VSUN
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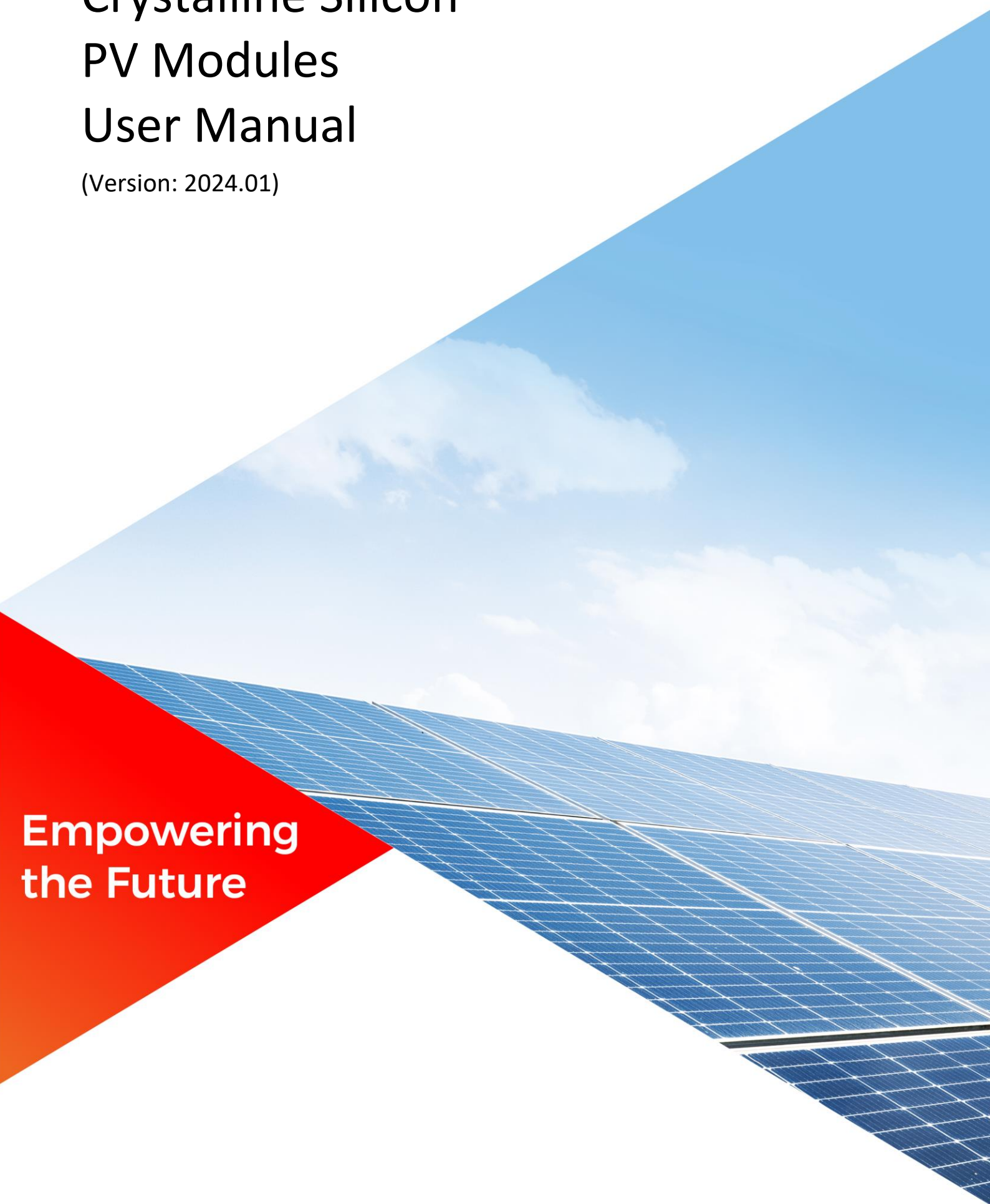
Crystalline Silicon PV Modules User Manual

(Version: 2024.01)



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Crystalline Silicon PV Modules

User Manual

1 Introduction

This manual contains information regarding the unloading, transportation, storage, unpacking, installation and safe handling of the photovoltaic module (hereafter is referred to as “module”) which are produced by VIETNAM SUNERGY JOINT STOCK COMPANY (hereinafter is referred to as “VSUN”).
Installers must read and understand the mechanical and electrical requirement for such a system before operation. Any questions, please contact the sales or customer service personnel of VSUN for further explanations.
No patent license or patent rights is granted to customer, express or implied, due to its use of VSUN’s modules. Information in this manual is based on VSUN’s best knowledge and experience and is believed to be reliable, such information including but without limitations product specification and suggestions. VSUN reserves the right to change the installation manual, the PV product, the electrical specifications, or product information sheets without prior notice.

2 Laws and Regulation

The mechanical and electrical installation of PV system should be performed in accordance with all applicable codes, including electrical codes, building codes and electric utility interconnection requirements. Such requirements may vary for mounting location. Requirements may also vary with system voltage, and for DC or AC applicable. Contact local authorities for governing regulations.

3 Unloading/Transportation/Storage Introduction

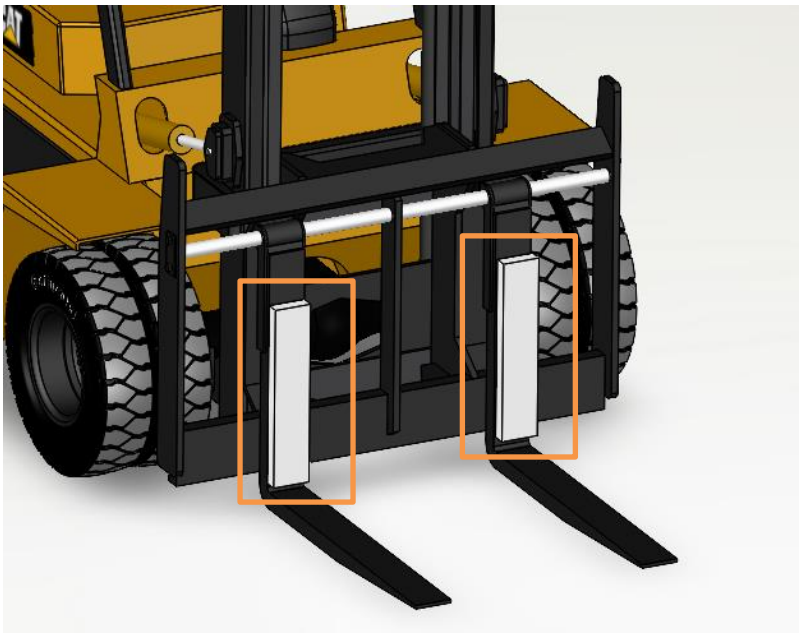
3.1 Unloading

Before unloading, please check if the packages are in good condition.

- During unloading, the forklift should be selected reasonably according to the size and weight of the goods. If the fork length is less than 3/4 of the size of the goods, extension sleeves should be fitted on the forks before the assembly is forked, in order to avoid the packing container dumping when moving the forklift.
- When the goods go out of the container port, please slow down and lower the height of the forklift arm from the ground, pay attention to the distance between the bottom of the goods and the top of the container, prevent the goods from colliding with the top of the container, and ensure that the whole pallet module is safety removed from the container.
- The height of the unloading tooling should be kept at basic level with the bottom of the container, and the height tolerance should be controlled within ±10mm. When using the fuel forklift, adjust the height of the forks from the ground, the forks into the short side of the pallet, after the forks into the bottom, lift the modules at an appropriate height (the tilt angle required to lift the modules $< 2°$).
- When the horizontal electric forklift is used to unload the goods, the arm length of the

forklift mechanical arm is required to be ≥1800mm. The arm length of the forklift mechanical arm is required to lift the modules from the short side of the pallet with a fork, and the modules are moved out slowly. No more than 2 pallets are unloaded each time.

