

# 晶体硅光伏组件安装使用手册

## Installation Manual for Crystalline Silicon Photovoltaic Modules

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# 晶体硅光伏组件安装使用手册

## Installation Manual for Crystalline Silicon Photovoltaic Modules

### 1 手册介绍 Manual introduction

本手册适用于安徽东旭康图太阳能科技有限公司 (以下简称东旭)生产的边框系列太阳能组件的安装、维护和使用。如果不遵守这些安全指南,将可能导致人员伤亡或财产损失。安装和操作太阳能组件需要专业的技能,只有专业人员才可以从事该项工作。请在使用和操作组件之前仔细阅读安全和安装说明。安装商必须相应地把上述事项告知终端客户(或消费者)。

本手册中的"组件"或"PV 组件"指的是一个或多个边框系列太阳能组件。请保留此说明书以供将来参考。

The manual is applicable to the installation, maintenance and use of the frame series solar modules produced by Anhui Tunghsu Kangtu Solar Technology Co., Ltd. (hereinafter referred to as Tunghsu). Failure to follow these safety guidelines may result in personal injury or death or property damage. Installing and operating solar modules requires professional skills, and only professionals can do this work. Please read the safety and installation instructions carefully before using and operating the modules. The installer must inform the end customer (or consumer) of the above matters accordingly.

The "module" or "PV module" in this manual refers to one or more frame series solar modules. Please keep this manual for future reference.

#### 1.1 免责声明 Disclaimer

东旭康图保留在没有预先通知的情况下变更本安装手册的权利。客户在安装组件过程中未按照本手册中所列出的要求操作,会导致提供给客户的产品有限质保失效。

Tunghsu Kangtu reserves the right to change this installation manual without prior notice. Failure to follow the requirements listed in this manual during the installation of modules, it will result in the invalidation of the limited product warranty provided to the customer.

## 1.2 责任范围 Limitation of Liability

东旭康图不为任何形式的伤害负责，包括但不限于组件操作、系统安装失误以及未按照本手册的指示产生的身体伤害、受伤和财产损失负责。

Tunghsu Kangtu is not responsible for any form of injury, including but not limited to module operation, system installation errors, and physical injury, injury and property damage caused by failure to follow the instructions in this manual.

## 2 安全措施 Safety measures

### 2.1 警告 Warning

对组件进行安装、接线、操作或维护前，应阅读并理解所有安全细则。当组件电池面直接暴露在阳光或其他光源下时，会产生直流电(DC)，无论是否连接组件，直接接触组件的带电部分，例如接线端子等，将可能导致人员伤亡。

Before installing,wiring,operating or maintaining modules,you should read and understand all the safety rules.When the battery surface of the module directly exposed to sunlight or other light sources, direct current (DC) will be generated. Whether the module is connected or not, direct contact with the live parts of the module, such as the terminal, may cause casualties.

### 2.2 通用安全 General safety

- 所有的安装工作必须完全遵守当地法规和相应的国际电气标准。
- 建议由具备光伏系统安装经验的人员进行安装。如果由不熟悉相应安全程序的人员操作将会非常危险。
- 不允许未经授权的人员接近安装区域或者组件仓储区域。
- 请不要安装玻璃已损坏或背板损坏的组件。
- 不要拆解或移动组件中的任何部分。
- 不要人为在组件上聚光。
- 当组件有电流或外部电流出现时，不得连接或断开组件
- All installation work must fully comply with local regulations and corresponding international electrical standards.
- It is recommended that the installation should be carried out by personnel with



experience in installing photovoltaic systems. It will be very dangerous if operated by personnel who are not familiar with the corresponding safety procedures.

- Unauthorized personnel are not allowed to approach the installation area or module storage area.

- Please do not install modules with damaged glass or damaged backsheet.
- Do not disassemble or move any part of the modules.
- Do not artificially condense light on the modules.
- Do not connect or disconnect the module when there is current or external current.

### 2.3 操作安全 Safe operation



- 请不要损坏或敲打组件的玻璃和背板面。
- 请不要拉扯、划伤或用力弯折输出线缆，否则线缆的绝缘部分会被损坏导致电流泄露或触电。

- 请不要在电源未断开的情况下，使用水来灭火。
- 请不要在潮湿或者大风期间安装或处理组件。在安装现场，请保持组件电器元件的清洁与干燥。如果线缆插头在潮湿条件下互相接触，会被腐蚀。任何被腐蚀的组件都不能被使用。

- 请不要松动或拧下光伏组件的螺丝，有可能导致组件载荷下降，甚至掉落
- 请不要让物体直击组件或物体直接掉落在组件上。
- 在阳光下，请不要在没有任何保护的情况下用手直接触摸组件的接线盒、连接器、线缆等带电体，无论光伏组件是否与系统连接。

- Please do not damage or knock the glass and backsheet surface of the module.

- Do not pull, scratch, or bend the output cable forcibly, otherwise the insulation of the cable will be damaged and cause current leakage or electric shock.

- Please do not use water to extinguish the fire when the power is not disconnected.

- Please do not install or dispose of modules during periods of humidity or strong wind.

At the installation site, please keep the electrical components of the module clean and dry. If the cable plugs touch each other in wet conditions, they will corrode. Any corroded modules cannot be used.

- Please do not loosen or unscrew the screws of the module, it may cause the load of the module to drop or even fall.

- Do not let objects hit the module directly or fall directly on the module.

- Under the sun, please do not directly touch the junction box, connector, cable and other charged objects of the module without any protection, regardless of whether the module is connected to the system.

### 3 卸货、运输和存储 Unloading, transportation and storage

预防措施和通用安全细则:

Precautions and general safety rules

- 组件在安装前应存储在原包装箱内, 请保护好包装不要使其受损。按照建议的拆包步骤打开组件包装。打开、运输和存储过程需小心操作;

- 禁止在未拆包的包装箱上及组件上站立、攀爬、行走或跳跃;

- 安装前, 确保所有组件和电气接触都是干净和干燥的;

- 如果需要暂时存放组件, 则应将组件存储在干燥通风的环境中;

- 拆包时, 必须由2个或2个以上人员同时操作, 禁止拉扯组件的导线或接线盒来搬运组件, 搬运组件时应由2个人以上带防滑手套同时手持组件搬运; 禁止头顶组件搬运;

禁止堆叠组件;

- 禁止将组件置于无可靠支撑或未固定的环境下;

- 禁止组件与尖锐物接触, 划痕, 以免直接影响组件的安全性;





- The modules should be stored in the original packaging box before installation. Please protect the packaging from damage. Follow the recommended unpacking steps to unpack the modules. Be careful during opening, transportation and storage;




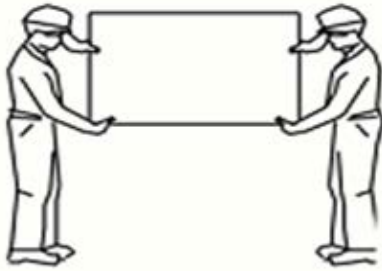
- It is forbidden to stand, climb, walk or jump on the unopened packing box and modules;
- Before installation, ensure that all modules and electrical contacts are clean and dry;
- If you need to store modules temporarily, they should be stored in a dry and ventilated environment;
- When unpacking, it must be operated by 2 or more people at the same time. It is forbidden to pull the wire or junction box of the module to carry the module. When moving the module, it should be carried by more than 2 people with non-slip gloves while holding the module; it is prohibited to carry the module overhead; Do not stack modules;
- It is forbidden to place the modules in an environment without reliable support or unfixed;
- It is forbidden for the modules to come into contact with sharp objects or scratches, so as not to directly affect the safety of the components;

### 3.1 包装标识说明 Packaging label description


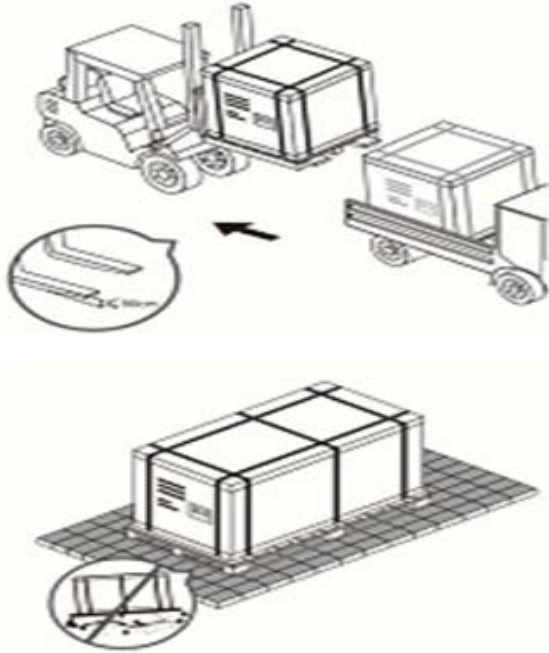
	禁止组件随意丢弃, 需要专门回收		禁止组件淋雨或者受潮
	纸箱中的组件为易碎品, 搬运时应小心轻放		包装在运输时应竖直向上

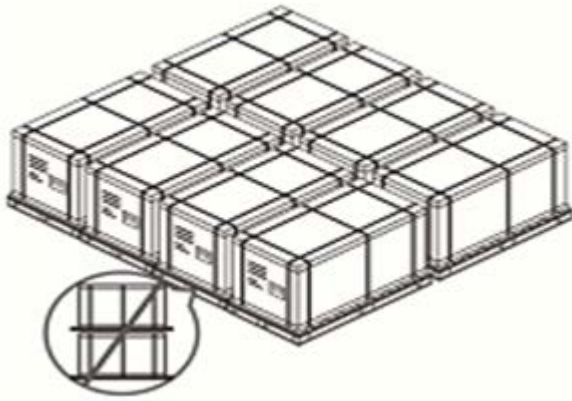
	<p>禁止在包装箱和组件上面踩踏</p>		<p>纸箱可循环再利用</p>
	<p>堆叠组件时请勿超过外包装箱上印刷标志的最高层数限制, (码 2 层; n =3 时, 最多堆码 3 层)</p>		<p>一块组件需由 2 个人同时搬运</p>

