

## 富创得在全球半导体行业拥有超过45年的技术积累和经验传承

Fortrend has over 45 years of technical accumulation and experience inheritance in the global semiconductor industry.



全国热线:021-34786180



Sorter/EFEM选型手册  
SORTER/EFEM SELECTION MANUAL

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抖音号

上海大族富创得科技股份有限公司  
SHANGHAI FORTREND TECHNOLOGY CO.,LTD



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# 关于富创得

ABOUT FORTREND

上海大族富创得科技股份有限公司是一家高科技企业、科技小巨人企业、“专精特新”企业，于2017年3月入驻上海市闵行区。全球员工超700人，共有五个子公司和深圳研发中心，总占地面积超33000m<sup>2</sup>，分别为：浙江大族富创得科技有限公司、浙江富创得智能装备有限公司、无锡富创得智能科技有限公司、无锡富创得精密设备有限公司、美国富创得工程公司。

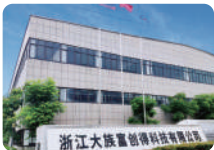
大族富创得在半导体行业拥有超过45年的技术积累和经验传承，自成立以来，深耕于半导体晶圆自动化传输领域的研发、生产和销售，致力打造以半导体晶圆传输、光罩传送自动化系统为核心的整体解决方案。在设备前端晶圆传输及存储系统(SORTER/EFEM)、晶圆标准机械界面(SMIF)、晶圆真空传输腔体(VTM)、晶圆传输机器人(Robot)、晶圆装载系统(LoadPort)、晶圆自动寻边装置 (Aligner)、Open Cassette Stage (OCS)、超洁净光罩片/EUV自动化解决方案 (Reticle)、晶圆全自动化存储系统整体解决方案AMHS (AMR+Stocker+OHT) 等，实现全自主研发、生产，为半导体领域提供具有行业竞争力的定制化整合方案。

Shanghai Fortrend Technology Co., Ltd. is a high-tech enterprise, a technology-based "little giant" enterprise, and a "specialized, refined, and innovative" enterprise. It was established in Minhang District, Shanghai in March 2017. With over 700 employees globally, the company operates five production bases covering a total area of more than 33,000 m<sup>2</sup>. These include: Shanghai Technology Co., Ltd., Zhejiang Fortrend Technology Co., Ltd., Zhejiang Fortrend Intelligent Equipment Co., Ltd., Wuxi Fortrend Intelligent Technology Co., Ltd., Wuxi Fortrend Precision Equipment Co., Ltd., Fortrend Engineering Corporation (USA), Sun Group Co., Ltd., and the Shenzhen R&D Center.

Fortrend has over 45 years of technical accumulation and experience in the semiconductor industry. Since its establishment, the company has been deeply engaged in the research, development, production, and sales of semiconductor wafer automation transfer systems. It is committed to providing integrated solutions centered on semiconductor wafer transfer and reticle handling automation systems. The company has achieved fully independent research, development, and production in various areas, including front-end wafer transfer and storage systems (SORTER/EFEM), wafer standard mechanical interface (SMIF), wafer vacuum transfer modules (VTM), wafer transfer robots, wafer loading systems (LoadPort), wafer auto-aligners, Open Cassette Statage (OCS), ultra-clean reticle/EUV automation solutions (Reticle), autonomous mobile robots (AMR), and wafer automated storage systems (Stocker). These innovations provide the semiconductor industry with highly competitive customized integrated solutions.



上海大族富创得科技股份有限公司



浙江大族富创得科技有限公司  
浙江富创得智能装备有限公司



无锡富创得智能科技



无锡富创得精密设备



富创得工程公司

## 关于SORTER/EFEM设备 Regarding the SORTER/EFEM Equipment



晶圆分选设备 (Sorter) 和前端自动化传输模块 (EFEM) 是集成电路制造的重要设备和组成部分，广泛应用于半导体制造过程及工艺设备、检测设备制程设备当中，是实现集成电路自动化生产的核心模块。大族集团在收购美国富创得 (Fortrend) 之后成立了大族富创得，并投入了大量研发，已实现Sorter/EFEM产品一级模组全自主自研，攻克了多项核心技术，拥有自主知识产权，并能够满足半导体及泛半导体客户的量产及高度客制化定制需求。

### 技术支持

富创得国内在华东/华北/华南/西南地区设有近18个当地客服中心，由专业的技术支持工程师提供售后服务，最快2-4h内响应并抵达现场；

在安装期间为客户的工程师提供免费的现场培训；

提供1年质保和零件保修，并为客户工厂安装的现有软件提供升级服务(1年免费软件升级)

富创得在国外：欧洲、亚洲、亚太等地区分布有各个销售站点与网点，为全球半导体自动化传输提供解决方案。

**45<sup>+</sup>**  
年  
半导体行业经验

**38<sup>+</sup>**  
%  
研发人员占比38%

**13<sup>+</sup>**  
%  
年度研发支出占比13%

**100<sup>+</sup>**  
专利  
富创得全球专利数量突破100+

## 部分合作客户 Partial list of partner clients





# 发展历程

Development History



**1979年**  
美国富创得成立  
FORTREND US Establishment

**1996年**  
200mm晶圆用标准机械界面(业界首台)  
200mm Wafer SMIF  
200mm Robot

**2002年**  
首套垂直晶圆传输系统  
Vertical Wafer Transfer System

**2006年**  
富创得进入中国  
FORTREND China  
0湿度裸掩膜储存室  
0% Humidity Barereticle  
Storage Chamber

**2011年**  
ISO-1洁净度的掩膜用标准界面  
ISO-1 Reticle SMIF

**2016年**  
ISO-1掩膜装载系统  
ISO-1 Reticle Load Ports

**2017年**  
上海大族富创得科技股份有限公司  
Shanghai Fortrend Technology Co., Ltd.  
H<sub>2</sub>O/O<sub>2</sub> 环境控制设备前端模块  
H<sub>2</sub>O/O<sub>2</sub> Environmental Controlled EFEM

**2018年**  
国产化便携式货架储存系统  
P-Rack Stocker System

**2019年**  
国产化自动搬运行走机器人  
Automatic Mobile Robot

**2021年**  
浙江大族富创得科技有限公司  
Zhejiang Fortrend Technology Co., LTD  
清洗晶圆传输储存系统  
Wet Wafer Transfer & Storage System

**2022年**  
炉管传输系统  
Furnace Transfer System

**2023年**  
无锡富创得智能科技有限公司  
Wuxi Fortrend Intelligent Technology Co.,Ltd  
无锡富创得精密设备有限公司  
Wuxi Fortrend Precision Equipment Co.,Ltd  
半导体真空传输系统  
(VTM) Semiconductor vacuum transfer system

