

# Installation Manual for KESUN Solar PVT Modules

## Regular Modules



### Safety Notes

- *This manual elaborates on installation and safety use information for PVT power generating modules (hereinafter referred to as module) of Zhejiang Kesun New Energy Co., Ltd.. (hereinafter referred to as KESUN). Please abide by all safety precautions in this guide and local regulations.*
- *Installation of modules requires professional skills and knowledge and is to be carried out by qualified personnel. Please read this manual carefully before installing and using this module. Installation personnel shall get familiar with mechanical and electrical requirements of this system. Please keep this manual properly as reference for future maintenance or upkeep or for sales and treatment of modules.*
- *If you have any doubts, please contact KESUN global quality and customer service department for further interpretation.*

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## **1 Introduction**

### **First thank you very much for choosing KESUN PVT modules!**

This installation manual covers key electric and mechanical installation information, so please understand such information before installing KESUN modules. In addition, this manual also covers some safety information that you shall get familiar with. All contents in this manual are intellectual properties of KESUN which originates from long term of technical exploration and experience accumulation of KESUN.

This installation manual does not entail any explicit or implicit quality warranty and does not stipulate on compensation schemes for losses, module damages or other costs caused by or related to module installation, operation, utilization and maintenance process. If patent rights or the third party rights are infringed by use of modules, KESUN will not take any responsibility. KESUN reserves the rights for modifying product manual or installation manual without notice in advance.

If customers fail to install modules as per requirements set forth in this manual, the quality warranty provided for customers during sales will become invalid. In addition, suggestions in this manual are to improve safety of module installation, which are tested and proved by practices. Please provide this manual to PVT system users for reference to and advise them of safety, operation and maintenance requirements and suggestions.

## **2 Laws and regulations**

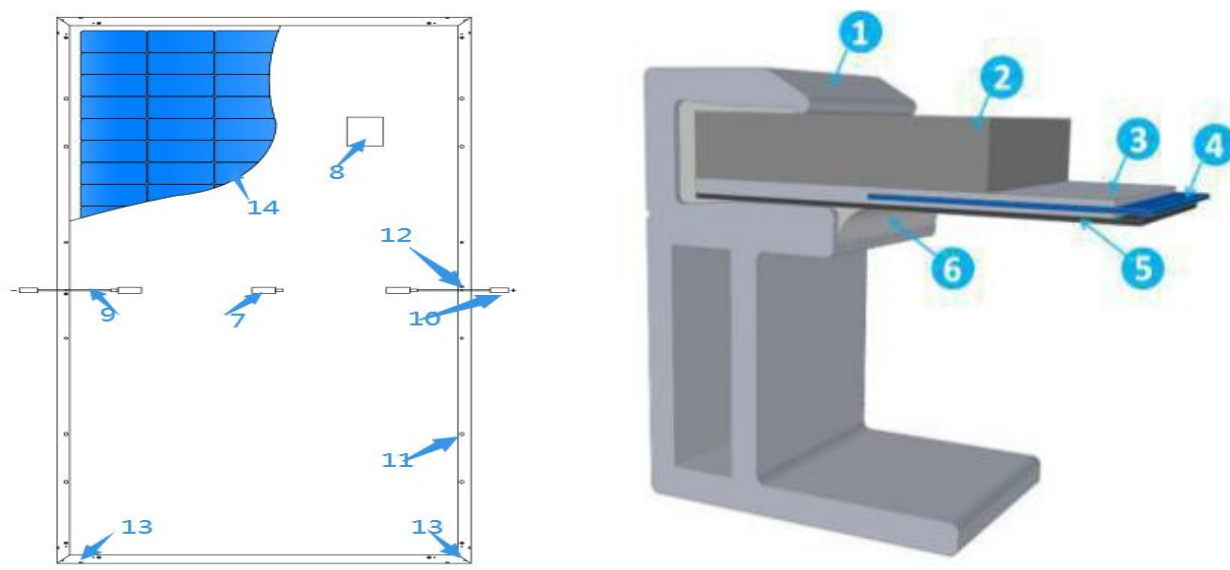
Mechanical and electrical installation of PVT modules shall follow proper regulations such as electric law, building law and electric connecting requirements. These regulations differ with different installation sites, such as building roofing installation, vehicle-mounted application. Requirements may also differ with installation system voltage, DC or AC. See specific clauses in local authorities.

## **3 General information**

### **3.1 Module identification**

Each module is pasted with 3 labels providing information below:

1. Nameplate: It describes product type, standard rated power, rated current, rated voltage, open circuit voltage, short circuit current under testing conditions, certification indicator, maximum system voltage, etc.
2. Current level label: Divide modules as per their optimal working current and there are values: H, M or L (H means the highest current level). The best practice is to install modules with the same current level (such as H) in one strand in the process of installation.
3. Serial No.: Each module has a unique serial number which is solidified inside the module permanently and it can be seen from front top of the module. Each serial number is put in before laminating of the module.



|    |                      |    |                    |    |                |    |                |
|----|----------------------|----|--------------------|----|----------------|----|----------------|
| 1  | Aluminum alloy frame | 2  | PVT tempered glass | 3  | Packaging EVA  | 4  | Cells          |
| 5  | Back plate or glass  | 6  | Silica gel         | 7  | Connecting box | 8  | Nameplate      |
| 9  | Cables               | 10 | Connector          | 11 | Mounting hole  | 12 | Grounding hole |
| 13 | Leakage hole         | 14 | Cell               |    |                |    |                |

**Figure 1 Module Section Structure and Components**

## 3.2 Regular safety

KESUN module is considered to be in compliance with IEC61215 and IEC61730 only when the module is mounted in the manner specified by the mounting instructions below.