	<p>Forbidden to discard , and special recycling is required</p>		<p>Prohibit from being exposed to rain or moisture</p>
	<p>The modules in the carton are fragile and should be handled carefully</p>		<p>The packaging should be upright during transportation</p>

	Forbidden to step on the packaging box or modules		Cartons can be recycled
	Stacking modules, please do not exceed the limit of the maximum number of layers printed on the outer packaging box, (code 2 layers; when n=3, stack up to 3 layers)		A module needs to be carried by 2 people at the same time

### 3.2 卸货注意事项 Precautions for unloading

 <p>使用合理的吊装治具，吊装一次性最多允许 2 托组件。吊装前应确认托盘和纸箱是否有破损及吊装的绳索是否结实、牢固。吊装快着地时，两人一人一边扶正纸箱轻轻放在项目地相对平坦的位置上。</p>	 <p>请使用叉车将组件从货车上卸下来，将组件放置于水平地面上，通风干燥处。</p>
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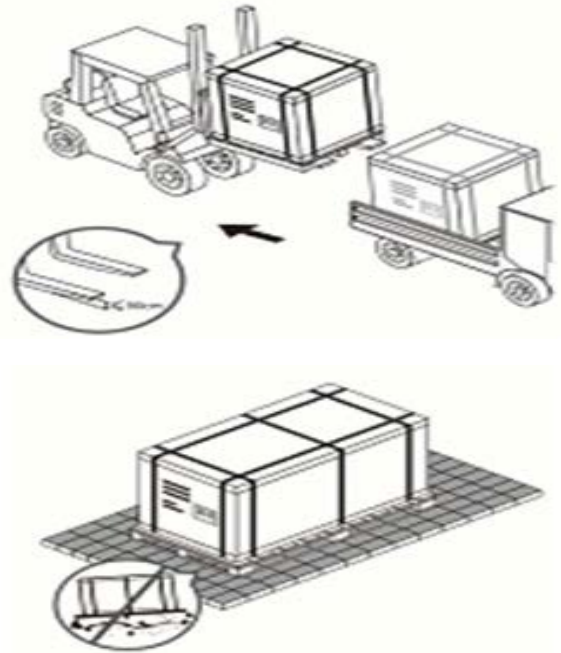
禁止在项目地将组件堆码



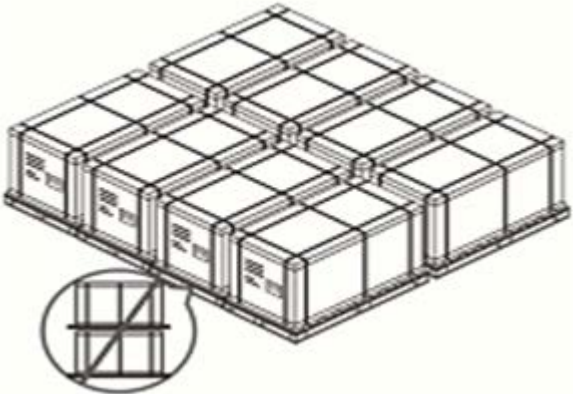

使用遮雨布盖住组件，防止组件受潮






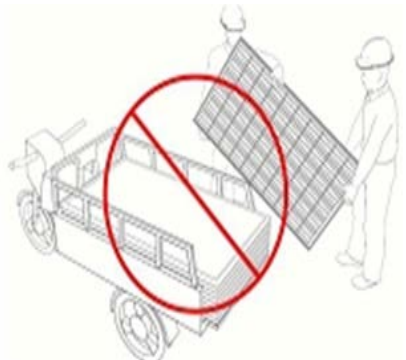
Use reasonable hoisting jigs, hoisting allows up to 2 supporting modules at a time. Before hoisting, confirm whether the pallets and cartons are damaged and whether the hoisting ropes are strong and firm. When the hoisting is about to touch the ground, two of them will straighten the carton and gently place it on a relatively flat position






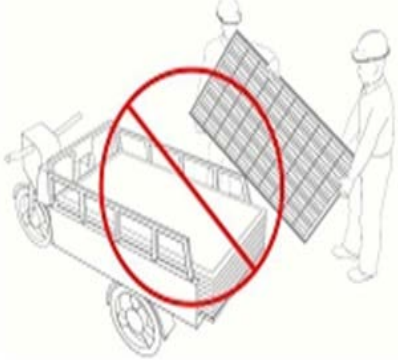


Please use a forklift to unload the modules from the truck, and place it on a level ground in a ventilated and dry place



 <p>Forbidden to stack modules at the project site</p>	 <p>Use rain cloth to cover the modules to prevent from getting wet</p>
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### 3.3 二次运输及注意事项 Second transportation and precautions

	<p>如果组件需要长途运输或长期存储, 请不要拆除原包装</p>		<p>包装的成品可以通过陆运、海运、或空运进行运输。在运输过程中: 请将包装箱固定在运输平台上, 确保包装不会翻滚。正常卡车运输时, 最多 2 层叠加。</p>
	<p>项目现场托运, 只允许 1 层运输。后运输</p>		<p>禁止三轮车转运包装不完整的组件</p>

	<p>禁止用绳子背组件</p>		<p>禁止单人背组件</p>
	<p>Do not remove the original packaging, if the modules need long-distance transportation or long-term storage,</p>		<p>The packaged products can be transported by land, sea, or air. During transportation: please fix the packing box on the transportation platform to ensure that the packing will not roll over. During normal truck transportation, up to 2 layers can be superimposed.</p>
	<p>Consignments at the project site, only 1 layer is allowed.</p>		<p>Prohibition of the transfer of incomplete modules on tricycles</p>



	<p>Do not use rope to carry modules</p>		<p>Prohibition of single to carry modules</p>
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### 3.4 存储 Storage

- 禁止淋雨或者受潮，请将包装的成品置于通风、防雨和干燥的地方。
- 如果组件需要长途运输或长期存储，请不要拆除它。
- 项目地仓库存储（湿度<85%；温度：-20°C ~+50°C）：60 片边框组件与 72 片边框组件静态堆码堆放 2 托
- Forbidden to be exposed to rain or moisture. Please place the packaged product in a ventilated, rain-proof and dry place.
- If the module needs long-distance transportation or long-term storage, please do not remove it.
- Warehouse storage at the project site (humidity <85%; temperature: -20°C ~+50°C): 60 frame modules and 72 frame modules are statically stacked 2 trays



be flat

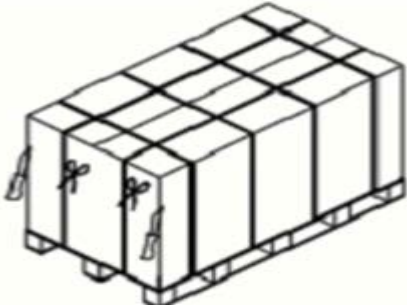

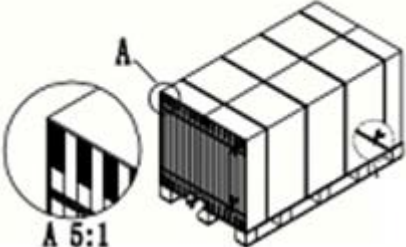
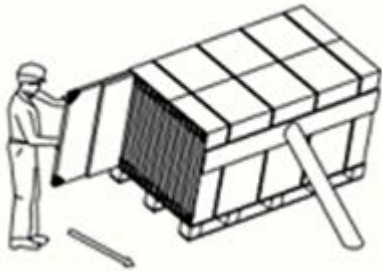