**2024年**  
浙江富创得智能装备有限公司成立  
自动物料搬运系统 (AMHS)



晶圆分选设备

WAFER SORTER

高洁净度

High Cleanliness

高兼容性

High Compatibility

高产能

High Capacity



- ◆ 晶圆厚度支持100~1500μm

Wafer thickness support: 100 - 1500μm
- ◆ 工位2-8可选

Workstations 2 to 8 are optional
- ◆ 支持各种尺寸晶圆传输

Supports the transportation of wafers of various sizes
- ◆ 多种上料形式可选

Various feeding methods are available
- ◆ 精小化设计

Compact design
- ◆ 半导体工厂标准传输协议

SECS/GEM
- ◆ 安全光栅

safety curtain
- ◆ Wafer ID 读码器

OCR (top or bottom)
- ◆ 充氮气料盒载具

N<sub>2</sub> purge LP

产品特点 SPECIFICATION PARAMETER

- ◆ 富创得晶圆分选机主要应用于晶圆的转移、分选、合并等操作,可适配3~12寸晶圆;

Fortrend wafer sorters are mainly used for wafer transfer, sorting, and merging operations, and can compatible with wafers ranging from 3" to 12";
- ◆ 采用模块化设计,内部洁净度可达到ISO Class 1,可适应不同尺寸和类型的晶圆。具备独立完整性;高洁净度;高兼容性等特点;

Adopting a modular design, the internal cleanliness can achieve ISO Class 1, and it can accommodate wafers of various sizes and types. It features independent integrity, high cleanliness, high compatibility, and other characteristics;
- ◆ 可以兼容所有符合SEMI标准的FOUP、FOSB、SMIF POD和Cassette;

It is compatible with all SEMI-standard FOUP (Front Opening Unified Pods), FOSB (Full Open Shuttle Bays), SMIF POD (Standard Mechanical Interface Pods), and Cassette;
- ◆ 极具优势的COO和COC,助力客户降本增效。

Highly advantageous COO and COC help customers reduce costs and increase efficiency.

规格参数 Specification parameter	
额定电压 Rated voltage	单相DC220V50/60 Hz Phase AC 220V 50/60 Hz
额定功率 Rated power	3.52千瓦(依配置决定) 3.52kW (Decide by config)
通讯接口 Comm interface	RJ45 RJ45
通讯协议 Comm protocol	ASCI/HEX/HSMS&SECS 1I ASCI/HEX/HSMS&SECS II
软件 Software	富创得自主研发软件 Fortrend independently developed software
洁净度 Cleanliness	ISO 14644-1 class 1 / ISO class 3 ISO 14644-1 class 1 / ISO class 3
产能 WPH	≥700 (Without Aligner and OCR) ≥300 (With Aligner and OCR)
正常运行时间 Uptime	≥99%
平均故障间隔时间 MTBF	≥4000 hours
平均故障处理时间 MTTR	≤2 hours
平均辅助间隔时间 MTBA	>100 hours
平均辅助时间 MTTA	<10 hours
两次异常间平均硅片传送数 MCBF	100,000Wafers
硅片破片破损率 Wafer Breakage Rate	≤1/100,000
OCR准确读取率 (Bare wafer) OCR Accuracy Rate for Bare Wafers	≥99.9%
重复定位精度 Repeatability of Positioning Accuracy	±0.1mm



# SORTER标准化(产品系列)

Wafer Sorter Standardized product series

**SORTER-2 Loadport**  
1605mm (L) ×1237mm(W)×1886mm (H)



**SORTER-3 Loadport**  
2155mm (L) ×1237mm(W)×1886mm (H)



**SORTER-4 Loadport**  
2600mm (L) ×1237mm(W)×1886mm (H)



## 自主研发核心模组 INDEPENDENTLY DEVELOPED CORE MODULE



**300mm晶圆装载系统**  
300mm Loadport



**150/200mm晶圆装载系统**  
150/200mm Loadport



**OCS**  
Open Cassette Stage



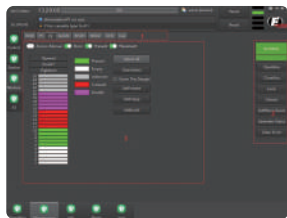
**晶圆传输机器人**  
Wafer transfer robot



**真空吸附式寻边器**  
Vacuum Pre-Aligner



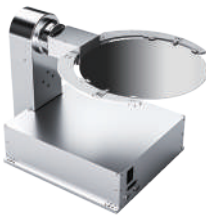
**边缘托举式寻边器**  
Edge-grip type Aligner



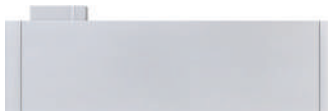
**自主研发软件**  
Independently Developed Software



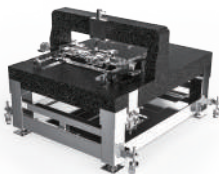
**读码器**  
Optical Character Recognition (OCR)



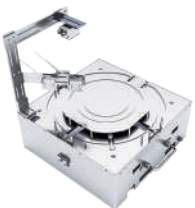
**翻转机构**  
Reversing Mechanism



**加高层选配:100-500mm**  
Optional high-rise configuration



**大理石平台**  
Marble Platform



**对中机构**  
Centralized Stage



# SORTER标准化(双侧多工位)

Sorter Standardized (Dual-sided Multi-station)

一体式布局  
Integrated layout

灵巧化设计  
Agile design

高产能  
High throughput



◆ 双侧多工位的晶圆分选设备在框架两侧设计晶圆承载台, 满足多种承载、对接方式的同时, 又能提供精巧化设计, 减少占地面积, 提升场地使用率。

The dual-sided multi-station wafer sorting equipment is designed with wafer carriers on both sides of the frame. This design not only meets various loading and docking requirements but also provides a compact layout, reducing the equipment footprint and improving the utilization rate of the facility space.

- ◆ 双侧二工位设备尺寸 (Bilateral Sorter with two Ports size): 1650mm (L) × 1662mm (W) × 1886mm (H);
- ◆ 双侧三工位设备尺寸 (Bilateral Sorter with three Ports size): 2155mm (L) × 1662mm (W) × 1886mm (H);
- ◆ 双侧四工位设备尺寸 (Bilateral Sorter with four Ports size): 2600mm (L) × 1662mm (W) × 1886mm (H)。

## 案例展示 Case Presentation



# SORTER客制化(For Taiko Wafer)

Sorter Customized (For Taiko Wafer)

定制化解决方案  
Customized Solutions

特殊晶圆处理  
Special Wafer Processing

支持托举/伯努利手指  
Support Lifting/Bernoulli Fingers



翻转机构



边缘托举式寻边器



夹持托举式/伯努利Fork

◆ Taiko Wafer Sorter最小支持50μm的6、8、12寸晶圆, 可选配夹持托举式/伯努利取放方式及提供高精度边缘托举式寻边器和翻转机构, 可实现分盒 (25→13/13→25) 翻转等功能。

The Taiko Wafer Sorter supports wafers as small as 50μm for 6-inch, 8-inch, and 12-inch diameters. It offers options for clamping lift/Bernoulli pick-and-place methods and provides high-precision edge-lifting aligners and flipping mechanisms. It is capable of performing functions such as box splitting (25→13/13→25) and flipping.

