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上迈（镇江）新能源科技有限公司

Sunman（Zhen jiang）Co, Ltd

SMB Installation Manual

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A/0	**2025/9/10**	新增 First Version	孙思益
A/1	2025/10/15	1. 删除机械性能/电性能； Remove mechanical/electrical performance specifications 2. 修改适用组件型号； Update module model numbers 3. 删除附件电性能参数 Delete electrical performance parameters in the appendix	孙思益

Contents

1.0 Summary

Thank you for purchasing SunMan photovoltaic modules.

This guide contains important information for the installation, maintenance, and safe use of SunMan (Zhenjiang) Company Limited, referred to as “SunMan”, SMB series solar PV modules, referred to as “modules”. Please read and understand this manual before installing or handling the modules.

Users and installers must complete a specific site engineering review to ensure the proposed methodology is fit for purpose. The installation and operation of solar modules require specialized skills, and must only be carried out by qualified personnel. Failure to follow these safety guidelines can result in personal injury or property damage.

1.1 Disclaimer

Sunman reserves the right to modify this manual without prior notice. Any changes will be published on the official SunMan website**.** Customers should regularly check for updates.

Failure to operate in accordance with the requirements in this manual (including the updates published on the official SunMan website), the limited product warranty shall be void.

This manual does not constitute any warranty, expressed or implied. Users and installers must complete their own project-specific engineering assessments to ensure compliance with local laws and construction standards.

1.2 Responsibility

Regardless of whether the installation follows this manual (including changes announces on the official SunMan website at the time of installation), SunMan shall not be held legally liable for any damages arising during installation, including but not limited to personal injury or property loss resulting from the operation of the modules and the installation of the system.

This manual is for installation guidance only and does not constitute any form of warranty, whether explicitly stated or implied.

1.3 Copyright and Trademark Information

1.4 Warranty Information

If non-approved hardware is connected to the SunMan module, the warranty shall be void.

1.5 For Further Information

For additional technical support or information please visit the support page of the official SunMan website:

www.sunman-energy.com.

2.0 Safety Precautions

Warning: Prior to the installation, wiring, operation, or maintenance of the modules, read and understand all safety instructions. Failure to adhere to these instructions may result in property damage, injury, or death. DC electricity is generated when the module is exposed to sunlight or other light sources. Direct contact with live parts of the module, such as the terminals, whether connected or not, may result in serious harm.

Safety Rules:

- All installation work must strictly comply with local regulations and applicable national or installation electrical standards.
- Use insulated tools to reduce the risk of electric shock.
- Wear protective gear (non-slip gloves, work clothing, etc.) to avoid direct contact with voltages above 30 VDC and also protect from sharp edges during installation.
- Do not install or handle modules in rain, strong winds, or mornings with heavy dew without proper safety precautions.
- Keep children and unauthorized personnel are not allowed to access the installation or storage areas.
- If the inverter or its breaker cannot be turned off, cover the array of modules with an opaque material before wiring to stop power output.
- Do not use or install damaged modules.
- Avoid scratching the backsheet of the module.

- Damaged surfaces may cause electric shock.
- Do not attempt to repair any part of the module. There are no user-serviceable components as part of the module.
- Keep the junction box closed at all times.
- Do not disassemble or modify any part of the module.
- Do not connect or disconnect the module while there is currently flowing.

3.0 Storage and Unpacking

Precautions and general safety rules

- The modules must be transport in the package provided by SunMan and stored in the original package before installation. Please protect the packaging from damage. Open the packaging according to the recommended unpacking steps. Cure must be taken during unpackaging, shipping, and storage.
- Store modules in a dry and ventilated environment. For long term storage, keep the modules in the original packaging.
- Follow the guidelines on the limitations of stacking as marked on the packaging.
- Do not unpack the modules outdoors in rain. Wet packaging may collapse, causing damage to modules in personnel.
- Please wear gloves while unpacking.
- Follow steps in Appendix A for unpacking.

Module Identification

- Barcode: each individual module has a unique serial number. The serial number has 21 digits. The 1st to 7th digits are the module type for internal use.

The 8th to 11th digits are the year code. The 12th and 13th digits are the month code. The 14th and 15th are the week code. The 16th to 17th digits are the order number. The 18th to 21st digits are the sequence codes. For example, SMSxxxxxxx20210415xxxxxx means the module was made in the 15th week of 2021.

- Each module has a unique barcode, shown twice. (The first is permanently fixed to the interior of the module and is visible from the front of the module at the top. This barcode is inserted prior to lamination. The second is fixed to the rear of the module.)
- The nameplate on the back shows the model, key electrical performance specifications, safety specifications, and certifications.

4.0 Module Installation

Precautions and general safety rules

- Prior to installing modules, complete a site-specific engineering review to ensure the proposed methodology complies with local laws, regulations, and construction standards.
- Check applicable building and construction codes to confirm the building is suitable for SunMan module installation.
- When installing modules, ensure they are mounted on a fire-resistant roof. According to UL 790 standards, SunMan modules are rated Class C for fire resistance.
- SunMan solar modules comply with Application Class A (equivalent to Safety Class II, IEC 61730-1). Such modules may be used in systems accessible to the public, with voltages exceeding 50V or power greater than 240W.

- The mounting structure must be strong enough to withstand site-specific loads. This is the responsibility of the mounting structure supplier.
- In accordance with IEC 61215-2:2021, the maximum test load is calculated from a corresponding maximum design load with a safety factor of 1.5 applied. (Test Load=Design Load × 1.5).

4.1 Operating Environment

The modules are suitable for general climate conditions, as referenced in IEC 60721-2-1 – Classification of environmental conditions, Part 2-1: Environmental conditions appearing in nature – temperature and humidity.

- If the modules are to be installed in special environments (such as altitudes above 2000m), SunMan technical support must be consulted in advance.
- Do not install modules near flames or flammable materials.
- Do not expose modules to artificial concentrated light sources.
- Modules must not be installed or used in environments with excessive hail, snow, sand, smoke, air pollution, coal dust, etc., nor in environments with highly corrosive substances (such as volatile chemical vapors, acid rain, or salt mist).
- SunMan recommends installing modules in environments with working temperatures between -40°C and 40°C (monthly average maximum and minimum). The absolute working temperature range is -40°C to 70°C.
- Do not install modules in locations where they may be submerged in water or continuously exposed to sprinklers or fountains.
- **Failure to comply with the above requirements will void the SunMan**

warranty。

4.2 Installation Requirements

- Ensure that neither the front nor back surfaces of the modules come into direct contact with the mounting structure, building surfaces, or foreign objects (such as stones), as external force may damage the encapsulation structure and void the product warranty.
- Modules must be securely installed on the mounting structure.
- To reduce mismatch losses in the array, it is recommended to connect modules with similar electrical performance in the same string.
- Ensure that wind or snow loads on installed modules do not exceed the maximum allowable load.
- When modules are installed on rooftops, provisions for long-term maintenance must be considered. The roof structure must be evaluated by an engineer, with a formal structural analysis proving it can withstand the additional system load, including the weight of PV modules.
- Maintain a minimum clearance of 10 cm between module frames and the mounting surface to allow for air circulation.
- Due to thermal expansion and contraction, maintain a minimum spacing of 10 mm between adjacent module frames.
- Suman recommends the installation angle of modules should no less than 10 degrees, so that surface dust on the modules can be easily washed away by rainwater during rainy days, thereby reducing the frequency of module cleaning. When installed in the Northern Hemisphere, modules should face

towards the south; when installed in the Southern Hemisphere, modules should face towards the north.