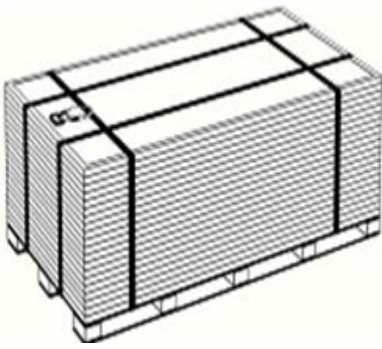
储存地面应相对平整 storage floor should

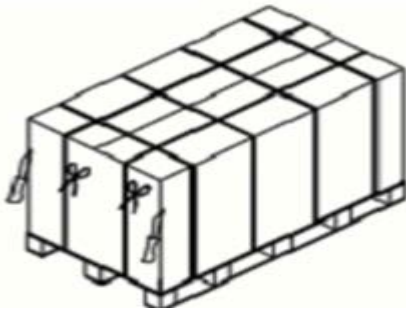

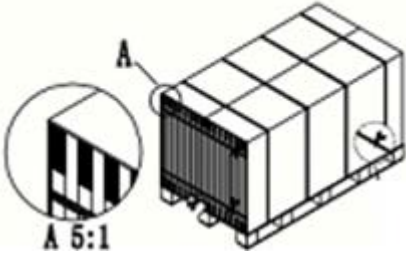


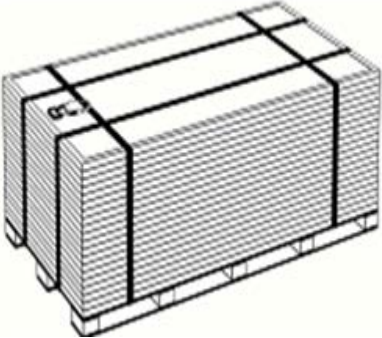
## 4 拆包说明 Unpacking instructions

### 4.1 拆包安装: Unpacking and installation

- 在户外拆箱时，禁止在下雨的条件下作业。因为纸箱淋雨后会变软散开，里面的光伏组件（下文简称“组件”）会脱出造成损坏或者砸伤人员。
- 如果现场有风，需要特别注意安全，尤其是大风的情况下，建议不要搬运组件，并且妥善固定好已拆开包装的组件。
- 作业地面需要保证包装箱能够水平稳定的放置，避免倾倒。
- 拆箱过程中请佩戴保护手套，避免伤手和在玻璃面留下指印。
- 外包装可查询组件信息和拆包作业指导，请在拆包前仔细阅读拆包说明。
- 每块组件需要 2 个人抬，抬组件时，禁止拉扯接线盒；禁止抓住长边取出组件。
- When unpacking outdoors, it is forbidden to work in rainy days. The carton will become soft and disperse after being exposed to the rain, the photovoltaic modules (hereinafter referred to as "modules") inside will fall out, causing damage or injuring people.
- If there is wind, you need to pay attention to safety, especially in the case of strong wind, it is recommended not to move the modules, and properly fix the unpacked modules.
- The working floor needs to ensure that the packing box can be placed horizontally and stably to avoid tipping.
- Please wear protective gloves during unpacking to avoid hurting your hands and leaving fingerprints on the glass surface.
- You can query module information and unpacking instructions on the outer packaging. Please read the unpacking instructions carefully before unpacking.
- Each module needs to be lifted by 2 people. When lifting the module, do not pull the junction box; do not grab the long side to take out the module.

**4.2 拆包步骤: Unpacking steps**

	用刀片或剪刀剪断托盘短边的两根打包带, 并沿垂直方向将侧面纸箱裁开		剪开短边胶带, 抓住被裁纸板的底边抬起 90°, 并抽出该纸板, 露出组件。
	剪断纸箱内部的上下两条横向打包带, 从托盘底部剪断靠近托盘的两条打包带, 取出打包带		若在水平地面拆包, 从包装一侧朝另一侧依次取出组件, 然后两人搬运。若在非水平地面拆包, 需要做好防倾斜措施, 如下图红色部分。
	禁止将组件斜靠在安装柱子上		如果拆包后没有将所有组件取出, 有组件剩余在包装中的情况, 则将剩余组件平放后重新打包, 防止倾倒, 需水平放置。组件叠放的数量: 60 片边框组件不超过 20 片, 72 片边框组件不超过 16 片。

	<p>Use a blade or scissors to cut the two straps on the short side of the tray, and cut the side carton in the vertical direction</p>		<p>Cut off the short-side tape, grasp the bottom edge of the cut cardboard and lift it 90°, and pull out the cardboard to expose the modules.</p>
	<p>Cut the upper and lower horizontal packing belts inside the carton, cut the two packing belts near the tray from the bottom of the tray, and take out the packing belt</p>		<p>If unpacking on a level ground, take out the modules one by one from one side of the package to the other, and two people carry it. If you unpack on a non-level ground, you need to take anti-tilting measures, as shown in the red part of the figure below.</p>
	<p>Forbidden to lean the module against the mounting post</p>		<p>If all the modules are not taken out after unpacking, put the remaining components flat and repack them to prevent from tipping over and place them horizontally. The number of modules stacked: 60 frame modules not more than 20pcs, 72 frame modules not more than 16pcs</p>

## 5 场地选择 Site selection

- 建议通过优化的倾斜角安装太阳能组件以达到能量输出最大化。一般来说它大致等同于项目所在地的纬度，面向赤道方向。但在实际的设计中还是按照当地具体情况设计并找出最佳倾斜角。
- 当在屋顶上安装太阳能组件时,屋顶上必须要覆盖有一层适用于该等级的防火材料,并且保证背板和安装面之间充分的通风,要在屋顶边缘和太阳能阵列的外边缘之间留出安全的工作区域。
- 如果住宅设施在地面上,组件的安装应按照当地法规进行,例如安装中需要用到围栏。
- 对组件进行定位以尽量减少其在一天中任何时间段遮光的可能性。
- 推荐组件安装在工作环境温度 $-20^{\circ}\text{C}$ ~ $46^{\circ}\text{C}$ 的环境,组件的极限工作环境温度为 $-40^{\circ}\text{C}$ ~ $85^{\circ}\text{C}$ 。
- 尽量将组件安装在一年中罕有遮阳的位置。
- 如果您计划在可能出现水渍侵害的地方(湿度: $> 85\text{RH}\%$ )使用光伏组件,请先向我司技术支持团队咨询以确定合适的安装方法,或确定是否可以安装。
- 如果组件安装在有频繁雷电活动的地方是,必须要对组件进行防雷击保护。
- 请勿安装在可燃气体附近。
- 按照IEC 61701要求开展的光伏(PV)组件盐雾腐蚀试验结果表明,我司太阳能组件可以安装在近海或亚硫酸盐区域附近的腐蚀性盐碱地区。组件不得浸泡在水中或长期沾水(纯水或盐水)的环境中(例如喷泉、浪花等)。如果组件置于盐雾(即海洋性环境)或者含硫(即含硫源、火山等)的环境中,会有腐蚀的风险。
- 在离海边50m~500mm的地方,必须采用不锈钢或者铝材料来与光伏组件接触,并且对安装部位做好防锈蚀的处理。
- IEC62716:2013"光伏(PV)组件的氨腐蚀试验"和DLG Fokus耐氨性试验的结果表明,我司太阳能组件可以安全地安装在像农舍这样的氨气较重的环境中。
- It is recommended to install solar modules with an optimized tilt angle to maximize energy output. In generally, it is roughly equivalent to the latitude of the project location, facing the equator. However, in the actual design, always to find the best tilt angle according to the local conditions.

- When installing solar modules on the roof, the roof must be covered with a layer of fireproof material suitable for this level, and sufficient ventilation between the backplane and the installation surface should be ensured, with a safe work area between the edge of the roof and the outer edge of the solar array.

- If the residential facility is on the ground, the installation of modules should be carried out in accordance with local regulations, for example, fences are required for installation.

- Position the modules to minimize the possibility of shading at any time of the day.

- It is recommended that the module be installed in an environment where the working environment temperature is  $-20^{\circ}\text{C}\sim 46^{\circ}\text{C}$ , and the extreme working environment temperature of the module is  $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ .

- Try to install the module in a location where there is rarely sunshade during the year.

- If you plan to use photovoltaic modules in a place where water damage may occur (humidity:  $>85\text{RH}\%$ ), please consult our technical support team to determine the appropriate installation method or whether it can be installed.

- If the module is installed in a place with frequent lightning activities, the module must be protected against lightning strikes.

- Do not install near flammable gas.

- The salt spray corrosion test results of photovoltaic (PV) modules carried out in accordance with the requirements of IEC 61701 show that our solar modules can be installed in corrosive salt-alkali areas near offshore or sulfite areas. The modules must not be immersed in water or long-term exposure to water (pure water or salt water) (such as fountains, waves, etc.). If the modules are placed in a salt spray (ie, marine environment) or an environment containing sulfur (ie, sulfur sources, volcanoes, etc.), there is a risk of corrosion.

- At a place 50m~500mm away from the sea, stainless steel or aluminum must be used to contact the photovoltaic module, and the installation site must with anti-corrosion measures.

- The results of IEC62716:2013 "Ammonia Corrosion Test of Photovoltaic (PV) Modules" and DLG Fokus ammonia resistance test show that our solar modules can be safely installed in environments with heavy ammonia, such as farm buildings.

## 6 倾角选择 Angle selection

- 光伏组件的倾角测量指组件与水平地面的角度。针对不同的项目有不同的安装倾角，推荐的组件安装夹角不小于 $10^{\circ}$ ，或依据当地法规指南或有经验的光伏组件安装商的建议。

- 通过测量 PV 组件和水平地面之间的夹角来得出 PV 组件的倾斜角测量值
- 在北半球安装，组件最好朝南，在南半球安装，组件最好朝北
- 应在组件边框和墙面或屋顶表面之间留有至少115mm（4.5英寸）（建议）的间隙。

如果采用其他安装方式，则有可能会影响UL认证或防火等级。

- The inclination measurement of photovoltaic modules refers to the angle between the module and the horizontal ground. There are different installation inclination angles for different projects. The recommended installation angle of the modules is not less than  $10^{\circ}$ , or according to local regulations or the recommendations of experienced photovoltaic module installers.

- Acquire the inclination angle of the PV module by measuring the angle between the PV module and the horizontal ground

- For installation in the northern hemisphere, the modules should better face south, and in the southern hemisphere, the modules better face north

- There should be a gap of at least 115mm (4.5 inches) (recommended) between the module frame and the wall or roof surface. If other installation methods are take, it may affect the UL certification or fire proof level.

## 7 安装 Installation

我司边框系列组件按照以下条件安装可以使用25年以上。除了所需的IEC和UL认证外，我司产品还经过测试以验证其对牛棚附近可能存在的氨气的抵抗性，以及其是否适合安装在潮湿（沿海）区域和沙尘暴频发区域。

Our frame series modules can be used for more than 25 years installed with the following conditions. Beside the required IEC and UL certifications, our products have been tested to verify their resistance to ammonia that may exist near the cowshed, and whether they are suitable for installation in humid (coastal) areas and areas with frequent sandstorms.