## 案例展示 Case Presentation





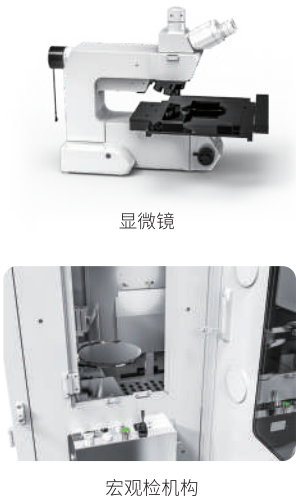
# SORTER客制化(OM loader)

Sorter Customized( OM loader)

灵巧化设计  
Dexterous Design

搭配全自动显微镜  
Paired with a fully automated microscope

具备宏观/微观检测功能  
Equipped with macro/microscopic inspection capabilities



◆ OM loader Sorter应用于多尺寸(6、8、12寸)晶圆的传输,满足晶圆进腔体倒片前的mapping功能,能兼容多种晶圆的传送、分拣、合并。并在内部微环境下实现晶圆片扫描、对位、排序、分批、合批、读取晶圆刻号的功能以及对晶圆片在微型检测平台和宏观检测平台上进行半自动及手动的晶圆表面检测。

The OM Loader Sorter is designed for multi - size wafer handling (6", 8", 12"). It supports mapping before wafer loading into the chamber and is compatible with various wafer transfer, sorting, and merging. It performs wafer scanning, alignment, sorting, batching, and reading wafer IDs in a micro - environment. Additionally, it enables semi - automatic and manual wafer surface inspection on both the micro - and macro - inspection platforms.

## 案例展示 Case Presentation



# SORTER客制化(打包机-Wafer To 蛋糕盒)

Sorter Customized(Packaging Machine)

一体化设计  
Integrated design

应用于自动化打包  
Applied to automated packaging

可支持蛋糕盒出货包装  
Capable of supporting cake box shipping packaging



◆ 晶圆打包机可自动完成晶圆包装过程,支持多种晶圆盒形式(Foup/ Smif Pod / cassette 转蛋糕盒),同时适用6、8、12寸晶圆和 Taiko Wafer。

The packaging machine can automatically complete the wafer packaging process, supporting various wafer box formats (Foup/Smif Pod/cassette to Coin Stack Box), and is suitable for 6-inch, 8-inch, and 12-inch wafers and Taiko Wafer.

## 案例展示 Case Presentation





设备前端自动化模块

WAFER EFEM



高洁净度

High Cleanliness



高兼容性

High Compatibility



高产能

High Capacity



- ◆ 晶圆厚度支持100~1500μm

Wafer thickness support: 100 - 1500μm
- ◆ 工位2-4可选

Workstations 2 to 4 are optional
- ◆ 支持各种尺寸晶圆传输

Supports the transportation of wafers of various sizes
- ◆ 多种上料形式可选

Various feeding methods are available
- ◆ 对接多种制程工艺设备

Interface with multiple process equipment
- ◆ 半导体工厂标准传输协议

SECS/GEM
- ◆ 安全光栅

safety curtain
- ◆ Wafer ID 读码器

OCR (top or bottom)
- ◆ 充氮气料盒载具

N<sub>2</sub> purge LP

产品特点 SPECIFICATION PARAMETER

- ◆ 富创得设备前端自动化模块主要针对制程需求满足客制化定制,可适配3~12寸的晶圆;

Fortrend equipment front - end modules are mainly designed to meet customized process requirements and are compatible with wafers ranging from 3" to 12";
- ◆ 设备内部洁净度可达到ISO Class 1,可适应不同尺寸和类型的晶圆,具有高洁净度、高兼容性等特点;

The internal cleanliness of the equipment can reach ISO Class 1, and it can adapt to wafers of different sizes and types, featuring high cleanliness, high compatibility, and other characteristics;
- ◆ 可以兼容所有符合SEMI标准的FOUP、FOSB、SMIF POD和Cassette。

It is compatible with all SEMI-standard FOUP, FOSB, SMIF POD, and Cassette.

规格参数 Specification parameter	
额定电压 Rated voltage	单相DC220V50/60 Hz Phase AC 220V 50/60 Hz
额定功率 Rated power	3.52千瓦(依配置决定) 3.52kW (Decide by config)
通讯接口 Comm interface	RJ45 RJ45
通讯协议 Comm protocol	ASCII/HEX/HSMS&SECS 1I ASCII/HEX/HSMS&SECS II
软件 Software	富创得自主研发软件 Fortrend independently developed software
洁净度 Cleanliness	ISO 14644-1 class 1 / ISO class 3 ISO 14644-1 class 1 / ISO class 3
正常运行时间 Uptime	≥99%
平均故障间隔时间 MTBF	≥4000 hours
平均故障处理时间 MTTR	≤2 hours
平均辅助间隔时间 MTBA	>100 hours
平均辅助时间 MTTA	<10 hours
两次异常间平均硅片传送数 MCBF	100,000Wafers
硅片破片破损率 Wafer Breakage Rate	≤1/100,000
OCR准确读取率 (Bare wafer) OCR Accuracy Rate for Bare Wafers	≥99.9%
重复定位精度 Repeatability of Positioning Accuracy	±0.1mm

EFEM标准化(产品系列)

EFEM Standardized(Product Series)

EFEM-2 Loadport  
1605mm (L) ×1237mm(W)×1886mm (H)



EFEM-3 Loadport  
2155mm (L) ×1237mm(W)×1886mm (H)



EFEM-4 Loadport  
2600mm (L) ×1237mm(W)×1886mm (H)



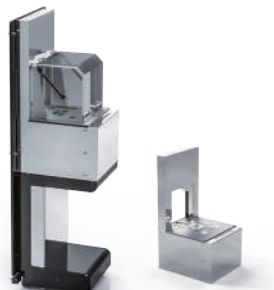
自主研发核心模组 INDEPENDENTLY DEVELOPED CORE MODULE



Wafer/Frame晶圆装载系统  
Wafer/Frame Loadport



150/200mm晶圆装载系统  
150/200mm Loadport



OCS  
Open Cassette Stage



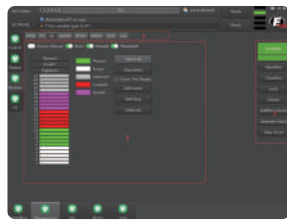
晶圆传输机器人  
Wafer transfer robot



真空吸附式寻边器  
Vacuum Pre-Aligner



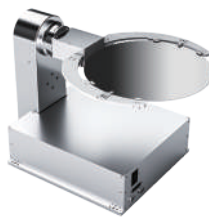
边缘托举式寻边器  
Edge-grip type Aligner



自主研发软件  
Independently Developed Software



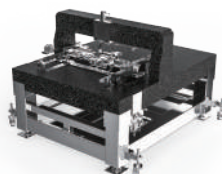
读码器  
Optical Character Recognition (OCR)



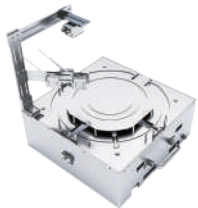
翻转机构  
Reversing Mechanism



加高层选配:100-500mm  
Optional high-rise configuration



大理石平台  
Marble Platform



对中机构  
Centralized Stage



# EFEM客制化(对接量检测制程)

EFEM Customized(Interface with Measurement Process)

-  高精度  
High Precision
-  高结晶度  
High Cleanness
-  高稳定性  
High Stability



◆ 对接量检测制程设备EFEM通常具备高精度寻边器和读码器, 泛应用于量测、AOI、CDSEM等设备, 对接浸润式量测制程中, 可配置风刀、湿法机械手、干燥模组用于对晶圆进行风干风冷、表面清洁等功能。

EFEM for interfacing with metrology process equipment typically come equipped with high-precision edge finders and code readers. They are widely used in devices such as metrology, AOI, and CD-SEM. In the context of interfacing with immersion metrology processes, they can be configured with air knives, humid robot, and drying modules to perform functions such as wafer air drying and cooling, as well as surface cleaning.