- Please make protections on the contact surfaces of forklift if they will contact the package to avoid damage of package by forklift. Take the following picture for example. Avoid to destroy the modules by forklifts.



- No more than one stack should be unloaded for each time. Put the modules on level ground and control the vehicle speed when the road condition is relatively poor.

3.2 Storage

Long-term storage in warehouse

Do NOT expose the modules to rain or moisture. Store the modules in a well-ventilated, waterproof and dry place. Do NOT remove the original packaging if the module requires long-term storage. It is recommended to store modules with regular inspection, reinforce the package in a timely manner if any anomalies are found.

Storage in warehouse or normal warehouse storage (moisture < 85%, temperature range from -40°C to + 50 °C). No more than 2 pallets of module to be stacked.

Storage in project site

Module must be installed as soon as possible in the project site.

If you need to store the modules in the project site, should choose a hard ground and a higher ground with flat surface to ensure the modules package not collapsing and tilting. In case of inclement weather (rain, snow, wind, etc.), materials such as plastic film and waterproof materials need to be covered on the packing boxes.

VSUN shall not be responsible for any damage or collapse of the modules caused by moisture in the packaging.

4 Unpacking/Second Transportation Introduction

4.1 Unpacking Introduction

There are some preparations that need to be made before unpacking
Tools and PPE: Utility Knife, Protective Gloves
Environmental Condition Requirement: Do not unpack the carton(s)in rainy environment
Product Inspection: Check if the carton numbers are consistent with the bills of lading. Check if there is external damage on the outside of the carton(s);

Safety Notes:

Do not collide when unloading; avoid scratching which may cause faulty modules; handle with care.

The maximum quantity of modules allowed on a single pallet: 30 pieces

Unloading operation of modules must be performed by two personnel.

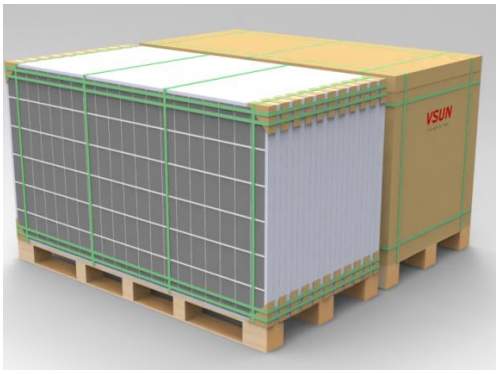
Do not place other items on top of the module(s).

Do not stomp on the module(s).

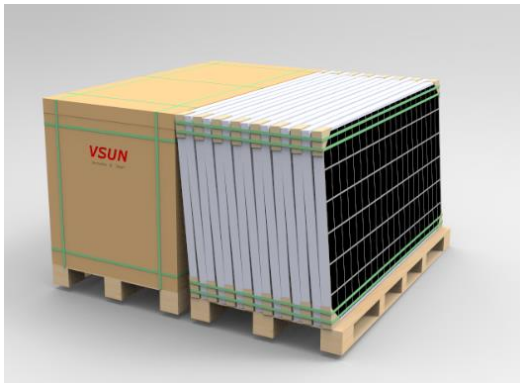
Do not touch the module glass with bare fingers, avoid leaving fingerprints on the module glass.

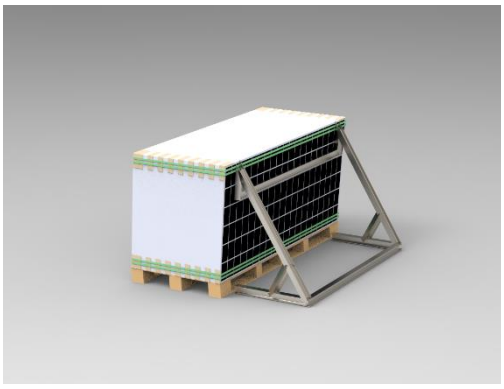
Unpacking Steps

Place the unpacked carton on the ground, maintain a gap of 50-100mm between them.

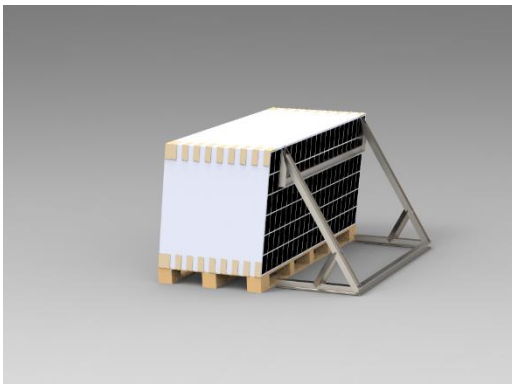


Cut packing belts and remove external and internal packaging

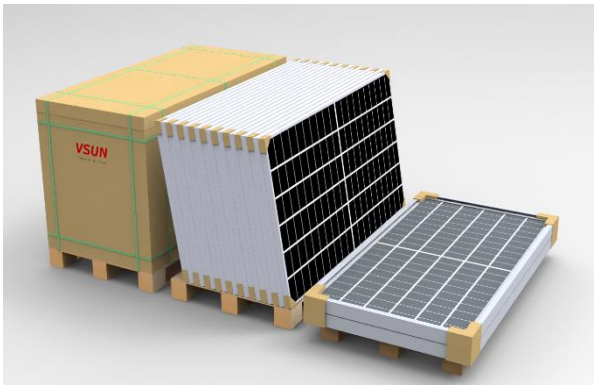




Cut off all the vertical packing belts, when there are one or two horizontal packing belts remaining, push the modules gently to tilt toward unopened carton or another support.



Cut all the remaining belts



Take out the modules by two persons

Stacking modules instruction:

Place the first module onto the empty pallet with its front side facing up to prevent damage during forklift handling.

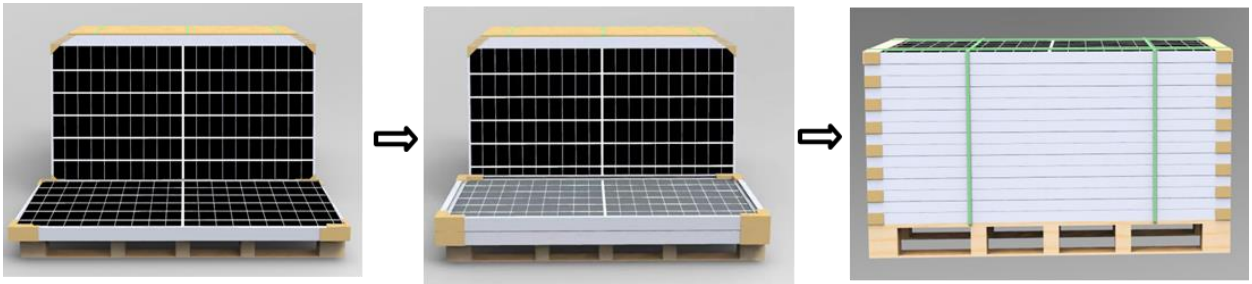
The subsequent module(s) shall be oriented to have its glass side down, and the placement shall be in alignment.

