

Linton

WAFER SINGULATOR & CLEANER

FC-011L



插片清洗一体机 Wafer Singulator & Cleaner FC-011L

1. 设备整体概述 Overall overview of the equipment

1.设备描述 Equipment description

| 序号 No | 项目 Item | 描述 Description |
|-----------------------------|---------------------------------|--|
| 插片机部分 Inserters section | | |
| 1 | 主要功能 Main Functions | 对太阳能电池用硅片进行插片处理 Insertion of silicon wafers for solar cells |
| 2 | 上下料 Loading and unloading | 人工上料/自动化下料 Manual feeding/automated feeding |
| 3 | 过程控制 Process Control | 品牌 PLC 自动控制, 设备自动处理 Brand PLC automatic control, equipment automatic processing |
| 4 | 碎片率 Fragmentation rate | ≤0.2% (排除人为因素和硅片自身质量问题) (excluding human factors and silicon wafer's own quality problems) |
| 5 | UPTIME | 98% (23h/天, 年工作日在 353 天以上) (23h/day, with more than 353 working days per year) |
| 6 | MTBF | >500H |
| 7 | MTTR | <2H |
| 8 | 设备噪音 Equipment noise | ≤65 dB |
| 10 | 平均用水量 Average water consumption | <1m³/h |
| 清洗机部分 Cleaning machine part | | |
| 1 | 主要功能 Main Functions | 对太阳能电池用硅片进行清洗处理 Cleaning process for silicon wafers for solar cells |
| 2 | 上下料 Loading and unloading | 自动化上料/下料 Automatic loading/unloading |
| 3 | 过程控制 Process Control | 品牌 PLC 自动控制, 设备自动处理 Brand PLC automatic control, equipment automatic processing |
| 4 | 碎片率 Fragmentation rate | ≤0.1% (排除人为因素和硅片自身质量问题) (excluding human factors and silicon wafer's own quality problems) |
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| 6 | MTBF | >500H |
| 7 | MTTR | <2H |
| 8 | 设备噪音 Equipment noise | ≤65 dB |
| 9 | 挂载能力 Mounting capacity | 5 篮(182mm 及以下 120 片/篮; 182mm 以上 104 片/篮;) 5 baskets (120 pieces/basket for 182mm and below; 104 pieces/basket for 182mm and above;) |
| 10 | 平均用水量 Average water consumption | <1.5m³/h |

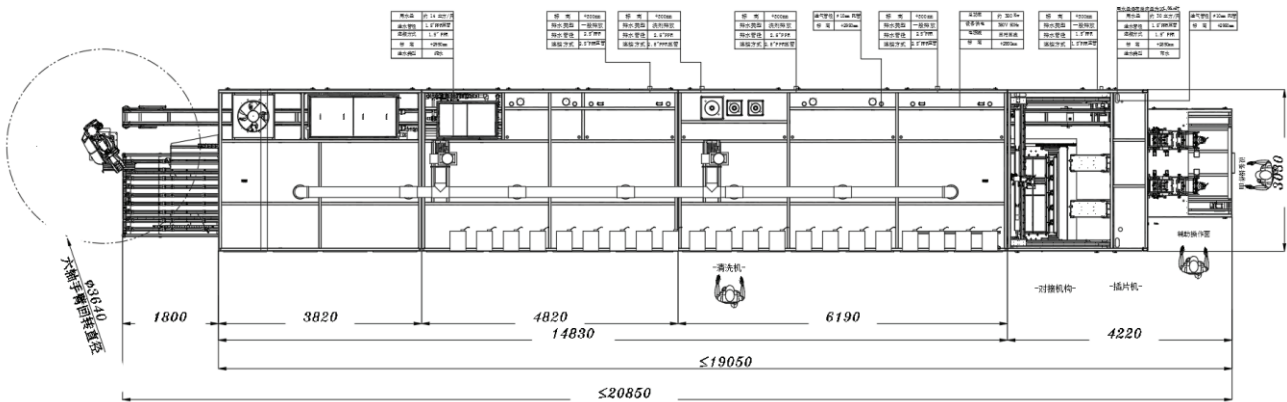
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| | | |
|----|--------------------------------|---|
| 11 | 设备方向 Equipment Direction | “右进左出”____台以人正对设备操作面为参考方向 “左进右出”____台以人正对设备操作面为参考方向 "Right-In-Left-Out" ____ table with a person facing the operating surface of the equipment as the reference direction "Left in, right out" ____ table with a person facing the operating surface of the equipment as the reference direction |
|----|--------------------------------|---|

设备组成如下 The equipment components are as follows

| 序号 No | 名称 Name | 数量 Quantity |
|-------|--|--------------|
| 1 | 插片机 (标配为 182 吸水板) Inserters (182 absorbent plates as standard) | 1 台 1 unit |
| 2 | 210 吸水板 210 Absorbent plate | 2 件 2 pieces |
| 3 | 182-210 兼容料托 182-210 Compatible Material Tray | 4 个 4 |
| 4 | 清洗机 (龙门五篮) Cleaning machine (gantry five baskets) | 1 台 1 unit |
| 5 | 清洗机自动补液系统 Washing machine automatic refill system | 1 套 1 set |
| 6 | 分选对接机械手 (六轴机器人) + 机器人护栏 Sorting and docking robot (six-axis robot) + robot guardrail | 1 套 1 set |

2. 设备设计参数 Equipment design parameters



2.1 生产能力 Production capacity

| 序号 No | 项目 Item | 数据 Data |
|-------|---|--|
| 1 | 生产时间 Production time | 三班制 (注: 一天工作 22h/天, 330 天/年) Three shifts (Note: 22h/day of work, 330 days/year) |
| 2 | 最大提升重量 Maximum lifting weight | ≤120 kg |
| 3 | 最大生产能力 (在工艺时间满足“X.X 工艺细节”表中工艺时间的情况下) Maximum production capacity (in case the process time meets the process time in the table "X.X Process Details") | ≥8500pcs/hr (182mm 及以下 120 片花篮) ≥7000pcs/hr (182mm 以上 104 片花篮) ≥8500pcs/hr (182mm and below 120 pieces flower basket) ≥7000pcs/hr (over 182mm 104 pieces flower basket) |

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| | | |
|---|---|---|
| 4 | 工艺时间 Process Time | 180S/批 (用户自定, 可调) 180S/batch (user-defined, adjustable) |
| 5 | 清洗篮装载能力 Washing basket loading capacity | 630*270*250mm 各 5 篮 630*270*250mm each 5 baskets |

2.2 设备设计尺寸 Equipment design size

| 序号 No | 项目 Projects | 数据 Data |
|-------|--------------------------------|-----------------------|
| 1 | 插片机外型尺寸 Inserting machine size | (≤L4220×W3030×H2900) |
| 2 | 清洗机外型尺寸 Cleaning machine size | (≤L16630×W3030×H2900) |

备注：以上尺寸仅供参考，请以实际设计为准，2900 为设备主体框架高度，不包含清洗机机顶排风管路尺寸；

Note: The above dimensions are for reference only, please refer to the actual design, 2900 is the height of the main frame of the equipment, not including the size of the cleaning machine roof exhaust piping.

2.3 硅片、花篮、料托 Silicon wafer, flower basket, material tray

硅片：设备经调整可满足□18Xmm 至□230mm 硅片，硅片厚度 130-220UM

Silicon wafer: the equipment can be adjusted to meet □18Xmm to □230mm silicon wafer, wafer thickness 130-220UM

花篮：□18Xmm 至□230mm 硅片----设备匹配此规格花篮。

Flower blue: □18Xmm to □230mm silicon wafer ---- equipment match this specification flower basket.

料托：单机配备 4 个料托。

Material tray: single machine is equipped with 4 material trays.

注：

1. 合同签订前请客户提供使用的花篮 CAD 档图纸，以便我司进行设计；
2. 合同签订前请客户提供生产硅片尺寸。
3. 客户提供花篮。
4. 机台生产 182 与 210 硅片切换时间<2 小时。（两种规格花篮外形尺寸相同）

Notes.

1. Please provide CAD drawings of the flower basket to be used before the contract is signed, so that our company can design.
2. Ask customer to provide production wafer size before contract signing.
3. Customer provides flower basket.
4. Machine production 182 and 210 silicon wafer switching time <2 hours. (Both sizes of baskets have the same external dimensions)

3. 插片机部分通用要求 General requirements for the inserting part of the machine

3.1 品质参数要求 Quality parameter requirements

3.1.1B/C 硅率：低于 0.1%（设备自身原因造成，不包括材质和其它设备的影响）；

3.1.1B/C silicon rate: less than 0.1% (caused by the equipment itself, excluding the influence of materials and other equipment).

3.1.2 A 崩率：182mm 及以下低于 0.6%；210mm 低于 0.8%（设备自身原因造成，不包括材质和其它设备的影响）；

3.1.2 A crash rate: 182mm and below below 0.6%; 210mm below 0.8% (caused by the equipment itself, excluding the influence of materials and other equipment).

3.1.3 破片率：低于 0.2%，破片漏判率<1%（设备自身原因造成，不包括材质和其它设备的影响）；

3.1.3 broken piece rate: less than 0.2%, broken piece leakage rate <1% (caused by the equipment itself, not including the impact of materials and other equipment).

3.1.4 隐裂：低于 0.35%（设备自身原因造成，不包括材质和其它设备的影响）；

3.1.4 hidden cracks: less than 0.35% (caused by the equipment itself, excluding the influence of materials and other equipment).

3.1.5 叠片率：低于 0.1%（设备自身原因造成，不包括材质和其它设备的影响）；

3.1.5 Stacking rate: less than 0.1% (caused by the equipment itself, excluding the influence of materials and other equipment).

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3.1.6 皮带印：无，设备皮带不会对硅片造成污染，导致后续工艺的异常（硅片自身问题除外）；

3.1.6 belt marks: none, the equipment belt will not cause contamination to the wafer, leading to abnormalities in the subsequent process (except for problems with the wafer itself).

3.1.7 卡片率：<0.1%（针对未变形花篮）。

3.1.7 Card rate: <0.1% (for undeformed baskets).

3.2 生产工艺流程 Production Processes

料托装片→插片机装入空花篮→插片→移走满篮→接收空篮……；

Material tray loading → insertion machine loading empty flower basket → insertion → removal of full basket → receiving empty basket ……

3.3 设备机械要求 Equipment mechanical requirements

插片机采用双插片头结构，两插片位有独立按键操作。

The inserter adopts a double-insertion head structure, and the two insertion positions are operated by independent keys.

3.3.1 分片水槽/传送机构 Slice sink/transfer mechanism

采用双机头上料，上料需人工切换，单托可以放置 400-500 片硅片；每一托完成后上料托里面不得留有余片。分片水槽从清洗机引热水（流量可调节），保证冬天硅片对温度的要求。

Adopt double head loading, loading needs to be manually switched, single tray can place 400-500 wafers; no remaining wafers inside the loading tray after each tray is completed. The wafer sink draws hot water from the cleaning machine (the flow rate can be adjusted) to ensure the temperature requirement of wafers in winter.