- Modules must be installed in areas free of year-round shading. Ensure there are no obstructions (e.g., trees, poles) that could block sunlight. Frequent shading will reduce the service life of modules.
- **Failure to follow the installation specifications in this manual may result in micro-cracks, fire, or other damage.**

5.0 Installation Guide

5.1 Module

Applicable module model number: SMBxxxJ-6X24DW.

5.2 Module Handling and Inspection Notice

- Do not apply excessive loads or twist the modules.
- Do not stand, climb, walk, or jump on the modules.
- Do not allow the modules to come into contact with sharp objects; scratches will directly affect safety.
- Do not place modules in an environment without reliable support or fastening.
- Do not lift the panels via the junction box or cables.
- Handle modules with care during transport, avoiding impacts of module edges against the ground or other sharp, hard objects.

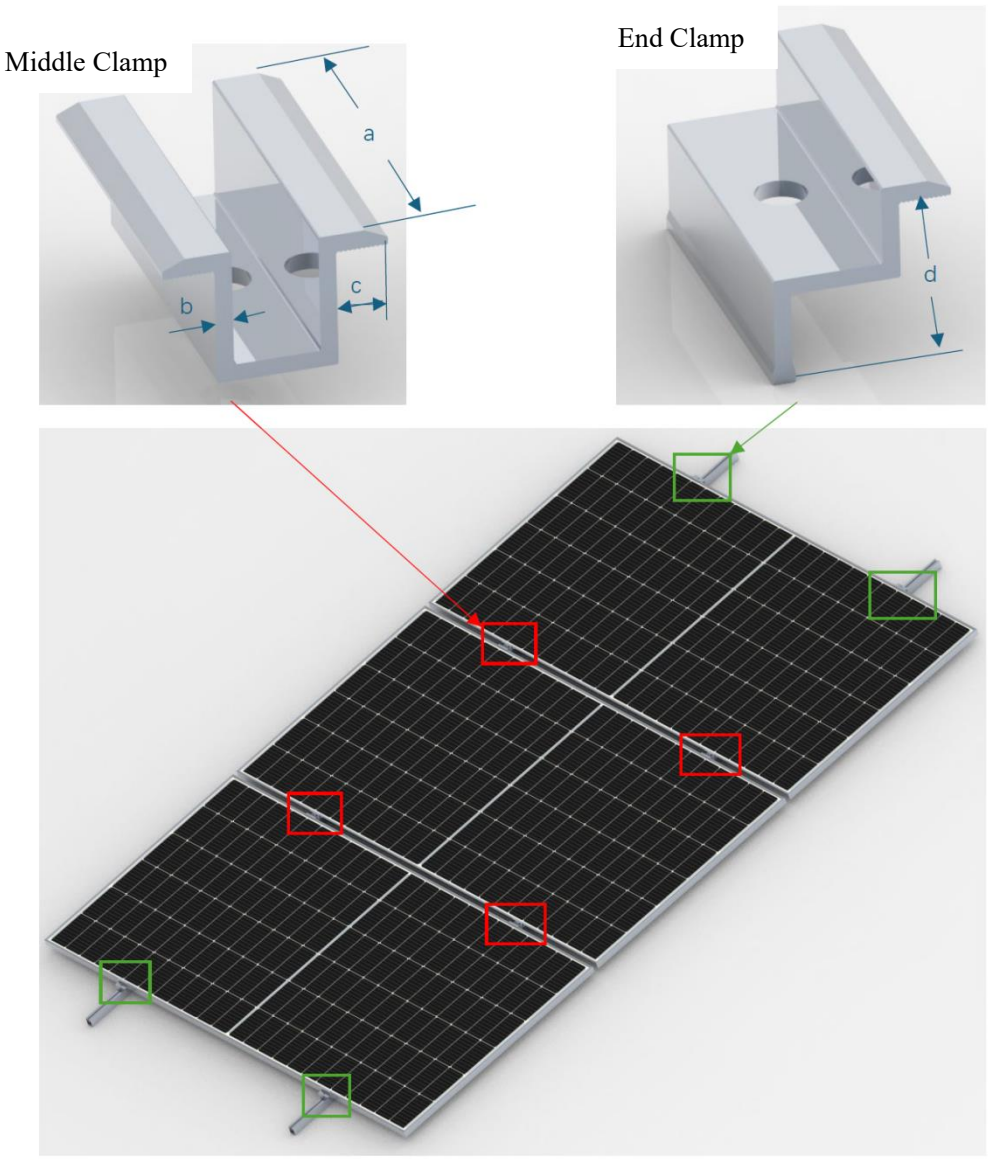
5.3 Installation Construction Plan

Modules and mounting systems may be installed using clamps. Module

installation must follow the requirements and recommendations below.

