**100MW Solar Panel Production Line**

**Technical Specifications**

**附件Attachment**

**附件1 Attachment 1：**

1. EVA/TPT裁切铺设机 EVA/TPT Cutting&Layup Machine

1. 机器人排版机 Robot Layup Machine
2. 二次上玻璃机 2nd Glass Loading Machine

4. EL+外观一体机 EL + Appearance All-in-one Machine

5. 气动在线组框机 Pneumatic Online Framing Machine

6. 接线盒涂胶机（离线）J-Box Glue Dispenser Machine(offline)

7. AB双组份打胶机（离线）AB Two-component Glue Filling Machine (offline)

8. 固化上下料移栽机+固化线 Curing Line Load And Unload Transplanting Machine+Curing Line

9. 180°翻转 180°Flip

10. 绝缘耐压测试 Insulation Withstand Voltage Test(HIPOT)

11. 双玻返修移栽机Double Glass Repair Transplanting Machine

12. 90度转向(升降换向传输机) 90° Turning

13. （横向/纵向）堆栈 Buffer

14. 手自一体旋转 Manual&Automatic Integrated Rotation

15. 纵向传输折叠通道 Longitudinal Conveyor Folding Aisle

16. （横向/纵向规正）传输机 Lateral/Longitudinal Alignment Conveyor

17. 3600无损激光划片机3600 No-constructive Cell Scribing Machine

18. 2000串焊机 2000 Solar Cell Tabber Stringer Machine

19. 2761层压机 2761 Laminator

20. 全自动IV测试仪CT-500（下打光）Automatic Bottom-light IV Tester CT-500

21. 手自一体旋转 Manual&Automatic Integrated Rotation

22. 在线EL检测仪 EL Tester

23. 自动分档机 Automatic Grading Machine

**附件2**

**Attachment 2：**

1. **生产范围Manufacturing Scope**

根据协议，将建立一条光伏组件自动化生产线。它由以下部分组成：

1.层前：上玻璃区，EVA上料区、排版，人工汇流焊区域、EVA和背板上料区、层前EL检查和返修区、堆栈（产线组件缓存工艺）、输送系统。

2.层后：修边和打胶装框区、接线盒焊接灌胶区、固化线、清洗和测试区、输送系统。

Under the agreement, an automated production line for photovoltaic modules will be established. It consists of the following parts:

1.Pre-lamination: glass loading area, EVA loading area, layup, manual convergence welding area, EVA and backsheet loading area, pre-lamination EL inspection and rework area, stack station (production line module caching process), conveying system.

2.After lamination: trimming and gluing framing area, junction box welding and gluing area, curing line, cleaning and testing area, conveying system.

1. **组件信息和需求：Module information and requirement:**

1.光伏组件生产线（1条）;

2.产能：100mw;

3.产组件类型：单玻组件;

4.组件电池尺寸： 166-210mm;

5.组件大小： L(1650~2500mm) x W(990~1400mm) x T(25~45mm);

6.组件焊带类型：扁焊带/圆焊丝。

1.Photovoltaic module production line (1 pcs).

2.Production capacity: 100mw.

3.Production module type: single-glass, double-glass module.

4.Module cell size: 166-210mm.

5. Module size: L(1650~2500mm) x W(990~1400mm) x T(25~45mm).

Module welding tape type: flat welding tape/round welding wire.

**三、 厂务要求：Factory Requirements**

1.电力供应：

进线主电源：380V 50Hz三相5线，单相220V。

2.空气压力需求：

空气压力需求：0.65〜0.8 Mpa。

3.建筑需求：

平整度：±10mm

高度：至少3.4米，

承重：至少1.0T / ㎡

1. Power supply:

Incoming main power supply: 380V 50Hz three-phase 5-wire, single-phase 220V .

2. Air pressure demand:

Air pressure demand: 0.65 ~ 0.8 Mpa.

3. Building demand:

Flatness: ±10mm

Height: at least 3.4 meters.

