

安装说明书

Installation Instructions

(适用于海泰系列光伏组件)

(Suitable for Haitai series photovoltaic modules)

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1. 概述 Overview

本手册包含关于唐山海泰新能科技股份有限公司生产的光伏组件的安装、维护和安全操作的信息。安装之前需要阅读和理解本说明。专业安装者在安装组件的时候需要遵从手册中的说明。如果存在任何问题请联系我司的销售部门寻求帮助。

This manual contains information on the installation, maintenance, and safe operation of PV modules produced by the Tangshan Haitai New Energy Technology Co., Ltd. Read and try to understand this note before installation. Professional installers are required to follow the instructions in the manual when installing the modules. If there is any problem please contact our sales department for help.

组件安全等级：II 级（IEC61140）

Module Safety Class : Class II（IEC61140）

组件防火等级：C级（IEC61730-2）

Module fire Class: Class C（IEC61730-2）

在安装太阳能光伏系统之前，安装者需要熟悉系统在机械和电气方面的要求。请妥善保管此手册以备后期使用。

Before installing solar PV system, the installers need to familiarize with the requirements of mechanical and electrical aspects. Please keep this manual for later use.

2. 免责声明 Disclaimer Notices

- ◇ 安装、操作和使用海泰新能系列组件已超出公司的控制，因此，海泰新能不承担因不当安装、操作、使用和维护所带来的任何损失、损害、伤害及由此产生的费用。

The installation, operation and use of Haitai New Energy series modules are beyond Haitai's control. Thereby, Haitai New Energy does not undertake any loss, damage, injury and consequent costs caused by improper installation, operation, use and maintenance.

- ◇ 海泰新能不承担对违反专利，第三方权力等使用光伏产品带来的责任。

Haitai New Energy does not undertake any responsibilities for the violation of patent, third-party rights and other uses of PV products.

- ◇ 没有授权不能对任何专利或专利权做任何修改。

Any modification towards any patent or patent right is not allowable if there is no authorization.

- ◇ 本手册基于海泰新能的科技与可靠的经验。但是包括产品规格的这些信息和建议并不构成任何保证。

This manual is made based on Haitai New Energy's technology and reliable experience, but the information and recommendations including product specifications do not constitute any warranty.

- ◇ 海泰新能保留改变手册，产品信息，技术规范或者产品数据的权力无需提前通知。

Haitai New Energy keeps the rights of changing manuals, product information, technical specifications and product data without prior notice.

3. 安全防范 Safety Precautions

- ◇ 安装太阳能光伏系统需要专业的技术和知识，安装必须由专业人士施行。

The installation of solar photovoltaic systems requires professional skills and knowledge, thus the installation must be carried out by professionals.

- ◇ 安装者承担安装过程中可能发生的受伤风险，包括但不限于触电的风险。

In the process of installation, the installers assumes the risk of injuries, including but not limited to the risk of electric shock.

- ◇ 当暴露在直射日光下的时候，单个组件可能产生大于 30V 的直流电压。接触 30V 或者更高的直流电压存在潜在风险。

When exposed to direct sunlight, a single module may produce more than 30V DC voltage. The exposure with 30V or higher DC voltage has potential risks.

- ◇ 当断开或链接暴露在日光下的光伏组件的连线时，可能产生电弧。这个电弧可能造成烧伤，引起火灾或者引发其它问题。

The electric arcs may occur when disconnecting or linking the photovoltaic modules exposed to the sunlight. This arc may cause burns, a fire or other problems.

- ◇ 不要在有负载的情况下断开组件之间或组件与逆变器等设备之间的连接线。

Do not disconnect the linking between the modules or between the modules and inverters in case of the load.

- ◇ 光伏电池组件把光能转换成直流电能。组件应用于地面、屋顶、车辆或船只等户外环境。合理设计支撑结构是系统设计者或安装者的责任。

The photovoltaic modules could convert the power energy into DC power. The modules could be applied for the ground, roofs, vehicles or boat and other outdoor environment. It is system designer and installers' responsibility to reasonably design the support structure.

- ◇ 请不要拆解组件，也不要摘除其它附带铭牌或者部件。

Do not disassemble the modules or remove other attached brands or parts.

- ◇ 不要在组件的上下表面喷涂或者涂胶。

Do not spray or glue on the upper and lower surfaces of the modules.

- ◇ 不要利用反射镜或者其它放大镜设备人为的集中阳光到组件上。

Do not use the mirror or other magnifying glass equipment to concentrate the sunlight artificially to the modules.

- ◇ 在安装系统的时候，需要遵守所有的地方，区域和国家法令规定。必要的时候需要获得施工许可证。

It needs to comply with all the local, regional and national laws and obtain a construction permit when necessary in the process of installing the system.

- ◇ 在运输和安装机械与电气部件的时候，需要保持儿童远离系统。

It needs to keep the children away from the system when transporting and installing mechanical and electrical components.

- ◇ 在安装或者检修光伏系统的时候，不要佩戴金属戒指，手表带，耳，鼻，唇环或者其它金属器件。

Do not wear metal rings, watch straps, ear, nose, lip rings or other metal parts when installing or inspecting the photovoltaic system.



- ◇ 电气安装工作只能使用合格的绝缘工具。

The qualified insulating tools are the only choice for the electrical installation work.



- ◇ 遵从系统中使用的所有其它部件的安全规定，包括线路和电缆，连接器件，充电控制器，逆变器，蓄电池和充电电池等。

Comply with the safety requirements of all other modules used in the system, including wiring lines and cables, connection devices, charging controllers, inverters, batteries and rechargeable batteries.

- ◇ 只使用适合太阳能电力系统使用的设备，连接器件，线路和支撑架。在特定光伏系统中尽可能只使用一种型号的组件，同一光伏阵列中必须使用同一种型号的组件。

Use the equipment suitable for solar power system, connection device, wiring lines and support frame only. In a particular photovoltaic system, use a type of module as much as possible and use the same type of the module in the same PV

array only. Each input voltage of the same tracking system of each inverter must be equal and the same type of modules must be used.

4. 拆箱及储存.Unpacking and Storage

- ◇ 在收货时，应检查交付的货物是否确实是订购的货物：每个包装箱的外面均标有产品名称、箱号、组件条形码。

When receiving the goods, you should check whether the goods delivered are indeed ordered goods: the outside of each box are marked with the product name, packaging box number, module barcode.

- ◇ 包装箱应存储在干净、干燥区域，避免阳光直射和潮湿。

The packaging carton should be stored in a clean, dry area, away from direct sunlight and moisture.

- ◇ 在安装现场，注意保持组件，尤其是电气连接处的清洁干燥。如果接头的电缆潮湿，连接处可能会腐蚀，不得使用任何连接处腐蚀的组件。

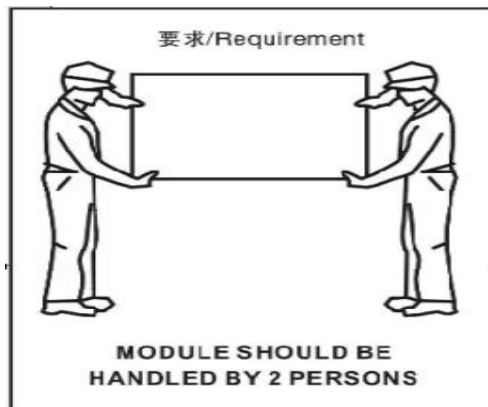
At the installation site, pay attention to keep clean and dry for the components, especially the electrical connections. If the connector cable is wet, the connections may be corroded, and the components that be corroded at any connections should not be used.

