

# PV Module Installation Instructions

(Applicable to URE PV modules)



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## PV Module Installation Instructions

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### 1. Overview

This manual contains information on the installation, maintenance, and safe operation of PV modules produced by [United Renewable Energy Co., Ltd.\(URE\)](#)

Read and try to understand this note before installation. Professional installers are required to follow the instructions in the manual when installing the modules. If there is any problem please contact our sales department for help.

Before installing solar PV system, the installers need to familiarize with the requirements of mechanical and electrical aspects. Please keep this manual for later use.

### 2. Disclaimer Notices

- ◇ The installation, operation and use of [United Renewable Energy](#) series modules are beyond [United Renewable Energy](#)'s control. Thereby, [United Renewable Energy](#) does not undertake any loss, damage, injury and consequent costs caused by improper installation, operation, use and maintenance.
- ◇ [United Renewable Energy](#) does not undertake any responsibilities for the violation of patent, third-party rights and other uses of PV products.
- ◇ Any modification towards any patent or patent right is not allowable if there is no authorization.
- ◇ This manual is made based on [United Renewable Energy](#)'s technology and reliable experience, but the information and recommendations including product specifications do not constitute any warranty.
- ◇ [United Renewable Energy](#) keeps the rights of changing manuals, product information, technical specifications and product data without prior notice.

### 3. Safety Precautions

- ◇ The installation of solar photovoltaic systems requires professional skills and knowledge, thus the installation must be carried out by professionals.
- ◇ In the process of installation, the installers assumes the risk of injuries, including but not limited to the risk of electric shock.

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- ◇ When exposed to direct sunlight, a single module may produce more than 30V DC voltage. The exposure with 30V or higher DC voltage has potential risks.
- ◇ The electric arcs may occur when disconnecting or linking the photovoltaic modules exposed to the sunlight. This arc may cause burns, a fire or other problems.
- ◇ Do not disconnect the linking between the modules or between the modules and inverters in case of the load.
- ◇ The photovoltaic modules could convert the power energy into DC power. The modules could be applied for the ground, roofs, vehicles or boat and other outdoor environment. It is system designer and installers' responsibility to reasonably design the support structure.
- ◇ Do not disassemble the modules or remove other attached brands or parts.
- ◇ Do not spray or glue on the upper and lower surfaces of the modules.
- ◇ Do not use the mirror or other magnifying glass equipment to concentrate the sunlight artificially to the modules.
- ◇ It needs to comply with all the local, regional and national laws and obtain a construction permit when necessary in the process of installing the system.
- ◇ It needs to keep the children away from the system when transporting and installing mechanical and electrical components.
- ◇ During installation, it is necessary to completely block the modules with opaque materials so as not to generate voltages that exceed the safety range of the human body which may cause electric shock.
- ◇ Do not wear metal rings, watch straps, ear, nose, lip rings or other metal parts when installing or inspecting the photovoltaic system.



- ◇ The qualified insulating tools are the only choice for the electrical installation work.

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- ◇ Comply with the safety requirements of all other modules used in the system, including wiring lines and cables, connection devices, charging controllers, inverters, batteries and rechargeable batteries.
- ◇ Use the equipment suitable for solar power system, connection device, wiring lines and support frame only. In a particular photovoltaic system, use a type of module as much as possible and use the same type of the module in the same PV array only. Each input voltage of the same tracking system of each inverter must be equal and the same type of modules must be used.
- ◇ Under normal outdoor conditions, the current and voltage generated by the module are different from those listed in the parameter table. The parameter table is measured under the standard test conditions (1000w/m<sup>2</sup> irradiance, AM 1.5 spectrum, 25°C temperature), so when determining other modules' rated voltage, conductor capacity, fuse capacity, controller capacity and other parameters correlated to module output power, it should refer to the value of short-circuit current and open circuit voltage marked on the module and design and install the module according to the value of 125%.
- ◇ The modules should be used in the ambient temperature ( -40°C ~+85°C) area where the component is applicable.

