CNBM | JETION SOLAR

Visionary Green Energy

INSTALLATION MANUAL

Lightweight Photovoltaic Modules

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Please read this manual carefully before installation and keep it for future reference.

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Introduction

Jetion Solar photovoltaic modules are composed of crystalline silicon solar cells, high-transmittance and low-iron tempered glass, anti-aging EVA, a highly flame-retardant backsheet, and an anodized aluminum alloy frame.

Jetion Solar modules comply with international standards IEC61215.2 and IEC61730, and have passed inspections by authoritative testing centers. Jetion Solar modules are widely used in rooftop photovoltaic systems, photovoltaic power plants, communication stations, fuel, marine, meteorological, and transportation applications, as well as building-integrated photovoltaics.

We are committed to providing technical and installation support to our global customers.

This manual includes important information on the installation, safe operation, and maintenance of photovoltaic modules.

Please be sure to read and understand all instructions before installing the modules. The installer shall comply with the requirements of this manual, corresponding local standards and rules, as well as building codes and installation regulations. All work related to the photovoltaic system must be performed by certified engineers who are familiar with the mechanical and electrical requirements of photovoltaic systems.

Disclaimer

Jetion Solar shall not be liable for any loss, damage, injury, or expense resulting from improper installation, operation, use, or maintenance.

Jetion Solar reserves the right to update its products, specifications, or installation instructions.

1. Certification Requirements

1.1 IEC 61730

The design of Jetion Solar modules complies with the Application Class A standard as specified in IEC 61730-1. Modules rated for Application Class A may be used in systems operating at greater than 50V DC or 240W. Modules rated for Application Class A that have passed the safety certification of IEC61730-1 and IEC61730-2 are considered to meet the requirements of Safety Class II.

1.2 UL

Under Standard Test Conditions (100 mW/cm^2 irradiance, AM1.5 spectrum, and a cell temperature of 25°C), the electrical properties are all within +/- 10% of the rated short-circuit current, open-circuit voltage, and maximum power.

The mounting rack height should be at least 100 mm (3.94 inches), with a recommended height of 115 mm (4.53 inches). The use of other mounting methods may affect the fire rating.

The maximum load for UL certified modules is 30 lb/ft^2 (146.5 kg/m^2).

The wiring method should comply with NEC standards.

If the installation site is in Canada, the installation should also comply with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part I.

2. Installation Requirements

2.1 Environmental Requirements

Avoid Shaded Areas

Even the slightest covering, such as dust accumulation, will reduce the power output.

Sufficient Ventilation

High module temperatures will reduce the performance and power output of the modules. Good

ventilation can effectively prevent the photovoltaic modules from overheating.

Others

Do not install modules near flammable gases (e.g., gas stations, gas storage tanks, etc.).

Do not install modules near open flames or flammable materials.

Do not install modules in areas with potential for extreme sand and dust damage.

Do not install modules in areas with extreme air pollution (such as chemical vapors, acid rain, heavy metal fume, and/or soot).

Do not expose the modules to laser radiation sources.

Do not install the modules in areas with extreme hail and/or snowfall.

Do not install the modules in areas where they may be submerged in water or have continuous contact with water from sprinklers or fountains.

Do not install the modules in a marine environment and/or in areas directly exposed to salt-laden winds. It is recommended to install the modules at least 500 meters away from the sea.

Recommended ambient temperature: -20℃ to 40℃.

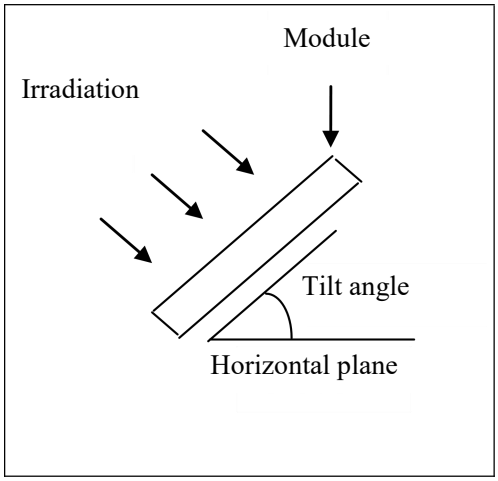
Operating temperature limits: -40℃ to 85℃.

