



锂电涂布及分切设备专家

Expert in Lithium Battery Coating and Slitting Systems



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CATALOG
LIB Coating and Slitting Systems

锂电智能设备产品手册

公司简介 Company Profile

上海福赛特机器人股份有限公司是一家基于复杂、精密机械设计、精准运动控制和人工智能等自动化、智能化核心技术的高端专用智能设备供应商，公司融合对应用领域的深度理解，产品已应用于新能源、新材料、半导体和智能交通等战略性新兴产业。

在新能源行业，公司构建了一套完备的核心工艺设备产品矩阵，涵盖极片、隔膜涂布智能设备，极片底涂智能设备，铜箔、铝箔及隔膜分切智能设备等。通过自主研发和技术创新，公司成功打破了国外高端设备的垄断，实现了进口替代，成为推动行业自动化、智能化进程的领航者。

公司曾获上海领军人才专项、上海人才发展基金专项、上海创新资金专项等专项资金；此外，公司取得国家高新技术企业、上海市“专精特新”企业等称号；公司基于点涂技术的锂电隔膜涂布智能设备被列为2023年度上海市高端智能装备首台突破专项立项支持项目。截至2024年3月末，公司已授权专利数量为169项，其中发明专利为33项。

Shanghai Foresight Robotics Co., Ltd. is a supplier of **high-end specialized intelligent systems**, leveraging core technologies in sophisticated mechanical design, precise motion control, and artificial intelligence. The company's products are employed in strategic emerging industries such as sustainable energy, membrane technology, semiconductors, and intelligent transportation.

In the sustainable energy sector, Foresight offers a comprehensive suite of core process systems, including **intelligent base-coating systems for electrodes, coating systems for electrodes and separators, and precision slitters for copper foil, aluminum foil, and separators.**

The company's Intelligent Lithium-ion Battery Separator Coating System based on **Spot-Coating technology** was included as a 2023 Breakthrough Project in Shanghai's High-end Intelligent Equipment Initiative. As of the end of March 2024, Foresight has been granted 169 patents, including 33 for inventions.

公司简介 Company Profile



成立时间
2015年3月27日

Founded on
27 Mar 2015

注册资本
1.1850亿元人民币

Registered Capital
118.50 mn yuan

生产制造基地面积
40000平方米

Area of the R&D and Production Base
40000

已授权专利数量
169项

Number of Granted IP
169

锂电隔膜涂布智能设备

Intelligent Lithium-ion Battery Separator Coating System

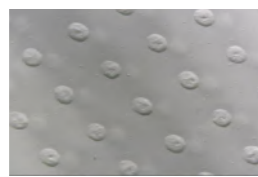


创新技术 Innovations

行业首创点涂技术

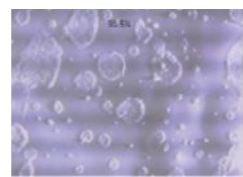
Industry's First Spot-Coating Technology

- 精确控制涂布点高和点间距, 提高涂布一致性, 有效降低锂枝晶风险。
- 提高浆料利用率, 与喷涂技术相比, 同等产品性能下可节约浆料30%以上。
- Precise Control: Controls the height and spacing of coating spots to improve coating consistency and effectively reduce the risk of lithium dendrite formation.
- Increased Slurry Efficiency: Compared to spray coating, spot-coating can save over 30% of slurry for equivalent product performance.



点涂(福赛特)

VS



喷涂(竞品)

Spot coating (Foresight) vs. Spray coating (others)

设备特点 Features

多热源整合烘箱技术

Multi-Heating Source Integrated Oven Technology

- 集成红外、陶瓷等多种热源, 热转化效率更高。
- 热桥轻量化减少热交换, 引用新材料降低热辐射, 实现高效隔热。
- Integrated Heat Sources: Combines infrared, ceramic, and other heat sources for higher thermal exchange efficiency.
- Efficient Thermal Insulation: Features a lighter heat bridge to reduce thermal conduction, with new materials that decrease thermal radiation.

人工智能(AI)收卷技术

AI Winding Technology

- 通过智能调控减少卷底起皱和打滑, 确保各阶段松紧适中, 为隔膜静置预留收缩空间。
- 利用AI技术, 快速调用历史数据, 减少调整次数, 降低废品率。
- Intelligent Adjustment: Reduces wrinkles and slippage at the roll's bottom, ensuring proper tension at all stages and reserving space for separator shrinkage.
- Rapid Data Utilization: Utilizes AI to quickly access historical data, minimizing adjustments and reducing scrap rates.