- ◇ 如果托盘临时存储在外，请铺上一层防护罩，以防止其受到天气的直接影响。

If the tray is temporarily stored outside, please put a protective cover to prevent it from being directly affected by the weather.

- ◇ 需要两名工作人员一起拆箱，取出组件时务必使用双手，禁止通过提拉组件的导线和接线盒搬运组件。

Two staff members are required to unpack the packaging carton. Be sure to use both hands when removing the modules. Do not carry the modules through the wires and junction boxes.



- ◇ 组件取出若需临时外放，需要保护好组件边缘。

If the modules needed to be temporarily stored outside, please protect the edge of the module well.

- ◇ 禁止任何情况下在组件上站立或者行走。

It is forbidden to stand or walk on modules in any case.

- ◇ 禁止掉落或堆放物品在组件上。

It is forbidden to drop or stack items on the modules.

5. 环境条件 Environment Conditions

- ◇ 建议安装环境条件为：

Recommended installation conditions:

环境空气温度 Ambient temperature: $-40^{\circ}\text{C} \sim +40^{\circ}\text{C}$

工作温度 Operating Temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$

组件[T₉₈]工作最大温度为 70℃，短时可达到 85℃。

Max operating temperature of Module T98 is 70℃, with short-term peak up to 85℃.

湿度 Humidity: $<85\%\text{RH}$

海拔高度 Altitude $\leq 2000\text{m}$

*注意 Note:

安装方法对于机械承载很重要，未能遵循本手册的安装，会有不同的雪压和风压荷载能力。

The installation method is very important for the mechanical load. Failure to follow the installation of this manual will result in different snow pressure and wind pressure load capacity.

-系统安装商需要确保安装方式符合当地法律法规。

The system builder needs to ensure that the installation is in accordance with local laws and regulations.

6. 机械安装 Mechanical Installation

6.1 选址 Site Selection

- ◇ 在北纬地区组件最好面向南，而在南纬地区组件最好面向正北。组件正面与正午太阳光线方向垂直为最佳。

In north latitude area it is best to face south for the module, while in south latitude area, it is best to face north. It is best that the front of the module is perpendicular to the direction of the midday sun light.

- ◇ 固定支架安装，组件建议安装在一个最佳倾角，可以最大限度捕获太阳光。根据右手螺旋定律，基本上与安装地点的纬度相同，面向赤道。设计时务必要根据当地情况，选出最优的倾角。

Fix bracket installation, the module is recommended to be installed at an optimum angle of inclination for maximum capture of sunlight. According to the right hand helical law, basically the same latitude as the installation site, facing the equator. The design must be based on local conditions and choose the best inclination.

- ◇ 跟踪支架安装，安装方式同样为压块和螺栓安装 2 种，具体安装方法参考支架厂家安装说明，此时组件没有固定的安装倾角，也不会面向赤道，而是跟踪太阳的角度从东向西转动。

Tracker supports adopt clamp and bolt mounting. Follow manufacturer instructions for installation. Modules tilt and rotate east to west to track sunlight without fixed inclination or equatorial orientation.

当在屋顶安装太阳能电池组件时，务必在屋顶的边缘和太阳能电池阵列之间保持一个安全的工作区域。大型电站的阵列之间要有一定的安全距离，方便对阵列里面的组件进行清理，检测和维修。

When installing solar modules on the roof, be sure to maintain a safe working area between the edge of the roof and the solar arrays. There must be a certain safety distance between arrays of large power stations in order to facilitate the cleaning, inspection, and maintenance of the modules inside the array.

- ◇ 屋面安装组件时，需兼顾整体防火等级与后续运维需求。安装组件的屋面，须经专业工程师评估并出具完整结构验算报告，确认屋面可承载组件及支架附加荷载。

For rooftop installation, overall fire rating and later maintenance shall be considered. The roof must be assessed by professional engineers with complete structural verification to bear extra loads of modules and brackets.

- ◇ 屋面结构与安装形式会影响建筑防火性能，不当安装存在火灾隐患。

Roof structure and installation mode affect building fire resistance. Improper installation poses fire risks.

- ◇ 组件应安装在阳光可以充分照射的位置，并确保在冬至日的 9:00 到 15:00 不能被遮挡。

The components shall be installed in a position with full sunlight and shall not be covered from 9:00 to 15:00 on the winter solstice .

- ◇ 组件不能在产生或者存放可燃气体的设备或者地点附近使用。

The modules can not be used in the vicinity of the equipment or place where the flammable gas is generated or stored.

- ◇ 组件不能安装于因各种化学反应导致组件缺陷的环境区域内，如酸雨、碱性气体、盐雾等。

The modules can not be installed in the environmental area where module defects are caused by various chemical reactions, such as acid rain, alkaline gas, salt mist, etc.

- ◇ 组件不能安装在超出组件最大系统电压的环境区域内，如高压电线旁，组件的安装位置与高压电保持一定的安全距离，安全距离根据高压电等级而定。

The modules can not be installed in the environmental area that exceeds the maximum system voltage of the modules, such as high-voltage power lines. The

module's position should be maintained at a safe distance from the high-voltage power while the safe distance is determined by the high voltage level.

- ◇ 若在住宅地面安装组件，需要遵守当地法规比如使用栅栏。（栅栏要与阵列保持一定的距离，避免栅栏的阴影对阵列产生影响）。

If the modules are to be installed on the floor of a dwelling, local regulations such as fences should be complied with (the fences should be kept at a certain distance from the array to avoid shading impact of the fence on the array).

- ◇ 请勿将光伏组件安装在可能浸入水中或持续暴露于洒水车或喷泉的位置。

Do not install the PV modules in places that may be immersed in water or continuously exposed to sprinklers or fountains.

6.2 安装支架选择 Mounting Bracket Options

- ◇ 在支架上安装组件时，选择能够承受当地预期地震等级的支柱和组件安装结构。

When installing the modules on the bracket, the pillar and module installation structure should be chosen those can withstand the local expected earthquake level.

- ◇ 支架结构必须由耐用、防腐蚀、抗紫外线的材料制成。

The bracket structure must be made of a durable, anti-corrosion, anti-ultraviolet materials.

6.3 组件安装 Module Installation

- ◇ 搬运时两人双手抓住组件，并保持水平稳定状态，禁止剧烈晃动，禁止单人搬运组件，禁止拖拉组件，禁止扯拉接线盒连接线，禁止搬运两板及以上数量组件等。

When carrying the modules, two hands are required to grasp the modules and keep a level of stability. It is forbidden to shake severely, carry the module by one person, drag the module, pull the connecting lines of junction box and handle two and more modules.

- ◇ 放置组件时放置于平整的地面上，下面垫纸板，禁止玻璃面直接接触地面。
注意：铭牌粘贴在组件的背面，玻璃面为组件正面。

Place the modules on a flat ground, place the cardboard in the bottom and the glass surface is forbidden to directly touch the ground.