2.2 Module Installation Orientation and Tilt Angle

Maximum power is generated when sunlight shines perpendicularly on the PV modules. Therefore, to obtain the maximum output power, the optimal orientation and tilt angle of the PV modules shall be calculated. To avoid a decrease in the output power of the PV system, ensure that all modules in the same system have the same orientation and tilt angle.

In the Southern Hemisphere, the modules must face north, and in the Northern Hemisphere, they must face south.

For off-grid installations, Jetion Solar modules are connected to a permanent structure, and the module tilt should be set to ensure good performance in winter. Generally, if the system's power generation is sufficient in winter, it will also be satisfactory at other times of the year. The tilt angle of a module is the angle between the PV module and the horizontal plane.



Recommended Tilt Angle for Fixed-Tilt PV Systems	
Latitude	Fixed tilt angle
0°~ 15°	15°
15°~ 25°	Same as latitude angle
25°~ 30°	Latitude angle +5°
30°~ 35°	Latitude angle +10°
35°~ 40°	Latitude angle +15°
＞40°	Latitude angle +20°

The actual angle should be adjusted according to the installation design

Table 5 Module Tilt Angle

2.3 Material Requirements

Support Structure

The module support structure must be made of durable, corrosion-resistant, and UV-resistant materials that meet structural requirements. The design of the support structure and module mounting accessories

must comply with the local wind and snow load requirements.

Bypass Diode

When part of a photovoltaic module is shaded, the shaded area forms a hot spot and generates a reverse voltage internally, while the current from the unshaded cells is forced to flow through the shaded region. When the diode is connected in series and parallel with the battery, the current from the unshaded part will bypass the shaded part and flow through the diode, thereby reducing the module temperature and current loss.

Blocking Diode

In systems utilizing batteries, a blocking diode is typically installed between the battery and the PV module output to prevent the battery from discharging back through the modules at night or during rainy weather.

A diode used for reverse polarity protection must meet the following requirements:

At the maximum operating temperature of the module, the rated average forward current [IF(AV)] must be higher than the maximum system current.

At the minimum operating temperature of the module, the rated repetitive peak reverse voltage [VRRM] must be higher than the maximum system voltage. (IEC: Vmax=1000V or 1500V; UL: Vmax=1000V)

Battery

When a PV module charges a battery, the battery must be installed in a way that protects system performance and ensures user safety. The battery must be kept away from main pedestrian and animal traffic flows. The battery installation site should be protected from sunlight, rain, snow, and debris, and it must be well-ventilated. Most batteries release hydrogen gas during charging, which is explosive. Do not light a match or create sparks near the battery bank. When the battery is installed outdoors, it should be placed in a specially designed, insulated, and ventilated battery box.

Cables and Other Components

To ensure that all components can meet the requirements for maximum system voltage, current, humidity, and temperature when exposed to sunlight, we recommend that all cables and electrical connection equipment must comply with the corresponding national electrical codes.

Under normal conditions, a PV module may output a higher current and/or voltage than under standard test conditions. Accordingly, when determining the rated voltage of modules, the rated current of conductors, fuse specifications, and control scale, the values of the short-circuit current (Isc) and open-circuit voltage (Voc) marked on the module's backsheet should be multiplied by a factor of 1.25. Under the U.S. National Electrical Code, Section 690.8, the requirement to multiply by 1.25 also applies.

Only cables with a single terminal can be used.