Load-bearing capacity: at least 1.0T / m2

**四、传输规范: Transmission Standard**

1.传输到达要求：所有传输单元适用于组件范围内的组件类型

2.传输速度：理论速度15-25m/分钟

3.传输高度：950mm ±50mm

4.传输单元间距：50到100mm

5.传输稳定性：组件传输过程中没有明显的抖动，位置偏差.

1.Transmission arrival requirements: all transmission units are applicable to component types within the component range

2. Transmission speed: Theoretical speed 15-25m/minute

3.Transmission height: 950mm ±50mm

4.Transmission unit spacing: 50 to 100mm

5.Transmission stability: no obvious jitter, position deviation during component transmission.

**五、通用设备规范：General equipment specification:**

**1.基本要求 Basic Requirement**

1.噪音：≤75 dbA

2.操作环境：在正常室温 （ 25 ± 5 ℃ ） 下运行。

3.配三色灯和蜂鸣器声音报警，所有单机都要配有地脚。

4.适用于60，72，120,144，132组件，具体参照由客户提供的组件图纸。

5.设备良率：99.5%。

6.整线设备稼动率：99.5%（因流水线造成的不良≤0.5%）。

1.Noise: ≤75 dbA

2.Operating environment: operating at normal room temperature (25 ± 5 ℃).

3.With three-color light and buzzer sound warning , all single machine should be equipped with ground feet.

4.Applicable to 60,72,120,144,132 components, refer to the component drawings provided by the customer.

5. Equipment yield: 99.5%.

6.Crop rate of the whole line of equipment: 99.5% (defects caused by the assembly line ≤ 0.5%).

**2. 配置要求 Configuration Requirement**

1.流水线兼容硅片组件生产需要，流水线采用模块化设计，为便于安装维修，每个模块单元必须采用变频器调速50HZ;

2.传输带支撑横梁：高强度铝型材，表面阳极氧化，美观耐用。马达安装板：Q235铁板，表面喷塑。机架：采用钢管焊接而成；模块化机架设计，便于安装、调试和运输。安全维护：同步带更换简单易操作，并配有安全防护;

3.所有的钢性部件要避免生锈;

4.输送皮带层整线采用绿色布面同步带，确保耐高温及镀膜玻璃表面传输无皮带印。传输带为对组件正面镀膜层无损伤的耐磨材料。操作工位主被动轮与皮带间隙尽量小，防止手指卷入;

5.流水线高度及调节范围：高度950±50mm，相邻两端高度差≤2mm;

6.层压前段速度15-25米/分可调；层压后段速度15-25米/分可调;

7.控制：采用PLC控制，传感器+电气控制。感应器用于降低移动的速度并且停止运行;

具有互动连锁控制、警示功能，确保操作安全合理;

8.层压后组件冷却：层压后段流水线至修边工位前安装静音冷却铁叶风扇，每个出料单元2个以上，过渡单元2个以上，旋转单元2个以上；

9.所使用电机等机械装置具有良好的性能和使用寿命，维护方便、快捷;

10.提供电气设计图纸。电器元件布局整齐规范，各档线、元件集中在控制柜中，各部件有明确注释，线号、管号有明确标示并与图纸一一对应，图纸中线路的起始位置需要明确标注该点位从哪页哪行来或到哪页哪行去。所有设备应具备良好接地，急停开关采用24V低压电源;

11.整线设备稼动率：≥99.5%（故障时间包含瞬间故障停止时间、故障时间，各工序故障时间累加统计）;

12.设备软件权限：操作工、工程师、管理员，全部软件备份及制作安装盘。操作界面支持中（英）文切换。操作屏带屏保功能，屏保状态下进入界面需要输入密码，参数校位等界面需要密码输入;

13.使用带蜂鸣器三色灯，报警声音为蜂鸣，反馈异常信息功能；

A、绿灯：设备正常运转中

B、黄灯：设备停止、维护、或者手动模式

C、红灯：设备异常或故障、报警;

14.测试设备的数据存储，保证断电情况下不丢失;

15.层压机前上料单元做到层压件精准上料：横向和竖向输送方向上有机械归正机构与光电定位，归正精度小于±2mm（剔除材料因素）;

