Sunport Power

Innovation Changes the World

Sunport Power
Lightweight Modules
INSTALLATION AND USER MANUAL

For professional use only

version:2024 05

Sunport Power Lightweight PV Modules

Installation and User Manual

1. Introduction

Thank you for choosing Sunport as your PV module provider. This manual contains important information about the safety, installation and maintenance of the modules. This manual does not have any warranty significance. It does not stipulate compensation scheme of any loss, damage or other expenses caused by or generated during module installation, operation or maintenance. Sunport PV modules shall not be liable for any infringement of patent rights or rights of third parties caused by the use of modules. Sunport reserves the right to change the product specification and this manual without prior notice.

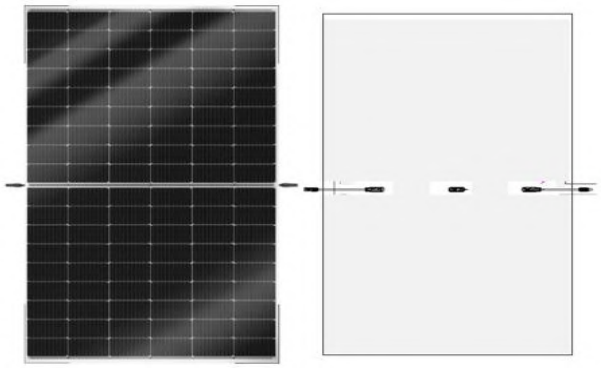
The installation personnel must read and understand this guide before installation. The installation personnel must follow all safety precautions, local requirements, and laws or regulations of authorized authorities described in this guide. Sunport shall not be responsible for injuries, losses or expenses arising from non-compliance with this manual, from or in connection with the products of other manufacturers. Please provide this manual to PV system owners for their reference and inform them of all safety, operation and maintenance requirements and recommendations. The installation manual is available in different languages. In case of any conflict, the Chinese version prevails.

2. Laws 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. Those regulation may vary for mounting location and requirements may also vary with system voltage, and DC or AC application. Contact local authorities for detailed governing regulations, and make a point of getting confirmation and relevant permission.

3. Module Information

3.1 Encapsulation Structure Sketch Map



3.2 Nameplate Information

The nameplate describes the product type, dimension, maximum power, optimum operating current, optimum operating voltage, open circuit voltage, short circuit current, certification mark and maximum system voltage etc. under standard test conditions.

4. Safety

Sunport's lightweight modules are compliant with IEC 61215 and IEC 61730 standards and the application rating is class A. The modules can be used for systems that may be exposed to the public and are larger than 50V or 235W DC. The modules passed the two parts of IEC 61730-1 and IEC 61730-2 and met the safety Class II requirements.

All installation work must comply with local and local regulations and corresponding national or international electrical standards. Do not install in rainy days, strong winds, rain or snow. To avoid potential safety risks, such as water immersion into the connector etc.

4.1 Transportation & Storage Safety

- Do not open the original package during transportation and storage until they are ready to be installed;
- Use lifting to uploading and downloading for package, refer to standard operation to prevent fail and other risks;
- Use reasonable assembly fixtures to support transfer, lifting 1pallet and stacking 2 pallets per time;
- Keep good packaging, prevent no broken and moisture. Keep in a well-ventilated, rainproof and dry place anytime;
- The unloading ground must be smooth and free from inclination;

- Note same power level products in same area when unloading, keep around 30cm distance between two stacks.

4.2 Packing & Operation Safety

Verify no packaging is damaged before unpacking. If the modules are damaged, contact the company from which you purchased the modules so that you can obtain the information to raise complaint for defective modules.

- Unpacking procedure, first save the side documents effectively, then cut the cable ties, remove the top cover and long cardboard;
- When unpacking, if lifting is required, do not cut the cable ties that are separately packed for the upper and lower pallets, so that the crane can lift the upper and lower pallets separately;
- modules should be placed on flatness ground, prevent hard scratch, damage;
- Ensure surface is clean, use soft cloth to wipe if dirty before installation;
- Two persons to carry 1 piece from head to tail. Do not place two or more modules together;
- ⌦ Do not stack unpacked modules in any way to avoid damage;
- ⌦ Do not place one side of the module t on the floor to prevent glass edge damage and handling by two persons together on the floor gently.
- ⌦ Do not exceed 6pcs modules for a single handling and stacking, refer to the below photo;
- ⌦ Do not hand grasp junction box or picked up the wire to move modules;
- ⌦ Do not stand, climb, walking and jumping on modules;
- ⌦ Do not use rope, back modules as transport method;
- ⌦ Do not touch with hard objects, sharp objects contact, impact, pressure;
- ⌦ Do not paint on the surface, add label or tear down label or nameplate;
- ⌦ Do not install the scratches, damaged or other faulty module;
- ⌦ Do not drilling extra hole on panels within installation process, unless confirmed accepted by Jiangsu professionals in advance.
- ⌦ Do not disassemble or modify the modules in any way that may affect the performance and safety of the modules or even cause irreparable damage and void applicable warranty;
- ⌦ Do not directly damage the module under any circumstances. Disassemble or replace the module according to the installation manual.