5.3.1 Clamp Specifications

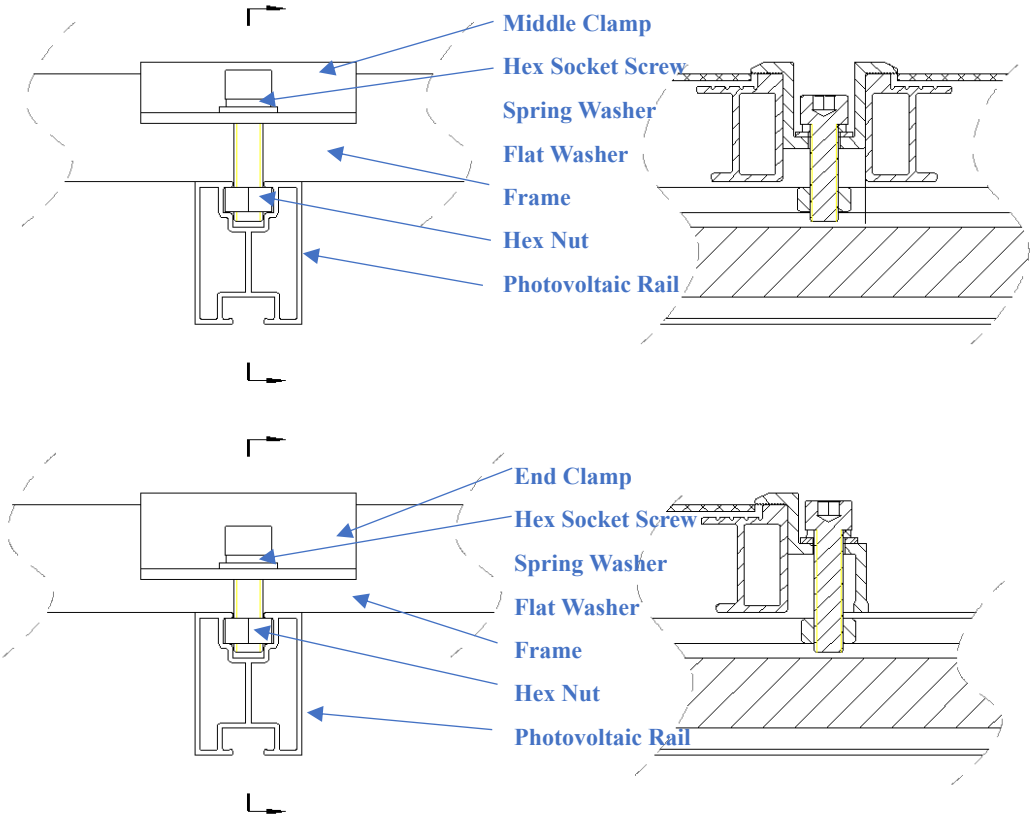
- Length a≥50mm，Thickness b≥3mm,
- Clamping contact width c=8~11mm,
- Clamp height d=30mm (matching frame height),
- Material: Aluminum alloy 6063-T5,
- Bolt size: Φ8~Φ9,
- The clamp shall not cause deformation of the module frame. The surface in contact with the frame must be flat and smooth, otherwise the frame and module may be damaged.
- Avoid clamps that cause shading. Drainage holes must not be obstructed.



5.3.2 Selection of Fasteners

- Fastener specification: M8
- Tightening torque for bolts/nuts: 16 N·m – 20 N·m
- An example, when using an aluminum PV rail as the mounting structure, the fastener specifications should be as shown in the diagram. For other mounting

structures (such as PV rails with different cross-sections, or steel C-purlins), suitable fasteners are to be used.

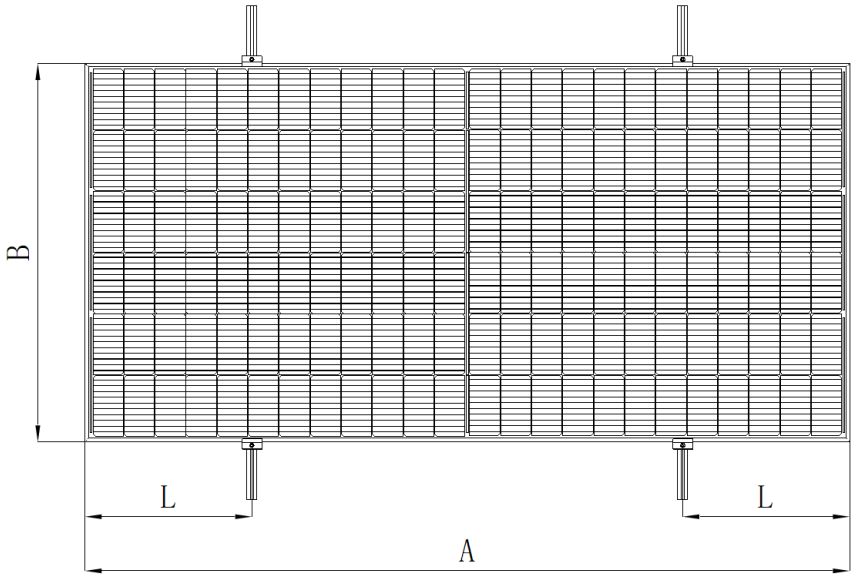


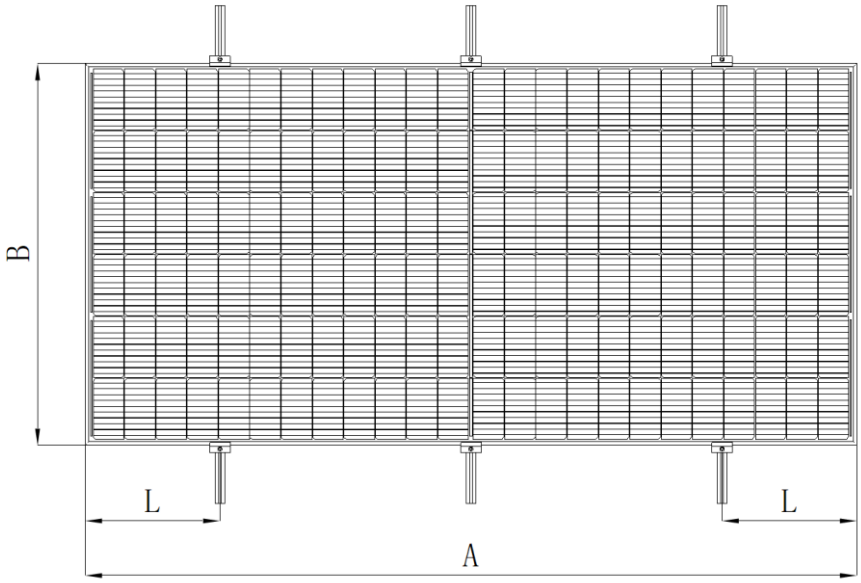
5.3.3 Clamp Position

- Modules can be fixed using either a four-point or six-point clamp solution.
- Low/normal load conditions, suitable for most environmental conditions: The maximum static load on the rear of the module is -2400Pa (equivalent to wind pressure), and the maximum static pressure on the front is +2400Pa (equivalent to wind and snow pressure). The four-point clamp solution can meet these conditions.
- Higher load conditions, suitable for harsh environmental conditions (such as

storms, heavy snow, etc.): The maximum static load on the back of the module is -2400Pa (equivalent to wind pressure), and the maximum static pressure on the front is +3600Pa (equivalent to wind pressure and snow pressure). A six-point clamp solution is required to meet these conditions.

- When using a four-point clamp, 1/5A≤L≤1/4A;
- when using a six-point clamp, 1/8A≤L≤1/6A, with the middle clamp centered on the long side of the module.





5.4 Electrical Characteristics

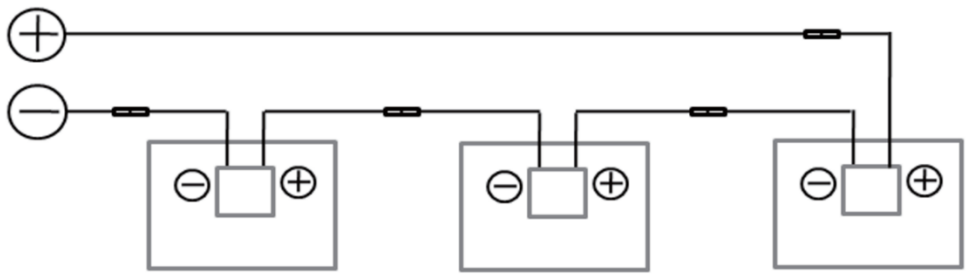
- When modules are connected in series, the total voltage is equal to the sum of the voltages of individual modules. When modules are connected in parallel, the total current is equal to the sum of the currents of individual modules. Modules of different electrical characteristics must not be connected within the same string.
- The maximum number of series-connected single-string modules must be calculated in accordance with the requirements of relevant regulations. The open-circuit voltage of the module under the local expected minimum temperature conditions must not exceed the maximum system voltage value specified for the module (the maximum system voltage of the Summan module is DC1000V/DC1500V --- the actual system voltage is designed based on the selected module model and inverter) and the values required by other DC electrical components.