兼容性广泛

Broad Compatibility

- 兼容市面上各种水性陶瓷和水性PVDF/PMMA组合。
- 兼容辊涂、点涂、喷涂等多种涂布方式。
- 采用模块化设计, 实现无缝衔接。
- Diverse Materials: Compatible with various water-based ceramics and PVDF/PMMA combinations.
- Diverse Coating Methods: Supports roller coating, spot coating, and spraying, among others.
- Modular Design: Ensures seamless integration.

智能化信息化

Intelligent and Data-Driven

- 生产数据自动采集, 免除人工记录, 可接入MES系统, 实现数据无缝传输。
- Automated Data Collection: Eliminates manual data entry and can be integrated with MES systems for seamless data transmission.

设备型号 Model	设备尺寸 Dimensions	基材宽度 Substrate Width	加热方式 Heating Mode
FST-CM-BS-100 (单面涂Single-Sided Coating)	L24.5m×W6m×H5m	1.3m	电/导热油/蒸汽 Electric/Thermal Oil/Steam
FST-CM-BS-200 (双面涂Double-Sided Coating)	L32.5m×W6m×H6m	1.3m	电/导热油/蒸汽 Electric/Thermal Oil/Steam
FST-CM-BS-101 (单面涂Single-Sided Coating)	L24.5m×W6m×H5m	1.5m	电/导热油/蒸汽 Electric/Thermal Oil/Steam
FST-CM-BS-202 (双面涂Double-Sided Coating)	L32.5m×W6m×H6m	1.5m	电/导热油/蒸汽 Electric/Thermal Oil/Steam

设备参数

Parameter

参数值

Value

涂布方式 Coating Method	辊涂/喷涂/点涂 Roller Coating/Spray Coating/Spot Coating
涂布宽度 Coating Width	Max. 1500mm
涂布速度 Coating Speed	Max. 200m/min
基材厚度 Substrate Thickness	5-16μm
卷径/重量 Reel Diameter/Weight	Max. Φ600mm/250KG
机械速度 Mechanical Speed	250m/min
辊面宽度 Roller Width	1650
烘箱温度 Dryer Temperature	Max. 120°C/±1°C

锂电电极片涂布智能设备

Intelligent Lithium Electrode Coating System



✦ 创新技术 Innovations

人工智能多参数面密度闭环控制

AI Closed-Loop Control on Multi-Parameter Surface Density

- 采用神经网络自学习及实时闭环控制技术,实现对涂布面密度的精准控制,提升涂布品质,提高设备利用率,节约浆料用量。
- Precise Control: Utilizes AI real-time closed-loop control to accurately manage the coating surface density, enhancing coating quality, increasing system utilization, and reducing slurry consumption.

设备特点 Features

高效率自动换卷技术

High-Efficiency Automatic Reel Change Technology

- 采用自动接带和转动换轴方式更换卷料,高效不停机,提升设备稳定性。
- Seamless Operation: Utilizes automatic substrate splicing and rotational shaft changing, allowing continuous operation without stopping, thus enhancing system stability.

高精度涂布技术

High-Precision Coating Technology

- 通过控制涂布唇口精度、供液系统精度、背辊精度、张力系统来控制涂布厚度,实现高精度涂布。
- Precision Control: Utilizes accurate control of coating lips, slurry supply system, back roller, and tension system to achieve high-precision coating.

智能调节烘箱技术

Intelligent Adjustable Dryer Technology

- 根据涂层种类和生产速度,自动调节风速、风压、温度,提升烘烤均匀性的同时节约能耗。
- Adaptive Settings: Dynamically adjusts air speed, air pressure, and temperature based on the coating type and production speed, optimizing drying uniformity and energy consumption.

自主研发CCD检测系统

Self-Developed CCD Detection System

- 采用线阵CCD相机、高频线性光源和编码器,实时监测涂布过程中的表面缺陷。
- Real-Time Monitoring: Employs a linear CCD camera, high-frequency linear light source, and encoder to monitor surface defects during the coating process.