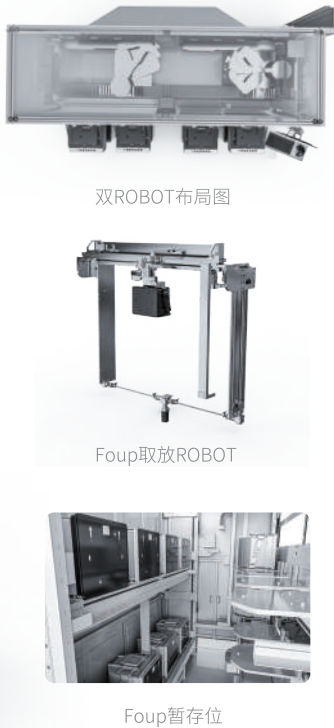
## 案例展示 Case Presentation



# EFEM客制化(对接离子注入制程)

EFEM Customized(Interface with Ion Implantation Process)

-  高洁净度  
High Cleanliness
-  模块化设计  
Modular design
-  高稳定性  
High stability



◆ 对接离子注入制程设备EFEM可搭配晶圆盒存储功能, 对接天车/人工上料, 配置Foup存储位、Foup Robot。通常具备双Robot传递晶圆, 提升产能, 也可配置1+5Robot, 支持五片晶圆同时取放功能。

The ion implantation process equipment EFEM can be equipped with wafer box storage functions, and can be interfaced with overhead cranes or manual loading. It is configured with FOUP storage positions and FOUP Robots. Typically, it features dual Robots for wafer transfer to increase production capacity. It can also be configured with a 1+5 Robot setup, supporting the simultaneous pick-up and placement of five wafers.

## 案例展示 Case Presentation



# EFEM客制化(对接外延制程)

EFEM Customized(Epitaxial)

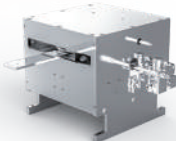
-  高集成度  
High integration
-  高性能  
Modular performance
-  高稳定性  
High stability



合并拆分模块



石磨盘Cassette



清洁模块

◆ 对接外延制程的前端自动化模块包含石墨盘/环合并拆分模块、石磨盘Cassette、清洁模块、飞片检测模块和石磨盘寻边模块, 对接真空传输腔体VTM。

The front-end automation module for epitaxy processes includes a graphite plate/ring merging and splitting module, a grinding plate Cassette, a cleaning module, a wafer flying detection module, and a grinding plate edge-finding module, interfacing with the vacuum transfer chamber (VTM).

## 案例展示 Case Presentation



# EFEM客制化(对接PVD/CVD/ETCH制程)

EFEM Customized(Interface with PVD / CVD / ETCH)

-  高洁净度  
High Cleanliness
-  模块化设计  
Modular design
-  高效率  
High efficiency



晶圆 Buffer 模组



单臂双叉ROBOT



EFEM+VTM

◆ 对接PVD/CVD/ETCH制程的前端自动化模块通常配置高速单臂双叉Robot提升产能, 晶圆buffer机构, 整机也可以对接真空传输腔体VTM。

The EFEM used for PVD/CVD/ETCH processes is typically equipped with a high-speed single-arm dual-fork robot to increase productivity. It also includes a wafer buffer mechanism, and the entire system can be integrated with a vacuum transfer module (VTM) to meet the needs of vacuum transfer.

## 案例展示 Case Presentation





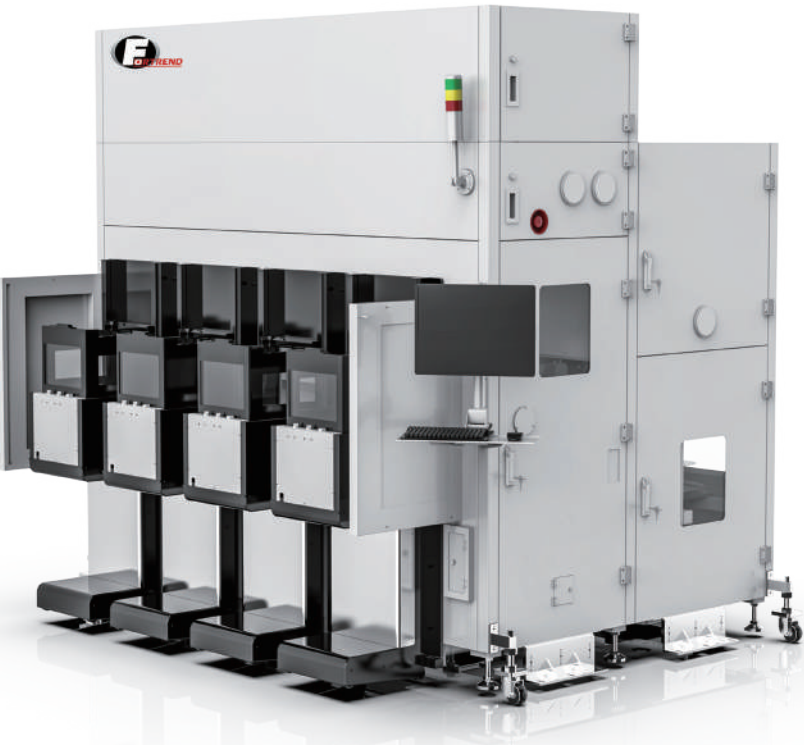
EFEM客制化(对接光刻机制程)

EFEM Customized (Interface with Lithography Process)

适配光刻机低上料口  
compatible with the low material input port of the lithography machine

双ROBOT  
Dual Robots

可独立对接光刻机  
Capable of independently interfacing with a photolithography machine



光刻机对接窗口



ROBOT



对接光刻机ROBOT

独立对接光刻机的前端自动化传输模块:可提供与光刻机直连实现自动上下料,机械手可适配从晶圆盒到光刻机对接窗口的传片功能,配置双ROBOT:常规ROBOT和小Z轴ROBOT,并提供各种尺寸晶圆(6"/8"/12")的传输方案。

小Z轴ROBOT满足对接平台高度620mm-800mm传输需求。

Independent front-end automated transfer module for direct docking with photolithography machines: It enables direct connection with the photolithography machine for automatic loading and unloading. The robotic arm is adaptable for transferring wafers from the wafer cassette to the photolithography machine's docking window. Equipped with dual robots: a standard robot and a small Z-axis robot, it offers transfer solutions for wafers of various sizes (6"/8"/12").

The small Z-axis robot meets the transfer requirements for docking platforms with heights ranging from 620mm to 800mm.