4.2 Second Transportation

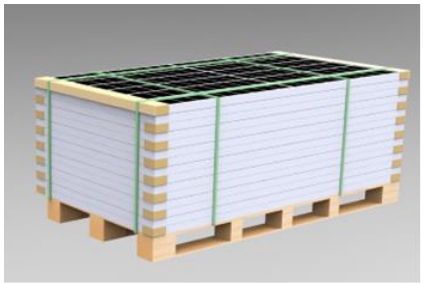
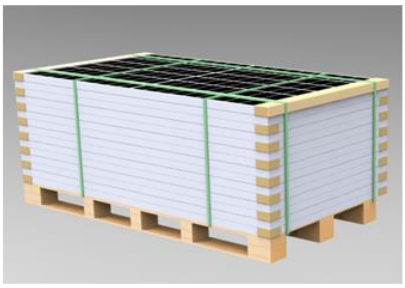
During transportation, make sure that the package is fixed with packing belts securely on the shipping platform without any movement.

If there are some remaining modules in the unpacked pallet and they shall be transport to another installation area, please know that they should be repacked as per manufacturer's original packaging or be placed horizontally and safely on pallet as per following steps are provided for reference on site.

- Put an empty pallet aside. Two persons respectively seize the short-side frame of each module and put it on the empty pallet. Please put the first module with front side up. And then place the module backside up from the second module. No more than 15 modules will be placed horizontally in one pallet. And keep the last module face up with front side to prevent rainwater inside the backside of modules.



- During repacking, please make sure all modules are placed in alignment and then use strapping belts to repack the remaining modules as shown below. And reuse the corner protecter in the contact surface between strapping belts and the top module to avoid glass scratch. If remaining modules are not repacked tightly, displacement will occur during secondary transportation, leading to module breakage especially when the road surface is uneven. Drive slowly to transfer them to specific area.

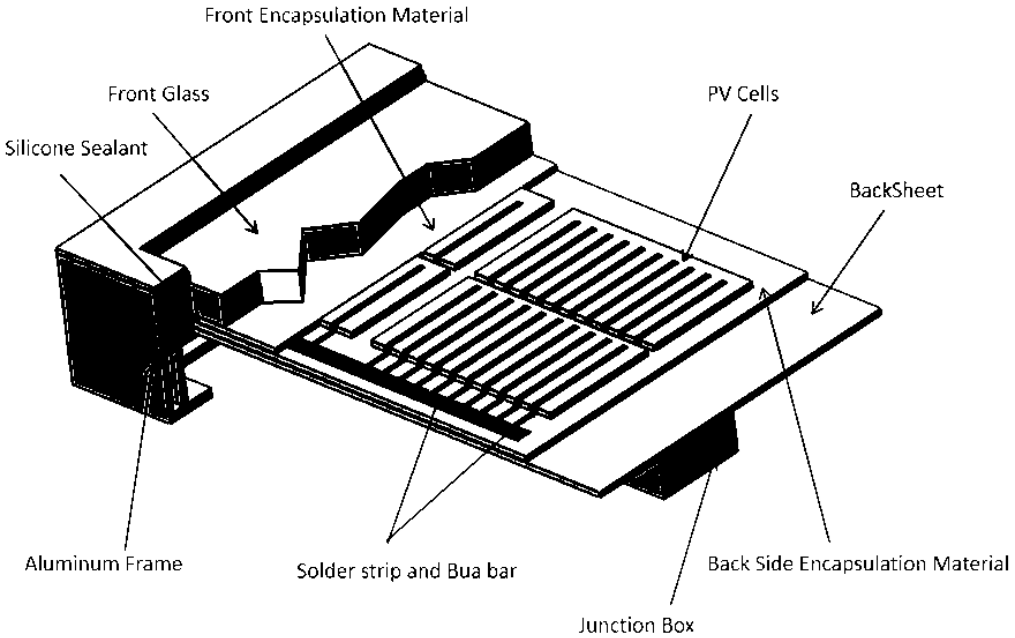




Safety Notes:
Improper transportation and placing may lead to glass breakage or power loss of the modules, resulting in the loss of the use value of modules.
Control the vehicle speed when the road condition is relatively poor.
Do not stack the modules for transportation. Do not set the modules down on any hard surface, which maybe cause the cells broken.
Modules not used up should be stored and transported after packaging in accordance with the manufacturer's packaging.

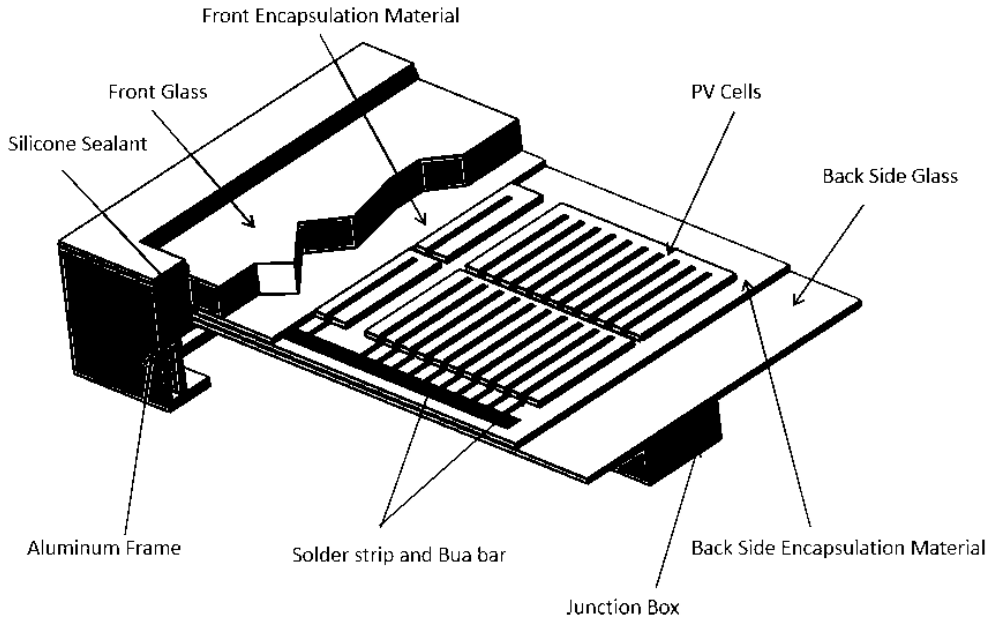
5 Product Information

5.1 Product Mechanical Drawing

Mono-facial modules and Bi-facial single glass modules



Bi-facial double glass modules



5.2 Product Identification

Each module has labels providing the following information:

Nameplate： Describes the product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current, all are measured at STC; weight, dimension, maximum system voltage and the fuse rating are all shown on the nameplate.

Barcode： Each module has a unique serial number. It contains the relevant production information of the module.

5.3 Electrical Property Parameters of Modules

Under Standard Test Conditions (1000W/m², AM1.5 and 25ºC (77°F)) the electric characteristics, including Isc and Voc, the deviation between the measured value and nominal value is within ±3%.

Under normal outdoor conditions, a module is likely to produce different current and voltage than the values measured under STC in the specification of VSUN module products. Therefore, when determining the parameters related to the power output of the module, for example, nominal voltage, conductor capacity, fuse capacity and controller capacity, etc., refer to the values of short-circuit current and open circuit voltage of the modules, and take 125% of those values during design and installation.

The maximum nominal voltage for all module series is 1000V or 1500V according to IEC/UL standards. Please check it according to the nameplate.

6 Safety Precaution

6.1 Regular Safety

- PV module safety class is Class II, where general contact access is anticipated.
- The installer should conform to all safety precautions in the manual and local laws & regulations (National Electrical Code (NEC) and Canadian Electric Code (CEC), etc.)., shall

strictly abide by the requirements of this manual when installing the modules of VSUN.