Note: The nameplate is affixed to the rear side of the PV module, and the glass surface is the front side.

- ◇ 组件放置与地面时严禁堆放杂物，踩踏，坐卧等造成组件变形的动作。

When the module is placed on the ground, it is forbidden to stack debris, step on, sit down and have other actions that may cause deformation for the module.

- ◇ 安装时禁止踩踏组件，禁止在支架上拖曳组件。

Do not step on the module during installation. Do not drag the module on the bracket.

- ◇ 组件在建筑物或屋顶上安装时，要确保它被安全的固定并且不会因为强风或大雪而损坏。

When the modules is installed on buildings or roofs, it needs to ensure that they are securely fastened and will not be damaged by strong wind or snow.

- ◇ 组件背面要确保通风流畅以便组件的散热。

Ensure that the back of the modules good ventilation for cooling the modules.

- ◇ 在屋顶安装组件时，要保证屋顶结构合适。此外，安装固定组件时所需要穿透的屋顶必须适当密封，以防屋漏。

When installing the modules on the roofs, make sure the roof structure is suitable. In addition, the roofs must be properly sealed to prevent leakage.

- ◇ 组件框架和墙面或屋面之间的空隙建议至少保持 115 毫米。如果有其他安装方式，就可能影响防火等级的评估。

The gap between the module frame and the wall or roof should be at least 115mm. If there are other installation methods, it may affect the assessment of fire rating.

- ◇ 两个组件最小间距为 10 毫米。

The spacing between two modules should be at least 10mm.

- ◇ 安装方式不能阻塞组件排水孔。

The installation can not block the module' drain hole.

6.4 安装方式 Installation Method

这里介绍的所有安装方式只供参考，本公司不负责提供相关的安装部件。组件系统的设计、安装、机器载荷和安全性必须由专业的系统安装商或者有经验的人来完成,安装方式夹具安装、安装孔安装任选其一。

All installation methods described here are for reference only, and our company is not responsible for providing relevant installation parts. The design, installation, mechanical load and safety of module system must be completed by professional system installers or experienced personnel.

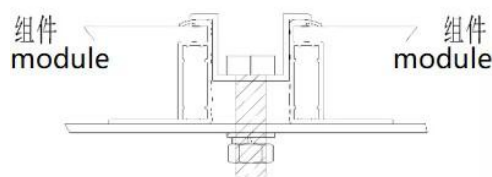
Nameplate is posted on rear side of the module

6.4.1 夹具安装 Fixture installation



图A 组件夹具

Figure A Fixture of module



图B 组件夹具示例

Figure B Module fixture example

注意事项 Cautions

- ◆ 请根据组件铝合金边框选择合适的夹具进行安装

Please select an appropriate fixture for installation according to the aluminum alloy frame of the module.

采用夹具安装时，单块组件夹具数量不少于四个，且对称排布。

No less than four symmetric clamps shall be used per module for fixture

mounting.

◆ 有框组件夹具建议满足以下要求

Module with frame fixtures meet the following requirements

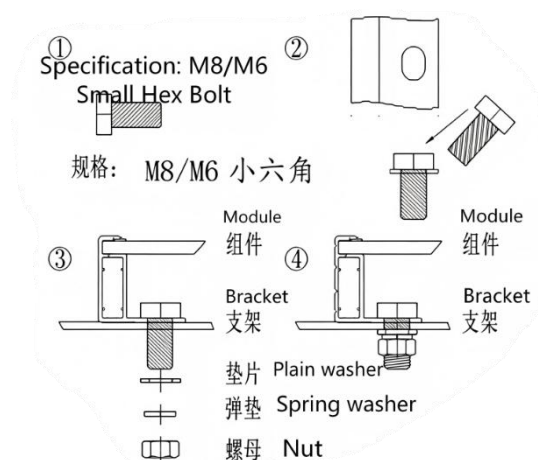
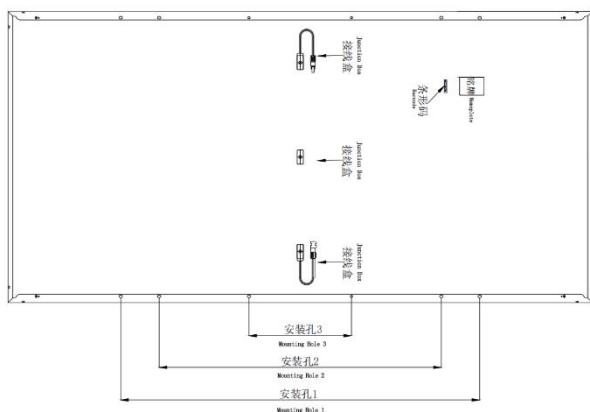
厚度: $\geq 3 \text{ mm}$	长度: $\geq 40 \text{ mm}$	材质: 铝合金
thickness: $\geq 3 \text{ mm}$	Length: $\geq 40 \text{ mm}$	Material: Aluminum alloy
螺栓: M8	扭紧力矩: 16-20 N.m	
Bolts: M8	Tightening torque: 16-20 N.m	

HTMxxxDMH8-60/66系列建议: 夹具长度应 $\geq 50\text{mm}$, 厚度 $\geq 4\text{mm}$, 材质: 铝合金6005-T6

HTMxxxDMH8-60/66 series recommended: fixture length $\geq 50\text{mm}$, thickness $\geq 4\text{mm}$, material: aluminum alloy 6005-T6

◆ 夹具不能使组件发生形变; 安装导轨和夹具应避免遮挡电池片; 夹具与边框接触面必须平整光滑, 防止边框损坏伤害组件; 排水孔不可被夹具遮挡。

The fixture shall not deform the module; the installation guide rail and fixture should avoid blocking the cells; the contact surface between the fixture and the frame must be smooth to prevent the frame damage from damaging the modules; the drainage hole should not be blocked by the fixture.



6.4.2 螺栓安装 Bolt Installation

注意事项 Cautions

- ◆ 使用组件背面的安装孔，将组件固定在支架上。

Use the mounting hole on the back of the module to fix the module on the bracket.

采用螺栓安装时，单块组件固定螺栓不少于四颗，呈对称布置。

At bolt mounting, each module uses minimum four symmetric bolts.

- ◆ 使用安装孔1和安装孔2安装螺栓、螺母和垫片建议满足以下要求。

You are advised to use mounting holes 1 and 2 to install bolts, nuts, and washers

材质：不锈钢

Material: Stainless steel

尺寸和长度：M8

Dimensions and lengths: M8

30mm高度边框组件建议选择 $L \leq 20\text{mm}$ 长度紧固件

For 30mm height frame components, fastening $L \leq 20\text{mm}$ is recommended

扭紧力矩：16-20 N.m

Tightening torque: 16-20 N.m

- ◆ 使用安装孔3安装螺栓、螺母和垫片建议满足以下要求

Using mounting holes 3 Bolts, nuts, and washers must meet the following requirements

材质：不锈钢

Material: Stainless steel

尺寸和长度：M6

Dimensions and lengths: M6

30mm高度边框组件建议选择 $L \leq 20\text{mm}$ 长度紧固件

For 30mm height frame components, fastening $L \leq 20\text{mm}$ is recommended

扭紧力矩: 8-12 N.m

Tightening torque: 8-12 N.m

6.5 安装点位置说明 Installation Point Location Description

正常水平的载荷设计适用于大部分环境: 组件**向上**承受的最大设计载荷为 1600pa (相当于风压), 安全系数 1.5, 组件**向下**承受的最大设计载荷为 1600pa (相当于风压), 安全系数 1.5。

The normal level load design is suitable for most environments: the maximum design load **that the module can withstand upward** is 1600 pa (equivalent to wind pressure) with a safety factor of 1.5, and the maximum design load **that the module can withstand downward** is +1600 Pa (equivalent to wind pressure) with a safety factor of 1.5.

