# MSH MODULE INSTALLATION USER MANUAL



**Module Types**
**MSH10-xxxHT4T**
**MSH10-xxxHN4G**

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# Table of Contents

## 1.0 INTRODUCTION

This manual contains the information for installation and safe handling of PV modules (hereafter is referred to as "module") manufactured or sold by Mission Solar Energy, LLC ("Mission Solar Energy").

All instructions shall be carefully read before installation. Please contact our sales department for further information if you have any question.

The installer shall be familiar with the mechanical and electrical requirement of PV system. The installer shall comply with safety precautions listed in this manual and local law regulations when installing the modules.

Mission Solar Energy does not take the responsibility for the loss, damage, or expense arising caused by any violation of this manual and reserves the rights to modify the product manual or installation manual without advance notice.

This manual shall be properly kept for future reference (care and maintenance) and in case of sale or disposal of the module at the end of its useful life.

Mission Solar Energy reserves the right of final interpretation of this installation manual.

According to UL61730 standard, the safety class of solar module is class II; the fire performance grade of Single Glass solar module is type 1; the fire performance grade of Dual-glass solar module is type 29.

## 2.0 DISCLAIMER OF LIABILITY

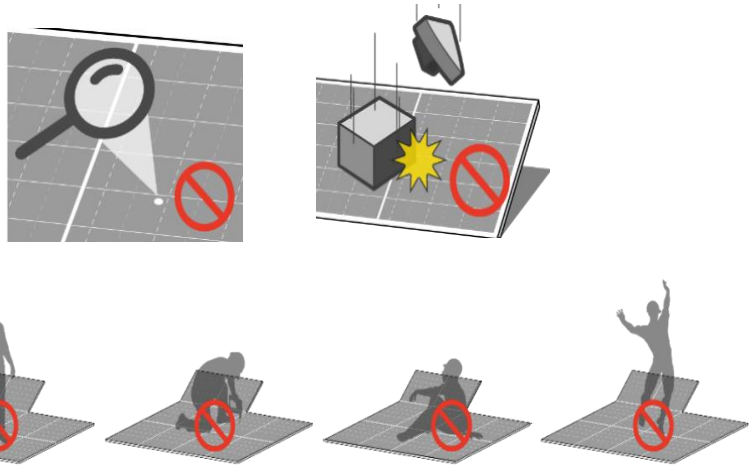
Since the use of this guide and the conditions or methods of installation, operation, use, and maintenance of the module are beyond Mission Solar Energy control, Mission Solar Energy does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use, or maintenance. Mission Solar Energy assumes no responsibility for any infringement of patents or other rights of third parties that may result from use of the module.

No license is granted by implication or otherwise under any patent or patent rights. The information in this guide is based on Mission Solar Energy knowledge and experience and is believed to be reliable; but such information including product specifications (without limitations) and suggestions do not constitute a warranty, expressed or implied. Mission Solar reserves the right to make changes to the product, specifications, or manual without prior notice.

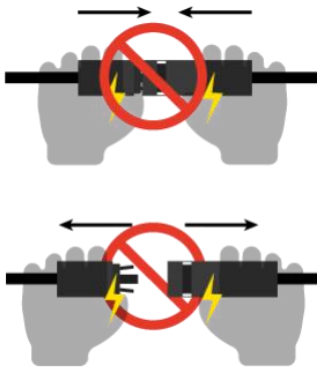
## 3.0 WARNING

1. Installing solar photovoltaic systems require specialized skills and knowledge Installation should be performed by qualified personnel
2. When the modules are exposed to sunlight or other light sources, direct current (referred to as DC) is generated Do not touch the electrical components of the module as this may result in an electric shock hazard.
3. Modules may be mounted in outdoor environments on ground, roofs etc. Modules installed on the roof, must be installed with a certain fire protection capability. The design of the racking or support structure shall be the responsibility of the system designer or installer. When installing modules on a bracket parallel to the roof or wall, maintain a minimum clearance of 10 cm (4 inches) between the module frame and the surface allow for air circulation and prevent overheating or damage to the wiring.
4. Do not disconnect the cables of modules when modules are in operation.
5. Do not disassemble the modules or remove any attached nameplates or components from the modules.

