

J.S.Machine

股票代码: 000821



智  
目

PIONEER OF SOLAR  
INDUSTRY INTELLIGENT  
EQUIPMENT MANUFACTURER

光伏行业智能装备制造领导者

SC-SOLAR 晟成光伏

+86-512-6661 5515 sales@sc-solar.com.cn

中国·苏州·高新区铜墩街188号  
No.188 Tongdun Street, New District, Suzhou, Jiangsu, PRC, 215129

WWW.SC-SOLAR.COM.CN

让 | 光 | 伏 | 制 | 造 | 更 | 轻 | 松  
MAKE PV MANUFACTURING AS EASY AS POSSIBLE

SC-SOLAR 晟成光伏

# COMPANY PROFILE

## 公司简介

苏州晟成光伏设备有限公司成立于2010年，是京山轻机（000821）的全资子公司。公司坐落于苏州高新区，现有员工1000多人，其中技术研发人员超过300人。

晟成光伏主要从事光伏行业智能化装备的研发、制造、销售及服务，目前产品已远销美国、德国、法国、新加坡、韩国、日本、印度、巴西等全球20多个国家和地区。晟成光伏不仅为客户提供光伏组件制造整体解决方案，满足常规、双玻、半片、MBB、叠瓦等不同需求，同时也为光伏电池和硅片制造等领域提供相关智能装备。

晟成光伏专注创新、研发和品质的提升，目前已获得“高新技术企业”、“瞪羚企业”、“高成长创新型企业”、“江苏省工程技术研究中心”、“江苏省企业技术中心”和“江苏省民营科技企业”等多项政府荣誉。产品方面已获得147项技术专利，其中发明专利31项。此外晟成光伏通过了ISO9001质量管理体系认证，产品获得CE、ETL、UL等认证，产品品质得到社会各界和客户的广泛认可。

晟成光伏真诚希望与广大客户朋友亲密合作，携手共进，助力光伏智造，共创绿色家园！

SUZHOU SC-SOLAR EQUIPMENT CO., LTD. founded in 2010, is a wholly owned subsidiary of J.S.Machine (stock code: 000821). Located in Suzhou New District, the company now has over 1000 employees among whom more than 300 are R&D personnel.

Specializing in R&D, manufacturing, sales and service of intelligent equipment in solar industry, products of SC-SOLAR have been distributed to more than 20 countries and regions all over the world, including USA, Germany, France, Singapore, South Korea, Japan, India, Brazil etc.

SC-SOLAR not only provides customers with turnkey solutions for solar module manufacturing, which meeting their diversified requirements such as conventional glass-back sheet, G2G, half-cell, MBB, shingling modules production and so on, but also provides intelligent equipment in PV cells, silicon wafer manufacturing and other domains. Dedicated to innovation, R&D and continuous quality improvement, SC-SOLAR has won numerous government honors such as "High-tech Enterprise", "Gazelle Enterprise", "High-growth Innovative Enterprise", "Jiangsu Engineering Research Center", "Jiangsu Enterprise Technology Center", "Jiangsu Private Science and Technology Enterprise". In terms of product development, SC-SOLAR has obtained 147 technical patents, of which 31 are invention patents. In addition, SC-SOLAR has acquired ISO9001 quality management system certification, and the products have been approved by CE, ETL, UL certification of many countries. The product and service quality has been broadly recognized by the society and customers.

SC-SOLAR sincerely wishes to cooperate with our clients and friends closely, make progress together, facilitate the PV intelligent manufacturing, and build up a green homeland.

# PROJECT DISTRIBUTION

项目全球分布



21国家+1地区  
 累计装机量180GW+  
 (截止于2020年12月)  
 (till Dec.2020)

**1300+** PROJECTS

**180GW+** INSTALLED BASE

# PRIMARY CUSTOMER

## 主要客户群体及装机量

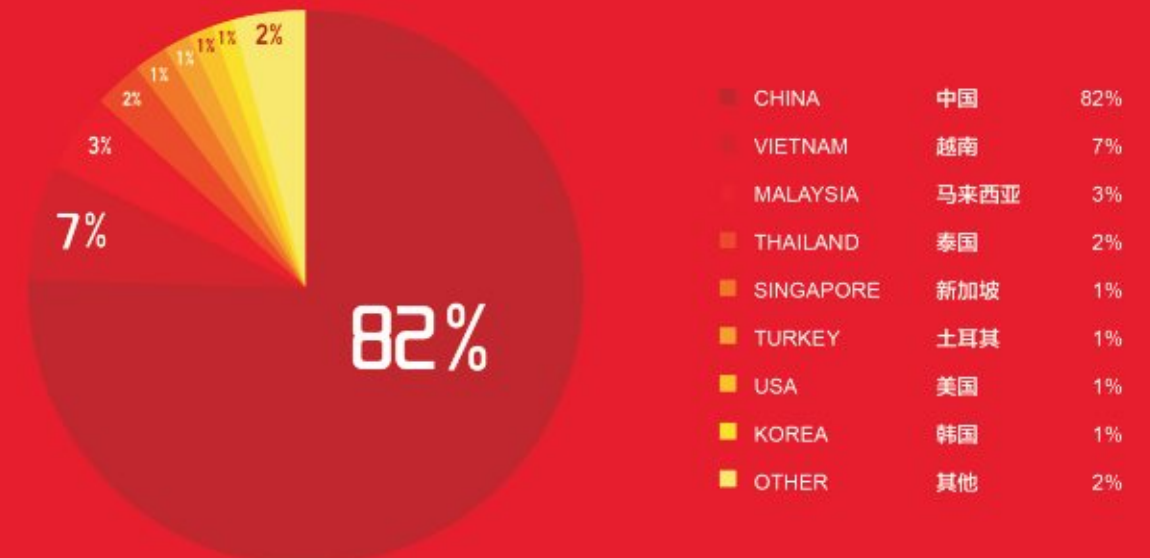


## 年装机量 ANNUAL INSTALLATION BASE



Total 180GW+ Installed/ 1300+ projects until the end of 2020

## 晟成前八大国家装机量占比 SC-SOLAR INSTALLATION BASE RATIO OF TOP 8 COUNTRIES



# CONTENTS

## 目录

- 
- |           |   |           |
|-----------|---|-----------|
| <b>01</b> | <b>组件自动化整体解决方案</b><br>PV module manufacturing automation turnkey solution | <b>9</b>  |
| <b>02</b> | <b>电池片硅片自动化设备</b><br>PV cell and wafer manufacturing automation equipment | <b>39</b> |
| <b>03</b> | <b>智能物流系统</b><br>Intelligent logistics system                             | <b>55</b> |
| <b>04</b> | <b>智能仓储系统</b><br>Stereoscopic warehouse system                            | <b>57</b> |
| <b>05</b> | <b>AI机器视觉智能检测</b><br>Machinery vision intelligent detection system        | <b>59</b> |
| <b>06</b> | <b>智慧工厂管理系统</b><br>Smart factory management system                        | <b>63</b> |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution

## SOLAR PANEL PRODUCTION LINE SOLUTION

### 太阳能光伏组件自动化生产线

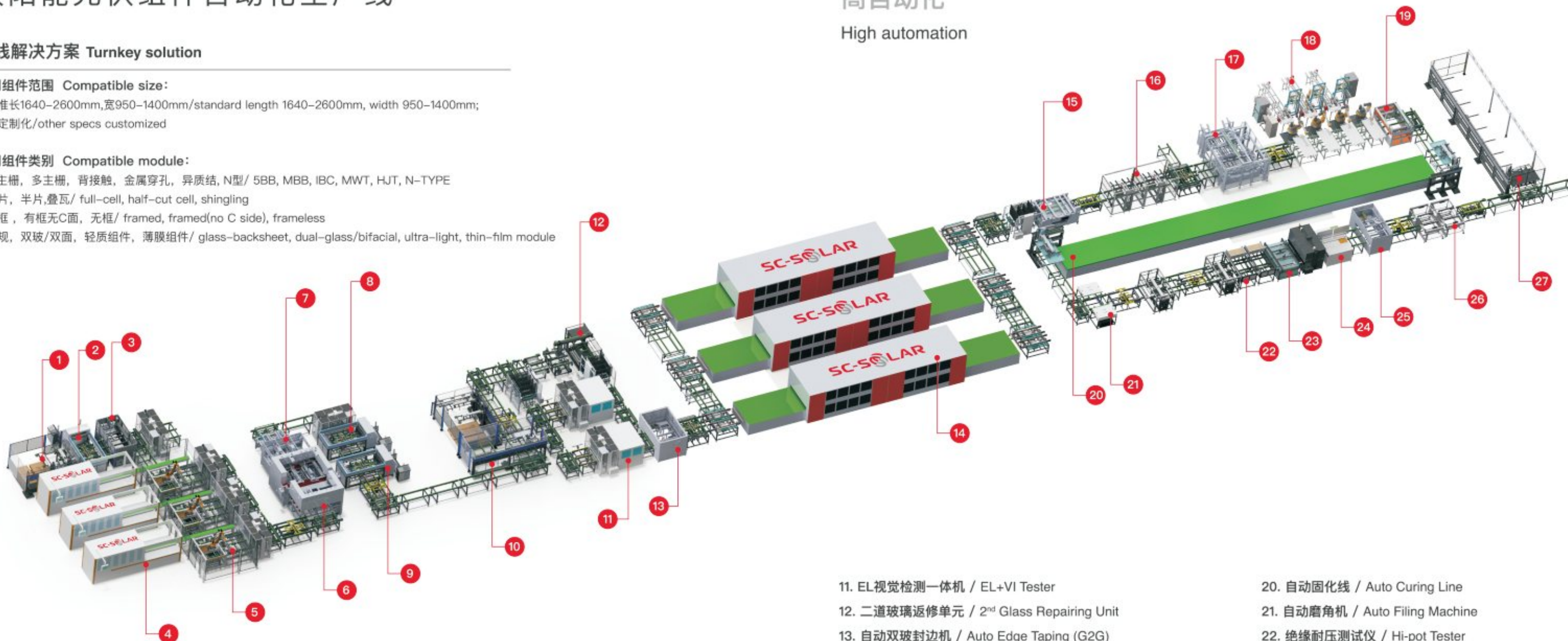
#### 整线解决方案 Turnkey solution

##### 适用组件范围 Compatible size:

- a. 标准长1640-2600mm,宽950-1400mm/standard length 1640-2600mm, width 950-1400mm;
- b. 可定制化/other specs customized

##### 适用组件类别 Compatible module:

- a. 5主栅, 多主栅, 背接触, 金属穿孔, 异质结, N型/ 5BB, MBB, IBC, MWT, HJT, N-TYPE
- b. 全片, 半片, 叠瓦/ full-cell, half-cut cell, shingling
- c. 有框, 有框无C面, 无框/ framed, framed(no C side), frameless
- d. 常规, 双玻/双面, 轻质组件, 薄膜组件/ glass-backsheet, dual-glass/bifacial, ultra-light, thin-film module



- 1. 自动上玻璃机 / Auto Glass Loader
- 2. 一道EVA 裁切铺设机 / 1<sup>st</sup> EVA Cutter
- 3. 自动上模板机 / Bussing Template Placer
- 4. 串焊机 / Stringer
- 5. 自动摆串机 / Auto Robotic Layout

- 6. 自动汇流条焊接机 / Auto Bussing/ICB Soldering
- 7. 自动贴胶带机 / Auto String Taping
- 8. 二道EVA裁切铺设机 / 2<sup>nd</sup> EVA Cutter
- 9. 背板裁切铺设机 / TPT/ Backsheet Cutter
- 10. 双玻合片机 / 2<sup>nd</sup> Glass Loader

高产出  
High productivity

高稳定性  
High equipment stability

高自动化  
High automation

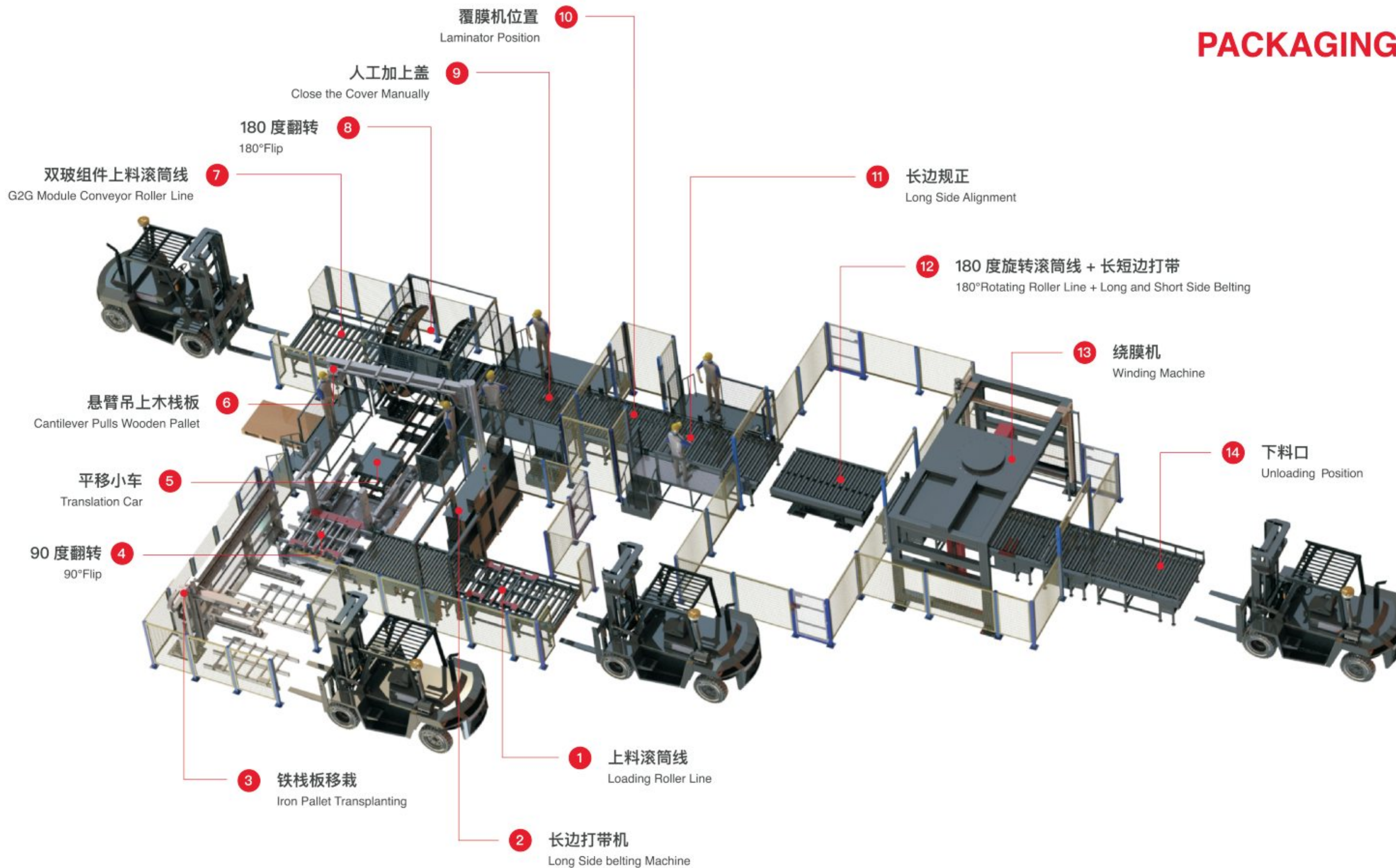
占地面积小  
Low floor area

更好的成本优势  
Better ROI

- 11. EL视觉检测一体机 / EL+VI Tester
- 12. 二道玻璃返修单元 / 2<sup>nd</sup> Glass Repairing Unit
- 13. 自动双玻封边机 / Auto Edge Taping (G2G)
- 14. 层压机 / Laminator
- 15. 自动修边机 / Auto Trimming
- 16. 人工检查 / Manual Inspection
- 17. 自动装框系统 / Framing System
- 18. 接线盒自动组装系统 / Auto Junction Box Assembly System
- 19. 接线盒焊接检测一体机 / Auto Junction Box Soldering & Testing Machine
- 20. 自动固化线 / Auto Curing Line
- 21. 自动磨角机 / Auto Filing Machine
- 22. 绝缘耐压测试仪 / Hi-pot Tester
- 23. 功率测试仪 / IV Tester
- 24. EL测试仪 / EL Tester
- 25. 自动贴标机 / Auto Labeling Machine
- 26. 终检单元 / Final Inspection Unit
- 27. 自动分档机 / Auto Palletizing

01 组件自动化整体解决方案  
PV module manufacturing automation turnkey solution

PACKAGING LINE  
包装线



# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution

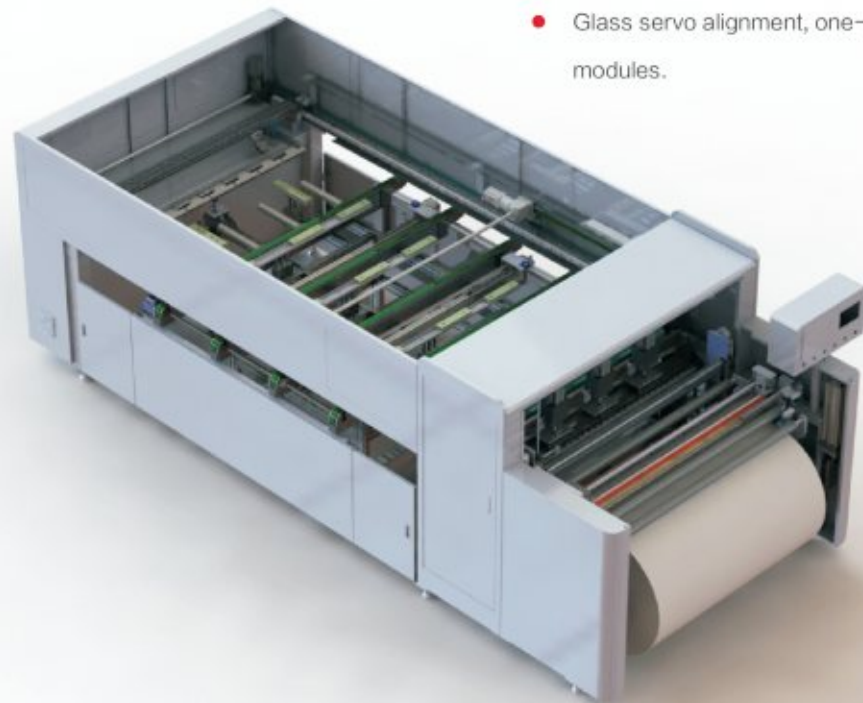
## AUTO EVA / TPT CUTTING & LAYUP 自动EVA/背板裁切铺设机

### 功能描述

- 自动提升上料。
- 带有热熔机构，无需重复穿料。
- 实时纠偏，保证铺设精度。
- 可满足客户不同形状冲孔要求。
- 双夹具铺料。
- 玻璃伺服归正，不同版型组件一键式切换。

### Features

- Automatic lifting feeding.
- With a hot-melt mechanism, no need to re-thread the material.
- Real-time correction to ensure laying accuracy.
- It can meet customer's punching requirements of different shapes.
- Double gripper laying.
- Glass servo alignment, one-click switching of different modules.