When the module is installed on roof, it is necessary to take the overall fire rating of the finished structure as well as later overall maintenance into account. The roofing PVT system shall be installed after assessment by construction experts or engineers and with official analysis results for the entire structure. It shall be proved capable of supporting extra system bracket pressure, including PVT module weight.

For your safety, please do not work on the roof without safety protective measures which include but not limited to fall protection, ladder or stair and personal protective articles.

For your safety, please do not install or handle modules in unfavorable conditions including but not limited to strong wind or gust, damp or sandy roofs.

### **3.3 Electric performance safety**

PVT products will produce DC in the sunlight, so there may be electric shock or burning when touching module connecting line metals. 30V DC voltage or higher voltage can be fatal.

In case of no connected load or external circuits, modules can also produce voltage. Please use insulation tools and wear rubber gloves when operating modules in the sunlight.

PVT modules do not have switch. PVT modules can only stop work when they are kept from sunlight or covered by cloth, hard board or light-proof materials or when front side of modules are placed on smooth and flat surfaces.

To avoid electric arc or electric shock hazards, please do not break down electric connection in loaded conditions. Wrong connections will also lead to electric arc or shock. Keep connectors dry and clean and make sure that they are in good working condition. Do not insert other metals into the connectors or carry out electric connection by whatever means.

Snow and water in surrounding environments will intensify light reflection and lead to increase of current and output power. And module voltage and power will increase under low temperature.

If module glass or packaging materials are damaged, please wear personal protective articles and isolate modules from the circuit.

Working is only allowed in dry conditions by means of dry tools. Do not operate when modules are wet unless you wear the proper electric shock protection device. Please operate following the cleaning requirements in this manual when cleaning modules.

### **3.4 Operation safety**

Do not open KESUN Package in transportation and storage process unless the modules arrive at the installation site.

Do not damage the package and do not make packaged modules on pallet fall directly.

Do not exceed the highest layer limit indicated on the packaging carton when piling modules

up.

Put packaging carton in the ventilated, rain-proof and dry places before unpacking of modules. Open KESUN's packaging carton following unpacking instructions.

Do not hold the connecting box or wires to lift the entire module in any cases.

Do not stand or walk on modules.

Do not pile one module onto another.

To avoid glass damage, do not put heavy objects on module glass.

Be careful when placing modules on a surface and at corners in particular.

Do not try to unpack the module or remove nameplate or parts of modules.

Do not paint surface of modules or apply any other glues.

Do not damage, grad or scratch back film of modules.

Do not drill frame of modules, which may reduce frame loading capacity or lead to frame corrosion.

Do not scratch anodic coating of aluminum alloy frame except for grounding connection.

Scratch may lead to frame corrosion and reduce frame loading capacity.

Do not repair glass or modules whose back film is damaged on your own.

### **3.5 Fire safety**

Please consult local laws and regulations before installing modules and abide by requirements on building fire protection. Fire rating of KESUN single glass modules is Class C and double glass modules is Class A according to IEC61730. Always refer to the respective IEC certification of the specific module type to confirm the correct fire class.

The roof shall be coated with a layer of fireproof materials of such rating for roofing installation and make sure that the back plate and the mounting surface are fully ventilated.

Difference of roofing structures and installation modes will affect fireproof performance of buildings. Improper installation may lead to fire disasters.

To guarantee roof fire rating, the module frame shall be at least 10cm from the roof surface. Adopt proper module accessories such as fuse, circuit breaker and grounding connector according to local regulations.

The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.

Please do not use modules if there are exposed inflammable gases nearby.

## 4 Installation conditions

### 4.1 Installation site and working environments

The modules can only be used on earth but not in outer space.

Do not focalize sunlight with mirrors or magnifying glass artificially onto modules.

KESUN modules shall be installed on proper buildings or other appropriate places (such as ground, garage, building outer wall, roof, PVT tracking system) but shall not be installed on any mobile vehicles.

Do not install modules at such places as that are possible to be submersed.

KESUN suggests that modules be installed in the working environment with the temperature of -20 to 46 which is the monthly average highest and lowest temperature of the installation places. The extreme working environment temperature for modules is -40 to 85.

Make sure that installed modules do not suffer wind or snow pressure that exceeds the permissible maximum load.

Modules shall be installed in places free from shades throughout the year. Make sure there are no light-blocking obstacles in the installation places.

Carry out lightning protection for modules installed in places with frequent lightning and thunder.

Do not install modules in places with possible inflammable gases.

According to salt mist corrosion testing of photovoltaic (PVT) in IEC 61701, KESUN SOLAR double glass modules can be installed in corrosive salt areas within proximity of the ocean. The module must not be soaked in the water or in the environment (i.e., fountain, spindrift, etc.) where the module would touch water (pure water or brine) for a long term. Modules can not be used in environments with too much hails, snows, flue gas, air pollution and soot or in places with strong corrosive substances such as salt, salt mist, saline, active chemical steam, acid rain, or other substances corroding modules. If the modules are placed in an environment of salt fog (i.e., marine environment), there is a risk of corrosion.