- The open-circuit voltage correction factor can be calculated using the following formula:C_{Voc}=1- β_{Voc}×(25-T). Here, T is the expected minimum ambient temperature at the system installation site, and β (%/°C)is the temperature coefficient of the open-circuit voltage (Voc)for the selected module.

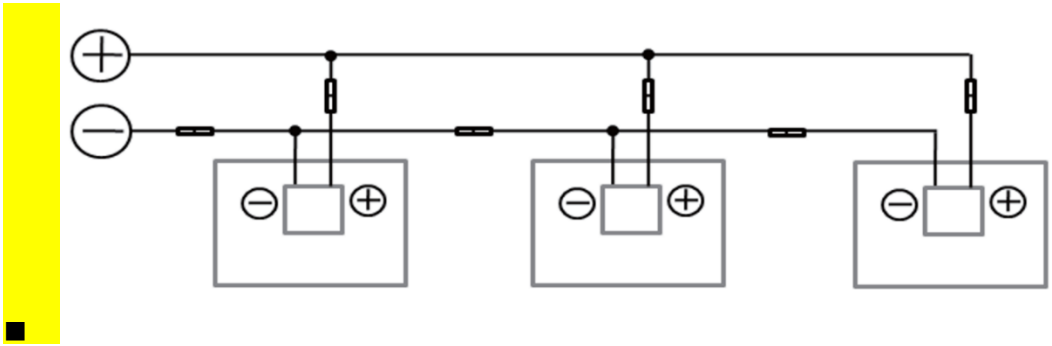
- The total voltage must not exceed the allowable maximum system voltage or the maximum inverter input voltage. The maximum number of modules per string must be calculated by qualified professionals in accordance with relevant regulations.

- If the number of parallel connections ≥2, there must be an over-current protection device on each string. The system designer shall design in accordance with local standards and requirements.

- Under normal conditions, modules may experience emitting more power than under standard conditions. When determining the accessories of the PV power generation system, such as the rated voltage, rated current, wire capacity, fuse specifications and other parameters related to the module power output, Isc and Voc marked on modules should be multiplied by 1.25.



- Series connection

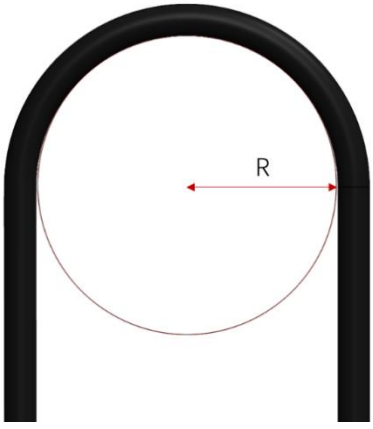


Parallel connection

5.5 Wiring and Testing

- Module connections must use junction boxes with IP68 protection rating. This provides protection for wires and connectors, and shielding accessible non-insulated live parts.
- Connector connections must be kept dry and clean, and protected from rain and moisture. Avoid direct sunlight and water immersion of connectors.
- Each module has two cables connected to the junction box: one positive, one negative. By inserting the positive connector of one module into the negative connector of the adjacent module, the two modules are connected in series.
- For applications requiring high operating voltage, multiple modules may be connected in series to form a string, in which case the array voltage equals the sum of voltages of the individual modules.
- For applications requiring high operating current, multiple module strings may be connected in parallel, in which case the array current equals the sum of currents of the strings.
- Excess cables must be organized and secured properly, and must not cover the cells.

- Permitted solar cables must be single-core cables, at least 4 mm² (12 AWG), 90°C rated, and with insulation adequate to withstand the maximum system open-circuit voltage. Select appropriate wire size to minimize voltage drop.
- Before starting the system, check the wiring. If the measured open-circuit voltage (Voc) and short-circuit current (Isc) differ from specifications, a wiring fault may exist.
- According to local fire, building, and electrical codes, use dedicated solar cables and connectors of the same brand and model as those used with SunMan modules, ensuring good electrical and mechanical performance.
- To ensure reliable electrical connection and prevent possible moisture ingress, connectors must be fully engaged and locked until a click is heard. Otherwise, arcing and electric shock may occur. Verify all electrical connections are firm and connectors are fully engaged..
- The minimum cable bending radius R shall be 42 mm.



The electricity generated by the photovoltaic system can be converted into AC electricity and connected to the grid. Local policies may vary region by region. Please acquire the necessary permissions, inspections, and approvals from your local electrical

utility department.

5.6 Bypass Diode

The Sunman module has junction boxes which contain bypass diodes connected in parallel with the solar cells. When hot spots occur locally within the module, the diodes are used to bypass the current flow away from the affected cells, limiting module heating and performance reduction. Note: bypass diodes are not current protection devices.

If a diode is confirmed or suspected to be faulty, the installer or system maintenance provider must contact Sunman customer service. Do not attempt to open or modify the module's junction box.

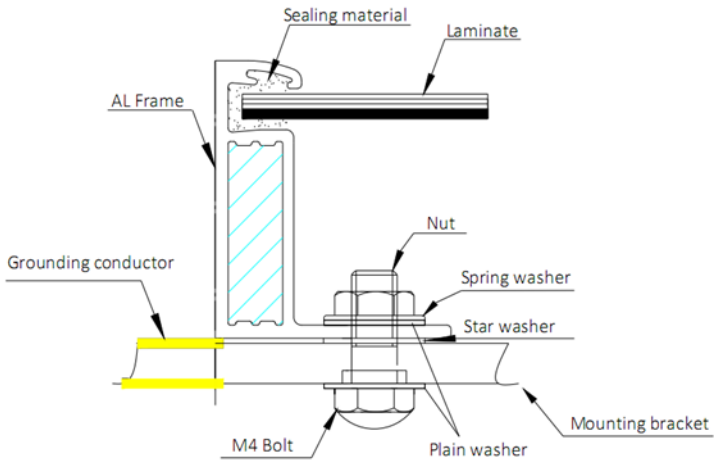
Connector: Stäubli Electrical Connectors AG，PV-KST4-EVO2A/xy / PV-KBT4-EVO2A/xy.