案例展示 Case Presentation



EFEM客制化(对接CMP/Bonding 制程)

EFEM Customized (Interface with CMP / Bonding Process)

高洁净度  
High Cleanliness

长期稳定性  
Long-term stability

高兼容性  
High compatibility



大Z轴Robot



大Z轴、大X轴双翻转Robot

对接CMP、Bonding制程的设备前端自动化模块可提供EFEM+制程robot的解决方案:制程robot, 可选配大Z轴Robot和大Z轴或大X轴双翻转Robot, 其中CMP制程还可匹配湿法机械手(Wet Robot)、干燥模组等。

Interface with CMP and Bonding processes: Solutions that integrate EFEM with process robots can be provided. Process robots can be configured with large Z-axis robots and large Z-axis, large X-axis dual-rotation robots. For the CMP process, they can also be matched with Wet Robot and drying modules.

案例展示 Case Presentation



EFEM客制化(Frame Wafer)

EFEM Customized(Frame wafer)

- 

高洁净度  
High Cleanliness
- 

高兼容性  
High Compatibility
- 

自主研发对中模组  
Independently Developed Alignment Module



- ◆ Frame EFEM可选择Frame Wafer Loadport和Frame Open Cassette Stage的晶圆装载系统;支持4-12寸Frame wafer, 可搭配自研高精度对中机构, 夹持形/真空吸附式机械手。可实现Frame Wafer与wafer的兼容。

The Frame EFEM supports both Frame Wafer Loadport and Frame Open Cassette Stage wafer loading systems. It is compatible with 4" - 12" frame wafers and can be equipped with our self - developed high - precision alignment mechanisms. The mechanical arms can be either clamping type or vacuum - suction type. Additionally, it can also meet the compatibility requirements between frame wafers and wafers.

案例展示 Case Presentation



核心模组(150mm/200mm晶圆承载系统)

Core Module150mm/200MM LOAD PORT

- 

高通用性 高兼容  
High Versatility High Compatibility
- 

可选配多种客制化组件  
Customization
- 

符合SEMI标准  
High Compatibility



- ◆ 标准PLM-200W设备、完全符合SEMI标准,具有高通用性、高兼容性;  
Standard Load Port Universal equipment , fully compliant with SEMI standards, with high versatility, high compatibility.
- ◆ 载料类型:SMIF POD可装载兼容 6" 8" 晶圆;  
Loading type: SMIF POD is compatible with 6" and 8" wafers.
- ◆ 内置原厂Mapping系统,可进行叠片、斜片、凸片等检测,杜绝整合晶圆传输中的撞片问题;  
Built-in original factory mapping system enables the detection of overlapping, skewed, and protruding wafers, effectively preventing wafer collisions during integrated wafer transportation.
- ◆ 可选配多种读码类型:RFID/ Smart Tag;  
Optional multiple types of code reading are available: RFID/Smart Tag.
- ◆ 可选配多种客制化组件:Info Pad Sensor;E84接口;Adapter 实现Open cassette 上料形式,灵活应对不同工况需求。  
Optional customization components are available: Info Pad Sensor; E84 interface; Adapter to implement the open cassette loading method, flexibly meeting various working condition requirements.

- ◆ PLM 是较为成熟的开盒器,所搭载传感器兼容6寸与8寸的晶圆开盒检测,可以精确检测POD盒中晶圆状态.PLM可与多种设备对接,丰富的功能选配为客户产线升级提供了更多的解决方案。

PLM is a mature wafer opener that is equipped with sensors compatible with both 6-inch and 8-inch wafer unpacking and inspection, capable of accurately detecting the status of wafers in POD boxes. PLM can interface with a variety of equipment, and its rich selection of optional features provides more solutions for customer production line upgrades.

规格参数 Specification parameter

外观尺寸 Outer dimensions	长432mm 宽422mm 高772mm L: 432mm W: 422mm H: 772mm	洁净度 Cleanliness	Class I @ 0.1um
通讯接口 Communication interface	串口 EIA-RS232C,Paralle I/O Serial EIA-RS232C,Paralle I/O	额定电压 Rated voltage	DC 24 V
主体材质 Main material	铝合金、不锈钢(SUS 304) Aluminum alloy, Stainless steel (SUS 304)	额定功率 Rated voltage	60 W
选配选项 Optional features	ID 读写装置选配RFID 模块或IR Link ID reading and writing device with optional RFID module or IR Link	通讯协议 Comm protocol	HEX, SECS



核心模组(300mm晶圆装载系统)

Core Module (300mm LoadPort)

- 自主研发核心部件  
Self-Developed
- 符合SEMI标准  
Compliant with SEMI Standards
- 高通用性, 高兼容性  
High Versatility, High Compatibility



**载料类型:FOUP/FOSB**  
Load Type: FOUP/FOSB

**整机生产自主化, 核心零部件专利自有;**  
Full-scale production autonomy and proprietary patents for core components.

300mm LoadPort 内关键结构与设计均为富创得自主专利, 设计与生产均在富创得自有生产基地内进行。软硬件垂直整合, 保证设备的标准性与一致性;

The key structures and designs of the 300mm LoadPort are all independently patented by Fortrend, and both the design and production are carried out within Fortrend's own production base. Integration of hardware and software ensures the standardization and consistency of the equipment;

**整机依照 SEMI 标准设计与制造, 运用 RS-232 HEX 通信协议与对接设备通讯。也可拓展多种通讯与对接方式;**  
The complete machine is designed and manufactured in accordance with SEMI standards, using the RS-232 HEX communication protocol for communication with interfacing equipment. It is also expandable with various communication and interfacing methods;

原厂自带的 Wafer Mapping, 利用自研的先进控制算法, 可以实现晶圆有 / 无、叠片、斜片检测。可选的 E84 通讯协议、氮气置换等功能, 满足各种现场需求;

The original Wafer Mapping system utilizes proprietary advanced control algorithms to enable detection of wafer presence, absence, stacking, and tilting. Optional functions such as the E84 communication protocol and N2 purge can meet various on-site requirements;

**可配置 Adapter, 实现 6"/8" 和 12" 晶圆的兼容。**  
The Adapter can be configured to achieve compatibility with 6", 8", and 12" wafers.

规格参数 Specification parameter

外观尺寸 Outer dimensions	长586mm 宽472mm 高1349mm L: 586mm W: 472mm H: 1349mm	设备重量 Equipment weight	66 kg ± 0.5 kg (依配置不同而变化) It varies depending on the configuration
额定功率 Rated power	144 W	额定电压 Rated voltage	DC 24 V
通讯方式 Communication mode	串口通讯RS-232C,并行通讯I/O Serial RS-232C, parallel I/O	额定电流 Rated voltage	6 A
选配选项 Optional features	自动物料搬运系统通讯接口 (E84) AMHS Communication Port (E84)	通讯协议 Comm protocol	HEX, SECS

核心模组(Frame LoadPort)

Core Module Introduction Frame LoadPort

- 自主研发核心部件  
Self-Developed
- 符合SEMI标准  
Compliant with SEMI Standards
- 高通用性, 高兼容性  
High Versatility, High Compatibility



**载料类型:Frame FOUP**  
Load Type: Frame FOUP

**整机生产自主化, 核心零部件专利自有;**  
Full-scale production autonomy and proprietary patents for core components.

Frame LoadPort 内关键结构与设计均为富创得自主专利, 设计与生产均在富创得自有生产基地内进行。软硬件垂直整合, 保证设备的标准性与一致性。

The key structures and designs of the 300mm LoadPort are all independently patented by Fortrend, and both the design and production are carried out within Fortrend's own production base. Integration of hardware and software ensures the standardization and consistency of the equipment.