设备参数 Parameter	参数值 Value
基材 Substrate	铝箔 Aluminum Foil (Al foil) 铜箔 Copper Foil (Cu foil)
基材厚度 Substrate Thickness	10-20 μ m 6-20 μ m
涂布宽度 Coating Width	1140mm 1140mm
涂布精度 Coating Accuracy	单面密度精度 $\leq \pm 1.2\%$ 双面密度精度 $\leq \pm 1.0\%$ Single-Sided Coating density: $\pm 1.2\%$ Double-Sided Coating density: $\pm 1.0\%$
涂布宽度精度 Coating Width Accuracy	± 0.5 mm
机械速度 Mechanical Speed	120m/min
工艺速度 Production Speed	100m/min
放卷卷径/重量 Unrolling Diameter/Weight	Max. 1000mm/Max. 2000KG
收卷卷径/重量 Winding Diameter/Weight	Max. 1200mm/Max. 2000KG
烘箱温度 Dryer Temperature	$\geq 180^{\circ}\text{C}$

锂电电极片底涂智能设备

Intelligent Lithium Electrode Base-Coating System



✦ 创新技术 Innovations

一次双面涂布技术

Simultaneous Double-Sided Coating Technology

- 融合基材夹辊和气浮防抖、高精度涂布模头等技术,实现了一次双面同时涂布且性能一致,节能高效。
- 采用精密气悬浮烘箱,让基材在烘箱内平稳输送和快速干燥,大幅提高干燥效率及产品品质。
- Integrated Technologies: Combines substrate pinch roller, air-float stabilization, and high-precision coating die head technologies, enabling simultaneous double-sided coating with consistent performance.
- Energy Efficiency and Effectiveness: Features a precision air suspension dryer that ensures smooth substrate conveyance and rapid drying, significantly improving both drying efficiency and product quality.

设备特点 Features

高精度涂布技术

High-Precision Coating Technology

- 通过控制涂布唇口精度、供液系统精度、背辊精度、张力系统来控制涂布厚度,实现高精度涂布。
- Precision Control: Utilizes accurate control of coating lips, slurry supply system, back roller, and tension system to achieve high-precision coating.

自主研发CCD检测系统

Self-Developed CCD Detection System

- 采用线阵CCD相机、高频线性光源和编码器,实时监测涂布过程中的表面缺陷。
- Real-Time Monitoring: Employs a linear CCD camera, high-frequency linear light source, and encoder to monitor surface defects during the coating process.

兼容性广泛

Broad Compatibility

- 适用锂电基材的底层改性材料的涂布,可与极片涂布设备配套使用。
- Application Flexibility: Suitable for the coating of base-modified materials of the lithium-ion battery (LIB) substrate, which can be used in conjunction with electrode coating system.

设备参数 Parameter	参数值 Value
涂布方式 Coating Method	凹版/狭缝连续涂布Gravure/ Slot Die continuous coating
涂布宽度Coating Width	Max. 1450 mm
涂布速度Coating Speed	Max. 160 m/min
涂布尺寸精度Coating Dimension Accuracy	$\leq \pm 0.3$ mm
涂布厚度精度Coating Weight Accuracy	± 0.3 μ m
基材厚度 Substrate thickness	AL 8-20 μ m /Cu4.5-20 μ m
卷径/重量 Reel Diameter/Weight	Max. Φ 800 mm/1000 KG
设备辊面宽度Roller width	Max. 1600 mm
张力范围/精度Tension Range /Accuracy	30-300 N/40-500 N
烘箱温度Dryer Temperature	Max. 160 $^{\circ}$ C \pm 3 $^{\circ}$ C

分切智能设备 Intelligent Slitting System

锂电铜箔分切智能设备

Intelligent Copper Foil Slitter for Lithium-ion Batteries



✦ 创新技术 Innovations

自动排刀设计

Automatic Cutting Tool Positioning

- 6套刀具系统可自动调节, 配备寿命管理预警, 提高设备稼动率和分切精度。
- 配备可视化测距和圆刀停转报警功能, 提升分切精度和安全性。
- Self-Adjusting Cutter Systems: Features 6 sets of cutters that automatically adjust, equipped with a life management warning system to improve system uptime and slitting accuracy.
- Enhanced Precision and Safety: Equipped with visual distance measurement and a circular cutter stop alarm to enhance slitting precision and safety.

设备特点 Features

创新收卷方式

Innovative Reel Rewinding Method

- 正反收自由搭配, 适应多样需求, 有效解决收卷时擦边隐患。
- 伺服驱动智能调整接近辊模块, 适配不同卷材直径。
- Flexible Rewinding Options: Enables versatile configurations of forward and reverse rewinding to accommodate diverse needs and effectively mitigate the risk of edge rubbing during the rewinding process.
- Servo-Driven Adjustments: Intelligent adjustment of approach roller modules, adaptable to different reel diameters.