The recommended cable area for connection with the connector is 4~6 mm^2, with a length of 1000 mm and an operating temperature of -40℃ to 90℃. Maximum Series Fuse Current Ratings: Monocrystalline 156 & Polycrystalline 156: IMax.Series fuse = 15A; Monocrystalline 166: IMax.Series fuse = 20A; Monocrystalline 182: IMax.Series fuse = 25A.

2.4 Requirements for Different Installation Methods

The module can withstand a wind load of 1000 Pa and a snow load of 2400 Pa, and it can also withstand the impact of hailstones with a diameter of 25 mm at a speed of 82 km/h.

Ground Mounting

Select an appropriate system mounting height to prevent the lowest edge of the module from being covered by snow for extended periods in winter in areas with heavy snowfall. In addition, ensure that the lowest part of the module is positioned high enough to prevent it from being shaded by windblown sand.

Rooftop Mounting

When the module is installed on a roof or building, ensure that it is sufficiently secure and will not fall due to wind or snow pressure.

The module should be supported parallel to the surface of the building wall or roof. The module frame and the wall or roof surface must be kept clean to prevent circuit damage and to facilitate air circulation at the rear of the module. The clearance height should be at least 100 mm (3.94 inches).

The installation of photovoltaic modules on rooftops may affect the fire safety performance of the building structure.

The modules must be mounted on a classified roof system. If the modules are Class C, they must not be installed on a Class C, B, or A roof. In some regions, the total area covered by modules may reduce the original fire resistance rating of the roof. Do not perform installation operations during strong winds to prevent accidents.

Pole Mounting

When mounting modules on a pole, select a suitable pole and mounting structure to ensure it can withstand the expected wind loads in the area.

3. Installation Methods

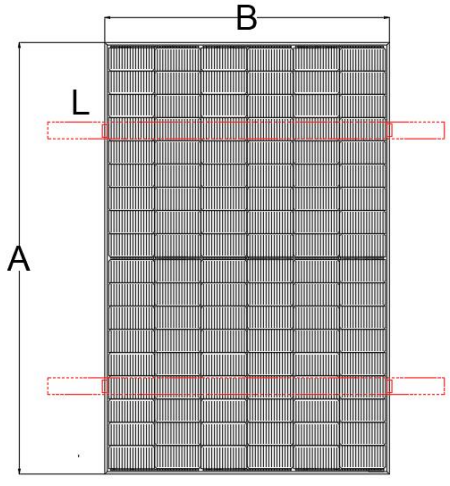
To prevent bending, vibration, mechanical stress, or deformation, the modules should be mounted on a flat surface. The minimum distance between modules should be no less than 20 mm.

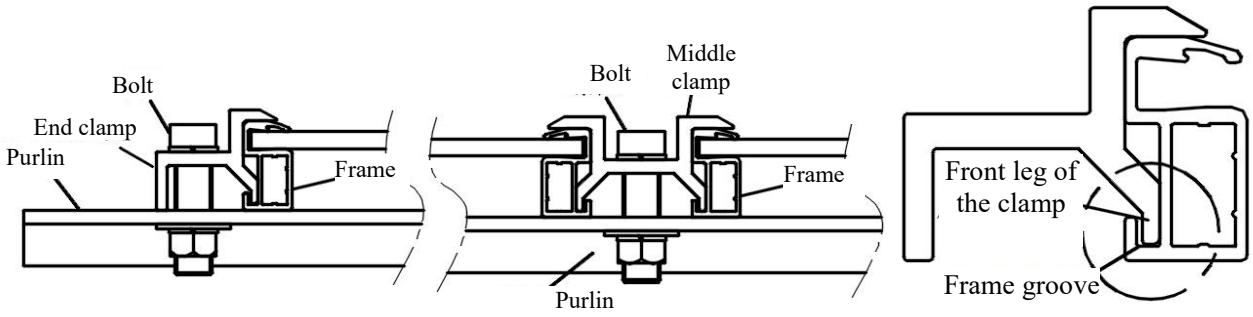
Use all provided installation contact points to avoid direct contact between glass and metal (e.g., bracket edges).

