环欧国际
HUANOU INTERNATIONAL

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INSTALLATION MANUAL

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Tianjin Huan'ou International New Energy Technology Co., Ltd.RELEASED

1 COMPANY BROCHURES

Tianjin Huan'ou International Silicon Material Co.,Ltd was founded in August 2011.The business scope includes all the sales of silicon material product under Zhonghuan Group and purchasing of raw material,supplementary material and equipment.Our main products consist of two parts which is semicondutor material and new energy solar material.For solar material,it mainly consists of P-type wafer for solar cell,N-type wafer for high-efficiency cell,solar wafer CFZ high-efficiency solar wafer,solar cells and module.

Tianjin Huan'ou International New Energy Technology Co., Ltd. has been adhering to the design concept of high efficiency, automation and informationization, focusing on the design, development and manufacture of high efficiency solar PV modules.Photovoltaic modules are the core of the solar system and the most important part of the solar system.Manufacture of photovoltaic modules in the photovoltaic industry is bearing the photovoltaic industry chain upstream (wafers, battery) and downstream (station).At present, we have built two efficient solar photovoltaic module production line, capable of producing 400 MW photovoltaic modules of equipment capacity.

2 PHOTOVOLTAIC MODULE

Huan'ou international Modules are a DC electrical source with high reliability under the light condition. Huan'ou international Modules can be applied to electrical power system, home power system, car, hydropower station and water pump using renewable energy, communication system and other application system in remote location ideally or build a solar photovoltaic power station. These systems can join in grid generation system or be used with battery.

3 INSTALLATION

This Installation Manual contains essential information for electrical and mechanical installation that you must know before handling, installing Huan'ou international Modules.

The mechanical and electrical installation of PV systems should be performed in accordance with all applicable codes, including electrical codes, building codes and electric utility interconnect requirements.

4 RESPONSIBILITY STATEMENT

This Manual does not constitute a warranty, expressed or implied. Huan'ou international does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with installation, operation, use or maintenance of Modules. No responsibility is assumed by Huan'ou international for any infringement of patents or other rights of third parties that may result from use of Modules. Huan'ou international reserves the right to make changes to the product, specifications or installation manual without prior notice.

Failure to comply with the requirement listed in this manual will invalidate the Limited Warranty for Modules as provided by Huan'ou international at the same time of sale to the direct customer. Additional recommendations are provided to enhance safety practices and performance results. Please provide a copy of this manual to the PV system owner for their reference, and inform them of all relevant aspects of safety, operation, and maintenance.

5 CODES AND REGULATIONS

The mechanical and electrical installation of PV systems should be performed in accordance with all applicable codes, including electrical codes, building codes and electric utility interconnect requirements. Such requirements may vary for mounting location, such as building rooftop or motor vehicle applications. Requirements may also vary with system voltage, and for DC or AC application. Contact local authorities for governing regulations.