Please take protective measures to ensure reliable and safe installation of modules in severe environments such as heavy snow, cold and strong wind or islands close to water and salt mist or deserts.

## **4.2 Selection of tilt angles**

Tilt angle of modules: Included angle between module surface and horizontal surface; the module will obtain the maximum power output in direct facing of sunlight.

Modules are preferred to be south-facing in the north hemisphere and north-facing in the south hemisphere.

A specific installation angle shall be determined according to installation guide for standard modules or suggestions from PVT module installer.

KESUN suggests that module installation tilt angle be no less than  $10^{\circ}$  so module surface dust can be washed away easily by rainfall and times of cleaning can be reduced. And it is easy for ponding to flow away and avoid water print on the glass due to long time of water ponding which may further affect module appearance and performance.

## **5 Mechanical installation**

### **5.1 Regular requirements**

Make sure that module installation mode and bracket system are solid enough to bear the expected load, which is requisite assurance that the bracket installer must provide. Installation bracket system shall be tested and inspected by the third party testing institution with static mechanical analysis capacity in accordance with local national or international standards.

Module bracket shall be made from durable, corrosion resistant, ultraviolet proof materials. Modules shall be fixed on the bracket solidly.

Use higher brackets in places with heavy snow accumulation so the lowest point of modules will not be covered by snow for a long time. In addition, make the lowest point high enough so as to avoid sheltering of vegetations and woods or damage of flying sands and stones.

If modules are installed on brackets parallel to the roof or wall, the minimum gap between the module frame and the roof, wall shall be 10cm for air ventilation so as to prevent module line damage.

Do not make holes on glass or frame of modules.

Make sure the building is suitable for installation before installing modules on roof. Moreover, seal permeable parts properly to prevent leakage.

The module frame has thermal expansion and cold contraction so the frame interval between two adjoining modules shall be at least 10mm.

Make sure that back plate of modules will not contact bracket into the module or building structures, especially when the module surface is imposed by pressure.

KESUN Solar Modules have been certified for a maximum design static load on the back of the Modules of up to 1600Pa\*1.5 (i.e. wind load) and a maximum design static load on the front of the Modules of up to 3600Pa\*1.5 (i.e. wind and snow load), depending on the clamp mounting (please refer to follow installing data for this information). And this is printed on the label of modules.

Module installation methods must prevent electrochemical corrosion between module aluminum frame and different metals. Electrochemical potential difference of contacting metals shall not exceed 0.6V as is recommended in IEC61730 Appendix Flat Plate Photovoltaic Modules and Panels.

Modules can be installed horizontally or vertically.

## **5.2 Way of installation**

Module and bracket system connection can be realized by clamp or embedded systems. Installation shall follow the demonstration and suggestions below. If installation mode is different, please consult KESUN and obtain approval. Otherwise, modules may be damaged and quality warranty will become invalid.

### **5.2.1 Use clamps to install modules**

Use the special clamp to install modules. See Figure 3.

A. Fix modules on the bracket by metal clamp. The following clamps or those clamps recognized by module system installer are recommended.

Width: no less than 40mm;

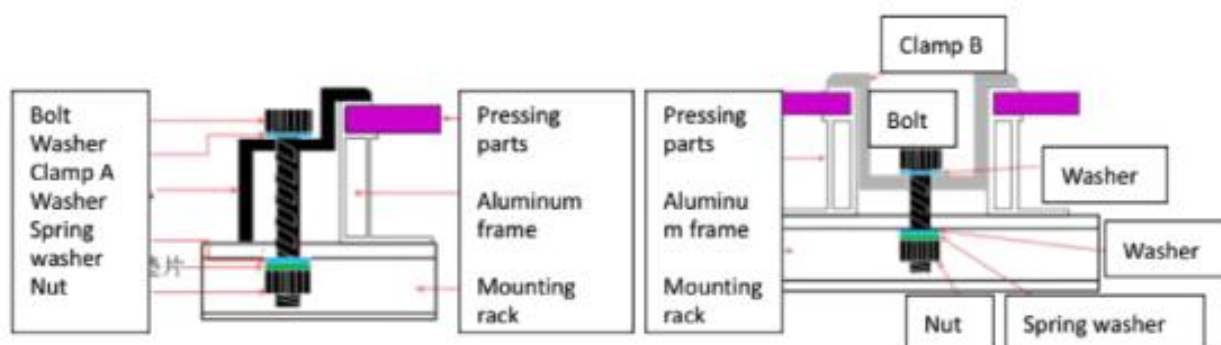
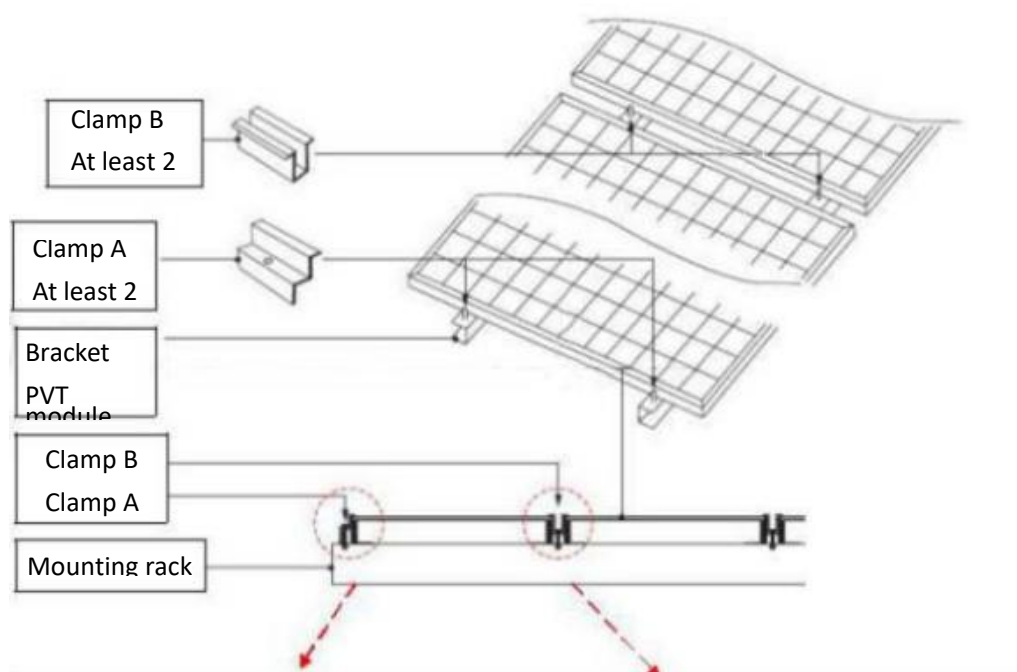
Thickness: no less than 3mm;