## 7.1 安装安全 Installation safety

● 我司的太阳能组件可以横向或纵向安装，但是采用横向安装的方式可以使灰尘对太阳能电池板的遮光影响最小化。

● 请使用干燥的绝缘防护措施：如绝缘工具、安全帽、绝缘手套、安全带和安全鞋（橡胶底）。

● 安装时请不要佩戴金属饰物，以免戳穿组件，引起触电危险。

● 请勿在下雨、下雪或大风的情况下安装组件。

● 安装时请保持连接器干燥清洁，以免触电风险，建议开箱后立即安装。

● 如果PV组件的端子潮湿则不能进行任何工作，以免触电。请在开箱后立即安装。

● 组件的应用等级为A类，可用于>直流50V 或240W以上的系统。

● 在安装之前，将PV组件保留在纸箱中。

● 在PV组件安装和布线期间，请使用绝缘材料将PV组件表面完全覆盖住。

● 如果系统电路与负载接通，请不要拔下连接插头。

● 工作时不要站在玻璃上，以免玻璃破碎造成伤害或引发触电危险。

● 不要单独工作（一直保持由2个或更多的人组成团队工作）。

● 在通过螺栓将PV组件紧固到支架上时，不要损坏PV组件的背板。

● 更换PV组件时，不要损坏周围的PV组件或安装结构。

● 电缆应固定起来或绑好，这样在安装后不会暴露在阳光直射下，可以防止电缆老化。从接线盒下引出电缆可能会引起各种问题，例如积水处漏电和火灾。

● 不同色系组件避免安装在同一阵列或屋顶中。

● Our solar modules can be installed horizontally or vertically, but the horizontal installation method can minimize the impact of dust on solar panels.

● Please use dry insulation protection measures: such as insulated tools, safety helmets, insulated gloves, safety belts and safety shoes (rubber soles).

● Do not wear metal ornaments during installation, so as not to puncture the modules and cause electric shock.

● Do not install the module under rain, snow or strong wind.

● Please keep the connector dry and clean during installation to avoid the risk of electric shock. Please install it immediately after unpacking.

● If the terminals of the PV module are wet, no work can be done to avoid electric shock.



Please install it immediately after unpacking.

- The application level of the modules is Class A, which can be used in systems > DC 50V or 240W.
- Before installation, keep the PV modules in the carton.
- During the installation and wiring of PV modules, please use insulating materials to completely cover the surface of PV modules.
- If the system circuit is connected to the load, please do not unplug the connection plug.
- Do not stand on the glass during work, otherwise the glass may break and cause injury or electric shock.
- Do not work alone (always keep working in teams of 2 or more people).
- When fastening the PV module to the bracket by bolts, do not damage the backplane of the PV module.
- When replacing PV modules, do not damage the surrounding PV modules or installation structure.
- The cable should be fixed or tied up so that it will not be exposed to direct sunlight after installation, which can prevent the cable from aging. Leading out cables from under the junction box may cause various problems, such as leakage of electricity or water and cause fire.
- Do not install modules of different colors in the same array or roof.

## 7.2 安装方法 Installation method

### 7.2.1 机械安装及注意事项 Mechanical installation and precautions

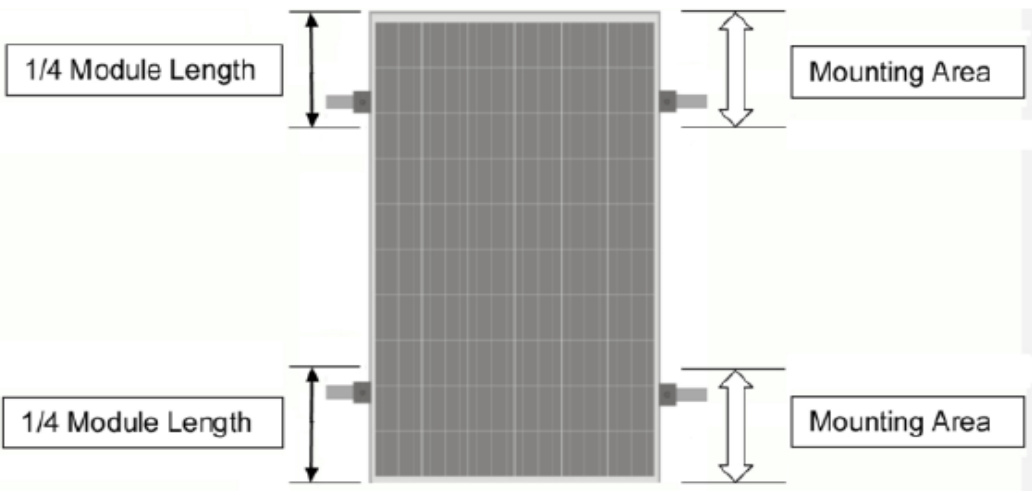
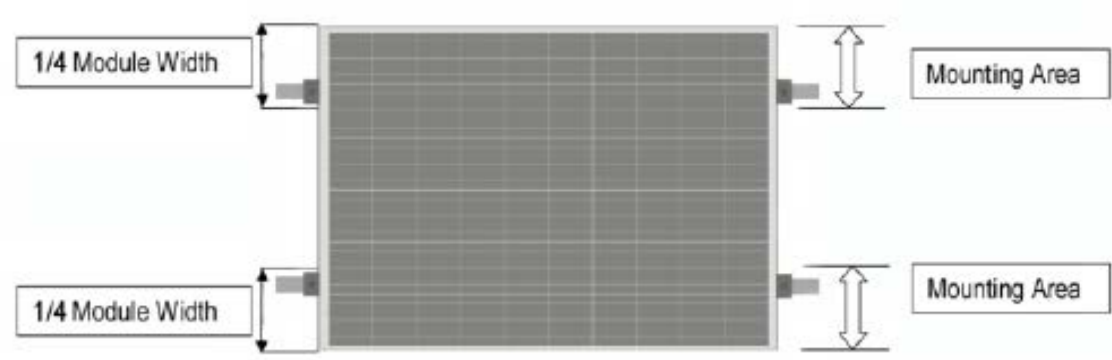
组件和支架系统的连接可以使用边框上的安装孔、夹具或者嵌入式系统来安装。安装组件必须依照下面示例和建议进行，如果安装方式与我司公示不同，请咨询我司技术支持或售后，并取得我司同意，否则会损坏组件并导致质保失效。

- 两个组件之间的最小间距为10mm（0.4英寸）
- 挡板不能承受超过最大许可载荷的暴风雪冲击，也不能承受因支撑结构的热膨胀而引起的过大的力。
- 安装或使用过程中，排水孔在任何情况下都不能堵塞。

The connection between the modules and the bracket system can be installed using mounting holes, clamps or embedded systems on the frame. The installation of the modules must be carried out according to the following examples and suggestions. If the installation way is different from

our company, please consult our technical support or after-sales service, and acquire our consent, otherwise the modules will be damaged and the warranty will be invalidated.

- The minimum distance between two modules is 10mm (0.4 inches)
- The baffle cannot withstand the impact of a snowstorm that exceeds the maximum allowable load, nor can it withstand the excessive force caused by the thermal expansion of the supporting structure.
- During installation or use, the drain hole should not be blocked under any circumstances.

夹紧系统连接到长边框 The clamping system is connected to the long frame	
夹紧系统连接到短边框 The clamping system is connected to the short frame	

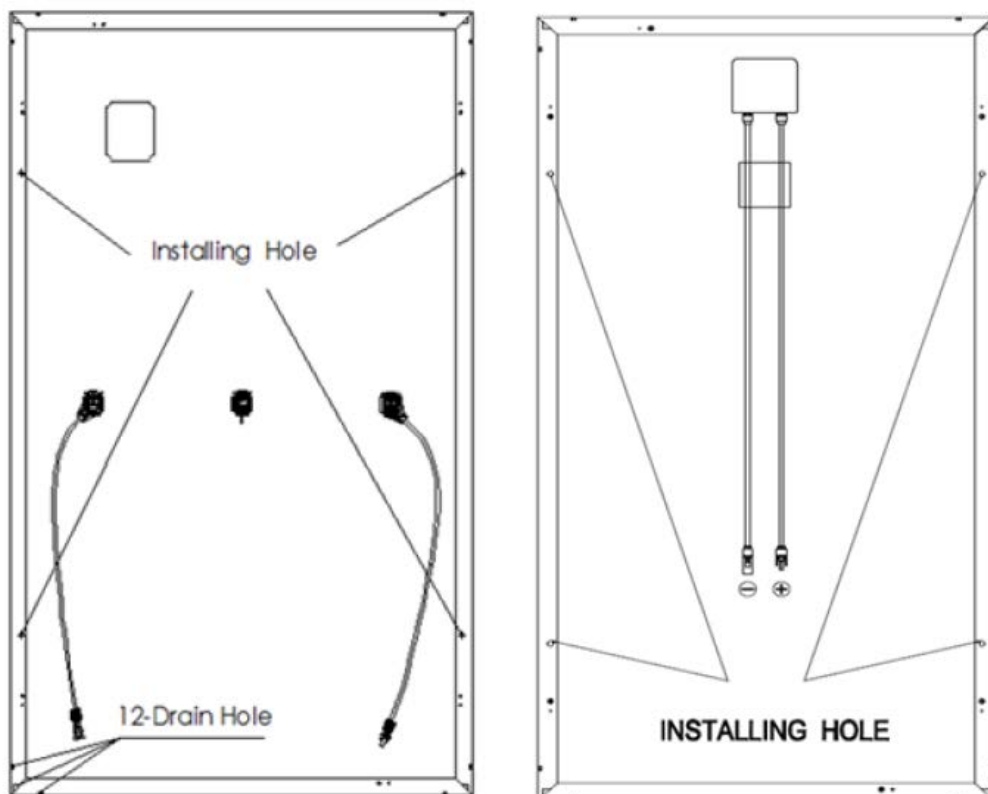
#### A. 安装孔安装 Mounting hole installation

通过组件背面边框上的安装孔，使用螺栓把组件固定在支架上，安装细节下图所示。每个组件的边框上都有4- $\phi 9 \times 14\text{mm}$ 的安装孔，通过这些安装孔可以很好地将组件固定到支撑结构上以优化其负载承受能力。

- 为了最大限度地延长安装寿命，强烈建议使用抗腐蚀（不锈钢）固定件
- 如图1所示，使用M8螺栓、平垫圈、弹簧垫圈和螺母在每个固定位置固定组件，并拧紧至16~20 N.m（140-180lbf.in）的扭矩。
- 与边框接触的所有部位应采用最小厚度为1.8mm且外径为20-24mm（0.79-0.94英寸）的扁平不锈钢垫圈。

Use bolts to fix the module on the bracket through the mounting hole on the back frame of the module. The installation details are shown in the figure below. There are 4-9\*14mm mounting holes on the frame of each module, through which the module can be well fixed to the supporting structure to optimize its load bearing capacity.

