Chongqing HG New Energy Group Co., Ltd.

Lightweight Flexible Modules Installation Manual

This installation manual is for reference only.
The installation method depends on the actual situation.

HG GROUP

Catalog

Installation Manual for HG Lightweight Flexible Photovoltaic Modules

This installation manual applies to the photovoltaic flexible modules(hereinafter referred to as "modules") manufactured by Chongqing HG New Energy Group Co., Ltd.(hereinafter referred to as "HG"). The installation of PV modules system requires professional skills and knowledge, and can only be carried out by qualified personnel. In the installation and daily maintenance of PV modules, the safety precautions in this manual and local regulations should be observed.

1. Introduction

First of all, great appreciation for choosing HG as your modules supplier. Please read this manual carefully and familiarize yourself with it before installing, using and maintaining the modules. This manual contains important information about the safety, installation and maintenance of the modules.

This manual is not intended to be a warranty of any kind. This manual does not provide, either expressly or impliedly, for compensation for loss, damage to modules or other expenses arising out of or in connection with the installation, operation, use or maintenance of the modules. HG shall not be liable for any infringement of patent rights or the rights of third parties arising from the use of the modules. HG reserves the right to change product specifications and this manual without prior notice.

HG is not responsible for injuries, damages and expenses caused by non-compliance with this manual, caused by products of other manufacturers or caused by connection with products of other manufacturers.

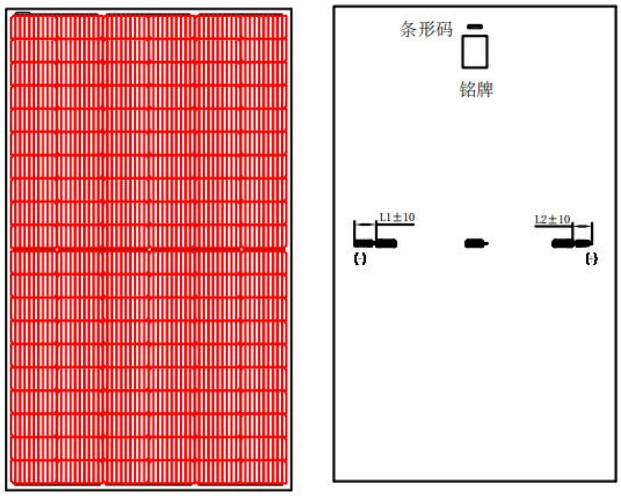
Failure by the customer to follow the requirements listed in this manual during installation of the modules may void the limited warranty on the product provided to the customer at the time of sale. The recommendations in this manual are designed to improve the safety of the modules during installation and have been tested and proven in practice. Please provide this manual to the owner of the PV system as their reference and inform them of all relevant safety, operational and maintenance requirements and recommendations. This installation manual is available in different languages. In case of conflict between versions, the Chinese version shall prevail.

2. Regulations

The mechanical and electrical installation of modules should refer to the appropriate codes, including the electrical code, building code and electrical connection requirements. These codes and regulations vary depending on the installation location and requirements may vary depending on the voltage of the installed system and whether DC or AC is used. Please contact your local department for specific terms and conditions and confirm that the appropriate permits have been obtained.