3.3.2 花篮切换机构 Flower basket switching mechanism

花篮快速装卸料，定位机构必须确保足够刚性，定位侧材质要耐磨，花篮行走无晃动、花篮收放准确。

Flower basket fast loading and unloading material, positioning mechanism must ensure sufficient rigidity, positioning side material to wear-resistant, flower basket walking without wobble, flower basket put away accurately.

3.3.3 插片机构 Insert mechanism

采用防水密封模组，防水耐用；Waterproof and durable with waterproof sealing modules.

对夹采用气缸抱紧对夹，在花篮排片升降过程中不会出现花篮晃动情况，不夹持花篮齿板，只夹持两端面板，可调节轻微变形花篮，保证精准入篮。

The clamping adopts cylinder holding clamping, which will not cause the basket to shake during the lifting and lowering of the planter row of pieces, not clamping the planter tooth plate, but only clamping the two end panels, which can adjust the slightly deformed planter to ensure accurate basket entry.

硅片入篮时防撞系统启动，防止硅片快速入篮撞击花篮底部。

The anti-collision system is activated when the silicon wafer is in the basket to prevent the silicon wafer from hitting the bottom of the basket when it enters the basket quickly.

3.3.4 花篮出料输送机构 Flower basket discharge conveying mechanism

采用三轴机械手输送满篮到清洗机，机械手采用齿轮齿条或气缸传动，保证花篮+硅片能平稳输送到清洗机上料端。

The three-axis robot is used to transport the full blue to the cleaning machine. The robot adopts rack and pinion or cylinder drive to ensure that the flower blue + silicon wafer can be smoothly transported to the loading end of the cleaning machine.

3.3.5 硅片姿态校正装置 Silicon wafer attitude correction device

具有硅片姿态校正机构，确保无出现卡片现象。校正装置可对应不同尺寸的硅片，保证硅片不被夹碎。

With silicon wafer attitude correction mechanism to ensure that no card phenomenon occurs. The correction mechanism can correspond to different sizes of silicon wafers to ensure that the wafers are not pinched.

3.3.6 碎片检测（激光传感器感应） Debris detection (laser sensor sensing)

插片机配备碎片系统，能检测出 8MM 以上破片，并能进行数据记录（能人工区分正常片、小缺角片、破片），自动剔除不良片，全部放置在一个盒中。

The inserting machine is equipped with a fragmentation system, which can detect broken pieces above 8MM and make data records (it can manually distinguish between normal pieces, small chipped pieces and broken pieces), automatically reject bad pieces and place them all in one box.

3.3.7 其他 Others

有水过滤装置，保证吸盘不堵塞，防止飞片。具有水压检测装置，靠近出片机构，便于及早发现前侧喷堵塞现象，带压力表，有流量监测功能。水槽内的感应器充分考虑到水脏因素的影响。

With water filtering device to ensure that the suction cups are not clogged and to prevent flying slices. With water pressure detecting device, close to the piece-out mechanism, to facilitate early detection of front side spray blockage phenomenon, with pressure gauge, with flow monitoring function. The sensor in the sink fully takes into account the influence of dirty water factor.

水槽，传输部分的接水盘需要做好防水。设备内部线槽不能在底部走线，防止线路浸泡水中。电机要具备防水防潮功能。

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传感器选用防水等级高于 IP67 以上的型号。

Sink, transmission part of the water receiving tray needs to be waterproof. The internal line sink of the equipment should not be at the bottom of the line to prevent the line from being immersed in water. The motor should have waterproof and moisture-proof function. The sensor should be waterproof above IP67 level.

清理、保养方便性，管道有活动接头易拆卸清理，水槽和管道无死角，清理方便。

Easy to clean and maintain, the pipe has movable joints for easy disassembly and cleaning, and there are no dead ends in the sink and pipe, so it is easy to clean.

配置水枪和气枪各一套，以便于设备清理。

Configure one set of water gun and one set of air gun to facilitate equipment cleaning.

设备出厂前进行漏水测试，管道耐压测试（加压 0.3Mpa，30 分钟无滴漏）

Leakage test and pipe pressure test (0.3Mpa pressure, 30 minutes without dripping) before equipment delivery)

主侧喷/吸水板、及其安装板加工精度足够，保证使用过程中不漏水。

The main side spray/absorbent plate, and its mounting plate are processed with sufficient precision to ensure no leakage during use.

防漏油：各机构（齿轮齿条、滑块导轨、链条、减速机、气缸等）均做好防漏油措施。

Oil leakage prevention: Each mechanism (rack and pinion, slider guide, chain, reducer, cylinder, etc.) is well protected against oil leakage.

门保护：插片机所有开门均有保护开关，开门自动停止相应部位机械臂，确保人员安全。

Door protection: All open doors of the inserting machine have their own protection switch, and the door will automatically stop the corresponding part of the robot arm to ensure the safety of personnel.

插片机散热风扇配有金属防护网。

The inserter cooling fan is equipped with a metal protection grid.

插片水槽具有过滤器装置。

The insert sink has a filter unit.

水槽过滤清洁（频率 2 班/次）；前侧喷清洁（频率 1 班/次）；碎片盒及漏水过滤网清洁（频率 1 班/次）。

Sink filter cleaning (frequency 2 shifts/time); front side spray cleaning (frequency 1 shift/time); debris box and leak filter cleaning (frequency 1 shift/time).

3.3.8 传动元器件及水槽等 Transmission components and sinks, etc.

必须防腐蚀，使用 PPR 材质或 SUS304 等（所有排水管道必须采用 PPR 材质），插片机进排水控制采用气动按钮控制。

Must be anti-corrosion, using PPR material or SUS304, etc. (all drainage pipes must be made of PPR material), and the inserter inlet and outlet controls are controlled by pneumatic buttons.

3.4 设备电气要求 Equipment electrical requirements

3.4.1 电源规格：380VAC；50/60Hz Power supply specifications: 380VAC; 50/60Hz

3.4.2 设备功率：约 12KW Power of the equipment: about 12KW

3.4.3 气源要求：干燥气体，压力：0.6MPa 以上 Gas source requirements: dry gas, pressure: 0.6MPa or more

3.4.4 气源流量：进气管管径不小于 10mm Gas source flow: inlet pipe diameter of not less than 10mm

3.4.5 用水规格：市政用水（无特殊要求），客户提供接入口（机台 +/-1 米内）及废水排放接口（机台 +/-1 米内）。

Water specifications: Municipal water (no special requirements), customer to provide access (within +/- 1 meter of the machine) and wastewater discharge interface (within +/- 1 meter of the machine).

3.4.6 电器元件要求 Electrical component requirements

所有电器元件使用国际一线品牌，如基恩士 PLC、触摸屏 10.1 英寸，传感器使用基恩士、兰宝等国产一线品牌，伺服使用汇川/禾川品牌，步进电机使用雷赛，丝杠使用上银或 TBA，气缸、接头使用 SMC 或亚德客，接触器、固态继电器使用施耐德、开关等选用施耐德，轴承使用 SKF 或同等品牌，防腐蚀、防水等级 IP67，气管、水管选用防腐材质，拖链电缆使用防腐抗柔性，模拟量信号一律使用屏蔽电缆。所有感应器必须防水、防腐蚀、防尘。

All electrical components use international first-line brands, such as Keenes PLC, touch screen 10.1 inches, sensors use Keenes, Lanbao and other domestic first-line brands, servo use Huichuan / Wo Chuan brand, stepper motor use Lacey, screw use on the silver or TBA, cylinders, joints use SMC or Yadec, contactors, solid state relays use Schneider, switches, etc. choose Schneider, bearings use SKF or the same brand, anti-corrosion, waterproof grade IP67, air pipe, water pipe use anti-corrosion material, drag chain cable use anti-corrosion anti-flexible, analog signal always use shielded cable. All sensors must be waterproof, anti-corrosion, dustproof.

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3.4.7 电机、水泵等 Motors, pumps, etc.

必须是一线品牌, 如国内使用南方泵等品牌, 安装及维护拆卸方便, 水泵电机选型需具有防水功能, 能有效避免絮状物附着在叶轮上等影响。

Must be a first-line brand, such as the domestic use of the South pump and other brands, easy to install and maintain disassembly, pump motor selection needs to have a waterproof function, can effectively avoid flocculation attached to the impeller and other effects.

喷/吸水泵出口阀门选用不锈钢闸阀, 其它进水阀门用 PPR 双由令球阀。

Spray / suction pump outlet valve selection of stainless steel gate valve, other inlet valves with PPR double by the order of the ball valve.

3.4.8 循环补新水排废水, 补水量客户可以自己调节, 外加水循环过滤系统, 过滤系统采用过滤棉的形式, 过滤碎硅片盒胶条等, 减少管道堵塞几率, 清洗容易。

Circulation of new water discharge wastewater, the amount of water can be adjusted by the customer, plus water circulation filtration system, the filtration system uses the form of filtering cotton, filtering broken silicon box rubber strip, etc., to reduce the chance of blocking the pipeline, easy to clean.

3.4.9 每班产量、每班破片缺角数、排片计数、故障记录等数据全面监控, 并且历史数据可查询; 有无料, 无篮, 收料槽满, 故障停机等报警功能 (记录可查询)

The data such as output per shift, number of broken pieces and missing corners per shift, counting of discharging pieces and fault records are comprehensively monitored, and the historical data can be queried; there are alarm functions such as no material, no basket, full receiving trough and fault stop (records can be queried)

3.4.10 其他要求 Other requirements

增加堵片按钮, 人员无需在触摸屏复位, 人工拿片后点击按钮继续运转,

Add the button to block the film, personnel do not need to reset in the touch screen, manually take the film and click the button to continue to run.

3.5 设备软件要求 Equipment software requirements

3.5.1 通讯接口 Communication interface

1、提供机台所有 PLC 地址清单。 Provide a list of all PLC addresses of the machine.

2、设备机台预配备安装支持标准 MODBUS 协议网络模块, 便于网络接入对机台数据进行采集及控制。

The equipment is pre-equipped with a network module supporting standard MODBUS protocol, which is convenient for network access to collect and control the data of the machine.

3、采用总线通讯系统, 实现多轴联动, 可快速抓取处理生产数据, 对接大数据系统实现智能监控, 信息以太网模式接入生产 MES 系统, 独立触摸屏操控, 电气元件采用 IP67 防水等级。

Adopt bus communication system, realize multi-axis linkage, can quickly capture and process production data, dock to big data system to realize intelligent monitoring, information can be connected to production MES system in Ethernet mode, independent touch screen control, electrical components with IP67 waterproof grade.

4、对于检测类设备, 上位机程序数据保存到 Access, SQL server 等标准的关系型数据文件中。

For the detection class equipment, the upper computer program data is saved to Access, SQL server and other standard relational data files.

5、机台设备根据需求方增加状态模式切换 (点检、维修、保养、停机等), 实时故障报警, 硬件参数上传。

machine equipment according to the demand side to increase the state mode switching (spot check, repair, maintenance, shutdown, etc.), real-time fault alarm, hardware parameters upload.

