

湖南红太阳新能源科技有限公司

Hunan Red Solar New Energy Science and Technology Co., Ltd.

光伏组件安装手册

Pv module Installation Manual

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一、目的 PURPOSE

- 本手册提供了湖南红太阳新能源科技有限公司所生产的光伏组件（以下简称为“组件”）安装和安全使用信息。湖南红太阳新能源科技有限公司以下简称为“红太阳新能源”。

- The manual provides information on the installation and safe use of photovoltaic modules (the "module") produced by HUNAN RED SOLAR NEW ENERGY SCIENCE AND TECHNOLOGY CO., LTD is hereinafter referred to as "RED SOLAR NEW ENERGY".

- 安装前，安装者必须阅读和理解本手册。安装组件时，安装者应遵守本手册的所有安全防范措施和当地法规。

installer must read and understand the manual before installing. When installing modules, the installer must comply with all safety precautions set forth in this manual and local regulations.

- 在安装太阳能光伏发电系统前，安装人员应熟悉此系统的机械和电气要求。本手册请妥善保管，以备将来维护与保养或组件需出售或处理时参考。

Before installing a solar PHOTOVOLTAIC system, installers should familiarize themselves with the mechanical and electrical requirements of the system. Please keep this manual for future maintenance and maintenance or when the modules need to be sold or disposed of.

二、免责声明 DISCLAIMER

- 由于本手册的使用及光伏组件安装、操作、使用和维护的条件或方法超出了红太阳新能源的控制范围，红太阳新能源不对任何与这些安装、操作、使用或维护相关的操作所引起的损失、破坏或费用负责。

As the use of this manual and the conditions or methods for the installation, operation, use and maintenance of photovoltaic modules are beyond the control of RED SOLAR NEW ENERGY, RED SOLAR NEW ENERGY shall not be liable for any loss, damage or expense arising from any operation related to such installation, operation, use or maintenance.

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The information in the manual is based on the knowledge and reliable experience of RED SOLAR NEW ENERGY; However, such information and recommendations, including product specifications, do not constitute any warranty, express or implied. RED SOLAR NEW ENERGY reserves the right to modify the manual, PV module products, specifications or product information without prior notice.

三、环境条件 ENVIRONMENTAL CONDITIONS/ 组件系列

本公司组件安装条件如下：

The installation conditions of our modules are as follows:

使用温度：-45℃ ~ +85℃

Operating temperature: -45℃ ~ +85℃

保存温度：-40℃ ~ +40℃

Storage temperature: -40℃ ~ +40℃

环境湿度：≤85RH%

Ambient humidity: ≤85RH%

组件表面最大负荷：5400Pa

Maximum load on module surface: 5400Pa

除此以外，其他的安装条件应该咨询当地的工程师。

In addition, consult local engineers for other installation conditions.

本公司组件型号系列 Models of PV Modules:

单玻 Models with single glass:

CETC-420M(H)/144, CETC-405M(H)/144, CETC-465M(H)/144, CETC-440M(H)/144,
CETC-455M(H)/144, CETC-380M(H)/120, CETC-595M(H)/156, CETC-590M(H)/156,
CETC-550M(H)/144, CETC-545M(H)/144, CETC-540M(H)/144, CETC-535M(H)/144,
CETC-530M(H)/144, CETC-505M(H)/132, CETC-500M(H)/132, CETC-455M(H)/120,
CETC-450M(H)/120

双玻 Models with double glass:

CETC-405M(GDF)/144, CETC-400M(GDF)/144; CETC-460M(GDF)/144, CETC-455M(GDF)/144,
CETC-450M(GDF)/144, CETC-380M(GDF)/120, CETC-375M(GDF)/120; CETC-590M(GDF)/156,
CETC-585M(GDF)/156, CETC-545M(GDF)/144, CETC-540M(GDF)/144, CETC-535M(GDF)/144,
CETC-530M(GDF)/144, CETC-500M(GDF)/132, CETC-495M(GDF)/132, CETC-455M(GDF)/120,
CETC-450M(GDF)/120

四、通则 GENERAL RULE

- 安装太阳能光伏发电系统要求专业的技能和知识，必须由具有专业资格的工程师来完成。

Installation of solar PV systems requires specialized skills and knowledge and must be done by professionally qualified engineers.

- 每个组件附带有有一个/组永久连接的接线盒。为了安装方便，本公司可按客户要求提供预制的电缆。

Each module is attached with a permanently connected junction box/group. In order to facilitate installation, the company can provide prefabricated cable according to customer requirements.

- 安装人员应该预先了解安装过程中可能会发生伤害的风险，包括电击等。
- The installer should know in advance the risk of possible injury during installation, including electric shock, etc.
- 为了防止电击，工作环境、组件以及安装工具应该保持干燥状态。

To prevent electric shocks, the working environment, modules, and installation tools should be kept dry.

- 每个组件在阳光直射下可产生 30V 以上的直流电压，接触电压达到 30V 或更高是很危险的。

Each module can generate dc voltage of 30V or more in direct sunlight, and contact voltage of 30V or more is dangerous.

- 不要在有负载的情况下断开连接线。

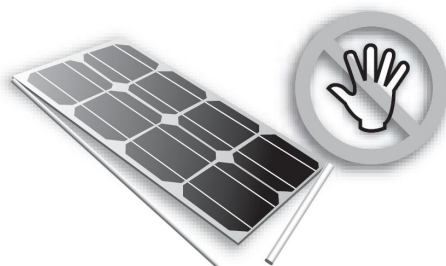
Anyway, don't disconnect a connection while you're loaded.

- 太阳能电池组件能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。

Solar battery modules that swap light energy for direct current are used in outdoor environments such as ground, roof, vehicle or boat. Proper design of supporting structures is the responsibility of the system designer or installer.