4.3 Electrical Safety

The module will generate direct current in the light environment when there is no connected or external circuit. Due to it will cause shock or burns when the non-protected touch the modules, 30V or higher DC voltage can be fatal.

- Use insulation tools and wear rubber gloves to operating modules in sunshine;
- Note no on/off switch on module, stop work only carry out to moving modules away sunlight area or shielding modules surface with cloth, cardboard, opaque material, or reverse module on a smooth, flat surface;
- Note the wrong connection may happen in arcs and electrical shock;
- Note to keep connectors dry and clean, ensure it in proper working condition;
- Note the snow and water will reflect light and then increase light intensity to improve current and output power.
- Note the voltage and power of the modules also increase at low temperatures.
- ⌦ Do not disconnect electrical connections under load to avoid arcs and electrical shock;
- ⌦ Do not insert any objects into the connector, or make wrong electrical connections;
- ⌦ Do not touch the fall off junction box or other damaged module unless it disconnected in advance and you are wearing proper PPE;
- ⌦ Do not touch damp modules under power running condition. According with this manual requirement for modules cleaning guide when need clean up.
- ⌦ Do not touch damp connector without wearing PPE or rubber glove.

4.4 Fire Safety

- Consult your local authority laws and regulations before installation work，comply with the building fire protection requirements. Pay attention the modules are generating equipment and may affect the fire safety of the building.
- Note the wrong installation method or faulty modules may produce electric arcs which have potential fire risk accidents.
- Do not install in the vicinity of flammable liquids, gases, or dangerous materials. If exposed flammable gas occurs in the vicinity of the modules after installation, please stop using the modules;
- In the event of a fire, modules may continue to generate dangerous DC voltage even if they are disconnected from the inverter, partially module damaged or full damaged, broken system cables or even destroyed;
- In case of fire, the firemen should be informed of the special danger of the modules and should stay away from the photovoltaic system during and after the fire until appropriate measures are taken to ensure the safety of the photovoltaic system

5. Installation

5.1 Installation conditions and precautions

Lightweight PV modules installed in a suitable building or other suitable installation locations (e.g.floor, roof). Preferably face south when installed in the Northern Hemisphere and north when installed in the Southern Hemisphere.

- Handle the modules gently during installation. Do not touch the edge of the module;
- Ensure the installation site or surface is free from aging, damage, dirt, or rust, and that the connection is firm. Need to do repair, replace, clean, and rectify the faults before installing the installation if can't meet request;
- When designing the photovoltaic system, consider the drainage and accumulation of water. Keep height or angle to prevent flooding and damage caused by accumulation of water in rainy days.
- When designing the photovoltaic system, consider the position of the support bracket to avoid the junction box, and the modules can be connected to each other.
- When designing the photovoltaic system, consider the suspension after the connector is connected between the modules to avoid the connector water problem caused by rain and water. The suspension device must be stable and reliable for a long time.
- When designing the photovoltaic system, consider installation method to avoiding the three junction boxes under the rear side, and the cables between the two modules s can be connected normally;
- Module spacing requirements: keep ≥30mm clearance between two modules to ensure the maintenance and overhaul;
- The section size of the bracket should be ≥30 (W) x 40mm (H) distance, to ensure the safe contact area between the module and the bracket;
- Note the installation area no shelter, such as trees, poles, billboards, etc., the module power will significantly reduce and impact system performance once the surface are blocked;
- Note to install the lightning protection device to prevent damage on where have higher frequency of the lightning activity;
- Installed in operating temperature ranges from -40 ° C to 85 ° C environment;
- If install in a special environment, consult the technical support personnel in advance (for example, the altitude is higher than 2000 m). If you do not comply with the above precautions, the warranty will be invalid.
- ⌦ Do not install in places with strong corrosive substances such as active chemical vapors, acid rain, sea water or other corrosive substances;
- ⌦ Do not near an open flame or flammable object;
- ⌦ Do not install in the long-term socking in water or immersion in water (pure water or salt water) environment (such as fountains, spray, etc.);