- In order to maximize the installation life, it is strongly recommended to use anti-corrosion (stainless steel) fixtures
- As shown in Figure 1, use M8 bolts, flat washers, spring washers and nuts to fix the modules at each fixed position and tighten them to a torque of 16-20 N.m (140-180lbf.in).
- All parts in contact with the frame should use flat stainless steel washers with a minimum thickness of 1.8mm and an outer diameter of 20-24mm (0.79-0.94 inches).



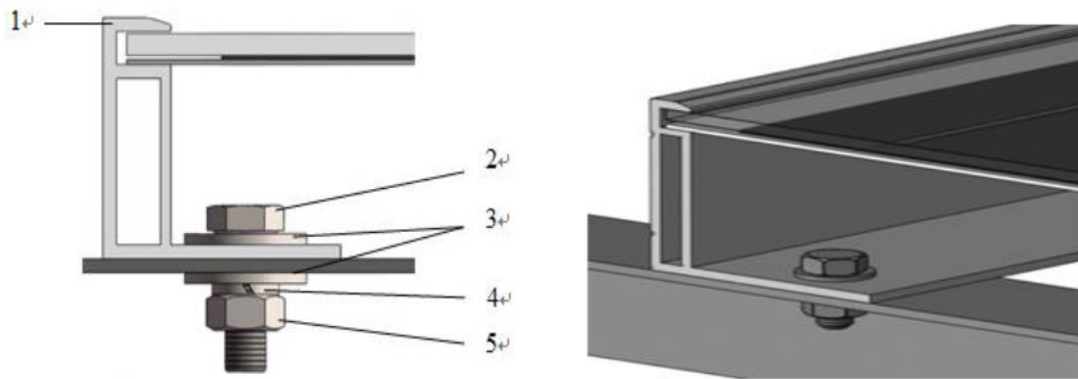


图 1. 使用螺栓嵌入法安装的 PV 组件 PV modules installed using bolt embedding method

- 1—铝边框 Aluminum frame
- 2—M8 不锈钢螺栓 Stainless steel bolt
- 3—扁平不锈钢垫圈 Flat stainless steel washers
- 4—弹簧不锈钢垫圈 Spring stainless steel washer
- 5—六角不锈钢螺母 Hexagonal stainless steel nuts

#### B. 夹具安装 Fixture installation

- 我司在用多家制造商的不同夹具测试过其组件后，建议使用具有EPDM或类似的绝缘垫圈且至少可以固定M8螺栓的夹具。

- 夹具必须与组件边框保持至少7mm（0.28英寸）但不超过10mm（0.39英寸）的重叠部分。

- 使用至少4个夹具将组件固定在安装导轨上。

- 组件夹具不能和前侧的玻璃接触，且不得使边框变形。

- 请务必避免组件夹具的遮光效应。

- 组件边框在任何情况下都不能调整

- 当选择这种类型的夹具安装方法时，每个组件上至少需要使用四个夹具。在组件的每个长边（纵向）上或每个短边（横向）上各安装两个夹具。视当地的风雪气象情况确定是否需要额外的夹具以确保组件能承受负载。

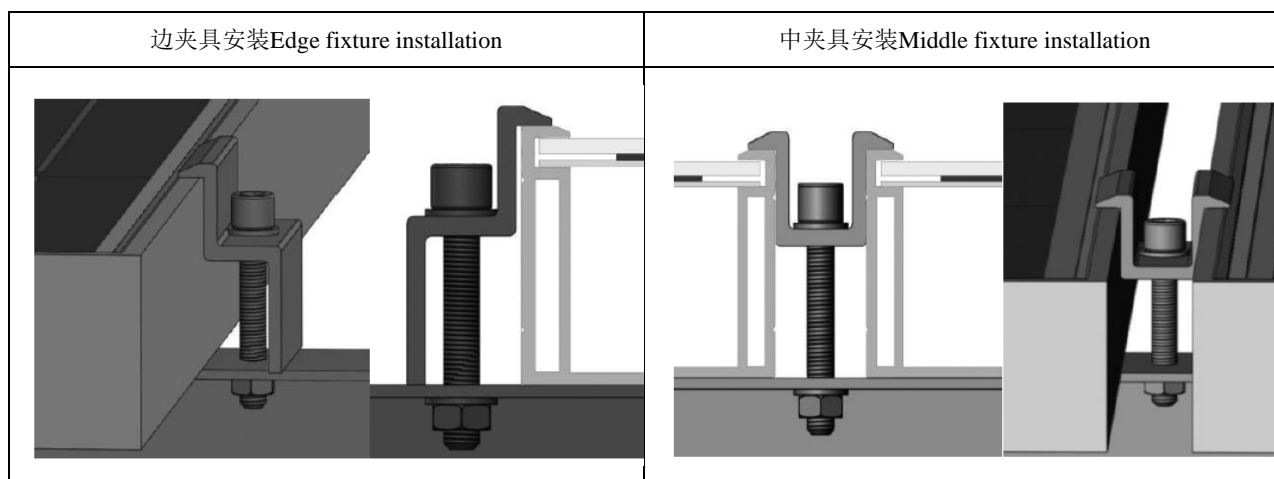
- 施加的扭矩应按照客户所用螺栓的机械设计标准来定，例如：M8 ---- 16-20N.m（140-180lbf.in）

- After our company has tested its modules with different fixtures from many manufacturers, it is recommended to use a fixture with EPDM or similar insulating washers that can at least fix M8 bolts.

- The clamp must maintain an overlap of at least 7mm (0.28 inches) but not more than

10mm (0.39 inches) with the module frame.

- Use at least 4 clamps to fix the module on the mounting rail.
- The module fixture must not be in contact with the glass on the front side, and the frame must not be deformed.
- Be sure to avoid the shading effect of the module fixture.
- The module frame cannot be adjusted under any circumstances
- When choosing this type of fixture installation method, at least four fixtures are required on each module. Install two clamps on each long side (longitudinal) or each short side (horizontal) of the module. Depending on the local wind, snow and weather conditions, determine whether additional fixtures are needed to ensure that the modules can withstand the load.
- The applied torque should be determined according to the mechanical design standard of the bolt used by the customer, for example: M8 ---- 16-20N.m



### C. 单轴跟踪方式安装Single-axis tracking installation

- 这种安装方式仅用于72片边框组件。
- 单轴跟踪方式：通过螺栓连接长边框将组件固定在轴上。
- 每个组件的边框上有4- $\phi$ 7\*10mm (0.28\*0.39英寸) 的安装孔，具体位置如图3所示。
- 使用M6螺栓、两个平垫圈、一个弹簧垫圈和螺母在每个固定位置如图3所示固定组件。
- 如果使用与M6类似的其他螺栓，则需要以9~12N.m. (80~120lbf.in) 的扭矩紧固。
- 与边框接触的所有部位应采用最小厚度为1.5mm且外径为16-20mm (0.63-0.79 英寸) 的扁平不锈钢垫圈。
- 螺栓应是不锈钢或其他抗腐蚀材料制成的。

- 采用此方法安装的机械负载压力: 按照UL1703, 前侧最大值为2400Pa (雪), 而后侧最大值为2400Pa (风)。

This installation method is only used for 72 frame modules.

Single-axis tracking method: The module is fixed on the shaft by bolting the long frame.

There are 4-7\*10mm (0.28\*0.39 inches) mounting holes on the frame of each module.

The specific location is shown in Figure 3.

Use M6 bolts, two flat washers, a spring washer and a nut to fix the modules at each fixing position as shown in Figure 3.

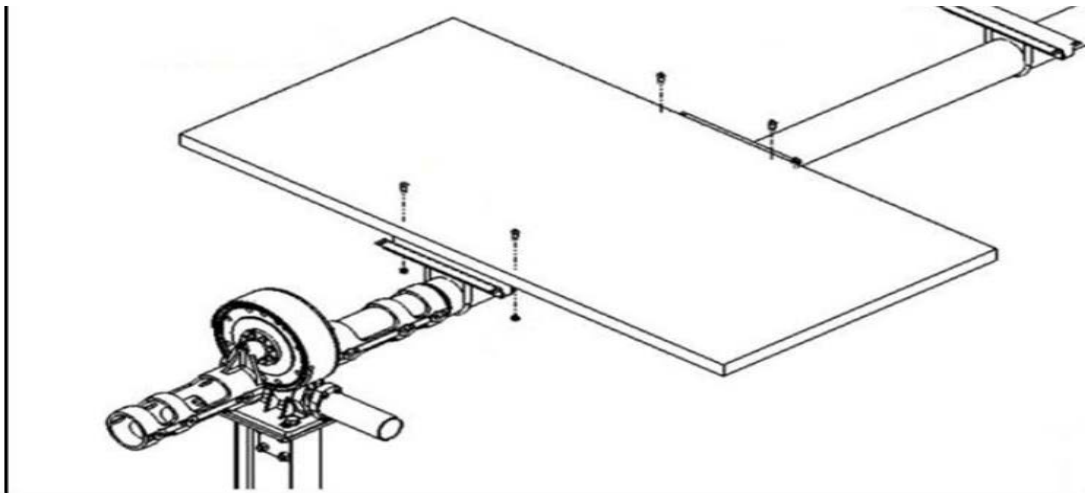
If other bolts similar to M6 are used, they need to be tightened with a torque of 9~12N.m. (80~120lbf.in).