### 设备技术性能

裁切精度:  $\pm 2\text{mm}$   
 铺设精度: 以玻璃中心为基准  $\pm 2\text{mm}$ , 铺设平整  
 裁切铺设节拍: 单玻组件21S, 双玻组件27S  
 裁切宽度: 990~1400mm  
 裁切长度, 1650~2600mm  
 工作噪音:  $\leq 70\text{db}$

### Functionality

Cutting precision:  $\pm 2\text{mm}$   
 Layup precision:  $\pm 2\text{mm}$  based on the center of the glass, smooth laying  
 Cycle time: 21S for single-glass module, 27S for dual-glass module  
 Cutting width: 990~1400mm  
 Cutting length, 1650~2600mm  
 Working noise:  $\leq 70\text{db}$



### 技术参数 Specifications

| 项目 Item                         | 数值 Value   |
|---------------------------------|--|
| 适用版型Compatible size             | 长度length 1650~2600mm; 宽度width 990~1400mm                                   |
| 整体节拍Cycle time                  | 单玻组件21S, 双玻组件27S<br>21S for single-glass module, 27S for dual-glass module |
| 工作气压Operation pressure          | 0.5Mpa ~ 0.7Mp   |
| 设备总功率Power requirement          | 3KW  |
| 最大外形尺寸Maximum dimension (L×H×W) | 4900*2100*1750mm   |
| 设备重量Weight                      | 2200Kg   |



# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution

## HIGH SPEED ROBOTIC STRING LAYUP

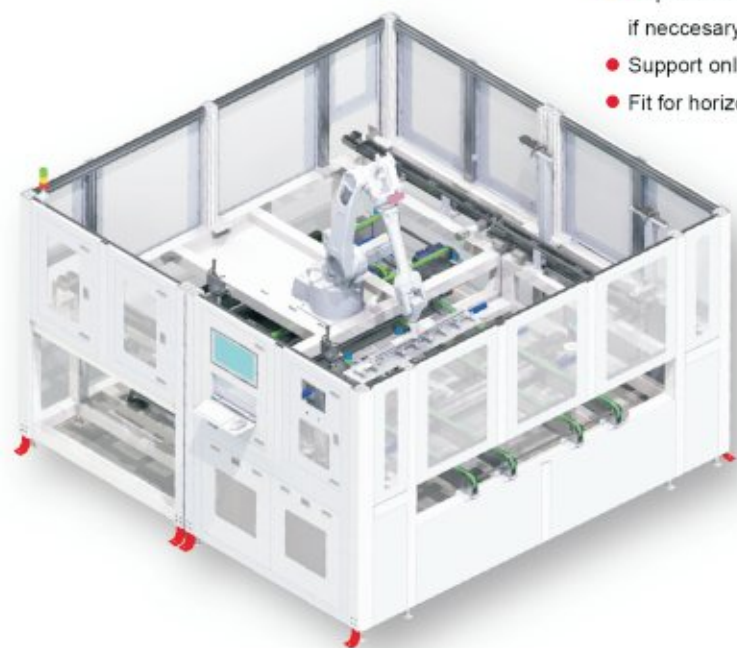
### 高速机器人摆串机

#### 功能描述

- 串焊机端电池串输出单轨、双轨均可适用，双轨对接2台4000型串焊机。
- 电池串定位方式：视觉定位。
- 主体框架结构为钢结构，牢固、可靠。
- 机器人速度快，定位精度高、稳定、可靠。
- 真空吸盘吸取电池串不留痕迹。
- 设备全自动控制，运行过程不需要人员干预。
- 电池串吸附夹具具有真空检测功能，有效避免电池片抓取过程中掉落。
- 更换不同电池串直接调用即可，部分调整。
- 支持上线返修串。
- 满足横向版型，竖向版型及A B串版型组件。

#### Features

- The cell string output of the stringer can be applied to single-rail and double-rail, and the double-rail is connected to two 4000-type stringer.
- String positioning method: visual positioning.
- The main frame structure is steel, firm and reliable.
- The robot has fast speed, high positioning accuracy, stability and reliability.
- The vacuum suction cup sucks cell string without leaving traces.
- Fully automatic equipment control, no human intervention is needed during the operation.
- The cell string adsorption fixture has a vacuum detection function to prevent string falling.
- Replace the different cell strings directly, some adjustments needed if necessary.
- Support online and offline rework of strings.
- Fit for horizontal, vertical and AB string module.



#### 设备技术性能

- 节拍: 常规 $\leq 6s/串$ , 半片 $\leq 4.5s/串$   
(玻璃进出料加归正时间10s)
- 摆串精度: 串间距 $\pm 0.4mm$ ;
- 电池串到玻璃长短边距离/误差 $\pm 1mm$
- 兼容电池片规格: 60片/72片/半片/MBB/MBB半片
- 稼动率:  $\geq 98\%$
- 常规、半片、MBB碎片率:  $< 0.02\%$
- 视觉: 双影像系统, 分辨率0.05;
- 噪音:  $\leq 72db$



#### Functionality

- Cycle time: normal $\leq 6s/pcs$ , half cell $\leq 4.5s/pcs$
- String tolerance: string spacing $\pm 0.4mm$ ;
- distance between string to the glass edge $\pm 1mm$
- Compatible size: 60 /72 / half-cell/MBB/MBB half-cell
- Moving rate:  $\geq 98\%$
- Fragment rate:  $< 0.02\%$
- Vision: dual image system, resolution of 0.05
- Noise: $\leq 72db$



#### 技术参数 Specifications

| 项目 Item                  | 数值 Value  |
|--------------------------|---|
| 型号Model                  | SC-SL54-RX-01   |
| 适用版型Compatible size      | 长length:1650-2450mm, 宽width:990-1400mm  |
| 节拍Cycle time             | 常规normal: $\leq 6s/pcs$ , 半片half cell: $\leq 4.5s/pcs$<br>( infeed,outfeed and alignment, 10s ) |
| 额定功率Rated power          | 6KW   |
| 电源Power supply           | AC380V $\pm 5\%$ , 3P+1N+1PE, 20A, 50/60HZ  |
| 工作气压Operation pressure   | 0.6-0.8MPa  |
| 耗气量Air consumption       | 500L/min  |
| 设备重量Weight               | 1100kg  |
| 外形尺寸Dimension(L x W x H) | 3900mm x 3900mm x 2600mm  |

01 组件自动化整体解决方案  
PV module manufacturing automation turnkey solution

**AUTO BUSSING  
MACHINE**  
全自动叠焊机

功能描述

- 自动切换程序可实现210组件（含双跳线），半片组件和双玻组件的焊接。
- 优化布局结构，合理拆分工艺流程，整体节拍提升至8S。
- 具有独特的理片结构与长跳线抓取机构；理片范围±20mm。
- 兼容更大尺寸的组件：2700\*1500mm。

Features

- The automatic switching program can realize the welding of 210 module (including double jumpers), half-cell module and double-glass module.
- Optimize the layout structure, rationally split the process flow, and optimize cycle time to 8S.
- It has a unique cell arrangement structure and a long jumper wire grabbing mechanism; cell arrangement range is ±20mm.
- Compatible with larger size modules: 2700\*1500mm.



设备技术性能

电池片规格：166\*166mm-230\*230mm/9BB-20BB  
 汇流带规格：卷状供料，料厚0.18-0.45mm，宽4mm、5mm、6mm、7mm、8mm，卷重≤13KG。  
 汇流带与焊带拉力：>5N/mm(喷涂助焊剂)。  
 中跳线汇流带焊接拉力：4\*4面积≥20N、4\*6面积≥25N、6\*6面积30N(喷涂助焊剂)。  
 节拍：常规半片版型 8S,开启双跳线焊12S  
 破损率：<0.2%(以片计算)。  
 良率：≥99%  
 稼动率：>98%  
 焊接方式：电磁感应。  
 组件输入、输出高度：950-980mm。  
 向上折弯U、L形引线高度范围：10-25mm。

Functionality

Cell specifications: 166\*166mm-230\*230mm/9BB-20BB  
 Bus-bar specifications: roll feed, material thickness 0.18-0.45mm, width 4mm, 5mm, 6mm, 7mm, 8mm, roll weight ≤ 13KG.  
 Bus-bar and solder strip tension: >5N/mm (spraying flux).  
 Middle jumper bus-bar welding tension : 4\*4 area ≥20N, 4\*6 area ≥25N, 6\*6 area 30N (sprayed flux).  
 Cycle time: Conventional half-cell 8S, turn on double jumper wire welding 12S  
 Fragmentation rate: <0.2% (calculated by piece).  
 Yield: ≥99%  
 Utilization rate: >98%  
 Welding method: electromagnetic induction  
 Component input and output height: 950-980mm.  
 The height range of U-shaped and L-shaped lead wires bent upward: 10-25mm.

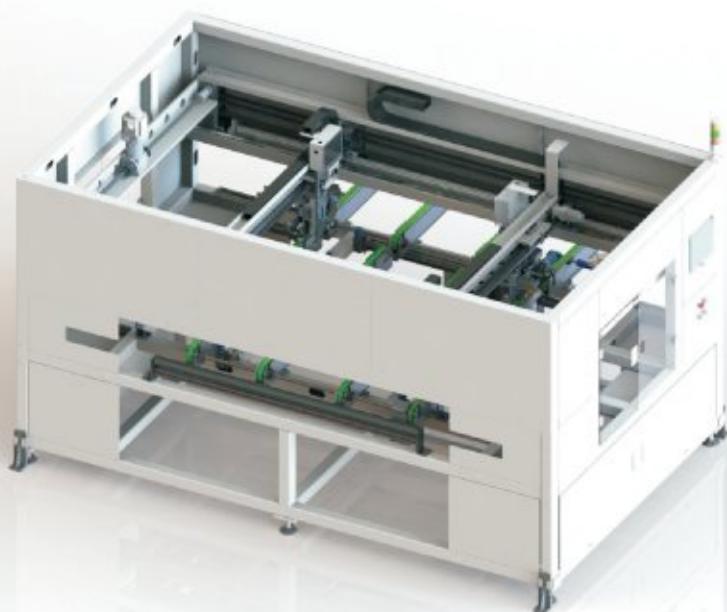
技术参数 Specifications

| 项目 Item                  | 数值 Value  |
|--------------------------|---|
| 适用玻璃尺寸Compatible size    | 2700mm*1500mm(max) , 1640mm*980mm(min)。                   |
| 节拍Cycle time             | ≤20s  |
| 功率Power requirement      | 额定50KW, 平均功率约35KW<br>Rated 50KW, average power about 35KW |
| 电压Voltage                | AC380V±5%, 3P+1N+1PE (3-phase 5-wire system)              |
| 气源pressure               | 0.5-0.8Mpa, 2.0m³/min                                     |
| 设备重量Weigh                | 6500KG  |
| 外形尺寸Dimension(L x W x H) | 6350*4890*2380mm  |



# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## AUTO STRING TAPING

### 自动贴胶带机

#### 功能描述

- 整体结构由玻璃归正输送单元，贴胶带系统，真空系统等组成。
- 伺服电机传动带动贴胶带机构，高速度，高精度。
- 贴胶带系统采用丝杆带动吸盘上的胶带下压。海绵吸盘可以增加下压缓冲，避免刚性接触，减少电池片破片和隐裂的概率。
- 用滚轮滚压胶带可以减少层压后贴胶带位置有气泡概率。

#### Features

- The overall structure consists of a glass alignment, a taping system, a vacuum system, and etc.
- The servo motor drive drives the tape mechanism, high speed and high precision.
- The taping system uses a lead screw to drive the tape on the suction cup to press down. The sponge suction cup can increase the buffer to avoid rigid contact and reduce the probability of chip fragmentation and cracking.
- Rolling the tape with a roller can reduce the probability of bubbles in the tape position after lamination.

#### 设备技术性能

- 组件定位精度  $\pm 1\text{mm}$ ，定位归正无震动
- 更换胶带时间  $\leq 180\text{s}$
- 整体节拍：单侧每个点  $\leq 0.9\text{s}$
- 胶带粘贴位置偏差： $\pm 2\text{mm}$
- 贴胶带时碎片率： $\leq 0.05\%$
- 不同版型切换时间：60cell $\leftrightarrow$ 72cell 换线一键切换(伺服)
- 常规 $\leftrightarrow$ 半片 $<30\text{min}/1\text{人}$
- 操作模式：手动 + 自动
- 噪音要求： $\leq 60\text{dB}$
- 人机界面：中英文模式
- 良率要求：贴胶带良率大于99.8%

#### Functionality

- Module positioning accuracy:  $\pm 1\text{mm}$
- Tape change time:  $\leq 180\text{s}$
- Cycle time:  $\leq 0.9\text{s}$  per point
- Taping positioning accuracy:  $\pm 2\text{mm}$
- Fragment rate:  $\leq 0.05\%$
- Change over time: 60cell $\leftrightarrow$ 72cell one button switch, normal  $\leftrightarrow$  half-cell  $<30\text{min}/1\text{ person}$
- Operation mode: Auto / Manual
- Noise level:  $\leq 60\text{dB}$
- HMI: Chinese/English mode
- Yield:  $>99.8\%$



#### 技术参数 Specifications

| 项目 Item                         | 数值 Value  |
|---------------------------------|---|
| 型号 Model                        | SC-AT30-CS-01   |
| 适用版型 Compatible size            | 长 length:1640-2300mm, 宽 width: 980-1200mm   |
| 设计节拍 Cycle time                 | 单侧每个点 $\leq 0.9\text{s}$ ,同进同出+归正 $\leq 9\text{s}$ ,<br>$\leq 0.9\text{s}$ per point, in+out+alignment $\leq 9\text{s}$ |
| 工作气压 Operation pressure         | 0.6Mpa-0.8Mpa   |
| 设备功率 Power requirement          | 4KW   |
| 归正方式 Alignment                  | 四边对中归正 four sides alignment   |
| 胶带长度 Tape length                | 18 $\pm$ 5mm  |
| 胶带宽度 Tape width                 | 5\8\10mm  |
| 胶带卷规格 Tape specification        | 内径inner diameter $\phi 77 \pm 1\text{mm}$ ,外径external diameter $\leq \phi 125\text{mm}$                                 |
| 最大设备尺寸 Maximum dimension(LxWxH) | 3350*3550*2000mm  |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution

## AUTO SHINGLING MATRIX ASSEMBLY MACHINE

### 叠瓦汇流条焊接机



焊接成形一体机主要分为电池移栽输送机(缓存), 摆串焊接折弯一体机, 焊条矫直机, 移栽铺设机。

Auto shingling matrix assembly machine is mainly divided into string layup transfer conveyor (buffer), pendulum welding and bending integrated machine, welding rod straightening machine and transfer layup machine.

#### 功能描述

- 电池串可以进行缓存, 提高生产效率。
- 机器人自动摆串, 效率高。
- 汇流条自动拉料, 自动焊接, 减少人工提高焊接效率。
- 汇流条自动矫直裁切提高产品的生产效率和质量。
- 自动折弯, 保证一致性, 整体铺设, 效率高。
- 触摸屏界面, 可根据工艺进行参数设置。
- 整体防护机构, 安全系数高。

#### Features

- The cell string can be cached to increase production efficiency.
- The robot automatically swings the string and is highly efficient.
- The bus bar automatically pulls the material and automatically welds, reducing the artificially improved welding efficiency.
- The automatic straightening and cutting of the bus bar improves the production efficiency and quality of the product.
- Automatic bending to ensure consistency, overall laying, and high efficiency.
- The touch screen interface allows parameter settings based on the process.
- The overall protection mechanism has a high safety factor.



#### 设备技术性能

型号: SC-SMA4000-N-02  
 摆串焊接折弯一体机(4000 带缓存)功率: 20KW  
 工作气压: 0.6Mpa~ 0.8Mpa  
 焊接成形一体机节拍: 兼容 4000 大片 <75S  
 适用范围: 自动叠瓦焊接线 60 片及 72 片(横版)  
 最大外形尺寸: 12600Lx4200Wx 2000H mm  
 重量: 约 23600 Kg

#### Specifications

Model: SC-SMA4000-N-02  
 Power: 20kw  
 Working pressure: 0.6Mpa--0.8Mpa  
 Cycle time: compatible with 4000 full cell<75s  
 Compatible modules: Shingling module of 60 full cell & 72 full cell  
 Dimensions: 12600L\*4200W\*2000H mm  
 Weight: 23600kg

01 组件自动化整体解决方案  
PV module manufacturing automation turnkey solution

# AUTO ICB LEAD BENDING

## 自动引线折弯机

### 功能描述

- 兼容多种规格组件尺寸，伺服归正系统，换型方便快捷。
- 稳妥的视觉系统，检测来料状态、引导定位、成品检查。
- 运动单元由伺服电机驱动，速度快，定位精度高、稳定、可靠。
- 实现自动放高温布，自动引线折弯，一致性好。
- 三处引线同时操作，节拍20s，速度快，效率高。
- 伺服控制与产品柔性接触，安全性高。
- 高温布供料单次缓存超1700片，上料简单、方便、快捷。

### Features

- Compatible with a variety of module sizes, servo alignment system, quick to change.
- A reliable vision system, detecting the status of incoming materials, guiding positioning, and final product inspection.
- The motion unit is driven by a servo motor, with fast speed, high positioning accuracy, stability and reliability.
- It realizes automatic placing of high temperature cloth, automatic lead bending, good consistency.
- The three leads are operated at the same time, the cycle time is 20s, quick and the efficient.
- The servo control is in flexible contact with the product, and the safety is high.
- The high-temperature cloth feeds a single buffer of over 1700 pieces, and the loading is simple, convenient and fast.