较高载荷设计适用于苛刻的环境条件 (如风暴、大雪等): 组件**向上**承受的最大设计载荷为 1600pa (相当于风压), 安全系数 1.5, 组件**向下**承受的最大设计载荷为 3600pa (相当于风压和雪压), 安全系数 1.5。选择不同的夹具数量、尺寸和安装范围可以获得不同的载荷承受力。

The higher load design is suitable for harsh environmental conditions (such as storm, heavy snow, etc.): the maximum design load **that the module can withstand upward** is 1600 pa (equivalent to wind pressure) with a safety factor of 1.5, and the maximum design load **that the module can withstand downward** is 3600 Pa (equivalent to wind pressure and snow pressure) with a safety factor of 1.5. Different load bearing can be obtained by selecting different fixture quantity, size and installation range.

6.5.1 夹具安装位置 Fixture Installation Position

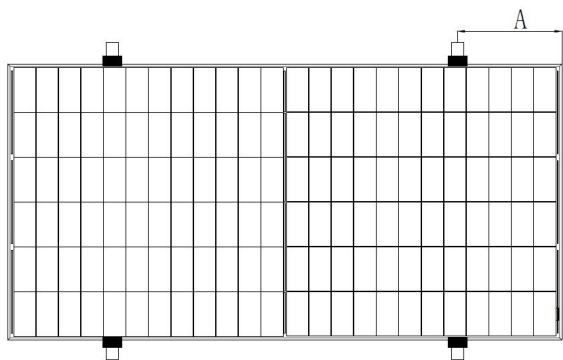


图 C 四点长边安装 横梁垂直长边
FigureC 4-point long-side mounting
Vertical long side of beam

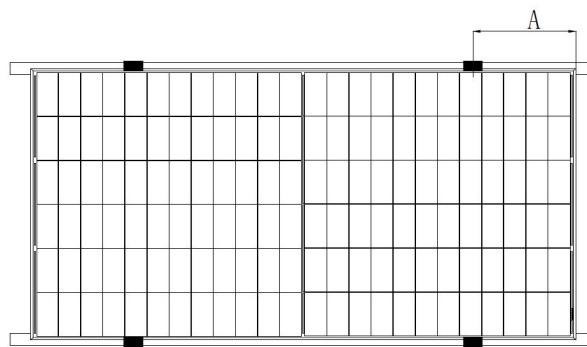


图 D 四点长边安装 横梁平行长边
FigureD 4-point long-side mounting
Parallel long side of beam

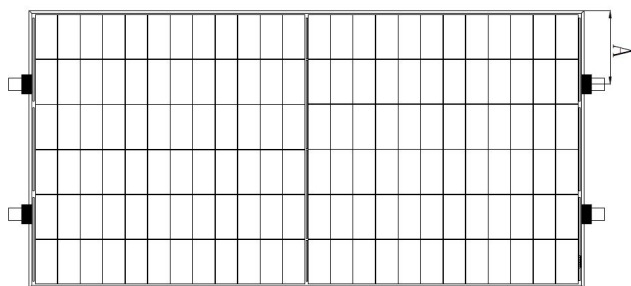


图 E 四点短边安装 横梁平行长边
FigureE 4-point short-side mounting
Parallel long side of beam

安装间距 A 为组件长边或短边长度的 1/5 长度($\pm 50\text{mm}$)

The installation spacing A is 1/5 of the length of the long or short side of the component ($\pm 50\text{mm}$)

有框组件可承受的设计载荷强度和安全系数如下表:

The design load strength and safety factor of module with frame is shown in the table below

组件型号 Module	图 C 安装方式 Figure C Installation mode	图 D 安装方式 Figure D Installation mode	图 E 安装方式 Figure E Installation mode
HTMxxxM/PA-60	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxM/PA-72	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxM/PH-60	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxM/PH-72	+3600Pa,1.5 -1600Pa,1.5	/	/

HTMxxxM/PH-78	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxMH3-60	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxMH3-72	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH3-60	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH3-72	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-54	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxMH5-54NT	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxDMH5-54	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxDMH5-54NT	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxMH5-72	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-72NT	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH5-72	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH5-72NT	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-78	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxMH5-78NT	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH5-78	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH5-78NT	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH6-66NT	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH6-48NT	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH7-54TB	+3600Pa,1.5 -1600Pa,1.5	/	+1600Pa,1.5 -1600Pa,1.5
HTMxxxDMH7-72TB	+3600Pa,1.5 -1600Pa,1.5	+1600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH6-66TB	+3600Pa,1.5	/	/

	-1600Pa,1.5		
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安装间距 A 为组件长边或短边长度的 1/4 长度($\pm 50\text{mm}$)

The installation spacing A is 1/4 of the length of the long or short side of the component ($\pm 50\text{mm}$)

有框组件可承受的设计载荷强度和安全系数如下表:

The design load strength and safety factor of module with frame is shown in the table below

组件型号 Module	图 C 安装方式 Figure C Installation mode	图 D 安装方式 Figure D Installation mode	图 E 安装方式 Figure E Installation mode
HTMxxxMH8-60	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxMH8-66	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH8-60	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH8-60NT	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH8-66	+3600Pa,1.5 -1600Pa,1.5	/	/
HTMxxxDMH8-66NT	+3600Pa,1.5 -1600Pa,1.5	/	/