All parts in contact with the frame should use flat stainless steel washers with a minimum thickness of 1.5mm and an outer diameter of 16-20mm (0.63-0.79 inches).

The bolts should be made of stainless steel or other corrosion-resistant materials.

The mechanical load pressure installed by this method: According to UL1703, the maximum value of the front side is 2400Pa (snow),

The maximum value on the rear side is 2400Pa (wind).



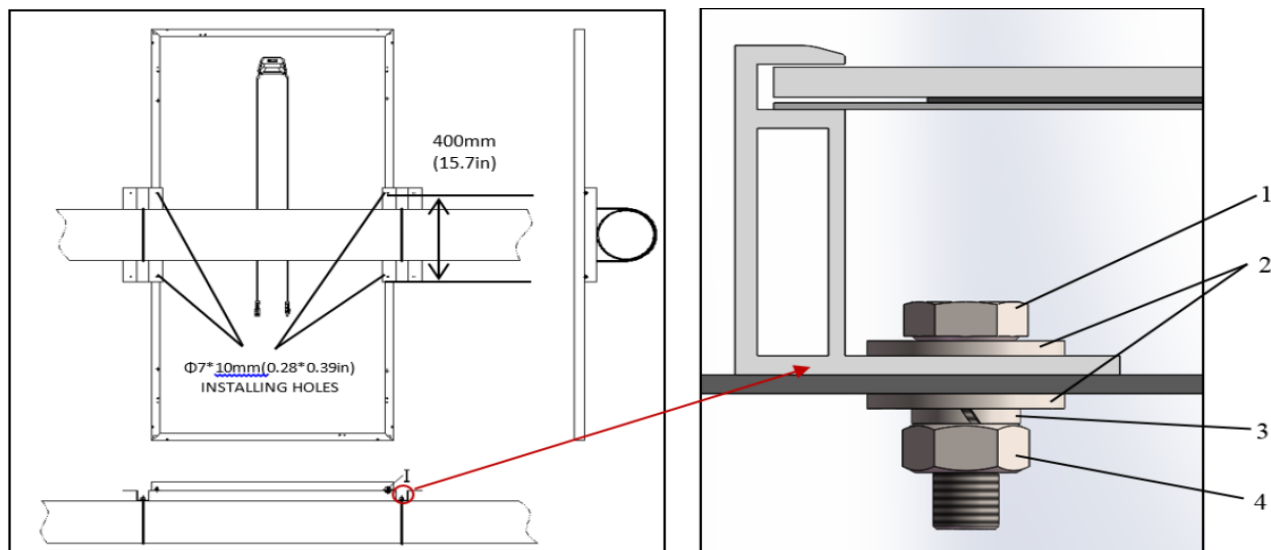


图3. 通过单轴跟踪方式安装的PV组件 PV modules installed by single-axis tracking

1—不锈钢螺栓Stainless steel bolt 2—扁平不锈钢垫圈Flat stainless steel washers 3—弹簧不锈钢垫圈Spring stainless steel washer 4—六角不锈钢螺母Hexagonal stainless steel nuts

### 7.2.2 接地 Grounded

所有组件边框和安装架必须按照相应的《国家电气规程》正确接地。通过使用合适的接地导体将组件边框和所有金属结构件连续连接在一起以实现正确接地。接地导体或接地线可以是铜、铜合金或任何其他符合相应的《国家电气规程》要求的用作电导体的材料。接地导体必须通过合适的接地电极连接到大地。可以使用第三方列出的接地装置对PV组件的金属边框进行接地安装。设备必须按照接地设备制造商的指定说明进行安装。

- 所有的组件边框和安装支架都必须接地。使用推荐的连接端子将接地电缆连接好，固定到组件框架上。
- 使用经过电镀处理的支撑框架，以保证导电良好。
- 用合适的接地导体，将该组件框架和支撑构件连接，以达到良好的接地效果。
- 接地导体必须通过一个合适的地面电极连接到地面。推荐使用接地线配件（接线鼻）连接接地电缆。将接地电缆焊接在接线鼻的插口内，然后用 M4 螺钉插入接线鼻的圆环和组件边框接地孔，用螺母紧固。应该使用星型弹簧垫圈，以防止螺钉松脱导致接地不良。如图4
- 组件的接地电阻必须小于 10 欧姆。
- 如果组件使用条件处于高温高湿的环境中，建议客户配置可以负极接地的含隔离变压器的逆变器，

All module frames and mounting frames must be properly grounded in accordance with the

corresponding National Electrical Code. Connect the module frame and all metal structural parts continuously by using a suitable grounding conductor to achieve proper grounding. The grounding conductor or grounding wire can be copper, copper alloy or any other material used as an electrical conductor that meets the requirements of the corresponding "National Electrical Code". The grounding conductor must be connected to the earth through a suitable grounding electrode. You can use a third-party listed grounding device to ground the metal frame of the PV module. The equipment must be installed in accordance with the instructions specified by the grounding equipment manufacturer.

- All module frames and mounting brackets must be grounded. Use the recommended connection terminal to connect the grounding cable and fix it to the module frame.
- Use a support frame that has been electroplated to ensure good conduction.
- Use a suitable grounding conductor to connect the module frame and the supporting member to achieve a good grounding effect.
- The grounding conductor must be connected to the ground through a suitable ground electrode. It is recommended to use a grounding wire accessory (terminal lug) to connect the grounding cable. Solder the grounding cable into the socket of the lug, then insert the M4 screw into the ring of the lug and the grounding hole of the module frame, and fasten it with a nut. A star-shaped spring washer should be used to prevent the screw from loosening and causing poor grounding. As shown in Figure 4
- The grounding resistance of modules must be less than 10 ohms.
- If the modules are used in a high-temperature and high-humidity environment, it is recommended that customers configure an inverter with an isolation transformer that can be negatively grounded

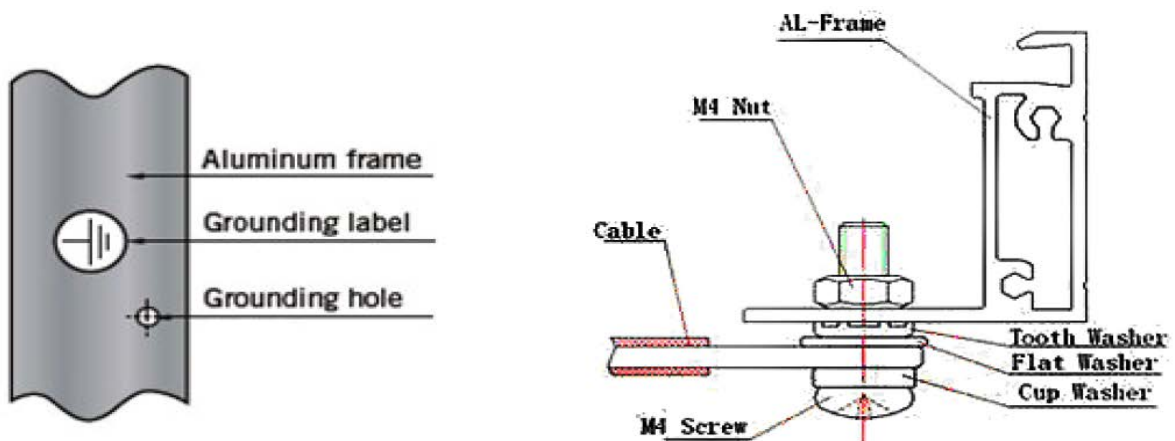




图4. 组件上接地标示及螺丝连接 Grounding mark and screw connection on the module

### 7. 2. 3 电气安装 Electrical Installation

- 所有接线应由合格的安装人员按照当地法规和程序进行。
- 组件可以串联，通过将一個组件的正极插头插入下一个组件的负极插座来提高工作电压。在连接组件之前，始终确保触点无腐蚀、清洁并且干燥。
- 如果一组阵列以相反极性连接到另一个，则会对产品造成无法修复的损坏。在进行并联之前，请务必确认各列的电压和极性。如果测量发现各列之间的极性相反或电压差值大于10V，则在连接之前检查其结构配置。
- 我司太阳能组件采用适合额定参数1000V直流及温度90°C 的截面积为4mm<sup>2</sup> (0.006in<sup>2</sup>) 且防紫外线的绞合铜电缆。用于连接直流系统的所有其他电缆应具有相似（或更高）规格。建议所有电缆应布设在适当的管道中且远离易积水的地方。
- 每个组件都有两条标准的90°C遮光输出电缆且在每个端子上接有即插即用的连接器。输出电缆的类型和规格为1000V的额定PV导线电缆，其截面积为4mm<sup>2</sup>。该电缆适用于接线直接暴露在阳光下的情况。我司要求所有接线和电气连接符合相应的《国家电气规程》要求。
- 电缆的外径范围为5到7mm (0.038~0.076 in2)
- 现场接线应使用最低90°C耐温、耐光且横截面不低于为4mm<sup>2</sup>的铜线作为PV连接线。
- 电缆的最小弯曲半径应为43mm (1.69英寸)。
- All wiring should be carried out by qualified installers in accordance with local regulations and procedures.
- The modules can be connected in series, and the working voltage can be increased by inserting the positive plug of one module into the negative socket of the next module. Before connecting modules, always make sure that the contacts are corrosion-free, clean and dry.
- If one set of arrays is connected to another with the opposite polarity, it will cause irreparable damage to the product. Before connecting in parallel, be sure to confirm the voltage and polarity of each column. If the measurement finds that the polarity between the columns is reversed or the voltage difference is greater than 10V, check the structural configuration before making the connection.
- Our solar modules use stranded copper cables with a cross-sectional area of 4mm<sup>2</sup> (0.006in<sup>2</sup>) suitable for rated parameters of 1000V DC and a temperature of 90° C and anti-ultraviolet rays. All other cables used to connect to the DC system should have similar (or

higher) specifications. It is recommended that all cables should be laid in appropriate pipes and away from places where water is easy to accumulate.