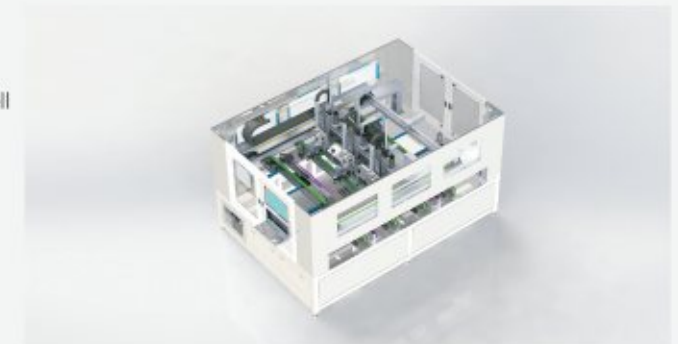
### 设备技术性能

常规、半片、MBB碎片率:  $\leq 0.04\%$   
 兼容电池片规格: 60片半片/72片半片/MBB半片  
 高温布换料频率:  $\geq 11$ 小时/次  
 视觉系统: 来料检测、引导定位、成品检查  
 视觉精度:  $\leq \pm 0.1\text{mm}$   
 输送方向: 横向输送  
 机械定位: 伺服归正  
 稼动率:  $\geq 98\%$   
 环境温度: 15-30°C  
 环境湿度: 5-75% (不结露) (no dewfall)



### Functionality

Normal, half-cell, MBB fragmentation rate:  $\leq 0.04\%$   
 Compatible cell specifications: 60 half-cell/72 half-cell/MBB half-cell  
 High temperature cloth changing frequency:  $\geq 11$  hours/time  
 Vision system: incoming material inspection, guiding positioning, final product inspection  
 Visual accuracy:  $\leq \pm 0.1\text{mm}$   
 Conveying direction: horizontal conveying  
 Mechanical positioning: servo alignment  
 Utilization rate:  $\geq 98\%$   
 Ambient temperature: 15-30°C  
 Environmental humidity: 5-75% (no dewfall) (no dewfall)



### 技术参数 Specifications

| 项目 Item                | 数值 Value   |
|------------------------|--|
| 适用玻璃尺寸 Compatible size | 长边 Long side 1600-2500mm<br>短边 Short side 900-1500mm |
| 节拍 Cycle time          | $\leq 20\text{s}$                                    |
| 额定功率 Power             | $\leq 5.5\text{KW}$                                  |
| 电源 Power               | AC380V $\pm 5\%$ , 3P+1N+1PE, 20A, 50/60HZ           |
| 气压 Pressure            | 0.6-0.8MPa   |
| 耗气量 gas consumption    | 200L/min   |
| 噪音 Noise level         | $\leq 75\text{db}$                                   |
| 设备重量 Weight            | 2000kg   |
| 外形尺寸 Dimensions        | L3200mm*W2200mm*H1900mm                              |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## 设备技术性能

组件定位精度 ±1mm, 定位归正无震动  
 更换胶带时间 ≤180s  
 整体节拍: ≤23s  
 不同板型切换时间: 60cell ↔ 72cell 换线一键切换 (伺服)  
 常规 ↔ 半片 <30min/1人  
 封边效果: 无褶皱, 无气泡, 无隐裂  
 操作模式: 手动 + 自动  
 噪音要求: ≤60dB  
 人机界面: 中英文模式  
 良率要求: 封边良率大于 99%



## Functionality

Module positioning accuracy: ±1mm  
 Tape change time: ≤180s  
 Cycle Time: ≤23s  
 Change over time: 60cell ↔ 72cell one button switch  
 normal ↔ half-cell <30min/1 person  
 Taping effect: no fold, no bubble, no crack  
 Operation mode: Auto / Manual  
 Noise level: ≤60dB  
 HMI: Chinese/English mode  
 Yield: >99%



## AUTO EDGE TAPING

### 双玻封边机

#### 功能描述

- 整体结构由组件传输单元、四边归正、升降平台、伺服丝杠、胶带封边伺服模组、真空系统等机构组成。
- 伺服电机、模组结合带动封边机构封边, 速度快, 精度高。
- 封边系统包含, 胶带固定机构、胶带封边黏贴机构、封边机构、压平机构、剪切机构等。
- 胶带黏贴、压平机构的滚轮采用聚氨酯软性材质黏贴和压平胶带, 防止刚性材质接触玻璃, 避免电池片破片和隐裂的概率。

#### Features

- The whole structure is composed of transmission unit, four-side alignment, lifting platform, servo screw, tape sealing servo module, vacuum system and so on.
- The servo motor and the module combine to drive the edge banding mechanism to seal the edge, and the speed is fast and the precision is high.
- The sealing system includes tape fixing mechanism, tape sealing and pasting mechanism, sealing mechanism, flattening mechanism, shearing mechanism, etc.
- The roller of tape and flattening mechanism adopts polyurethane flexible material to prevent the rigid material from contacting the glass and to avoid the probability of cell chips and cracks.

## 技术参数 Specifications

| 项目 Item                         | 数值 Value  |
|---------------------------------|---|
| 型号 Model                        | SC-ES28-DG-01   |
| 适用版型 Compatible size            | 长 length:1640-2400mm, 宽 width:980-1400mm                                    |
| 设计节拍 Cycle time                 | ≤23s  |
| 归正方式 Alignment                  | 四边对中归正 four sides alignment   |
| 胶带长度 Tape length                | ≥800m   |
| 胶带宽度 Tape width                 | >350mm  |
| 胶带卷规格 Tape specification        | 内径inner diameter $\Phi 77 \pm 1$ mm, 外径external diameter $\leq \Phi 330$ mm |
| 工作气压 Operation pressure         | 0.5Mpa ~ 0.7Mpa   |
| 设备功率 Power requirement          | 6 KW  |
| 最大设备尺寸 Maximum dimension(L*W*H) | 3660*2650*1850mm  |

# LAMINAOTR

## 层压机



晟成层压机目前主要机型有单层单腔层压机，单层双腔层压机，单层三腔层压机，双层单腔层压机，双层双腔层压机，双层三腔层压机等，并且可根据客户需求定制。

Main models of SC laminators: single-layer single chamber laminator, single-layer double chambers laminator, single-layer three chambers laminator, double-layer single chamber laminator, double-layer double chambers laminator, double-layer three chambers laminator and other customized.

层压机目前有油加热和电加热两种加热方式，可根据客户需求定制规格型号。

The laminator currently has two heating methods: oil heating and electric heating, and specifications and models can be customized according to customer needs.



单腔层压机  
Single-chamber laminator



双腔层压机  
Oouble-chamber laminator



三腔层压机  
Three-chamber laminator

### 设备技术性能

作业温度 (°C): 室温 RT-180  
 温度均匀性 (°C): ±1.5  
 温度精度 (°C): ±1  
 传输精度 (mm): ±5mm  
 成品良率 (%): 99.99  
 操作模式: 自动/手动  
 噪音要求: ≤80dB



### Functionality

Working Temperature (°C): 室温 RT-180  
 Temperature Uniformity (°C): ±1.5  
 Temperature Accuracy (°C): ±1  
 Transmission accuracy (mm): ±5mm  
 Good Products Rate: 99.99  
 Operation mode: Auto/Manual  
 Noise level: ≤80dB



### 技术参数 Specifications

| 设备型号 Specification<br>油加热 Oil heating/<br>电加热 Electric heating | OL2692D1A/EL2692D1A                      | OL2778D2A/EL2778D2A                      | OL2787D2A/EL2787D2A                      |
|--|--|--|--|
| 层压面积 Laminating Area(mm)                                       | 2600*9200                                | 2700*7800                                | 2700*8700                                |
| 加热方式 Heating Method  | 油加热 Oil heating/<br>电加热 Electric heating | 油加热 Oil heating/<br>电加热 Electric heating | 油加热 Oil heating/<br>电加热 Electric heating |
| 压缩空气 Compressed Air(Mpa)                                       | 0.6-0.8                                  | 0.6-0.8                                  | 0.6-0.8                                  |
| 额定功率 Rated Power(KW)   | 230/640                                  | 432/890                                  | 432/970                                  |
| 运行功率 Working Power(KW)   | 115/320                                  | 216/445                                  | 216/485                                  |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## AUTO TRIMMING

### 自动修边机

#### 功能描述

- 伺服电机驱动，模组传动，直线导轨导向，保证到位精准和运行平稳。
- 四边同时进行切割，削边机四角采用可顶升式吸盘结构。
- 刀片采用圆弧刃口，切割干净，利用刀片背刃有效切除组件四角残料。
- 削边后切面平滑，对玻璃不会造成损伤。
- 刀片采用快换结构，更换快速方便。

#### Features

- Servo motor drive, module drive, linear guide to ensure accurate and stable operation.
- Four edges cutting at the same time, the four corners adopt jacked suction cup structure.
- The blade adopts arc edge to cut clean; use the back edge of the blade to effectively remove the corner residue.
- The cut surface is smooth after trimming, which will not cause damage to the glass.
- The blade adopts quick change structure, easy to replace.

#### 设备技术性能

阻挡归正方式：单侧阻挡，两边归正  
 尾料方式：滚筒电动夹料  
 更换刀片时间≤180s  
 整体节拍：≤23s  
 设备换型时间≤20分钟  
 削边时碎片率：≤0.05%  
 操作模式：手动 + 自动  
 噪音要求：≤60dB  
 人机界面：中英文模式  
 良率要求：修边良率大于 98.5%

#### Functionality

Alignment blocking: one side block, two sides alignment  
 Tailing mode: electric roller clamp tailing  
 Tape change time: ≤180s  
 Cycle time: ≤23s  
 Change over time ≤20min  
 Fragment rate: ≤0.05%  
 Operation mode: Auto / Manual  
 Noise level: ≤60dB  
 HMI: Chinese/English mode  
 Yield: >98.5%



#### 技术参数 Specifications

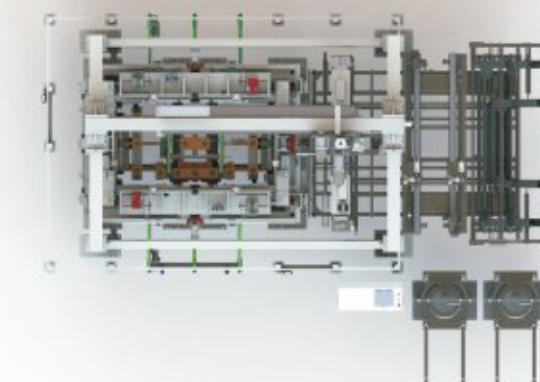
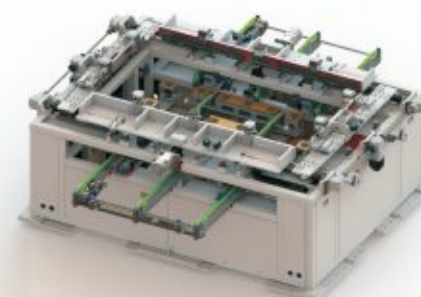
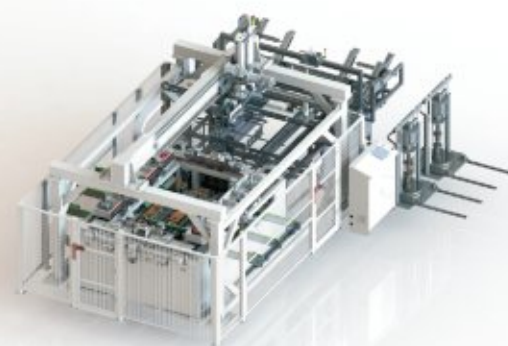
| 项目 Item                         | 数值 Value                                 |
|---------------------------------|--|
| 型号 Model                        | SC-TR25-K8-01                            |
| 适用版型 Compatible size            | 长 length:1640~2450mm, 宽 width:950~1400mm |
| 设计节拍 Cycle time                 | ≤22S                                     |
| 工作气压 Operation pressure         | 0.6Mpa ~ 0.8Mpa                          |
| 设备功率 Power requirement          | ≤2KW                                     |
| 最大设备尺寸 Maximum dimension(LxWxH) | 3200*2210*1620mm                         |



# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution

## FRAMING MACHINE 高位组框机



### 功能描述

- 人工摆放铝框到打胶移动平台或边框料仓平台上，平台自动移动，双胶头自动打胶，运行平稳。配置边框料仓（边框料斗不掉料）、固瑞克及PCF系统。
- 双胶头打胶系统运行平稳，出胶均匀。
- 采用三段速打胶机，三段速度均可单独设定。四根边框的三段速可以单独设定。
- 抓取边框采用气动手指夹取，可兼容无C边边框。
- 高位组框机采用组框机构高于输送线，可预先放置边框，提高组框节拍。
- 长短边采用伺服+丝杆传动，短边组角力可达2T。
- 铝框与装框机接触面 > 90%，边角正面无溢胶，不损伤边框膜，可适应无膜边框。
- 装框机放置边框底板、侧挡板采用40Cr/SKD11材质表面抛光，淬火后硬度要求达到55以上。

### Features

- The aluminum frame is manually placed on the glue dispensing platform, the platform automatically moves, the glue is automatically dispensed, and the equipment runs smoothly. Configure the frame silo (the frame hopper does not drop), the Graco pump and the PCF system.
- The rubberizing system runs smoothly and the glue is evenly distributed.
- With a three-stage speed glue machine, the three-stage speed can be set separately.
- The capturing frame is clamped by pneumatic fingers, which is compatible with no C-side frame.
- The frame machine adopts frame mechanism higher than the conveyor, the frame can be placed in advance to improve cycle time.
- The long and short sides are driven by servo screw, and the Angle of the short side can reach 2T.
- The contact surface of aluminum frame and framing machine is > 90%, no glue overflow on the front of the edges and corners, no damage to the frame film, it can adapt to the frame without film.
- The frame bottom plate and the side baffle with 40Cr/SKD11 material for surface polishing. After quenching, the hardness is required to be above 55.

### 设备技术性能

- 组件边角错位精度:  $\leq 0.3\text{mm}$
- 精度: 长、短边  $\pm 1\text{mm}$ , 对角线  $\leq 1.5\text{mm}$ , 去除材料偏差, 长短边的头、中、尾偏差  $\pm 1.0\text{mm}$
- 均匀溢胶: 合格率 > 98%
- 归正方式: 伺服归正 + 气缸归正
- 漏水孔错位:  $\leq 0.3\text{mm}$
- 边框边角间隙:  $\leq 0.3\text{mm}$
- 不同版型切换时间:  $\leq 2\text{H}$
- 操作模式: 手动 + 自动
- 噪音要求:  $\leq 60\text{dB}$
- 人机界面: 中英文模式

### Functionality

- Module corner misalignment accuracy:  $\leq 0.3\text{mm}$
- Accuracy: long and short sides  $\pm 1\text{mm}$ , diagonal  $\leq 1.5\text{mm}$ ;
- head, middle and tail deviation of long and short sides  $\pm 1\text{mm}$
- Evenly overflowing glue: pass rate > 98%
- Alignment method: servo alignment + cylinder alignment
- Leakage hole displacement:  $\leq 0.5\text{mm}$
- Conner gap:  $\leq 0.3\text{mm}$
- Change over time:  $\leq 2\text{H}$
- Operation mode: Auto / Manual
- Noise level:  $\leq 60\text{dB}$
- HMI: Chinese/English mode

### 技术参数 Specifications

| 项目 Item                         | 数值 Value  |
|---------------------------------|---|
| 型号 Model                        | SC-FM150-SN-01  |
| 适用版型 Compatible size            | 长 length:1640-2450mm, 宽 width:950-1400mm, 厚 thickness:30-50mm |
| 设计节拍 Cycle time                 | $\leq 20\text{s}$   |
| 工作气压 Operation pressure         | 0.6Mpa ~ 0.7Mpa   |
| 设备功率 Power requirement          | 10KW  |
| 最大设备尺寸 Maximum dimension(LxWxH) | 7800*4000*3600mm  |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution

## AUTO SUPPORT BAR INSTALLATION MACHINE

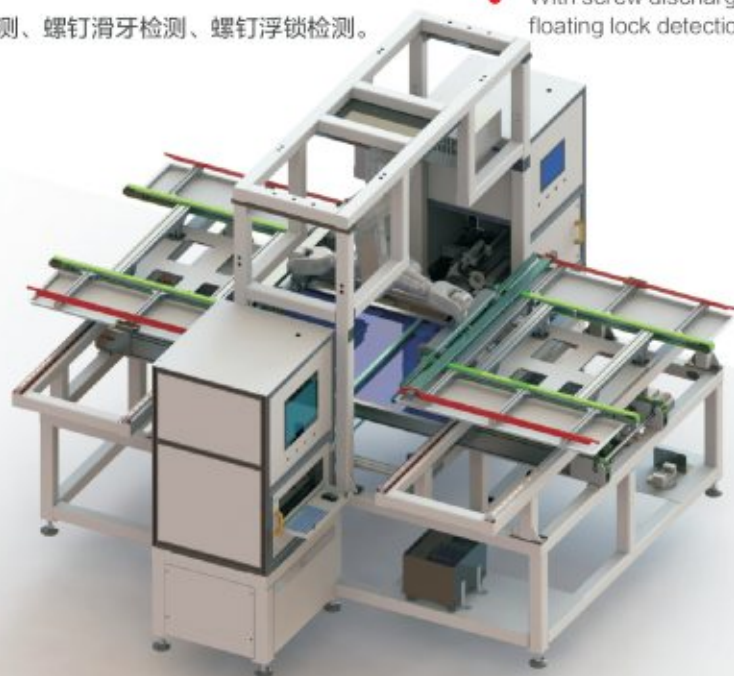
### 背筋自动安装机

#### 功能描述

- 整体结构由组件归正输送单元，背筋缓存单元，机械手抓取机构，背筋定位机构，自动打螺丝系统等组成。
- 螺丝机伺服驱动，自动切换；保证组件可同进同出，节省工作节拍。
- 相机拍照定位螺丝钉位置，机械手放置背筋，对准安装孔位置。
- 触摸屏界面，切换组件规格、手动操作、报警信息等参数设置。
- 具备螺钉出料检测、螺钉滑牙检测、螺钉浮锁检测。

#### Features

- The overall structure is composed of a module alignment conveying unit, a support bar buffer unit, a manipulator grabbing mechanism, a support bar positioning mechanism, an automatic screwing system, etc.
- The screw machine is driven by servo, automatic switching; to ensure that the modules can be in and out at the same time, saving cycle time.
- The camera takes a picture to locate the screw position, and the manipulator places the support bars and aligns the position of the mounting hole.
- Touch screen interface, switch module specifications, manual operation, alarm information and other parameter settings.
- With screw discharge detection, screw sliding detection, screw floating lock detection.