6. Never place the module in locations where flammable gases may be easily generated or collected
7. Do not expose the module to artificially concentrated sunlight. Avoid prolonged exposure of the back side of the module to direct sunlight.
8. Avoid dropping objects on the modules or placing heavy items over them. Do not tread, stand or walk on the modules as doing so may result in risk of damage to the module or personal injury.



9. Do not pull the junction box or cables when carrying or lifting the modules.
10. Keep children away from modules during transportation and installation.
11. Do not wear metal rings, bracelet, earrings, nose rings, lip rings or any metallic accessories during transportation and installation of the modules.

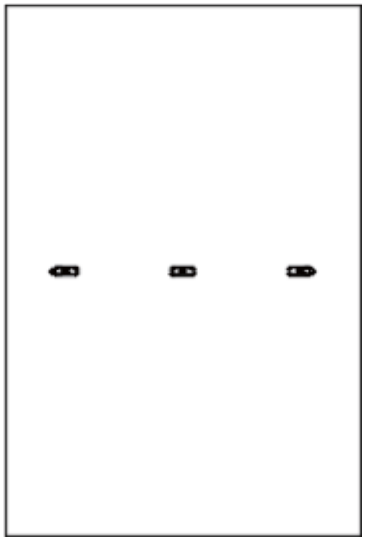
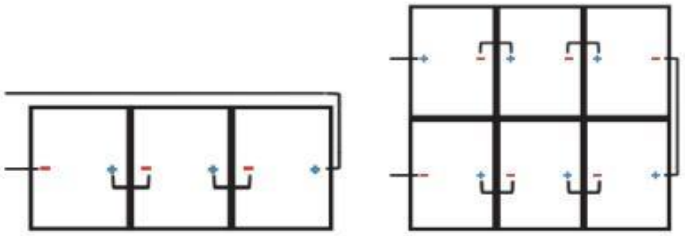
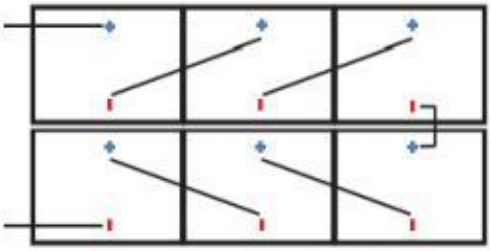


12. Do not touch electrical parts of the modules by hand without insulated protection.
13. Use insulated tools approved for working on electrical installations to connect electrical parts of the modules.
14. During transportation of the modules, avoid any impact and strenuous vibration as this may lead to damage of the solar cells.
15. When the modules arrive at the destination and before installation, place them on a flat, stable surface with adequate protection against moisture, wind, rain, and snow.

16. Unpack the modules carefully to avoid damage
17. Avoid any damage to the module glass or the edge seals, as these components protect the module from risk of damage. If the glass or seal is damaged there may be a risk of electric shock or fire. Damaged modules cannot be repaired. If any damage is found, replace the module immediately.
18. In order to reduce the risk of electric shock or combustion, cover the modules with opaque material when installing to keep electricity from being generated.
19. Installers must ensure that all connections between the racking system and the PV modules are secure and properly tightened.
20. All modules system must be properly grounded., unless otherwise specified, comply with the International Electrical Standards (IEC) or other international standards.
21. Do not clean the modules with corrosive chemicals.
22. For roof applications, the fire resistance rating of the system depends on the module and roof condition. The fire rating is valid when modules are installed correctly in accordance with this installation manual.

    During the storage, transportation, installation and maintenance of components, it is strictly prohibited to allow the modules to come into contact with any form of oil, grease, or corrosive chemical reagent.