- It is need to obtain the required certificates in advance when necessary, such as the building permit.
- Abide by the safety regulations for all other components used in the system, including wiring and cables, connectors, solar charge controller, inverters, storage batteries, etc. Use suitable equipment, connectors, wiring and mounting system for a PV system.
- Use the same type modules and ensure color grade consistent as far as possible in one system.
- Notification is needed while the modules are reinstalling.
- Follow the battery manufacture's recommendations, if batteries are used with modules.
- Do not use this module to replace or partly replace roofs and walls of living buildings.
- Do not disconnect under load, or apply paint or adhesive to module surface and do not cover materials such as plastic film and waterproof to module surface.
- Do not disassemble the modules or remove any attached nameplates or components from the modules.
- Do not use mirrors or other magnifiers to artificially concentrate sunlight on the modules. Do not expose the backside of modules directly to sunlight for a long time.
- Do not use modules in an environment with aliphatic, aromatic, phenols, ketones, halogenated substance or mineral oil, which may corrode the junction box by chemical attack.
- Keep children and unauthorized persons away from the modules while transporting and installing them.
- When looking at PV modules with anti-reflection (AR) coating technology, it will be normal to see some cells with a slight color difference at different angles.
- Inappropriate transport and installation may damage the module, please attempt to minimize shock or vibration to the module, as this may damage the module or lead to cell micro cracks.
- Keep this manual in a safe place for future reference (care and maintenance) and in case of sale or disposal of the modules.
- VSUN has the right to refuse to compensate for the product damage due to construction or design defects of the solar photovoltaic system. If the conditions or methods of loading/unloading, transportation, storage, installation, use and maintenance of the customer are beyond the range specified in this manual and cause damage, VSUN does not assume responsibility for any loss, damage or expense thus caused.
- VSUN's limited warranty will be void in cases where improper clamps or installation methods are not in accordance with this manual.
- When installing inter-modules or end type clamps, take measures so as:
  Not to bend the module frame.
  The clips must only fix the modules by the contact with the frame, can not contact glass.
  Do not connect different connectors (brand and model) together.
  Do not drill holes on the surface of module glass.
  Do not drill additional mounting or grounding holes on module frames.

When mounting, be sure that the module's drain holes are not blocked. For matters concerning installation not mentioned in this section, contact the local dealer for professional support.

6.2 Electrical Performance Safety

- A module with exposed conductive parts is considered to be in compliance with UL 61730

only when it is electrically grounded in accordance with the instructions presented below and the requirements of the National Electrical Code.

- If the front glass is broken or if the backsheet is burned-out, contact with any module surface or the aluminum frame can produce electrical shock, particularly when the module is wet.
- A single module may produce the direct current (hereafter is referred to as DC) voltage of above 30V in direct sunlight and it is extremely dangerous to contact it. Do not touch or lean on an operating module.
- The maximum system voltage is indicated in the nameplate. During the system installation, the maximum open circuit voltage in series cannot exceed the maximum system voltage.
- Keep all electrical contacts clean and dry. Do not change the wiring of the bypass diodes.

6.3 Installation Safety

- Photovoltaic modules are designed for outdoor use. Modules may be mounted on ground, rooftops, vehicles or boats. Proper design of support structures is the responsibility of the system designers or installers. Mounting holes or clamp range and numbers suggested in this manual shall be used.
- Do not place the glass surface or the backsheet surface of the modules down directly on the ground in the installation site (mud, sandy land, grassland, Gobi, etc.).
- Installing solar photovoltaic systems require specialized skills and knowledge. Installation should be performed only by qualified persons. Installers should assume the risk of all injuries that might occur during installation, such as electric shock.
- Completely cover the module with an opaque material during installation to keep electricity from being generated. Under high temperature and high humidity environment, the material component of glass surface will not cause pollution, such as rubber glue splotch, oil, printing and dyeing, etc. Contact the glass surface with bare hand is prohibited.
- Do not carry out installation in rainy weather for humidity will void the insulation protection, thus causing safety accidents.
- Handle modules with care. Lift and put down modules gently. Do not drop modules or drop objects on the modules. Pay special attention not to collide, scratch or press the module backside when transporting and installing the modules. The double glass module should be handled more carefully. Non-slip gloves are required when handling and during installation.
- It is forbidden to pull the junction box or cables when carry or lift the modules. Carry a module by its edges with two or more persons. Increasing one or two persons lift up the middle of the panel is necessary for non-frame module.
- To avoid module damage, do not place heavy objects or tools on the modules, and do not stand or step on the modules.
- PV Modules shall be handled with care. Improper operations may cause the glass breakage.
- Do not install or handle the modules when they are wet or during strong wind, snow, rain.
- Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic devices while installing or troubleshooting photovoltaic systems. Use insulated tools that are approved for working on electrical installations and always keep them dry.
- The triangle hole punched on the backside frame of the module is the drain hole which cannot be blocked.
- During modules interconnection, guarantee to fix the connecting cables to the mounting system, so as to restrict the swing amplitude of the slack part of the wire.
- Minimum bending radius of wires is 43mm.

- Please use the connector which is specially designed for photovoltaic system and assemble it with the tools recommended or specified by the manufacturer. In case that the connector applicable to the solar photovoltaic system is required, please contact the local supplier.
- Make sure that the polarity is correct when connecting the module with inverter, storage battery or combiner box to avoid the unrecoverable damage of bypass diodes in the modules due to incorrect polarity.
- The cable shall be fixed on the installation system (frame or bracket, guide rail) with UV resistant cable ties, in cable conduits or wire cards to avoid direct sunlight or immersion in water and mechanical damage of the cable. Otherwise, it may cause accelerated aging of the cable or even leakage and fire.
- Bifacial PV modules should also avoid blocking the solar cells on the back of the module. The open area should minimize arc coil, which can reduce the risk of induced lightning impact on PV module.
- Only PV modules with the same or similar electrical parameters should be connected in series.
- Insert module connectors fully and correctly. An audible “click” sound should be heard. This sounds confirms the connectors are fully seated.
- Always protect the wire with conduit where animals or children can touch it.

6.4 Fire Safety

- Consult your local authority for guidelines and requirements for building or structural fire safety. VSUN modules have been tested in according with IEC 61730-2 standard.
- For roof installation, modules should be mounted over a fire-resistant covering suitable for this application, with adequate ventilation space between the module backsheet and the mounting surface.
- Roof constructions and installations may affect the fire safety of the building. The module shall be installed on the fire-resistant roof. The modules Fire Resistance Rated Class of the modules is Class C, and the modules are suitable for mounting on an above Class A roof. Improper installations may create hazards in the event of a fire.
- Do not use modules where flammable gasses may be generated.
- VSUN modules have not been tested for explosion protection. Please consult local regulations whether the modules can be used or not.
- Broken solar module glass is an electrical safety hazard (may cause electrical shock or fire). These modules cannot be repaired and should be replaced immediately.