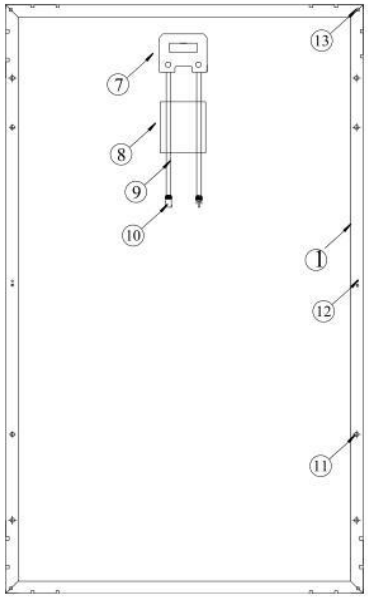
6 SAFETY PRECAUTIONS

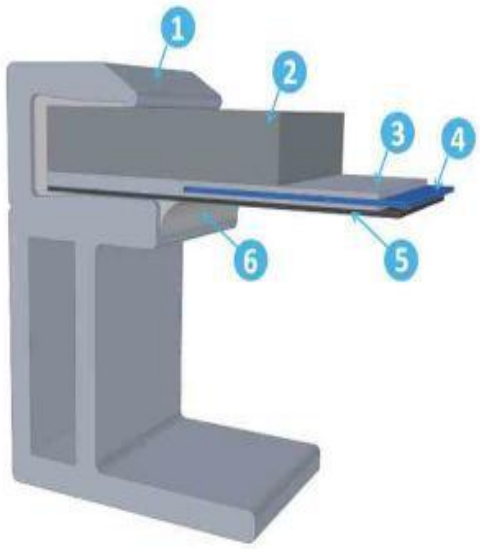
- Modules must be mounted by professional staff.
- Must understand fully the installation, operation and maintenance of PV systems.
- Please use insulated tools and rubber gloves when working with Modules in sunlight.

- Do not stand or step on the Modules.
- Do not damage the glass or backsheet of Modules.
- Do not use the damaged Modules, otherwise will bring deadly perils.
- Do not attempt to disassemble the Modules, and do not remove any attached nameplates or components from the Modules.
- Keep connectors dry and clean, and ensure that connector caps are hand tight before connecting the Modules. Do not attempt to make an electrical connection with wet, soiled, or otherwise faulty connectors.
- For roof installations, Modules should be mounted over a fire resistant covering suitable for this application, with adequate ventilation between the Modules backsheet and the mounting surface.
- Do not install or handle Modules under adverse conditions, including without limitation strong or gusty winds, and wet or frosted roof surfaces.

7 MODULES COMPONENTS

1.Aluminum Frame 2.Tempering glass 3.Ecapsulating EVA 4.Cell 5.Backsheet





6.Silicone adhesive7.Junction Box 8.Nameplate 9.Cable 10.Connector11.Mounting hole

12.Grounding hole 13.Drainage hole

8 NAMEPLATE

Each module has a label. It describes the product type; Peak power, Max.power current, Max.power voltage, open circuit voltage, short circuit current, all as measured under standard test condition; Certification marks, the maximum system voltage etc.

9 CLIMATE

Modules running needs to meet the following conditions:

- The recommended ambient temperature：-40℃～+40℃
- The limit operating temperature：-40℃～+85℃
- Storage temperature：-40℃～+40℃
- Humidity：≤85RH%
- The static load：2400Pa,the safety factor:1.5

Notice: the maximum permissible load of Modules is based on the installation method. Mounting the PV system must calculate the maximum permissible load.

10 CONDITION

- Do not use mirrors or other magnifiers to concentrate sunlight onto the Modules.
- Modules must be mounted on appropriate mounting structures positioned on suitable buildings, the ground, or other structures suitable for Modules (e.g. carports, building facades or PV tracker). Modules must not be mounted on moving vehicles of any kind.
- Modules must not be installed in locations where they could be submerged in water.
- The Modules should be installed in a location where there's no shading throughout the year. Ensure there's no obstacle to block light near the installation site.
- Lightning protection is recommended for PV systems that are to be installed in locations with high probability of lightning strikes.

- Do not use Modules near equipment or in location where flammable gasses may be generated or collected.
- Modules must not be installed nor operated in areas where hail, snow, sand, dust, air pollution, soot, etc., are excessive. Modules must not be sited in locations where aggressive substances such as salt, salt mist, salt-water, chemically active vapors, acid rain, any other type of corrosive agent, could affect the safety and/or performance of the Modules.
- Please adopt appropriate measures to ensure the performance and safety of the Modules when they are installed or operated in the areas where produces heavy snow, extremely cold, strong wind, or near the island or desert where is prone to produce salt fog, or near water.

11 MECHANICALLY MOUNTING

- Regardless of the location for Module installation is on the roof or ground or others, it must adopt appropriate security measures. The installation process must adopt the necessary safety equipment to avoid potential safety hazard. Please note that installation on the roof may require additional fire precautions according to the local building fire regulations.
- When sunlight or other light sources shine on the surface of Module, the Module will generate electric energy. When the Modules are in series, the voltage will accumulate. When Modules are in parallel, the current will accumulate. Therefore, large-scale photovoltaic system can produce high voltage and current. Improper operation can cause severe personal injury even death.