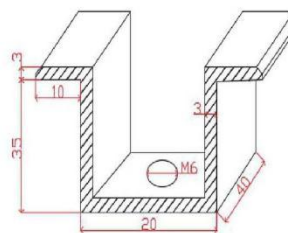
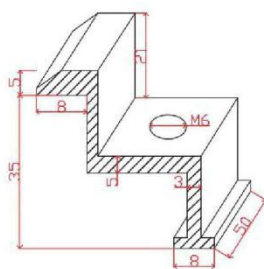
Material: aluminum alloy;

Bolt: M6.

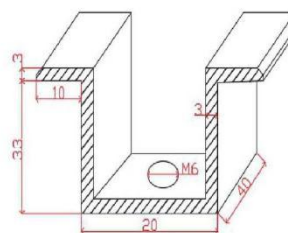
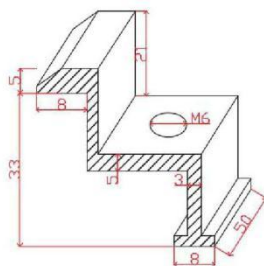
B. Torque range for bolt fastening: 18N•m to 24N•m

C. The clamp shall not contact glass or make module frame deformed in any case. The contacting surface of the clamp and frame front side shall be neat and smooth. Otherwise, frame and module may be damaged. Make sure that the clamp will not produce shading effect. Drain holes can not be sheltered by the clamp.

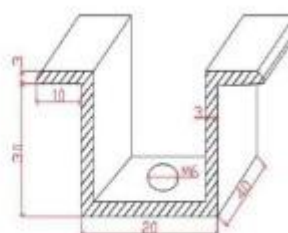
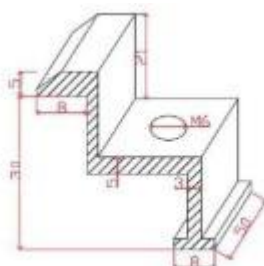




Applicable to B side 35mm frame



Applicable to B side 33mm frame



Applicable to B side 30mm frame

Clamp A for tail end module edge

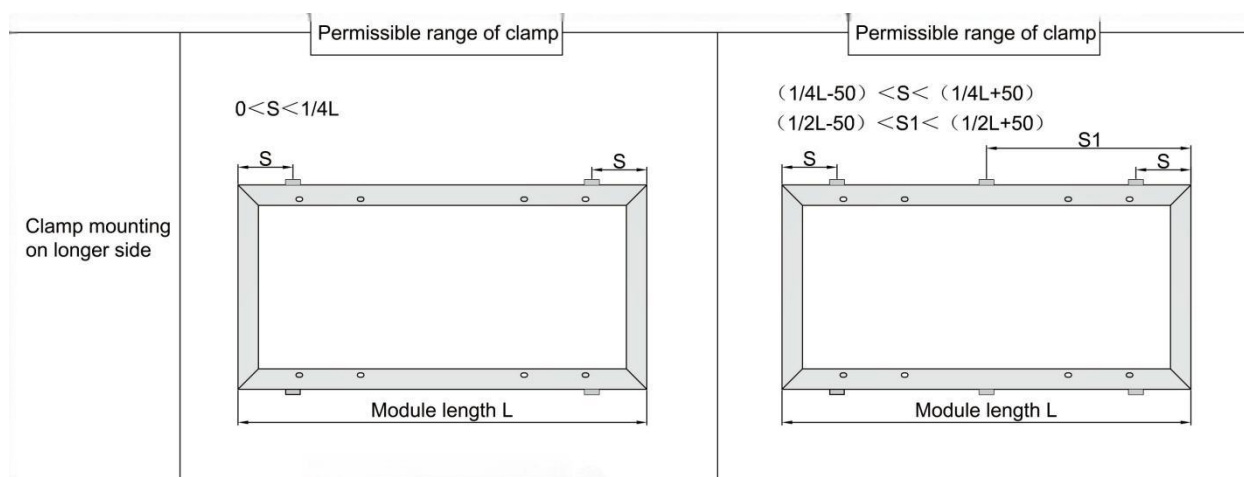
Clamp B for middle modules

**Figure 3** Clamp Illustration (unit: mm)

## 5.2.2 Position of installation connecting points

- ✧ Low/normal load working condition applies to most environments: the maximum static load for backside is 2400Pa (equal to wind pressure) and the maximum static pressure for the front side is 2400Pa (equal to wind pressure and snow pressure).
- ✧ Higher load applies to severe environments (such as wind storm, heavy snow): the maximum static load for backside is 2400Pa (equal to wind pressure) and the maximum static pressure for the front side is 5400Pa (equal to wind pressure and snow pressure). This is also the highest requirement for pressure specified in the IEC standards.