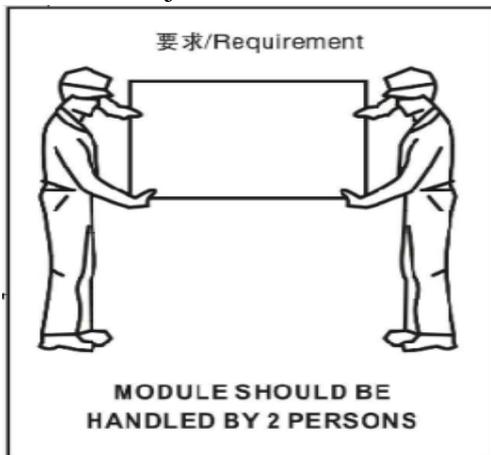
### 4. Unpacking and Storage

- ◇ When receiving the goods, you should check whether the goods delivered are indeed ordered goods: the outside of each box are marked with the product name, packaging box number, module barcode.
- ◇ The packaging carton should be stored in a clean, dry area, away from direct sunlight and moisture.

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- ◇ At the installation site, pay attention to keep clean and dry for the components, especially the electrical connections. If the connector cable is wet, the connections may be corroded, and the components that be corroded at any connections should not be used.
- ◇ If the tray is temporarily stored outside, please put a protective cover to prevent it from being directly affected by the weather.
- ◇ Two staff members are required to unpack the packaging carton. Be sure to use both hands when removing the modules. Do not carry the modules through the wires and junction boxes.



- ◇ If the modules needed to be temporarily stored outside, please protect the edge of the module well.
- ◇ It is forbidden to stand or walk on modules in any case.
- ◇ It is forbidden to drop or stack items on the modules.

### 5. Environment Conditions

- ◇ The double-glass modules can be installed in the following environment for more than 30 years

Ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

Operating Temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

Storage Temperature:  $-20^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

Humidity:  $<85\%RH$

Mechanical load strength: 5400Pa positive snow pressure, 2400Pa back wind pressure.

\*Note :

According to IEC31215, the maximum design load of the TUV evaluation module is less than 5400Pa.

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The installation method is very important for the mechanical load. Failure to follow the installation of this manual will result in different snow pressure and wind pressure load capacity.

The system builder needs to ensure that the installation is in accordance with local laws and regulations.

### 6. Mechanical Installation

#### ➤ Site Selection

- ◇ In north latitude area it is best to face south for the module, while in south latitude area, it is best to face north. It is best that the front of the module is perpendicular to the direction of the midday sun light.
- ◇ The module is recommended to be installed at an optimum angle of inclination for maximum capture of sunlight. According to the right hand helical law, basically the same latitude as the installation site, facing the equator. The design must be based on local conditions and choose the best inclination.
- ◇ When installing solar modules on the roof, be sure to maintain a safe working area between the edge of the roof and the solar arrays. There must be a certain safety distance between arrays of large power stations in order to facilitate the cleaning, inspection, and maintenance of the modules inside the array.
- ◇ The modules can be installed horizontally or vertically, but the horizontal installation method can minimize the shading effect of dust on the solar panels. When installing, choose a location where the sunlight can be fully illuminated and ensure that it cannot be blocked at any time.
- ◇ The modules can not be used in the vicinity of the equipment or place where the flammable gas is generated or stored.
- ◇ The modules can not be installed in the environmental area where module defects are caused by various chemical reactions, such as acid rain, alkaline gas, salt mist, etc.
- ◇ The modules can not be installed in the environmental area that exceeds the maximum system voltage of the modules, such as high-voltage power lines. The module's position should be maintained at a safe distance from the high-voltage power while the safe distance is determined by the high voltage level.
- ◇ If the modules are to be installed on the floor of a dwelling, local regulations such as fences should be complied with (the fences should be kept at a certain distance from the array to avoid shading impact of the fence on the array).

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◇ Do not install the PV modules in places that may be immersed in water or continuously exposed to sprinklers or fountains.

### ➤ Mounting Bracket Options

◇ When installing the modules on the bracket, the pillar and module installation structure should be chosen those can withstand the local expected earthquake level.