自主研发除尘系统

Self-Developed Dust Removal System

- 基于空气动力学原理, 提高粉尘去除率, 显著提升分切后成品的品质。
- Aerodynamic Design: Improves dust removal efficiency, significantly enhancing the quality of the finished products after slitting.

分切智能设备 Intelligent Slitting System

自主研发CCD检测系统

Self-Developed CCD Detection System

- 分切前后均能识别针孔、凹凸点、褶皱、压痕等各种缺陷, 确保产品质量。
- Comprehensive Defect Detection: Capable of identifying various defects such as pinholes, bumps, creases, and indentations both before and after slitting to ensure product quality.

创新高效及安全设计

Innovative, Efficient and Safe design

- 创新辊筒快换结构解决辊筒难更换和轴承无法维护的痛点。
- 利用红外线辅助参考线精准贴胶带, 确保收卷质量和一致性。
- 集成防夹手设计和易触达安全拉绳, 有效预防安全事故, 保障操作人员安全。
- Quick-Change Roller Structure: Introduces an innovative roller quick-change structure that addresses the challenges of roller replacement and maintenance of bearings.
- Precision Taping with Infrared Assistance: Utilizes infrared-assisted reference lines for precise taping, ensuring consistent and high-quality winding.
- Safety Features: Integrates anti-pinch design and easily accessible emergency stop ropes to effectively prevent accidents and ensure operator safety.

设备型号 Model	设备尺寸 Dimensions	设备重量 Weight	整机功率 Power
FST-SM-CF-101 (龙门式Gantry)	L4700mm×W3800mm×H3100mm	8500KG	40KW
FST-SM-CF-100 (卧式Horizontal)	L4440mm×W4180mm×H2276mm	8500KG	40KW

设备参数 Parameter	参数值 Value	
基材 Substrate	厚度 Thickness	4-20 μm
	直径 Diameter	Max. .800 mm
	重量 Weight	Max. .3500KG
速度 Speed	宽度 Width	150-1550 mm
	机械速度 Mechanical Speed	Max. 200 m/min
分切 Slitting	工艺速度 Production Speed	30-150 m/min
	分切宽度 Width	Min. 200 mm
收卷 Rewinding	分切精度 Accuracy	±0.1 mm
	直径 Diameter	Max. 600 mm (龙门式/Gantry) Max. 650 mm (卧式/Horizontal)
	收卷管芯 Rewinding Core	3"和6"选配 3" & 6" optional
	形式 Method	正收、反收、正反交叉收 Forward, reverse, forward and reverse cross winding
边料收卷 Off-cut Rewinding	独立收卷, 张力可独立调整 Independent winding, tension adjustable independently	

分切智能设备 Intelligent Slitting System

锂电铝箔分切智能设备

Intelligent Aluminium Foil Slitter for Lithium-ion Batteries



✦ 创新技术 Innovations

自主研发切刀冷却装置

Self-Developed Cutter Cooling System

- 基于空气动力学原理,有效降低分切时产生的温度,提高分切速度和良率。
- Aerodynamic Design: Effectively reduces the temperature generated during slitting, thereby enhancing slitting speed and yield.

设备特点 Features

自动排刀设计

Automatic Cutting Tool Positioning

- 6套刀具系统可自动调节,配备寿命管理预警,提高设备稼动率和分切精度。
- 配备可视化测距和圆刀停转报警功能,提升分切精度和安全性。
- Self-Adjusting Cutter Systems: Features 6 sets of cutters that automatically adjust, equipped with a life management warning system to improve system uptime and slitting accuracy.
- Enhanced Precision and Safety: Equipped with visual distance measurement and a circular cutter stop alarm to enhance slitting precision and safety.

自主研发除尘系统

Self-Developed Dust Removal System

- 基于空气动力学原理,提高粉尘去除率,显著提升分切后成品的品质。
- Aerodynamic Design: Improves dust removal efficiency, significantly enhancing the quality of the finished products after slitting.

自主研发CCD检测系统

Self-Developed CCD Detection System

- 分切前后均能识别针孔、凹凸点、褶皱、压痕等各种缺陷,确保产品质量。
- Comprehensive Defect Detection: Capable of identifying various defects such as pinholes, bumps, creases, and indentations both before and after slitting to ensure product quality.