➢ **Location**

- Modules should be installed in where most accept the sunlight. In the northern hemisphere, Modules should typically face south, and in the southern hemisphere, Modules should typically face north. Make sure there are no obstacles around the site.
- The location should be chose according to the requirement of various electrical and fire prevention code. The flammability class of these Modules is class C. When the Modules are

installed on the roof, the roof must be fire-resistant. So we need to consider building structure, raw materials of roof, as well as the local relevant laws and regulations.

- If the Modules are installed on the area of snow, low temperature, strong wind and region around surface water (the area vulnerable to the corrosion of brine), island, desert and so on, take appropriate steps to guarantee the reliability and security, and keep all electrical contacts clean and dry.
- We suggest that Modules are installed at the temperature od -20 ℃~ 46 ℃. Besides, the limit temperature for Modules working is -40 ℃ ~ 85 ℃.

➢ **Tilt angle**

The tilt angle of the Modules is measured between the surface of the Modules and a horizontal ground surface (see figure 1). All Modules should be installed with the same direction and angle. Different direction and angle will cause the power output loss. The reason is that the amount of absorb sunlight about each Modules is different. So the current and voltage does not match and reduces the efficiency of the system.

The Modules generates maximum power output when it faces the sun directly. Should consider the output of Modules in winter when select the best installation angle for permanent Modules.

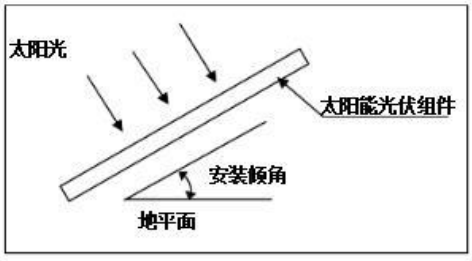


Figure 1. The tilt angle of Modules

12 INSTALLATION METHODS

Modules can be installed on the frame using mounting holes. Modules must be installed

according to the following examples and recommendation. If not mounting the Modules according to these instructions, may void the warranty. Der normal conditions, a Module may produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of ISC and VOC marked on the Module should be multiplied by a factor of 1.25 when determining component voltage ratings, current ratings, fuse sizes, and size of controls connected to the PV output.

- **Modules installed with mounting holes (8 holes installation).**

  Modules should be bolted to support structures through mounting holes located in the frame's back flanges. Refer to what is shown in Figure 2 (Mounting Details).The type of mounting bolt is M8×25. Recommended screw tightening torque size range is 14 N▪m and 20 N▪m.

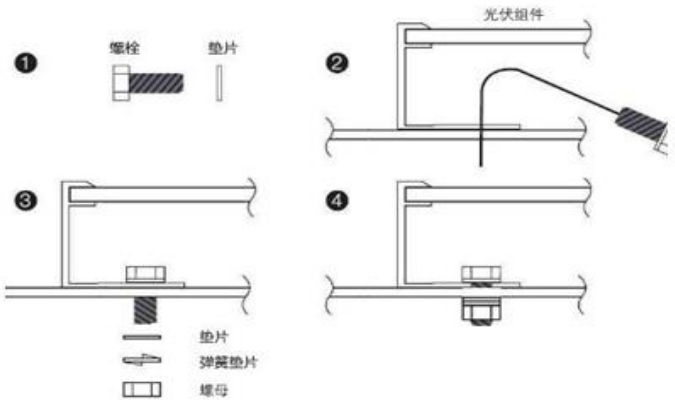


Figure 2. Mounting

13 MAXIMUM PERMISSIBLE LOAD

The maximum permissible load of the PV Modules are 2400 Pa, the coefficient is 1.5.