**专为后道封测工序设计;**  
Designed specifically for back-end packaging and testing processes.

**整机依照 SEMI 标准设计与制造, 运用 RS-232 HEX 通信协议与对接设备通讯。也可拓展多种通讯与对接方式;**  
The complete machine is designed and manufactured in accordance with SEMI standards, using the RS-232 HEX communication protocol for communication with interfacing equipment. It is also expandable with various communication and interfacing methods;

原厂自带的 Wafer Mapping, 利用自研的先进控制算法, 可以实现晶圆有 / 无、叠片、斜片检测。可选的 E84 通讯协议, 可应用于 AMHS/AGV 自动化传输需求。

The original Wafer Mapping system utilizes proprietary advanced control algorithms to enable detection of wafer presence, absence, stacking, and tilting. The optional E84 communication protocol can be applied to AMHS/AGV automated transportation.

规格参数 Specification parameter

外观尺寸 Outer dimensions	长594mm 宽485mm 高1349mm L: 594mm W: 485mm H: 1349mm	设备重量 Equipment weight	70 kg ± 0.5 kg (依配置不同而变化) It varies depending on the configuration
额定功率 Rated power	144 W	额定电压 Rated voltage	DC 24 V
通讯方式 Communication mode	串口通讯RS-232C,并行通讯I/O Serial RS-232C, parallel I/O	额定电流 Rated voltage	6 A
选配选项 Optional features	自动物料搬运系统通讯接口 (E84) AMHS Communication Port (E84)	通讯协议 Comm protocol	HEX, SECS

核心模组(Open Cassette Stage)

Core Module (Open Cassette Stage)

- 自主研发核心部件  
Self-Developed
- 可选配多种客制化组件  
Customization
- 高通用性, 高兼容性  
High Versatility, High Compatibility

专为Wafer Open Cassette、Frame Open Cassette设计;  
Designed Specifically for Wafer Open Cassette、Frame Open Cassette;

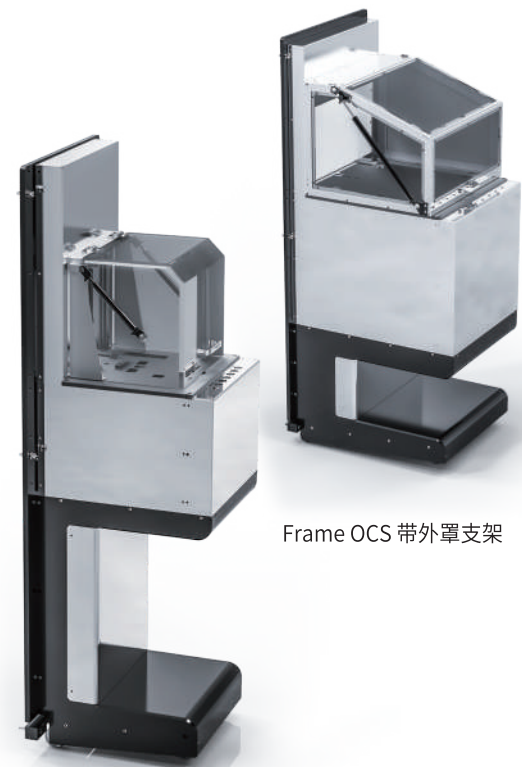
Wafer ocs适配晶圆尺寸:2"、4"、5"、6"、8"  
Frame ocs适配晶圆尺寸:6"、8"、12"  
可根据需求配置实现相邻尺寸兼容

Wafer OCS compatible wafer sizes: 2"、4"、5"、6"、8"  
Frame OCS compatible wafer sizes: 6"、8"、12"  
Can be configured to accommodate adjacent sizes as needed.

可选配多种客制化配件, 灵活应对不同工况需求;  
Optional with a variety of customized accessories, flexibly meeting different working condition requirements;

可原配原厂Mapping系统, 可进行叠片、斜片等检测, 杜绝晶圆传输中的撞片问题;

Equipped with the original factory Mapping system, capable of detecting stacked and skewed wafers, eliminating wafer collision issues during transportation;



Frame OCS 带外罩支架

Wafer OCS 带外罩支架



Wafer OCS Base



Frame OCS Base

规格参数

Specification parameter

设备尺寸 Outer dimensions	长425mm 宽365mm 高772mm (依配置不同而变化)	设备重量 Equipment weight	35 ~ 60 千克 (依配置不同而变化) It varies depending on the configuration
额定电压 Rated voltage	DC24V	额定电流 Rated current	6A
额定功率 Rated power	144W	通讯方式 Communication mode	RS485、RS232
通讯协议 Communication protocol	HEX、ASCII		

核心模组(晶圆传输机器人)

Core Module (Wafer Transfer Robot)

- 自主研发核心部件  
Self-Developed
- 通用RS232协议接口  
Universal RS232 Protocol Interface
- 可选配多种客制化组件  
Customization

整机生产自主化, 核心零部件专利自有

Full-scale production autonomy and proprietary patents for core components.

Robot 内关键模块均为富创得自主专利, 生产均在富创得自有生产基地内进行。软硬件垂直整合, 保证设备的标准性与一致性。

Fortrend owns the patents of key Robot modules which are also produced in Fortrend production base. The vertical integration of software and hardware ensures the standardization and consistency of the equipment.

多样化的客制组件, 适用多种工况

Diversified custom components. Applicable to various working situations.

可选的多种末端执行器与直线模组, 适用半导体与泛半导体的精密环境, 应对现场急需满足的各种工艺工况需求。

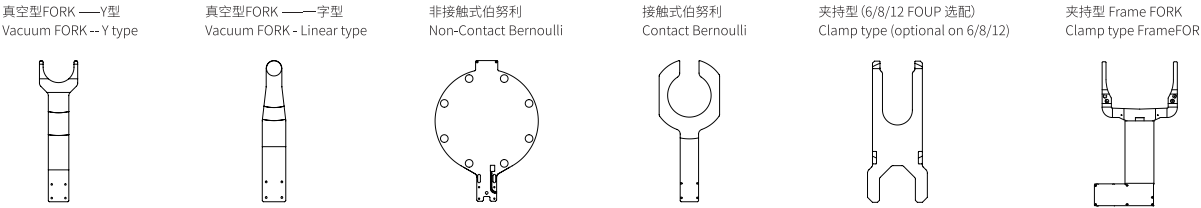
Multiple optional end effectors and linear mouldles are suitable for precision environment of semiconductors and pan semiconductors, and can meet various process urgently requirements on site.

久经测试的Smart Move功能, 与易上手的教导设计

Time tested Smart Move function and easy-to-use teaching design.

最优化手臂运动路径的 smart move 功能, 高效且精准的完成传输工作, 同时其人性化且符合直觉的教导设计, 使得操作者经过简单的培训即可上手操作。

The smart move function with optimized arm motion path can complete transmission work efficiently and accurately, while its humanized and intuitive teaching design allows operators to get started with simple training.