- ✧ The connection of the module to the racking system can be created through the mounting holes, with clamps, or an embedded system on the frame. The modules must be installed according to the following examples and recommendations. If a different installation method is desired, please contact KESUN SOLAR customer service or technical support team for consultation. Improperly mounted modules maybe damaged. If alternative mounting method is used and not approved by KESUN SOLAR, the modules will not continue to have a valid warranty.



**Figure 4** Position requirements of connecting points

## 6 Electric installation

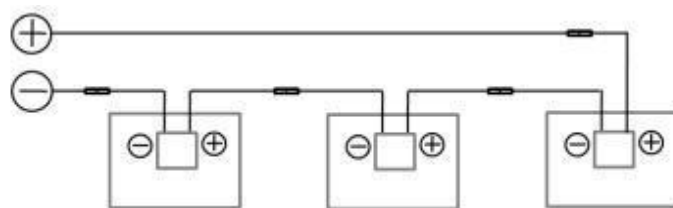
### 6.1 Electric performance

Module electric performance parameters such as  $I_{sc}$ ,  $V_{oc}$  and  $P_{max}$  nominal values have  $\pm 3\%$  error with those under standard testing conditions of: irradiance of  $1000 \text{ W/m}^2$ , cell temperature of  $25^\circ\text{C}$  and air mass of AM1.5.

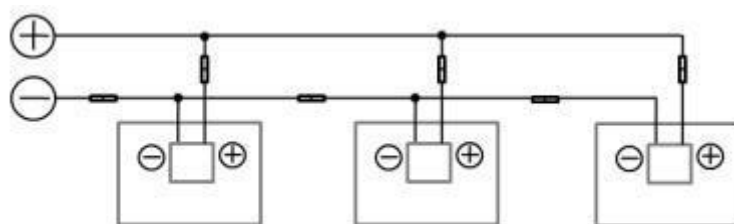
Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. The requirements of the National Electrical Code (NEC) in Article 690 shall be followed to address these increased outputs. In installations not under the requirements of the NEC, the values of  $I_{sc}$  and  $V_{oc}$  marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, overcurrent device ratings, and size of controls connected to the PVT output.

When modules are in series connection, the final voltage is sum of that of the single module. When modules are in parallel connection, the final current is sum of the single module. See Figure 5

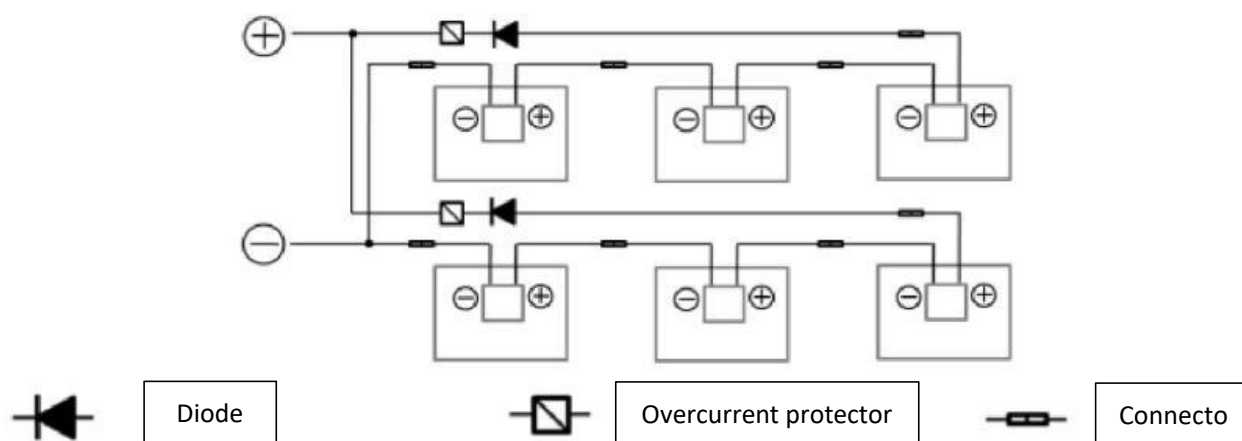
Modules with different electric performance models can not be connected in one series. Serial connection



Parallel connection



Parallel connection after series connection



**Figure 5:** Series connection and parallel connection circuit diagram

The number of modules in series connection in each strand shall be calculated as per requirements. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value stipulated for modules (KESUN module maximum system voltage is DC1500V according to IEC61730) and other values required by DC electric parts.