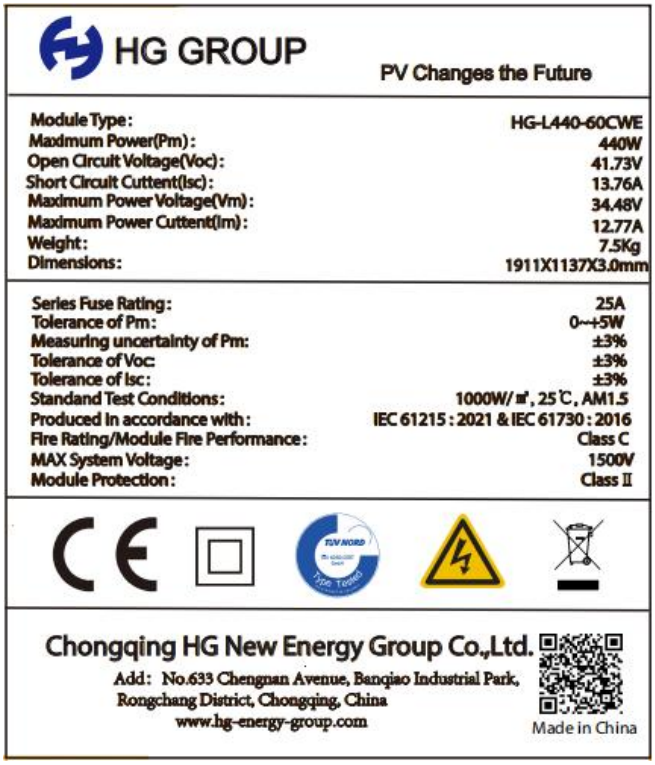
3. Modules Information

3.1 Modules Structure Diagram



3.1.1 Modules Nameplate Information

Describes the product type, maximum power under standard test conditions, optimum operating current, optimum operating voltage, open circuit voltage, short circuit current, maximum system voltage, and other information.



4. Security Information

HG's flexible modules are designed to meet the international IEC 61215 and IEC 61730 standards with an application class rating of A: the modules can be used in systems with public access greater than 50V DC or 235W, and the modules meet the requirements of Safety Class II.

WARNING: Read and understand all safety rules before installing, wiring, operating or maintaining the modules. When the modules are exposed to sunlight or other light sources, direct current will be generated. Direct contact with energized parts of the modules, such as terminals, whether or not the modules are connected, may result in injury or death.

4.1 Security Rules

(1) All installation work must be in full compliance with local and regional codes and the appropriate national or international electrical standards.

(2) Use insulated tools to reduce the risk of electric shock.

(3) Use appropriate protective measures (non-slip gloves, coveralls, etc.) to avoid direct contact between personnel and 30V DC or higher, and avoid direct contact with sharp edges during installation to protect the installer's hands.

(4) Do not wear metal ornaments during installation to avoid poking through the modules and causing a risk of electric shock.

(5) If modules are installed or operated in rain, strong winds, or on mornings with dew, proper protection is required to avoid injury to modules and personnel.

(6) Do not allow children or unauthorized personnel to approach the installation area or modules storage area.

(7) During modules installation or wiring, if the circuit breaker and overcurrent protection circuit breaker cannot be opened, or the inverter cannot be turned off, use an opaque material to cover the array modules to stop the power output.

(8) Do not use or install damaged modules.

(9) Direct contact with the modules surface may result in electric shock if the surface material is damaged or worn.

(10) Do not attempt to repair any part of the modules; there are no user-available components within the modules.

(11) The lid of the junction box should be kept closed at all times.

(12) Do not split the modules or move any part of the modules.

(13) Do not artificially focus light on modules.

(14) Do not connect or disconnect the modules when current is present in the modules or external current is present.

4.2 Transportation and Storage Safety

(1) Do not open the modules packing box during transportation and storage unless the modules arrives at the installation site.

(2) Protect the package from damage.

(3) Do not directly drop the pallet with modules.

(4) Do not exceed the maximum number of layers printed on the box when stacking the modules.

(5) Store the box in a ventilated, rainproof and dry place until the modules are unpacked.

(6) Do not under any circumstances lift the entire modules by grasping the junction box or wires.

(7) Do not stand or walk on the modules.

(8) Do not drop one modules onto another.

(9) To avoid breaking the modules, do not press any heavy objects against the flexible modules.

(10) Be careful when placing a modules on a flat surface, especially at the corners of the modules.

4.3 Operational Safety

(1) When removing the modules from the box provided by HG, remove the box lid first (after removing the securing straps) and remove the modules, one at a time.

(2) Taking care that the remaining modules in the box do not tip over to one side as you take them out of the box.

(3) Before installing the modules, check if the modules have been damaged during shipping.

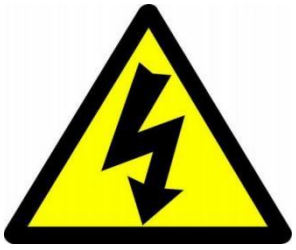
(4) Do not install damaged modules. If you find a damaged module, contact the company from which you purchased the HG modules in order to get the information you need to file a complaint against the defective module.

(5) Do not remove components from the modules.

(6) Do not paint or label the surface of the modules; do not scratch the front and rear film of the modules to avoid any damage to it; carry the modules gently to avoid breaking the cells.

(7) For your safety, do not disassemble or modify HG modules in any way, as doing so may affect the performance and safety of the product or even cause irreparable damage, and will void any applicable warranty.

4.4 Electrical Safety



(1) Without a connected load or external circuit, the modules will generate direct current as long as there is light, so touching the modules circuit will risk electric shock or burns, and 30V or higher DC voltage may even be fatal. Please use insulated tools and wear rubber gloves when operating PV modules in the sun.