5.7 Grounding

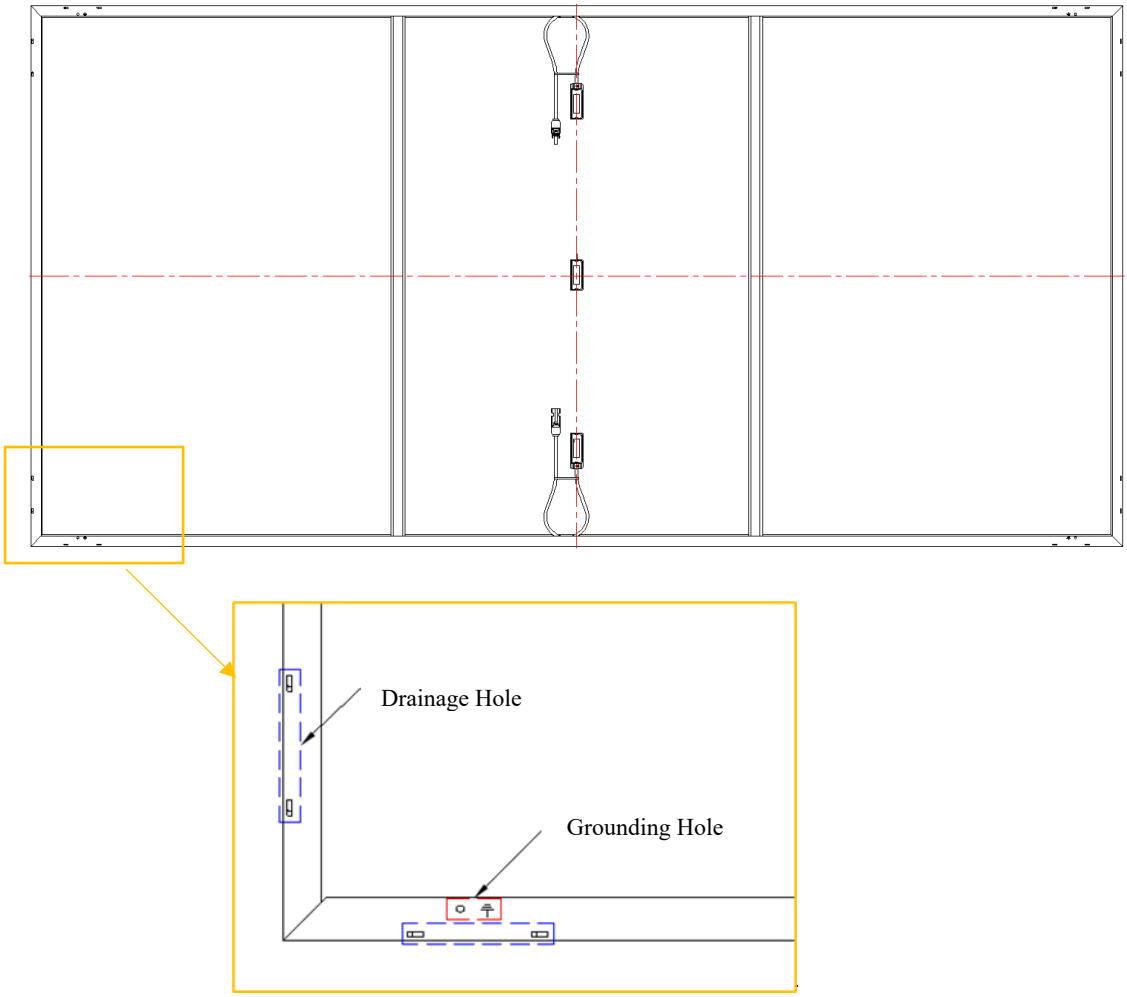
- The module design incorporates anodized, corrosion-resistant aluminum alloy frames or composite frames as rigid supports. For safe use and to prevent damage from lightning or static electricity, aluminum-framed modules must be grounded. Composite frames are non-conductive and do not require grounding.
- When grounding, the grounding device must make full contact with the aluminum, penetrating the oxide layer of the frame surface. Do not add any additional grounding holes on the module frame.
- Grounding conductors may be copper, copper alloys, or other materials permitted as conductors, depending on local rules and regulations. Grounding conductors must be connected to earth via suitable grounding

electrodes.

- On the back of the module frame, there is a Ø4 mm grounding hole, marked with the typical grounding symbol per IEC 61730-1 (⏚). This hole is only for grounding and must not be used for mounting.
- It is recommended to use the copper wire (4-14 mm2 or AWG 6- 12) as the grounding wire.The ground wire must also be connected to ground through a suitable ground electrode. The tight connection of all the joint point should be ensured.



- Using a separate grounding wire and related accessories to connect the aluminum frame of the solar PV module and connect the grounding wire to the ground. The grounding uses the M4 x 12mm bolts and M4 nuts, star washers and plain washers, this ensures that the modules are firmly grounded. You can find the corresponding product drawing in module datasheet to know the detailed number, size and position of the grounding holes, The torque applied to ground fixation is 4N· m~8N ·m.
- Grounding between modules must be verified by a qualified electrician, and grounding devices must be manufactured by certified electrical suppliers.



6.0 Operation & Maintenance

To ensure modules perform optimally and maximize system output, the following maintenance measures are recommended:

1. Module appearance inspection.

a) Whether there any visible damage to the module.

b) Whether there any sharp objects in contact with the module surface.

c) Whether modules are obstructed by objects (e.g., trees, poles).

d) Whether corrosion is present near cell busbars, which may result from encapsulation material damage during transport, which allows moisture ingress.

2. Module cleaning – dust or dirt accumulation on the surface reduces power output. Clean regularly to maintain a clean surface. Cleaning frequency may depend on site-requirements. Cleaning guidelines:

a) Rinse first with clean water, then wipe dry with a soft cloth. Do not use corrosive solvents or abrasive tools.

b) Clean when irradiance is below 200 W/m², preferably at night, early morning, or evening.

c) Do not clean modules under strong wind (>grade 4), heavy rain, or snow conditions.

Note: Do not walk, stand, or sit on modules while cleaning.

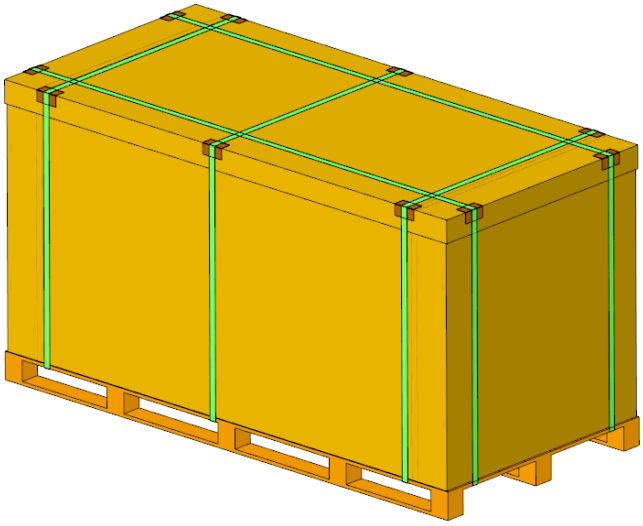
3 **Connector and cable inspection**

a) Inspect modules for signs of aging. This includes potential rodent damage, weathering, and whether all connectors are securely fastened and free from corrosion.