6、操控屏幕可接入扫描枪设备(USB), 实现扫码交互。

The control screen can be connected to the scanning gun device (USB) to realize the scanning code interaction.

7、提供以太网接口, 提供 PLC 各级密码, 以满足工厂 MES 生产信息化管理系统的需要。

Provide Ethernet interface and provide PLC password at all levels to meet the needs of factory MES production information management system.

3.5.2 HMI 功能 HMI Functions

1、Warm/Alarm 等信息的指导性内容 (含报警自我诊断相关提示及排查顺序) 并可由高等级密码界面修改添加。

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Warm/Alarm and other information of the guiding content (including alarm self-diagnosis associated with the point tips and troubleshooting sequence) and can be added by the high level password interface modification.

2、HMI 应具备每班的产量、每天的产量，数据在未清零前准备保存一个月的数据，并且具备详细的报警故障信息，以便于故障的快速排除，触摸屏必需有 I/O 点位显示及故障报警详细提示信息界面。

HMI should have the output of each shift, the daily output, data before the data is not cleared with a month of data storage, and with detailed alarm fault information, so as to facilitate rapid troubleshooting, touch screen must have I/O point display and failure alarm detailed prompt information interface.

3、触摸屏增加维修保养界面（红色背景黑色大号文字），当点击维修界面时，在不输入密码情况下不能进入其他界面。

Touch screen to increase the maintenance interface (red background black large text), when click on the maintenance interface, in the case of not entering the password can not enter other interfaces.

3.5.3 程序设置权及密码 Program setting rights and passwords

分级设计，设置分级密码，分别定义不同人员的权限，做动态密码分权限控制。触摸屏画面设置高级参数密码。

Graded design, set graded passwords, define the rights of different personnel respectively, and do dynamic password sub-rights control. Touch screen screen to set advanced parameter password.

3.6 设备外观要求 Equipment appearance requirements

3.6.1 所有机台无供应商 LOGO 及名称。

All machines without supplier LOGO and name.

3.6.2 操作界面上统一，模板待中标后招标人提供。

Uniformity on the operation interface, template to be provided by the bidders after winning the tender.

4. 清洗机技术方案 Cleaning machine technology program

4.1 设备清单 Equipment list

本自动设备由以下几个部分组成 This automatic equipment consists of the following parts:

| 序号 No | 名称 Name | 数量 Quantity | |
|-------|---|--------------------------------------|---------|
| 1 | 下料台 Unloading table | 1 个 1pc | |
| 2 | 自动配、补液系统 (NaOH)补液系统管理采用 PPH 材质 Automatic dispensing and replenishment system (NaOH) replenishment system management using PPH material | 以实际设计为准 Subject to the actual design | |
| 3 | 高速移栽机械手 High-speed transfer robot | 2 套 2 sets | |
| 4 | 分选对接机械手（六轴机械手非龙门式） Sorting and docking robot (six-axis robot non-gantry type) | 1 套 1 set | |
| 5 | 电控箱 Electric control box | 1 套 1 set | |
| 6 | 人机控制台 Human-machine console | 1 套 1 set | |
| 7 | 热水箱 Hot water tank | 1 套 1 set | |
| 8 | 设备主体 Equipment body | 碱性处理工位 Alkaline treatment station | 3 个 3pc |
| | | 酸性处理工位 Acid treatment station | 1 个 1pc |
| | | 中性处理工位 Neutral handling station | 7 个 7pc |
| | | 烘干处理工位 Drying and processing station | 2 个 2pc |
| | 合计 Total | 13 个工艺槽体 13 process tanks | |

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| 序号 No | 流程 Process | 洗剂 Detergent | 超声波 Ultrasound | 加热棒 Heating Rod | 时间 Time | 温度 Temperature | 补液 hydration on fluid | 溢流 Overflow | 材质 Material | 抛动 Throwing | 抽风 Twitch |
|----------|---|---------------------------------|----------------------|--------------------|--------------|-------------------|-----------------------------|----------------------------------|----------------|-------------------|-----------------------|
| 0 | 上料槽 Feed chute | 1 槽溢流水 tank verflow water | / | / | / | / | / | 单面溢流 Single-sided overflow | SUS304 | / | / |
| 1 | 超声清洗 Ultrasonic Cleaning | 纯水 Pure water | 2*2.5K w 40KHz | 12Kw | 180- 300S | 0-50°C | / | 溢流至0槽 Overflow to 1 tank | SUS304 | 有 There are | 有 The re are |
| 2 | 超声碱洗 Ultrasonic alkaline washing | 纯水-碱液 Pure water - lye | | 15Kw | 180- 300S | 0-50°C | 有 There are | 单面溢流 Single-sided overflow | SUS304 | 有 There are | 有 The re are |
| 3 | 超声碱洗 Ultrasonic alkaline washing | 纯水-碱液 Pure water - lye | | 15Kw | 180- 300S | 40-80°C | 有 There are | 单面溢流 Single-sided overflow | SUS304 | 有 There are | 有 The re are |
| 4 | 超声碱洗 Ultrasonic alkaline washing | 纯水-碱液 Pure water - lye | | 15Kw | 180- 300S | 40-80°C | 有 There are | 单面溢流 Single-sided overflow | SUS304 | 有 There are | 有 The re are |

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| | | | | | | | | | | | |
|---|-------------------------------|--|---|-------------------------------------|----------|----------|----------------|---|--------|-----------------|----------------|
| 5 | 超声漂洗 Ultrasonic rinsing | 纯水 Pure water | | 12Kw | 180-300S | 40-80°C | 有 There are | 溢流至 1 槽 Overflow to 1 tank | SUS304 | 有 There are | 有 There are |
| 6 | 酸洗 Pickling | 纯水-双氧水 Pure water - hydrogen peroxide | | 15Kw | 180-300S | 40-80°C | 有 There are | 单面溢流 Single-sided overflow | SUS304 | 有 There are | 有 There are |
| 7 | 超声漂洗 Ultrasonic rinsing | 纯水 Pure Water | | 12Kw | 180-300S | 40-80°C | / | 溢流至 5 槽、1 槽、插片机 Overflow to 5 slots, 1 slot, inserters | SUS304 | 有 There are | 有 There are |
| 8 | 超声漂洗 Ultrasonic rinsing | 纯水 Pure Water | | 12Kw | 180-300S | 0-50°C | / | 阶梯溢流 7 槽 Step overflow 7 tanks | SUS304 | 有 There are | 有 There are |
| 9 | 超声漂洗 Ultrasonic rinsing | 纯水 Pure Water | | 12Kw | 180-300S | 0-50°C | / | 阶梯溢流 8 槽 Stepped overflow 8 tanks | SUS304 | 有 There are | 有 There are |
| 10 | 超声漂洗 Ultrasonic rinsing | 纯水 Pure Water | | 2*12Kw | 180-300S | 0-50°C | / | 阶梯溢流 9 槽 Stepped overflow 9 tanks | SUS304 | 有 There are | 有 There are |
| 11 | 慢拉脱水 Slow pull dehydration | 纯水 Pure Water | / | 24Kw+48KW(预热槽) (preheating tank) | 180-300S | 40-95°C | / | 阶梯溢流 10 槽 Stepped overflow 10 tanks | SUS304 | 慢拉 Slow pull | 有 There are |
| 12 | 烘干槽 Drying tank | 热风 Hot air | / | 21Kw | 180-300S | 80~100°C | / | / | SUS304 | / | 有 There are |
| 13 | 烘干槽 Drying tank | 热风 Hot air | / | 21Kw | 180-300S | 80~100°C | / | / | SUS304 | / | 有 There are |
| 下料台 (配备硅片风冷风幕器) Unloading table (equipped with silicon wafer air-cooled air curler) | | | | | | | | | | | |

4.2 工艺细节 Process details
4.3 设备性能要求 Equipment performance requirements

| 序号 No | 项目内容 Project content | 技术要求 Technical Requirements |
|-------|------------------------------------|---|
| 1 | 单槽篮数 Number of single slot baskets | ≥5 篮 ≥5 baskets |
| 2 | 备用加热水箱 Spare heating water tank | 满足慢提拉≥500L Meet the slow lifting ≥ 500L 满足药洗槽换水≥1500L Meet the drug washing tank water exchange ≥ 1500L |
| 3 | 设备产能 Equipment capacity | ≥8500pcs/hr (182mm 及以下) ≥8500pcs/hr (182mm and below) ≥7000pcs/hr (182mm 以上) ≥7000pcs/hr (182mm or more) |

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| | | |
|----|--|--|
| 4 | 设备开机率 Equipment start-up rate | ≥98% |
| 5 | 湿片率 Wet film rate | ≤0.1% |
| 6 | 脏污率 Soiling rate | ≤0.1% |
| 7 | 碎片率 Fragmentation rate | ≤0.1% |
| 8 | 返洗率 Washback rate | ≤0.1% |
| 9 | 超声频率声强 Ultrasonic frequency sound intensity | 频率≥40KHZ 声强≥0.5W/cm ² Frequency ≥ 40KHZ sound intensity ≥0.5W/cm ² |
| 10 | 超声功率 Ultrasonic power | 超声振板功率≥2.5KW Ultrasonic vibration plate power ≥ 2.5KW |
| 11 | 排风 Exhaust air | 具备抽风系统≥5000m ³ /H (配备2组电机) With extraction system ≥ 5000m ³ /H (with 2 groups of motors) |
| 12 | 机械臂精度及承重 Robotic arm precision and load-bearing capacity | 移动精度±1mm, 承重≤120KG Moving accuracy ±1mm, load capacity ≤120KG |
| 13 | 清洗花篮 (客户自备) Washing flower basket (customer's own) | 182mm 以上, 104 片花篮; 182mm 及以下, 120 片花篮。 182mm and above, 104 pieces baskets; 182mm and below, 120 pieces baskets. |
| 14 | 供液方式 Liquid supply method | 具备药剂 (A/B 剂/双氧水) 存储自动计量功能, 磁致伸缩液位计和传感器选配 (程序自动控制非人工干预) With agent (A/B agent / hydrogen peroxide) storage automatic measurement function, magnetostrictive level meter and sensor option (program automatic control non-manual intervention) |
| 15 | 储液桶 Liquid storage tank | 双氧水容积≥30L, A/B 剂≥30L Hydrogen peroxide volume ≥ 30L, A/B agent ≥ 30L |

4.4 功能描述 Function description

本设备处理功能

This equipment handles functions

自动化把装有硅片的花篮放到上料槽, 直接检测自动进料;

Automated placement of baskets with silicon wafers into the loading trough and automatic feeding with direct detection;

根据设备的程序, 机械手自动把清洗花篮放入各工艺槽进行清洗处理;

The robot automatically puts the cleaning baskets into each process tank for cleaning treatment according to the program of the equipment.

清洗后的硅片通过传送系统自动运送到出料口;

The cleaned wafers are automatically transported to the discharge port through a conveyor system.

上料端可容纳 5 个花篮下料端可容纳 15 花篮;

5 baskets at the top feed end and 15 baskets at the bottom feed end.