7 Installation Instructions

7.1 Installation Conditions

7.1.1 Installation Site and working Environment

- In most applications, PV modules should be installed in a location where they will receive maximum sunlight throughout the year.
- The module shall be installed in the place where the sunshine is adequate. The module should not be shaded at any time during its operation. During installation, the module surface shall not be partly shaded by clothes, tools, packaging materials, etc.
- VSUN suggests installing the module in dry areas where the climate is moderate. The modules shall not be allowed to be mounted in the site with excessive hail, snow, sand,

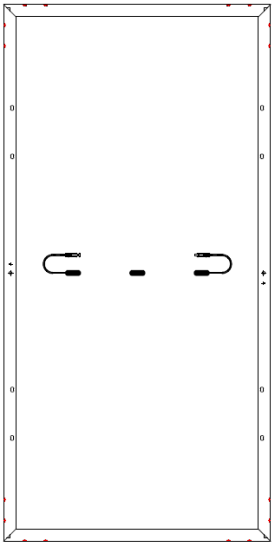
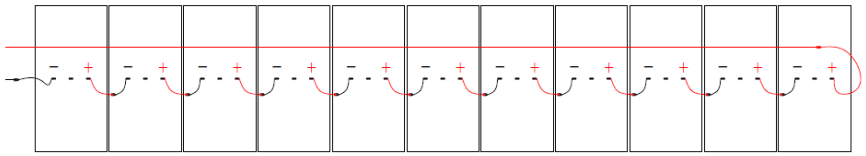
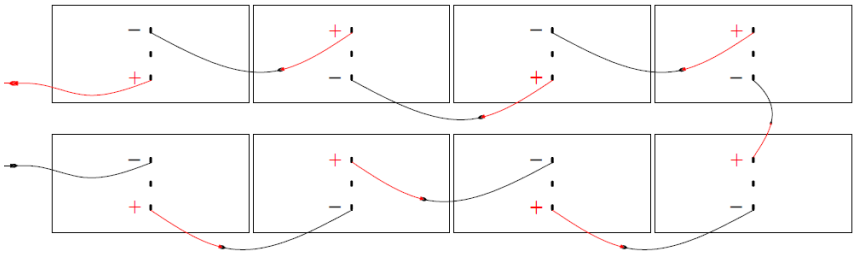
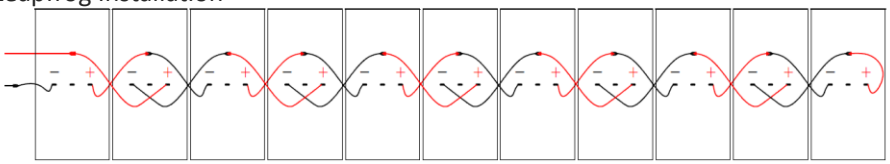
smoke dust and so on.

- VSUN's modules have passed the certification of IEC 61701 with 5% NaCl. But corrosion probably occurs in the contact place between modules and mounting brackets. Without the approval of VSUN, modules should not be installed in the site which is within 500m away from the sea.
- VSUN's modules can not be installed where there is water soaking, sprinkler or water spray.
- Modules connected in series should be at the same tilt and azimuth. Differing orientations or angles may cause a loss of power output due to differing amount of sunlight exposure for each module. Typically, the optimal tilt for a module is roughly the same as the installation location.
- The entire PV system consisting of modules must be able to withstand anticipated mechanical pressure which comes from local wind force, snow, etc.
- When unpacking the modules should be installed as soon as possible and connected to the combiner box to avoid connection failure. Protecting covers are advised to be used if modules are installed in the site with heavy sand or salt mist.
- The mounting system structure (such as screw) must be made of durable, corrosion-resistant and UV-resistant materials. Force generated during thermal expansion and contraction of the mounting system structure shall not influence the performance and use of the module.
- The bearing surface of the mounting structure must be smooth without any twist or deformation, and the connected support frames shall be at the same height.
- VSUN recommends to install modules at the temperature from -40℃ to 50℃, and the relative humidity should be less than 85RH%. Besides, the ultimate temperature of working is from -40℃ to 85℃. If the modules are used in high-temperature and high-humidity environment, VSUN requires the customer to ground the negative end of the inverter (as shown in FIG8). Offset Box or PID Box can also be used instead to apply a positive voltage to the module arrays at night to avoid PID.
- The modules have been evaluated by IEC61215 standard for mechanical load design (testing load). According to the requirements of IEC61215, 1.5 times of safety parameter should be considered while calculating corresponding maximal design load.
- Normal load is suitable for the most condition of environment: the obverse side can sustain 5400Pa static load, the reverse side can sustain 2400 Pa static load.
- According to the requirements of IEC61215, in regard to dynamic load, like gust, 3 times of safety factor should be considered. That is to say, 800 Pa dynamic wind load in the condition of gust equals 2400 Pa static wind load (wind speed≤130km/h).

7.1.2 Selection of Tilt Angles

- To be suitable for operation, reduce steam condensation and facilitate the ventilation & heat dissipation of the module during tile installation, the module shall be parallel to roof surface of the building, and the clearance between module and surface of the roof shall be at least 115mm to prevent wiring damage and to allow air circulation, ventilation and heat dissipation behind the module.
- The tilt angle of the PV module refers to the angle between the module and the horizontal ground. The tilt angle shall be selected according to the local conditions for different projects. VSUN recommends that the mounting tilt angle should not be less than 10°.For specific tilt angles, it shall be chosen in accordance with the local design procedures, specifications and regulations, or following the recommendations of the experienced PV module installers.
- The PV module is highly recommended facing south in the northern hemisphere and north in the southern hemisphere to get the best performance.

7.2 Junction box style and wiring method

Junction Box on the Module	Recommended Wiring Method
	Portrait Installation  Landscape Installation  Note: Adjacent two modules (left to right) need to be rotated 180 degrees Leapfrog Installation 

Note:

Cable length should be reviewed and approved by the EPC contractor; In particular required cable lengths should be cross-checked considering the specificities of the tracker structure like bearing house gaps. If longer cable or additional jumper cables are requested, please contact VSUN's sales representative in advance.

7.3 Three kinds of Mounting

(A) Roof Mounting

- It is necessary to provide a special support frame for the roof mounting. When installing a module on a roof or building, ensure that it is securely fastened and cannot fall or be damaged as a result of strong winds or heavy snows. During roof mounting, check the building codes being used to ensure that the building and its structure where the module is installed have adequate bearing capacity. The roof needs to be penetrated during module installation and fixing shall be sealed to avoid rainwater seepage.

(B) Pole Mounting

- When installing a module on a pole in Figure 1, choose a pole and module mounting structure that will withstand the anticipated wind power of the local area. The support rod must be constructed on a solid foundation.

(C) Ground Mounting

- Select the height of the mounting system to prevent the lowest edge of the module from being covered by snow for a long time in winter in areas that experience heavy snowfalls in Figure 2. The module shall be installed on the mounting system with appropriate height instead of being directly laid on the ground. In addition, assure the lowest portion of the module is placed high enough, so that it is not shaded by plants or trees, and the module is not damaged by sand and stone driven by wind, or the module surface is not shaded by the mud splashed by rain water.

FIG 1 Pole mounting

FIG 2 Ground mounting

- Notice: For the roof system installed in the area that ever experienced relatively heavy snowfall or snow cover, the customer shall reinforce the mounting system at the lower frame of the module, in order to prevent the lower frame from being pressed and damaged by the falling snow, and avoid the module damage due to melt snow freezing in daytime. VSUN suggests to selecting the support reinforcing mechanism shown in Figure 3.

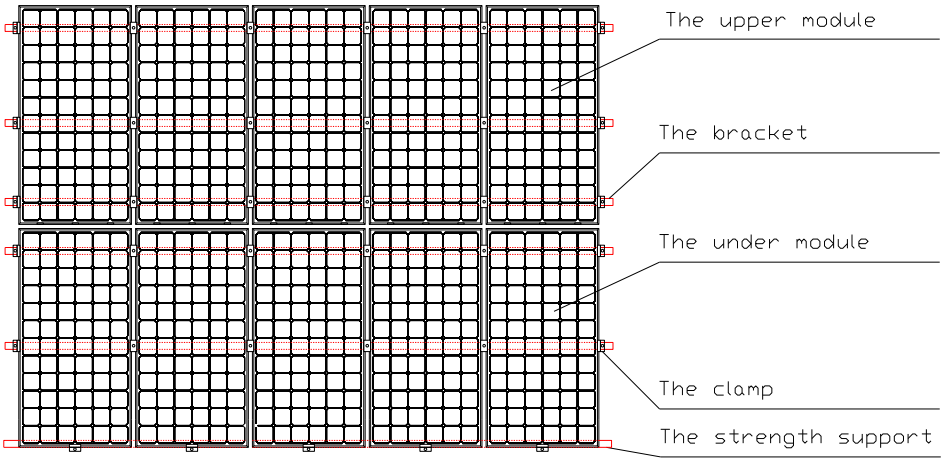


FIG 3 Schematic diagram of reinforcement mounting of module

7.4 Three Installation Methods

Concerning to modules with frame (including double glass module). Modules can be installed on the frame using mounting holes or clamps. Modules must be installed according to the following examples. Not mounting the modules according to these instructions may void the warranty.