◇ The bracket structure must be made of a durable, anti-corrosion, anti-ultraviolet materials.

### ➤ Module Installation

◇ When the modules is installed on buildings or roofs, it needs to ensure that they are securely fastened and will not be damaged by strong wind or snow.

◇ Ensure that the back of the modules good ventilation for cooling the modules.

◇ When installing the modules on the roofs, make sure the roof structure is suitable.

In addition, the roofs must be properly sealed to prevent leakage.

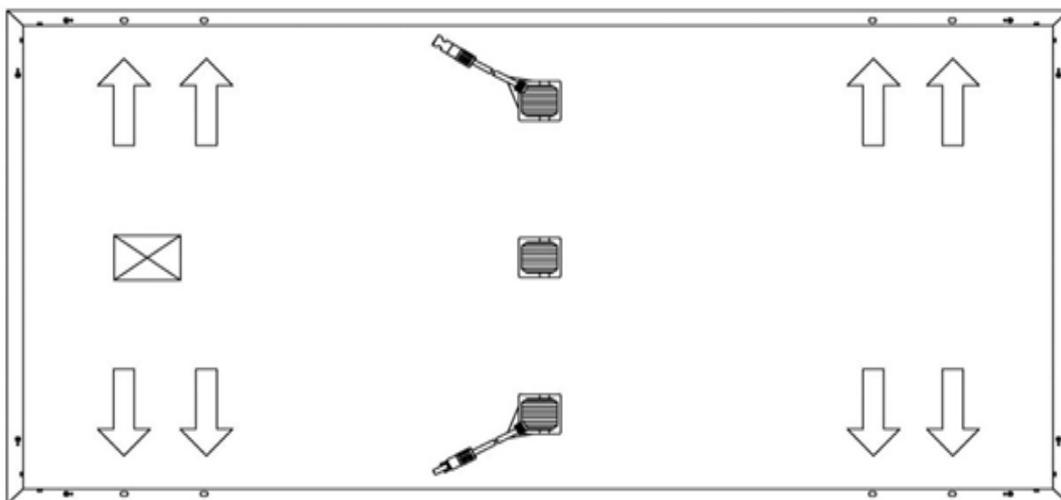
◇ The gap between the module frame and the wall or roof should be at least 115mm.

If there are other installation methods, it may affect the assessment of fire rating.

◇ The spacing between two modules should be at least 10mm.

◇ The installation can not block the module' drain hole.

◇ In normal installation cases, four symmetrical mounting holes inside the border are used for securing the modules to the bracket. If the installation is expected to have a higher wind or snow-resistant requirements, then it could use eight mounting holes to strengthen. See the figure below for more information. The load calculation needs to be made by system designer or installers.



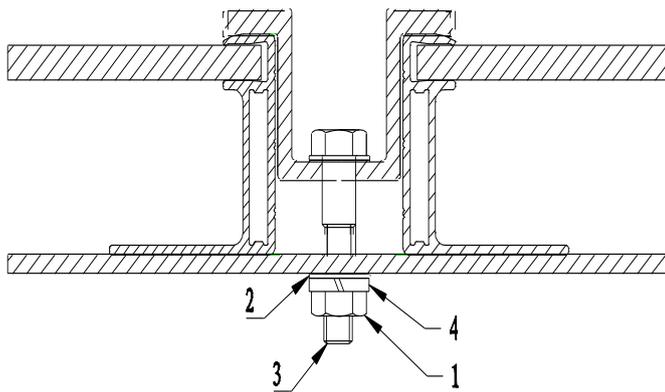
The arrow marks the mounting hole location

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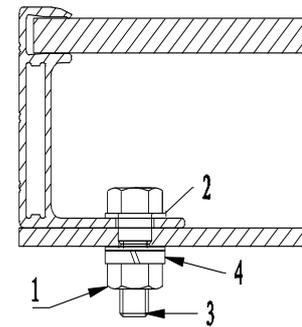
### ➤ Installation Method

There are two ways to install the modules: Figure A shows a lock block clamp type and Figure B shows a back bolt fixed type.