- 不要拆解组件，移动任何铭牌或粘附的部件。

Regardless, don't disassemble modules and move any nameplates or glued parts.



- 不要在组件的上表面刷油漆或其他粘合剂。

Anyway, don't buy a ticket by brushing paint or other adhesive onto the upper surface of a module.

- 不要用镜子或透镜聚焦阳光照射到组件上，不要将组件背面直接暴露在阳光下。

Anyway, don't use a mirror or lens to focus the sun's rays onto the module, exposing the back of the module directly to the sun.



- 组件安装时，应遵守所有地方、地区和国家的相关法规，必要时应先获得建筑许可证。

Installing a module automatically complies with all local, regional and national regulations and requires a building permit if necessary.

五、安装太阳能光伏系统的安全防范

SAFE PRECAUTIONS FOR INSTALLING SOLAR PHOTOVOLTAIC SYSTEMS



- 阳光照射组件正面时，太阳能电池组件产生直流电能且直流电压可能超过 30V。如果组件串联，总电压等于单个组件电压总和；如果组件并联，则总电流等于单个组件电流总和。

When sunlight shines the front of the module, the solar cell module generates direct current power and the DC voltage may exceed 30V. If the modules are in series, the total voltage is equal to the sum of the individual module voltages; If the modules are connected in parallel, the total current equals the sum of the currents of the individual modules.

- 在运输和安装组件时，应使儿童远离组件。

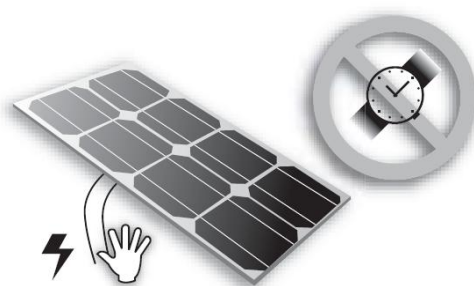
Keep children away from modules when transporting and installing them.

- 在安装过程中用不透明材料完全覆盖组件以防止电流产生。

Completely cover modules with opaque material during installation to prevent electricity from being generated.

- 安装或维护光伏系统时，不要穿戴金属戒指、手表、耳环或其它的金属配饰，禁止利器与组件玻璃表面接触。

When installing or maintaining a PHOTOVOLTAIC system, you don't wear metal rings, watches, earrings or other metal accessories, and prevent sharp objects from coming into contact with the module's glass surface.



- 使用符合电力安装工作绝缘要求的工具，穿戴符合电力安装工作绝缘要求的劳动保护用品。

Use tools that meet the insulation requirements of power installation and wear labor protection articles that meet the insulation requirements of power installation.



- 遵守适用于所有安装导线、充电控制器、逆变器、蓄电池等。

Adhere safety rules that apply to all installed modules, such as wires and cables, connectors, charging controllers, inverters, batteries, etc.

- 只使用与太阳能电力系统相匹配的设备、连接线、电线和支架。在特定系统中，尽可能使用相同类型的组件。
- Only use equipment, connecting wires, wires and supports matching the solar power system. In a specific system, use the same type of components as much as possible.
- 在标准测试条件下（ $1000\text{w}/\text{m}^2$ 的辐照度，AM1.5 光谱，以及 25°C （ 77°F ）的环境温度），组件的电性能参数如 I_{sc} ， V_{oc} 和 P_{max} 与标称值有一定的偏差。

At standard test conditions (irradiance: $1000\text{W}/\text{m}^2$, AM1.5 spectrum, and ambient temperature of 25°C (77°F)), the module's electrical parameters such as I_{sc} , V_{oc} , and P_{max} deviate somewhat from the nominal values.

- 在普通室外条件下，组件产生的电流和电压与参数表中列出的有所不同。参数表是在标准测试条件下测得，所以在确定光伏发电系统中其它部件的额定电压、导线容量、保险丝容量、控制器容量等和部件功率输出有关联的参数时，参照标在组件上的短路电流和开路电压的值，并按 125% 的值设计和安装。

At ordinary outdoor conditions, the modules unconsciously generate different currents and voltages compared to those listed in the parameters sheet. The parameter table is measured under standard test conditions, so when determining the rated voltage, wire capacity, fuse capacity, controller capacity of other modules in the photovoltaic power generation system and the parameters related to the power output of modules, refer to the value of the short-circuit current and open-circuit voltage marked on the module, and design and installation according to 125% value.






六、产品标识 PRODUCT MARKING

每个组件的背面都有两个标签，提供了以下信息：

On the back of each module are two labels that provide the following information:

- 铭牌:描述产品型号，包括额定功率、额定电流、额定电压、开路电压、短路电流等所有在标准测试条件下测得的值；重量、尺寸等；最大的保险丝容量以及系统最高电压。

Nameplate: describes the product model, including rated power, rated current, rated voltage, open circuit voltage, short circuit current and other values measured under standard test conditions; Weight, size, etc. Maximum fuse capacity and maximum system voltage.