## 4.0 JUNCTION BOX STYLE AND WIRING METHOD

<table>
<tr><th>Junction Box Location Icon</th><th>Recommended Wiring Method</th></tr>
<tr><td rowspan="2">  </td><td>Vertical Installation: Standard Cable length<br>Note: An extension cord is required at the rotor head of the double row assembly and at the end of the single row.<br>  </td></tr>
<tr><td>Horizontal Installation: module cable length≥1.4m<br>  </td></tr>
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# 5.0 INSTALLATION

## 5.1 INSTALLATION SAFETY

- Wear protective headgear, insulating gloves and rubber shoes when installing modules.
- Standing or walking on modules during installation can result in damage and serious injury. Handle modules carefully and minimize contact. The surface and frame may become extremely hot and pose a risk of burns or electric shock.
- Keep modules in packaging until time for installation. Avoid installing modules in rainy, snowy or windy weather.
- Stop installation if junction box connectors are wet as this can pose an electric shock hazard.
- During installing, do not throw anything, including modules and installation tools.
- Ensure the junction box is connected correctly. Verify that all wiring connections are secure and undamaged. Avoid scratches or excessive pressure that may damage the cables or module.
- During installation or exposure to sunlight, avoid touching the junction boxes or connectors, regardless of whether the modules are connected to the photovoltaic system or not.
- Avoid applying pressure, placing heavy objects on the module surface, or deforming the module frame.
- Avoid hitting or placing heavy objects on the modules glass as this may cause damage or microcracks in the solar cells.
- Avoid cleaning the modules with sharp tools, which may lead to scratches on the modules glass.
- Avoid drilling holes into module frame without permission.
- For BIPV or roof application, follow the installation rules of "from top to bottom" or / and "from left to right" referred to in section “Bifacial Module Arrangement and Layout Optimization”
- The module frames can experience thermal expansion and cold contraction, therefore requiring a minimum clearance of 10mm (0.39in) between adjoining modules.

## 5.2 INSTALLATION CONDITIONS

The module should be installed at an ambient temperature of –40°C to +40°C (-40°F to +104°F). The module’s limit working ambient temperature range is from –40°C to +85°C (-40°F to +185°F)

The maximum altitude for PV module is 2000m.

Under standard test conditions (1000W/m2 irradiance, AM 1.5 spectrum, 25°C (77°F) ambient temperature), the electrical performance parameters of modules, such as Isc, Voc, and Pmax.

Tolerance of rating for Pmax is ±3%, Voc and Isc is ±5%.

A suitable installation location shall be carefully selected for modules.

In the Northern Hemisphere, modules should be installed facing south; in the Southern Hemisphere, modules should face north.

The tilt angle of the PV module is measured between the surface of the PV module and a horizontal ground surface (as shows in Figure 1). The PV module generates maximum output power when it faces the sun vertical.

If you want the specific information of best install tilt angle, please consult the local authoritative solar system construction company.

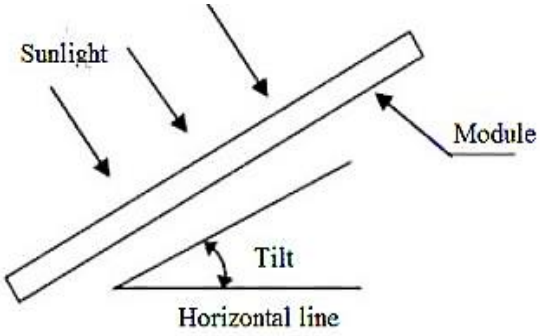



Figure 1 PV Module Tilt Angle

Modules shall be installed in the position of full sun exposure and not be obscured at any time.

When the battery is used in the photovoltaic system, the battery must be installed correctly so as to protect the safe operation of the photovoltaic system. Battery installation, use and maintenance shall be carried out in accordance with battery manufacturer's instructions.