14 GROUNDING

- All module frames and mounting racks must be properly grounded in accordance with appropriate respective National Electrical Code.
- Proper grounding is achieved by bonding the module frame(s) and all metallic structural members together continuously using a suitable grounding conductor. The grounding conductor or strap may be copper, copper alloy, or any other material acceptable for use as

an electrical conductor per respective National Electrical Codes. The grounding conductor must then make a connection to earth using a suitable earth ground electrode.

- The modules can be installed with the use of third party listed grounding devices for grounding the metallic frames of PV modules. The devices have to be installed in accordance with the grounding device manufacturer's specified instructions.
- Electrical contact must be made by penetrating the anodized coating of the aluminum frame, and tightening the mounting hex nut (come with the star washer) to the proper torque of 14 N▪m.
- Grounding wire size should be selected and installed underneath the wire binding bolt.
- The wire binding bolt should be tightened to the proper torque of 20 N▪m.

15 BYPASS DIODES

The junction boxes used with Huan'ou international Modules contain bypass diodes wired in parallel with the PV cell strings. In the case of partial shading, the diodes bypass the current generated by the nonshaded cells, thereby limiting Modules heating and performance losses. In the event of a known or suspected diode failure, installers or maintenance providers should contact Huan'ou international. Never attempt to open the junction box by yourself.

Manufacturer of junctiobox	Type of bypass diode	Type of connector
Zhejiang Jiaming tianheyuan Photovoltaic Technology CO.,Ltd	THY2550	PV-JM601A
Yangzhou Langri New-energy Technology Co., Ltd.	SB1640LDC	PV-JY-0901-3
Dongguan Zerun Electronics Technology Co.,Ltd	20SQ045	Z4S

16 OPERATION AND MAINTENANCE

It is required to perform regular inspection and maintenance of the Modules, especially within warranty scope. It is the user's responsibility to report to the supplier regarding the damage found within 2 weeks.

- **Cleaning**
  - The dust accumulated on the front transparent substrate may reduce the power output,

and may even cause regional hot-spot effect. The industrial effluents or bird drops may be serious, and the extent of the severity depends on the transparency of the foreign objects. It's usually not dangerous for the accumulated dust to reduce the sunshine, because the light intensity is still homogeneous and the power reduction is not usually obvious.

- When Modules are working, there should not be environmental influence factors to cast shadows and cover part or even all of the Modules, such as other Modules, system support, bird drops and a lot of dust, clay or plant and so on, these may distinctly reduce the power output. Huan'ou international advises that there should be no obstructed object over the Modules surface at any time.
- The cleaning frequency depends on the accumulated frequency of the fouling. In many instances the front surfaces of the Modules will be cleaned with the rain, and we can decrease the cleaning frequency. It is recommended to wipe the glass surface with a wet sponge or soft cloth. Please do not clean the glass with a cleaning agent which contains acid or alkali.

Warning: Modules maintain must close the PV system, otherwise may lead to deadly danger such as electric shock and burning.

➢ **Visual Inspection of Modules**

Inspect the Modules visually to find whether there are appearance defects, the following need particularly special attention:

- Whether the glass is broken.
- Corrosion along the cell's bus-bar. The corrosion is caused by the dampness infiltrated into the Modules because that the surface encapsulation materials are damaged during the installation or transportation.
- Whether there is burning vestige on the backsheet.

- **Inspection of Connector and Cable**

  Itis recommended to implement the following preventive maintenance every 6 months:

  - Check the encapsulation of the connector with the cable.
  - Check the sealing gel of the junction box to ensure it have no crack or crevice.