#### 设备技术性能

组件定位精度  $\pm 1\text{mm}$ ，定位归正无震动  
 扭力要求： $11.5 \pm 1.5\text{kgf}\cdot\text{cm}$  (ST3.5\*32MM)  
 可兼容双背筋组件  
 可不停机补充螺钉



#### Functionality

Module positioning accuracy:  $\pm 1\text{mm}$   
 Torque requirements:  $11.5 \pm 1.5\text{kgf}\cdot\text{cm}$  (ST3.5\*32MM)  
 Compatible with double support bar modules  
 Replenish screw without stop



#### 技术参数 Specifications

| 项目 Item                         | 数值 Value                                 |
|---------------------------------|--|
| 适用版型Compatible size             | 长度length 1900~2600mm; 宽度width 980~1600mm |
| 整体节拍Cycle time                  | $\leq 22\text{s}$                        |
| 工作气压Operation pressure          | 0.5Mpa ~ 0.7Mp                           |
| 气流量Gas flow                     | 400L/min                                 |
| 设备总功率Power requirement          | 5KW                                      |
| 最大外形尺寸Maximum dimension (L×H×W) | 3100*3750*1900                           |
| 设备重量Weight                      | 2000Kg                                   |

# AUTO ICB LEAD PICKING UP

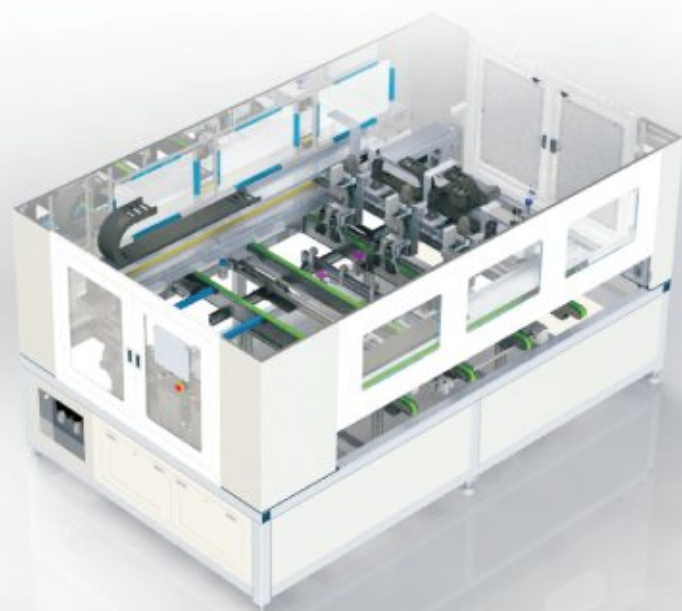
## 自动挑引线机

### 功能描述

- 兼容多种规格组件尺寸，伺服归正系统，换型方便快捷。
- 运动单元由伺服电机驱动，速度快，定位精度高、稳定、可靠。
- 实现自动挑引线，自动取下高温布。
- 三处引线同时操作，节拍20s，速度快，效率高。
- 伺服控制与产品柔性接触，安全性高。
- 可选配高温布自动堆叠功能，省心省力。

### Features

- Compatible with a variety of specifications and module sizes, servo correction system, convenient and quick to change the model.
- The motion unit is driven by a servo motor, with fast speed, high positioning accuracy, stability and reliability.
- Realize automatic lead picking and automatic removal of high temperature cloth.
- The three leads are operated at the same time, the cycle time is 20s, very fast and efficient.
- The servo control is in flexible contact with the product, high security.
- Optional high-temperature cloth automatic stacking function, save your worry and effort.



### 设备技术性能

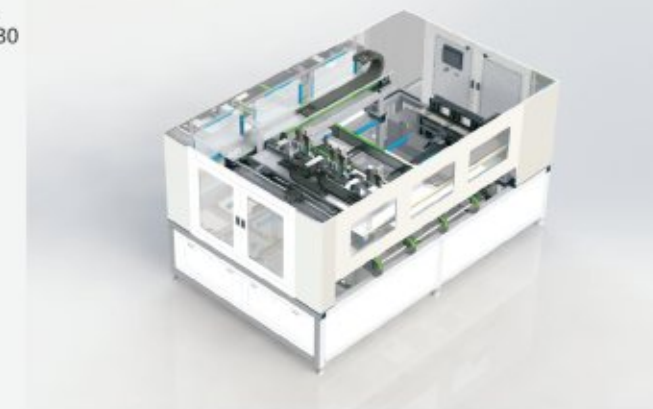
常规、半片、MBB碎片率:  $\leq 0.04\%$   
 兼容电池片规格: 60片半片/72片半片/MBB半片  
 高温布换料频率:  $\geq 11$ 小时/次  
 输送方向: 横向输送  
 机械定位: 伺服归正  
 稼动率:  $\geq 98\%$   
 噪音要求:  $\leq 75$ db  
 环境湿度: 5-75% (不结露)  
 环境温度: 15-30°C



### Functionality

Fragmentation rate of normal, half-cell, MBB:  $\leq 0.04\%$   
 Compatible cell specifications: 60 half-cell/72 half-cell/MBB half-cell  
 High temperature cloth changing frequency:  $\geq 11$  hours/time  
 Conveying direction: horizontal conveying  
 Mechanical positioning: servo correction  
 Utilization rate:  $\geq 98\%$   
 Noise level:  $\leq 75$ db  
 Environmental humidity: 5-75% (no dewfall)  
 Ambient temperature: 15-30°C

30



### 技术参数 Specifications

| 项目 Item               | 数值 Value                                |
|-----------------------|---|
| 适用组件尺寸Compatible size | 长Length 1600-2500mm,宽Width 900-1500mm   |
| 节拍Cycle time          | $\leq 20$ s                             |
| 额定功率Power             | $\leq 5.5$ KW                           |
| 电源Power               | AC380V $\pm 5\%$ ,3P+1N+1PE,20A,50/60HZ |
| 气压Pressure            | 0.6-0.8MPa                              |
| 耗气量Gas consumption    | 200L/min                                |
| 设备重量Weight            | 2000kg                                  |
| 外形尺寸Dimensions(L*W*H) | 3600*2200*1900                          |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## AUTO J-BOX INSTALLATION SYSTEM

### 接线盒自动安装系统

#### 特点 Features

- 布局紧凑,可在现有产线上集成  
Compact design, easily integrated into the existing production line
- 兼容单接线盒、三分体接线盒  
Compatible for single and triple j-box module
- 集成接线盒安装、引线压倒功能  
Tab pressing down function integrated

#### 选项 Options

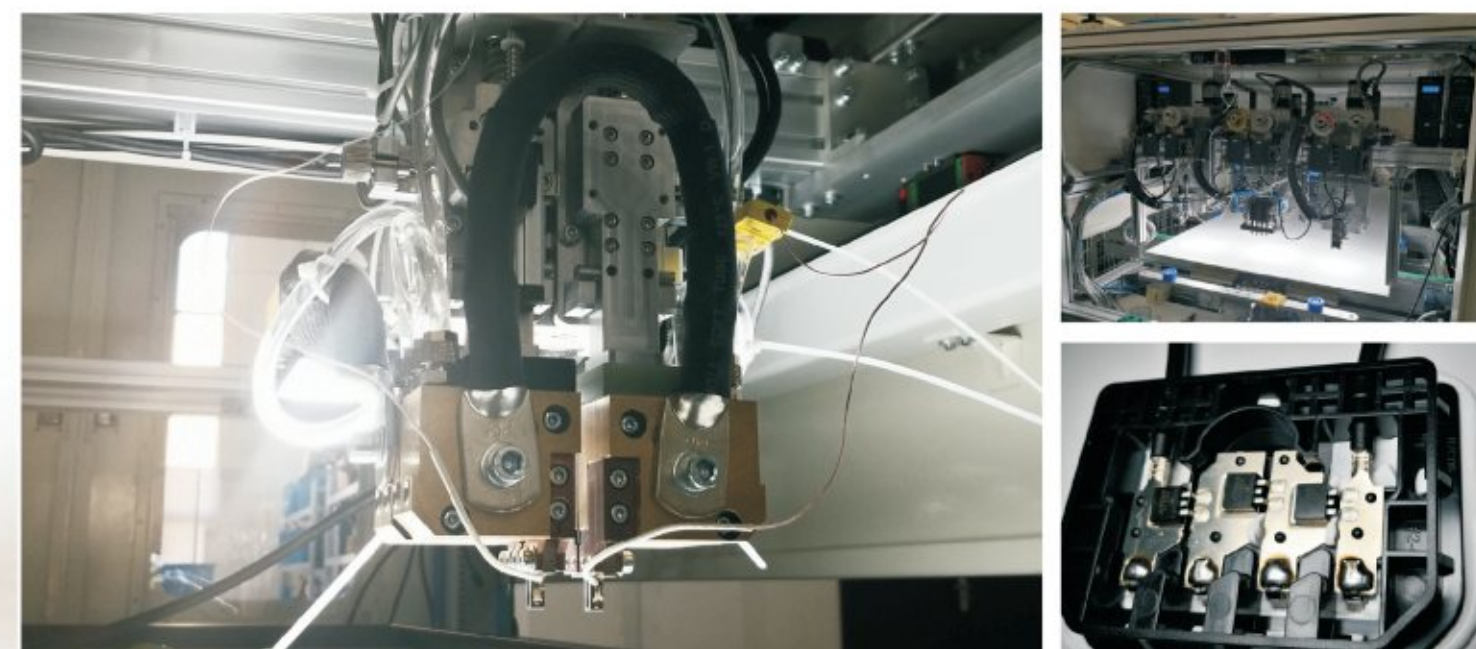
- 自动挑引线模块  
Tab bending station
- 接线盒贴胶带模块  
J-box taping machine
- 自动撕离型纸模块  
Liner remove station
- AGV 对接导向模块  
AGV interface

#### 技术参数 Specifications

|                                    | SCI-JBI140-S                              | SCI-JBI140-T           | SCI-SJBI140-T       |
|------------------------------------|---|------------------------|---------------------|
| 适用组件类型 Module type                 | 常规单接线盒 Single J-box                       | 半片、双玻三接线盒 Triple J-box | 叠瓦 Shingling module |
| 适用组件尺寸 Module size                 | 长 Length: 1600-2200mm 宽 Width: 900-1200mm |                        |                     |
| 节拍 Cycle time                      | 22s                                       |                        |                     |
| 接线盒缓存数量 J-box storage quantity     | >200                                      |                        |                     |
| 接线盒来料方式 J-box cable status         | 线缆轧带固定 Fixed by rolling strip, 绕圈直径 <10cm |                        |                     |
| 安装完成后压引线功能 Tab pressing function   | 包含 included                               |                        |                     |
| 尺寸(L x W x H) Dimension(L x W x H) | 3000 x 4500 x 2500 mm                     |                        |                     |
| 重量 Weight                          | 2000 kg                                   |                        |                     |
| 传输高度 Transportation height         | 950 +/- 30 mm                             |                        |                     |
| 组件进料方式 Module infeed               | 长边进料 (LEL)                                |                        |                     |
| 稼动率 Technical availability         | 95% (VDI 3423)                            |                        |                     |
| 噪音 Noise level                     | Max 70dB                                  |                        |                     |
| 供电 Power requirement               | AC 3 phase 380V/N/PE 50Hz 15KVA           |                        |                     |
| 压缩空气 CDA                           | 0.4-0.6 Mpa , 一个接入点 one drop, 500l/min    |                        |                     |
| 换型时间 Change over time              | 2 Hours                                   |                        |                     |
| PLC                                | 汇川 Innovance                              |                        |                     |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## J-BOX SOLDERING MACHINE

### 接线盒焊接机

#### 加锡焊接特点 Auto soldering features

- 焊接工艺成熟  
Predictable and reproducible process
- 成本相对较低  
Cost effective
- 对接线盒来料要求不高  
Compatible with different J-box

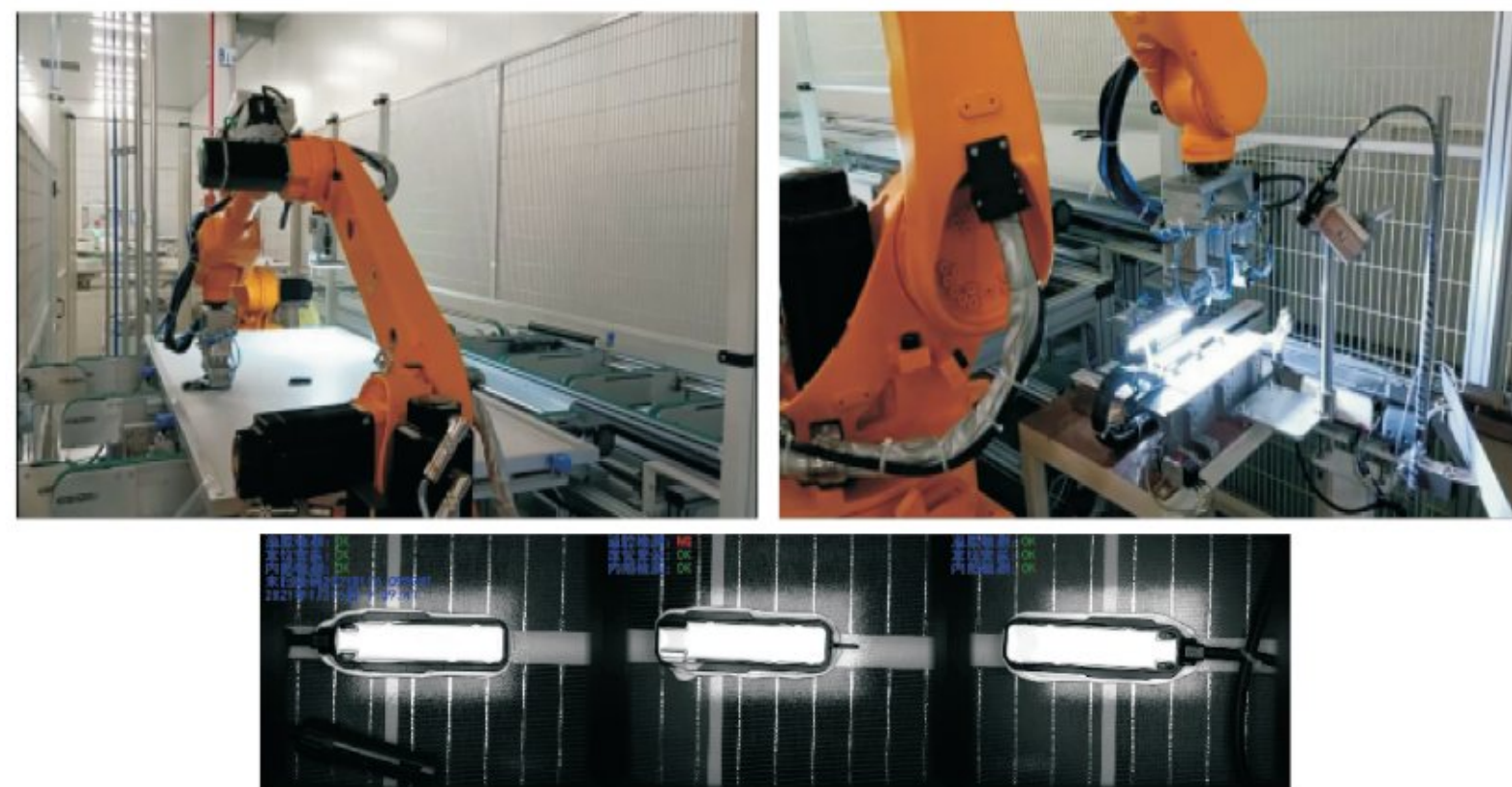
#### 热压焊接特点 Hot bar soldering features

- 焊接稳定性好  
Robust Process
- 工艺窗口宽  
Wide process window
- 焊头寿命长  
Long life time of welding head(wearing parts)
- 焊接质量检查可靠性高  
Reliable welding quality check
- 维护维修方便  
Maintenance friendly and good accessibility
- 产品换型方便  
Easy change over
- 设备可用率高  
High yield and high equipment utilization

#### 技术参数 Specifications

|                                   | SCI-JBS140-H  | SCI-JBS140-HW       | SCI-JBS140-W                   |
|-----------------------------------|---|---------------------|--------------------------------|
| 焊接方式Soldering technology          | 热压焊Hotbar   | 热压加锡Hotbar with tin | 烙铁加锡焊Soldering iron            |
| 适用组件类型Module type                 | 常规单接线盒半片、双玻三接线盒、叠瓦Half-cut, glass-glass, shingling module |                     |                                |
| 适用组件尺寸Module size                 | 长: 1600-2400mm 宽: 900-1400mm                              |                     |                                |
| 节拍Cycle time                      | 22s   |                     |                                |
| 焊接质量检测方式Soldering quality check   | 位移/视觉Position transducer/vision                           |                     |                                |
| 焊接温度范围Temperature control range   | 50-500 °C   |                     |                                |
| 温度波动范围Temperature tolerance       | ± 5°C   |                     |                                |
| 焊头使用寿命Soldering head life time    | 35000 cycle   |                     | 15000 cycle                    |
| 焊接位置精度Soldering position accuracy | +/-0.5 mm   |                     |                                |
| 尺寸Dimension ( L x W x H )         | 1800 x 2800 x 2000 mm                                     |                     |                                |
| 重量Weight                          | 1000 kg   |                     |                                |
| 传输高度Conveyor height               | 950 +/- 30 mm   |                     |                                |
| 组件进料方式Module moving direction     | 长边进料Long edge leading ( LEL )                             |                     |                                |
| 稼动率Technical availability         | 95% ( VDI 3423 )  |                     |                                |
| 噪音Noise level                     | Max 50dB  |                     |                                |
| 供电Electrical power requirement    | AC 3 phase 380V/N/PE 50Hz 25KVA                           |                     | AC 3 phase 380V/N/PE 50Hz 5KVA |
| 压缩空气CDA                           | 0.4-0.6 Mpa , 一个接入点 one drop, 100l/min                    |                     |                                |
| 排风Exhaust                         | 360 m3/h  |                     |                                |
| 换型时间Change over time              | 30min   |                     |                                |
| PLC                               | 汇川Innovance   |                     |                                |

01 组件自动化整体解决方案  
PV module manufacturing automation turnkey solution



# J-BOX COVER INSTALLATION SYSTEM

## 接线盒自动盖盖机

### 特点 Features

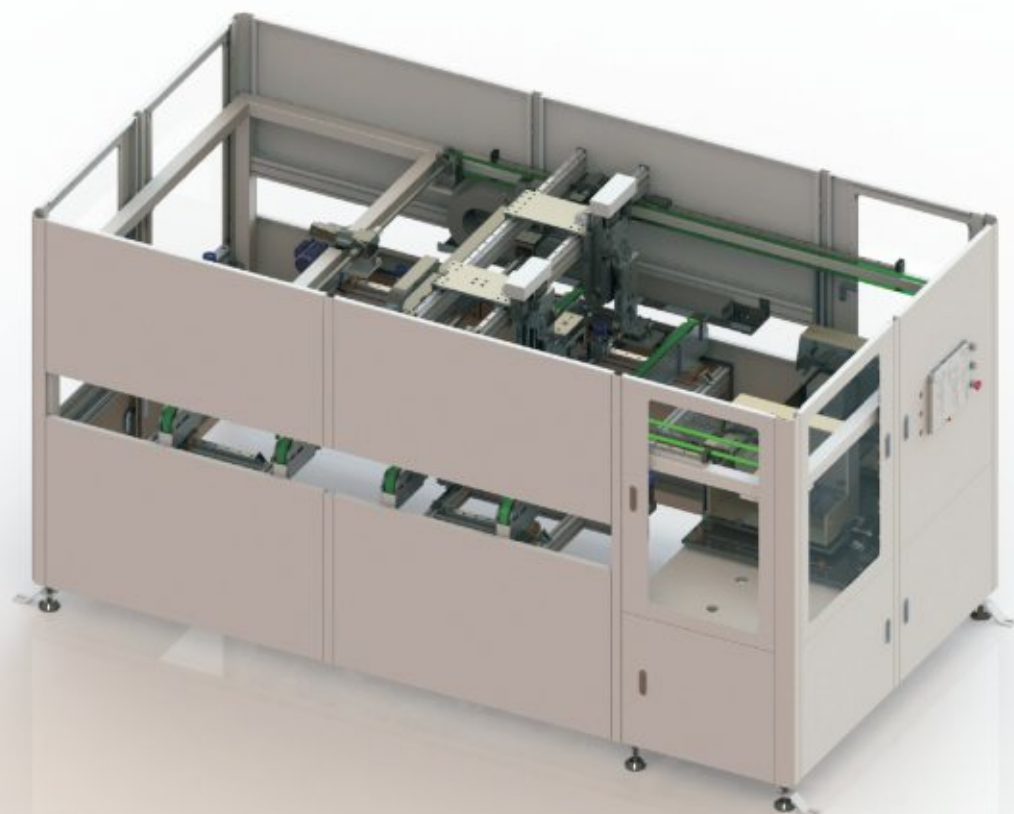
- 布局紧凑，可在现有产线上集成  
Compact design, easily integrated into the existing production line
- 兼容单接线盒、三分体接线盒  
Compatible for single and triple j-box module
- 合盖前集成灌胶检测、固化检测功能  
Potting inspection integrated
- 合盖后集成合盖质量检测功能  
Cover quality inspection integrated
- 盒盖缓存量大，上料方便  
Material loading with vibration feeder