具备兼容 □230mm 硅片花篮

Compatible with □230mm wafer baskets

槽体、侧壁可直接用水冲洗, 维护方便;

The tank and side walls can be flushed directly with water for easy maintenance.

具备自动配液和自动排液功能;

With automatic liquid dispensing and automatic liquid draining functions.

4.5 设备组成 Equipment Composition

4.5.1 机架 Rack

机架构成设备的基本框架, 由方通和扁通焊接而成;

The frame constitutes the basic framework of the equipment and is made of square and flat passages welded together.

方通和扁通位均为 Q235A 管

Square pass and flat pass bit are Q235A pipe

槽体底部设计带有斜度, 排液更彻底;

The bottom of the tank is designed with a slope for more thorough drainage.

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4.5.2 封板 Seal plate

封板构成设备的结构，采用 PP-W 阻燃板；

The cover plate constitutes the structure of the equipment and is made of PP-W flame retardant board.

封板组成了抽风道、设备前部观察维修门、设备后部维修门；

The sealing plate forms the extraction duct, the front observation and maintenance door of the equipment, and the rear maintenance door of the equipment.

设备前部观察维修门全透明设计且配有门保护控制系统，方便观察设备的整体运行状况；

The front observation and maintenance door of the equipment is fully transparent and equipped with a door protection control system, which is convenient to observe the overall operation of the equipment.

设备气密性好，正常运行时无气味泄漏；

Good gas tightness of the equipment, no odor leakage during normal operation.

4.5.3 上料槽 Loading chute

上料槽（浸泡），上料端插片机待内置搬运机械手摆放清洗花篮完毕后，通过伺服电机驱动，水下潜送至清洗机内部，由清洗机机械手抓取。

The loading tank (soaking), the loading end of the inserting machine to be built-in handling robot to place the cleaning flower basket finished, through the servo motor drive, water submerged to the cleaning machine inside, by the cleaning machine robot to grab.

4.5.4 移载机械手（龙门结构） Load transfer robot (gantry structure)

移载机械手实现清洗篮按工艺流程顺序移动；

The lifting robot enables the cleaning basket to move in sequence according to the process.

移载机械手能实现上下、左右方向的移动；

The ability to move up and down, left and right directions with the transfer robot.

机械手的运行由伺服驱动器控制，能精确定位；

The operation of the manipulator is controlled by a servo drive, capable of precise positioning.

机械臂采用平稳控制方式，提篮不会晃动；

Smooth control of the mechanical arm so that the basket does not sway.

可以对各个槽处理时间单独设置，实现柔性管理，可以自动和手动转换并继续原程序运行；

The possibility of setting the processing time for each slot individually for flexible management, with the possibility of automatic and manual conversion and continuation of the original program.

机械手定位以接近开关和伺服脉冲互相校对，精度极高，安全性好；

Manipulator positioning with proximity switches and servo pulses calibrated against each other for high precision and safety.

机械手的承载力 $\leq 120\text{Kg}$ ，每次钩取五个花篮，机械手直接钩取花篮；

The load-bearing capacity of the manipulator $\leq 120\text{Kg}$, hooking five baskets at a time, and the manipulator directly hooking the baskets.

机械手设有压篮监控功能；

Manipulator with basket press monitoring function.

机械手上下移动设有上、下、上极限、下极限限位感应器；

Manipulator up and down movement with up, down, upper limit and lower limit limit sensors.

机械手槽面以上部分全部采用耐腐蚀材料，内部无电路转接板或相关转接盒；

All parts above the groove surface of the manipulator are made of corrosion-resistant materials, with no internal circuit adapter plates or related adapter boxes.

二个机械手之间有行程和光电保护，防止相撞，安全防护措施；

Safety measures with travel and photoelectric protection between the two manipulators to prevent collision.

机械手坦克链具备耐酸碱腐蚀，耐磨，耐热，高速运动无噪音，且有隔离片（线与线之间有挡片），有序规整；

Manipulator tank chain has acid and alkali corrosion resistance, wear resistance, heat resistance, high speed movement without noise, and isolation piece (there is a blocking piece between the line and the line), orderly and regular.

电机和驱动器线缆，采用进口带屏蔽层柔性电缆；

Motor and drive cables, using imported flexible cables with shielding layer.

机械手横移导轨需设置在槽体侧面，以免药液腐蚀导轨；

Manipulator traverse guide needs to be set on the side of the tank to avoid corrosion of the guide by the chemical solution.

导轨上的滑块都要配备注油嘴，且安装位置方便注油操作；

slider on the guide rail are to be equipped with oiling nozzles, and the installation position is convenient for oiling operations.

4.5.5 槽体 Tank body

槽内水流溢流方向与硅片金刚石切割方向垂直；5槽 10槽 11槽配备流量计，并流量可实施监视（屏幕显示，不可在屏幕调节，流量大小采用手阀调节），采用 485 模块抓取信息，流量异常时报警提醒。

The overflow direction of the water in the slot is perpendicular to the silicon wafer diamond cutting direction; 5 slots 10 slots 11 slots

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are equipped with flow meters, and the flow rate can be implemented to monitor (screen display, not adjustable in the screen, the flow rate size is adjusted by hand valve), using 485 modules to capture information, and alarm alerts when the flow rate is abnormal.

| 槽号 | 功能 | 槽内液体 | 电加热 | 超声波 | 槽体材质 | 溢流 | 备注 |
|----------------|---------------------------------|---|---|---|--------|---|---|
| 0 槽 0 Slot | 进料槽 Feed chute | 1#槽溢流水 1# tank overflow water | / | / | SUS304 | 溢流排走 Overflow drainage away | 溢流 Overflow |
| 1 槽 1 slot | 超声预洗 Ultrasonic pre-cleaning | 溢流水或纯水 Overflow water or pure water | 加热功率 12KW (药槽 加热 15kw) , 温 度 RT-55°C可 调 Heating power 12KW (15kw for drug tank heating), temperature RT-55°C adjustable | 超声频率 40KHZ 超声功率 2.5KW*2, 超声强度 ≥0.5W/cm ² Ultrasound frequency 40KHZ Ultrasonic power 2.5KW*2, ultrasonic intensity ≥0.5W/cm ² | SUS304 | 回用至 0 槽 Reuse to tank 0 | 溢流+抛动 Overflow + Throwing |
| 2 槽 2 slots | 超声药洗 Ultrasonic drug washing | 纯水+清洗剂 Pure water + cleaning agent | | | | 药排 Pill row | 抛动 Throwing |
| 3 槽 3 slots | 超声药洗 Ultrasonic drug washing | 纯水+清洗剂 Pure water + cleaning agent | | | | | |
| 4 槽 4 slots | 超声药洗 Ultrasonic drug washing | 纯水+清洗剂 Pure water + cleaning agent | | | | | |
| 5 槽 5 slots | 超声漂洗 Ultrasonic rinsing | 7 槽回用水或 纯水+双氧水 (可选) 7 tanks of reuse water or pure water + hydrogen peroxide (optional) | 12kw, RT- 55°C, 温度 要求可控 12kw, RT- 55°C, temperature requirement can be controlled | | | 可回用至 1 槽, 接 入药排管 道 Can be reused to 1 tank, connected to the drug discharge pipe | 单面溢流+ 抛动 Single-sided overflow + throwing |
| 6 槽 6 slots | 超声药洗 Ultrasonic drug washing | 纯水+双氧 水, pure water + hydrogen peroxide. | 15kw, RT- 55°C | | SUS304 | 药排 Pill row | 抛动 Throwing |
| 7 槽 7 slots | 超声漂洗 Ultrasonic rinsing | 纯水 Pure water | 加热功率 12KW, 温度 RT-70°C Heating power 12KW, temperature RT-70°C | | SUS304 | 可回用至 5 槽、1 槽、插片 机 Can be reused to 5 slots, 1 slot, inserters | 阶梯溢流+ 抛动 Step overflow + throwing |
| 8 槽 8 slots | 超声漂洗 Ultrasonic rinsing | 纯水 Pure water | | 水排放, 高位溢流 至 7 槽 Water discharge, high level overflow to tank 7 | | | |
| 9 槽 9 slots | 超声漂洗 Ultrasonic rinsing | 纯水 Pure water | | 水排放, 高位溢流 至 8 槽 Water | | | |

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| | | | | | | | |
|-------------------------|--|---|---|--------|--------|---|-------------------|
| | | | | | | discharge, high level overflow to 8 tanks | |
| 10 槽 | 超声漂洗 Ultrasonic rinsing | 纯水 Pure water | 加热功 2*12kw, 温度 50-80°C Heating power 2*12kw, temperature 50-80°C | | | 水排放, 高位溢流至 9 槽 Water discharge, high level overflow to 9 tanks | |
| 11 槽 | 高温脱水 (慢提拉) 慢拉斜度可控 High temperature dehydration (Slow lift) Slow pull slope controllable | 纯水 (来自高位预加热水箱) Pure water (from high preheated water tank) | 加热功 2*12kw, 温度 85±10°C Heating power 2*12kw, temperature 85±10°C | 无 None | | 水排放, 喷淋溢流至 10 槽 Water discharge, spraying overflow to 10 tanks | 带喷淋 With spraying |
| 12 | 烘干槽 1 Drying tank 1 | 无 None | 温度 RT-95°C Temperature RT-95°C | 无 None | SUS304 | 无 None | 纯净风 Pure Breeze |
| 13 | 烘干槽 1 Drying tank 1 | 无 None | 温度 RT-95°C Temperature RT-95°C | 无 None | SUS304 | 无 None | 纯净风 Pure Breeze |
| 烘干槽 Drying tank | 风机出风带过滤功能, 过滤精度 50 目, 纯净风, 耐高温, 可便捷清理更换。 底部带不锈钢碎片滤网, 便于清理碎片。 带超温保护功能。 风路方向需保证循环风进入硅片缝隙内, 与硅片平行。 Fan out of the air with filter function, filter precision 50 mesh, pure wind, high temperature resistance, can be easily cleaned and replaced. Bottom with stainless steel debris strainer for easy debris cleaning With over-temperature protection. The direction of the air path needs to ensure that the circulating air enters the silicon wafer gap and is parallel to the wafer. | | | | | | |
| 自动下料 Automatic lowering | 有冷却工位(自硅片上方向下吹风, 风向与硅片方向平行。) There is a cooling station (blowing air from the top of the wafer to the bottom, the wind direction is parallel to the wafer direction.) | | | | | | |
| 抛动 Throwing | 抛动为固定频率。慢提拉速度可调、角度可调, 5-10° Throwing is fixed frequency. Slow lifting speed adjustable, angle adjustable, 5-10° | | | | | | |

4.5.6 下料台 Lowering table

采用步进、顶升机构, 三个工位可缓存 15 个花篮;

Adopt step and jacking mechanism, three stations can cache 15 flower baskets;

4.5.7 分选机械手 Sorting robots

使用 6 轴机械手 (非龙门架式) 将清洗完成的硅片移动到分选机上料位, 并放置好。

Use a 6-axis robot (not gantry type) to move the cleaned wafers to the sorting machine loading position and place them in place.