 Hunan Red Solar New Energy Science and Technology Co., Ltd. <small>1025, Xinkaipu Road, Tianxin District, Changsha City, Hunan Province, 410111, P.R.China</small>	
MODULE TYPE:	CETC-335P/72
Peak Power(Pmax)	(Wp) : 335
Production Tolerance	(%) : 0~+3
No.of cells	(pcs) : 72
Cell Type	: P-Poly
Maximum Power Current(Imp)	(A) : 8.84
Maximum Power Voltage(Vmp)	(V) : 37.89
Short-Circuit Current(Isc)	(A) : 9.28 ± 3%
Open-Circuit Voltage(Voc)	(V) : 46.10 ± 3%
Maximum series fuse rating	(A) : 15
Nominal Module Operating Temperature(NMOT)	(°C) : 45 ± 2
Weight	(Kg) : 21 ± 5%
Dimensions	(mm) : 1956 × 992 × 40
Maximum System Voltage	(V) : 1000
All technical data at standard test condition AM=1.5 E=1000W/m ² Tc=25°C	
IEC61215 IEC61730	 Application Class A Classification: Class II Fire Class C
WARNING ELECTRICAL HAZARD THIS UNIT PRODUCES DC ELECTRICITY WHEN EXPOSED TO LIGHT.COVER GLASS BEFORE REMOVING TERMINAL JUNCTION BOX LID.	 
Made in China	

组件铭牌示例 Example module nameplate

- 条形码: 每个组件都有一个唯一的序列号。该序列号有 18 位，其中第 1~4 位字母为本公司

代码，第 5 位字母为组件类型代码，第 6~7 位数字组件电池数量（按整片计），第 8~9 位数字为组件技术代码，第 10~11 位为生产年月，第 12 位为生产车间，最后 5 位为组件流水号。

Queue barcoding: Each module has a unique serial number. The serial number has 18 digits, in which the first to fourth letters are the company code, the fifth letter is the module type code, the sixth to seventh digits are the module battery quantity (by the whole piece), the eighth to ninth digits are the module technical code, the tenth to eleventh digits are the production date, the twelfth digit is the production workshop, and the last five digits are the module serial number.

- 例如：条形码 CETCM72550DE500001，为湖南红太阳新能源科技有限公司组件五车间生产的五栅单晶 72 片单玻组件，2017 年 2 月份产品的第一块组件。（组件正面和背面上各有一个条形码。正面的条形码被永久地固定在组件内部。）

Barcode CETCM72550DE500001, a five busbar mono crystal 72-chip single glass module produced by module Workshop no.5 of HUNAN RED SOLAR NEW ENERGY SCIENCE AND TECHNOLOGY CO., LTD, participates in the first module of the product in February 2017. There is a bar code on the front and back of the module. The bar code on the front is permanently fixed inside the module.



条形码示例 Bar code example

特别注意：不要撕掉任何标签，如果标签被撕掉，本公司将不再提供产品质保。

Attention: do not remove any label, if the label is removed, the company will no longer provide product warranty.

车间代码说明：

Workshop Code Description:

05—湖南红太阳新能源科技有限公司（地址：湖南省长沙市天心区 1025 号）

05-Hunan Red Solar New Energy Science and Technology Co., Ltd (Address: 1025, Xinkaipu Road, Tianxin District, Changsha City, Hunan Province, 410111, P.R. China)

03—湖南红太阳新能源科技有限公司（地址：湖南省长沙市高新区桐梓坡路 586 号科研大楼二楼）

03-Hunan Red Solar New Energy Science and Technology Co., Ltd (Address: No. 586, West Tongzi po Road, High-tech Development Zone, Changsha City, Hunan Province, 410205, P.R. China)

0R—江苏润达光伏无锡有限公司（地址：江苏省无锡市鹅湖镇延祥路108号）

0R - Jiangsu Runda PV Co., Ltd. (Address: Yanxiang Road 108, Ehu Town, Xishan District, Wuxi City, Jiangsu Province, P.R. China)

0Y—润达光伏盐城有限公司（地址：江苏省盐城市建湖县严桥路南，经四路西）

0Y- Runda PV Yancheng Co., LTD (Address: No. 128 Yanqiao West Road, Jianhu County Yancheng City, Jiangsu Province, P.R.China)

七、机械安装 INSTALLATION OF MECHANISMS

7.1 选择位置 Chosen position

- 在北半球，组件最好朝南，而在南半球最好朝北。

In the northern hemisphere, it is best for the module to face south, while in the southern hemisphere it is best to face north.

- 要了解最佳的安装倾斜角的详细信息，请参考标准的太阳能光伏组件安装指导手册或咨询可靠的太阳能系统安装公司。

For details on the optimal installation inclination, refer to the standard solar PV module installation instruction manual or consult a reliable solar system installation company.

- 组件应安装在阳光可以充分照射的位置并确保在任何时间内不被遮挡。

The modules shall be installed in a position where full sunlight is available and shall not be covered at all times.

- 不要把组件放置在易产生或聚集可燃气体的地方。

Do not place modules where combustible gases are likely to be generated or collected.

7.2 选择合适的支架 Choose the right bracket

- 必须遵守支架所附的说明书指导和安全守则。

you have to adhere to the instructions and safety rules that come with the stand.

- 不要在组件玻璃的表面钻孔，以防对组件造成破坏，从而使保修失效。

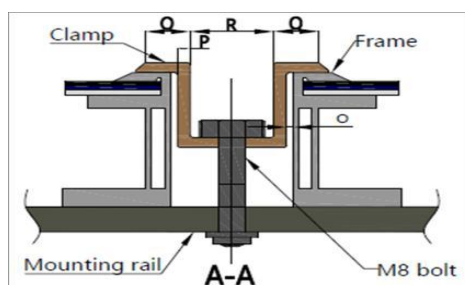
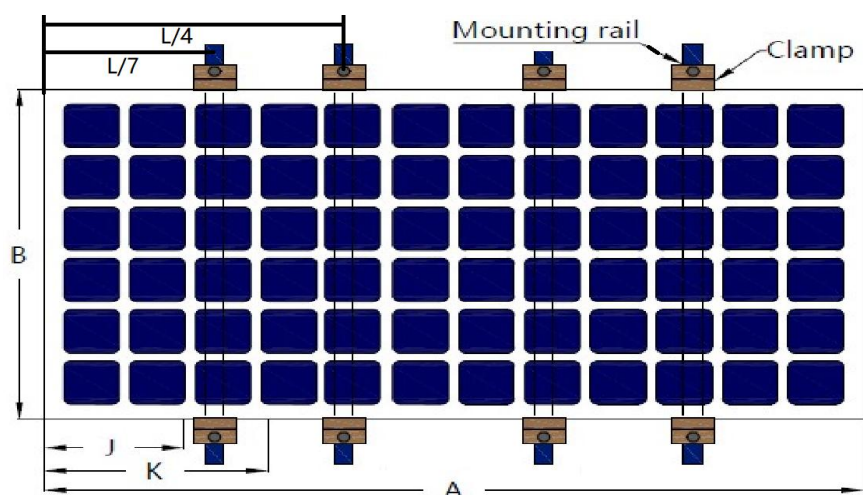
Anyway, don't drill holes into the surface of a module's glass, in case you damage the module and void your warranty.