### 技术参数 Specifications

|                                      | SCI-JB1140-S                              | SCI-JB1140-T           | SCI-SJB1140-T       |
|--------------------------------------|---|------------------------|---------------------|
| 适用组件类型Module type                    | 常规单接线盒 Single J-box                       | 半片、双玻三接线盒 Triple J-box | 叠瓦 Shingling module |
| 适用组件尺寸Module size                    | 长Length: 1600-2500mm 宽Width: 900-1400mm   |                        |                     |
| 节拍Cycle time                         | 20s                                       |                        |                     |
| 接线盒盖缓存数量J-box cover storage quantity | 4H  |                        |                     |
| 接线盒盖供料方式J-box cover supply           | 振动盘Vibration feeder                       |                        |                     |
| 合盖前灌胶检测功能Potting quality inspection  | 固化检测、灌胶检测Curing quality & potting quality |                        |                     |
| 尺寸Dimension (L x W x H)              | 3000 x 4500 x 2500 mm                     |                        |                     |
| 重量Weight                             | 2000 kg                                   |                        |                     |
| 传输高度Transportation height            | 950 +/- 30 mm                             |                        |                     |
| 组件进料方式Module infeed                  | 长边进料 (LEL)                                |                        |                     |
| 稼动率Technical availability            | 95% (VDI 3423)                            |                        |                     |
| 噪音Noise level                        | Max 70dB                                  |                        |                     |
| 供电Power requirement                  | AC 3 phase 380V/N/PE 50Hz 15KVA           |                        |                     |
| 压缩空气CDA                              | 0.4-0.6 Mpa, 一个接入点one drop, 500l/min      |                        |                     |
| 换型时间Change over time                 | 2 Hours                                   |                        |                     |
| PLC                                  | 汇川Innovance                               |                        |                     |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## 设备技术性能

组件定位精度  $\pm 1\text{mm}$ , 定位归正无震动  
 设计节拍: 整体节拍  $\leq 23\text{S}$   
 归正方式: 四边归正  
 贴标位置偏差:  $\pm 1\text{mm}$   
 不同板型切换时间:  $< 3\text{min}$   
 碎片率:  $\leq 0.05\%$   
 操作模式: 手动 + 自动  
 噪音要求:  $\leq 60\text{dB}$   
 人机界面: 中英文模式  
 良率要求: 贴胶带良率大于 98.5%

## Functionality

Module positioning accuracy:  $\pm 1\text{mm}$   
 Cycle time:  $\leq 23\text{s}$   
 Alignment: four side alignment  
 Label position deviation:  $\pm 1\text{mm}$   
 Change over time:  $< 3\text{min}$   
 Fragment rate:  $\leq 0.05\%$   
 Operation mode: Auto / Manual  
 Noise level:  $\leq 60\text{dB}$   
 HMI: Chinese/English mode  
 Yield:  $> 98.5\%$



## AUTO LABELING

### 自动贴标机

#### 功能描述

- 整体结构由输送归正、吸标、贴标、真空系统等组成。
- 伺服电机传动带动贴标机构，高速度，高精度。
- 吸标、贴标系统采用丝杆和同步带传送。精确快速吸标、贴标，贴标时有压缩弹簧起到缓冲效果。
- 用滚轮滚压条码及名牌，确保条码及名牌牢固的贴在组件上面。

#### Features

- The overall structure consists of transportation correction, suction labeling, labeling, and vacuum system.
- Servo motor drive drives the labeling mechanism, high speed and high precision.
- The suction and labeling system is delivered by a screw and a timing belt. Accurate and fast suction and labeling. A compression spring for buffering when labeling.
- Rolling the bar code and brand name with the roller to ensure that bar code and brand name are firmly attached to the module.

#### 技术参数 Specifications

| 项目 Item                         | 数值 Value                                 |
|---------------------------------|--|
| 型号 Model                        | SC-AL26-CS-01                            |
| 适用版型 Compatible size            | 长 length:1640-2400mm, 宽 width:950-1400mm |
| 设计节拍 Cycle time                 | $\leq 23\text{s}$                        |
| 工作气压 Operation pressure         | 0.5Mpa ~ 0.7Mpa                          |
| 设备功率 Power requirement          | 2.5KW                                    |
| 最大设备尺寸 Maximum dimension(L*W*H) | 3400*2100*1700mm                         |

# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## 设备技术性能

组件定位精度  $\pm 1\text{mm}$ , 定位归正无震动  
 归正方式: 四边对中归正  
 整体节拍:  $\leq 22\text{s}$   
 更换护角时间:  $\leq 180\text{s}$   
 不同板型切换时间: 60cell $\rightarrow$ 72cell 换线一键切换 (伺服)  
 常规  $\rightarrow$  半片  $< 30\text{min}/1\text{人}$   
 操作模式: 手动 + 自动  
 噪音要求:  $\leq 60\text{dB}$   
 人机界面: 中英文模式



## Functionality

Module positioning accuracy:  $\pm 1\text{mm}$   
 Alignment: four side alignment  
 Cycle time:  $\leq 22\text{s}$   
 Change paper protector time:  $\leq 180\text{s}$   
 Change over time: 60cell $\leftrightarrow$ 72cell one button switch  
 Normal $\leftrightarrow$ half-cut module  $< 30\text{min}/1\text{person}$   
 Operation mode: Auto / Manual  
 Noise level:  $\leq 60\text{dB}$   
 HMI: Chinese/English mode



# AUTO CORNER PROTECTOR INSERTING

## 自动包护角机

### 功能描述

- 整体结构由玻璃归正输送单元, 包护角系统, 真空系统等组成。
- 伺服进给, 自动切换, 保证组件可同进同出, 节省工作节拍。
- 自动进行组件上护角, 随即沿折痕折叠。
- 触摸屏界面, 切换组件规格、手动操作、报警信息等参数设置。

### Features

- The overall structure consists of alignment and conveyor unit, a corner protector inserting system and a vacuum system.
- Servo feeding automatic switching, to ensure module entering and exiting, saves cycle time.
- Paper protector inserts automatically and then folds along the creases.
- Touch screen interface for changing module specifications, manual operation type, alarm information and other parameter setting.

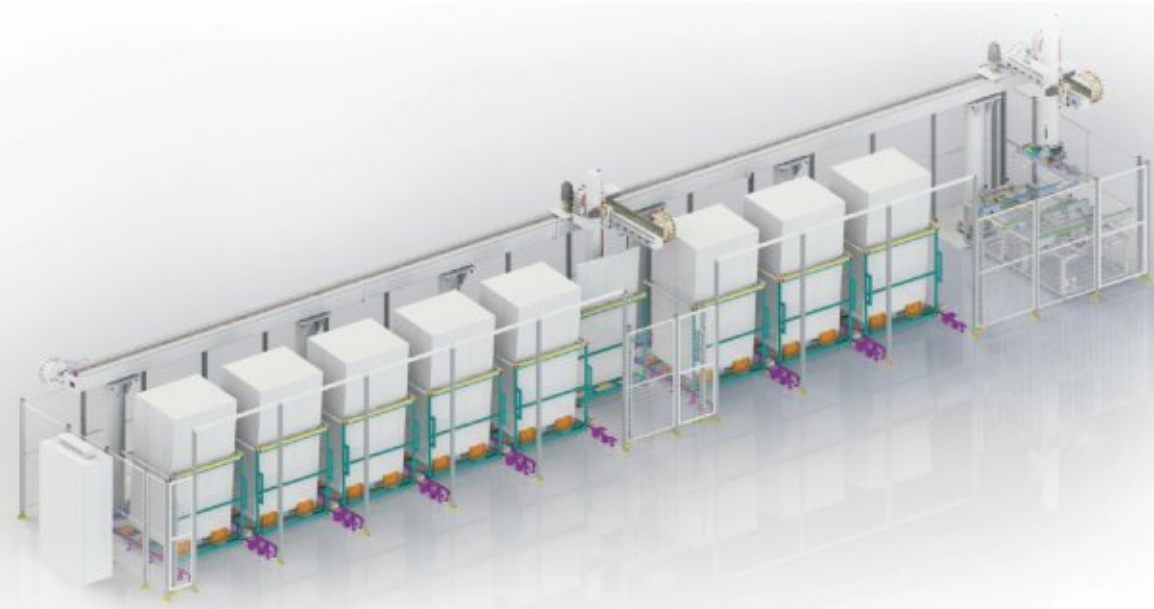
## 技术参数 Specifications

| 项目 Item                            | 数值 Value                                 |
|------------------------------------|--|
| 型号 Model                           | SC-CG25-CS-01                            |
| 适用版型 Compatible size               | 长 length:1640~2450mm, 宽 width:950~1400mm |
| 设计节拍 Cycle time                    | $\leq 22\text{s}$                        |
| 工作气压 Operation pressure            | 0.5Mpa ~ 0.7Mpa                          |
| 设备功率 Power requirement             | 5KW                                      |
| 最大设备尺寸 Maximum dimension(LxWxH)    | 4150*1860*2000mm                         |
| 重量 Weight                          | 2800Kg                                   |
| 边框高度 Frame                         | 30~45mm                                  |
| 护角材质 Protector material            | tri-wall corrugated paper                |
| 护角厚度 Protector thickness           | 1 $\pm$ 0.2mm                            |
| 护角盒存放护角数量 Protector storage number | $\leq 500\text{pcs}$                     |



# 01 组件自动化整体解决方案

PV module manufacturing automation turnkey solution



## SOLAR MODULE VERTICAL PALLETIZING SYSTEM

### 组件垂直码垛系统

#### 特点

- 适用于目前主流的所有组件类型和装箱方式
- 可结合组件纸箱设计完成常规边框组件的垂直装箱和双玻组件的垂直装箱
- 高速、稳定、布局紧凑
- 采用机器人控制器, 操作简单, 灵活
- 标准化、模块化程度高, 可通过增加 2&3 轴实现模块化扩展

#### Features

- Compatible for all types of palletizing for solar module, (horizontal/vertical)
- High speed, reliable, compact
- Controlled by a robot controller which makes the programming easy and flexible
- High level of standardization and modularization



#### 选项 Options

- 符合 UL / CE 标准的元器件  
UL/CE standard parts
- 常规组件, 双玻组件抓手快换装置  
Gripper changing tools
- 装箱抓手浮动装置  
Floating mechanism inside the gripper
- 装箱质量检测  
Quality check
- 组件翻转装置  
Module flipping tools



#### 技术参数 Specifications

|                                    | SCI-VP140-S   | SCI-VP140-D            |
|------------------------------------|---|------------------------|
| 适用组件类型 Module type                 | 常规、双玻、半片、叠瓦: normal/double-glass/half-cut/shingling |                        |
| 适用组件尺寸 Module size                 | 长 Length: 1600-2500mm 宽 Width: 900-1400mm           |                        |
| 码垛方式 Palletizing type              | 水平/垂直/短边竖放 horizontal/vertical                      |                        |
| 组件抓取方式 Module picking type         | 吸盘 / 夹边框 suction cup/clamp                          |                        |
| 节拍 Cycle time                      | 20s   |                        |
| 垛位 Number of bins                  | <6  | <12                    |
| 尺寸(L x W x H) Footprint(L x W x H) | 15000 x 4500 x 4800 mm                              | 25000 x 4500 x 4800 mm |
| 重量 Weight                          | 10500 kg  | 21000 kg               |
| 传输高度 Transportation height         | 950 +/- 30 mm                                       |                        |
| 稼动率 Technical availability         | 95% (VDI 3423)                                      |                        |
| 噪音 Noise level                     | Max 75dB  |                        |
| 供电 Power requirement               | AC 3 phase 380V/N/PE 50Hz 20KVA                     |                        |
| 压缩空气 CDA                           | 0.4-0.6 Mpa, 一个接入点 one drop, 600l/min               |                        |
| 换型时间 Change over time              | 1Hours  |                        |
| PLC                                | 汇川 Inovance   |                        |
| HMI                                | 汇川 Inovance   |                        |

## 02 电池片硅片自动化设备 PV cell and wafer manufacturing automation equipment



### 性能指标

上下料方式: 叠片盒倒 100 槽花篮  
 产能:  $\geq 8500$  片 / 小时  
 破片率:  $\leq 0.03\%$  ,(A 类片, 仅统计由自动化造成的碎片)  
 UpTime:  $\geq 98.5\%$   
 MTBF  $\geq 500$  小时  
 MTTR  $\leq 1$  小时  
 预留 MES 接口, 支持数据上传

### Specifications

Loading and unloading manner: transfer wafer from stack box to 100 slot cassette.  
 Throughput:  $\geq 8500$  pieces / hour  
 Fragmentation rate:  $\leq 0.03\%$ , (A type wafer, only statistics of broken caused by automation)  
 UpTime:  $\geq 98.5\%$   
 MTBF  $\geq 500$  hours  
 MTTR  $\leq 1$  hour  
 Reserve MES interface to support data upload



## TEXTURING EQUIPMENT WAFFER LOADER / UNLOADER

### 制绒上下料机

#### 设备功能 Function

- 制绒工艺设备的自动上下料  
Texturing equipment automatic loading and unloading

#### 兼容硅片尺寸 Compatible wafer size

- 182\*182 $\pm$ 0.5mm-230\*230 $\pm$ 0.5mm

| 项目 Item             | 数值 Value   |
|---------------------|--|
| 型号 Model            | PUM8000  |
| 电源 Power            | AC380V $\pm$ 10%, 50HZ $\pm$ 5%, 15KW                                    |
| 气源 Working pressure | 最小 Min: 0.6MPa   |
| 环境 Environment      | 温度 Temperature: 17 $^{\circ}$ C-34 $^{\circ}$ C, 湿度 Humidity < 80%       |
| 尺寸 Equipment size   | 上料机 Loading: 2900mm*2100mm*1920mm<br>下料机 Unloading: 2000mm*1650mm*1840mm |

## 02 电池片硅片自动化设备 PV cell and wafer manufacturing automation equipment



# INLINE DIFFUSION WAFER TRANSFERING MACHINE

## 在线扩散插片机

### 设备功能 Function

- 在线扩散插片机  
Inline diffusion wafer inserting machine

### 兼容硅片尺寸 Compatible wafer size

- 182\*182 ± 0.5mm-230\*230 ± 0.5mm

### 可选项 Options

- 可根据客户要求选配方阻检测  
Choose the formula resistance test according to customer requirements

### 说明 Description

- 吸盘为陶瓷材质,耐高温、耐氧化及硬度高,不易对硅片表面产生氧化等印记。  
The material of the sucker is ceramic, so it has high temperature resistance, oxidation-resistivity and high hardness, and that is not easy to make mark on wafer surface.
- 吸盘在三维空间内分别采用伺服控制方式,可调节性强,位置精度高,大大降低了碎片率以及不良率。  
In three dimensions, the suckers use servo control manner, so it is easy to tune and the position accuracy is high. The wafer broken rate and defect rate can drop down a lot.
- 真空发生器就近安装在吸盘上方,可以降低管路损耗同时提高响应时间。  
The vacuum maker is installed near the top of the sucker, that can drop down the pipeline loss and improve the response time.

### 性能指标

硅片 I :边长182,厚度160-220 μ m  
 硅片 II :边长210,厚度160-220 μ m  
 花篮传输轨道可兼容,花篮端面尺寸不变  
 设备产能: 10000片/小时  
 开机率: >99%,  
 破片率: <0.03%  
 花篮: 100槽,中间有空档;上下花篮4通道,上料暂存2个花篮,下料暂存2个花篮  
 预留AGV对接空间,相关感应器及通讯接口

### Specifications

Wafer size: length 182mm/230mm, thickness: 160-220 μ m  
 Cassette track is compatible and cassette size no need to change  
 Throughput: ≥ 10000 pieces / hour  
 Uptime: >99%  
 Fragmentation rate: <0.03%,  
 Cassette: 100 slots, space in middle; loading and unloading 4 tracks, loading stage 2 cassettes, unloading state 2 cassettes  
 Reserve AGV space, relevant sensors and communication interfaces.



| 项目 Item         | 数值 Value                                   |
|-----------------|--|
| 型号 Model        | SAM16000                                   |
| 电源 Power        | AC380V±10%, 50HZ±5%, 15KW                  |
| 气源 Gas pressure | 最小 Min 0.6MPa                              |
| 环境 Environment  | 温度 Temperature 17°C-34°C, 湿度 Humidity <80% |

## 02 电池片硅片自动化设备

PV cell and wafer manufacturing automation equipment



# ETCHING EQUIPMENT

## WAFER LOADER / UNLOADER

### 刻蚀上下料机

#### 设备功能 Function

- 刻蚀工艺设备的自动上下料(5道)  
Etching equipment automatic loading and unloading(5 lanes)

#### 性能指标

上下料方式: 100 槽花篮  
 产能:  $\geq 6000$  片 / 小时  
 破片率:  $\leq 0.01\%$ , (A 类片, 仅统计由自动化造成的碎片)  
 开机率:  $\geq 99\%$   
 MTBF  $\geq 500$  小时  
 MTTR  $\leq 1$  小时  
 预留 MES 接口, 支持数据上传功能

#### 兼容硅片尺寸 Compatible Wafer size

- $182*182 \pm 0.5\text{mm} - 230*230 \pm 0.5\text{mm}$

#### Specifications

Loading and unloading manner: 100 slot cassette  
 Throughput:  $\geq 6000$  pieces / hour  
 Fragmentation rate:  $\leq 0.01\%$ , (A type wafer, only statistics of broken caused by automation)  
 Up time:  $\geq 99\%$   
 MTBF  $\geq 500$  hours  
 MTTR  $\leq 1$  hour  
 Reserve MES interface to support data upload

#### 说明 Description

- 上料与下料设备结构基本相同。  
The loading and unloading equipment structure is basically the same.
- 与工艺设备进行信号交互, 确保安全生产。  
Signal interaction with process equipment to ensure safe production.
- 花篮具有放反防呆检测功能。  
Including poka yoka detection function for cassette placing reversely.
- 硅片进出花篮轨道有两组, 可交替进行传输, 提高产能。  
There are two sets of tracks for wafer flowing in and out of the cassette, which can transfer alternately to increase productivity.
- 硅片传输轨道采用伺服驱动, 具有变速功能, 以减少硅片摩擦及撞击阻挡。  
The wafer transfer track is driven by servo and has a variable speed function to reduce wafer friction and impacting block.
- 具有硅片缓存盒, 以规避更换花篮时的产能损失。  
It has a wafer buffer box to avoid the loss of capacity when replacing the cassette.
- 为便于操作, 满花篮全部从下轨道进出。  
For convenient operation, the full cassettes all flow in and out from lower track.
- 具有硅片导向功能, 防止卡片。  
Including wafer guiding function to prevent wafer blocking.
- 下料设备可以增加翻片功能。  
Unloading station can add wafer flipping function.



| 项目 Item         | 数值 Value   |
|-----------------|--|
| 型号 Model        | EUM8000  |
| 电源 Power        | AC380V $\pm 10\%$ , 50HZ $\pm 5\%$ , 5KW                           |
| 气源 Gas pressure | 最小 Min: 0.6MPa   |
| 环境 Environment  | 温度 Temperature: 17 $^{\circ}$ C-34 $^{\circ}$ C, 湿度 Humidity: <80% |

## 02 电池片硅片自动化设备

PV cell and wafer manufacturing automation equipment



# HIGH SPEED WAFER TRANSFER MACHINE

## 高速倒片机

ALD 在线倒片机主要分为花篮传输轨道, 舟传输轨道, 硅片自动上料系统, 硅片自动下料系统, 软件控制系统, 可完全配合生产线生产, 提高工作效率。

ALD inline wafer transfer machine includes cassette transfer track, boat transfer track, auto wafer loading and unloading system and software control system. That can be fully matched with the production line to improve work efficiency.