规格参数

Specification parameter

设备尺寸 Outer dimensions	长340mm 宽340mm 高931mm (依配置不同而变化)	设备重量 Equipment weight	45 ~ 60 千克 (依配置不同而变化) It varies depending on the configuration
手臂负载 Arm load	3千克 3KG	主体材质 Body material	铝合金 Aluminum
手臂数量 Arm qty	单臂/双臂 Single Arm/ Double Arm	末端执行器材质 End effectors(EEF) Specif	陶瓷/铝合金/碳纤维复材 Ceramics/Aluminum /CFRP
洁净度 Cleanliness	ClassI@0.1um	适用载具类型 Applicable carrier types	SMIF 吊舱、光罩盒、FOUP/FOSB SMIF Pod、Reticle Box、FOUP/FOSB



# 核心模组(晶圆寻边器)

Core Module(Wafer Pre-Aligner)

- 自主研发核心部件  
Self-Developed
- 可选配多种客制化组件  
Customization
- 高通用性, 高兼容性  
High Versatility, High Compatibility



高效的运行,寻晶圆缺口位置<7S(不包括晶圆取放时间),快速完成晶圆中心与角度补正。

Efficient operation, locating the wafer notch position in less than 7 seconds (excluding the time for wafer handling), quickly completing the correction of the wafer center and angle.

可支持半透明与不透明晶圆应用,适用于直径150-300mm的硅晶圆,碳化硅片等。

It supports both translucent and opaque wafer applications, suitable for silicon wafers and silicon carbide wafers with diameters ranging from 150 to 300mm.

一体化设计,内嵌式控制器,无需额外设置控制器及走线空间,实现超小体积尺寸。

Integrated design with a built-in controller, eliminating the need for an additional controller and wiring space, achieving an ultra-compact size.

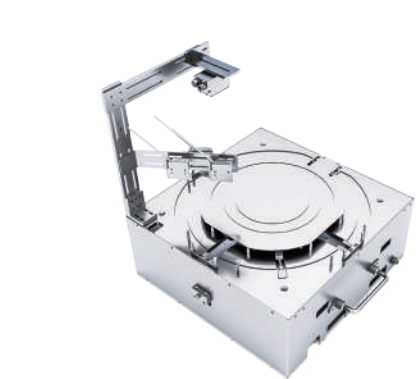
系统配备即时监控功能,可实时检测电机驱控系统、真空系统、侦测系统、循环系统等系统状态。

The system is equipped with real-time monitoring capabilities, allowing for the live detection of the status of motor drive control systems, vacuum systems, detection systems, and circulation systems.

◆ FPA系列晶圆寻边器为四轴控制,采用微型单轴机器人模组,具有高刚性、小体积之特性。实现高速高效高精度的晶圆寻边和中心位置校准。(晶圆位置 $\leq \pm 0.1\text{mm}$ ;晶圆缺边/缺口 $\leq \pm 0.1^\circ$ )

The FPA series wafer edge finder is a four-axis controlled device that uses a miniature single-axis robotic module, characterized by high rigidity and small size. It achieves high-speed, efficient, and high-precision wafer edge detection and center position calibration. (Wafer position  $\leq \pm 0.1\text{mm}$ ; Wafer notch/-flat  $\leq \pm 0.1^\circ$ )

## 对中机构 Centralized Stage



可兼容 6、8、12 寸Frame环；

Compatible with 6, 8, and 12-inch Frame rings.

可配置读取二维码功能；

Capable of configuring QR code reading functionality.

重复定位精度 $\leq \pm 0.1\text{mm}$ , 旋转角度 $\leq \pm 0.1^\circ$ ；

Repeat positioning accuracy  $\leq \pm 0.1\text{mm}$ , rotation angle  $\leq \pm 0.1^\circ$ .

调整时间 < 6 s；

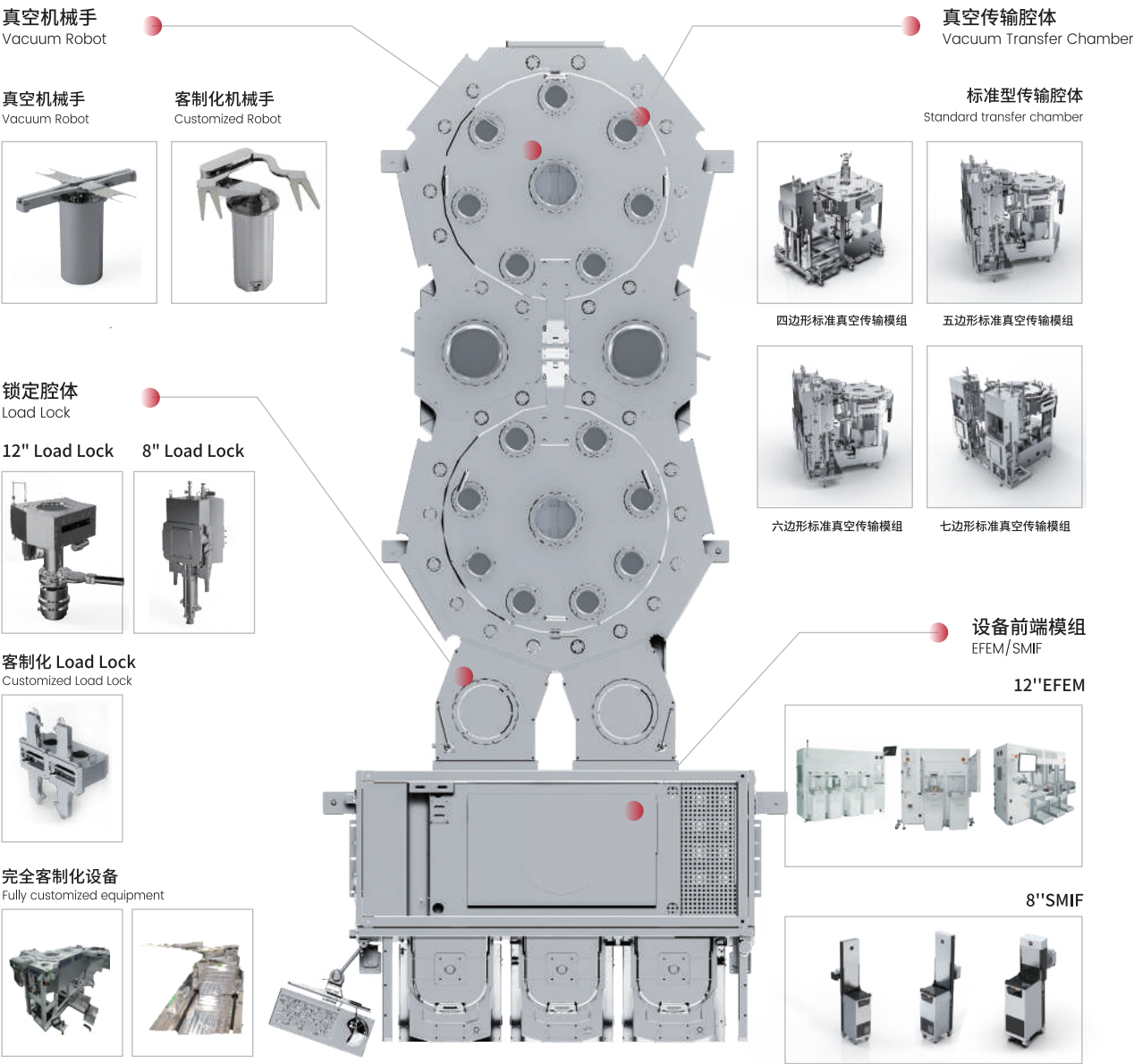
Adjustment time < 6 seconds.