将分选仪上空的花篮, 移动到清洗机的回篮线上。

Move the planter over the sorter, to the return basket line of the washer.

配备压篮、有篮、有料检测, 自动识别下料台提供的花篮是否带有硅片, 空花篮直接放回回篮线。

Equipped with pressing basket, with basket, with material detection, automatic identification of whether the basket provided by the lower material table has silicon wafer, empty flower blue directly put back to the blue line.

机械手周围做安全护栏, 颜色为交通白并张贴安全标示, 同时并开有维修门。

Safety fence around the robot, the color of the traffic white and posted safety signs, and at the same time and open a maintenance door.

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4.5.8 抛动结构 (龙门双面式抛动结构) Throwing structure (gantry double-sided throwing structure)

采用偏心轮机构, 2-3 个槽设一套抛动装置;

Adopt eccentric wheel mechanism and set up a set of throwing device for 2-3 slots;

抛动电机采用减速电机, 功率: $\geq 0.75\text{KW}$;

Throwing motor using reducer motor, power: $\geq 0.75\text{KW}$;

抛动速度: ≥ 14 次/min。 Throwing speed: ≥ 14 times/min.

4.5.9 慢提拉机构 (龙门双丝杆式慢拉结构) Slow pulling mechanism (gantry double screw type slow pulling structure)

单独慢提拉结构, 不依赖机械手, 大幅度提高生产效率;

Separate slow lifting structure, not dependent on manipulators, substantially increasing productivity.

单边慢提拉速度及倾斜度可调节;

Adjustable single-sided slow lifting speed and tilt.

花篮出水时, 为倾斜状态, 完全出水后, 花篮能自动校平, 保证不产生粘片现象。

When the flower basket is out of the water, it is tilted state, and after it is completely out of the water, the flower basket can be automatically leveled to ensure that the phenomenon of sticky piece is not produced.

4.5.10 预热水箱 Preheating water tank

2 个预加热水箱, 11 槽慢提拉一个, 容量大于 500L, 温度 85 度; 药洗槽共用一个, 容量大于 1500L, 温度 60 度。

2 pre-heated water tanks, 11 tanks slow lift one, capacity greater than 500L, temperature 85 degrees; drug washing tank shared one, capacity greater than 1500L, temperature 60 degrees.

换水时加热快, 提高效率。

Fast heating and efficiency during water change.

4.5.11 自动加液系统 Automatic liquid filling system

设置双组份清洗剂自动添加系统, 对每个药剂槽能进行定时定量自动补充药剂。

Set up two-component cleaning agent automatic adding system, for each pharmaceutical tank can be automatically replenished at regular intervals.

自带储药箱, 预留接口, 可与外部药剂管道连接。

Comes with its own medicine storage box, reserved interface, can be connected with external pharmaceutical pipeline.

且满足国家化学品管路运输标准。药剂包含 NaOH, 过氧化氢, 清洗剂等。设置报警器 (可调节时间点) 提醒更换药剂功能。

And meet the national chemical pipeline transportation standards. The agent contains NaOH, hydrogen peroxide, cleaning agent, etc. Set the alarm (adjustable time point) to remind the function of changing agents.

4.5.12 抽风系统 Air extraction system

抽风系统 $\geq 5000\text{m}^3/\text{H}$ (配备电机)。

Air extraction system $\geq 5000\text{m}^3/\text{H}$ (equipped with motor)

4.5.13 设备安全 Equipment safety

报警可分不同等级, 连锁, 用户可根据实际情况决定下步动作 (如停机、排液等);

Alarm can be divided into different levels, chain, the user can decide the next action according to the actual situation (such as stop, drain, etc.).

符合中国设备电气安全法规;

Compliance with Chinese equipment electrical safety regulations.

在调试和试生产过程中不能出现设备安全事故(以 EHS 部的评判为依据);

No equipment safety accidents can occur during commissioning and trial production (based on the judgment of the EHS Department).

设备工作区域有安全防护措施;

Safety precautions in the working area of the equipment.

设备使用材料、电气件、管路要符合安全标准, 管道走向无叠加在一起现象;

Equipment using materials, electrical parts, pipelines to meet safety standards, pipeline direction without superimposed together phenomenon.

设备操作要严格按照操作说明书进行, 操作维护人员要进行专门的培训;

The operation of the equipment should be carried out in strict accordance with the operating instructions, and the operation and maintenance personnel should be specially trained.

可能对人体造成伤害的部分, 在设备上有明显的警告标示;

Parts that may cause harm to humans are clearly marked with warnings on the equipment.

专业操作部分在设备上有明确的警告标示;

Professional operating sections are clearly marked with warnings on the equipment.

特殊部分有明确操作步骤;

Special sections with clear operational steps.

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4.5.14 信息化集成要求 Information integration requirements

设备主 PLC 必须带有以太网口，并预留至少一个空余接口（配有小型交换机亦可）。且设备主 PLC 的 IP 地址及端口号可以根据用户的需求进行现场配置。如需要出厂时事先配置好 IP 的设备（现场不能再修改）用户可提前根据厂商需求提供相应的 IP 地址。

The main PLC must have an Ethernet port with at least one spare interface (a small switch is also available). And the IP address and port number of the main PLC can be configured on site according to the user's needs. If you need to factory-configured IP equipment (on-site can not be modified), you can provide the corresponding IP address in advance according to the manufacturer's requirements.

如果某一厂商设备较多，且已有自身局域网可由设备厂商增加路由器对其网络内的所有设备做好端口映射，并将映射对应关系表提供给用户。

If a vendor has more devices and has its own LAN, the device vendor can add a router to map all devices in its network and provide the mapping correspondence table to users.

有上位机软件的设备可提供 OPC 协议（建议如可直连至 PLC 尽量避免采用此种方式，因目前大多数上位软件支持的 OPC 协议为 OPC DA 协议，此协议集成时配置步骤繁琐，且后期稳定性差。如设备支持 OPC UA 协议则建议使用此方式）。

The OPC protocol is available for devices with host software (it is recommended to avoid this method if direct connection to PLC is available, because most of the OPC protocols supported by host software are OPC DA protocol, which is cumbersome to configure during integration and has poor stability later. (If the device supports OPC UA protocol, it is recommended to use this method).

设备如配有关系型数据库（如：Mysql、oracle、sql server）则可以采用 ODBC 方式采集数据。

If the device is equipped with a relational database (e.g. Mysql, oracle, sql server), then ODBC can be used to collect data.

设备上位机软件如为自主开发（非第三方组态软件），可以采用 web service 接口的集成方式。

If the device upper computer software is self-developed (not third-party configuration software), the integration method of web service interface can be adopted.

对于既没有 PLC，也没有上位机软件的设备（如嵌入式的控制电路板）应支持最常见的 Modbus 协议（需配有串口转 RJ45 模块），便于系统集成。每个设备厂家必须提前告知用户需要做集成时需要用到的网络点位数量（网线数量）以及 IP 地址数量，以便用户提前安排弱电施工计划及规划 IP 地址，避免造成资源浪费。

For devices that have neither PLC nor upper computer software (such as embedded control boards) should support the most common Modbus protocol (need to be equipped with a serial to RJ45 module) to facilitate system integration. Each equipment manufacturer must inform the user in advance of the number of network points (number of network cables) and the number of IP addresses that need to be used when doing integration, so that the user can arrange the weak construction plan and plan the IP addresses in advance to avoid wasting resources.

5. 动力条件要求 Power condition requirements

5.1 设备电力供应 Equipment power supply

| 项目 | 数据 |
|--|---|
| 操作控制回路 Operation control circuit | DC24V |
| 设备总功率（插片+清洗） Total power of equipment (insert + cleaning) | 1、~360KW(含预热槽功率) 2、380v, 50Hz, 3相5线制 3、设备进线开关上侧配备进线铜排（铜排10cm，根据载流量选配），铜排从开关上侧引出10cm； 4、设备内部各个电源最终全部集中在电柜内接线端子； 5、设备技术协议约定电源，厂家到货设备必须保持一致； 1、~360KW(including preheating tank power) 2、380v, 50Hz, 3-phase 5-wire system 3. The upper side of the equipment inlet switch is equipped with an inlet copper row (copper row 10cm, optional according to the load capacity), and the copper row is led 10cm from the upper side of the switch. 4, each power supply inside the equipment eventually all concentrated in the electrical cabinet terminals. |

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5.2 设备公用工程条件 Equipment utility conditions

表 1-1 化学品参数 Table 1-1 Chemical parameters

| 介质 Media | 温度 Temperature [°C] | 预留端口 Reserved ports | 性质 Characteristic | 压力 Pressure [mpa] | 消耗量 Consumption [m ³ /h] |
|-------------------------------|---------------------|---|---------------------------------------|-------------------|-------------------------------------|
| 液体 Liquid | | | | | |
| 纯水 Pure Water | RT | 1 1/2"PPR 管 (1 处) 1 1/2" PPR pipe (1 place) | 电阻率 > 18MΩ·cm Resistivity >18MΩ·cm | 0.25±0.05 | 1.5 |
| NaOH | RT | 1/2"PPH 接头 1/2" PPH connector | / | / | 由反应决定 Determined by reaction |
| 清洗剂 Cleaning agent | RT | 1/2"PPH 接头 1/2" PPH connector | / | / | 由反应决定 Determined by reaction |
| H ₂ O ₂ | RT | 1/2"PPH 接头 1/2" PPH connector | / | / | 由反应决定 Determined by reaction |
| 气体 Gases | | | | | |
| 压缩空气 Compressed air | RT | Φ12 气管接头 Φ12 gas pipe fitting Dew point <-10°C | 露点 <-10°C Dew point <-10°C | 0.6±0.05 | 15 |

表 1-2 排水管连接 Table 1-2 Drainage pipe connection

| 排放类型 Type of emission | 温度 Temperature [°C] | 性质 Characteristic | 连接 Connections | 材质 Material |
|--|---------------------|---|----------------|-----------------|
| 含碱/酸废水排放 Discharge of wastewater containing alkali/acid | <60°C | 含碱/酸废水 Wastewater containing alkali/acid | DN110 | PPR |
| 废水排放 Wastewater discharge | <60°C | DI 废水 DI wastewater | DN110 | PPR |
| PP 接水盘 PP water catch tray | 常温 room temperature | DI 废水 DI wastewater | DN25 | 金属软管 Metal Hose |

5.3 设备环境 Equipment environment

| 项目 Projects | | 指标 Indicators |
|---|------------------------|---------------|
| 设备工作环境 Equipment working environment | 温度 Temperature | 10~32°C |
| | 相对湿度 Relative Humidity | <70% |
| | 海拔高度 Altitude | 3000m 以下 |

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| | | |
|---|---|--|
| 设备存放环境 Equipment storage environment | 温度 emperature | 5~40°C (在温度低于零度时注意对管道进行防冻保护措施) (pay attention to anti-freeze protection measures for pipes when the temperature is below zero) |
| | 24 小时内温差 Temperature difference in 24 hours | <20°C |
| | 海拔高度 Altitude | 15000m 以下 |
| | 相对湿度 Relative Humidity | <90% |