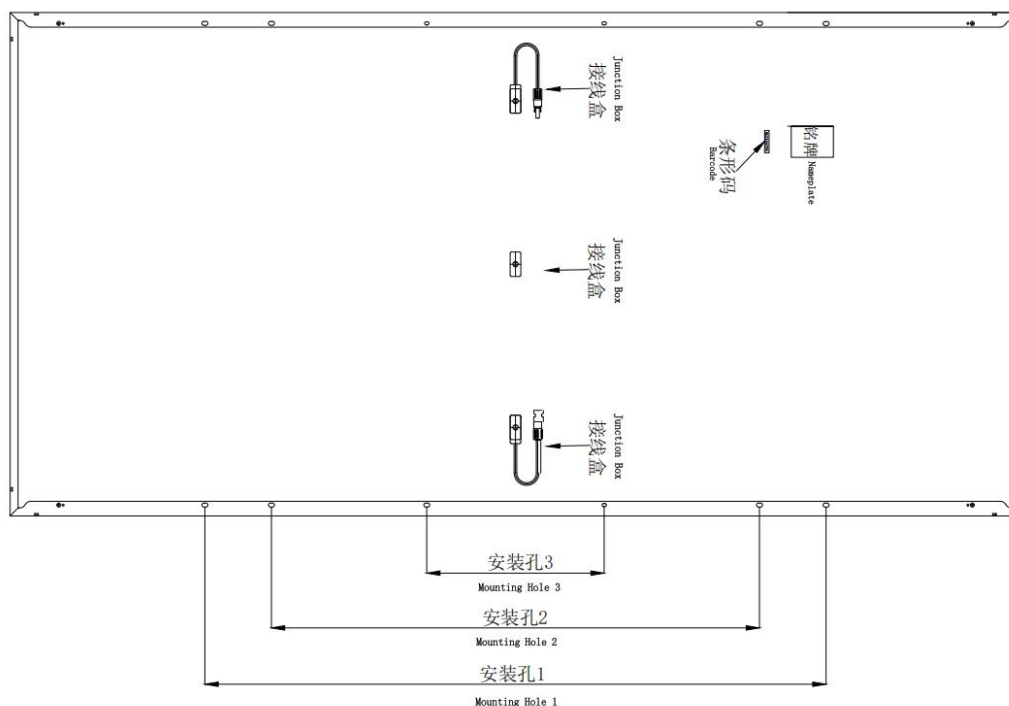
6.5.2 螺栓安装位置 Bolt Mounting Position

使用螺栓安装组件情况下,横梁应垂直于组件长边,根据适用版型选择安装孔 1 或者安装孔 2 进行固定。

When bolt-mounted, cross beams shall be perpendicular to module length side. Fasten

via mounting hole 1 or 2 based on module model.

不同安装方式及可承受的设计载荷强度和安全系数如下：



The design load strength and safety factor to be sustained is as follows:

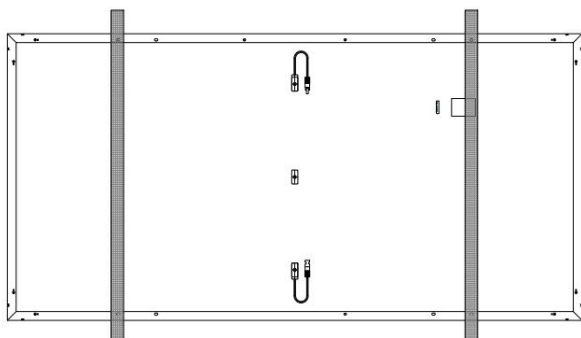


图 F 安装孔 1 安装

Figure F Mounting hole 1 Installation

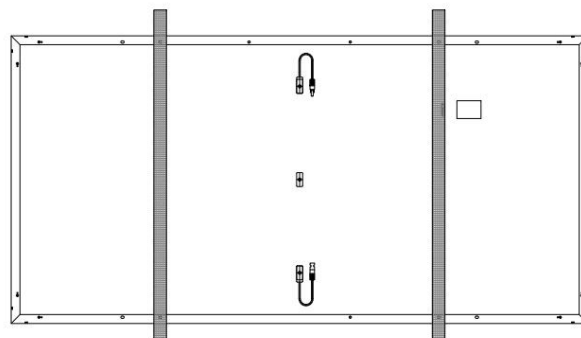


图 G 安装孔 2 安装

Figure G Mounting hole 2 Installation

组件型号 Module	图 F 安装方式 Figure F Installation mode	图 G 安装方式 Figure G Installation mode
HTMxxxM/PA-60	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxM/PA-72	+3600Pa,1.5 -1600Pa,1.5	/

HTMxxxM/PH-60	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxM/PH-72	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxM/PH-78	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH3-60	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxMH3-72	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH3-60	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxDMH3-72	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-54	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxMH5-54NT	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxDMH5-54	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxDMH5-54NT	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxMH5-72	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-72NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH5-72	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH5-72NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-78	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH5-78NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH5-78	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH5-78NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH6-66NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH6-48NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxMH8-60	+3600Pa,1.5	/

	-1600Pa,1.5	
HTMxxxMH8-66	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH8-60	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH8-60NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH8-66	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH8-66NT	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH7-54TB	/	+3600Pa,1.5 -1600Pa,1.5
HTMxxxDMH7-72TB	+3600Pa,1.5 -1600Pa,1.5	/
HTMxxxDMH6-66TB	+3600Pa,1.5 -1600Pa,1.5	/

7. 电气安装 Electrical Installation

7.1 接地 Grounding Connection

- ◆ 所有的太阳能光伏组件边框和安装支架都必须按照相应的《国家电气规程》或者当地的电气法规规定正确的接地。

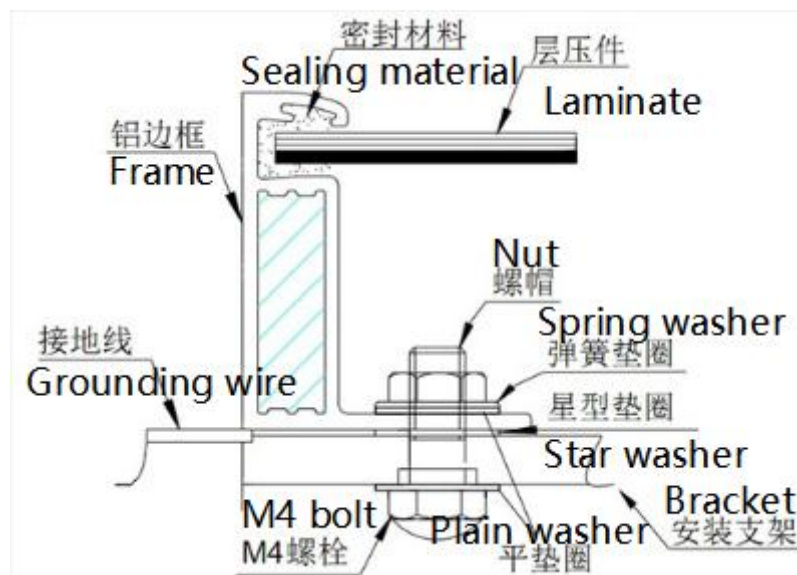
All solar pv module frames and mounting brackets must be grounded in accordance with the corresponding National Electrical Code or local electrical code regulations .

- ◆ 导体的材料推荐使用4-14mm²的铜导线（AWG 6-12）作为接地导线。组件的接地孔位置有接地标识“ $\frac{\perp}{=}$ ”。接地线也必须通过合适的接地电极连接到大地。所有的导电连接点必须牢固连接。

You are advised to use a 4-14mm² copper conductor (AWG 6-12) as the grounding conductor. The ground hole of the component is marked with “ $\frac{\perp}{=}$ ”. The ground wire must also be connected to the ground through a suitable ground electrode. All conductive connections must be securely connected .

- ◆ 接地孔在光伏组件背面的铝合金边框上，直径为4.2mm，使用单独的接地线和相关配件连接太阳能光伏组件的铝合金边框并将接地线连接到大地上，建议使用M4 x 12mm的接地螺栓并配套有M4的螺母，星型垫圈及平垫圈，这样能确保组件被牢靠接地。您可以在海泰产品图纸上了解详细的产品接地孔数量，尺寸和位置，接地固定应用扭力矩为4-8N·m。

The diameter of the ground hole is 4.2mm on the aluminum alloy frame at the rear of the photovoltaic module. Connect the ground cable and related accessories to the aluminum alloy frame of the solar photovoltaic module and connect the ground cable to the ground. It is recommended to use M4 x 12mm ground bolt with M4 nut, star washer and flat washer. This ensures that the component is securely grounded. You can learn about the number, size and position of the grounding holes in detail on the Product drawings of Haitai. The torsional torque for grounding fixation is 4-8N·m.