- 不要在组件的边框上钻附加的安装孔，否则保修失效。

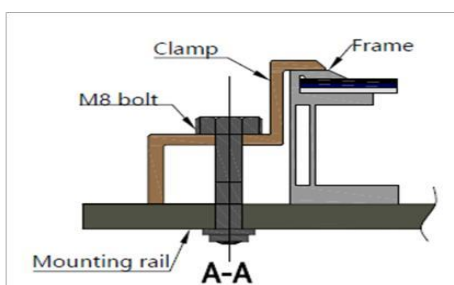
Anyway, don't drill additional mounting holes in the bezel of a module, otherwise your warranty lapses.

- 光伏组件采用压块固定安装方式时：压块不得压住组件正面玻璃且不能脱离边框。确保压块不会导致盖住组件的阴影。请确保在任何环境下未对边框做改造。当选择压块安装方式时，请确保至少有 4 个/8 个压块固定在长边框上（如下图）。取决于当地的载荷情况，如果预期有超出设计载荷的情况时，应当增加额外的压块或者支撑材料。当固定压块时，应当提供足够强度的固定扭矩（特殊设计请咨询压块供应商）以便保证压块的可靠。

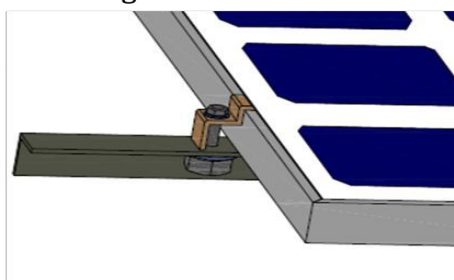
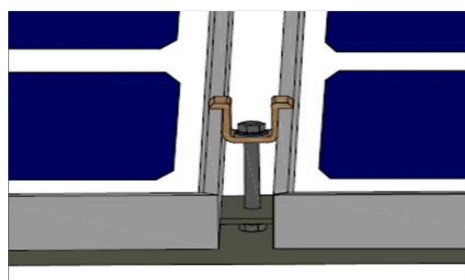
When the photovoltaic module is fixed by pressing block, the pressing block shall not press the front glass of the module and shall not break away from the frame. Ensure that the lumps do not cause shadows that cover the modules. Make sure you do not change the frame in any environment. When selecting the mounting method of the pressing block, ensure that at least 4 or 8 pressing blocks are fixed on the long frame (as shown below). Depending on the local load conditions, additional blocks or support materials should be added if the design load is expected to exceed it. When the block is fixed, a fixed torque of sufficient strength should be provided (consult the block supplier for special designs) to ensure the block is reliable.



Middle modules installation



Fringe modules installation



单玻组件安装要求 Installation requirements for single glass modules

组件型号 The module models	尺寸(mm) size			载荷 load	安全因子 Safety factory	最小压块数量 Minimum number of pressing blocks
	A*B	J	K			
CETC-420M(H)/144 CETC-405M(H)/144 (158 cell)	2015 x 996 x 35mm	280	480	+3600Pa/-1600Pa	1.5	4
CETC-380M(H)/120 (166 cell)	1755 x 1038 x 30mm	280	420	+3600Pa/-1600Pa	1.5	4

CETC-440M(H)/144 CETC-455M(H)/144 CETC-465M(H)/144 (166 cell)	2094 × 1038 × 30mm	280	480	+3600Pa/-1600Pa	1.5	4
CETC-590M(H)/156 CETC-595M(H)/156 (182 cell)	2465x 1133 x40mm	L/4±50mm (L 表示长边长度)		+3600Pa/-1600Pa	1.5	4
CETC-550M(H)/144 CETC-545M(H)/144 CETC-540M(H)/144 CETC-535M(H)/144 CETC-530M(H)/144 (182 cell)	2279 x 1133 x35mm	L/7&L/4±50mm (L 表示长边长度)		+3600Pa/-1600Pa	1.5	8
CETC-505M(H)/132 CETC-500M(H)/132 (182 cell)	2090 x 1133 x35mm	L/7&L/4±50mm (L 表示长边长度)		+3600Pa/-1600Pa	1.5	8
CETC-450M(H)/120 (182 cell)	1904 x 1133 x30mm	280	480	+3600Pa/-1600Pa	1.5	4