3.1 Clamp Mounting Solution

Clamps must not overlap the glass, obstruct the glass surface, or distort the frame. The recommended torque is 5 Nm.

Method Standard Mounting

<table>
<tr><td colspan="2">Clamp Mounting (movable range of mounting rail)</td></tr>
<tr><td> 
</td><td>1. Mounting range: L = 1/5 A ± 50 mm (where A is the module length)
2. Static load: 2400 Pa on the front side and 1000 Pa on the back side (tested)
3. The torque should refer to mechanical design standards based on the bolts used by the customer, for example:
M8 ---- 16-20 N.m (140-180 lbf/ft)
4. The dimensions of the module can be found in Appendix 1.</td></tr>
<tr><td colspan="2">The clamps are dedicated matching clamps. The usage method is as follows:</td></tr>
</table>



Clamp wall thickness: ≥3 mm, length ≥60 mm. During installation, ensure the front leg of the clamp is inserted into the groove on the side of the frame.

4. Grounding

To prevent electric shock or fire hazards, the module frame must be grounded before energizing.

The module frame grounding shall comply with NEC Article 250 (United States) or CEC requirements (Canada).

To ensure effective grounding, the grounding hardware must penetrate the anodized layer of the module frame.

Jetion Solar recommends using the following components or their equivalents.

Grounding screws are fastened into the side holes at both ends of the module frame.

Attach a separate conductor as a grounding wire to the 4 mm diameter grounding hole, and secure it with an M4 bolt, countersunk washer, toothed lock washer, spring washer, and nut.

Jetion Solar PV modules can be grounded using third-party grounding devices, which should be suitable for grounding the metal frames of PV modules; the device must be installed according to the instructions provided by the grounding device manufacturer.

The exposed copper of the grounding wire must not contact the module frame to prevent corrosion.

5. Wiring

5.1 General Wiring Requirements:

Correct Wiring Scheme: To minimize lightning strike risk, loop formation should be avoided in system design. Check that the wiring is correct before starting to operate the photovoltaic system. If the measured open-circuit voltage (Uoc) and short-circuit current (Isc) differ from those in the specifications, there may be a wiring problem.

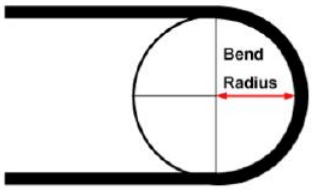
the junction box used on the back of Jetion Solar modules is weatherproof and suitable for standard wiring and conduit connections. The wiring method must comply with the National Electrical Code (NEC). Each module is guaranteed to include bypass diodes and cable connectors upon leaving the factory.

Use modules with identical parameters within the same system. In a series connection, the current through all modules is identical. In a parallel connection, the voltage must be the same across all modules. The connected modules must be compatible with the voltage of the system equipment. The voltage generated by the module connection must not be higher than the maximum system voltage. When using Jetion Solar modules, please account for the variation in module voltage with temperature (check the temperature coefficient of different modules; as temperature decreases, module voltage increases).

The current and voltage data on the nameplate are typical values. For actual measured data of the modules, please refer to the power test report/sheet.

Before connection, ensure that the connectors are clean and the sealing rings are intact. The positive and negative plugs must be securely fastened. A poor connection may lead to electrical leakage or burnout at the module connection point. The junction box and connector housings are made of organic materials. Do not allow them to come into contact with organic solvents, as this may cause deformation or cracking.

The minimum bending radius of the module cable is 43mm.