- ◆ 除了使用接地孔来进行接地外，您也可以选用以下方式来进行接地。

In addition to using the ground hole for grounding, you can also use the following methods for grounding.

使用未被使用的安装孔接地。

Use unused mounting holes for grounding.

导体的材料推荐使用4-14mm²的铜导线（AWG 6-12）作为接地导线。

Copper conductors of 4-14mm² (AWG 6-12) are recommended for earthing cables.

螺栓套件各配件选择时应能满足组件可靠固定，推荐尺寸可参考6.4.2小节。

Bolt assembly shall ensure firm module fixation, refer to Clause 6.4.2 for recommended dimensions.

- ◆ 其他专用接地装置不管采用哪一种接地方式，所有和光伏组件铝合金边框的接地电接触点都需要穿透铝边框的阳极氧化涂层。在使用专用接地装置等其他第三方的接地装置接地时，需要确保这些接地装置是可靠的，并且通过专业认证的产品，在安装时需要遵守接地装置生产商的使用规定。

Other special grounding devices No matter which grounding method is adopted, all grounding electrical contacts with the aluminum alloy frame of the PHOTOVOLTAIC module need to penetrate the anodized coating of the aluminum frame. When grounding a third-party grounding device, such as a dedicated grounding device, ensure that the device is reliable and professionally certified. When installing the device, comply with the manufacturer's regulations.

7.2 测试，调试，与故障排除 Test, Debugging and Troubleshooting

- ◇ 串联组件连接到系统前的测试，使用数字万用表(推荐 fluke 170 系列或 DC 量程可以达到 1500V 的数字万用表)检查串联组件的开路电压。测量值应等于单个组件开路电压的总和。您将在所用类型组件的技术说明书中找到额定电压。

Before connecting series modules to the system, perform the following test. Use digital multimeter (recommended Fluke 170 series or digital multimeter which DC range can reach 1500V) to check open-circuit voltage of the series modules. The measurement value should be equal to the sum of the open-circuit voltage of a single module and you will find the rated voltage in the technical specification of the type module you are using.

- ◇ 低电压故障排除。鉴别正常的低电压和故障低电压。这里提到的正常低电压是指组件开路电压的降低，它是由太阳能电池温度升高或辐照度降低造成的。故障低电压通常是由于终端连接不正确或旁路二极管损坏引起的。

Low voltage troubleshooting. Identify the normal low voltage and fault low voltage. The normal low voltage mentioned here refers to the decrease of the open circuit voltage of the module caused by the temperature increase of the solar

cell or the decrease of the irradiance. Fault Low voltage is usually caused by improper terminal connection or bypass diode damage.

7.3 阻塞二极管和旁路二极管故障排除 **Blocking Diode and Bypass**

Diode Troubleshooting

- ◇ 阻塞二极管能够在组件没有电流生成时阻止电流从蓄电池流向组件。如果没有使用充电控制器，则推荐使用阻塞二极管。关于充电控制器请咨询专业经销商。

Blocking diodes could prevent current from flowing from the battery to the module when the module is not generating current. If you do not use the charge controller, it is recommended to use blocking diodes. About charge controller, please consult a professional dealer.

- ◇ 在系统中，当组件的一部分被遮挡而其它部分暴露在阳光下时，会发生热斑效应，导致电池过热甚至会损坏组件。在组件中使用旁路二极管可以保护组件不受这种过高的反向电流影响。所有额定功率大于 55 瓦的组件都已在接线盒中集成了旁路二极管。

In the system, hot spot effect occurs when part of the module is blocked and other parts are exposed to the sunshine and thereby lead to overheat of the cell and damage the module. Using bypass diodes in the module protects the module from being affected by this excessive reverse current. All modules those rated power are more than 55 watts have a bypass diode integrated in the junction box.

7.4 并网电气系统 **On-grid Electrical System**

- ◇ 在一个光伏发电系统中尽量使用相同的组件，组件串联数量 $(N) \leq V(\max) / [Voc(atSTC)]$ 。V (max) 为组件最大系统电压，Voc(atSTC)为组件标称状态下开路电压。

Try to use the same components in a photovoltaic power generation system, the number of modules in series $(N) \leq V(\max) / [Voc(atSTC)]$. V (Max) is the maximum system voltage of the component, and Voc(atSTC) is the open-circuit voltage under the nominal state of the component.

- ◇ 几个组件串联，然后并联形成光伏阵列，这特别适用于电压较高的情况下。如果组件串联，总电压等于各个组件电压的总和。

Several modules in series, and then form a PV array in parallel, which is particularly suitable for high voltage situations. If the modules are connected in series, the total voltage is equal to the sum of the voltages of the individual modules.

- ◇ 需要使用高电流的情况下，可以将几个光伏组件并联，总电流等于各个组件电流的总和。

In the case of using high current, you can put several PV modules in parallel, the total current is equal to the sum of the current of each module.

- ◇ 组件可提供预制连接器，用于系统的电气连接。电缆线尺寸、类型和温度等参数的选择请参考相关的规程。

The module can provide prefabricated connectors for system's electrical connections. As for cable size, type and temperature and other parameters' choice, please refer to the relevant rules.

- ◇ 电缆横截面和连接器大小必须满足最大系统短路电流。否则电缆线和连接器会因为电流过大而过热！有烧坏的危险！

The cable cross-section surface and connector's size must meet the maximum system short-circuit current, otherwise the cables and connectors will overheat because of excessive current and has the danger of burning!

- ◇ 在调试或维修太阳能系统时要保护自己免遭电击，戴好绝缘手套和绝缘鞋等防护用品使用专用的电工工具进行维修。

Protect yourself from electric shock when debugging or repairing the solar system. Wear protective gloves and insulated shoes and other protective equipment. Use special electrician tools for repairs.