6.元器件清单 Component list

6.1 主要元件清单 List of main components

| N0. | 名称 Name | 规格 Specification | 供应商 Suppliers |
|-----|--|-----------------------------|--|
| 1 | PLC | 设计选型 Design Selection | 基恩士 Keenes |
| 2 | 触摸屏 Touch Screen | 10.1 寸 | 威纶、繁易、昆仑通态 Viren, Prosperity, Kunlun Tongzhou |
| 3 | 塑壳断路器 Plastic Case Circuit Breaker | A 系列 A Series | 施耐德、ABB (瑞士) Schneider, ABB (Switzerland) |
| 4 | 漏电断路器 Earth leakage circuit breaker | GS 系列 GS Series | 施耐德、ABB (瑞士) Schneider, ABB (Switzerland) |
| 5 | 交流接触器 AC Contactors | AX 系列 AX Series | 施耐德、ABB (瑞士) Schneider, ABB (Switzerland) |
| 6 | 中间继电器 Intermediate Relay | AR 系列 DC24V AR Series DC24V | 施耐德、ABB (瑞士) Schneider, ABB (Switzerland) |
| 7 | 光电开关 Photoelectric switch | 设计选型 Design Selection | OMRON (日本) /LANBAO 等国内一线品牌 OMRON (Japan)/LANBAO and other domestic first-line brands |
| 8 | 按钮开关 Push Button Switch | LA 系列 LA Series | 长江 Yangtze River |
| 9 | 升降马达 Lifting motor | 伺服电机 Servo Motor | 汇川、禾川 Huichuan, Hechuan |
| 10 | 平移马达 Panning motor | 伺服电机 Servo Motor | 汇川、禾川 Huichuan, Hechuan |
| 11 | 滑块 Slider | 设计选型 Design Selection | 上银 (台湾) /银泰 Shangyin (Taiwan)/Yintai |
| 12 | 滚珠丝杆 Ball Screws | SFU2510 系列 SFU2510 Series | 上银 (台湾) /银泰 Shangyin (Taiwan)/Yintai |
| 13 | 气缸 Cylinder | 设计选型 Design Selection | 亚德客 Ardec |
| 14 | 磁性开关 Magnetic switch | D 系列 D Series | 亚德客 Ardec |
| 15 | 电磁阀 Solenoid Valve | 设计选型 Design Selection | 亚德客/EMC Adecker/EMC |
| 16 | 步进电机 Stepper motors | 设计选型 Design Selection | 雷赛 Raisai |
| 17 | 固态继电器 Solid State Relays | KSI 系列 KSI Series | 库顿/旭瑞等 Couton / Xurui, etc. |
| 18 | 三相异步电动机 Three-phase asynchronous motor | 设计选型 Design Selection | 万鑫 Wanxin |
| 19 | 磁力泵 Magnetic Pump | 设计选型 Design Selection | 易威特 Ewert |

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| | | | |
|----|----------------------|------|---|
| 20 | 电加热器 Electric heater | 16KW | / |
|----|----------------------|------|---|

由于市场的变化或产品的升级，设备实际采用会有所不同，但保证替代品的品质会更优。

设备在使用过程中不允许锁机。

The actual adoption of the equipment will vary due to market changes or product upgrades, but the alternatives are guaranteed to be of better quality .

The equipment is not allowed to be locked during use.

6.2 备品备件清单 Spare parts list

| NO. | 备件名称 Spare parts name | 规格型号 Specification Model | 品牌 Brands | 单位 Unit | 数量 Quant | 备注 Remark |
|-------------------------|-----------------------|-------------------------------------|---------------------------------------|----------|----------|-----------|
| 插片机部分 Inserters section | | | | | | |
| 1 | 轴承 Bearings | 7000AC | 哈轴 Ha axis | 件 Pieces | 2 | |
| 2 | 轴承 | 7001AC | 哈轴 Ha axis | 件 Pieces | 2 | |
| 3 | 圆柱齿轮 | M=1.5, Z=20, B=15, L=27, B形, φ=12.7 | 国产 Homemade | 件 Pieces | 2 | |
| 4 | 同步带 | 闭环 275-S5M-15 | 国产 Homemade | 件 Pieces | 2 | |
| 5 | 导轨滑块 | SBR25UU | 国产 Homemade | 件 Pieces | 8 | |
| 6 | 直线轴承 | LHBBD25 | 国产 Homemade | 件 Pieces | 4 | |
| 7 | 联轴器 | 30-12B-8B, 梅花型 | 韩国成一/ 日本 Sung-II Korea / NBK | 件 Pieces | 12 | |
| 8 | 轴承 | FAG2201.2RS.TV | 哈轴 Ha axis | 件 Pieces | 4 | |
| 9 | 轴承 | 6800 | 易格斯 Iigus | 件 Pieces | 24 | |
| 10 | 轴承 | BB-626-A180-10-GL | 易格斯 Iigus | 件 Pieces | 8 | |
| 11 | 微型菱形带座轴承 | UFL001 内径 12mm | 米思米 Mismi | 件 Pieces | 12 | |
| 12 | 微型菱形带座轴承 | UFL002 内径 15mm | 米思 Misi | 件 Pieces | 4 | |
| 13 | 轴承 | 6901 | 易格斯 Iigus | 件 Pieces | 28 | |
| 14 | 3mm 粗面绿色圆带 | 3mm | VOLTA | 件 Pieces | 30 | |
| 15 | 回转夹紧气缸 | QCKL40x10SM | 亚德客 Ardeche | 件 Pieces | 2 | |

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| | | | | | | |
|-----------------------------|---|--------------------|----------------|-------------|----|--|
| 16 | 回转夹紧气缸 | QCKR40x10SM | 亚德客 Ardeche | 件 Pieces | 2 | |
| 17 | 磁感应开关 | DMSG-020-W | 亚德客 Ardeche | 件 Pieces | 8 | |
| 18 | 减速机 | PRF90-L1-5-P2 | 国产 Homemade | 件 Pieces | 1 | |
| 清洗机部分 Cleaning machine part | | | | | | |
| 1 | 小型浮球液位开关 Small float level switch | MF-2802S | 飞卓 Feizhuo | 件 Pieces | 16 | |
| 2 | 液位开关 Liquid level switch | 耐高温不锈钢 (弯) | 国产 Homemade | 件 Pieces | 6 | |
| 3 | 加热管 Heater tube | 380V, 15Kw, SUS304 | 国产 Homemade | 件 Pieces | 10 | |
| 4 | 加热管 Heater tube | 380V, 12Kw, SUS304 | 国产 Homemade | 件 Pieces | 2 | |
| 5 | 快接加热管 Quick connect heating | 380V, 12Kw, SUS304 | 国产 Homemade | 件 Pieces | 2 | |
| 6 | U型加热管 U-shaped heating tube | 380V, 8Kw, SUS304 | 国产 Homemade | 件 Pieces | 6 | |
| 7 | 烘干槽加热棒 Drying tank heating rod | 3.5Kw | 国产 Homemade | 件 Pieces | 12 | |
| 8 | 开口直线滑块 Open-end linear slider | SBR20UU | 国产 Homemade | 件 Pieces | 16 | |
| 9 | 耐高温电机 High temperature resistant motors | YX3-100L-23KW-2极 | 国产 Homemade | 件 Pieces | 6 | |

6.3 易损件清单 List of wearing parts

| NO. | 备件名称 Spare parts name | 规格型号 Specification Model | 品牌 Brands | 单位 Unit | 数量 Quantity | 备注 Remarks |
|-------------------------|------------------------|--------------------------|----------------|-------------|-------------|------------|
| 插片机部分 Inserters section | | | | | | |
| 1 | 轴承 Bearings | 7000AC | 哈轴 Ha axis | 件 Pieces | 2 | |
| 2 | 轴承 Bearings | 7001AC | 哈轴 Ha axis | 件 Pieces | 2 | |
| 3 | 导轨滑块 Guide rail slider | SBR25UU | 国产 Homemade | 件 Pieces | 8 | |

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| | | | | | | |
|-------|--|--|------------------------|----------|----|--|
| 4 | 直线轴承 Linear bearings | LHBBD25 | 国产 Homemade | 件 Pieces | 4 | |
| 5 | 轴承 Bearings | FAG2201.2RS.TV | 哈轴 Ha axis | 件 Pieces | 4 | |
| 6 | 轴承 Bearings | 6800 | 易格斯 Igus | 件 Pieces | 24 | |
| 7 | 轴承 Bearings | BB-626-A180-10-GL | 易格斯 Igus | 件 Pieces | 8 | |
| 8 | 微型菱形带座轴承 Miniature diamond shaped | UFL001 内径 12mm UFL001 Inner diameter 12mm | 米思米 Mismi | 件 Pieces | 12 | |
| 9 | 微型菱形带座轴承 Miniature diamond shaped | UFL002 内径 15mm UFL002 15mm inner diameter | 米思米 Mismi | 件 Pieces | 4 | |
| 10 | 轴承 Bearings | 6901 | 易格斯 Igus | 件 Pieces | 28 | |
| 11 | 3mm 粗面绿色圆带 3mm thick surface green round tape | 3mm | VOLTA | 件 Pieces | 30 | |
| 清洗机部分 | | | | | | |
| 1 | 小型浮球液位开关 Small float level switch | MF-2802S | 飞卓 Feizhuo | 件 Pieces | 26 | |
| 2 | 液位开关 Liquid level switch | 耐高温不锈钢 (弯) High temperature resistant stainless steel | 国产 Homemade | 件 Pieces | 6 | |
| 3 | 直线滑块 Linear slider | SC 30UU | 宁波美亚特 Ningbo Meiyat | 件 Pieces | 2 | |
| 4 | 深沟球轴承 Deep groove ball bearings | 61900ZZ | 哈轴 Ha axis | 件 Pieces | 4 | |
| 5 | 深沟球轴承 Deep groove ball bearings | 61902ZZ | 哈轴 Ha axis | 件 Pieces | 4 | |
| 6 | 直线滑块 Linear slider | LHMCWM35L | 宁波美亚特 | 件 Pieces | 8 | |
| 7 | 深沟球轴承 Deep groove ball bearings | 6018-2Z | 哈轴 Ha axis | 件 Pieces | 8 | |
| 8 | 直线滑块 Linear slider | SBR30LUU | 宁波美亚特 Ningbo Meiyat | 件 Pieces | 4 | |
| 9 | 法兰式直线轴承 Flange type linear bearings | LMH20LUU | 宁波美亚特 Ningbo Meiyat | 件 Pieces | 16 | |
| 10 | 加热管 Heater tube | 380V, 15Kw, SUS304 | 国产 Homemade | 件 Pieces | 10 | |