Appendix A

Unpacking Steps

1. Inspect the condition of the goods before opening



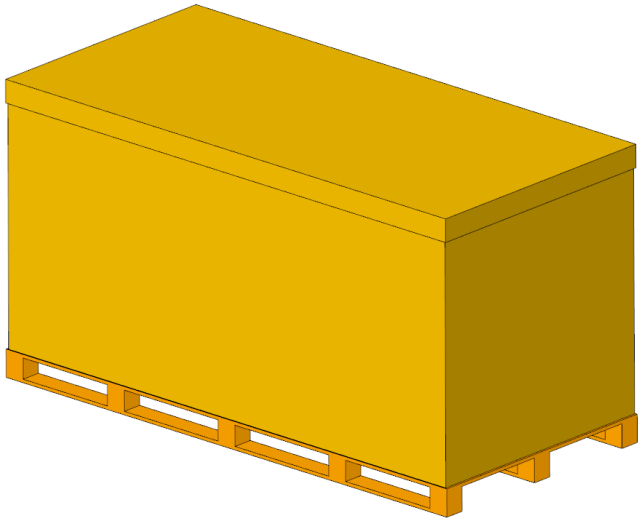
1、 Check the straps are intact and secure,

2、 Do not unload in rainy conditions,

3、 Ensure the ground is level and suitable for pallet placement,

4、 Use a forklift to move the pallet to the work area. Transport smoothly to avoid unnecessary shock to the pallet.

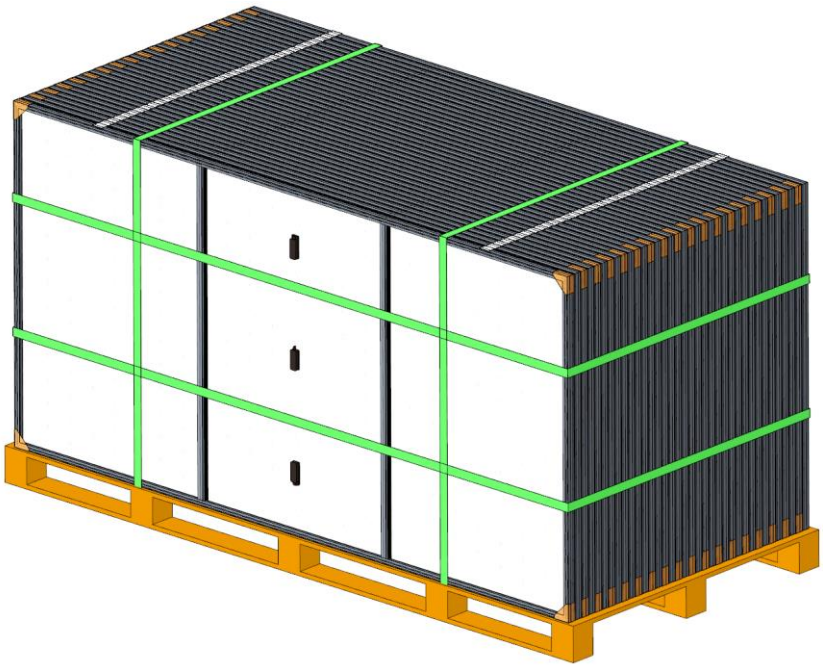
2. Remove outer packaging and packing straps



1、 If heavy winds are present, be especially careful while unpacking. It is not recommended to unpack or move modules under these conditions.

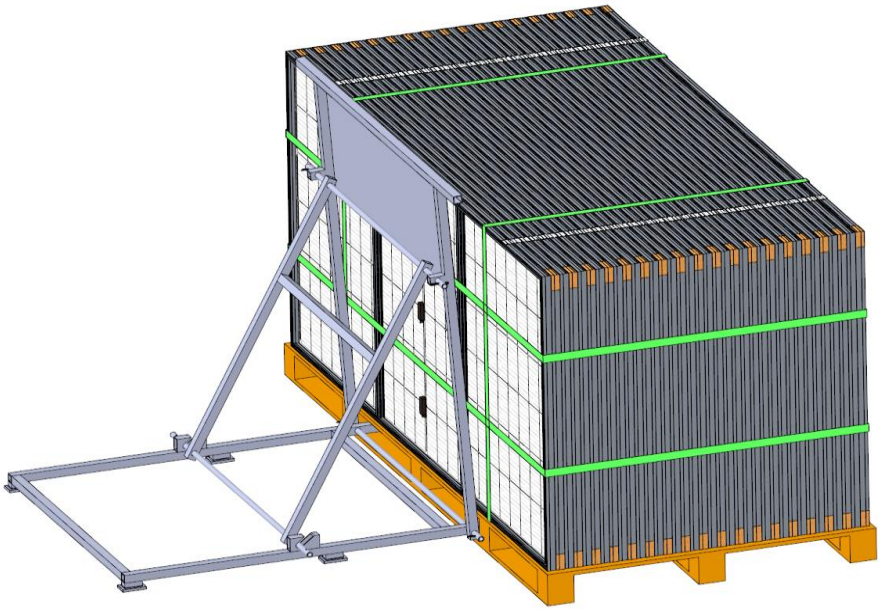
2、 Locate the joint where the packing straps meet. Separate by pulling each end apart.