16.作业线体上设OK和NG按钮，且具备记忆功能，双人作业线体两侧操作必需各有一组按钮；配物料放置盒;

17.折叠通道角度接近80度;

18.机械手起步动作或停止动作时无晃动，机械手具备有料检测和限位保护的功能;

19.线体重复升降机需加装安全围栏，且有急停按钮;

20.过道使用气缸或人工伸缩/折叠通道;

21.气缸用磁性开关，扎带走线时松紧适中，防止将磁性开关线弄断;

22.移栽伺服速度可在操作屏调整;

23. 边框厚度25-45mm，固化及分类支持吸取和抓取功能，仅适用于有C边边框;

24.流水线输送平稳，组件表面无划痕、皮带印、滚轮印、破损;

25.IV测试设备进料前配带规正流水线；

26.组件进入叠焊机、层压机、功率测试仪器等单机设备前配置归正流水线单元。

1. The assembly line is compatible with the needs of silicon wafer module production, the assembly line adopts modular design, in order to facilitate the installation and maintenance, each modular unit must adopt frequency converter speed regulation 50HZ.

2. Transfer belt support beam: high-strength aluminum profile, anodized surface, beautiful and durable. Motor mounting plate: Q235 iron plate with plastic spraying surface. Frame: welded with steel pipe; modular frame design, easy to install, debug and transport. Safety maintenance: synchronous belt replacement is simple and easy to operate, and equipped with safety protection.

3. All steel parts should avoid rusting.

4. The whole line of conveyor belt layer adopts green cloth synchronous belt to ensure high temperature resistance and transmission of coated glass surface without belt marks. The conveyor belt is made of wear-resistant material that does not damage the coated layer on the front side of the component. The gap between the active and passive wheels of the operating station and the belt is as small as possible to prevent fingers from being involved.

5. Height and adjustment range of the assembly line: Height 950±50mm, height difference between neighboring ends ≤2mm;

6. The speed of the front section of lamination is adjustable from 15 to 25 meters/minute; the speed of the back section of lamination is adjustable from 15 to 25 meters/minute;

7. Control: PLC control, sensor + electrical control. Sensor is used to reduce the speed of movement and stop running.

It has interactive chain control and warning function to ensure safe and reasonable operation.

1. Cooling of components after lamination: Silent cooling iron blade fans are installed in front of the assembly line to the trimming station in the back section of lamination, more than 2 for each discharging unit, more than 2 for the transition unit, and more than 2 for the rotating unit;

9. The motor and other mechanical devices used have good performance and service life, and maintenance is convenient and quick.

10. Provide electrical design drawings. The layout of electrical components is neat and standardized, each file line, components are concentrated in the control cabinet, each component has a clear annotation, the line number, pipe number is clearly marked and corresponds to the drawings one by one, the starting position of the line in the drawings need to be clearly labeled from which page which line or to which page which line of the point to go. All equipment should have good grounding, and the emergency stop switch adopts 24V low-voltage power supply.

11. The whole line of equipment crop rate: ≥ 99.5% (fault time including instantaneous fault stop time, fault time, fault time of each process cumulative statistics).

12. Equipment software rights: operators, engineers, administrators, all software backup and production installation disk. The operation interface supports Chinese (English) language switching. Operating screen with screen saver function, screen saver state to enter the interface needs to enter the password, parameter calibration and other interfaces need to enter the password.

13. The use of three-color light with buzzer, alarm sound for the buzzer, feedback abnormal information function;

A. Green light: equipment in normal operation

B, yellow light: equipment stop, maintenance, or manual mode

C, red light: equipment abnormal or fault, alarm

1. Test the data storage of the equipment to ensure that the power failure is not lost.

15. Laminating machine before the loading unit to do laminating parts accurate loading: horizontal and vertical conveying direction with mechanical correction mechanism and photoelectric positioning, correction accuracy of less than ± 2mm (excluding material factors).

16. There are OK and NG buttons on the operation line, and it has memory function, and there are one set of buttons on each side of the two-person operation line; it is equipped with material placing box.