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| | | | | | | |
|----|-----------------------------------|--------------------|----------------|-------------|----|--|
| 11 | 加热管 Heater tube | 380V, 12Kw, SUS304 | 国产 Homemade | 件 Pieces | 2 | |
| 12 | 快接加热管 Quick connect heating | 380V, 12Kw, SUS304 | 国产 Homemade | 件 Pieces | 2 | |
| 13 | U型加热管 U-shaped heating tube | 380V, 8Kw, SUS304 | 国产 Homemade | 件 Pieces | 6 | |
| 14 | 烘干槽加热棒 Drying tank heating rod | 3.5Kw | 国产 Homemade | 件 Pieces | 12 | |
| 15 | 开口直线滑块 Open-end linear slider | SBR20UU | 国产 Homemade | 件 Pieces | 16 | |

注意:

设备在保修期内, 备品备件由卖方在买方现场设备件库, 备件数量以现场实际工况进行调整(需不影响买方现场设备的正常运行和生产), 保修期满后现场备件库内物料可由买方出资购买或由卖方处理。

易损件由卖方提供型号清单, 买方自行购买储备。

7.安全性能 Safety performance

7.1 参考标准和规范 Reference standards and specifications

- 《通用用电设备配电设计规范》GB50055-2011
- 《流量测量节流装置用孔板、喷嘴和文丘里管测量充满圆管的流体流量》GB/T2624-93
- 《工业自动化仪表工程施工及验收规范》GB50093-2013
- 《石油化工企业设计防火规范》(99年修订)GB50160-2008
- 《自动化仪表选型规定》HG/T20507-2000
- 《控制室设计规定》HG/T20508-2000
- 《仪表供电设计规定》HG/T20509-2000
- 《仪表供气设计规定》HG/T20510-2000
- 《信号报警、联锁系统设计规定》HG/T20511-2000
- 《可编程序控制器系统设计规定》HG/T20700-2000
- 《过程测量和控制仪表的功能标志和图形符号》HG/T20505-2000
- 《仪表配管配线设计规定》HG/T20512-2000
- 《仪表系统接地设计规定》HG/T20513-2000
- 《自控安装图册》HG/T21581-2010
- 《化工装置自控工程设计规定》HG/T20636-20639-98
- 《钢管管法兰、垫片、紧固件》HG20592~20635-2009
- 《供配电系统设计规范》GB50052-2009
- 《10kV及以下变电所设计规范》GB50053-94
- 《低压配电设计规范》GB50054-2011
- 《工业与民用电力装置的接地设计规范》GBJ65-1983
- 《石油化工静电接地设计技术规范》HG3097-2000
- 《电力工程电缆设计规范》GB50217-2007

Design Code for the Distribution of General Electricity Equipment GB50055-2011

Flow measurement throttling device with orifice, nozzle and venturi to measure the flow of fluid filled with a circular tube GB/T2624-93

Specification for Construction and Acceptance of Industrial Automation Instrumentation Engineering GB50093-2013

Code of Practice for the Design of Petrochemical Enterprises (Revised in 1999) GB50160-2008

Provisions on the Selection of Automation Instruments HG/T20507-2000

Control Room Design Regulations" HG/T20508-2000

Instrument Power Supply Design Provisions" HG/T20509-2000

Design Provisions for Instrument Gas Supply" HG/T20510-2000

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Design Provisions for Signal Alarm and Interlocking System" HG/T20511-2000
 Design Provisions for Programmable Controller System" HG/T20700-2000
 Functional signs and graphic symbols for process measurement and control instruments" HG/T20505-2000
 Instrument Piping and Wiring Design Regulations" HG/T20512-2000
 Instrument System Grounding Design Regulations" HG/T20513-2000
 Self-Control Installation Drawing Book" HG/T21581-2010
 The chemical plant automatic control engineering design regulations" HG/T20636-20639-98
 Steel pipe flanges, gaskets, fasteners" HG20592~20635-2009
 Code for the Design of Power Supply and Distribution Systems GB50052-2009
 Design Code for Substation of 10kV and below GB50053-94
 Low-voltage Distribution Design Code GB50054-2011
 Grounding Design Code for Industrial and Civil Power Installations" GBJ65-1983
 Technical Specification for Electrostatic Grounding Design of Petrochemical Industry" HG3097-2000
 Specification for the Design of Electric Power Engineering Cables GB50217-2007

7.2 设备安全 Equipment safety

设备操作要严格按照操作说明书进行，操作维护人员要进行专门的培训；

The operation of the equipment should be carried out in strict accordance with the operating instructions, and the operation and maintenance personnel should be specially trained.

可能对人体造成伤害的部分，在设备上有明显的警告标示；

Parts that may cause harm to humans are clearly marked with warnings on the equipment.

专业操作部分在设备上有明确的警告标示；

Professional operating sections are clearly marked with warnings on the equipment.

特殊部分有明确操作步骤；

Special sections with clear operational steps.

7.3 设备上的安全标志 Safety signs on the equipment

设备运行状态三色指示灯，绿色：设备正常运行中，黄色：设备休止或其他，红色：设备异常或故障；

Three-color indicator for equipment operation status, green: equipment in normal operation, yellow: equipment rest or other, red: equipment abnormal or fault.

设备操作主要控制台，包括有手动/自动转换开关，蜂鸣器停止开关，自动启动、停止开关，紧急停止开关等；

Main console for equipment operation, including a manual/automatic transfer switch, buzzer stop switch, automatic start and stop switch, emergency stop switch, etc..

各处紧急停止开关和安全操作标识；

Emergency stop switches and safety operation signs at all locations.

设备主体部分紧急停止开关；

Emergency stop switch for the main part of the equipment.

电控柜总电源安全警告标识；

Safety warning signs for the main power supply of the electric control cabinet.

设备高温警告标识；

Equipment high temperature warning signs.

上料台处安全操作警告标识；

Warning signs for safe operation at the loading table.

机械手操作维护方法提示；

Tips on how to operate and maintain manipulators.

机械手操作保养方法提示；

Tips on how to operate and maintain manipulators.

机械手手动操作控制开关；

Manually operated control switches for manipulators.

电气盒操作安全警告及手动阀门在设备运行时开关状态指示牌标识；

Electrical box operation safety warnings and manual valves in the operation of the equipment on and off status indicator signs sign.

机械手操作提示； Manipulator operation tips.

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各类安全标识 Various safety signs

8. 设备安装和调试 Equipment installation and commissioning

8.1 设备的安装和调试 Installation and commissioning of equipment

设备的安装由无锡釜川负责，并于安装前一到两周提供安装场地要求；

The installation of the equipment is the responsibility of FIT Wuxi, and the installation site requirements will be provided one to two weeks before the installation.

在调试条件具备后，由客户开始设备的调试工作；

Commissioning of the equipment by the customer when the conditions for commissioning are available.

在客户提供保证条件的情况下，保证质量完成安装调试工作；

Quality assurance of the completion of the installation and commissioning work under guaranteed conditions provided by the customer.

8.2 出厂测试 Factory test

验收流程，在无锡釜川完成设备安装以后，双方在无锡釜川工厂进行设备的出厂验收工作。在双方共同监督下进行设备运行状态模拟（无锡釜川提供市水/洁净压缩空气/不含加热的电力负载支持）。如果设备能够完全满足规定的指标，即证明设备出厂验收合格。

Acceptance process, after the installation of the equipment in FIT Wuxi, both parties will carry out the factory acceptance of the equipment in FIT Wuxi factory. Simulation of the operating condition of the equipment is carried out under the supervision of both parties (FIT Wuxi provides municipal water/clean compressed air/electric load support without heating). If the equipment can fully meet the specified specifications, the equipment will be certified as qualified for factory acceptance.

验收地点：无锡釜川厂内； Acceptance site: FIT plant in Wuxi.

验收条件：满足无锡釜川模拟运行/静态检测条件；

Acceptance conditions: meet the FIT Wuxi simulation operation/static testing conditions.

8.3 最终验收 Final acceptance

验收条件： Acceptance conditions.:

1. 设备产能：≥8500PCS/hr（182 及以下），≥7000（182 以上）
2. 设备开机率：98%
3. 湿片率≤0.1%，脏污率≤0.1%，碎片率≤0.1%。返洗率≤0.1%；
4. 本技术协议规定内的其他设备性能，材料及主要元器件的型号品牌规格等；
5. 试加工 1 个月，加工物料由买方提供；
6. 验收期：正常生产 3 个月后开始验收；

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7. 验收签署的报告作为验收的依据，验收报告双方各执一份；

1. Equipment capacity: ≥ 8500 PCS/hr (182 and below), ≥ 7000 (182 and above)
2. Equipment on rate: 98%
3. Wet flake rate $\leq 0.1\%$, dirty rate $\leq 0.1\%$, fragment rate $\leq 0.1\%$. Rework rate $\leq 0.1\%$.
4. The performance of other equipment, materials and major components within the provisions of this technical agreement, such as the model brand specifications.
5. Trial processing for 1 month, with processing materials provided by the buyer.
6. Acceptance period: acceptance starts after 3 months of normal production.
7. Acceptance of the signed report as the basis for acceptance, a copy of the acceptance report for each side.

9. 质量保证及措施 Quality assurance and measures

9.1 质量保证要求 Quality Assurance Requirements

设备设计布局图在合同生效 20 个工作日后提供；

Equipment design layout drawings to be provided 20 working days after contract commencement.

工艺布局、设备布置、总装配图等技术文件需经双方确认会签后方可投入施工；

Process layout, equipment layout, general assembly drawings and other technical documents need to be confirmed and countersigned by both parties before they can be put into construction.

无锡釜川保证所有材料和零部件的质量、规格、品牌、产地与合同要求相符；

FIT Wuxi guarantees that the quality, specifications, brand and origin of all materials and components are in accordance with the contract requirements.

客户在协议签订后，若在设计、制造过程中有技术、工艺改动，需双方确认后方可生效，同时协商是否延期交货以及其他相关事项；

After the agreement is signed, if there are technical and technological changes in the design and manufacturing process, both parties need to confirm before the agreement can take effect, while negotiating whether to delay delivery and other related matters.

由于技术的不断进步，允许无锡釜川做以提高设备性能的技术调整；

Due to continuous technological progress, technical adjustments to improve the performance of the equipment are permitted in Wuxi Kama River.

无锡釜川制造施工应严格执行图纸、技术文件和有关规定的要求，并进行各方面的技术质量监督控制；

FIT Wuxi manufacturing construction should strictly implement the requirements of the drawings, technical documents and relevant regulations, and carry out technical quality supervision and control in all aspects.

客户在无锡釜川制造过程中对制造质量进行中间检查。设备出厂前客户在无锡釜川工厂进行预验收；

Intermediate inspection of manufacturing quality by the customer during the manufacturing process in FIT Wuxi. Pre-inspection by the customer at the FIT Wuxi factory before the equipment leaves the factory.

无锡釜川提供的设备必须运转正常、安全可靠、外观美化、色调和谐；

The equipment provided by FIT Wuxi must be in normal operation, safe and reliable, with a beautified appearance and harmonious color.