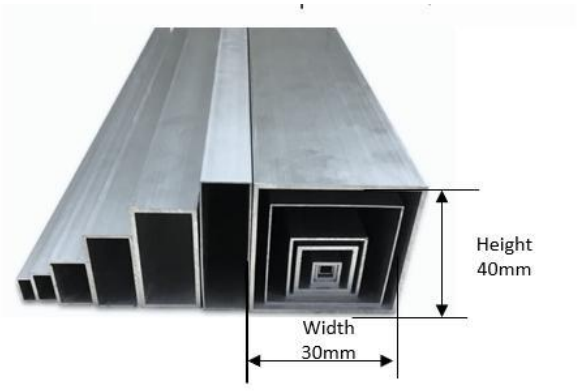
- Do not install in frequent hail, year-round snow, perennial wind sand, smoke, air pollution, soot and so on, security or performance will affect. If installation is required, the installation plan should be evaluated by technician.
- Do not mirror or magnifying glass focusing light directly into the surface;
- Do not install modules in windy, rainy, snowy weather to prevent accidents;

5.2 Installation Methods

Lightweight PV module can be installed in different ways according to different installation environments, including direct adhesive installation, support and fixture auxiliary installation, removable fixture installation, and replacement module installation. Suitable for PVC surface, TPO, asphalt, concrete surface, color steel tile and other flat roof or shaped scene, The installation method depends on the technical personnel evaluation.

Common installation tools for lightweight modules

Guide rail or aluminum strip width is recommended width *length is 30 *40mm, thickness is recommended 1 ~ 2mm, the material is recommended aluminum alloy 6063 or equivalent material high corrosion resistance, not easy to deformation.



PVC /TPO/ asphalt/concrete/color steel tile and other surfaces are recommended to use Tianshan 1527, Huitian 906Z or others from Sunport power approved structural adhesive.

Double-sided tape recommended 3M-2204（Apply for circular surface as pre-installation）;

High viscosity waterproof coating is recommended by Manbalit T401/T8000 or Tianshan P10

Color steel tile and other metal surface recommended structural adhesive for Tianshan-1527 or approved structural adhesive.

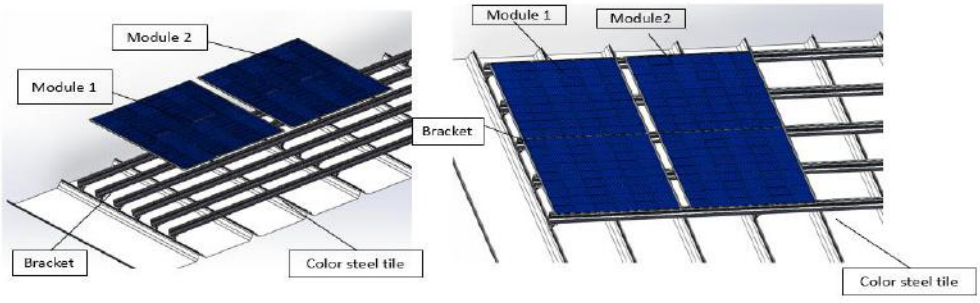
The following are the precautions when making structural glue

- Cleanup the construction surface and check no water stains on the surface before gluing;
- Glue along the center of the crest, glue width of 6 ~ 10mm, about 3 ~ 5mm high;
- Smear must be uniform, continuous, before pasting is not allowed to scrape the rubber strip, to rely on extrusion to make the glue spread;
- Glue and assembly time should be controlled in the shortest time (not more than 5 minutes);
- Structural adhesive in 48 hours, the colloid will be cured 2~3mm depth, not fully cured before do not force;

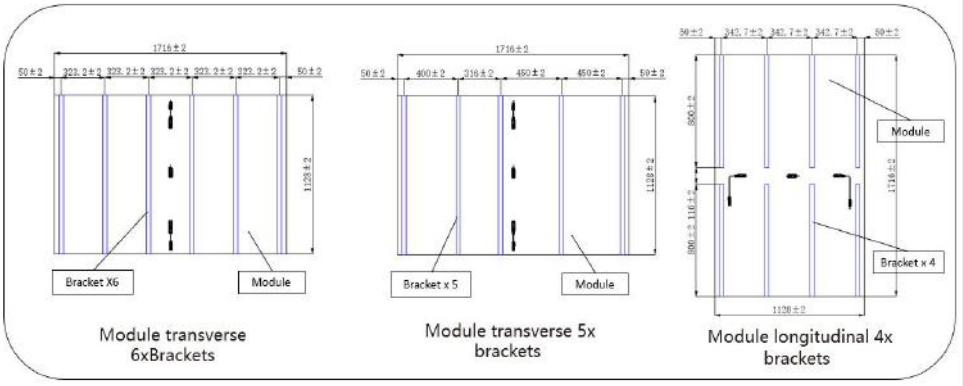
The following is the bracket layout and lightweight module installation scheme for reference:

- (Preferred) transverse module installation solution: select 5 or 6 components to install. Pay attention: the middle support bracket must avoid the junction box to ensure cable connections between modules;
- Longitudinal module installation solution use four rows. Ensure that the upper and lower sections are spaced 110±2mm, as shown in the following figure.