Incorrect Bending Method

Correct Bending Method

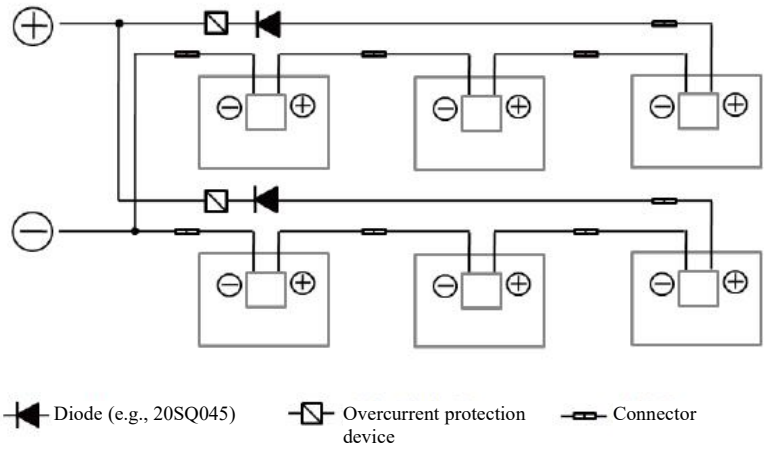
When the cable is fixed to the mounting rack, mechanical damage to the cable or module must be avoided. Do not apply excessive force to the cables. For proper cable routing and securing, specially designed UV-resistant cable ties and clips must be used to fasten them to the mounting structure. Although the cables are UV-resistant and waterproof, avoid direct sunlight exposure and water immersion.

5.2 Number of Modules in Series and Parallel Connections

When modules are connected in series, the total voltage must be less than the maximum system voltage Umax (IEC: Umax=1000V or 1500V; UL: Umax=1000V).

When modules are connected in parallel, the total current must be less than the maximum system current.

When modules are connected in series and then paralleled, if a reverse current exceeding the module's maximum series fuse rating may flow through them, the modules must be protected by overcurrent protection devices of equivalent specifications. When two or more strings are connected in parallel, each string must be equipped with one overcurrent protection device and one blocking diode.



5.3 Protection Against Potential Induced Degradation (PID) Effect

After the module is connected to the system, the potential of its internal circuit relative to ground (zero potential) must be maintained as positive. Otherwise, the modules will experience a Potential Induced Degradation (PID) effect, and the module power may be significantly reduced.

5.4 Connector Cleaning and Protection

During module installation, connectors are easily exposed to the air or even come into contact with the ground, causing connector contamination. Do not use organic solvents (such as electrode cleaners) to clean the connectors, as this can easily cause cracking after such cleaning.

The connectors are susceptible to corrosion in the chemical environments listed in the table below. Avoid prolonged exposure of the connectors to chemicals marked with "△", and prohibit any contact with chemicals marked with "×":

Chemical Type	Resistance
Aliphatic hydrocarbons	×/△
Aromatic hydrocarbons	×
Halogenated hydrocarbons	×
Alcohols	+
Phenols	×
Ketones	×
Esters	×/△
Ethers	×
Inorganic acids	×/△
Organic acids	△
Oxidizing acids	×
Alkalis	×
Gasoline	×

Note:

++ Excellent

+ Good

△ Moderate

× Poor

6. Loading, Unloading, and Handling

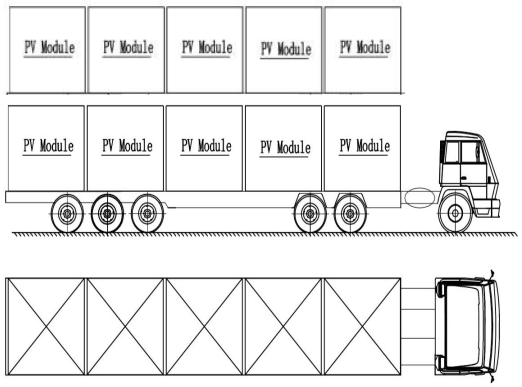
6.1 Module Loading and Unloading

If the modules are loaded by container, insert the forks of the electric forklift from the short side of the pallet when loading or unloading the modules. The fork length must be more than 2/3 of the pallet length. If the length is insufficient, fork extensions must be added to lengthen the forks. If the modules are loaded by flatbed truck, they can be lifted from the long side of the pallet during loading and unloading. However, the fork spacing must be adjusted to the maximum width, and the tines should be inserted through the central gap along the long side of the pallet. The forklift must maintain a constant speed during operation. Do not start or stop abruptly. Lift and lower the load slowly to avoid shaking the modules.

