

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

上海大族富创得科技股份有限公司(总部)

Shanghai Fortrend Technology Co.,Ltd

地址:上海闵行区万芳路555号

Address: No.555 Wanfang Road,
Minhang District, Shanghai P.R. China

邮箱/E-mail

邮箱(E-mail):service@fortrend.com.cn

官网/Web

上海大族富创得(总部):www.fortrend.cn

美国工程公司:www.fortrend.com

无锡智能科技:www.fortrendit.com

无锡精密设备:www.fortrendpe.com

浙江子公司 Zhejiang subsidiary

浙江大族富创得科技有限公司

Zhejiang Fortrend Technology Co.,Ltd

浙江富创得智能装备有限公司

Zhejiang Fortrend Intelligent Equipment Co., Ltd.

地址:浙江省平湖市新埭镇创新路139号

Address: No. 139, Chuangxin Road, Xindai Town, Pinghu
City, Zhejiang Province, P.R. China

无锡子公司 Wuxi subsidiary

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

地址:无锡市新吴区梅村街道梅育路100号

Address: No.100 Meiyu Road,Meicun Town,
Wuxi District,Jiangsu Province,China

美国子公司 USA subsidiary

富创得工程公司

Fortrend Engineering Corporation

地址:圣何塞奥图尔大道2220号

Address: 2220 ' Toole Avenue, San Jose
USA, CA95131

电话(Tel):(1)408-734-9311

邮箱(E-mail):sales@fortrend.com

经销商 Distributors

英国 UK Sistem Technology

Address: Grafton Suite, Caswell

Science & Technology Park,Towcester,

Northants, NN12 8EQ, UK

电话(Tel):(44)1327 317621

韩国 ROK SD Solution

Address: #509, Biz Tower, 63-12

Dongtancheomdansaneop 1-ro,

Hwaseong-si, Gyeonggi-do, South Korea

电话(Tel):(81)42-468-4164



微信公众号



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

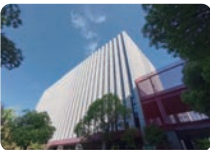
ABOUT FORTREND

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33000m²，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 m². 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。

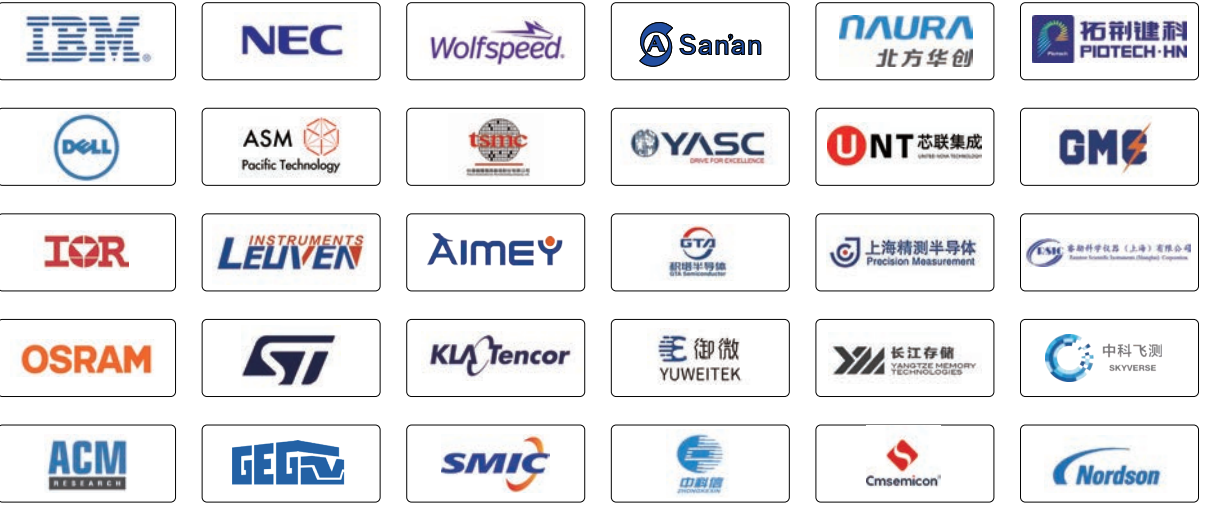
45⁺
年
半导体行业经验

38⁺
%
研发人员占比38%

13⁺
%
年度研发支出占比13%

100⁺
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.
H₂O/O₂ 环境控制设备前端模块
H₂O/O₂ 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
自动物料搬送系统 (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
N₂ 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)



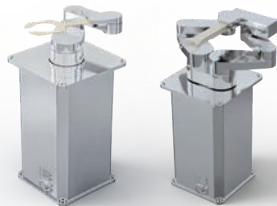
300mm晶圆装载系统
300mm Loadport



150/200mm晶圆装载系统
150/200mm Loadport



OCS
Open Cassette Stage



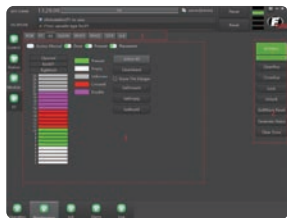
晶圆传输机器人
Wafer transfer robot



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)



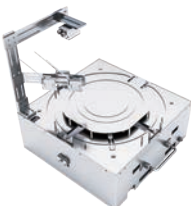
翻转机构
Reversing Mechanism



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



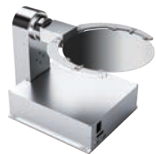
SORTER客制化(For Taiko Wafer)

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



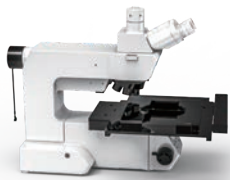
SORTER客制化(OM loader)

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



显微镜



宏观检机构

◆ 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



伯努利ROBOT



打包机构

◆ 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

N₂ 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