17 MODULE TYPES

Monocrystalline Silicon Module							
Module type	Peak power (W)	Max.power voltage (V)	Max.power current (A)	Open voltage (V)	Short circuit current (A)	Temperature coefficient （%/℃）	Tolerance (%)
						Pmax,Voc,Isc	Pmax,Voc,Isc
HOGJ-M4-XXX-60C							
HOGJ-M4-300-60C	300	31.5	9.53	38.5	10.20	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-305-60C	305	31.9	9.57	38.7	10.26	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-310-60C	310	32.3	9.61	38.9	10.32	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-315-60C	315	32.7	9.64	39.1	10.38	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-320-60C	320	33.1	9.68	39.3	10.42	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M2-XXX-72C							
HOGJ-M2-335-72C	335	37.6	8.91	46.7	9.32	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2-340-72C	340	37.7	9.02	46.8	9.49	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2-345-72C	345	38.1	9.06	47.0	9.42	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2-350-72C	350	38.5	9.09	47.2	9.48	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2- XXX-60C							
HOGJ-M2-280-60C	280	31.2	8.98	38.9	9.47	-0.41,-0.33,+0.059	0-3,±3, ±4
HOGJ-M2-285-60C	285	31.6	9.02	39.3	9.49	-0.41,-0.33,+0.059	0-3,±3, ±4
HOGJ-M2-290-60C	290	32.0	9.09	39.7	9.57	-0.41,-0.33,+0.059	0-3,±3, ±4
HOGJ-M2-295-60C	295	32.4	9.12	40.1	9.68	-0.406,-0.287,+0.0397	0-3,±3, ±4
HOGJ-M2-300-60C	300	32.8	9.15	40.5	9.80	-0.406,-0.287,+0.0397	0-3,±3, ±4
HOGJ-M4- H-XXX-60C							
HOGJ-M4-H-300-60C	300	31.5	9.53	38.5	10.20	-0.416,-0.296,+0.046	0-3,±3, ±4

HOGJ-M4-H-305-60C	305	31.9	9.57	38.7	10.26	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-H-310-60C	310	32.3	9.61	38.9	10.32	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-H-315-60C	315	32.7	9.64	39.1	10.38	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M4-H-320-60C	320	33.1	9.68	39.3	10.42	-0.416,-0.296,+0.046	0-3,±3, ±4
HOGJ-M2- H-XXX-72C							
HOGJ-M2-H-335-	335	37.6	8.91	46.7	9.32	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2-H-340-	340	37.7	9.02	46.8	9.49	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2-H-345-	345	38.1	9.06	47.0	9.42	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2-H-350-	350	38.5	9.09	47.2	9.48	-0.406,-0.287,+0.039	0-3,±3, ±4
HOGJ-M2- H-XXX-60C							
HOGJ-M2-H-280-	280	31.2	8.98	38.6	9.47	-0.41,-0.33,+0.059	0-3,±3, ±4
HOGJ-M2-H-285-	285	31.6	9.02	39.1	9.49	-0.41,-0.33,+0.059	0-3,±3, ±4
HOGJ-M2-H-290-	290	31.9	9.09	39.2	9.57	-0.41,-0.33,+0.059	0-3,±3, ±4
HOGJ-M2-H-295-	295	32.4	9.12	40.1	9.68	-0.406,-0.287,+0.0397	0-3,±3, ±4
HOGJ-M2-H-300-	300	32.8	9.15	40.5	9.80	-0.406,-0.287,+0.0397	0-3,±3, ±4

19 RECORD

Table 1 Edition Record Sheet

Edition	Date of enforcement	Changeable storage	Compile	Check	Approve
01	2017.06.07	First made	Hui Wang	Liming Li	Zheng Liu
02	2017.12.13	Adding new solar module naming rules	Jianliang Zhang	Liming Li	Zheng Liu
03	2018.02.09	Adding new solar module type	Jianliang Zhang	Liming Li	Zheng Liu
04	2018.03.06	Adding tolerance，temperature coefficient of Module type； type of bypass diode，connector and mounting bolt； Adding installation methods and company	Anqin, JianliangZhang	Liming Li	Zheng Liu

		information.			
05	2018.03.09	Modify the temperature coefficientof Pmax,Voc and Isc and tolerance of Isc.	Anqin	Liming Li	Zheng Liu
06	2018.3.26	Adding the details of mechanically mounting.	Anqin, Kang Wang	Liming Li	Zheng Liu
07	2018.04.16	Modify the details of grounding	Jianliang Zzhang	Liming Li	Zheng Liu