7.4.1 Screw fitting:

- Using corrosion-proof screws (M8) in the existing installing holes in the module frame. The range of torque is from 16-20N.m while tightening the screw.
- Do not attempt to drill holes in the glass surface or additional mounting.
- The frame of each module has 4 mounting holes used to secure. As shown in Figure 4, four mounting holes are needed in normal. If in the condition of sustaining higher load, please consult VSUN customer service or technical support team.
- The module frame must be attached to the mounting system using M8 stainless steel hardware together with spring washers and flat washers in four places symmetrical on the module, as shown in Figure 5.

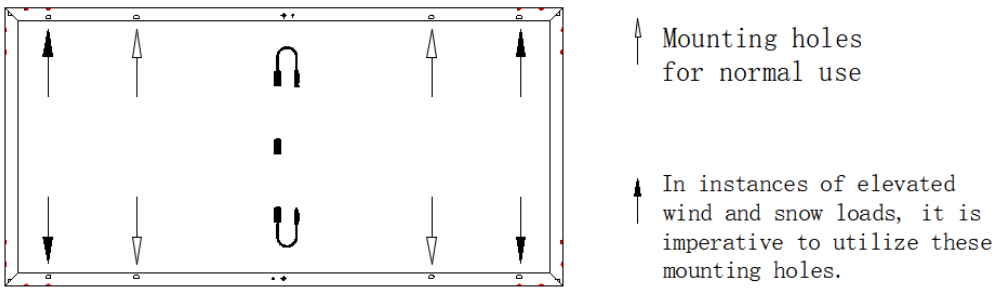


FIG 4 Mounting holes

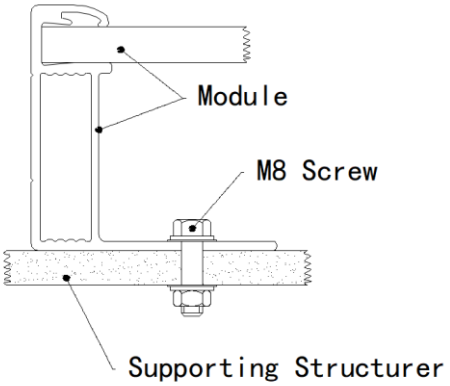
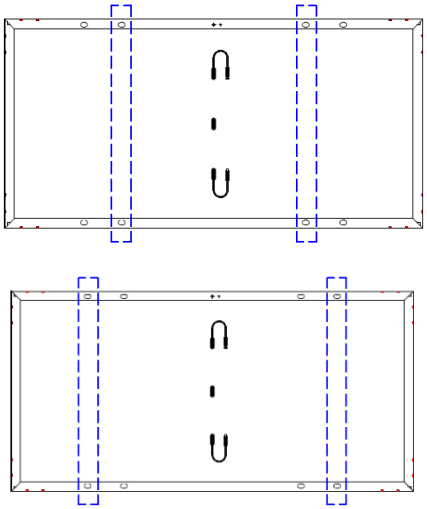
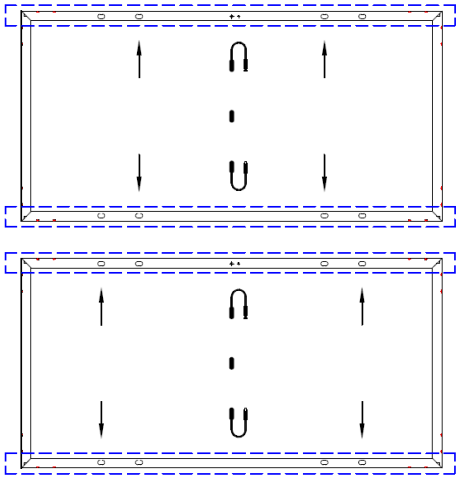


FIG 5 Screw fitting method

Long Side	
	
Inner four holes(990mm), mounting rails cross the long frame: Back static load≤2400Pa, Front static load≤5400Pa Applicable PV Modules: VSUNxxx-108MH (108MH-BW/108MH-BB), VSUNxxxN-108MH (108MH-BW/108MH-BB), VSUNxxxN-108BMH (108BMH-BW/108BMH-BB/108BMH-BT/108BMH-WT), VSUNxxx-108BMH-DG (108BMH-DG-BW/108BMH-DG-BB/108BMH-DG-BT/108BMH-DG-WT),VSUNxxxN-108BMH-DG (108BMH-DG-BW/108BMH-DG-BB/108BMH-DG-BT/108BMH-DG-WT), VSUNxxx-120MH (120MH-BW/120MH-BB), VSUNxxxN-120MH (120MH-BW/120MH-BB), VSUNxxxN-120BMH (120BMH-BW/120BMH-BB/120BMH-BT/120BMH-WT), VSUNxxx-120BMH-DG (120BMH-DG-BW/120BMH-DG-BB/120BMH-DG-BT/120BMH-DG-WT),VSUNxxxN-120BMH-DG (120BMH-DG-BW/120BMH-DG-BB/120BMH-DG-BT/120BMH-DG-WT)	Inner four holes(990mm), mounting rails parallel the long frame: Back static load≤2400Pa, Front static load≤2400Pa

Long Side	
Outer four holes(1400mm), mounting rails cross the long frame: Back static load≤2400Pa, Front static load≤5400Pa. Applicable PV Modules: VSUNxxx-132MH (132MH-BW/132MH-BB), VSUNxxxN-132MH (132MH-BW/132MH-BB), VSUNxxxN-132BMH (132BMH-BW/132BMH-BB/132BMH-BT/132BMH-WT), VSUNxxx-132BMH-DG (132BMH-DG-BW/132BMH-DG-BB/132BMH-DG-BT/132BMH-DG-WT), VSUNxxxN-132BMH-DG (132BMH-DG-BW/132BMH-DG-BB/132BMH-DG-BT/132BMH-DG-WT), VSUNxxx-144MH (144MH-BW/144MH-BB), VSUNxxxN-144MH (144MH-BW/144MH-BB), VSUNxxxN-144BMH (144BMH-BW/144BMH-BB/144BMH-BT/144BMH-WT), VSUNxxx-144BMH-DG (144BMH-DG-BW/144BMH-DG-BB/144BMH-DG-BT/144BMH-DG-WT), VSUNxxxN-144BMH-DG (144BMH-DG-BW/144BMH-DG-BB/144BMH-DG-BT/144BMH-DG-WT)	Outer four holes(1400mm), mounting rails parallel the long frame: Back static load≤2400Pa, Front static load≤2400Pa

7.4.2 Clamp fitting (frame module):

- Using suitable module clamps on the side of the module frame to mount the modules, as shown in FIG 6. The thickness of the clamp should be no less than 3mm, the length should be no less than 50mm and the length of the overlap should be no less than 5mm.
- At least 4 clamps should be used in each module, and install 2 clamps on each side. For harsh environments, please contact with VSUN technical support team to check the compatibility of mechanical load.
- Modules should be mounted by screw, flat washer and spring washer on mounting rack. The clamp should be mounted in a symmetric position respect to the center, as shown in FIG. 6. The torque should be determined by the mechanical design standard of the screw. For instance, M8--16-20N.m.
- The clamp cannot be attached with the front glass, and keep the shape of frame while mounting.
- Avoid shading effects creative by clamps on the cells of modules' obverse side.
- If the customer has special clamping and installation schemes which are not included in this manual, please contact the local dealer for professional support.
- If heavy snowfall, relatively large snow load or large wind pressure exist in the module installation area, VSUN suggests the customer to ask help from professional installer to improve the bearing capacity of the whole PV system.