- ◇ 单串组件最大可串联组件数量必须根据相关规定要求计算，在当地预计最低气温条件下其开路电压数值不得超过组件规定的最大系统电压及其他直流电器部件要求的值。建议使用以下公式计算组件最大串联数：

The maximum number of modules connectable in a single string shall be calculated in accordance with relevant regulations. The open-circuit voltage at the local minimum ambient temperature shall not exceed the maximum system voltage specified for the modules and the rated voltage limits of other DC electrical components. It is recommended to calculate the maximum series number of modules using the following formula.

$$N \times V_{OC} \times [1 - TC_{Voc} \times (25 - T_{min})] \leq V_{max}$$

其中：

N:组件串联数量 Number of series-connected modules

Voc:组件开路电压 Module open-circuit voltage

TC_{Voc} :组件开路电压温度系数 Module open-circuit voltage temperature coefficient

T_{min} :当地最低环境温度 Local minimum ambient temperature

V_{max} :最大系统电压 Maximum system voltage

- ◇ 组件并联时，整串组件的输出电流等于每个支路组件或组件串的电总流和，每串组件都要安装保险丝，组件最大并联数可参考公式：

最大保护电流 / (1.25 * 短路电流)，具体请参考该国家或地区或当地的规范。

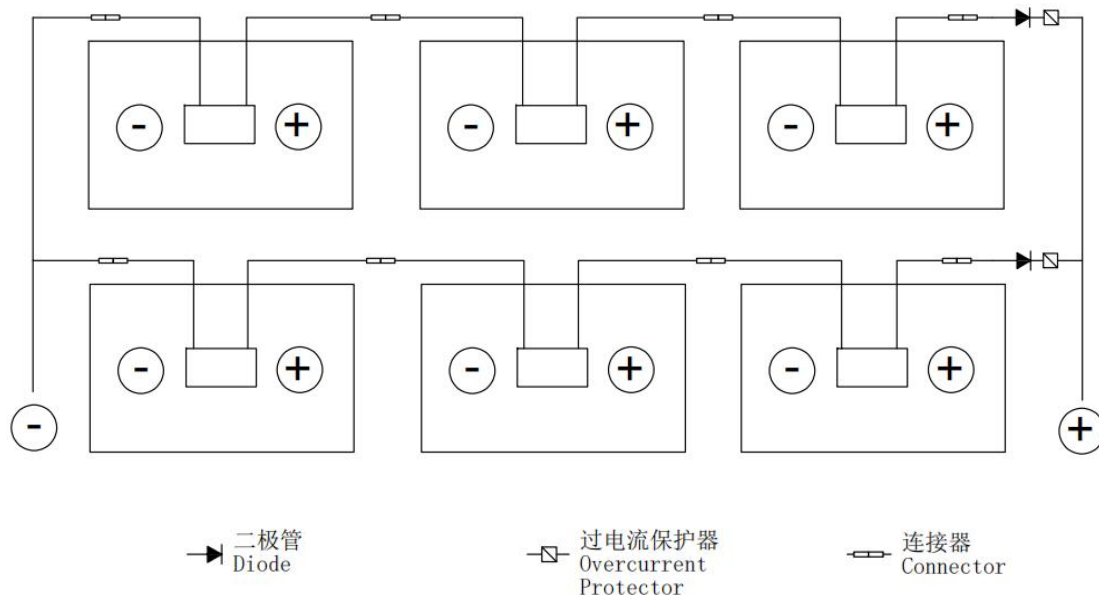
When PV modules are connected in parallel, the total output current equals the sum of currents from each branch module string. A fuse shall be installed for each module string.

The maximum parallel number of modules can be calculated by the formula: Maximum protective current / (1.25 × Short-circuit current)

Relevant local codes and regional standards shall be followed for specific design.

当组件可能承受超过其最大保险丝电流的反向电流时，必须采用同规格过电流保护装置进行保护；并联数量 ≥ 2 时，每串组件支路应设置独立的过电流保护装置，如下图所示。

Modules must be protected with same-rated OCPD if reverse currents exceed their maximum fuse current rating. For ≥ 2 parallel strings, each string requires an independent OCPD (see figure below).



并联电路示意图 Parallel Connection Schematic

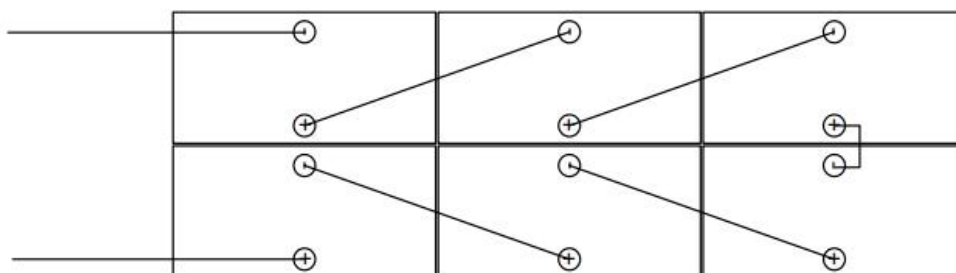
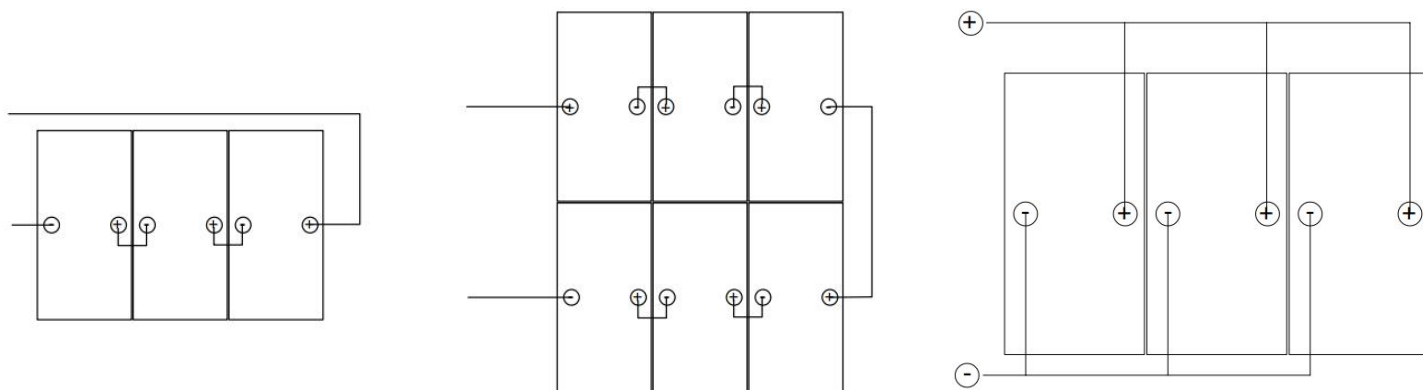
7.5 组件排布 Module Arrangement

- ◇ 组件排布较为常见的单竖排、双竖排、单横排、双横排接线：

Common module layouts: single vertical row, double vertical rows, single horizontal row, double horizontal rows wiring

推荐布线方式 Recommended wiring method

竖装 Vertical installation



横装 Horizontal installation

(注意：具体串接个数及线缆长度根据实际设计确定)

(Note: Series count and cable length as per actual design.)

组件布线作业需严格把控线缆最小弯曲半径，该数值为线缆容许弯折极限。不同线缆对应专属弯折系数，光伏直流电缆弯折系数取值为4倍线缆外径。

Strictly control the minimum bending radius during module wiring. Different cables have respective bending coefficients. The coefficient for DC cables is 4 times cable outer diameter.