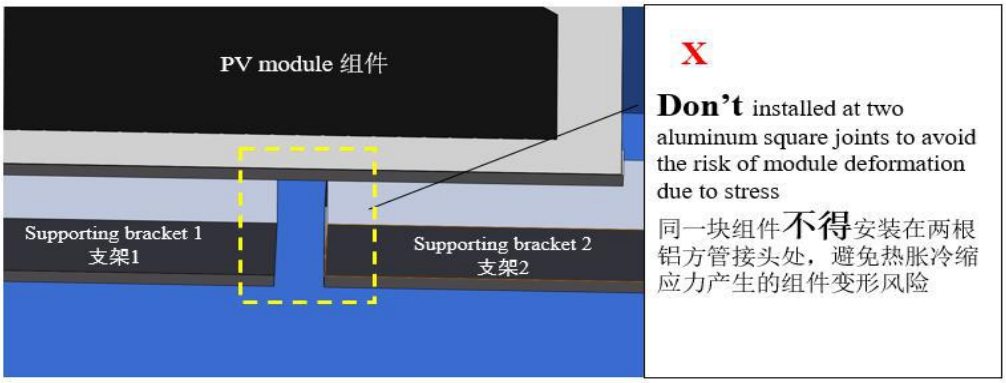
Color Steel Tile+Bracket+Module Design Diagram



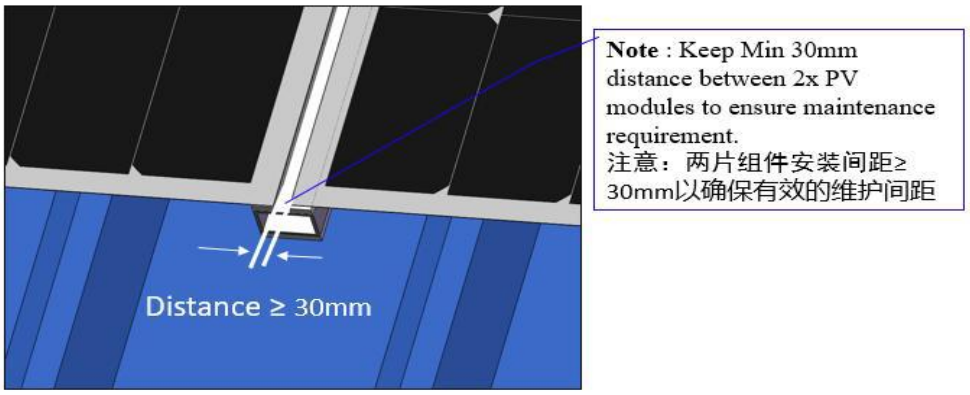
Module+Supporting bracket dimension installation diagram
(Preferably Transverse installation)



- Two persons to lift 1 unit lightweight module to the installation position. Another person responsible for connect the cable of the second module to the connector of the first module. After hearing the" snap "sound, place the second module flat on the installation position.
- Use wooden strips or hand roller to tightly bind the adhesive to the modules.
- Layout design should avoid two splicing joints of supporting brackets, to avoid the relative displacement caused by thermal expansion and cold contraction to be damaged module by tension;



- The spacing between two adjacent modules must be at least 30mm. Reserve a maintenance interval to avoid stress during long-term use.



- Proper operation and maintenance channels should be set aside around modules. Do not step on modules.
- Recommended to test the pullout force of the gluing effect to ensure the effective binding force of installation.
- The cantilever height at both ends of the module must ≤ 50mm. use aluminum square strip to pad the cantilever horizontally and the height of the aluminum bars must be the same as the wave crest height.

For the installation methods not mentioned above, please consult technical engineer, otherwise the loss caused by improper installation methods will not be borne.