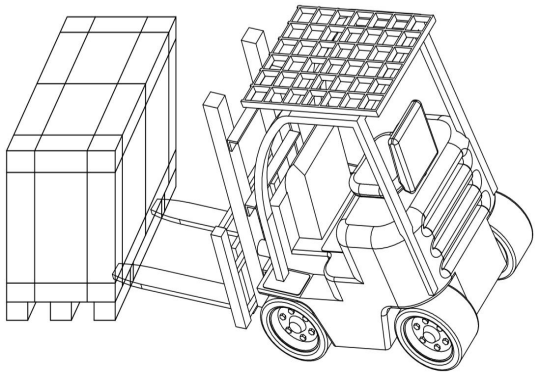
6.2 Project Site Module Transportation

If a flatbed truck is used to transport modules at the project site, the modules can be stacked in two layers for transport, as shown in Figure (1) Flatbed Truck Transport (except for loose packages).

If a forklift is used to transport modules at the project site, the modules can only be transported in a single stack after the upper and lower pallets are separated, as shown in Figure (2) Forklift Transport.



(1) Flatbed Truck Transport



(2) Forklift Transport

6.2 On-Site Storage

Place the on-site modules properly to prevent them from tipping over and being damaged. Jetion Solar modules are packaged in a vertical insertion method, with two packages placed vertically on each pallet; please separate the upper and lower pallets of the modules promptly upon arrival.

If temporary storage of modules is required, they must be stored in a dry, well-ventilated space at a temperature of 0-40℃ and a humidity of 30%-70%.

6.3 Unpacking

Correct unpacking method:

Step 1: Tear off the packing straps and stretch film, and open the top cover of the packing box.

Step 2: Two construction personnel shall sequentially lift the modules vertically from within the packaging box and remove them. The remaining modules inside the box should be tilted and leaned against the side with a support ledge.

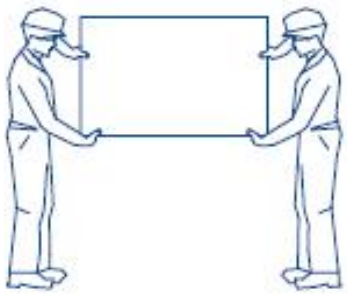


Illustration: How to handle modules

6.4 Module Handling

Modules must be carried and handled by two people using both hands; single-person or single-handed operation is not allowed. Do not lift the entire module by grasping the junction box or cables.

6.5 Others

Do not open the packaging before the modules arrive at the installation site, and protect the packaging from damage.

Please handle the cargo with care during loading and unloading. Do not place it on slopes or severely uneven ground to prevent the palletized modules from tipping over or falling. When stacking modules, do not exceed the maximum number of layers indicated on the packaging.

7. Maintenance and Cleaning

Do not arbitrarily modify the photovoltaic modules (diodes, junction boxes, plug connectors).

If there is sufficient inclination (at least 15°), it is usually unnecessary to clean the modules (rainwater will serve as a self-cleaning agent). If a module has severe dust accumulation, it will lead to a reduction in power output. We recommend wiping and cleaning the modules with plenty of water and a gentle cleaning tool (such as a sponge).

Please do not wipe or scrub when the dirt is dry, as this may cause scratches on the glass. We recommend performing regular inspections of the system.

Do not clean the modules with cold water during the hotter parts of the day to prevent damage from severe thermal shock.

Warning: Do not use detergents containing abrasives, acetone, or other corrosive ingredients.

8. Inspection

All fasteners are tight, secure, and not corroded.