最小弯曲半径=电缆外径*电缆系数

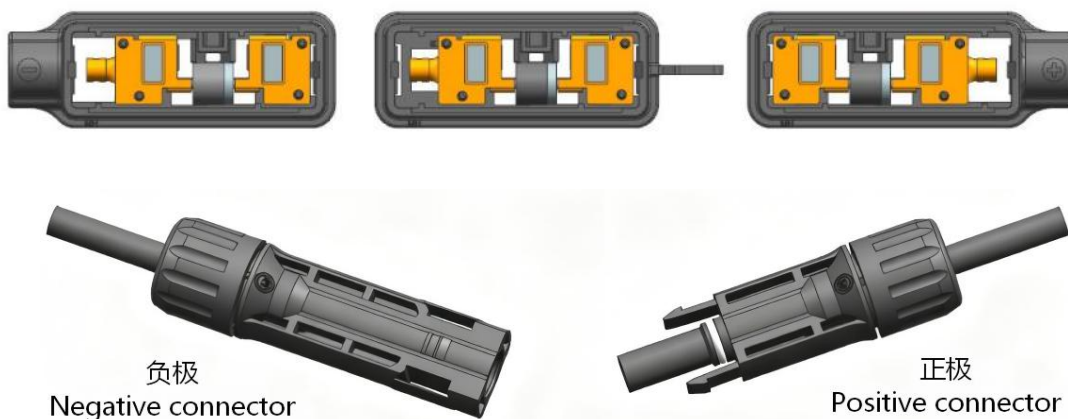
Minimum bending radius = Outer diameter * Coefficient

7.6 电缆和连接器 Cables and Connectors

- ◇ 组件配备3个IP68防护等级的分体式接线盒，对线缆连接部位提供安全防护。单块组件从接线盒引出正、负两根线缆，将组件正极接头插接至相邻

组件负极接口，即可完成组件串联布设。下图仅为示意，具体接线盒的具体尺寸见组件规格。

The module is equipped with three IP68-rated split junction boxes to protect cable connections. Each module has one positive and one negative lead from the junction box; series connection is made by plugging the positive connector of one module into the negative connector of the adjacent module. The figure is for illustration only; refer to the module datasheet for exact junction box



dimensions.

- ◇ 接线盒额定电流 25A/30A，具体参数依组件型号而定，详见规格书。产品符合 IEC 62790:2020 标准，二极管参考型号 30SQ045-SL/40SQ045（明禾有限公司）、30SQ045/ 40SQ045（泽润有限公司），[连接器参考型号 PV-MH8（明禾有限公司）](#)，实际配置以出厂成品为准。

The junction box rated current is 25A/30A, varying by module model, see specification for details. It complies with IEC 62790:2020. The reference model of diode is 30SQ045-SL/40SQ045(Minghe Co., LTD.)、30SQ045/ 40SQ045(Zerun Co., LTD), [The reference model of connector is PV-MH8 \(Minghe Co., LTD.\)](#) , actual configuration subject to factory delivery.

- ◇ 为保障系统稳定运行，组件或负载设备接线时，务必确认线缆极性无误。错误连接易造成旁路二极管损毁。

To ensure stable system operation, verify cable polarity when connecting modules or loads. Incorrect connections may damage bypass diodes.

- ◇ 遵照当地防火、建筑及电气规范，选用专用光伏电缆与适配连接器，保障线缆电气、机械性能达标。使用不低于 4mm²（12AWG）、耐温 90℃ 的光伏电缆，绝缘性能需满足系统最高开路电压要求。合理选配线径以降低线路压降。

In compliance with local fire, building and electrical codes, use dedicated PV cables and matching connectors to ensure electrical and mechanical

performance. Use PV cables with a cross-section of no less than 4mm² (12 AWG), rated for 90°C, whose insulation meets the system's maximum open-circuit voltage requirements. Select appropriate wire gauge to minimize voltage drop.

- ◇ 保持连接器干燥洁净，对接前检查螺帽是否紧固。潮湿、污损状态下禁止插接。严禁不同型号连接器混接使用。

Keep connectors dry and clean. Ensure nuts are tightened before connection. Do not mate damp or dirty connectors. Different types of connectors cannot be interconnected.

- ◇ 连接器应避免阳光直射、雨淋与积水环境，禁止直接接触地面或屋面。

Avoid direct sunlight, rain and water accumulation. Do not place connectors on ground or roof surface.

- ◇ 组件电池串并联旁路二极管防护，整体封装于接线盒内。组件出现热斑时现象时，二极管启动工作，使主电流不再从热斑电池片上流过，限制电池片发热，减少功率损耗。旁路二极管不具备过流保护功能。若确定或疑似二极管故障，需联系厂商售后处理，严禁私自拆解接线盒。

Bypass diodes are parallel-connected to cell strings and sealed inside junction boxes. When hot spots occur, diodes divert main current away from affected cells to reduce heat generation and power loss. Bypass diodes do not provide overcurrent protection. Contact manufacturer service for confirmed or suspected faults. Unauthorized disassembly of junction boxes is prohibited.

8. 维护 Maintenance

- ◇ 为保证电池板最佳性能，海泰新能提交以下维护措施。

To ensure the best performance of the solar panels, Haitai New Energy provide the following maintenance measures.

- ◇ 应在早晨或傍晚发电功率低或没有功率时进行电池板清洁。

The solar panel should be cleaned in the morning or evening when the power is low or no power is processing.

- ◇ 必要时清洗玻璃表面，清洁玻璃表面应使用清水和软质物体擦洗，可使用中性洗涤剂，切不可使用酸性或碱性或加研磨剂洗涤剂。

Cleaning the glass surface when necessary through clean water and soft objects. The neutral detergent should be used for cleaning while the acidic or alkaline or abrasive detergent is forbidden.

- ◇ 在下雨天气时如果出现逆变器或其他电器设备断电不要进行送电，等待下雨天气过后对线路进行检查确保没有问题后再进行送电。

In case of rainy weather, do not deliver the electricity if the inverter or other electrical equipment is power off. It is better to check and ensure that there is no problem in the lines before sending the electricity.

- ◇ 清洗电池板时不能用高压水枪进行冲洗，以免电池板接头处因冲洗压力过大进水导致线路漏电。

When cleaning, the solar panel can not be washed with a high-pressure water gun for avoiding line leakage caused by excessive pressure in the connection place of the solar panel.

- ◇ 每六个月进行一次机械和电器检查，确保表面清洁及连接可靠。

Conduct a mechanical and electrical inspection for every six months and ensure that the surface is clean and the connection is reliable.

- ◇ 如有任何其它异常情况出现，请咨询厂家或有经验的工程师。

If any other abnormal situation occurs, please consult factory or experienced engineer.

- ◇ 注意，遵守系统使用的所有部件，如支架、充电控制器、逆变器、电池等的维护说明。

Observe the maintenance instructions for all parts used in the system, such as bracket, charge controller, inverter, solar cell, etc.

9. 声明 Declaration

- ◇ 光伏组件在实际运行中，可能出现电流和/或电压高于标准测试条件（STC）标称值的工况。影响因素包括组件温度、正面辐照度，双面组件还需考虑地面/屋顶反照率、排间距和安装高度。因此，在确定与光伏组件输出端相连部件的电压、电流额定值时，组件铭牌标注的开路电压（VOC）和短路电流（ISC，双面组件为 ISC-aBSI）应乘以 1.25 的安全系数。

During actual operation, PV modules may generate current and voltage exceeding STC rated values, affected by module temperature and irradiance. For bifacial modules, ground/roof albedo, row spacing and mounting height shall also be considered. Hence, a safety factor of 1.25 shall be applied to rated Voc and Isc (Isc-bsi for bifacial modules) when selecting matching electrical components.