每台设备在运行时应平稳、无爬行撞击或抖动泄漏等不良现象，加热系统安全可靠，风管布置合理；

Each equipment should be smooth in operation, no crawling impact or shaking leakage and other undesirable phenomena, safe and reliable heating system, reasonable air duct arrangement.

所有电器、配电箱及控制箱的设计安装，应符合国家电器技术的安全标准，所有机械安装应符合国家有关规定的要求和精度等级；

The design and installation of all electrical appliances, distribution boxes and control boxes shall conform to the national safety standards for electrical technology, and all mechanical installations shall conform to the requirements and precision levels of the relevant national regulations.

水路、气路，风路连接处，不得有漏气、漏风、漏水等现象；

Water, air and wind connections must not have air, wind or water leaks.

设备各衔接处，应平直，金属表面喷涂应平整、光滑、无漏漆、颜色均匀；

Each articulation of the equipment, should be straight, metal surface spraying should be smooth, smooth, no leakage of paint, uniform color.

设备、热风机或其他动力设备应有良好的过载保护，并有紧急制动等保护装置；

Equipment, heaters or other power equipment should have good overload protection, and have emergency brakes and other

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protective devices.

文件确认方式：签字、正式传真、会议纪要；

Document acknowledgement methods: signature, official fax, minutes of meetings.

9.2 质量保证措施 Quality assurance measures

设计控制：无锡釜川依据本协议的全部要求，并按照行业规范，做出合理的设计，并在与客户的交流过程中，不断优化方案设计。对设备的线体、传动、动力、气动、温控等部分的结构、选型必须留有余量，保证能够长期安全、可靠、稳定地运行，为客户保证产品质量提供最基本的条件；

Design control: FIT Wuxi makes reasonable design according to all the requirements of this agreement and in accordance with the industry norms, and constantly optimizes the program design during the communication process with customers. The structure and selection of the line body, transmission, power, pneumatic, temperature control and other parts of the equipment must be left to ensure that it can operate safely, reliably and stably for a long time, providing the most basic conditions for customers to ensure product quality.

无锡釜川分供方的审查认定：为无锡釜川提供原材料、部件、整机的分供方，需要有对其质量保证的认证。无锡釜川提供封样样品，客户按封样验收；

Review and identification of subsuppliers: subsuppliers who provide raw materials, components and complete machines to FIT Wuxi need to have certification of their quality assurance. FIT Wuxi provides sealed samples, and the customer accepts them according to the sealed samples.

制造过程控制：无锡釜川为客户制作设备的过程中，应严格按照规定进行过程控制，保证按设计要求生产出合格产品；

Manufacturing process control: In the process of making equipment for customers, FIT Wuxi shall strictly follow the regulations for process control to ensure that qualified products are produced according to the design requirements.

生产的检验和验收：无锡釜川在设备制作过程中和形成部件成品后，进行严格的检验和试验，不合格品不得进入下一工序；

Inspection and acceptance of production: FIT Wuxi conducts strict inspection and test during the production of equipment and after the formation of finished parts, and unqualified products are not allowed to enter the next process.

搬运、存储、包装、防护和交付：无锡釜川应采取保证产品质量的措施，这种保护应延续到交付的目的地，直至安装、调试完毕，交付客户验收；

Handling, storage, packaging, protection and delivery: FIT Wuxi shall take measures to ensure the quality of products, and such protection shall continue to the destination of delivery until installation, commissioning and delivery to the customer for acceptance.

安装、调试：无锡釜川按行业规定进行设备的安装、调试；

Installation and commissioning: FIT Wuxi carries out the installation and commissioning of the equipment according to the industry regulations.

10. 技术服务与培训 Technical service and training

10.1 备品备件 Spare parts

免费提供从调试之日起一年的技术支持、服务及设备正常使用及维护所需的备品备件；

Free technical support, service and spare parts required for the normal use and maintenance of the equipment for one year from the date of commissioning.

验收完成，无锡釜川提供以下清单：

Acceptance is complete and FIT Wuxi provides the following list.

保修期外三年强制配备部分（价格不包含在设备报价中，需要客户另行购买/放置在客户工厂备件库）；

Compulsory equipment part for three years outside the warranty period (the price is not included in the equipment quotation and needs to be purchased separately by the customer/placed in the customer's factory spare parts store).

保修期外三年推荐配备部分（价格不包含在设备报价中，需要客户另行购买/放置在无锡釜川工厂内）；

Recommended equipment part for three years outside the warranty period (price is not included in the equipment quotation and needs to be purchased separately by the customer/placed in the FIT Wuxi factory).

保修期外三年易损件部分（价格不包含在设备报价中，需要客户另行购买/放置在无锡釜川工厂内）；

The part of wearing parts for three years outside the warranty period (the price is not included in the equipment quotation and needs to be purchased separately by the customer/placed in the FIT Wuxi factory).

10.2 软件服务 Software Services

提供设备相关硬件、软件升级服务；

Providing equipment-related hardware and software upgrade services.

硬件升级包括：自动化升级和搭接模块升级，速度提升，产量提升等；

Hardware upgrades including: automation upgrades and lap module upgrades, speed increases, yield increases, etc..

软件升级包括：正常设备软件升级，生产管理系统 MES，射频识别 RFID 等；

Software upgrade including: normal equipment software upgrade, production management system MES, RFID, etc..

设备主 PLC 必须带有以太网口，并预留至少一个空余接口（配有小型交换机亦可）及相关通讯模块（作设备间交互使用）。

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设备 PLC 应支持 S7 TCP/IP Ethernet、Modbus TCP/IP、EtherNet/IP 等主流协议中的一种。

The main PLC of the equipment must have an Ethernet port and at least one spare interface (with a small switch) and related communication modules (for interaction between devices). The equipment PLC should support one of the mainstream protocols such as S7 TCP/IP Ethernet, Modbus TCP/IP, EtherNet/IP, etc.

有上位机软件的设备需提供 OPC Server、ODBC、web service 接口的集成方式。

Devices with upper computer software need to provide OPC Server, ODBC, web service interface integration methods.

10.3 操作培训 Operation Training

设备试生产运行期间，提供详细的操作、维护、应急处理培训，具体内容如下：

Detailed training on operation, maintenance and emergency handling is provided during the trial production operation of the equipment, as follows.

| 序号 No | 内容 Content | 参与培训人员 Training Participants | 开始时间 Start time | 时间 Time | 备注 Remarks |
|----------|--|---|--|--------------------------|--|
| 1 | 设备原理 结构培训 Equipment Principle Structural Training | 负责设备的电气及机械 工程师 Electrical and mechanical engineer in charge of the equipment | 在用户通电调试 一周后 After a week of commissioning by the user | 0.5-2 天 0.5-2 days | 提供设备说明书及培训资料及相关录 像资料 Provide equipment manuals and training materials and related video materials |
| 2 | 应急处理 维修保养 Emergency Handling Maintenance | 负责设备的电气及机械 工程师 Electrical and mechanical engineer in charge of the equipment | 在用户通电调试 一周后 After a week of commProvide equipment manuals and training materials and related video materials issioning by the user | 0.5-3 天 0.5-3 days | 提供设备说明书及培训资料及相关录 像资料 Provide equipment manuals and training materials and related video materials |
| 3 | 设备原理 结构培训 Equipment principle Structural Training | 设备使用人员 Equipment users | 在用户通电调试 三周后 After three weeks of power commissioning by the user | 0.5-2 天 0.5-2 days | 提供设备说明书及培训资料及相关录 像资料 Provide equipment manuals and training materials and related video materials |
| 4 | 设备操作 应急处理 Equipment Operation Emergency Handling | 设备使用人员 Equipment users | 在用户通电调试 三周后 After three weeks of power commissioning by the user | 0.5-3 天 0.5-3 days | 提供设备说明书及培训资料及相关录 像资料 Provide equipment manuals and training materials and related video materials |

10.4 设备附件及零备件 Equipment accessories and spare parts

提供设备正常使用及维护所需的备品备件；

提供易损件清单及有关图纸；

Provide spare parts required for normal use and maintenance of the equipment.

Provide a list of wearing parts and relevant drawings.

10.5 设备技术资料 Equipment technical data

使用维护说明书：设备安装调试完成后，向客户提供最终使用维护说明书；

安装说明书或现场安装指导，关键外购件说明书；

设备验收单；

Maintenance manual: After the installation and commissioning of the equipment is completed, the final use and maintenance manual is provided to the customer.

Installation instructions or on-site installation instructions, instructions for key external parts.

Equipment acceptance sheets.

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10.6 技术培训 Technical Training

设备试生产运行期间，无锡釜川负责培训客户指定机电维修人员，培训包括设备操作维护，普通故障的分析和处理；
无锡釜川质保期内每年派出 1-2 名相关技术人员到厂作指导及进行相应维护；

During the trial operation of the equipment, FIT Wuxi is responsible for training the customer's designated electromechanical maintenance personnel, which includes equipment operation and maintenance, analysis and treatment of common faults.

FIT Wuxi will send 1-2 technicians to the factory every year during the warranty period for guidance and maintenance.

11. 售后服务承诺 After-sales service commitment

11.1 售后服务承诺 After-sales service commitment

质保期内非操作原因出现设备故障，无锡釜川保证在接到客户通知 24 小时内到达现场（国内），并在 8 小时内解决。人工费、差旅费由无锡釜川承担；

If the equipment fails during the warranty period for non-operating reasons, FIT Wuxi guarantees to arrive at the site (domestic) within 24 hours after receiving the customer's notice and to solve the problem within 8 hours. Labor cost and travel cost will be borne by FIT Wuxi.

质保期内操作原因出现设备故障，无锡釜川保证在接到客户通知 24 小时内到达现场（国内），并在 8 小时内解决。其间因发生的更换零部件费用由客户承担，人工费由客户承担，差旅费由客户承担；

If the equipment fails during the warranty period for operational reasons, Wuxi Kettle River guarantees to arrive at the site (domestic) within 24 hours of receiving the customer's notification and to solve the problem within 8 hours. The cost of replacement parts due to occur during this period will be borne by the customer, labor costs will be borne by the customer and travel costs will be borne by the customer.

质保期外出现设备故障，无锡釜川保证在接到客户通知 36Hr 内到达现场，并在 8Hr 内解决（国内）。其间发生的更换零部件费用由客户承担，人工费由客户承担，差旅费由客户承担；

If the equipment fails outside the warranty period, FIT Wuxi guarantees to arrive at the site within 36Hr after receiving the customer's notice and to solve the problem within 8Hr (domestic). The cost of replacement parts, labor costs and travel costs incurred during this period will be borne by the customer.

无锡釜川保证优先优价向客户提供备品备件；

FIT Wuxi guarantees the supply of spare parts to customers at a preferential price.

无锡釜川对设备终身提供售后服务；

Lifetime after-sales service for the equipment from FIT Wuxi .

***海外项目的售后服务承诺由买卖双方另行约定。The after-sales service commitment for overseas projects is agreed separately by the buyer and seller.**

由于技术的不断进步，以上方案允许做以提高设备性能的技术调整。

Due to continuous technological advances, the above solutions allow for technical adjustments to improve the performance of the equipment.