(2) The modules do not have switches and can only be stopped by moving them away from the lighted area or by covering them with cloth, cardboard, completely opaque materials, or by placing the front of the modules on a smooth, flat surface.

(3) To avoid arcing and shock hazards, do not disconnect the circuit with a load.

(4) Incorrect connections can also lead to arcing and electric shock.

(5) Connectors must be kept dry and clean to ensure they are in good working condition.

(6) Do not insert other metal objects into the connectors or make electrical connections in any other way.

(7) Do not touch or handle modules with broken front film, disconnected junction boxes, or damaged modules unless the modules are disconnected electrically and you have worn personal protective equipment.

(8) Do not touch the modules if they are wet, except when cleaning the modules, but follow the modules cleaning requirements as specified in this manual.

(9) Always do not touch wet connectors without wearing personal protective equipment or rubber gloves.

(10) Snow and water around the modules will reflect light and increase the light intensity, which will cause the current and output power to increase.

(11) In addition, the voltage and power of the modules will also increase accordingly at low temperatures.

4.5 Fire Safety

(1) Before installing the modules, please consult local laws and regulations to comply with the requirements for fire resistance in buildings. According to IEC 61730-2, HG's modules have a Class C fire resistance rating. Please use appropriate accessories, such as fuses, circuit breakers, grounding connectors, etc., according to local regulatory requirements.

(2) When installed on the roof, the PV modules may affect the fire safety of the building because they are power generating equipment. Incorrect installation methods or defective modules during the operation of the modules may cause the modules to arc and accidents may occur. To reduce the risk of fire in such cases, modules must not be installed in areas where flammable liquids, gases, or hazardous materials are present nearby, and if exposed flammable gases are present in the vicinity after the modules are installed, suspend use of the modules.

(3) In a fire event, modules may continue to generate dangerous DC voltages even if modules and inverters are disconnected, modules are partially or completely destroyed, and system cables are broken or even destroyed. In a fire event, firefighters must be informed of the special hazards of the modules and are to stay away from the PV system during and after the fire until appropriate measures have been taken to ensure the safety of the PV system before approaching.

5. Installation

5.1 Installation Conditions

(1) HG lightweight and flexible modules (HG-LXXX-60XXB: HG-LXXX-60XXE:HG-LXXX-60XXH:HG-LXXX-54XXB: HGLXXX-54XXE:HG-LXXX-54XXH:HG-LXXX-72XXB: HG-LXXX-72XXE:HG-LXXX-72XXH series) must be installed in suitable buildings or other places suitable for modules installation (e.g. ground, roof).

(2) Modules cannot be installed in places where there are strong corrosive substances such as active chemical vapors, acid rain or other corrosive substances, and cannot be installed and used in hail, snow, wind, sand, smoke, air pollution, soot, next to seawater or other substances that affect the safety or performance of the modules in excess.

(3) It is recommended that the modules be installed in an operating environment with an ambient temperature of -40°C to 85°C.

(4) Do not allow focused lights such as mirrors or magnifying glasses to shine directly on the modules.

(5) HG recommends that the installation angle of the modules should be not less than 10°, so that the dust on the surface of the modules can be easily carried away by the rain when it rains, thus reducing the number of times of cleaning the modules, and facilitating the flow of water on the surface of the modules to avoid the long-term accumulation of large amounts of water on the front film, which will affect the appearance and performance of the modules.

(6) The system performance will be significantly reduced when one or more modules are partially or completely shaded, so HG recommends installing modules in a place where there is no shading all year round to increase the power generation of the PV system.

(7) In places where lightning activity is frequent, lightning protection devices must be installed for the PV system; the high voltage generated in an induced lightning strike may cause damage to the modules

units in the PV system.

(8) For northern hemisphere installations, modules should preferably face south, and for southern hemisphere installations, modules should preferably face north. For detailed installation angles, please follow standard modules installation guidelines or the recommendations of an experienced PV modules installer.

5.2 Mechanical Installation

(1) Ensuring the mounting system is strong enough to withstand all intended load.

(2) The mounting bracket must be inspected and tested by a third party testing facility with static mechanical analysis capabilities, using local national or international standards such as DIN 1055 or equivalent.

(3) The modules mounting bracket must be made of durable, corrosion-resistant and UV-protected material.