分切智能设备 Intelligent Slitting System

创新高效及安全设计

Innovative, Efficient and Safe design

- 创新辊筒快换结构解决辊筒难更换和轴承无法维护的痛点。
- 利用红外线辅助参考线精准贴胶带,确保收卷质量和一致性。
- 集成防夹手设计和易触达安全拉绳,有效预防安全事故,保障操作人员安全。
- Quick-Change Roller Structure: Introduces an innovative roller quick-change structure that addresses the challenges of roller replacement and maintenance of bearings.
- Precision Taping with Infrared Assistance: Utilizes infrared-assisted reference lines for precise taping, ensuring consistent and high-quality winding.
- Safety Features: Integrates anti-pinch design and easily accessible emergency stop ropes to effectively prevent accidents and ensure operator safety.

设备参数

Parameter

参数值

Value

基材 Substrate	厚度 Thickness	8-20 μm
	直径 Diameter	Max. .850 mm
	重量 Weight	Max. .2000 KG
	宽度 Width	Max. .1650 mm
速度 Speed	机械速度 Mechanical Speed	Max. .400 m/min
	工艺速度 Production Speed	30-350 m/min
分切 Slitting	分切宽度 Width	Min.200 mm
	分切宽度精度 Width Accuracy	≤ ±0.5 mm
收卷 Rewinding	直径 Diameter	Max. .850 mm
	收卷管芯 Rewinding Core	3"和6"选配 3" & 6" optional
设备重量 Weight	8200 KG	
设备尺寸 Dimension	L2800mm×W3600mm×H2700mm	
整机功率 Power	53 KW	

分切智能设备 Intelligent Slitting System

锂电隔膜分切智能设备

Intelligent Separator Slitter for Lithium-ion Batteries



✦ 创新技术 Innovations

创新收卷方式

Innovations Reel Winding Method

- 兼容压力和距离模式,有效应对隔膜厚度不一致的问题,显著减少收卷缺陷。
- Compatibility with Pressure and Distance Modes: Effectively addresses issues with inconsistent separator thickness, significantly reducing winding defects.

设备特点 Features

自主研发除尘系统

Self-Developed Dust Removal System

- 基于空气动力学原理,提高粉尘去除率,显著提升分切后成品的品质。
- Aerodynamic Design: Improves dust removal efficiency, significantly enhancing the quality of the finished products after slitting.

高精度张力闭环控制

High Precision Tension Closed-Loop Control

- 锥度控制可实时调节,提升分切质量及收卷良率。
- Real-Time Adjustable Taper Control: Enhances slitting quality and winding yield by allowing for real-time adjustments.

创新高效及安全设计

Innovative, Efficient and Safe design

- 压合棒设计防止剩余料膜脱落,减少材料浪费。
- 集成防夹手设计和易触达急停按钮,有效预防安全事故,保障操作人员安全。
- Pressing-Bar Design: Prevents the remaining film from falling off, reducing material waste.
- Safety Features: Includes anti-pinch design and easily accessible emergency stop buttons to effectively prevent accidents and ensure operator safety.

分切智能设备 Intelligent Slitting System

设备参数

Parameter

参数值

Value

速度 Speed	机械速度 Mechanical Speed	Max. .200 m/min
	工艺速度 Production Speed	Max. .150 m/min
放卷 Unwinding	来料厚度 substrate Thickness (μm)	5-30 μm
	基材宽度 Substrate Width (mm)	Max. .1650 mm
	端面整齐度 flatness Of End Surface (mm)	±0.2 mm
	放卷形式 UnwindingMode	上下放, 切换加权限 Top and bottom loading, switchable with permissions
分切 Slitting	分切宽度 Width (mm)	30-1100 mm
	分切精度 Accuracy (mm)	幅宽30-500mm时,公差±0.2mm 幅宽500-750mm时,公差±0.4mm 幅宽750-1500mm时,公差±0.6mm Width 30-500 mm, ±0.2 mm Width 500-750 mm, ±0.4 mm Width 750-1500 mm, ±0.6 mm
	收卷直径 Rewind Diameter (mm)	370-450 mm
	收卷张力 Rewind Tension (N/mm)	0.03-0.1 N/mm
	收卷形式 Rewinding Mode	正反收, 切换加权限 Forward and reverse winding, switch- able with permissions
整机 Overall Machine	收卷模式 Rewinding Method	压力模式、距离模式 Pressure, distance
	计米精度 Metering Accuracy	3‰
设备重量 Weight	CCD安装 CCD Installation	安装空间预留 Space reserved
	设备尺寸 Dimension	5500 KG
整机功率 Power	设备重量	5500 KG
	设备尺寸	L2185mm×B3615m×H1900mm
整机功率	30KW	