3. Remove the carton cover and enclosure

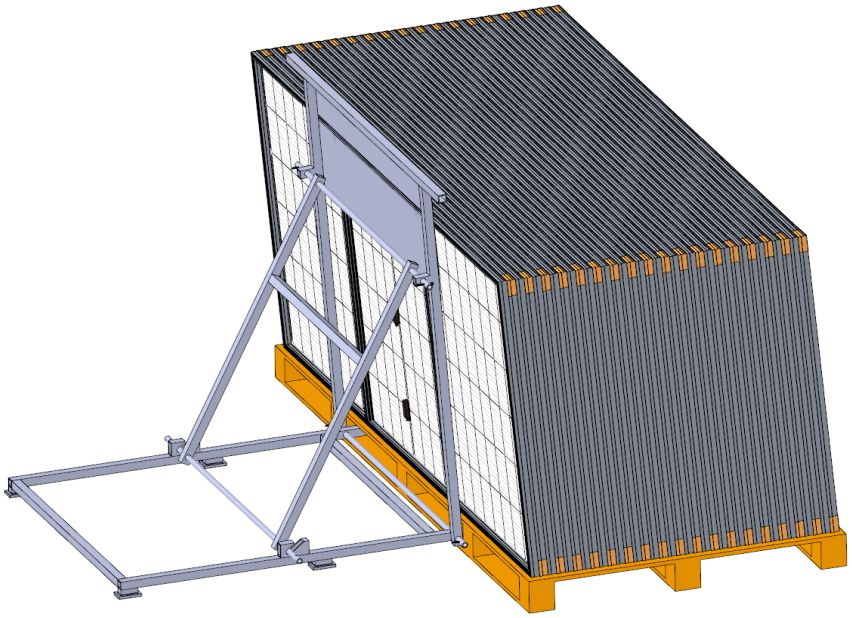


4. Support method 1: Fall support

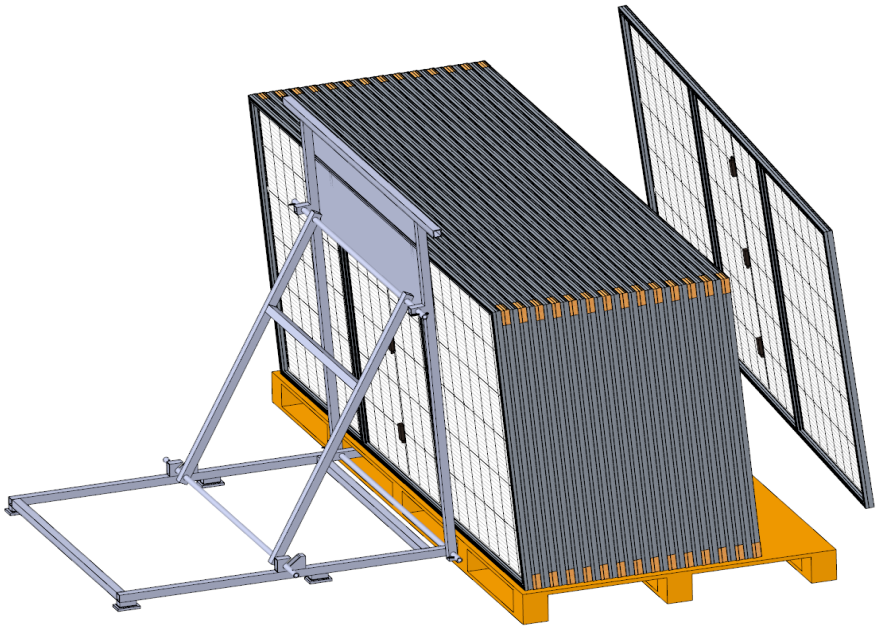
a) Insert anti-fall bracket



b) Remove the inner packing tape and place the assembly on the anti-fall bracket.

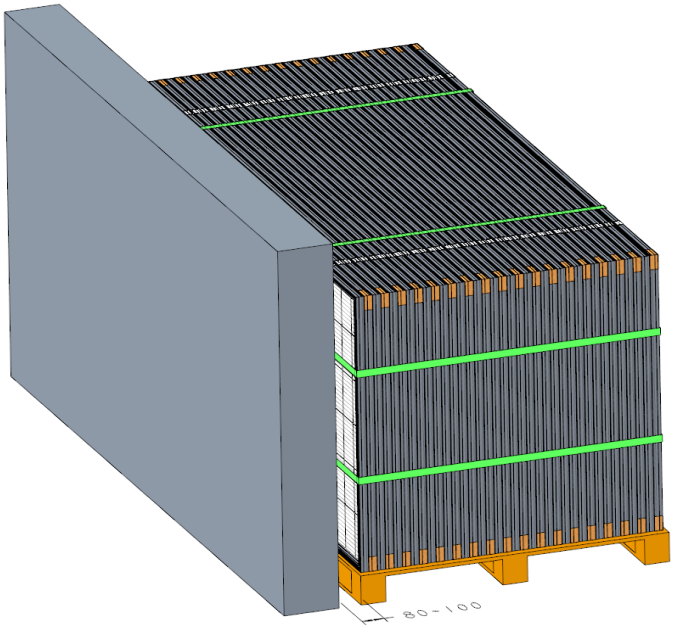


c) Remove the modules one at a time.

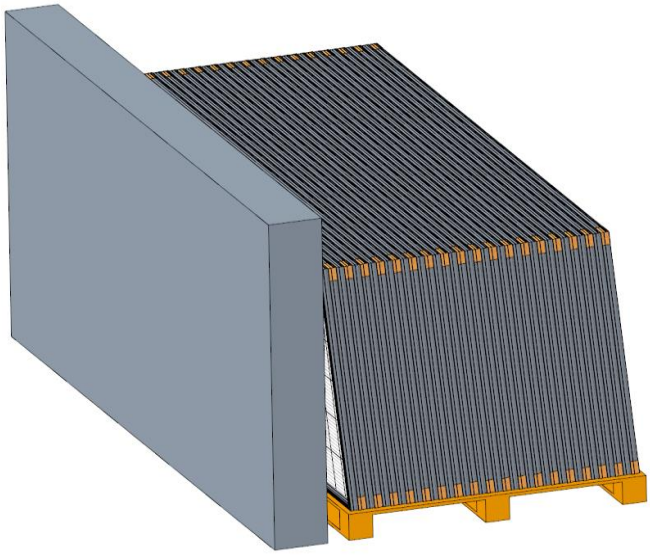


5. Support method 2: Vertical face support

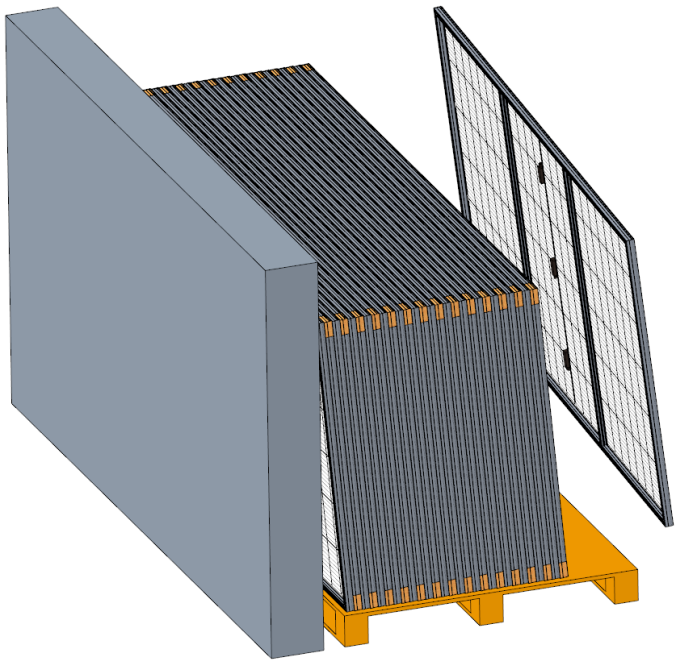
a) Place the pallet close to a solid vertical surface (such as wall or another pallet), with a distance of approximately 80 to 100mm,



b) Remove the inner packing strap and place the modules against the vertical surface,