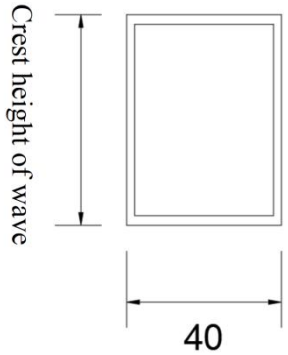
(4) The modules must be firmly fixed on the mounting bracket, in areas with large snow accumulation in winter, please choose a higher mounting bracket so that the lowest point of the modules will not be covered by snow for a long time. In addition a higher mounting bracket can avoid modules being shaded by plants and trees, or being hurt by flying sand and rocks.

(5) The modules will have thermal expansion and contraction effect, the interval between two adjacent modules should not be less than 2mm.

5.2.1 Installation Accessories

Matting flat aluminum strips, structural adhesive, plastic rollers, cleaning tools, leather rulers, wire release tools, etc.

(1) Matting aluminum strip: made of 6063-T5/T6; the recommended width is 40 mm and the height is approximately the height of the color steel tile crest (H±5 mm) aluminum profile guide.



(2) Structural adhesives: special sealant for solar cell modules, recommended for silicone structural adhesive.

5.3 Notes on Unpacking, Handling and Inspection of Modules

(1) To ensure the safety of the modules during transportation, open the modules boxes after reaching the installation site.

(2) Check the box for damage before unpacking.

(3) Unpackers are advised to wear non-slip gloves beforehand.

(4) Under no circumstances should a junction box or connecting cable be used as a puller for lifting or handling modules.

(5) Exercise caution during modules handling to avoid knocking the edges of the modules against the ground or other sharp, hard objects.

(6) Check the surface of the modules for damage, and do not use it if there is damage or wear to the modules surface material.

(7) Please check if the junction box, connectors and cables are damaged and if the lid is tightly covered, if there is damage, please do not use.

(8) It is strictly prohibited to paint, apply adhesives, or apply labels to the surface of the modules.

5.4 Construction Notes

(1) To be applied in the temperature range of -10 to 45°C (optimum temperature range 5 to 40°C) with humidity below 80 %.

(2) The substrate surface must be cleaned or wiped clean, kept dry, free of floating dust, oil, etc.

(3) No tearing or peeling of the bond within 24 hours after construction.

(4) The paste surface needs to be flat and free of pits or bumps.

5.5 Gluing Specifications

(1) Clean the construction surface and only glue after the surface is free of water stains.

(2) Glue along the center of the crest, with a width of not less than 10mm and a height of not less than 4mm.

(3) Application must be uniform and continuous, and no scraping of the adhesive strips is allowed before pasting, relying on extrusion to spread the adhesive.

(4) The gluing and modules time should be kept to a minimum (no more than 5 minutes).

(5) Within 48 hours, the adhesive will cure to a depth of 2 to 3 mm, so do not apply force until it is fully cured.

5.6 Construction Solutions

5.6.1 Cleaning the Roof

Remove the debris, dust and oil from the roofing base and keep the roof dry.

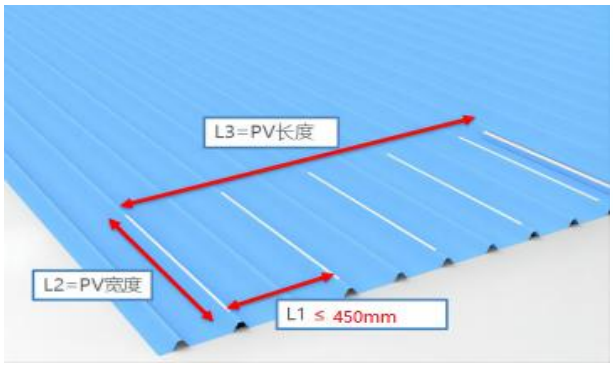
5.6.2 Placement and Positioning

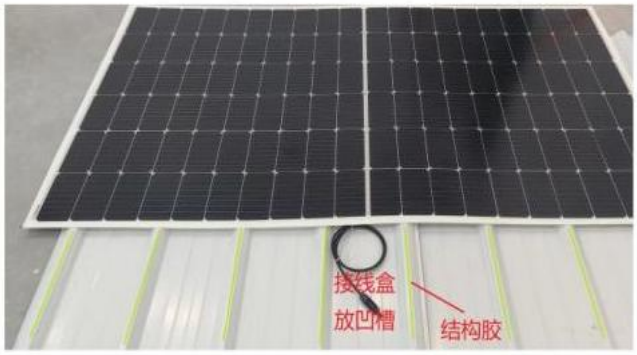
Determining the position of the modules on the roof according to the design drawings and performing the placement measurements.