Example A: Fixture Fixed



Example B: Bolt Fixed



- 1) stainless steel nut
- 2) stainless steel washers
- 3) M8 stainless steel bolts
- 4) spring washer

As shown in the example, the tightening torque (stainless steel bolts with M8) must be 8-10N.m. Use the holes that already exist on the modules to secure the modules and not allow further drilling (doing so will no longer provide warranty). Use a suitable corrosion-resistant fastening material.

### Precautions during installation

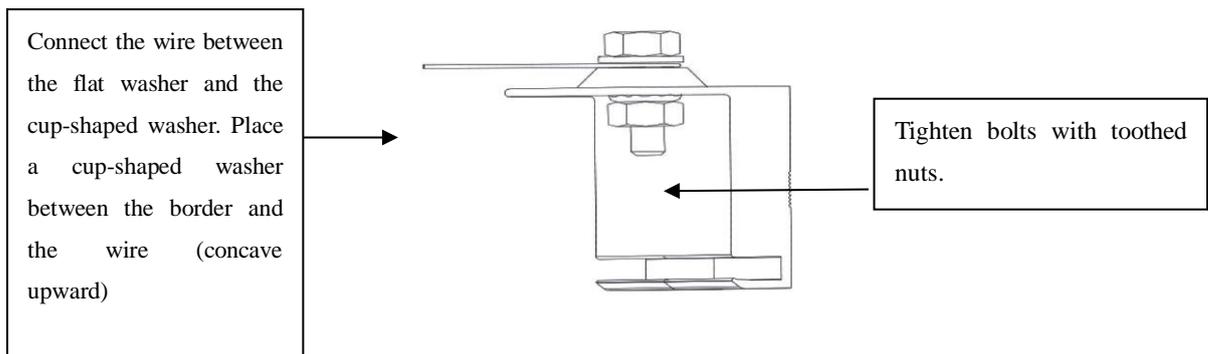
- ◇ When carrying the modules, two hands are required to grasp the modules and keep a level of stability. It is forbidden to shake severely, carry the module by one person, drag the module, pull the connecting lines of junction box and handle two and more modules.
- ◇ Place the modules on a flat ground, place the cardboard in the bottom and the glass surface is forbidden to directly touch the ground.
- ◇ When the module is placed on the ground, it is forbidden to stack debris, step on, sit down and have other actions that may cause deformation for the module.
- ◇ Do not step on the module during installation. Do not drag the module on the bracket.
- ◇ Other incorrect transportation or installation those may damage the modules.

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### 7. Electrical Installation

#### ➤ Grounding Connection

- ◇ The modules need to be grounded, although it has been confirmed that the module meets the security level II and it meets local electrical directives and regulations.
- ◇ The grounding connection operation should be carried out by a qualified electrician.
- ◇ Use the suitable grounding wire to connect the modules' frame to each other and it is recommended to use 4-14 (the 10mm<sup>2</sup>) mm<sup>2</sup> copper conductor (AWG 6-12) as the grounding conductor. The grounding hole of the module uses grounding identification. All conductive connection points must be securely connected.
- ◇ Stainless steel material shall be used for bolts, nuts, washers, lock washers or other related parts unless otherwise specified.
- ◇ The following grounding method is recommended.
- ◇ Bolt + toothed nut + cup washer



- ◇ In accordance with the above diagram, the copper conductor is connected to the grounding hole of the module frame through grounding parts (M5 stainless steel cover bolts, M5 stainless steel flat washers, M5 stainless steel cup-shaped washers, M5 stainless steel toothed nut) and connect flat washer and cup-shaped washers by the wire. Ensure that the cup-shaped washers are between the frame and the wire and concave faces up to prevent current corrosion. Tighten the bolts securely by stainless steel toothed nuts. Torque wrenches may be used during installation. The tightening torque of the nut is 3~7nm.
- ◇ The modules' installation could use grounding device registered by the third-party to ground the metal frame of the modules. The device must be installed in accordance with the installation instructions of grounding device manufacturer.