If modules are connected in series, the total voltage is equal to the sum of individual voltages. The recommended system voltage is as below,

$$\text{System voltage} \geq N \cdot V_{oc} [1 + TC_{Voc} \cdot (T_{min} - 25)]$$

If the modules are connected in parallel, the recommended number of modules in parallel is:

maximum series fuse rating,  $I_{sc}+1$

Where

N module numbers in series

Voc Open circuit voltage (refer to product label or data sheet)

TCVoc Temperature coefficient of open circuit voltage (refer to product label or data sheet)

Tmin Minimum ambient temperature

Maximum series overcurrent protective device, where required.

If there is reverse current exceeding the maximum fuse current flowing through the module, use overcurrent protection device with the same specifications to protect the module; if parallel connection strands are more than 2, there shall be an overcurrent protection device on each strand of module. See Figure 5.

## 6.2 Cables and connecting lines

In module design, adopt enclosed connecting junction boxes with the protective level of IP68 for on-site connection to provide environmental influence protection for wires and connections and contacting protection for non-insulating electric parts. The connecting box has well connected cables and connectors with the protective level of IP68. These designs facilitate parallel connection of modules. Each module has two independent wires connecting the connecting box, one is negative pole and the other is positive pole. Two modules can be in parallel connection by inserting the positive pole at one end of wire of one module into the negative pole of the adjoining module.

Cables connecting modules shall satisfy the module maximum short circuit current. Adopt the special PVT system sunlight resistant cables.

The minimum standards of cables connecting modules are:

| Testing standards | Wire diameter    | Temperature range | Voltage |
|-------------------|------------------|-------------------|---------|
| IEC62930          | 4mm <sup>2</sup> | -40°C to +85°C    | 1500V   |

When cables are fixed on the bracket, avoid mechanical damage to cables or modules. Do not press cables by force. Adopt special designed light resistant wires and clamps to fix cables on the bracket. Though cables are light resistant and water proof, it is still necessary to prevent cables from direct sun radiation and water immersion.

## 6.3 Connector

Please keep connectors clean and dry. Make sure connector nuts are fastened before connection. Do not connect connectors that are damp or dirty or under other status. Protect connectors from direct sun radiation and water immersion or fall onto ground or roof.

Wrong connection may lead to electric arc and electric shock. Please make sure that all electric connection is reliable. Make sure all connectors with lock are fully locked.

## 6.4 Bypass diode

KESUN solar module connecting junction boxes contains bypass diode which is in parallel connection with the cell string. If heat spot occurs locally within the module, the diode will come into operation to stop the main current from flowing through the heat spot cells with the view to restrain module heating and performance loss. But bypass diode is not the overcurrent protection device.

If the diode is found or doubted to get out of order, the installer or system maintenance supplier shall contact KESUN. Please do not try to open the module connecting box on your own.

## 7 Grounding

In design of modules, the anodized corrosion resistant aluminum alloy frame is used for rigidity support. For safety utilization and to protect modules from lightning and static-electricity damage, the module frame shall be grounded.

The grounding device shall be in full contact with inner side of the aluminum alloy and penetrate the frame surface oxide film.

Do not drill additional grounding holes on module frame.

Module installation methods must prevent electrochemical corrosion between module aluminum frame and different metals. Electrochemical potential difference of contacting metals shall not exceed 0.6V as is recommended in IEC61730 Appendix Flat Plate Photovoltaic Modules and Panels.

The module frame includes pre-drilled grounding holes, which are identified by grounding symbols. These holes are only used for grounding but not for installation of modules.

A module with exposed conductive parts is considered to be in compliance with IEC61730 only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.

Where common grounding hardware (nuts, bolts, star washers, split-ring lock washers, flat washers and the like) is used to attach a listed grounding, bonding device, the attachment must be made in conformance with the grounding device manufacturer's instructions.

KESUN recommends must thoroughly detail the attachment means in the module installation instructions.