5.6.3 Playing structural Adhesive

On the color steel tile crest platform, evenly glued.

The length of structural adhesive L2 is equal to the width of the modules, the spacing of structural adhesive L1≤450mm, the overhanging part of the modules >50mm use the pad flat aluminum strip.





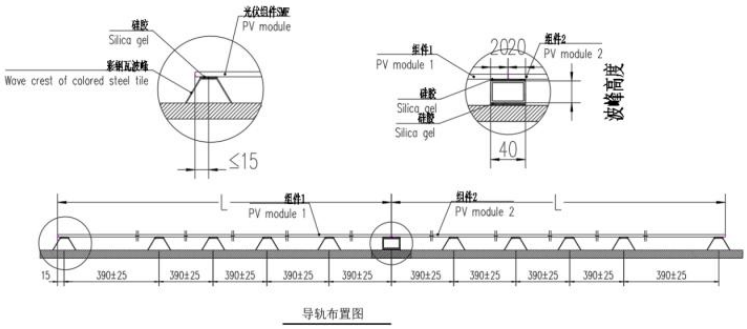
5.6.4 Paste Modules

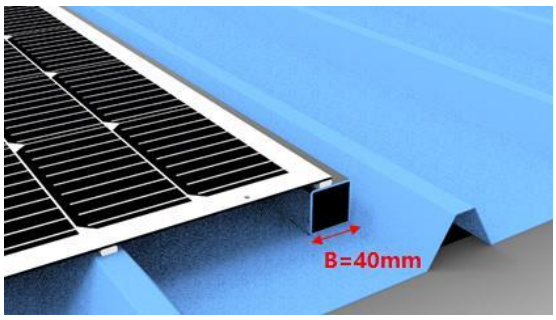
(1) Do not twist the modules excessively when installing it. Hold the white edge of the modules with two persons and slowly put it into the gluing area. When gluing modules, do so horizontally and vertically and do not glue them twice.

(2) After the modules are pasted flat, it is prohibited to press the cell by hand for stabilization, and it is necessary to use crimping rollers to compact the non-cell area of the modules and use plastic rollers to roll on the surface of the modules to ensure good bonding between the modules and the roof.

(3) A minimum distance of 2mm between modules and 500-800mm construction access between arrays.

(4) Shared padding aluminum strip for adjacent modules (aluminum strip can be reinforced according to site construction needs).





5.7 Electrical Installation

5.7.1 Standard Test and Calculation Methods

(1) The nominal values of the electrical performance parameters of the modules such as Isc, Voc and Pmax deviate from the values obtained under the standard test conditions of the modules: irradiance 1000W/m², cell temperature 25°C, atmospheric quality AM1.5, and under normal conditions the modules produces current and voltage values that may be higher than the values obtained under the standard test conditions.

(2) In determining the modules voltage rating, wire current rating, fuse type and controller type associated with the modules power output, the short-circuit current is calculated by multiplying the short-circuit current by a factor of 1.25 based on the maximum ambient temperature at the installation site, combined with the temperature coefficient of the current in the technical manual; the open-circuit voltage is calculated based on the minimum ambient temperature at the installation site, combined with the voltage temperature coefficient in the technical manual voltage.

(3) When the modules are connected in series, the voltage is added; when the modules are connected in parallel, the currents are added.

(4) PV modules with different electrical characteristics cannot be connected in series, and connecting different electrical modules of PV modules may cause a mismatch of electrical connections, so be sure to install them according to the manufacturer's installation manual.

5.7.2 Connection

(1) The maximum number of modules that can be connected in series per string must be calculated according to the requirements of the relevant regulations, and its open circuit voltage values (maximum system voltage of DC 1500V for HG flexible modules according to IEC61730 safety test qualification) and other values required for DC electrical modules. The open-circuit voltage correction factor can be calculated according to the following formula:

$$Voc=1-\beta Voc \times (25-T)$$

T is the minimum expected ambient temperature at the system installation location and β(% /°C) is the temperature coefficient of Voc of the selected modules(refer to the corresponding modules parameter table).

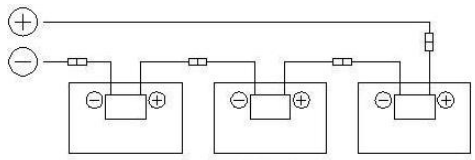
(2) If a reverse current exceeding the maximum fuse current of the modules may pass through the modules, an overcurrent protection device of equal size must be used to protect the modules.

