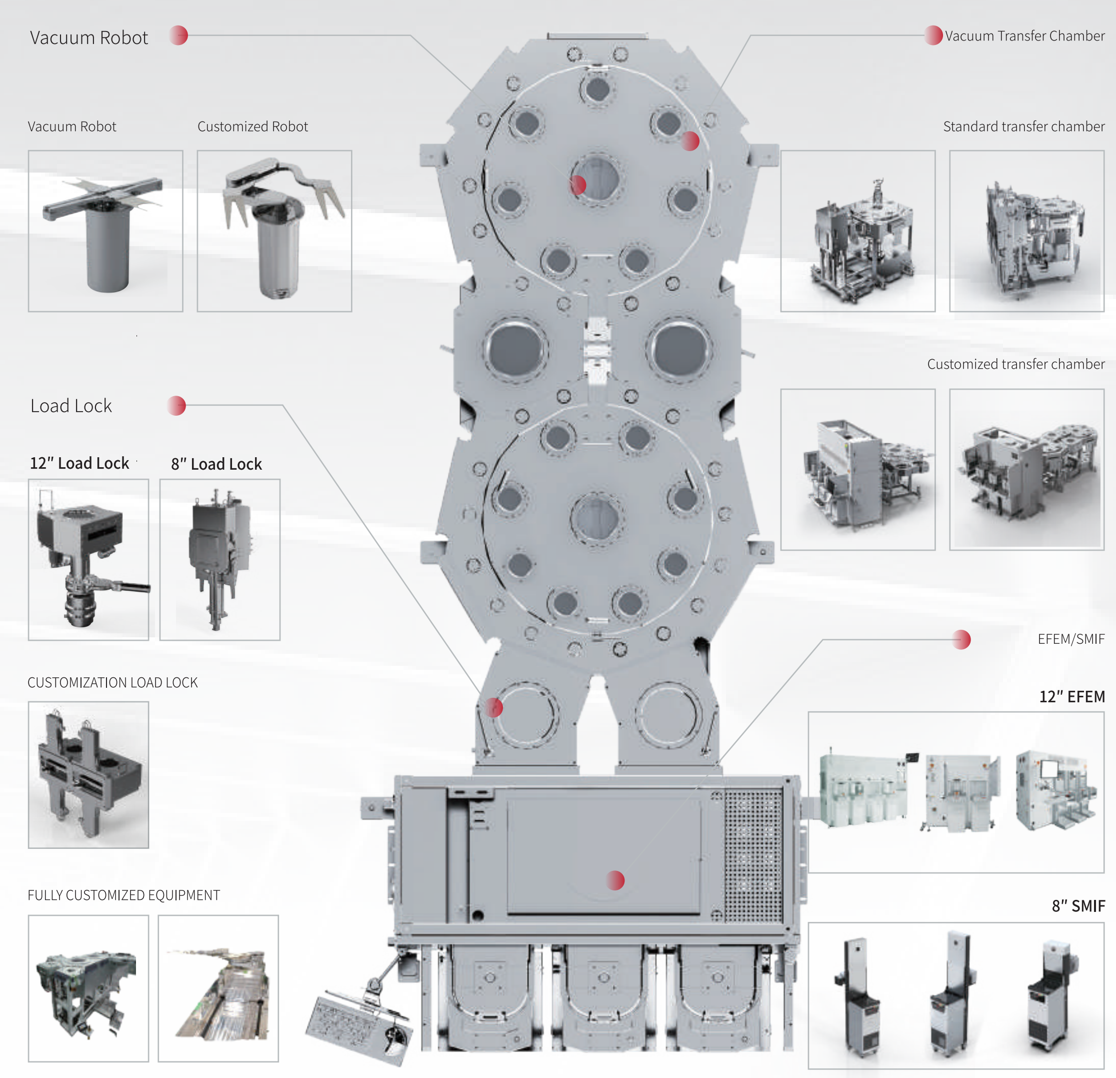
| | |
|---|---|
| Cleanliness | Class 1 @ 0.1μm |
| Wafer box interface | SEMI E19.4 |
| Load loop | VAC： - 80 kPa (Ø6 air tube) |
| Removal loop | CDA： 0.5 ~ 0.6 MPa(Ø6 air tube) |
| Matching options | 150/200mm Open box to detect sensor configuration |
| | E84 Electric control module selection |
| | Communication protocol module selection HEX/SECS |
| | ID read/write device with RFID module or IR Link |

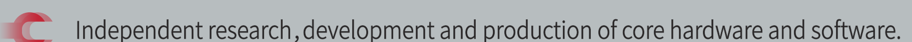
## SEMICONDUCTOR VACUUM TRANSFER SYSTEM









### Independent research, development and production of core hardware and software.

The core components of the vacuum transfer system are independently designed and developed by Fortrend, and assembled and produced at its own production base, achieving better delivery times and performance.

### Deeply rooted in the semiconductor field for many years, adaptable to most semiconductor front-end process equipment.

Fortrend has been deeply involved in the semiconductor transfer field for over forty years, with equipment adapted to most semiconductor front-end processes. All production equipment complies with SEMI standards and adapts to the process requirements of various semiconductor/microelectronic material processing equipment, such as wafers/masks.

### Providing standardized modules and customized solutions to meet different requirements.

Fortrend vacuum transfer systems can provide standard solutions for process equipment integration and can also be customized according to customer requirements. Both software and hardware have mature solutions to choose from, meeting the needs of different process equipment and actual operating conditions.

## Customized solutions

- EFEM / SMIF can be optionally equipped at the equipment front end, with EFEM offering standard and custom types.
- Load Lock can be chosen with different structures and transfer methods.
- Customized transfer chambers can be made according to actual process chamber requirements.
- Vacuum mechanical arms can be selected with different models and end effectors according to actual operating conditions.
- Transfer chambers & Load Lock can include optional built-in directional / cooling / pre-heating modules.
- Optional features include AWC functionality, Buffer functionality, wafer storage modules.