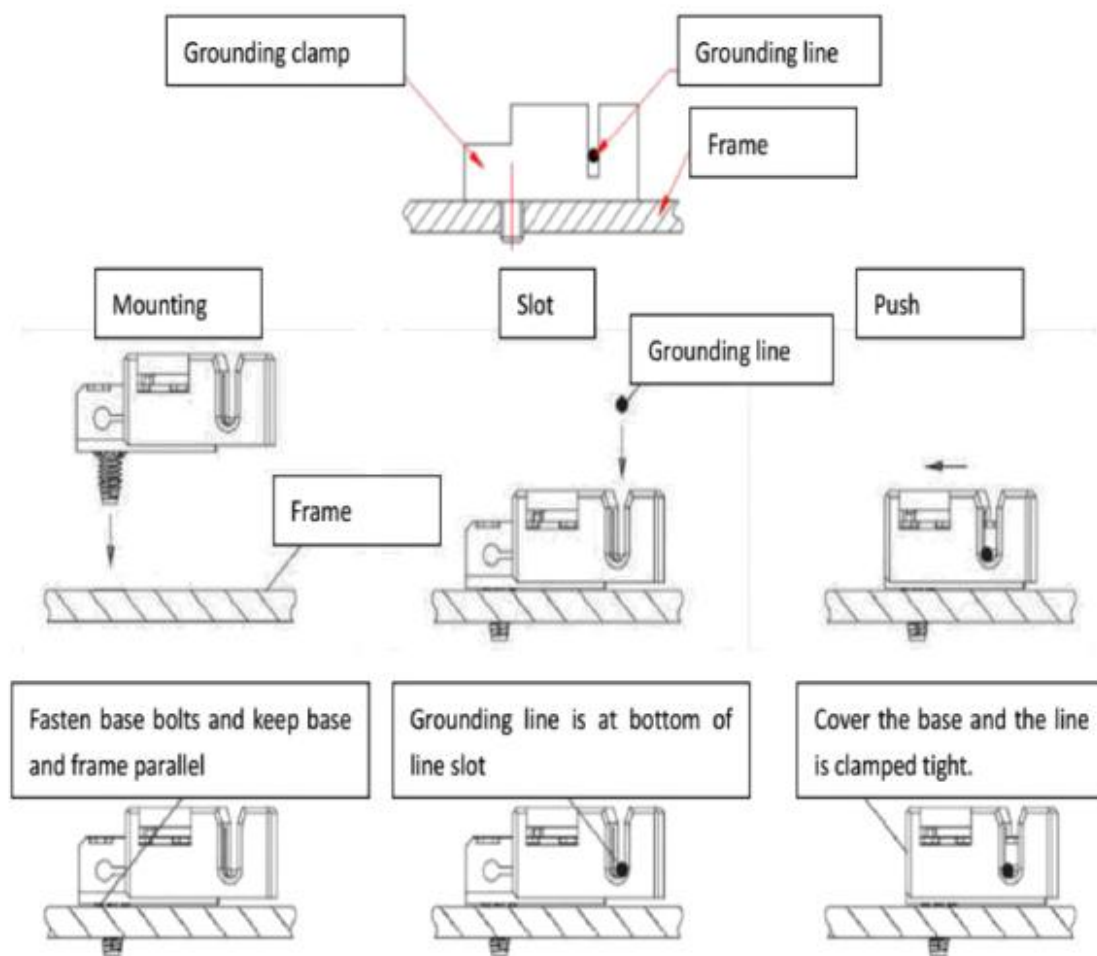
Common hardware products, such as nuts, bolts, star washers, and locking washers, have not undergone conductivity evaluation and cannot be used as grounding devices. They can only be used to maintain mechanical connections and to secure electrical grounding devices in appropriate conductive positions. These devices, if supplied together with the components and have passed evaluations in accordance with IEC 61730 standard requirements, can then be used for grounding connections according to the instructions provided with the components.

Grounding methods below are permissible:

## **7.1 Grounding by grounding clamp**

There is a grounding hole with the diameter of Ø4.2mm at the edge of the module back frame. The central line of the grounding sign and that of the hole overlaps and is consistent with the frame length direction.

Grounding between modules shall be confirmed by qualified electricians and grounding devices shall be manufactured by qualified electric manufacturer. The torque is recommended to be 2.3N•m. 12 AWG copper core wire is used for the grounding clamp. And copper wires can not be pressed damaged in installatio



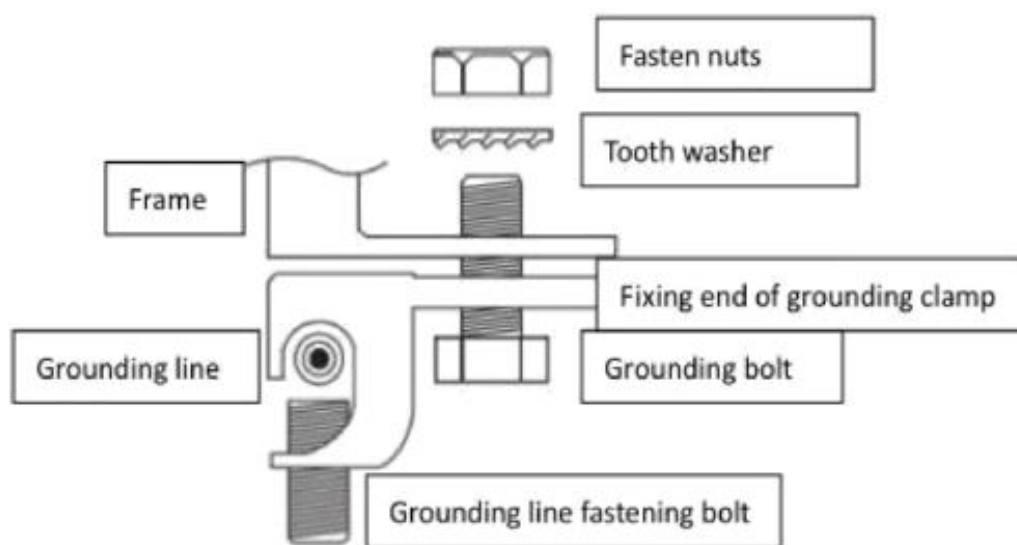
**Figure 6 Grounding Clamp Installation**

Note: TYCO. 1954381-1 (recommended) is used in figures above.

## 7.2 Grounding by unoccupied mounting holes

Mounting holes on modules that are not occupied can be used for installing grounding devices.

1. Align grounding clamp to the frame mounting hole. Use grounding bolt to go through the grounding clamp and frame.
2. Put the tooth side of the washer on the other side and fasten the nuts. The recommended torque for nut fastening is 2.0Nm to 2.2Nm.
3. Put grounding lines through the grounding clamp and grounding wire material and dimension shall meet requirements in local national and regional law and regulations.
4. Fasten bolts of grounding lines and installation ends.



**Figure 7 Way of Installation**

### 7.3 The third party grounding devices

The third party grounding device can be used for grounding of KESUN modules but such grounding shall be proved to be reliable. Grounding device shall be operated in line with stipulations of the manufacturer.