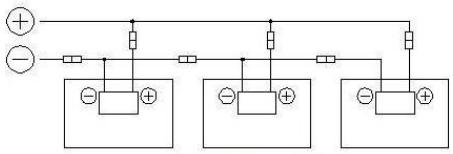
(3) If the number of parallel connections is greater than or equal to 2 strings, there must be an overcurrent protection device on each string.

(4) The modules are designed to be connected in the field using sealed junction boxes with protection class IP67, providing protection from environmental influences for the conductors and their corresponding connections, and accessible protection for uninsulated live parts.

(5) The junction boxes have connected cable wires and connectors with protection class IP67, which are designed to facilitate series connection between the modules.

(6) Each module has two separate wires connected to the junction boxes (one positive and one negative). By inserting the other end of the positive connector of one module wire into the socket of the negative wire of the adjacent module, you can connect two modules in series.





5.7.3 Cable

(1) The cables used to connect the modules on site must meet the maximum short-circuit current of the modules and be made of light-resistant cables (TUV 2 PfG 1169, 4 mm² wire diameter, -40°C to 90°C).

(2) The cable must be fixed to the bracket by means of specially designed light-resistant cable ties and cable clips.

(3) Do not press cable heavily.

(4) For the cable to be fixed through the appropriate way, it must be fixed on the bracket with a specially designed light-resistant cable and cable card.

(5) although the cable is light and water resistant, it must be protected from direct sunlight and water immersion.

5.7.4 Connectors

(1) Please keep the connectors dry and clean, make sure the nuts are tightened before connecting.

(2) Do not connect the connectors if they are wet, dirty or otherwise.

(3) Avoid direct sunlight and immersion in water.

(4) Incorrect connections may cause arcing and electric shocks; check the security of all electrical connections; make sure all connectors with locking are fully locked.

5.7.5 Bypass Diodes

(1) The junction boxes of HG modules contain bypass diodes connected in parallel to the cell strings within the modules. When a hot spot phenomenon occurs locally in the modules, the diodes will operate to stop the main current from flowing through the hot spot cells, thus limiting modules heating and performance loss.

(2) Note that the bypass diodes are not overcurrent protection devices; when you know or suspect a diode failure, please ask the installer or system maintainer to contact HG. Please do not attempt to open the modules' junction boxes yourself.

6. Maintenance and Care

HG recommends that PV systems should be regularly maintained by the installer or other qualified person for routine maintenance.

6.1 Maintenance

Check whether the modules cells are shattered; whether there are burn marks on the backsheet; whether the cables and connectors are damaged and well protected by insulation; and whether the installed grounding device is corroded.

6.2 Care

(1) To reduce potential electrical or thermal shocks, HG recommends that modules cleaning be done in the morning or later in the afternoon, when solar irradiance is weak and modules temperatures are lower. This is especially true where the temperature is higher.

(2) When the modules are in operation, there must not be environmental influences present that cast shadows on the modules and obscure some or all of the modules, such as: other modules, modules system supports, birds staying, large amounts of dust, dirt or vegetation, all of which can cause a significant reduction in output power; HG recommends that there be no shading on the modules surface at any time.

(3) As for the frequency of cleaning, it depends on the rate of dirt accumulation. Under normal circumstances, rain will clean the surface of the modules, which can reduce the frequency of cleaning; to prevent damage to the modules and scratches on the surface of the front film, please do not use electric or pressure cleaners. It is recommended to use a damp sponge containing water or a soft cloth to wipe the

surface of the modules. It is strictly prohibited to use cleaners containing alkali or acid to clean the modules. To remove the snow on the surface to increase power output, please use a brush to gently remove the snow. Do not try to remove frozen snow or ice from the modules surface.

7. Disclaimers

(1) Due to the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic products beyond HG's control, HG shall not be responsible for any loss, damage or expense caused by operations related to such installation, operation, use or maintenance.

(2) Infringement of third party patents or other rights that may result from the use of PV products does not fall within the scope of HG's responsibility. The customer is not authorized to use any patents or patent rights by using HG's products.

(3) The information in this manual is based on HG's knowledge and reliable experience. However, this information and recommendations including product specifications (without limitation) do not constitute any warranty or guarantee, either express or implied. HG reserves the right to change the contents of this installation manual without prior notice.