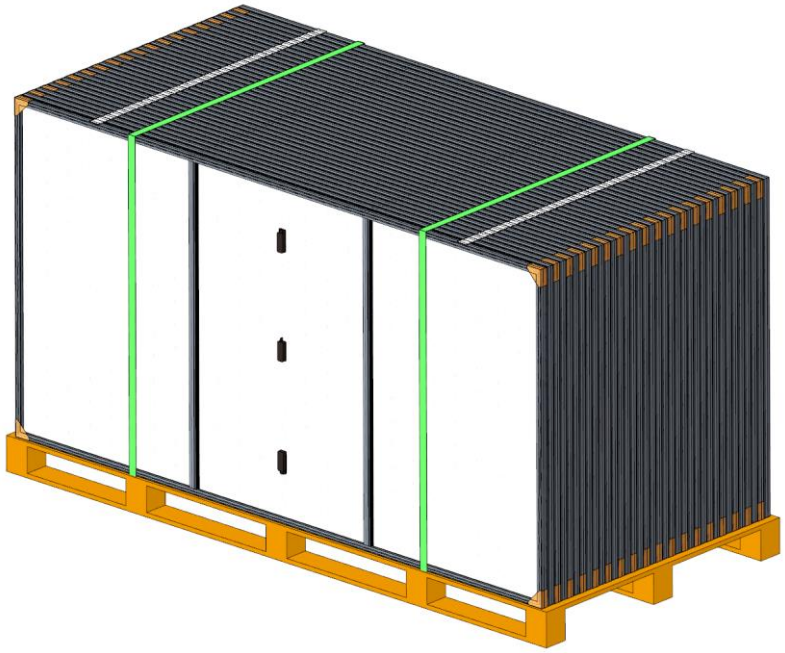


c) Remove modules one at a time,

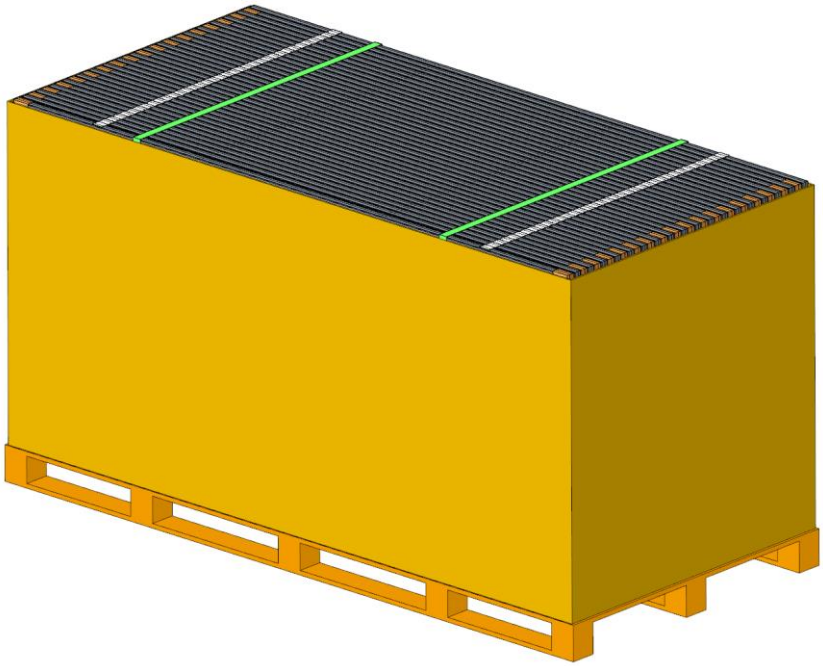


6. Support method 3: Pallet enclosure support

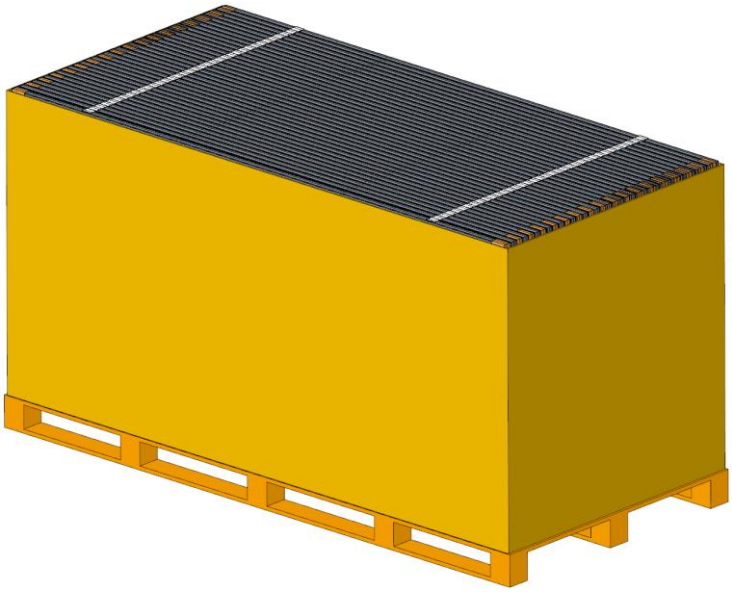
a) Remove horizontal inner packing strap,



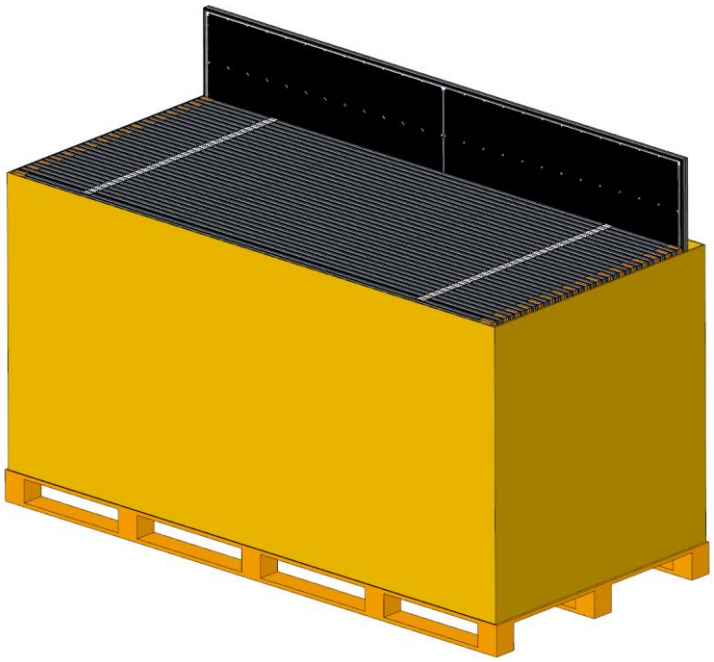
b) Reinstall pallet enclosure,



c) Remove vertical packing straps,



d) Remove the modules one by one, starting from the outermost modules. Tear off any tape attached the modules.



7. Note

a) If modules are not installed immediately after unpacking and need to be

changed from upright to flat stacking: place the top module face down, all others face up, stack in order on pallet; stack no more than 18 modules high.

b) Modules must be aligned and restrained with straps or other methods, otherwise they may tilt or fall during transport.

c) When handling single modules, always have two people operate together, lifting and placing carefully.