## 8 Operation and maintenance

Carry out regular inspection and maintenance for modules and this is the user' responsibility within the quality warranty period in particular; and, inform the supplier within two weeks when modules are found to be damaged.

### 8.1 Cleaning

Accumulated dust on module surface glass will reduce the power output and lead to local heat spot, such as industrial waste water and birds droppings. The degree of influence is determined by transparency of wastes. Small amounts of dust will affect sunlight strength and evenness but are not dangerous and power will not be reduced remarkably in general.

During operation of modules, there shall be no environmental factors projecting shades or shelter partial or the entire module, including other modules, module system bracket, birds, dust,

soil or plants. These will reduce output power. KESUN suggests that the module surface should not be sheltered in any case.

Frequency of cleaning depends on dirt accumulation speed. In normal situations, rainwater will clean the module surface and the cleaning frequency is reduced therefore. It is suggested to use damp clean water sponge or soft cloth to wipe the glass surface. Do not use acid and alkaline detergents to clean modules.

## 8.2 Module appearance inspection

Check module appearance defects visually, especially:

1. Module glass cracks.
2. Corrosion at welding parts of the cell main grid: it is caused by moisture into the module due to damage of surface packaging materials during installation or transportation.
3. Check whether there is burning traces on the module back plate.

## 8.3 Inspection of connectors and cables

It is suggested to carry out a preventive inspection once every 6 month:

1. Check connector sealing and cable connection solidness.
2. Check whether sealant of the terminal box is cracking with gap.

## 9 The list of the modification

| Date       | Version | Contents    | Remark                             |
|------------|---------|-------------|------------------------------------|
| 2021.01.30 | 1.0     | 1st edition | Updated parameters table           |
| 2022.11.05 | 2.0     | 2st edition | Updated parameters table           |
| 2023.04.21 | 2.1     | 3st edition | 6.1 Adding Calculation Formulas    |
| 2023.07.01 | 2.2     | 4st edition | 5.2.2 Clamp mounting on width side |
| 2024.01.27 | 3.0     | 5st edition | Updated parameters table           |
| 2024.05.31 | 3.1     | 6st edition | Updated 33mm                       |

|            |     |             | modules                                               |
|------------|-----|-------------|-------------------------------------------------------|
| 2025.01.07 | 3.2 | 7st edition | Updated parameters table<br>Updated 30mm/33mm modules |
| 2025.04.08 | 4.0 | 8st edition | Updated parameters table                              |

#### Additional information

Meaning of crossed out wheeled dustbin: Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of inland fills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. Disposal of this product shall be carried out in accordance with local regulations for electronic waste..



## 10 SUITED MODULE TYPES

### SG:

With ½ cut of Topcon c-Si cells:

PVTTxxx-36V-MH, PVTTxxx-36V-MHB (xxx = 550-610, in steps of 5, 144 cells)

PVTTxxx-27V-MH, PVTTxxx-27V-MHB (xxx = 410-455, in steps of 5, 108 cells)

### Certified Product Information:

|                                             |                                                                                           |                                                                     |  |
|---------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--|
| Type name or model number                   | PVTxxx-36V-MH<br>PVTxxx-36V-MHB (xxx=<br>550-610,in steps of 5W)                          | PVTxxx-27V-MH<br>PVTxxx-27V-MHB (xxx=<br>410-455,in steps of 5W)    |  |
| Rated maximum power<br>range [W]            | 550,555,560,565,570,575,<br>580,585,590,595,600,605,<br>610                               | 410,415,420,425,430,435,<br>440,445,450,455                         |  |
| Module technology                           | TOPCon Mono-Si                                                                            | TOPCon Mono-Si                                                      |  |
| Number of cells                             | 144                                                                                       | 108                                                                 |  |
| Rated short circuit current<br>range [A]    | 13.14,13.24,13.34,13.44,<br>13.54,13.64,13.74,13.84,<br>13.94,14.04,14.14,14.24,<br>14.34 | 13.06,13.19,13.33,13.46,<br>13.60,13.73,13.86,14.00,<br>14.13,14.26 |  |
| Rated open circuit voltage<br>range [V]     | 52.33,52.40,52.47,52.54,<br>52.61,52.68,52.75,52.82,<br>52.89,52.96,53.03,53.10,<br>53.17 | 39.25,39.32,39.39,39.46,<br>39.53,39.60,39.67,39.74,<br>39.81,39.88 |  |
| Maximum system voltage<br>[VDC]             | 1500                                                                                      | 1500                                                                |  |
| Maximum Series Fuse<br>Rating [A]           | 20                                                                                        | 20                                                                  |  |
| Dimensions(l*w*h) [mm]                      | 2278*1134*30/33/35                                                                        | 1722*1134*30/33/35                                                  |  |
| Module area [m <sup>2</sup> ]               | 2.58                                                                                      | 1.95                                                                |  |
| Protection class<br>(for IEC certification) | Class II                                                                                  | Class II                                                            |  |
| Type name or model number                   | Class C                                                                                   | Class C                                                             |  |

characteristics are within  $\pm 3$  percent of the indicated values of  $I_{sc}$ ,  $V_{oc}$  and  $P_{max}$  under standard test conditions (irradiance of  $1000 \text{ W/m}^2$ , AM 1.5 spectrum, and a cell temperature of  $25^\circ\text{C}$  ).

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