双玻组件安装要求 Installation requirements for dual-glass modules

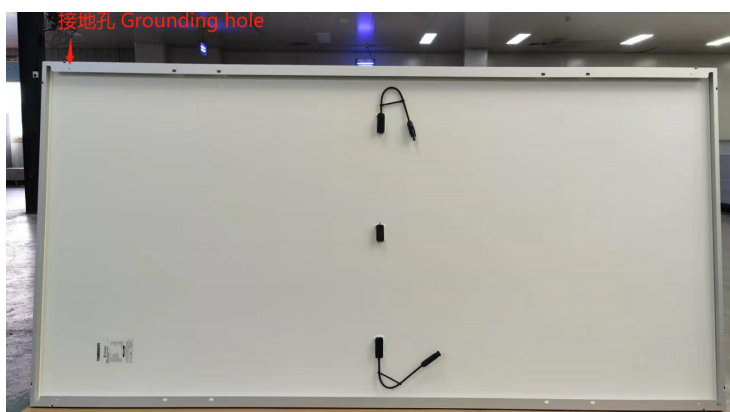
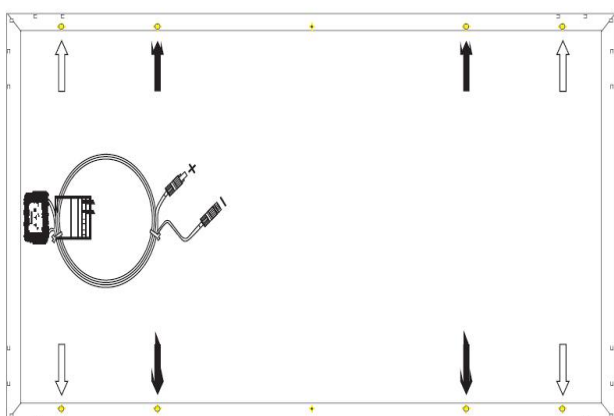
组件型号	尺寸(mm)			载荷	安全因子	最小压块数量
	A*B	J	K			
CETC-405M(GDF)/144 CETC-400M(GDF)/144 (158 cell)	2030 x 1010 x 30mm 2015 x 996 x 30mm	280	480	+1600Pa/-1600Pa	1.5	4
CETC-375M(GDF)/120 CETC-380M(GDF)/120 (166 cell)	1755×1038×30mm	280	420	+3600Pa/-1600Pa	1.5	4
CETC-450M(GDF)/144 CETC-455M(GDF)/144 CETC-460M(GDF)/144 (166 cell)	2094×1038×30mm	280	480	+3600Pa/-1600Pa	1.5	4
CETC-585M(GDF)/156 CETC-590M(GDF)/156 (182 cell)	2465x 1133 x40mm	L/4±50mm (L 表示长边长度)		+3600Pa/-1600Pa	1.5	4
CETC-530M(GDF)/144 CETC-535M(GDF)/144 CETC-540M(GDF)/144 CETC-545M(GDF)/144 (182 cell)	2278 x 1133 x30mm	L/7&L/4±50mm (L 表示长边长度)		+3600Pa/-1600Pa	1.5	8
CETC-495M(GDF)/132 CETC-500M(GDF)/132 (182 cell)	2090 x 1133 x30mm	L/7&L/4±50mm (L 表示长边长度)		+3600Pa/-1600Pa	1.5	8

CETC-455M(GDF)/120						
CETC-450M(GDF)/120 (182 cell)	1904 x 1133 x30mm	280	480	+3600Pa/-1600Pa	1.5	4

- 光伏组件采用螺栓安装孔安装时：使用边框内侧的四个对称的安装孔将组件固定在支架上；在有强风或大雪的地区，同时使用外侧对称的安装孔来加强固定。细节请参见下图。

when the PV module is installed with bolt mounting holes: use four symmetrical mounting holes on the inner side of the frame to fix the module on the support; In areas with strong wind or heavy snow, use symmetrical mounting holes on the outside to strengthen fixation. See the figure below for details.

↓ 接地孔 Grounding hole



- 内侧标准安装孔：适用于大部分环境，低的/正常水平的载荷工况：组件最大背面承受的静载荷为 2400Pa（相当于风压），正面承受的最大静压力为 2400Pa（相当于风压和雪压）；

Built-in standard mounting holes: suitable for most environments, low/normal level load conditions: the maximum static load on the back side of the module is 2400Pa (equivalent to wind pressure), and the maximum static pressure on the front side is 2400Pa (equivalent to wind and snow pressure);

- 外侧安装孔：内测安装孔固定后使用以加强组件抗载荷能力。适用于较高载荷条件：组件最

大背面承受的静载荷为 2400Pa（相当于风压），正面承受的最大静压力为 5400Pa（相当于风压和雪压）；

External mounting hole: The internal test mounting hole is fixed to enhance the load resistance of modules. Suitable for high load conditions: the maximum static load on the back of the module is 2400Pa (equivalent to wind pressure), and the maximum static pressure on the front is 5400Pa (equivalent to wind pressure and snow pressure);

- 压块安装：螺栓建议采用 M8 规格（长度根据压块设计高度定）并配备相应的垫片、弹簧垫片和螺母；采用扭力扳手拧紧，扭力大小范围为：18N.m 到 24N.m 之间。

Installation of pressing block: M8 specification is recommended for bolts (length is determined according to the design height of pressing block) and corresponding gaskets, spring gaskets and nuts are provided; Use a torque wrench to tighten the screw. The torque range is from 18N.m to 24N.m.

- 安装孔安装：螺栓建议采用 M8 规格（长度根据横梁设计定）并配备相应的垫片、弹簧垫片和螺母；采用扭力扳手拧紧，扭力大小范围为：14N.m 到 20N.m 之间。
- installation of mounting hole: it is recommended to adopt M8 specification (the length is determined according to the beam design) and be equipped with corresponding gaskets, spring gaskets and nuts; tighten with torque wrench, and the torque range is between 14N.M and 20n. M.
- 支架结构必须由耐用、防腐蚀、抗紫外线的材料制成。

The support structure must be made of durable, corrosion-resistant and uv resistant materials.