- Each module has two standard 90° C shading output cables and plug-and-play connectors are connected to each terminal. The type and specification of the output cable is a 1000V rated PV conductor cable with a cross-sectional area of 4mm<sup>2</sup>. This cable is suitable for the case where the wiring is directly exposed to the sun. Our company requires all wiring and electrical connections to comply with the requirements of the corresponding "National Electrical Code".

- The outer diameter of the cable ranges from 5 to 7mm (0.038~0.076 in2)
- For field wiring, use a copper wire with a temperature resistance of at least 90° C, light resistance, and a cross section of not less than 4mm<sup>2</sup> as the PV connection wire.
- The minimum bending radius of the cable should be 43mm (1.69 inches).

#### 7.2.3.1 接线Wiring

- 为了确保系统正常运行，在连接组件或连接负载（如变频器、电池等）时，应观察确保电缆的极性连接正确。如果组件连接不正确，旁路二极管可能会损坏。

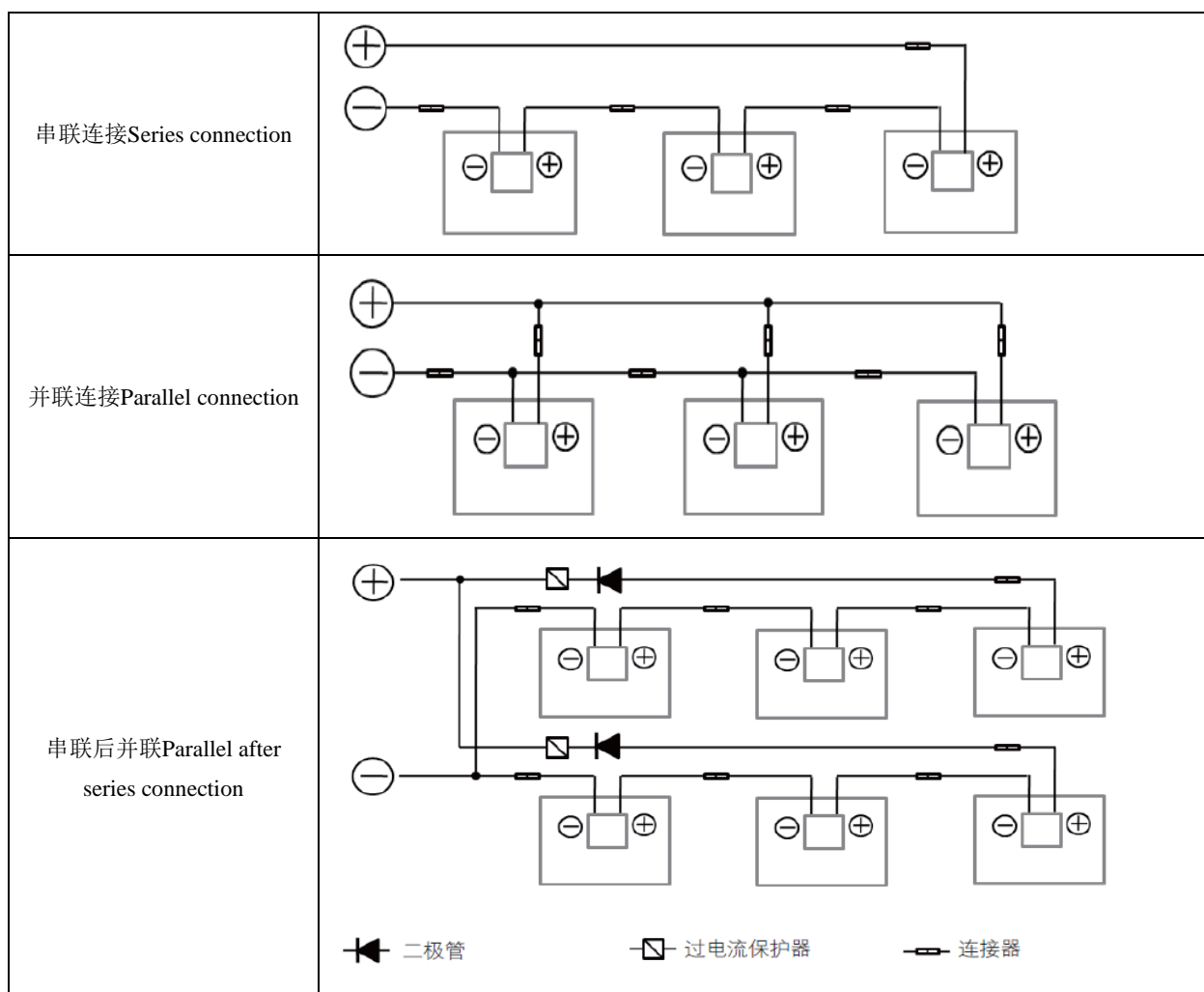
- PV组件可以串联接线以增加电压，串联连接是将接线从一个组件的正极端子连接到下一个组件的负极端子上。PV组件可以并联连接以增加电流，并联连接是将接线从一个组件的正极端子连接到下一个组件的正极端子上。

- 组件串联并联数量，需根据系统配置合理设计。
- 不同型号的组件，不能连接到一串内。
- 组件连接后，电压比较高，严禁直接同时接触组件正负极，否则会引起触电危险。
- In order to ensure the normal operation of the system, when connecting modules or connecting loads (such as inverters, batteries, etc.), observe to ensure that the polarity of the cable is connected correctly. If the modules are not connected correctly, the bypass diode may be damaged.

- PV modules can be connected in series to increase the voltage. The series connection is to connect the wiring from the positive terminal of one module to the negative terminal of the next module. PV modules can be connected in parallel to increase current. Parallel connection is to connect the wiring from the positive terminal of one module to the positive terminal of the

next module.

- The number of modules in series and parallel must be designed reasonably according to the system configuration.
- Different types of modules cannot be connected in a string.
- After the modules are connected, the voltage is relatively high. It is strictly forbidden to directly touch the positive and negative poles of the modules at the same time, otherwise it will cause the risk of electric shock.



### 7. 2. 3. 2 熔丝Fuse

- 在安装熔丝时应将其额定为最大直流电压并连接到阵列的每个非接地极上（换言之，如果系统没有接地则应将熔丝连接到正负极上）。
- 与阵列串联连接的熔丝的最大额定值通常为15A，但实际的组件特定额定值可在产品标签和产品数据表中获得。
- 该熔丝的额定值也对应于组件可承受的最大反向电流值（当一个阵列被遮蔽时，该阵列会加载到其他并联的组件阵列生成电流），因此会对并联连接阵列的数量产生影响。

- 禁止两串或多串并联后再接熔丝。
- When installing the fuse, it should be rated for the maximum DC voltage and connected to each non-grounded electrode of the array (in other words, if the system is not grounded, the fuse should be connected to the positive and negative poles).
  - The maximum rating of the fuse connected in series with the array is usually 15A, but the actual module-specific rating can be obtained on the product label and product data sheet.
  - The rated value of the fuse also corresponds to the maximum reverse current that the module can withstand (when an array is shielded, the array will be loaded into other parallel module arrays to generate current), so it will affect the number of parallel connected arrays influences.
  - It is forbidden to connect the fuse after two or more series are connected in parallel.

## 8 组件的维护 Maintenance of modules

### 8.1 组件外观检查和替换 Module visual inspection and replacement

应定期检查光伏方阵中组件是否有坏，例如玻璃破裂、线缆破损、接线盒损坏等因素导致组件发生功能性和安全性故障，须更换相同型号组件。

- 建议每6个月执行一次预防性检查，不要擅自更换组件的元部件。如果需要进行电性能或机械性能的检查或维护，建议让具有资质的专业人员进行操作，以免发生触电或人员伤亡
  - 除去一切可能遮蔽太阳能阵列从而影响其性能的植被。
  - 检查安装的硬件是否紧固到位。
  - 检查每个非接地极中的所有阵列熔丝是否正常工作。
  - 组件必须用相同类型的更换。不许触碰电缆和连接器的带电部位。搬运组件时应使用适当的安全防护装置（绝缘工具、绝缘手套等）。
  - 修复时用不透明材料覆于组件的前侧表面上。暴露在阳光下的组件会产生高电压，极其危险。
  - 光伏组件接线盒中配有旁路二极管，会使组件加热和电流的损耗最小化。

Regular inspections should be made to see if the modules in the photovoltaic array are damaged. For example, the functional and safety failures of the modules such as broken glass, broken cables, damaged junction boxes, etc., must be replaced with modules of

the same model.

- It is recommended to perform preventive inspections every 6 months, and do not replace components of modules without authorization. If electrical or mechanical performance inspection or maintenance is required, it is recommended that qualified professionals perform the operation to avoid electric shock or personal injury

- Remove all vegetation that may shade the solar array and affect its performance.
- Check whether the installed hardware is fastened in place.
- Check whether all the array fuses in each non-grounding electrode are working properly.

- The modules must be replaced with the same type. Do not touch the live parts of cables and connectors. Appropriate safety protection devices (insulating tools, insulating gloves, etc.) should be used when handling modules.

- Use opaque material to cover the front surface of the module when repairing. Modules exposed to the sun will generate high voltage, which is extremely dangerous.