### 功能描述

- 4道花篮轨道, 两两交替省去换花篮时间, 提高生产效率;
- 进出花篮2组缓存台, 每组可缓存20个花篮;
- 可同时满足2台AGV同时对接;
- 金属舟传输轨道有2个上下料位, 可独立运行, 且都有90°翻转功能;
- 耐高温, 稳定性高, 吸盘顶齿侧齿均为陶瓷
- 吸盘位100片一组, 提高生产效率;
- 触摸屏界面, 可显示报警信息、参数设置、舟的使用次数及是否需要维修清洗等。

### Function description

- 4 lanes cassette tracks, fulfill non-stop during cassette exchange and improving production efficiency;
- There are 2 sets of cache tables, each set can cache 20 cassettes.
- 2 AGVs can be connected at the same time.
- The metal boat transfer track has two loading and unloading positions, which can run independently and both have 90° flipping function.
- High temperature resistance, high stability, the top and side teeth of the sucker are ceramic.
- The suction cup is grouped by every 100pcs to improve production efficiency.
- The touch screen interface can display alarm information, parameters setting, the number of boat using times and whether needs to be repaired or cleaned.

### 设备规格 Specifications

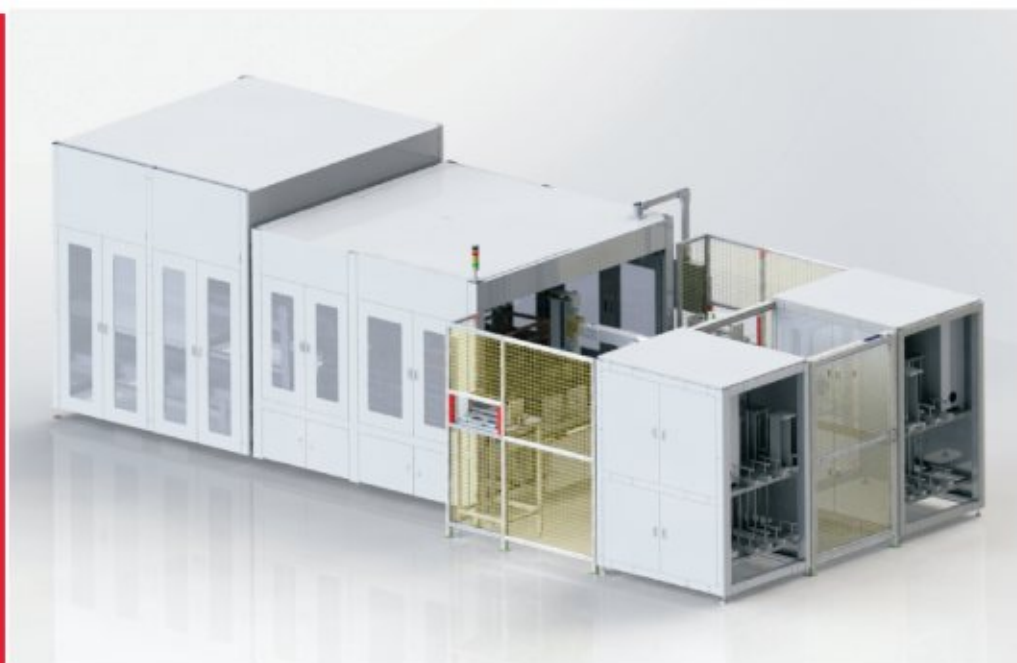
- 硅片: 边长182-230mm, 厚度160-220 μm  
Wafer size: length 182-230mm, thickness 160-220 μm
- 花篮传输轨道可兼容, 花篮端面尺寸不变  
Cassette transfer tracks compatible, and the cassette header size fixed.
- 设备产能: 16000片/小时(硅片花篮互导: 16000片/小时, 花篮舟互导: 16000片/小时)  
Throughput: 16000 pieces / hour (wafer and cassette interexchange: 16000 pieces / hour, cassette and boat interexchange: 16000 pcs/hour)
- 开机率: >98%, 破片率: <0.08% (含破损、崩边、开裂及其他损伤), 划伤: <0.1%, EL不良: <0.3% (含EL划伤、黑斑及其他不良)  
Uptime > 98%, Fragmentation rate: <0.08%, Scratch: <0.1%, EL failure: <0.3%
- 花篮: 100槽, 槽间距: 4.76mm, 中间有空档; 上下花篮4通道, 上料暂存2个花篮, 下料暂存2个花篮  
Cassette: 100 slots, 4.76mm distance between slots and with gap in middle. 2 cassettes buffer in loading station and 2 cassettes buffer in unloading station. 4 lanes of loading and unloading cassettes.
- 金属舟200槽, 槽间距2.38mm, 每槽面对面两片硅片  
Metal boat: 200 slots, and 2.38mm distance between two slots, each slot has two face-to-face wafers.
- 导片机金属舟摆放位自带翻转、水平推拉及金属舟定位夹紧功能, 翻转过程动作平稳保证硅片与金属舟无相对位移。(直立摆放的金属舟翻转90°至水平并具有识别金属舟放反功能)  
The boat position is equipped with function of turning over, horizontal pushing/pulling, and boat positioning and clamping function. The movement of turning over is stable to ensure that there is no relative displacement between the silicon wafer and the boat. (Vertical boat turn over 90° to horizontal, and can identify reverse of boat.)
- 预留AGV对接空间, 相关感应器及通讯接口  
Reserve AGV docking space, related sensors and communication interface.



| 项目 Item                  | 数值 Value                                      |
|--------------------------|---|
| 型号 Model                 | SRM16000                                      |
| 工作电源 Working power       | AC 380V, 3相5线制 3 phase 5 wires 50Hz, 10kw/pcs |
| 工作气压 Working pressure    | 0.5-0.6Mpa, 200L/min                          |
| 工作环境 Working environment | 0-40° 相对湿度: Humidity ≤60%                     |
| 噪音控制 Noise level         | <70db   |

## 02 电池片硅片自动化设备

PV cell and wafer manufacturing automation equipment



# ANNEALING/OXIDATION WAFER TRANSFERRING MACHINE

## 退火/氧化插片机

### 设备功能 Function

- 退火/氧化插片机  
Annealing/oxidation wafer inserting machine

### 性能指标

硅片 I :边长182,厚度160-220 μ m  
 硅片 II :边长210,厚度160-220 μ m  
 花篮传输轨道可兼容, 花篮端面尺寸不变  
 设备产能: 10000片/小时  
 开机率: >99%,  
 破片率: <0.03%  
 花篮: 100槽, 中间有空档; 上下花篮4通道,  
 上料暂存2个花篮, 下料暂存2个花篮  
 预留AGV对接空间, 相关感应器及通讯接口

### 兼容硅片尺寸 Compatible Wafer size

- 182\*182 ± 0.5mm-230\*230 ± 0.5mm

### Specifications

Wafer size: length 182mm/230mm, thickness: 160-220 μ m  
 Cassette track is compatible and cassette size no need to change  
 Throughput: ≥ 10000 pieces / hour  
 Uptime: >99%  
 Fragmentation rate: <0.03%,  
 Cassette: 100 slots , space in middle; loading and unloading 4 tracks, loading stage 2 cassettes, unloading state 2 cassettes  
 Reserve AGV space, relevant sensors and communication interfaces.

### 说明 Description

- 吸盘为陶瓷材质, 耐高温、耐氧化及硬度高, 不易对硅片表面产生氧化等印记  
The material of the sucker is ceramic, so it has high temperature resistance, oxidation-resistivity and high hardness, and that is not easy to make mark on wafer surface.
- 吸盘在三维空间内分别采用伺服控制方式, 可调节性强, 位置精度高, 大大降低了碎片率以及不良率。  
In three dimensions, the suckers use servo control manner, so it is easy to tune and the position accuracy is high. The wafer broken rate and defect rate can drop down a lot.
- 真空发生器就近安装在吸盘上方, 可以降低管路损耗同时提高响应时间  
The vacuum maker is installed near the top of the sucker, that can drop down the pipeline loss and improve the response time.



| 项目 Item         | 数值 Value                                   |
|-----------------|--|
| 电源 Power        | AC380V±10%, 50HZ±5%, 15KW                  |
| 气源 Gas pressure | 最小 Min: 0.6MPa                             |
| 环境 Environment  | 温度 Temperature: 17℃-34℃, 湿度 Humidity: <80% |

## 02 电池片硅片自动化设备

PV cell and wafer manufacturing automation equipment



# PE WAFER INSERTING MACHINE

## PE插片机

### 设备功能 Function

- PE 工艺设备的自动上下料  
PECVD equipment automatic loading and unloading

### 性能指标

型号: TPM8000  
 上下料方式: 100 槽花篮  
 产能:  $\geq 4500$  片 / 小时  
 破片率:  $\leq 0.03\%$  (A 类片, 仅统计由自动化造成的碎片)  
 Up time:  $\geq 99\%$   
 MTBF  $\geq 500$  小时  
 MTTR  $\leq 1$  小时  
 预留 MES 接口, 支持数据上传  
 机器人: 史陶比尔 TX90L

### 兼容硅片尺寸 Compatible wafer size

- $182*182\pm 0.5\text{mm}-230*230\pm 0.5\text{mm}$

### Specifications

Loading and unloading manner: 100 slot cassette  
 Throughput:  $\geq 4500$  pieces / hour  
 Fragmentation rate:  $\leq 0.03\%$ , (A type wafer, only statistics of broken caused by automation)  
 Up time:  $\geq 99\%$   
 MTBF  $\geq 500$  hours  
 MTTR  $\leq 1$  hour  
 Reserve MES interface to support data upload  
 Robot: Staubli TX90L

### 说明 Description

- 花篮上下料集中在设备同一侧, 提高设备的可操作性。  
The cassette loading and unloading mechanism is in the same side of the equipment to improve the operability.
- 花篮升降采用伺服模组控制。The cassette lifting up and down system is controlled servo module.
- 预留碎片检测+翘片检测++不良抓取模组  
Fragmented and curled wafer inspection, detective picking out function are reserved.
- 预留 CCD 色差检测 + 不良抓取功能。  
Wafer CCD color difference detection and picking out function are reserved as optional.
- 采用旋转翻片方式, 减少硅片接触, 降低不良。  
Using rotary flipping wafer manner to reduce wafer contact and minimize defect wafer.
- 吸盘主体采用航空铝, 具有良好的力学性能, 吸嘴采用陶瓷材质, 并且欧弹簧柔性定位。  
The main part of sucker using aviation aluminum, and that has good mechanical property. The suction nozzle is made of ceramic material and has spring flexible positioning function.
- 使用六轴机器人进行取放片提高控制灵活性。  
Using six axis robot for wafer picking and placing to promote the control flexibility.
- 石墨舟采用伺服传送方式, 为了减少机器人的定位偏差同时提高效率, 采用舟工作移位的方式来完成硅片的取放。  
The carbon boat using servo transfer manner. In order to reduce the robotic positioning deviation and improve efficiency at the same time, adopt boat work moving manner for wafer picking and placing.



## 02 电池片硅片自动化设备

PV cell and wafer manufacturing automation equipment

# CELL SLICING MACHINE

## 激光划片机



### 性能指标 Specifications

型号: WDM6000-V2 Model: WDM6000-V2

划片深度: 0-0.2mm (可根据实际情况加以调整)  
Dicing depth: 0-0.2mm (can be adjusted base on actual situation)

深度公差:  $\pm 10\%$  Depth tolerance deviation:  $\pm 10\%$

切割精度:  $\leq 0.1\text{mm}$  Dicing accuracy:  $\leq 0.1\text{mm}$

掰片方式: 上掰片方式  
Breakoff wafer manner: up break off wafer

产能: 7000片/小时 (整片) 14000片/小时 (半片)  
Capacity: 7000 pieces/hour (whole piece) 14,000 pieces/hour (half piece)

进料盒: 4盒  $\times$  200片  
Loading box: 4 boxes  $\times$  200 pieces

出料盒: 4盒  $\times$  200片  
Unloading box: 4boxes  $\times$  200 pieces

### 设备功能 Function

- 对太阳能电池片的激光划片  
Dicing solar cell wafer

### 激光介绍 Laser introduction

激光品牌: 英国 SPI 光纤激光器  
Brand: SPI fiber laser ( Britain)

激光特点: 支持 20 几种波形, 脉宽 15-220ns 可调,  
单点能量 0.1-0.7mJ  
Characteristic: support more than 20 kinds of wave pattern,  
Pulse width: 15-220ns is adjustable, one point energy: 0.1-0.7mJ

光束质量: S 型 - 单模 ( $M^2 < 1.3$ ) 发出非常细幼的光束  $< 20$  微米, 功率稳定性高, 景深大, 非常适合需要较小特征尺寸的应用

Laser beam quality: S shape-single mode ( $M^2 < 1.3$ ), thin beam  $< 20 \mu\text{m}$ , high power stable, big depth of focus, very suitable for tiny size application.

转盘吸附采用平面吸附的方式;  
吸附的原理采用伯努利原理;  
这样即便有电池片破碎, 也不会平台上残留, 不会导致隐裂或碎片。

The turn table sucking uses flat sucking method.

The principle of sucking is Bernouli, there will be no broken wafer left on table if broken happens. That will not lead to hidden break or fragment.

### 视觉系统

水平放反检测, 通过检测栅线的方向来判断;

边缘破片检测, 可以检测边缘最小  $1 \times 1\text{mm}$  的破损;

位置信息获取, 通过硅片定位将偏移量信息 (X, Y,  $\theta$ ) 反馈给激光系统, 做切割位置补偿

重复切割精度  $\leq 0.1\text{mm}$

产品快速切换

检测不合格品可快速剔除

### Vision system

Horizontal reverse inspection, judged by inspecting the direction of the grating line.

Edge breakage inspection: minimize  $1 \times 1\text{mm}$  of edge breakage can be detected.

Position information obtain: Compensate the dicing position by feeding back the offset data (X, Y,  $\theta$ ) to laser system through wafer positioning.

Repeat dicing accuracy:  $\leq 0.1\text{mm}$

Quick switching production

Defective products can be quickly removed.





03 智能物流系统  
Intelligent logistics system

PHOTOVOLTAIC  
SMART CARRIER  
光伏智能运载车



灵活多变，可搭载光伏花篮等多种设备。车型小巧，无转弯半径，无需改造工厂便可快速部署。自动充电，多重安全防护，安全快捷。

Flexible and adaptable, it can be equipped with a variety of equipment such as photovoltaic baskets. The compact size of the car has no turning radius and can be deployed quickly without the need to rebuild the factory. Automatic charging, multiple security protection, safe and fast.



伺服系统  
server system

灵活移动，响应迅速  
Flexible movement and quick response



视觉系统  
visual system

自动避障，安全可靠  
Automatic obstacle avoidance, safe and reliable



调度系统  
Dispatch system

可对接ERP系统，调度系统自动计算路径，超高效运行  
Can be connected to the ERP system, the scheduling system automatically calculates the path, and runs ultra-efficiently

| 技术参数                         |                                  |   |
|------------------------------|----------------------------------|---|
| 基本信息 Basic Information       | 外形尺寸 Dimensions                  | 940*650*250mm   |
|                              | 车体自重 Body weight                 | 135KG   |
|                              | 电显方式 Electric display            | 液晶显示屏 LCD   |
|                              | 控制系统 Control System              | 韩信系统 Han Xin System                                       |
| 运载信息 Carrying information    | 运载能力(负载)Load                     | 600KG   |
|                              | 前进速度 Forward speed               | 1.5m/s  |
| 运行信息 Operational information | 导航方式 Navigation method           | 激光 Laser  |
|                              | 行走方向 Walking direction           | 双轮差动 Two-wheel differential                               |
|                              | 最小转弯半径 Minimum turning radius    | 自旋 Spin   |
| 精度 Precision                 | 障碍物检测范围 Obstacle detection range | 0-8000mm  |
|                              | 定位精度 positioning accuracy        | ±2mm  |
| 电池信息 Battery information     | 导航精度 Navigation accuracy         | ±5mm  |
|                              | 充电方式 charging method             | 自动在线充电 / 手动充电 Automatic online charging / manual charging |
|                              | 充电时间 Charging time               | 4h(10A)或 2h(20A)  |
| 驱动方式 Drive mode              | 运行时间 operation hours             | 8h  |
|                              | 电机类型 Motor type                  | 伺服电机 Servo motor  |
| 其他 other                     | 输出功率 Output Power                | 2x400w  |
|                              | 安全系统 Security system             | 激光避障、安全触边 Laser obstacle avoidance, safe touch            |
|                              | 报警形式 Alarm form                  | 声、光报警 Audible alarm                                       |



INTELLIGENT LOGISTICS  
- STACKING AGV  
智能物流—堆垛AGV

3D 自然导航，超强环境适应性，加长双叉，更适应光伏行业。自动堆垛AGV 替代传统叉车，更少人员、更多安全、更高效。

3D natural navigation, super-environmental adaptability, extended double fork, more suitable for the photovoltaic industry. Automated stacking AGV replaces traditional forklifts with fewer people, more safety and greater efficiency.