5.2.1 Plane, Curved Surface, Trapezoidal Color Steel Tile Installation

a． For flat and curved roof installation: design the support brackets on the roof as evenly as possible, the distance between the brackets ≤500mm and the edge support distance of the module ≤ 50mm. Fixed between the ground and the roof with structural glue, and the upper surface of the aluminum bracket is coated with structural glue, and then install modules.

Flat and curved roof including but not limited to: PVC/TPO/ asphalt waterproof coil, metal curved surface and color steel tile or flat roof;

b. For the trapezoidal color steel tile installation: according to the structure of the color steel tile, the supporting bracket is pasted on the trapezoidal wave peak (such as the trough must be ensured that the height after installation exceeds the peak height 40mm), the bottom surface of the aluminum bracket and the roof are fixed with structural glue. Note: the distance between the brackets ≤500mm and the edge support distance of the module ≤50mm.

- Select the appropriate size of the supporting square bracket. If it is attached to the trough of the color steel tile, the height of the square tube should be ≥40mm or above; If it is attached to the crest of the color steel tile, the height of the square tube is ≥40mm as well.

Process is following the below steps:

① (Pretreatment)Polish the roof to remove the powdery layer (concrete roof); Cleanup the PVC/TPO/asphalt material area, repair, flatness or replace new one to ensure good condition; the color steel tile also need repair the damage area and rust removal action.

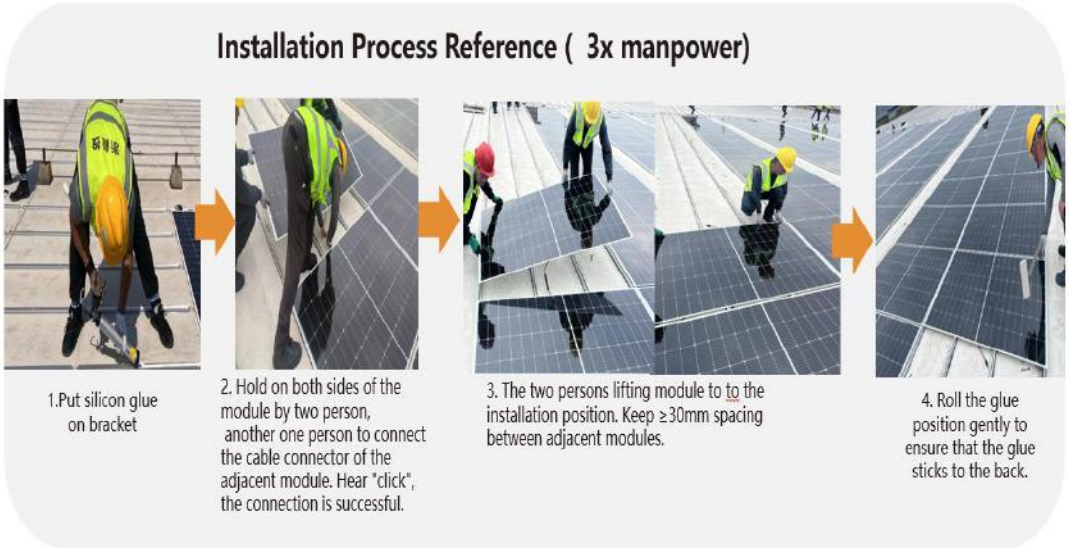
② Fix the water leakage points; paint the assembly installation location or the overall installation area with a high viscosity waterproof paint; After the coating is cured, make sure that no gap overflows and leak, and then install the modules. (Concrete, PVC/ asphalt substrates, etc.)

③ After installation, the integrated waterproof roof will ensure additional waterproof performance.

④ Cleanup the surface to supporting brackets, then apply structural glue on the lower surface which match with roof contract assembly and installation;

⑤ After 24hr, apply glue on the brackets up surface and then install modules;

⑥ Press the glue position with the press tools or roller in the guide bracket area. To ensure good contact between the glue, bracket, modules.



5.2.2 Metal Roofing of Vertical lock Type and Angle Break Type

Metal roofing, the most typical and most common is color steel tile vertical locking type, angular roof.

Auxiliary fixture and bracket installation

According of installation design put the supporting brackets on the position of the color steel tile, the aluminum bar and the color steel tile are fixed with structural adhesive, the surface of the aluminum bar is flush with the surface of the color steel tile, the structural adhesive is placed on the aluminum bar, and the modules are installed. This scheme can be used alone or in conjunction with the crest guide scheme.