- The junction box of the photovoltaic module is equipped with a bypass diode, which minimizes the heating and current loss of the module.

- 不许尝试打开接线盒更换二极管，即使它们发生故障。

- 在使用电池的系统中，阻塞二极管通常放置在电池和 PV 组件输出装置之间以防止夜间电池放电。

- 如果组件损坏（玻璃破碎或背板上有划痕），则需要对其进行更换。

- 请注意本手册前面列出的安全注意事项。

- 进行特殊安装时需要穿戴防切割手套和其他个人防护装备。

- 在尝试移除组件之前，一定要将受影响的阵列隔离以防止电流产生。

- 用供应商提供的相关断开工具去断开受影响组件的连接器。

- 使用相同类型的新组件更换损坏的组件。

- 检查阵列的开路电压并验证与其并联连接的其他阵列的开路电压是否在10V以内。

- 重新合上断路器。

- Do not try to open the junction box to replace the diodes, even if they fail.

- In systems using batteries, blocking diodes are usually placed between the battery and the PV module output device to prevent battery discharge at night.

- If the modules are damaged (glass broken or scratches on the backplane), they need to be replaced.
- Please pay attention to the safety precautions listed in the front of this manual.
- Wear cut-resistant gloves and other personal protective equipment during special installation.
- Before attempting to remove modules, be sure to isolate the affected array to prevent current generation.
- Use the relevant disconnect tool provided by the supplier to disconnect the connector of the affected module.
- Replace damaged modules with new modules of the same type.
- Check the open circuit voltage of the array and verify whether the open circuit voltage of other arrays connected in parallel with it is within 10V.
- Close the circuit breaker again.

## 8.2 连接器和线缆检查 Connector and cable inspection

- 检查所有电缆以验证其连接是否牢固；避免电缆受阳光直射且使其远离积水区域。
- 建议至少每年检查一次端子螺栓的扭矩和接线的各方面情况。此外，检查安装的硬件是否紧固到位。连接松动会导致阵列损坏。
- Check all cables to verify that they are firmly connected; avoid direct sunlight and keep them away from areas with water.
- It is recommended to check the torque of terminal bolts and all aspects of wiring at least once a year. In addition, check whether the installed hardware is fastened in place. Loose connections can cause damage to the array.

## 8.3 清洗 Cleaning

太阳能组件产生的电量与落在其上的光照成比例。电池被遮挡的组件产生的能量相对较少，因此保持组件的清洁十分重要。

- 应在辐照度低于 $200\text{W}/\text{m}^2$ 的情况下清洁光伏组件，不宜使用与组件温差较大的液体清洗组件；
- 严禁在风力大于4级、大雨或大雪的气象条件下清洗光伏组件；

- 压力水流清洗时，组件玻璃表面的水压不得超过700千帕(14619.80磅/英尺)，组件严禁承受额外的外力；

- 光伏组件清洁工作中，严禁踩踏组件、严禁流水溅射至组件背面和电缆，严禁清洁组件背面，要保证连接头的清洁和干燥，防止电击和火灾危险；严禁使用蒸汽清洁器；

- 应定期削减植被，避免植被遮挡光伏组件。

- 清洁组件时，应使用软布和温和的清洁剂以及清水。注意避免出现严重的可能损坏组件的热冲击。清洁组件时应保证水与组件之间的温差不大。

- 应使用干燥或潮湿的柔软洁净的布料擦拭光伏组件，严禁使用腐蚀性溶剂或用硬物擦拭光伏组件；

- 光伏组件表面有油污等难清洁物质，可使用常规家用玻璃清洗剂；注意不能使用碱性及强酸性溶剂。

- 清洁组件的背面时，注意避免清洗液渗到材料底层。应稍微频繁地清洁水平安装的组件（0°倾斜角），因为这些组件不会像以10°倾斜角或更大倾斜角安装的组件那样具有"自清洁"功能。

- 如果不确定是否需要清除阵列或截面，则首先选择一列特别脏的阵列开始。

- 测量并记录来自逆变器对该列电流的反馈

- 清洗该列的所有组件

- 重新测量逆变器的反馈电流并计算清洁后的改进百分比。

- 组件的后表面通常不需要清洁；但在认为确实有必要对其进行清洗时，应避免使用可能引起损坏或穿透基底材料的一切尖锐物体。

The amount of electricity generated by the solar module is proportional to the light falling on it.

The modules whose batteries are shaded produce relatively little energy, so keeping the modules clean is very important.

- The photovoltaic modules should be cleaned when the irradiance is lower than 200W/m<sup>2</sup>. It is not advisable to use liquids with large temperature differences to clean the modules;

- It is strictly forbidden to clean photovoltaic modules under weather conditions with wind greater than level 4, heavy rain or heavy snow;

- When cleaning with pressure water flow, the water pressure on the glass surface of the module must not exceed 700 kPa (14619.80 lb/ft), and the module is strictly forbidden to

withstand additional external force;

- During the cleaning of photovoltaic modules, it is strictly forbidden to step on the modules, do not splash the back of the modules and cables, and clean the back of the modules. Ensure that the connectors are clean and dry to prevent electric shock and fire hazards; do not use steam cleaners;

- The vegetation should be cut regularly to avoid vegetation covering the photovoltaic modules.

- When cleaning the modules, use a soft cloth, mild detergent and clean water. Take care to avoid severe thermal shock that may damage the modules. When cleaning the modules, ensure that the temperature difference between the water and the modules is not large.

- Use dry or damp soft and clean cloth to wipe photovoltaic modules, and it is strictly forbidden to use corrosive solvents or hard objects to wipe photovoltaic modules;

- There are oily dirt and other difficult-to-clean substances on the surface of the photovoltaic module. You can use conventional household glass cleaners; be careful not to use alkaline and strong acid solvents.

- When cleaning the back of the module, take care to prevent the cleaning fluid from leaking into the bottom layer of the material. Modules installed horizontally ( $0^\circ$  tilt angle) should be cleaned slightly frequently, because these modules will not have the "self-cleaning" function like those installed at  $10^\circ$  tilt angle or greater.

- If you are not sure whether you need to clear the array or section, first select a particularly dirty array to start.

- Measure and record the feedback from the inverter to the column current

- Clean all modules in the column

- Re-measure the feedback current of the inverter and calculate the improvement percentage after cleaning.

- The rear surface of the module usually does not need to be cleaned; however, when it is deemed necessary to clean it, all sharp objects that may cause damage or penetrate the base material should be avoided.

### 8.3.1 水质要求 Water quality requirements

- PH: 5 ~7;



- 氯化物或盐分含量: 0 - 3,000 mg/L
- 浑浊度: 0-30 NTU
- 电导率: 1500~3000  $\mu$ s/cm
- (TDS)总溶解固体:  $\leq$ 1000 mg/L
- 水硬度: 0-40 mg/L
- 必须采用非碱性水, 具备条件时应使用软化水。
- PH: 5 ~7;
- Chloride or salt content: 0-3,000 mg/L
- Turbidity: 0-30 NTU
- Conductivity: 1500~3000 s/cm
- (TDS) Total dissolved solids: 1000 mg/L
- Water hardness: 0-40 mg/L
- Non-alkaline water must be used, softened water should be used when conditions are available

### 8.3.2 清洗后组件检查 Inspection after cleaning

- 目视组件整体外观清洁、明亮, 无污渍;
- 抽样检查组件表面是否有积灰存在;
- 组件表面无明显的刮伤痕迹;
- 组件表面无人为造成的破裂现象;
- 清洗后组件支架有无倾斜、弯曲现象;
- 组件接线端子是否有脱落的现象等;
- 光伏组件清洗完后, 完成光伏组件清洗文字记录。
- Visually observe that the overall appearance of the modules is clean, bright and free of stains;
- Sampling check whether there is dust accumulation on the surface of the modules;
- There is no obvious scratch on the surface of the module;
- The cracking phenomenon caused by no one on the surface of the module;
- Whether the module bracket is tilted or bent after cleaning;
- Whether the module terminals are falling off, etc.;
- After the photovoltaic module is cleaned, complete the written record of the

photovoltaic module cleaning.

### 8.3.3 故障排查 Troubleshooting

如果安装后无法正常工作，请立即通知安装商。建议每6个月执行一次预防性检查，不要擅自更换组件的元部件。如果需要进行电性能或机械性能的检查或维护，建议让具有资质的专业人员进行操作，以免发生触电或人员伤亡。

If it fails to work normally after installation, please notify the installer immediately. It is recommended to perform preventive inspections every 6 months, and do not replace components of modules without authorization. If electrical or mechanical performance inspection or maintenance is required, it is recommended that qualified professionals perform the operation to avoid electric shock or personal injury

### 8.3.4 组件寿命到后的处理 Disposal after the end of the life of the modules

晶体硅光伏组件寿命为25年，25年后光伏组件还会有一定的功率，依然会发电。当到需要拆除并报废时，请移交给处理资质的公司进行处理，切记不可随意丢弃或自行拆卸，会造成环境污染和资源浪费。报废晶体硅光伏组件主要成分：3.101%的硅、54.721%的玻璃、0.03%的银、0.451%的铜、12.771%的铝等等，由此可看出报废的晶体硅光伏组件有很高的经济回收价值。

Crystalline silicon photovoltaic modules have a lifespan of 25 years. After 25 years, photovoltaic modules will still have a certain amount of power and still generate electricity. When it needs to be dismantled and scrapped, please transfer it to a qualified company for disposal. Remember not to discard or disassemble it by yourself, which will cause environmental pollution and waste of resources. The main modules of scrap crystalline silicon photovoltaic modules: 3.101% silicon, 54.721% glass, 0.03% silver, 0.451% copper, 12.771% aluminum, etc. It can be seen that scrap crystalline silicon photovoltaic modules have a high Economic recovery value.