7.3 地面安装 Floor covering installers

选择合适的光伏系统安装高度，防止冬天下雪时组件的下部长时间被积雪覆盖。此外，还要确保组件的最低部分足够高，以防被植物或树遮挡或被风吹来的沙石损坏。

Choose the appropriate pv system installation height to prevent the module from being covered by snow for a long time when it snows in winter. Also, make sure the lowest part of the module is high enough to prevent it from being obscured by plants or trees or being damaged by wind-blown sand.

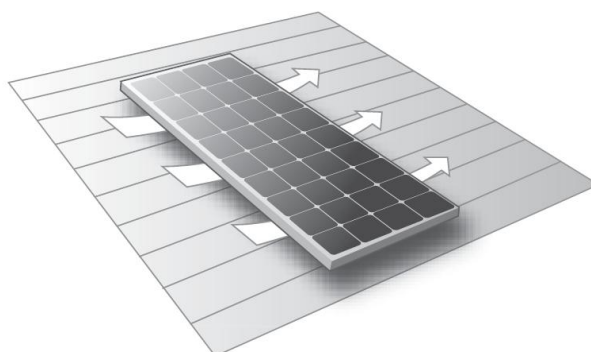
7.4 屋顶安装 Roof mounting

- 组件安装在屋顶或建筑物上时，要确保它被安全地固定并且不会因为强风或大雪而破坏。

Installing a module on a roof or building guarantees that it is secured securely and won't be damaged by high winds or snow.

- 组件背面要确保通风顺畅以便组件的冷却（组件和安装表面的最小间距为 10cm，以确保组件运行环境 $-45^{\circ}\text{C}\sim+85^{\circ}\text{C}$ ）。

The rear of a module lends itself to ventilation for cooling (a minimum of 10cm between the module and the mounting surface ensures that the module operates at -45°C to $+85^{\circ}\text{C}$).



- 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 modules on the roof, ensure that the roof is structurally appropriate. In addition, the roof penetration required to install the fixtures must be properly sealed to prevent leaks.

- 在屋顶安装太阳能组件可能会影响房屋的防火性。

Installing solar panels on the roof may affect the fire resistance of the house.

- 光伏组件的额定防火等级为 C 级，适合安装于防火等级 A 级以上的屋顶。刮大风时不要在屋顶或建筑物上安装组件，以防意外。

The solar modules are rated C for fire rating and fit on roofs rated A or higher. Do not install modules on roofs or buildings during high winds as a precaution.

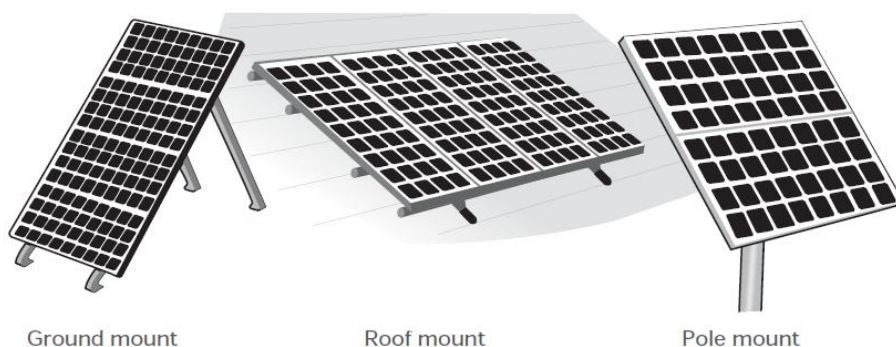
- 在某些情况下，可能需要使用特殊支架。

In some cases, special stents may be required.

7.5 支柱安装 Mounting rack

当在支柱上安装组件时，请选择能够承受当地预期风力的支柱和组件安装结构。

When installing modules on struts, select a strut and module installation structure that can withstand the expected local wind force.



7.6 机械安装通则 General rules for mechanical installation

- 使用安装孔安装时：

Installing using a mounting hole

- 标准情况下，使用组件边框上内侧的 4 个对称安装孔来安装组件。

A module is installed automatically using four symmetrical mounting holes on the inside of the module's bezel.

- 如果当地有强风或大雪，同时使用外侧的 4 个对称的安装孔。

Use four symmetrical mounting holes on the outside simultaneously if there is strong wind or snow in the area.

- 不要利用组件的接线盒或电缆头来移动组件。

Don't move a module using its junction box or cable head.

- 不要站在或踩在组件上。

Anyway, don't stand or step on modules.

- 不要使组件掉落或让物体落在组件上。

Do not drop modules or let objects fall on them.

- 为了避免组件玻璃破碎，不要在组件上放置重物。

To avoid module glass breakage, do not place heavy objects on the module.

- 不可重摔组件。

Anyway modules cannot be slammed.

- 不正确的运输或安装可能会损坏组件，运输时应使组件边框均匀受力，避免组件玻璃面和背板受冲击或重压。

Faulty transport or installation can damage a module, so transport the bezel evenly to prevent impact or heavy load on the glass and backplane.

八、电气安装 ELECTRICAL INSTALLATION

8.1 并网电气系统 Grid-connected electrical system

光伏系统产生的直流电可以转换为交流电并连接到公共电网上。关于连接可再生能源系统到公共电网的政策，各地区有所不同。设计本系统时请向资深的系统设计工程师咨询相关信息。通常情况下，安装并网光伏系统需要得到公共事业部门的认可、验收及正式批准。

The direct current generated by photovoltaic systems can be converted to alternating current and connected to the public grid. Policies for connecting renewable energy systems to the public grid vary from region to region. When designing this system, please consult a senior system design engineer for relevant information. Installation of grid-connected pv systems typically requires approval, acceptance, and formal approval by utilities.