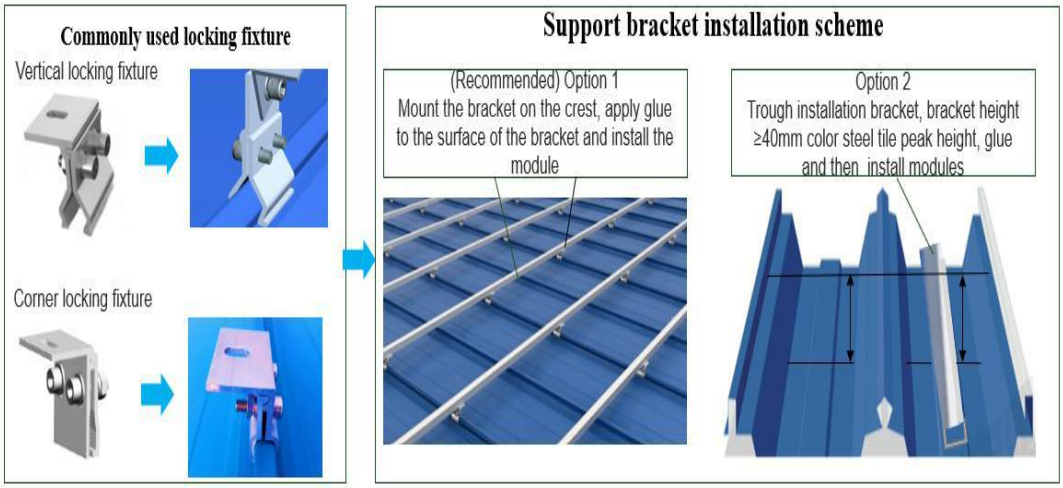
According to the design scheme, the supporting bracket is installed in the trough or peak position of the color steel tile, the structural glue is fixed between the bracket and the color steel tile, the surface of the bracket exceeds the peak height of the color steel tile 40mm, and the structural glue is placed on the bracket to install the modules. This scheme can be used alone or in conjunction with the crest guide scheme.

① Use of vertical locking or special angular fixture, connect the fixture and color steel;

② Connect the guide rail to the fixture and tighten it, then connect the corner code to the fixture. Note: The fixture should be drawn and tested on site to ensure its firmness;

③ Clean the surface of the guide rail, and then apply structural glue on the back of the guide rail contact module;

④ Put the modules on, and press the gluing position with a press tool or roller in sequence to ensure good contact between the structural adhesive and the modules and guide rail. The height of the fixture is 20 ~ 50mm.



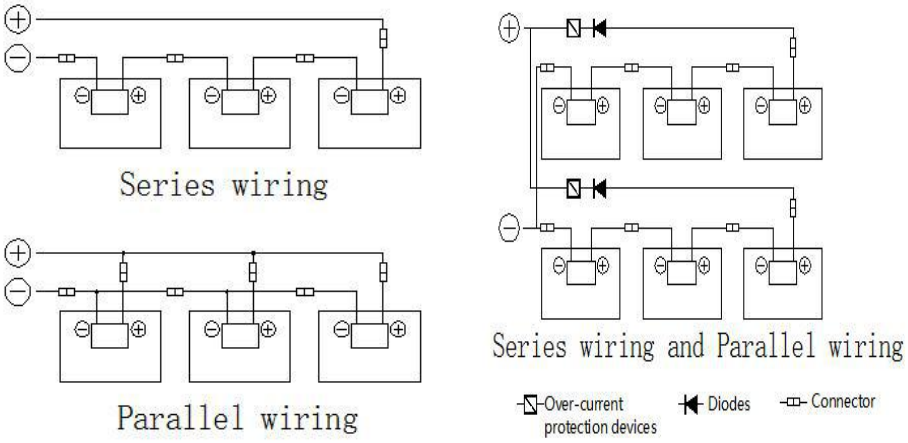
5.3 Electrical Installation

- Electrical parameters such as the Isc,Voc and Pmax nominal value have deviate with the standard test conditions. Standard test conditions: irradiance 1000W/m², battery temperature 25℃, atmospheric quality AM1.5. When irradiance plus normal conditions, the current and voltage values generated may be higher than those obtained under standard test conditions. Therefore, when determining the controller model associated with the module rated voltage, wire rated current, fuse type and module power output, on the basis of the highest ambient temperature at the installation site, combined with the temperature coefficient of the current in the technical manual, the short-circuit current is multiplied by the coefficient of 1.25 to calculate the short-circuit current.
- On the basis of the installation lowest temperature which combining the technical manuals to calculate the open circuit voltage. The voltages are added up when the modules is in series; current are added up when modules are connected in parallel.
- Different electrical characteristics of PV modules cannot series. It may cause electrical connections mis-match. should be carried out according to the manufacturer's installation manual.