#### Test, Debugging and Troubleshooting

- ◇ The serial modules are connected to the test before the system. Use digital multimeter (recommended Fluke 170 series or digital multimeter which DC range can reach 1000V) to check open-circuit voltage of the series modules. The

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measurement value should be equal to the sum of the open-circuit voltage of a single module and you will find the rated voltage in the technical specification of the type module you are using.

- ◇ Low voltage troubleshooting. Identify the normal low voltage and fault low voltage. The normal low voltage mentioned here refers to the decrease of the open circuit voltage of the module caused by the temperature increase of the solar cell or the decrease of the irradiance. Fault Low voltage is usually caused by improper terminal connection or bypass diode damage.

### ➤ Blocking Diode and Bypass Diode Troubleshooting

- ◇ Blocking diodes could prevent current from flowing from the battery to the module when the module is not generating current. If you do not use the charge controller, it is recommended to use blocking diodes. About charge controller, please consult a professional dealer.
- ◇ In the system, hot spot effect occurs when part of the module is blocked and other parts are exposed to the sunshine and thereby lead to overheat of the battery and damage the module. Using bypass diodes in the module protects the module from being affected by this excessive reverse current. All modules those rated power are more than 55 watts have a bypass diode integrated in the junction box.

### ➤ On-grid Electrical System

- ◇ Try to use the same modules in a photovoltaic system with maximum number of the modules.
- ◇  $(N) = V(\max) / [V_{oc}(\text{atSTC})]$
- ◇ Several modules in series, and then form a PV array in parallel, which is particularly suitable for high voltage situations. If the modules are connected in series, the total voltage is equal to the sum of the voltages of the individual modules.
- ◇ In the case of using high current, you can put several PV modules in parallel, the total current is equal to the sum of the current of each module.
- ◇ The module can provide prefabricated connectors for system's electrical connections. As for cable size, type and temperature and other parameters' choice, please refer to the relevant rules.
- ◇ The cable cross-section surface and connector's size must meet the maximum system short-circuit current, otherwise the cables and connectors will overheat because of excessive current and has the danger of burning!
- ◇ When installing, the junction box's one end to be upward to avoid being rained.

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- ◇ Protect yourself from electric shock when debugging or repairing the solar system. Wear protective gloves and insulated shoes and other protective equipment. Use special electrician tools for repairs.

### 8. Maintenance

- ◇ To ensure the best performance of the solar panels, [United Renewable Energy](#) provide the following maintenance measures:
- ◇ The solar panel should be cleaned in the morning or evening when the power is low or no power is processing.
- ◇ Clean the glass surface when necessary through clean water and soft objects. The neutral detergent should be used for cleaning while the acidic or alkaline or abrasive detergent is forbidden.

For large-scale systems, when considering whether all of the dust and deposits on the solar cell array should be cleaned or not, factors such as cleaning costs, increased energy output after cleaning, and the time it takes to get dirty again after cleaning need to be taken into consideration. If you are not sure whether the array or its sections need to be cleaned or not, you should firstly select the heavily polluted array string and then measure and record the inverter's input current from that string.

- 1) Clean all the modules within a string.
  - 2) Measure the input current of the inverter again and calculate improvement percentage after the cleaning.
  - 3) If the improvement degree is less than 5%, it is usually not worthy to pay the cost for cleaning.
- ◇ In case of rainy weather, do not deliver the electricity if the inverter or other electrical equipment is power off. It is better to check and ensure that there is no problem in the lines before sending the electricity.
  - ◇ When cleaning, the solar panel cannot be washed with a high-pressure water gun for avoiding line leakage caused by excessive pressure in the connection place of the solar panel.
  - ◇ Conduct a mechanical and electrical inspection for every six months and ensure that the surface is clean and the connection is reliable.
  - ◇ If any other abnormal situation occurs, please consult factory or experienced engineer.
  - ◇ Observe the maintenance instructions for all parts used in the system, such as bracket, charge controller, inverter, solar cell, etc.