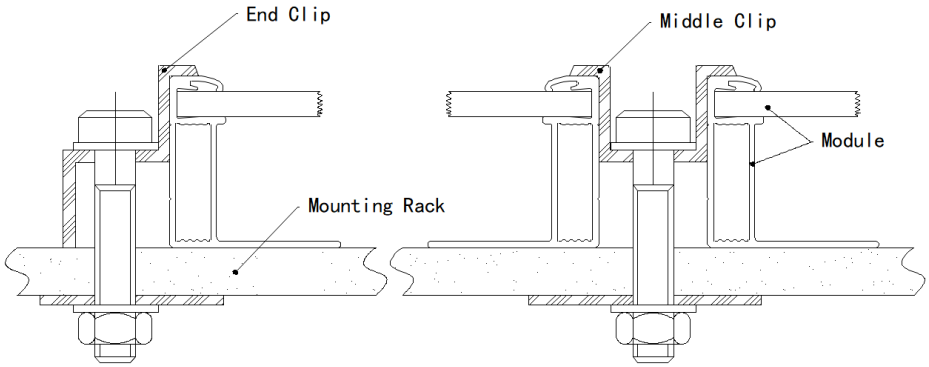
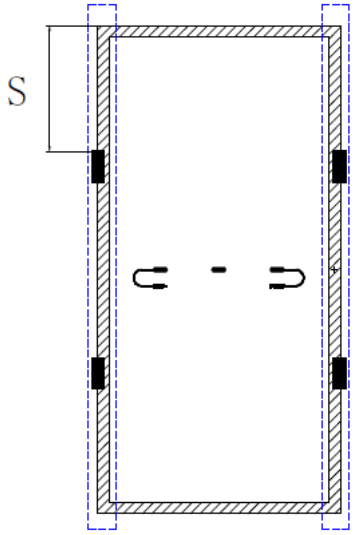
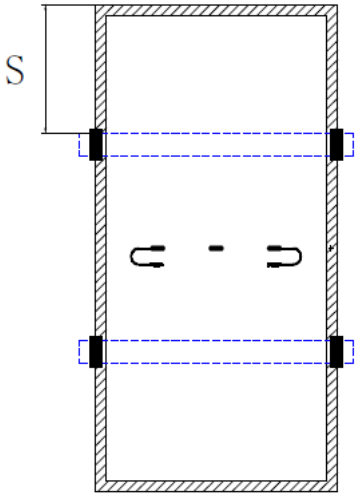
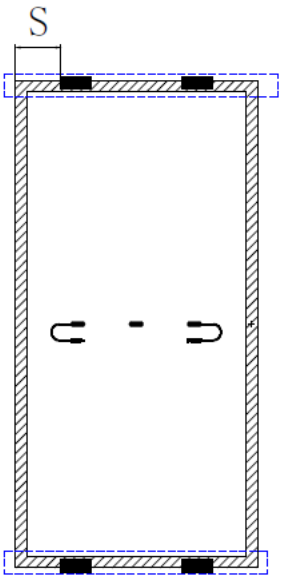


FIG 6 Clamping mounting method

Short Side	Long Side	
 Clamps,mounting rails parallel the short frame	 Clamps,mounting rails cross the long frame	 Clamps,mounting rails parallel the long frame
Back static load≤2400Pa, Front static load≤2400Pa:(L/4-50) ≤S≤ (L/4+50)	Front static load≤5400Pa, Back static load≤2400Pa: (L/4-50) ≤S≤(L/4+50)	Front static load≤1600Pa, Back static load≤1600Pa: (W/4-50) ≤S≤ (W/4+50) Applicable PV modules: VSUNxxx-108MH (108MH-BW/108MH-BB), VSUNxxxN-108MH (108MH-BW/108MH-BB), VSUNxxxN-108BMH (108BMH-BW/108BMH-BB/108BMH-BT/108BMH-WT), VSUNxxx-108BMH-DG (108BMH-DG-BW/108BMH-DG-BB/108BMH-DG-BT/108BMH-DG-WT),VSUNxxxN-108BMH-DG (108BMH-DG-BW/108BMH-DG-BB/108BMH-DG-BT/108BMH-DG-WT)

7.4.3 Tracker Mounting System

- If VSUN modules will be mounted on Tracker system, such as ATI, Nextracker, Gamechange…, please contact VSUN customer service or technical team to get the compatibility approval.
- Modules are attached through the mounting holes ϕ7*10mm on the back of the module frame. Using corrosion-proof screws (M6) in the installing holes in the module frame, tightening them with 16N-m or suitable force.

7.5 Electrical Installation

- Try to use the modules with the same configuration in the same photovoltaic system. If the modules are connected in series, the total voltage is the sum of voltages of all the modules, and the maximum number of the series modules (N)=Vmax (System)/ [Voc (at STC)].
- If the system requires the installation of high current, several photovoltaic modules can be connected in parallel, and total current is the sum of current of all the modules. The

maximum number of the parallel module strings (N)=Imax (fuse rating) /Isc.

- When connecting modules, make sure that the connectors of the same series module shall come from the same manufacturer or totally be compatible with each other, and the same requirements shall go to the connection terminals of module end and system end, for the connectors of the different manufacturers may not be compatible with each other, which easily leads to mismatch risk.
- The cross-section area and connector capacity of the cable selected must satisfy the maximum short-circuit current of the system (It is recommended that the cross-section area of the conductor used for the single module is 4mm^2, and the rated current of the connector is not less than 30A. Please note that the upper temperature limit of the cable and connector is 85℃ and 105℃ respectively).

8 Grounding

- All module frames and mounting racks must be properly grounded. As shown in FIG 8-a. The grounding wire must be properly fastened to the module frame to assure good electrical contact. Use the recommended type, or an equivalent, connector for this wire.
- If the mount system is made of metal, the surface of the structure must be electroplated and have excellent conductivity.
- Proper grounding is achieved by connecting the module frame(s) and structural members contiguously using a suitable grounding conductor.
- The grounding conductor must then make a connection to earth using a suitable earth ground electrode. Recommend to use the ground wire accessories (lugs) connected to ground Cable. Welding ground cable to the jack of lugs, and then with the M4 screws inserted into the wiring nose ring and the grounding hole of the module frame, fastening with nuts. Star spring washers should be used to prevent the screws from loosening and lead to poor grounding (as shown in FIG8-b).
- The torque of bolt is 1.5~2.2 N-m with minimum No. 12 AWG (4 mm^2) grounding wires.
- Additional third-party grounding device can be used for grounding of VSUN modules but such grounding method shall be proved to be reliable. Grounding device shall be operated in line with stipulations of the manufacturer. The module frame to EARTH resistance must be less than 4 ohm.