All cable connections are secure, tight, and not corroded.

All connectors are undamaged.

Check the grounding resistance of all metal parts.

9. Warning

The maximum load of the module cannot exceed 30 lb/ft² (146.5 kg/m²). To avoid exceeding the maximum load, real-time loads in specific regions, such as wind and snow, should be taken into account.

We recommend that the maximum number of module strings in parallel should not exceed 2. When two or more modules or module strings are placed in parallel, each module string must use a series fuse. The number of modules connected in series must be determined based on the maximum system voltage of the inverter used, and the total open-circuit voltage of all series-connected modules should not exceed the system's maximum voltage.

Plug-in connectors have their own positive and negative polarity. Please ensure the connectors are secure and tight. Ensure that the electrical and mechanical properties are in good condition.

Plug-in connectors should not be subjected to extreme stress.

Do not pull hard on the connectors and cables. Tightly fastened cables can be loosened with a special tool (such as pliers).

Do not rotate the connector locknut.

Do not attempt to drill holes in the glass surface of the module.

Do not add mounting holes to the module frame.

Do not lift the module by the junction box or cables.

Do not use modules with broken glass or torn materials. Damaged modules cannot be repaired. Contact with any surface or the frame of a module may result in electric shock.

Do not install or handle modules when they are wet or during high winds.

Keep children away during the transportation and installation of mechanical and electrical components.

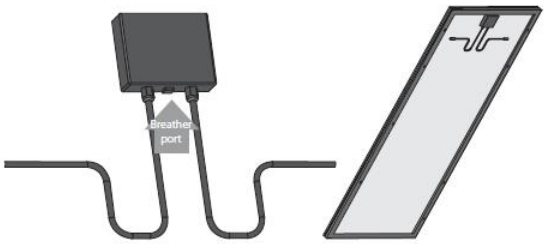
Do not strike or violently damage the module.

Avoid scratching or damaging the frame, front, or back of the module during handling and installation.

Do not stand or step on the module.

Do not place excessive objects on the module to avoid glass breakage.

When installing the module, the junction box must be at the higher end of the module.



Do not disassemble or drop the modules, and do not remove the manufacturer's nameplate or any modules.

Do not bend or twist the module.

Do not apply paint or adhesive to the front of the module.

Do not use sharp objects on the module.

Do not allow artificially concentrated sunlight to shine directly on the modules.

Rainwater and snowmelt can drain through the small holes on the backside of the module frame. Ensure that the small holes are not blocked during module installation and connection.

Do not wear rings, watches, metal jewelry, etc., during installation.

10. Danger Warning

Electric shock can be fatal!

Photovoltaic modules generate voltage and current when exposed to light. Although the voltage output of a single module is below the safety voltage, connecting multiple modules in series (adding voltages) or in parallel (adding currents) can create a hazard. Pay attention to the following points during operation to prevent fire, electrical sparks, and fatal electric shock.

Do not insert conductive objects into plugs and sockets!

Do not handle wet plugs and sockets when installing solar modules!

Exercise extreme caution when performing wiring work and use safety equipment (insulated tools, insulated gloves, etc.)!

Do not damage, disassemble, or mark the back of the modules with sharp objects!

Exercise extreme caution when wiring and installing the inverter. Ensure all operations follow the manufacturer's installation and user manual!

Electric arcs can be life-threatening!

The modules generate direct current when exposed to light. Electric arcs are generated when the circuit is connected and disconnected. Therefore, we recommend covering the modules with a light-blocking cloth during installation. This is especially important when the system circuit is disconnected (e.g., when disconnecting the inverter and cables under load), otherwise lethal electric arcs may occur.

When the inverter is connected to the power grid, do not disconnect the photovoltaic system from the inverter - first disconnect the DC-side fuse of the inverter!

Ensure that the connections are clean, uncontaminated, and that both electrical and mechanical connections are secure!