8.2 接地 Ground connection

- 所有的组件框架和安装支架都必须合理地接地。使用推荐的连接端子并将接地电缆良好地连接，固定到组件框架上。

Automatically all module frames and mounting brackets have to be properly grounded. Secure the grounding cable to the module frame using the recommended connection terminals.

- 使用经过电镀处理的支撑框架，以保证电路导通良好。

buy a ticket using an electroplated support frame to ensure the circuit runs smoothly.

- 用一适当的接地导体，将该组件框架和支撑构件连接，可做到合适的接地效果。

An appropriate grounding effect can be achieved by connecting the module frame to the supporting member with an appropriate grounding conductor.

- 接地导体必须通过一个适当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。若没有通过螺栓和螺母连接机械地到已接地的光伏组件上，支架也必须接地。

The ground conductor must be connected to the ground buy an appropriate ground electrode. You are advised to use a ground cable accessory (wiring nose) to connect the ground cable. The bracket must also be grounded if it is not mechanically connected to the grounded PV module by bolts and nuts.

8.3 电气安装通则 General rules for electrical installation

- 在同一个光伏发电系统上尽量使用相同配置的组件。

buy a ticket to use the same configuration of modules on the same PV system.

- 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。组件串联的最大串联数量 $(N) = V_{\max \text{ 系统}} / [V_{oc}(\text{at } T)]$ ，T 为实际使用环境温度，单个组串组件开路电压之和应在组件设计系统电压之内。

Several modules are connected in series and then connected in parallel to form a PHOTOVOLTAIC array, which is particularly suitable for high voltages. The maximum number of modules in series $(N) = V_{\max \text{ system}} / [V_{oc}(\text{at } T)]$, T is the actual ambient temperature, the sum of the open circuit voltage of each module in series should be within the voltage of the module design system.

- 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。

To use a high electrical current, several PV modules can be connected in parallel, allowing the total current to equal the sum of the modules' currents.

- 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定。

modules can be supplied with prefabricated connectors for electrical connections to the system. Please refer to relevant regulations for cable size, type, temperature and other parameters.

- 所选电缆的横截面积和连接器容量必须满足最大系统短路电流（用于单个组件的电缆线横截面积推荐为 4mm^2 ），否则电缆线和连接器会因为大电流而过热。请注意电缆温度的上限是 85°C ，连接器温度的上限是 105°C 。

The cable cross-sectional area and connector capacity selected for a ticket must meet the maximum system short-circuit current (the recommended cross-sectional area for a cable used for a single module is 4mm^2), otherwise the cable and connector can overheat due to high current. Please note that the cable temperature upper limit is 85°C and the connector temperature upper limit is 105°C .

8.4 组件内部电路设计--详见附 1

九、调试和维护 DEBUGGING AND MAINTENANCE

9.1 阻塞二极管和旁路二极管 Blocking diode and bypass diode

- 阻塞二极管能够在组件没有电流生成时阻止电流从其他来源流向组件。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。

A blocking diode prevents current from flowing to a module from other sources when no current is being generated. If a charging controller is not used, a blocking diode is recommended. Please consult a professional dealer about charging controller.

- 在由两个以上组件串联的系统中，当组件的一部分被遮挡而其它部分暴露在阳光下时，过高的反向电流会流经局部或完全被遮挡的电池，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。二极管不容易坏。

In systems with more than two modules in series, when one part of the module is shielded and the other part is exposed to sunlight, excessive reverse current can flow through the partially or completely shielded cell, causing the cell to overheat and even damage the module. The use of by-pass diodes in the assembly protects the assembly from this excessive reverse current. All modules rated greater than 55 w have bypass diodes integrated in the junction box. Diodes don't break easily.

- 在调试或维修太阳能系统时要保护自己免遭电击。

Protect yourself from electric shocks while tuning or repairing a solar system.

9.2 调试 Debug

使用之前测试系统的所有电气和电子部件，并遵守随部件和设备提供的说明指导书。

Use all electrical and electronic modules of the previously tested system and follow the instructions provided with the modules and equipment.

- 串联组件连接到系统前的测试

Lends a test before connecting a tandem module to the system

使用数字万用表（推荐 fluke 系列）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。如果测量值比预期值低很多，请按照下文中“低电压故障排除”中的说明进行处理。

Use a digital multimeter (Fluke series is recommended) to check the open circuit voltage of the series modules. The measured value shall be equal to the sum of the open circuit voltages of the individual modules. You will find the rated voltage in the technical specification for the type of module used. If the measured value is much lower than the expected value, follow the instructions in "Troubleshooting low Voltage" below to resolve the problem.

- 检查每个串联电路的短路电流

Check the short-circuit current of each series circuit

可以通过将数字万用表（推荐 fluke 系列）连接到串联组件的两端直接测量，或使用 PV 灯等负载进行粗测。注意，电流表的额定刻度或负载的额定电流应该大于串联组件额定短路电流的 1.25

倍。您可在所用型号组件的技术说明书中找到额定电流。测量值随着气候条件、时刻和组件的遮光情况发生显著变化。

It can be measured directly by connecting a digital multimeter (Fluke series is recommended) to both ends of a series module, or crude measurement can be made using a load such as a PV lamp. Note that the rated scale or load current of the ammeter should be greater than 1.25 times the rated short-circuit current of the series module. You can find the rated current in the technical specification of the module of the model used. The measured values vary significantly with climatic conditions, time and shading of the modules.

- 低电压故障排除

A low-voltage fault is troubleshooting

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。

Identify normal undervoltage and fault undervoltage. The normal low voltage referred to here refers to the reduction of the open circuit voltage of the module, which is caused by the increase in solar cell temperature or the decrease in irradiance. Fault undervoltages are usually caused by incorrect terminal connections or by bypass diode damage.