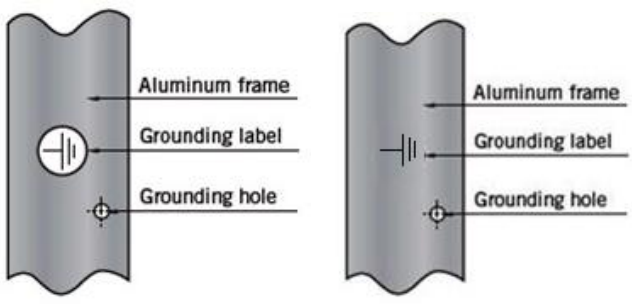


FIG 8-a Grounding hole

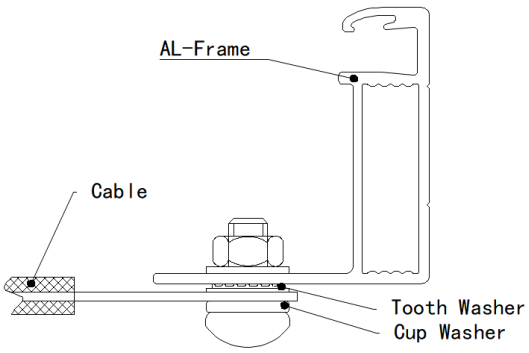


FIG 8-b Grounding method

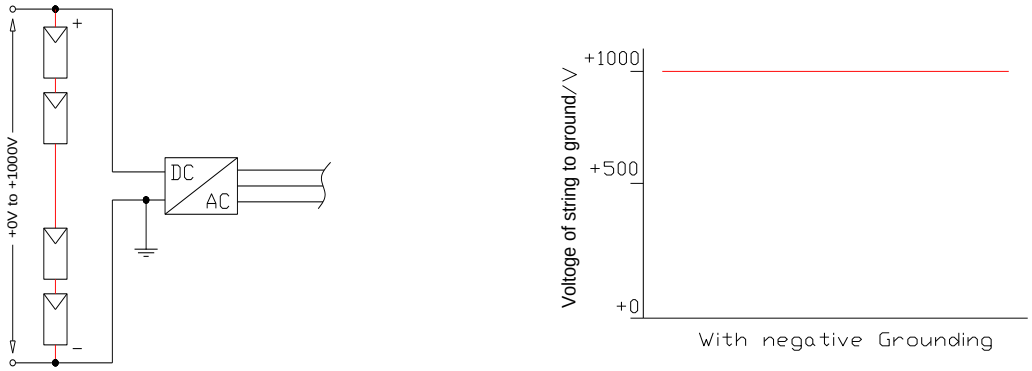


FIG 8 Schematic diagram for grounding potential of the inverter

9 Maintenance and Care

9.1 Cleaning

The dust accumulated on the front transparent substrate may reduce the power output, and may even cause regional hot-spot effect. Industrial effluents or bird drops may be a serious case, and the extent of the severity depends on the transparency of the foreign objects.
When Modules are operational, there may exist environmental factors that cast, dust, Industrial effluents or bird drops and so on, that may distinctly reduce the power output. VSUN advises that there should be no obstructed object over the Module's surface at any time.
Remove the snow covered on the module in time to avoid the module damage caused by long-term accumulation of snow cover and freezing of melted snow. Never clean the electrical connectors including cable, junction box and connector with the cleaning agents that contain organic matters such as alkane.
If a water torch is used to clean the module, the recommended maximum water pressure is 4 MPa (40 bar). This is because excessive pressure may cause deformation of the glass, damage to the cells and shortened service life.
The cleaning frequency depends on the accumulating velocity of the fouling. In many instances the front substrate is cleaned with the rain, and we can decrease the cleaning frequency. It is recommended to wipe the glass surface with wet sponge or soft cloth. Please do not clean the glass with cleaning agent which contains acid or alkali, etc.

9.2 The visual inspection of the Modules

Inspect the Modules visually to find if there are appearance defects, the following types need more attention especially:
Check all wiring for possible rodent damage, weathering and that all connections are tight and corrosion free.
Check the junction box to ensure it is not cracked or creviced.
Check if any crack or gap of silicone nearby the junction box.
Check whether the glass is broken.
Check whether corrosion along the cells' bus-bar.
Check that the corrosion is caused by the dampness infiltrated into the Modules when the surface encapsulation material is damaged during the installation or transportation.
Check there is burning vestige on the backsheet.

Check if any obstacles shading the PV modules.
Check electrical leakage to ground.
Check if any loose or damage screws between the modules and mounting system. If so, adjust and fix in time.
If any problem arises, have it investigated by a competent specialist.

10 PV Recycling

Do not dispose the PV module as unsorted municipal waste in accordance with WEEE Directive (Waste from Electrical and Electronic Equipment Directive), EN50419 and all the other applicable laws.

-END

Annex 1 APPLICABLE MODULE TYPE

Double Glass Bifacial Module	VSUNxxxN-144BMH-DG (144BMH-DG-BW/144BMH-DG-BB/144BMH-DG-BT/144BMH-DG-WT)
	VSUNxxxN-132BMH-DG (132BMH-DG-BW/132BMH-DG-BB/132BMH-DG-BT/132BMH-DG-WT)
	VSUNxxxN-120BMH-DG (120BMH-DG-BW/120BMH-DG-BB/120BMH-DG-BT/120BMH-DG-WT)
	VSUNxxxN-108BMH-DG (108BMH-DG-BW/108BMH-DG-BB/108BMH-DG-BT/108BMH-DG-WT)
	VSUNxxx-144BMH-DG (144BMH-DG-BW/144BMH-DG-BB/144BMH-DG-BT/144BMH-DG-WT)
	VSUNxxx-132BMH-DG (132BMH-DG-BW/132BMH-DG-BB/132BMH-DG-BT/132BMH-DG-WT)
	VSUNxxx-120BMH-DG (120BMH-DG-BW/120BMH-DG-BB/120BMH-DG-BT/120BMH-DG-WT)
	VSUNxxx-108BMH-DG (108BMH-DG-BW/108BMH-DG-BB/108BMH-DG-BT/108BMH-DG-WT)
Single Glass Bifacial Module	VSUNxxxN-144BMH (144BMH-BW/144BMH-BB/144BMH-BT/144BMH-WT)
	VSUNxxxN-132BMH (132BMH-BW/132BMH-BB/132BMH-BT/132BMH-WT)
	VSUNxxxN-120BMH (120BMH-BW/120BMH-BB/120BMH-BT/120BMH-WT)
	VSUNxxxN-108BMH (108BMH-BW/108BMH-BB/108BMH-BT/108BMH-WT)
	VSUNxxx-144BMH (144BMH-BW/144BMH-BB/144BMH-BT/144BMH-WT)
	VSUNxxx-132BMH (132BMH-BW/132BMH-BB/132BMH-BT/132BMH-WT)
	VSUNxxx-120BMH (120BMH-BW/120BMH-BB/120BMH-BT/120BMH-WT)
	VSUNxxx-108BMH (108BMH-BW/108BMH-BB/108BMH-BT/108BMH-WT)
Single Glass Monofacial Module	VSUNxxxN-144MH (144MH-BW/144MH-BB)
	VSUNxxxN-132MH (132MH-BW/132MH-BB)
	VSUNxxxN-120MH (120MH-BW/120MH-BB)
	VSUNxxxN-108MH (108MH-BW/108MH-BB)
	VSUNxxx-144MH (144MH-BW/144MH-BB)
	VSUNxxx-132MH (132MH-BW/132MH-BB)
	VSUNxxx-120MH (120MH-BW/120MH-BB)
	VSUNxxx-108MH (108MH-BW/108MH-BB)

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Vietnam Sunergy Joint Stock Company

Add: Lot III - Dong Vang Area, Dinh Tram Industrial Zone, Viet Yen District, Bac Giang province, Vietnam
PC: 230000
Tel: (+84)204 3566 688
E-mail: vsun@vietnamsunergy.com (Customer Service)
Web: vsun-solar.com