最大初始偏移量 $\pm 7\text{mm}$ 。

Maximum initial offset  $\pm 7\text{mm}$ .

# 三段式整合方案

Three-stage Integration Plan



设备前端可选配EFEM/SMIF, EFEM可提供标准型与客制型；  
The equipment front end can optionally be equipped with an EFEM or SMIF. The EFEM is available in both standard and customized types;

真空机械手可根据实际工况选择不同型号与末端执行器；  
Vacuum robots can be selected in different models and end effectors based on actual operating conditions;

Load Lock可选不同结构与传输方式；

The Load Lock is available with different structures and transfer methods;

传输腔体与Load Lock可选内置的定向/冷却/预热模组；

The transfer chamber and Load Lock can be optionally equipped with built-in modules for orientation, cooling, and preheating.

可根据实际工艺腔要求制作客制化传输腔体；

Customized transfer chambers can be designed to meet the specific requirements of the process chambers;

可选配的AWC功能、Buffer 功能、晶圆存储模组。

Optional AWC (Automatic Wafer Centering) function, Buffer function, and wafer storage module.

富创得Lamina系列设备前端模块 (EFEM/SORTER) 配置表				
FUCHUANGDE LAMINA SERIES EQUIPMENT FRONT END MODULE (EFEM/SORTER) CONFIGURATION TABLE				
公司名称 Company name		公司地址 Company address		
技术联系人 Technical contact		商务联系人(可选) Business Contact (optional)		
电话 Telephone		电子邮箱 Email address		
规格 SPECIFICATIONS	选项 OPTIONS		可选规格 OPTIONAL SPECIFICATIONS	备注 REMARKS
基础规格 Basic Spec	应用	Station Qty	<input type="checkbox"/> Wafer <input type="checkbox"/> Frame	
	晶圆材质	Material	<input type="checkbox"/> Si <input type="checkbox"/> SiC (碳化硅) <input type="checkbox"/> GaN (氮化镓) <input type="checkbox"/> 玻璃片 <input type="checkbox"/> 其他 _____	
	适用尺寸	Size	<input type="checkbox"/> 6" <input type="checkbox"/> 8" <input type="checkbox"/> 12" <input type="checkbox"/> 其他 _____	
	载具类型	载具形式	<input type="checkbox"/> SMIF POD <input type="checkbox"/> Open cassette <input type="checkbox"/> FOUP/FOSB	
		规格	<input type="checkbox"/> 2个 <input type="checkbox"/> 3个 <input type="checkbox"/> 4个 <input type="checkbox"/> 个数: _____	
对接规格 Docking Spec	Load port (300mm FOUP / FOSB)	规格	<input type="checkbox"/> 300mm <input type="checkbox"/> 个数: _____	
		读码类型	<input type="checkbox"/> RFID <input type="checkbox"/> 条形码 <input type="checkbox"/> 其他	
	PLM (150 -200mm SMIF Pod)	规格	<input type="checkbox"/> 150mm <input type="checkbox"/> 200mm <input type="checkbox"/> 个数: _____	
		读码类型	<input type="checkbox"/> RFID <input type="checkbox"/> Smart Tag <input type="checkbox"/> 其他 _____	
	Open Cassette Station(100 -200mm OpenCassette)	规格	<input type="checkbox"/> 100mm <input type="checkbox"/> 150mm <input type="checkbox"/> 200mm <input type="checkbox"/> 个数: _____	
		读码类型	<input type="checkbox"/> RFID <input type="checkbox"/> 条形码 <input type="checkbox"/> 其他 _____	
	Robot	规格	<input type="checkbox"/> 1个 <input type="checkbox"/> 2个 <input type="checkbox"/> 其他 _____	
		类型	<input type="checkbox"/> 单臂双叉 <input type="checkbox"/> 单臂单叉 <input type="checkbox"/> 双臂双叉 <input type="checkbox"/> 其他 _____	
	吸爪	类型	<input type="checkbox"/> 真空吸附 <input type="checkbox"/> 边缘夹持 <input type="checkbox"/> 伯努利 <input type="checkbox"/> 其他 _____	
		材质	<input type="checkbox"/> 陶瓷 <input type="checkbox"/> 铝合金 <input type="checkbox"/> 陶瓷+镀膜 <input type="checkbox"/> 其他 _____	
其他规格 Other Specifications	Alinger/对中机构		<input type="checkbox"/> 有 <input type="checkbox"/> 无    【数量: <input type="checkbox"/> 1个 <input type="checkbox"/> 2个 】 <input type="checkbox"/> 其他 _____	
	OCR		<input type="checkbox"/> 有 <input type="checkbox"/> 无    【数量: <input type="checkbox"/> 1个 <input type="checkbox"/> 2个 】 <input type="checkbox"/> 其他 _____	
	离子棒		<input type="checkbox"/> 有 <input type="checkbox"/> 无	
	洁净度		<input type="checkbox"/> ISO 1 <input type="checkbox"/> ISO 3 (Class 1) <input type="checkbox"/> 其他 _____	
	产能		_____ PCS / h	
	FFU		<input type="checkbox"/> 有 <input type="checkbox"/> 无    【数量: <input type="checkbox"/> 1个 <input type="checkbox"/> 2个 】 <input type="checkbox"/> 其他 _____	
	塔灯		<input type="checkbox"/> 三色 <input type="checkbox"/> 四色 <input type="checkbox"/> 其他 _____	
	内部灯光		<input type="checkbox"/> 白色 <input type="checkbox"/> 黄色 <input type="checkbox"/> 其他 _____	
	显示器		<input type="checkbox"/> 触摸屏 <input type="checkbox"/> 普通屏 <input type="checkbox"/> 其他 _____	
	急停 (EMO)		<input type="checkbox"/> 1个 <input type="checkbox"/> 2个 <input type="checkbox"/> 其他 _____	
	FFU压差表		<input type="checkbox"/> 有 <input type="checkbox"/> 无    【数量: <input type="checkbox"/> 1个 <input type="checkbox"/> 2个 】 <input type="checkbox"/> 其他 _____	
	E84		<input type="checkbox"/> 有 <input type="checkbox"/> 无	
	安全光栅      Safety Curtain		<input type="checkbox"/> 有 <input type="checkbox"/> 无	
	框架材质		<input type="checkbox"/> 碳钢 <input type="checkbox"/> 不锈钢 <input type="checkbox"/> 铝型材	
	通信协议		<input type="checkbox"/> HSMS <input type="checkbox"/> ASCII TCP <input type="checkbox"/> HEX TCP <input type="checkbox"/> 其他 _____	