显示界面 | UI  
信息实时显示，随时了解设备运行状况。  
Real-time display of information, keep abreast of equipment health.



举升机构 | Lifting mechanism  
承重可达1000KG，举升高度可达1.6m。  
Load capacity up to 1000KG, lift height up to 1.6m.



视觉系统 | visual system  
基于雷达的二次定位，整体定位精度可达10mm。  
Based on radar secondary positioning, the overall positioning accuracy can reach 10mm.



雷达系统 | Radar system  
全向雷达，采用自然导航，无需调整基础设施，具备超高环境适应能力。  
Omnidirectional radar, using natural navigation, no need to adjust infrastructure, with high environmental adaptability.

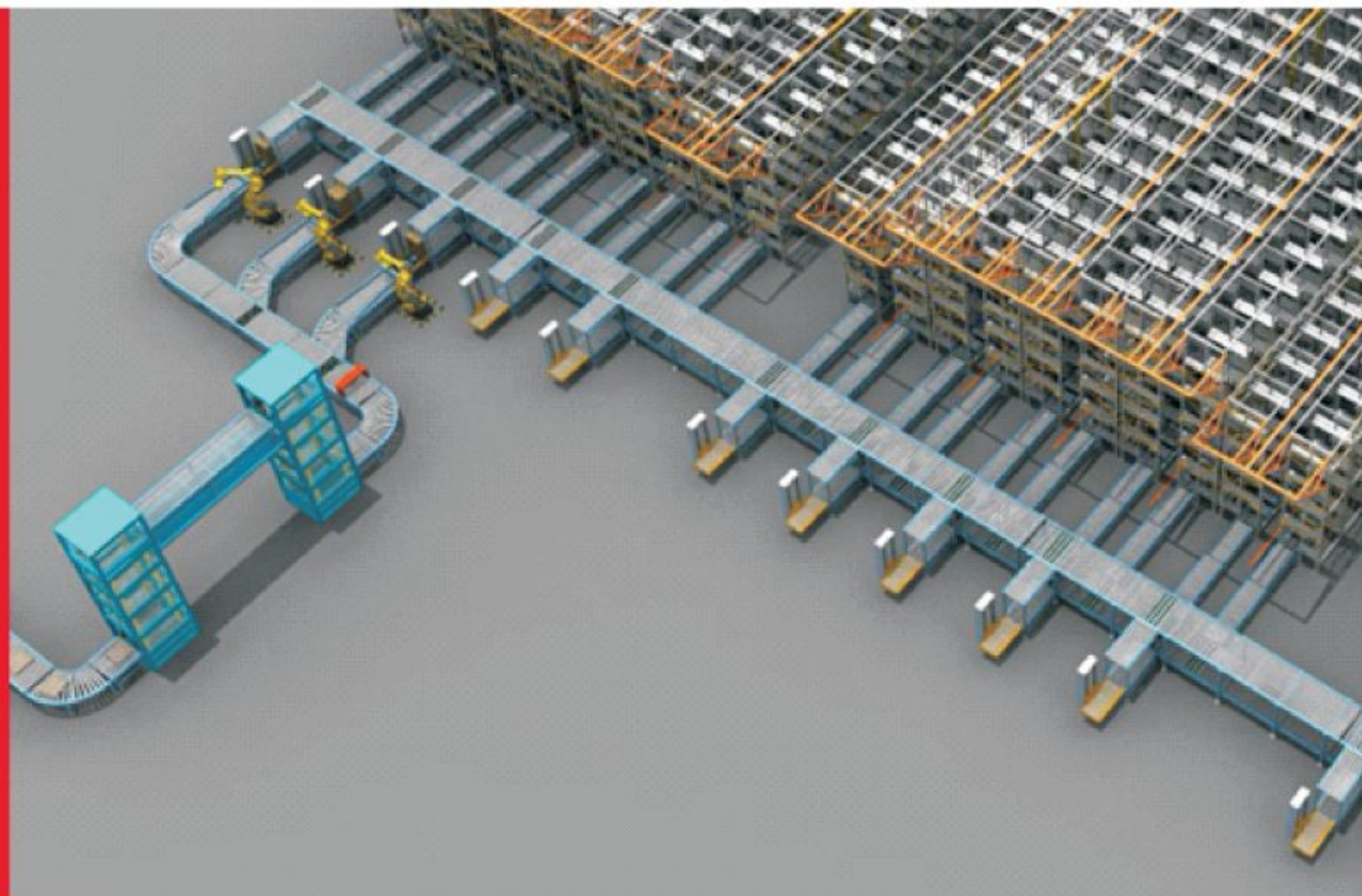


调度系统 | Dispatch system  
可对接ERP系统，调度系统自动计算路径，超高效运行。  
Can be connected to the ERP system, the scheduling system automatically calculates the path, and runs ultra-efficiently.

| 技术参数                         |                                  |   |
|------------------------------|----------------------------------|---|
| 基本信息 Basic Information       | 外形尺寸 Dimensions                  | 2095*990*2175mm   |
|                              | 车体自重 Body weight                 | 850KG   |
|                              | 电显方式 Electric display            | 液晶显示屏 LCD   |
|                              | 控制系统 Control System              | 韩信系统 Han Xin System                                       |
| 运载信息 Carrying information    | 运载能力(负载)Load                     | 1500KG  |
|                              | 前进速度 Forward speed               | 1.2m/s  |
| 运行信息 Operational information | 举升高度 Lift height                 | 1.6m  |
|                              | 导航方式 Navigation method           | 激光 Laser  |
|                              | 行走方向 Walking direction           | 两轮驱动 Two-wheel drive                                      |
| 精度 Precision                 | 最小转弯半径 Minimum turning radius    | 1630mm  |
|                              | 障碍物检测范围 Obstacle detection range | 0-8000mm  |
| 电池信息 Battery information     | 定位精度 positioning accuracy        | ±2mm  |
|                              | 导航精度 Navigation accuracy         | ±5mm  |
|                              | 充电方式 charging method             | 自动在线充电 / 手动充电 Automatic online charging / manual charging |
| 驱动方式 Drive mode              | 充电时间 Charging time               | 4h(10A)或 2h(20A)  |
|                              | 运行时间 operation hours             | 8h  |
| 其他 other                     | 电机类型 Motor type                  | 交流电机 AC motor   |
|                              | 输出功率 Output Power                | 1.5KW   |
|                              | 安全系统 Security system             | 激光避障、安全触边 Laser obstacle avoidance, safe touch            |
| 报警形式 Alarm form              | 声、光报警 Audible alarm              |   |

## 04 智能仓储系统

Stereoscopic warehouse system



# STEREOSCOPIC WAREHOUSE SYSTEM

## 智能仓储

自动化立体智能仓储，是一套利用自动化存储设备与计算机管理系统共同协作的智能系统，可以实现立体仓库的高层合理化、存取自动化以及操作简便化。

根据每个客户的具体需求及条件，量身定做高效节能、经济实惠的立体仓库

Auto three-dimensional intelligent storage, is a system realized via collaboration of auto storage devices with computer management system. High-layer rationalization, storage and fetch automation, and operation simplification to be realized for 3-D Storage.

On customers' requirements and conditions to customize and design an high efficient, energy-saving, economical and practical 3-D Warehouse.

### 系统特点

- 标准化设计；
- 高端的机械、电气配置，设备可靠性高；
- 多重机械、电气安全保护及运行联锁措施，安全系数高；
- 采用国际知名品牌减速电机；
- 垂直及行走方向采用激光绝对认址方式；
- 信息传输采用红外光通讯（或无线通讯）；
- 采用国际知名品牌的可编程控制器；
- 具备载货单元外形检测及重量检测；
- 管式或柔性滑触线供电；
- 可与周边的各种物流设备结合，形成完整的自动化物流存储系统；
- 系统可实现维修、手动、单机自动和联机自动控制模式。

### Features

- Standardized design;
- Advanced mechanical and electrical configuration, high reliability of equipment;
- Multiple mechanical, electrical safety protection and operation interlocking measures with high safety factor;
- Adopt international famous brand geared motors;
- Vertical and mobile direction adopts laser absolute addressing mode;
- Information transmission uses infrared optical communication (or wireless communication);
- Adopting programmable controllers of internationally renowned brands;
- It has the shape detection and weight detection of the cargo unit;
- Pipe or flexible sliding contact power supply;
- Can be combined with various logistics equipment in the surrounding to form a complete automated logistics storage system;
- The system can achieve maintenance, manual, single automatic and linkage control mode.

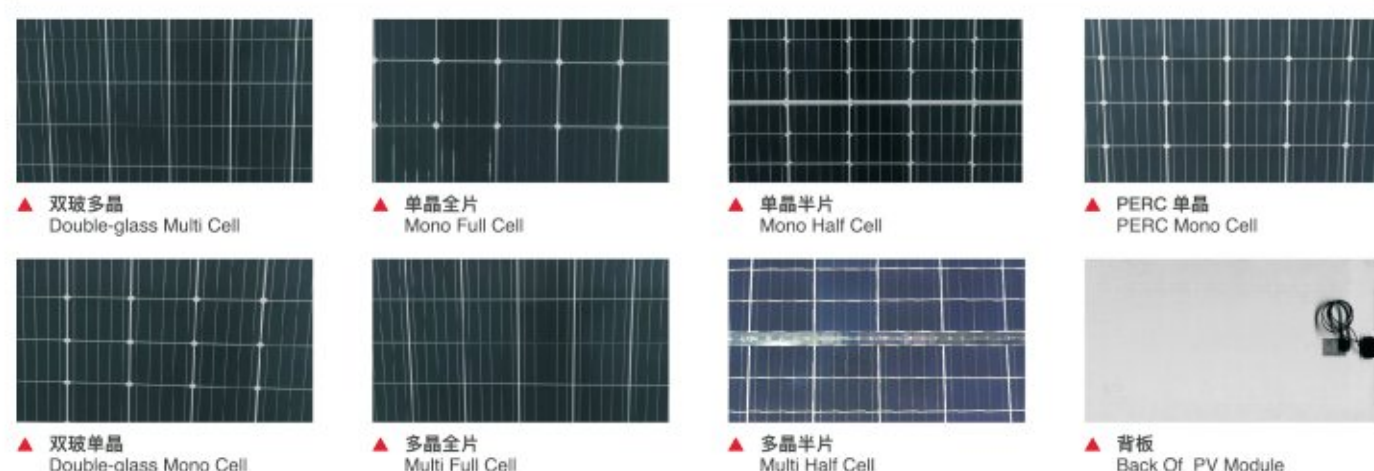


# 05 AI机器视觉智能检测 Machinery vision intelligent detection system

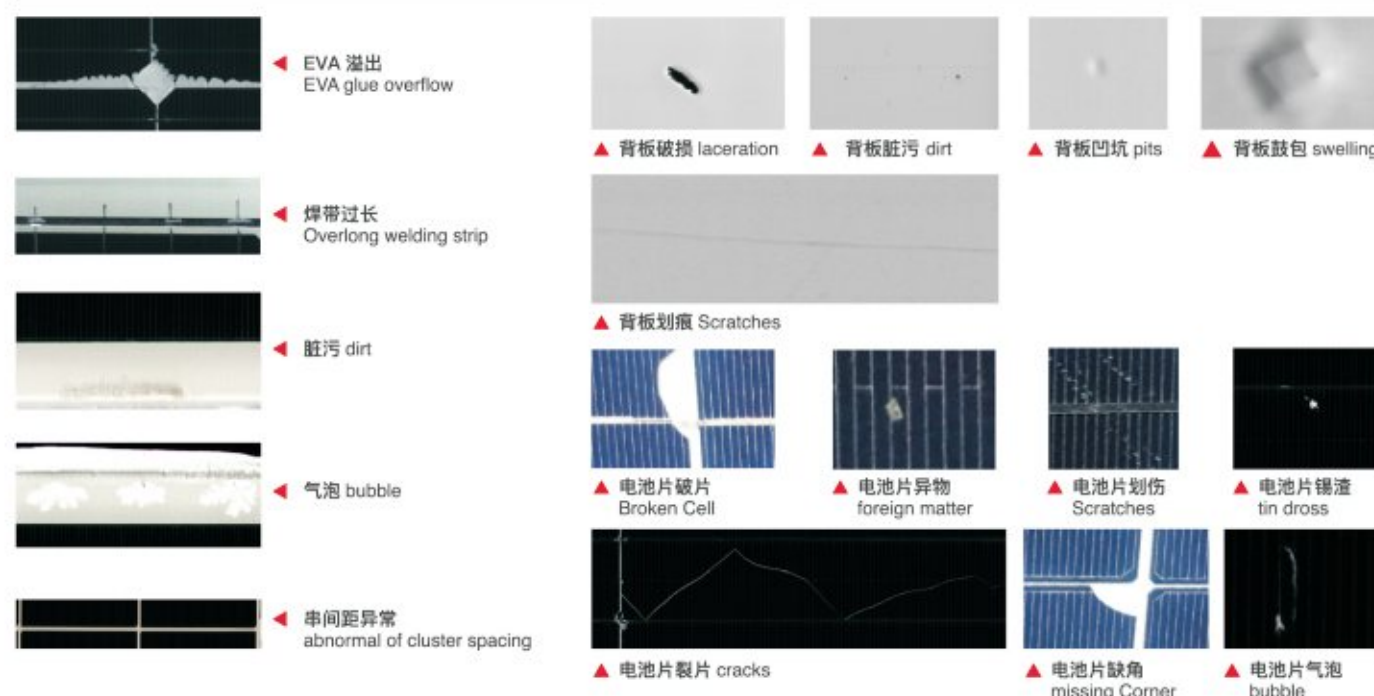
## MODULE APPEARANCE AUTO DETECTION SYSTEM

### 外观检测自动识别系统

#### 光伏组件类型 Compatible PV Module Type



#### 检测主要缺陷示例图 What are we inspecting?



#### 产品特点 Feature

- 实时在线检测,提高了生产检测效率,同时极大的降低流水线的人力成本。  
Real-time on-line detection improves the efficiency of production detection and greatly reduces the labor cost of the pipeline.
- 实现对缺陷进行自动识别与判断,自动报警和上传检测数据。  
Automatic identification and judgment of defects, automatic alarm and upload detection data.
- 条码自动识别,适应多种类型的组件,对于常规组件、非常规组件可进行自动识别与标识。  
Automatic Bar Code Recognition; Adapt to various types of PV module, automatic identification and labeling of conventional PV module, unconventional PV module.
- 快速进行产品切换,适应小量多样的组件类型。  
Fast product changing-over; Adapt to small yield and diverse PV module.
- 自主学习功能,边检测边学习,不仅能提高当前产品类型的准确度,还能学习新的产品类型。  
Autonomous learning function, while testing while learning; not only can improve the accuracy of current product types, but also learn new product types.
- 与 ERP 系统对接,实现检测设备的远程化管理。  
Connect with ERP system to realize remote management of testing equipment.



#### 技术参数 Specifications

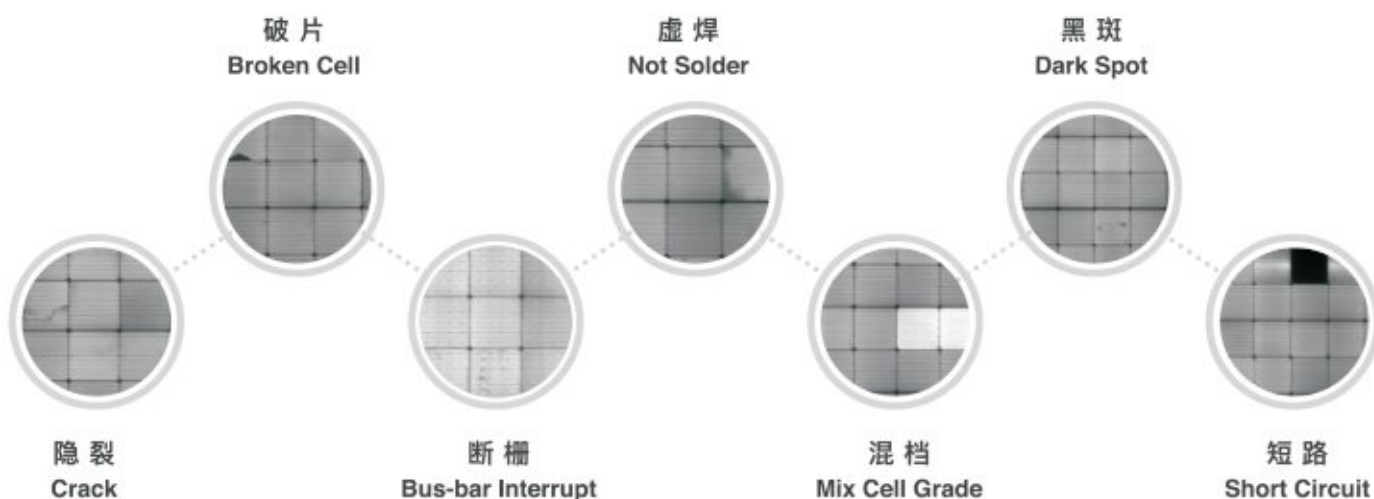
| 产品型号 Product model                | HDC-MI900   | HDC-MIL901     |
|-----------------------------------|---|----------------|
| 组件类型 Module type                  | 单、多晶电池片组件(60、72片)、双玻电池组件、半片电池组件、PERC 单晶 Mono, Multi cell(60, 72), Double-glass, Half cell, PERC Mono cell |                |
| 检测区域 Detection region             | 缺陷类型 Type of defect   |                |
| 背板 Back Of PV Module              | 凹坑 Pits   |                |
|                                   | 鼓包 swelling   |                |
|                                   | 划伤 laceration   |                |
|                                   | 划伤 Scratches  |                |
|                                   | 脏污 Dirt   |                |
|                                   | 气泡 Bubble   |                |
| 电池片 Cell                          | 破片 Broken Cell  |                |
|                                   | 划伤 Scratches Cell   |                |
|                                   | 串间距、片间距异常 abnormal of cell and cluster spacing  |                |
|                                   | 焊带过长 Overlong welding strip   |                |
|                                   | 锡渣、锡丝 Tin dross; Tin wire   |                |
|                                   | 昆虫 insect   |                |
| 其他区域 Other regions                | 气泡 Bubble   |                |
|                                   | 白色 EVA 褶皱 EVA fold  |                |
|                                   | 脏污 Dirt   |                |
| 检测方式 Detection mode               | 正面 + 背面同时检测(可选只正面检测) Front + Back (Only Front)  |                |
| 相机配置 Camera                       | 彩色高端线扫 + 黑白高端线扫 High-end Color line scan + black and white line scan                                      |                |
| 光源配置 Light source                 | 高端定制光源 High-end customized light source   |                |
| 缺陷判断方式 Defect judgment method     | 自动判断 Automatic  |                |
| 显示方式 Display                      | 55寸大屏显示(显示内容可自由切换) 55 inch large screen display   |                |
| 组件大小 Size                         | 2m*1m   |                |
| 边框 Frame                          | 无 No  |                |
| 进板方式 Entry mode                   | 短边进 Short edge entry  |                |
| 运动速度 Speed                        | 18m/s   |                |
| 检测时间 Detection time               | Max 25s   |                |
| 流水线 Assembly Line                 | 无 No  | 有 Yes          |
| 设备尺寸 (mm) Dimension               | 1450*400*2400(L*W*H)  | 1450*4600*2400 |
| 设备重量 (kg) Weight                  | 450   | 500            |
| 电柜尺寸 (mm) Power Cabinet Dimension | 300*750*1100(L*W*H)   |                |
| 供电要求 Power Supply                 | AC220V/50Hz/16A   |                |
| 设备功率 Power                        | 2.2KW   | 2.7KW          |
| 其他模块 Additional Features          | 条码识读, 缺陷统计, 自动报警功能 Identify barcode; Defect statistics; Automatic alarm function                          |                |