5.3.1 Connection Type

- The maximum number of modules that can be connected in a series string must be calculated in according with applicable regulations in such a way that the specified maximum system voltage (According to IEC61730 tests and appraisal, the maximum system voltage is 1000Vdc or 1500Vdc depending on the series and model.) of the modules and all other electrical DC modules will not be exceeded in open circuit operation at the lowest temperature expected at the PV system location. Variation of open-circuit voltage with temperature can be calculated based on the following formula: $Voc_{(T)}=Voc_{(25)}\times[1-\beta\times(25-T)]$. $Voc_{(25)}$ is open-circuit voltage at standard temperature 25°C. T is the lowest expected

ambient temperature at the system location. B (%/℃) is the temperature coefficient of the selected module Voc (Refer to corresponding datasheet).

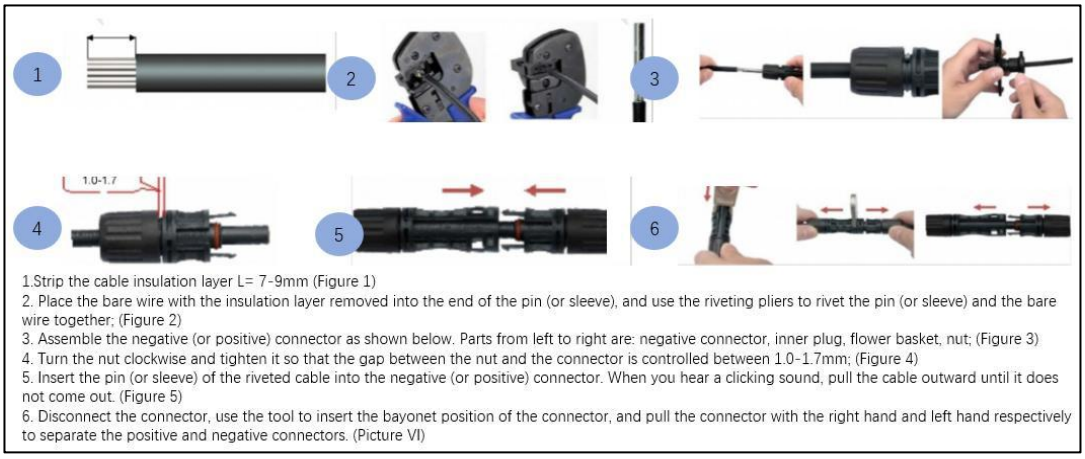


- An appropriately rated over-current protection device must be used when the reverse current could exceed the value of the maximum fuse rating of the modules. An over-current protection device is required for each series string if more than two series strings are connected in parallel;
- In the design of the modules, field connections use sealed IP68 junction boxes to provide environmental protection for the wires and their corresponding connections and accessible protection for uninsulated live parts;
- The junction box is provided with connected cable and IP68 connector, which is used for series between modules; Each module has two wires (a positive electrode and a negative electrode) separately connected to the junction box. The two modules can be connected in series by inserting the positive interface at the other end of the wire of one module into the jack of the negative wire of the adjacent module. The connection is successful when the clicking sound is heard.

5.3.2 Cable

- Field connection modules with cable must meet the maximum short-circuit current, use photovoltaic (pv) systems special light resistant cable.
- Recommended to fixed cable by the binding wire resistance to light and line card to fixed on the bracket;
- ⌦ Avoid cable or modules by mechanical forces crushed;
- ⌦ Avoid long soak in the water cables.

Precautions of connection head modulation



1.Strip the cable insulation layer L= 7-9mm (Figure 1)
2. Place the bare wire with the insulation layer removed into the end of the pin (or sleeve), and use the riveting pliers to rivet the pin (or sleeve) and the bare wire together; (Figure 2)
3. Assemble the negative (or positive) connector as shown below. Parts from left to right are: negative connector, inner plug, flower basket, nut; (Figure 3)
4. Turn the nut clockwise and tighten it so that the gap between the nut and the connector is controlled between 1.0-1.7mm; (Figure 4)
5. Insert the pin (or sleeve) of the riveted cable into the negative (or positive) connector. When you hear a clicking sound, pull the cable outward until it does not come out. (Figure 5)
6. Disconnect the connector, use the tool to insert the bayonet position of the connector, and pull the connector with the right hand and left hand respectively to separate the positive and negative connectors. (Picture VI)

5.3.3 Connectors

- When designing the photovoltaic system, it is necessary to consider that the connector cannot directly fall on the roof, and should be suspended and fixed to avoid soaking in water on the roof, which will cause the connector resistance to heat and failure, or even lead to heating, arc fire and other serious situations.
- The connector is dustproof and waterproof. Avoid poor contact after the connector enters the dust and water, which will lead to serious situations such as heating and arc fire;
- Ensure connector is dry and clean to avoid immersion in water before installation;
- Ensure the male and female ends of the two adjacent components are connected properly, and then install the second component at the specified position.
- Ensure check all electrical connections for reliability;
- Ensure that all locking connectors are fully locked.