17. The angle of the folding channel is close to 80 degrees.

18. No shaking when the robot starts or stops moving, and the robot has the function of material detection and limit protection.

19.The line repeated lifts need to be installed with safety fences, and have emergency stop button

20. Aisle using cylinders or manual telescopic / folding channel.

21. Cylinder with a magnetic switch, tie off the line when loose and tight, to prevent the magnetic switch line broken.

22. Transplanting servo speed can be adjusted at the operation screen.

23. Border thickness 25-45mm, curing and sorting support sucking and grasping function, only for with C edge border.

24. Smooth conveyance of assembly line, no scratches, belt marks, roller marks or breakage on component surface.

25. IV test equipment before feeding with the belt gauge assembly line;

26. Components into the stack welding machine, laminating machine, power testing instruments and other stand-alone equipment before the configuration of the normalization assembly line unit.

**3. 安全性能和操作安全性的要求Requirements for safety features and operational safety**

1.设备上按照ISO7010张贴安全警示标示，报警和故障有声光提醒。

2.具有警示功能，确保操作安全合理，所有单机机械运动部件需有安全防护围栏。

3.设备电源线接头和预留插座需符合项目国家使用规范。

4.设备调试完成后所有单机程序进行备份

5.所有管道、电缆线、信号线、指示灯、开关以及所有的中文标签都需要有标识。

6.接入线槽的电缆必须有套管保护，接口处电气专用螺纹接头保护，套管和接头必须紧密连接，不能有松动。

7.按下紧急停止按钮必须切断所有危险动作。

8）按下光栅或安全门的申请按钮时指示灯开始闪烁，设备完成当前循环动作后自动回到原点，指示灯常亮，按下复位键后设备开始自动运行。

9.设备包装具有良好防水功能。

10.设备电气接线与电气图纸必须保持一致（包含电箱图纸），电气图纸中线末端需要标注清楚走向具体位置。

11.所有运动部件必须有机械安全防护和电气安全互锁。

12.层压前配1套操控屏,层压后配1套操作屏。

13.合理配置流水线中间人工通道，通道收起后宽度大于30cm。

14.单机设备的所有报警都需要有报警提醒和记录。

15.设备设计结构合理，满足2500\*1400生产需求，无框组件流线不能出现下垂。

16.流水线与单机设备操作界面、通用功能操作同项目需要保持一致，复位需要从按键上进行，而不是从操作屏。

1. Safety warning labels are posted on the equipment in accordance with ISO7010, and there are sound and light reminders for alarms and malfunctions.

2. With a warning function to ensure that the operation is safe and reasonable, all single mechanical moving parts need to have a safety fence.

3. The equipment power cord connector and reserved socket need to comply with the utilization norms of the project country.

4. After the device is debugged, back up all single-machine programs.

5. All pipes, cables, signal lines, lights, switches and all Chinese labels need to be marked.

6. Access to the cable trough must be protected by a casing, the interface electrical special threaded connector protection, casing and connector must be tightly connected, there can be no loosening.

7. Press the emergency stop button must cut off all dangerous actions.

8. Press the application button of the grating or safety gate when the indicator begins to flash, and the equipment completes the current cycle of action automatically return to the origin, the indicator light is always on, press the reset button and the equipment begins to run automatically.

9. The equipment is packed with good waterproof function.

10. Equipment electrical wiring and electrical drawings must be consistent (including electrical box drawings), the end of the line in the electrical drawings need to be labeled clearly towards the specific location.

11. All moving parts must have mechanical safety protection and electrical safety interlocks.

12. Before lamination with a set of control screen, after lamination with a set of operating screen.

13. Reasonable configuration of the assembly line in the middle of the artificial channel, the width of the channel is more than 30cm after closing.

14. All alarms of single equipment need to have alarm reminders and records.

15. The equipment design structure is reasonable to meet the 2500 \* 1400 production needs, frameless component flow line can not appear sagging.

16. Assembly line and stand-alone equipment operating interface, general function operation with the project needs to be consistent, reset needs to be carried out from the keys, not from the operating screen.