05 AI机器视觉智能检测  
Machinery vision intelligent detection system

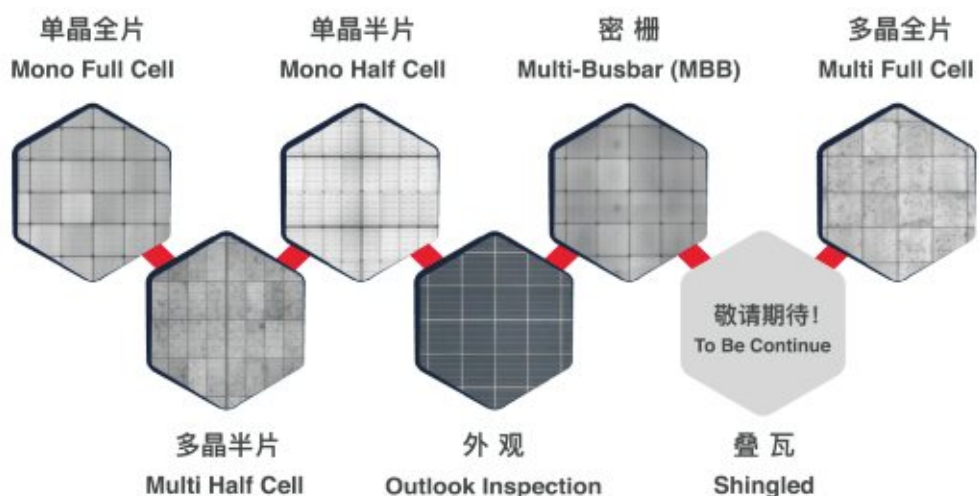
# EL AUTO IMAGE RECOGNITION SYSTEM

## EL影像自动识别系统

我们在检测什么? What are we inspecting?



可以测试的组件类型 Compatible Cell Type



### 新产品快速爬坡 Fast Ramping Time for New Product



密栅、叠瓦、双面等产品焊接难点通过  
串 EL 自动判定快速定位异常发生点, 缩减工艺窗口寻找周期

Multi-Busbar, Shingled, Bi-facial & etc. product welding point detection  
Automatic detection of abnormal occurrence points by String EL function and reduction of searching period of on monitor

### 判定、返修人力精简 Lean on Manpower for Manual Detection & Rework



串 EL 自动判定导入后大幅降低组件返修率(组返人力), 串返修率基于隐裂大部分来源于组件返修换串小幅上升但返修难度减少

After Automatic String EL Detection are in place, the rate of repair (module level repairing manpower) will be greatly reduced. String repairing rate is based on the fact that most of the cracks are caused by the repairing string of at module level, but the difficulty of repairing will be reduced.

### 电池片损失降低 Reduced Loss of Cell



串 EL 自动判定引入避免焊机至层前 EL 过程中的 WIP 批量不良, 从而有效降低因焊机批量不良导致的破片率。

Automatic String EL Detection can avoid massive defect WIP occurrences from Stringer to Pre-Lamination EL, it can prevent massive defect string produced by stringer

### 质量良率提升 Yield of Quality Improve



前后道组件 EL 自动判定统一质量标准, 避免人员应疲劳操作导致的漏检, 从而消除前道 EL 漏检提升良率

With standardized of detection protocol, Pre & Post Lamination module EL automatic detection can reduced human dependent factor which cause miss detection due to fatigue for long operation can improve yield.

### 产线快速切换 Fast Change-over Time

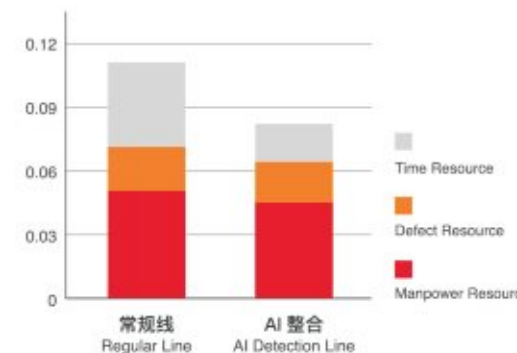


小量多样的市场需求愈发明显, 快速定位并解决异常时智能判定的核心作用, 帮助客户不再为虚焊隐裂而发愁

Multiple type product market demand is becoming more and more obvious, the core role of rapid positioning and intelligent judgment in solving abnormal situations is to help customers stop worrying about hidden cracks in virtual welding.

#### A 公司密栅产品引入智能判定前后对比

Comparisons of AI Detection before and after of Multi-Busbar



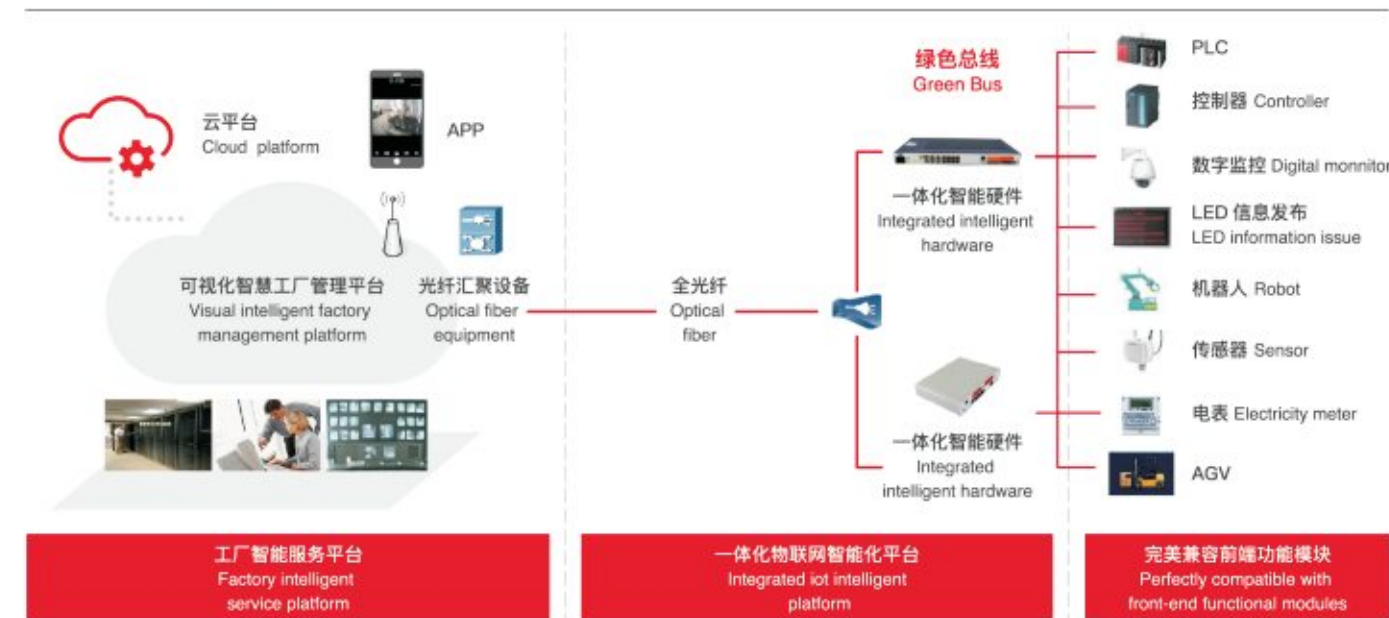
| 单线生产指标 Single Line KPI                        | 原模式 Original | 智能判定 AI Detection |
|---|--------------|-------------------|
| 组件日产量(块) Daily Module Output (piece)          | 1800         | 2330              |
| 满产达成时间(天) Reach Full Product Capacity (day)   | 5            | 2                 |
| 组件返修率(%) Module Rework Rate (%)               | 18.2         | 5.7               |
| 组件返修人力(人) Module Rework Manpower (pax)        | 12           | 4                 |
| 串返修率(%) String Rework Rate (%)                | 4.3          | 3.8               |
| 串返修人力(人) String Rework Manpower (pax)         | 5            | 5                 |
| 破片率 / 工损率(%) Defect Rate (%)                  | 0.32         | 0.28              |
| 串焊机日均故障时间(h) Stringer Daily Downtime (h)      | 1.87         | 1.15              |
| 焊接不良成品降级率(%) String Down Grade Rate (%)       | 0.15         | 0.05              |
| 年创造收益(万元) Annual revenue generation (10K RMB) |              | 354(万元)           |

# 06 智慧工厂管理系统

Smart factory management system



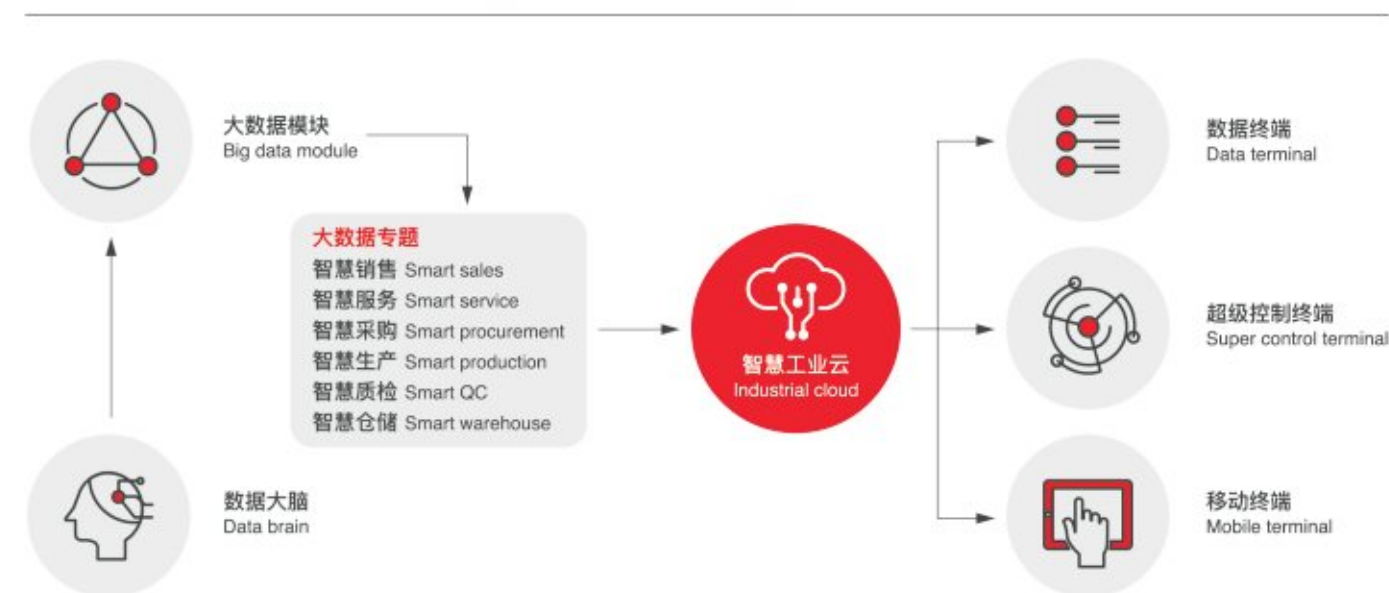
## 智慧工厂 - 工业物联网 Smart factory - industrial Internet of things



智能感知和云架构的控制系统作为核心生产控制手段,工业物联网技术,在供应链体系中应用传感网络技术,基于智能传感器,智能设备,实现数据自动采集,生产环节智能监测,生产全流程自动控制,并为生产工艺过程优化提供基础支撑。

Intelligent perception and cloud architecture control system as the core means of production control,Industrial iot technology, the application of sensor network technology in the supply chain system, based onIntelligent sensor, intelligent equipment, realize automatic data collection, productionIntelligent monitoring, automatic control of the whole production process, and provide foundation support for the production process optimization.

## 智慧工厂 - 工业大数据 Smart factory - industrial big data



工业大数据应用将企业数据和外部数据各类要素信息实现同步采集、管理和调用,从各类活动数据中通过统计分析、特征提取、关联挖掘、模式识别和深度学习等智能分析方法,实现活动数据的认知和预测,分析数据通过两个平台的实时传输接口,反应至“企业数据云”和“工业大数据云”,所有数据通过云平台发布至“企业互联和互动门户”。

Applications of industrial big data synchronize the acquisition, management, and calling of data from enterprises and external. Through intelligent analysis methods, such as statistical analysis, feature extraction, association mining, pattern recognition and deep learning etc, realize cognition and prediction of activity data. The analysis data is transmitted to“enterprise data cloud” and “industrial big data cloud” through the real-time transmission interface of the two platforms, and all data is released to the “enterprise Internet and interactive portal” through the cloud platform.



# 06 智慧工厂管理系统

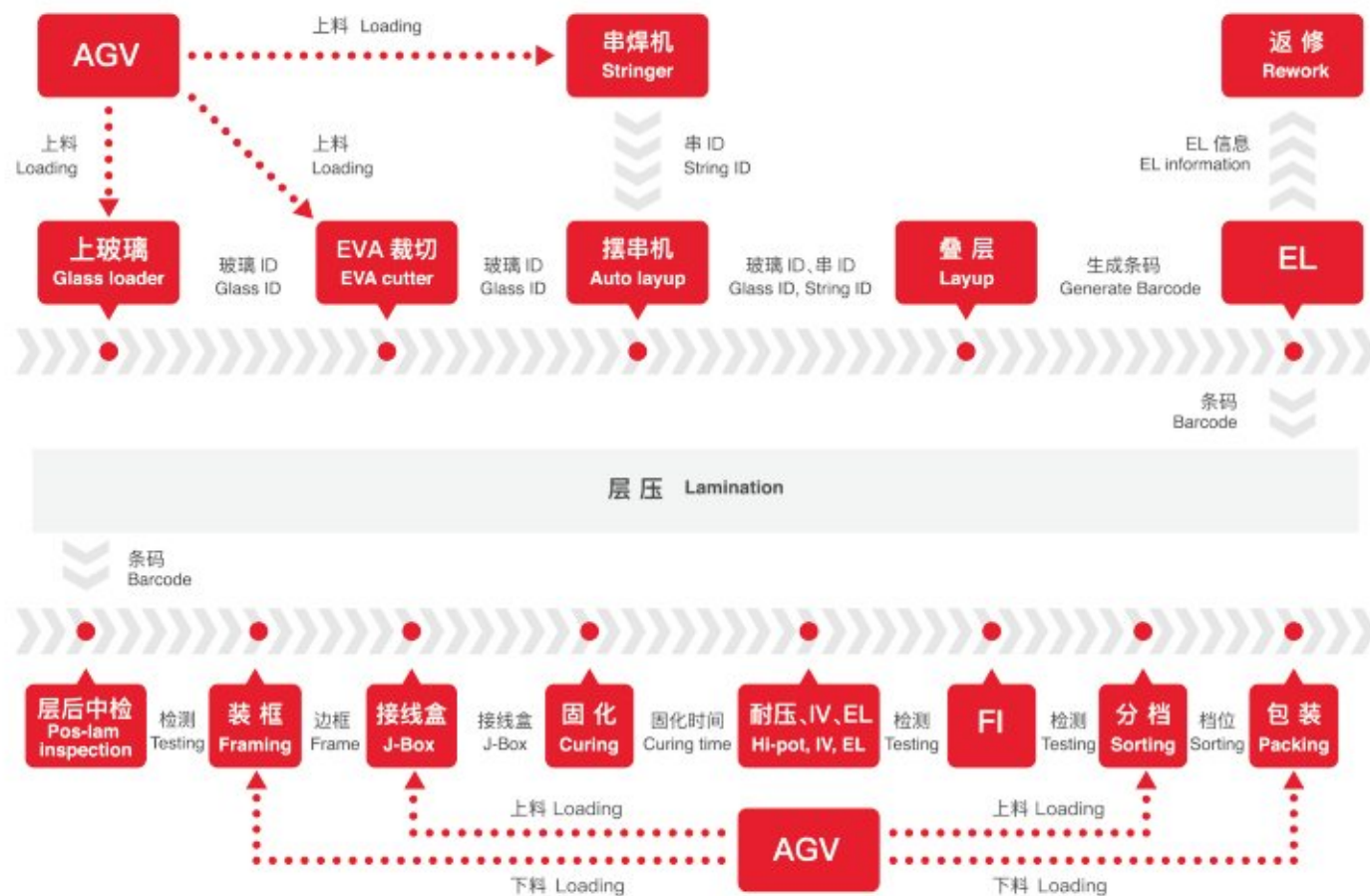
Smart factory management system

## SMART FACTORY-MES

### 智慧工厂-生产执行系统 (SC-MES)

- 改善企业生产计划的制定和调整  
Improve the formulation and adjustment of production plan
- 加快企业生产计划执行状况的反馈速度  
Speed up the feedback speed of production plan execution
- 改善设备管理状况  
Improve equipment management
- 极力改善生产过程中的质量控制力度  
Improve the quality control in the production process
- 极大地改善了企业的实时数据报表能力  
Greatly improve the real-time data reporting capabilities of enterprises
- 消除企业中的信息孤岛, 实现企业内部的信息共享  
Eliminate the information island in the enterprise, realize the information sharing within the enterprise

#### 智慧工厂-MES 主要管控站点



#### MES 亮点 MES Features

- 融合性:** 系统和设备高度融合, 软件驱动设备  
Integration: Highly integrated system and equipment, software driver device
- 信息中枢:** MES 系统双向通讯, 提供整个供应链的生产活动信息, 无缝对接 ERP, 避免信息孤岛实时大屏监控看板  
Information center: MES system two-way communication, provide production activity information of whole supply chain, seamless connect ERP, avoid information island, real-time large screen monitor board.
- 可追溯:** 全生命周期产品追溯, 全生命周期设备追溯  
Traceability: Full life cycle product traceability, full life cycle equipment traceability
- 实时性:** MES 实时收集采集数据和信息, 并分析处理  
Real-time: MES collects and processes data and information in real time