①首先，检查所有的电线连接，确保没有开路，连接良好。

① First, check all wire connections to make sure they are open and well connected.

②检查每个组件的开路电压：用一块不透明的材料完全覆盖组件。断开组件两端的导线。取掉组件上的不透明材料，检查并测量终端的开路电压。如果测量的电压只是额定值的一半，说明旁路二极管已坏。

② Check the open circuit voltage of each module: cover the module completely with an opaque material. Disconnect the wires at both ends of the assembly. Remove the opaque material from the assembly and check and measure the open circuit voltage of the terminal. If the voltage measured is only half of the rated value, the bypass diode is broken.

③在辐照度不足（很低）的情况下，如果终端的电压与额定值相差 5%以上，说明组件连接不好。

③ In the case of insufficient irradiance (very low), if the voltage difference between the terminal and the rated value is more than 5%, it indicates that the module is not connected well.

9.3 维护 Maintenance

- 应保持太阳能电池方阵采光面的清洁，应先用清水冲洗，然后用干净的纱布将水迹擦干，切勿用有腐蚀性的溶剂冲洗或用硬物擦拭。遇风沙和积雪后，应及时进行清扫。一般应至少每月清扫1次。

should remain on the surface of the solar cell phalanx daylighting is clean, you should rinse, then water wipe with a clean gauze, do not use corrosive solvent wash or wipe with hard objects. In case of sand and snow, should be cleaned in time. Generally, it should be cleaned at least once a month.

- 值班人员应注意太阳能电池方阵周围有没有新生长的树木、新立的电杆等遮挡太阳光的物体，以免影响太阳能电池组件充分地接受太阳光，一经发现，要报告电站负责人，及时加以处理。

The personnel on duty should pay attention to whether there are new trees, new poles and other objects blocking the sunlight around the solar cell array, so as not to affect the solar cell module to fully accept the sunlight, once found, to report to the responsible person of the power station, timely treatment.

- 带有向日跟踪装置的太阳能电池方阵，应定期检查跟踪装置的机械和电性能是否正常。

Solar arrays that incorporate a suntracking device spend time periodically checking the mechanical and electrical properties of the device.

- 太阳能电池方阵的支架，可以固定安装，也可按季节的变化调整电池方阵与地面的夹角，以便太阳能电池组件更充分地接受太阳光。通常的调整角度是（以北半球为例）：①春分以后的接收角是当地的纬度 $-11^{\circ}48'$ ；②秋分以后的接收角是当地的纬度 $+11^{\circ}48'$ ；③全年平均的接收角是当地纬度的 $+5^{\circ}$ 。

- the bracket of the solar cell array can be fixed and installed, and the included angle between the solar cell array and the ground can also be adjusted according to seasonal changes, so that the solar cell modules can more fully receive sunlight. The usual adjustment angles are (taking the northern hemisphere as an example): ① the receiving angle after the spring equinox is $-11^{\circ}48'$ of the local latitude; ② the receiving angle after the autumn equinox is $+11^{\circ}48'$ of the local latitude; ③ the annual average receiving angle is $+5^{\circ}$.

of the local latitude.

- 要定期检查太阳能电池方阵的金属支架有无腐蚀，并根据当地具体条件定期进行油漆。方阵支架应良好接地。

Solar arrays are routinely checked for corrosion on their metal supports, and painted regularly depending on local conditions. Square brackets should be well grounded.

- 电站系统要能对太阳能电池方阵的光电参数包括其输出功率进行自动检测分析，出现异常，如组件出现热斑效应保护后系统能自动报警，这样能第一时间排除故障，保证方阵不间断地正常供电。

The power station system should be able to automatically detect and analyze the photoelectric parameters of the solar cell array including its output power. If there is any abnormality, such as the hot spot effect protection of the module, the system can automatically alarm, so as to eliminate the fault in the first time and ensure the normal uninterrupted power supply of the solar cell array.

- 遇有大雨、冰雹、大雪等情况，太阳能电池方阵一般不会受到损坏，但应对电池组件表面及时进行清扫、擦拭。

Solar arrays are generally not damaged during heavy rain, hail, snow, etc., but the surface of the battery modules should be cleaned and wiped in time.

- 应每月检查 1 次各太阳能电池方阵封装及接线接头，如果有封装开胶进水、电池变色及接头松动、脱线、腐蚀等，应及时进行处理。不能处理的，应及时向电站负责人报告。

Check the package and wiring joints of each solar cell array once a month. If there is water in the package opening glue, battery discoloration, loosening of the joint, disconnection, corrosion, etc., it should be dealt with in time. If it cannot be handled, it shall report to the person in charge of the power station in time.

附件 1: 电路图

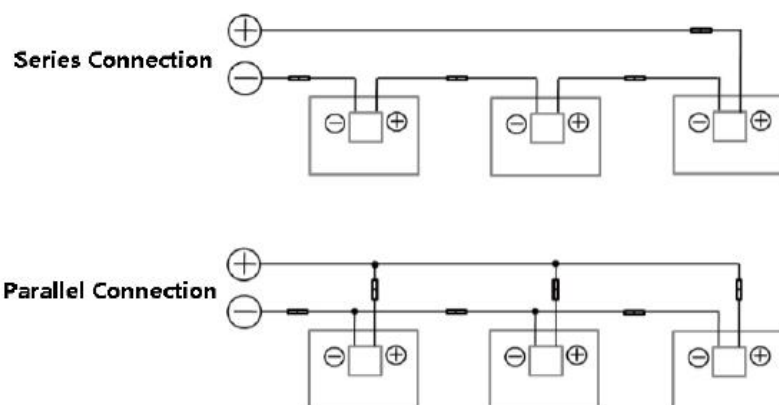


Fig 1