5.3.4 Bypass Diode

The junction box of modules contains a bypass diode connected in parallel to a battery string inside the module;

When hot spots occur in parts of the module, the diode will work, so that the main current will not flow through the hot spot cell, thus limiting the module heat and performance loss;

- Note that the bypass diode is not an overcurrent protection device;
- ⌦ When the diode is known or suspected to be faulty, please contact the installation or system maintenance provider for Sunport company;
- ⌦ Do not attempt to open the junction box of the module yourself.

6. Maintenance and repair

Sunport recommends that PV systems shall be periodically inspected by the installer or qualified person. Module's problems due to improper maintenance or mis-operation will void the warranty.

Clean up modules at least once a year or according to contamination. Stained or contaminated modules may reduce the power generation of the system.

- Check the front board no scratches and damage before installation;
- No signs of burning on backplane traces;
- No damaged for cable and plug, and insulation protection are in good condition;
- Check hardware fastening after installation.
- Check all electrical mechanical connection parts, modules, a clean, safe, no damage and no rust;
- Replace the same model if needed.
- It is recommended to clean modules in the morning or evening when the temperature is low to reduce potential electrical or thermal shock, especially where the temperature is high;
- Clean up all surface organic matter to ensure surface no covered, such as: building or utility poles and other shadow, birds stay, a large amount of dust, dirt or trees;
- Recommended to use a damp sponge or a soft cloth, damp sponge or related soft material to wipe the surface and do not press the surface when wiping.
- Conventional non-high-pressure water gun can be used for module surface cleaning options, PH value is controlled between 6~8, use a mild, non-abrasive cleaner to remove stubborn stains;
- ⌦ Before cleaning, ensure that power connection operation;
- ⌦ forbidden with high-pressure electric or cleaning machine, straight flush modules;
- ⌦ containing alkali, acid cleanser modules is strictly prohibited;
- ⌦ it is forbidden to remove modules with good thing on the surface of the thin snow or other dirt, can use soft brush gently remove snow.
- ⌦ don't try to remove the module surface frozen snow or ice.

PV module surface cleaning tool reference组件表面清洁工具参考

7. Product Appendix.

The installation manual applicable module types are as follows. The module types are subject to changes without prior notice due to continuous module innovation research and development., all flexible module type reference to this manual. “XXX” shows the peak power of the module label in increment of

Product specification	Power (W)	Module size (L*W*H) mm
SSDXXXAH5T	400～420	1716*1128*2.2

8.Contact Information

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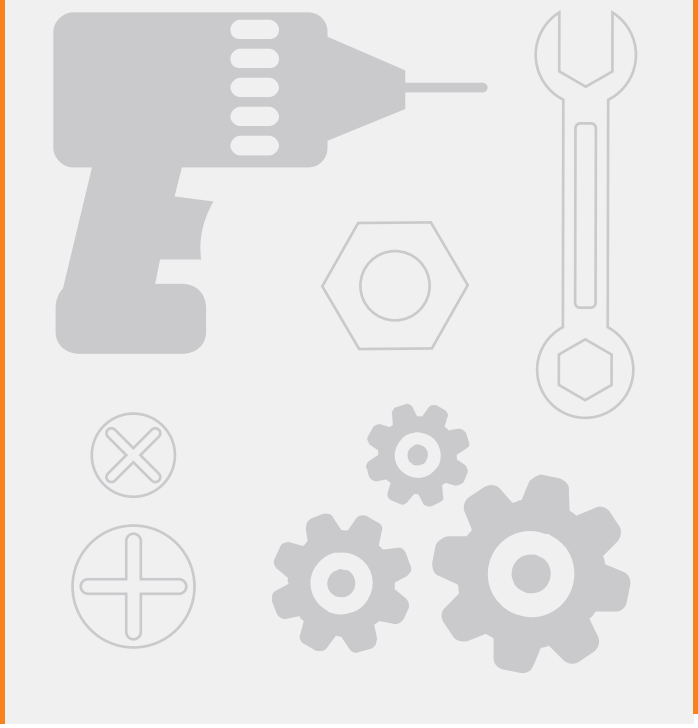

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