It is recommended that the height of the module is 0.3- 1m higher than actual environment.

## 5.3 INSTALLATION INCLINATION ANGLE SELECTION

PV modules connected in series should be installed in the same orientation and angle.

If connected to an independent photovoltaic system, the installation angle of the module should be based on the season and light conditions to achieve the maximum power output. At the lowest illumination intensity, if the power generated by module with certain angle can satisfy the lowest power generation, it is that the modules with the certain angle can satisfy the power generation all year around. For grid-connected system, the installation angle of modules depends on the max power generation all year around.

## 5.4 CHOOSE THE PHOTOVOLTAIC SUPPORT

The system designer or installer is responsible for calculating the system load to make sure all modules can support the estimated load. The module support manufactures should supply qualified module supports.

To maximize the utilization of the power generated by the back of the double-sided photovoltaic module, obstacles on the back should be avoided to prevent obstruction of the backside of the module.

## 5.5 CHOOSING THE PHOTOVOLTAIC INVERTER

When choosing photovoltaic inverter, consider the power, open-circuit voltage, short-circuit current of PV module array. Ensure that the minimum voltage of the module array is higher than the threshold voltage of inverter to ensure proper operation.

When calculating the number of modules in a series array, use suitable equipment, connectors, wires and racking. Ensure that all modules used in a single PV system are the same type. When determining rated voltage, wire capacity, fuse, the controller capacity and module output power of relevant parts of the PV system, refer to

the short-circuit current (Isc) and open circuit voltage (Voc) shown on the module's label to determine suitable parameters. In normal outdoor conditions, the current and voltage generated by module may be different from the parameters listed on the label as those parameters were measured under standard test conditions (STC). In different outdoor climate and surroundings, due to different power generation coefficients, the actual parameters, including rated voltage, wire capacity, fuse, the controller capacity and module power output, varies depending on module location. In order to obtain the module's actual electrical parameters, usually, the photovoltaic system designers or installers can use the short-circuit (Isc) current and open circuit voltage (Voc) noted on the module's label multiply by 1.25 (redundant value). If the bifacial modules are installed at high reflective surrounding, the redundant value can increase suitably.

Ensure that the system voltage of each module array is lower than the maximum voltage of the photovoltaic system, rated voltaic of the inverter and the controller. The system current of each module array is less than the maximum current of the photovoltaic system as well as the rated current of the inverter and controller.

According to the system requirement of output voltage and current, modules are connected in series or parallel. The maximum number of modules in series (N) is equal to the number of the maximum system voltage (Vmax) divided by the open circuit voltage (Voc) of each module. The number of modules in parallel has relate to the parameters of electrical equipment (such as inverter and controller) in STC.

$$N \leq \frac{Vmax}{Voc * [1 + Tc(voc) * (Tmin - 25)]}$$

N: Number of modules in series.
Vmax: Maximum system voltage
Voc: Open circuit voltage of each module (refer to product label or data sheet).
Tc(voc): Thermal coefficient of open circuit voltage for the module (refer to data sheet).
Tmin: The lowest ambient temperature.

## 5.6 BIFACIAL MODULE ARRANGEMENT AND LAYOUT OPTIMIZATION

Generally, for normal modules' array, there are two (2) methods of module connection:

- First method connects the upper module and the under module in series.
- The second method separates the upper and the under modules.

All upper modules connect in series, and all under modules connect in series separately. There is significant height difference between upper and under modules. The significant height difference leads to light illumination difference between upper and under modules. The light illumination difference leads to different working current of the module.

If choosing the first method, the under module, which has lower working current, will decrease the working current of the upper module. The decreasing of upper modules' working current will reduce the whole power generation of photovoltaic system.

When choosing the second method, the upper modules and the under modules have different working current. It can decrease power loss due to working current mismatch, which improves the advantage of bifacial modules and increases whole power generation of photovoltaic system.

The light illumination rises with height increasing at the same outside surrounding. Therefore, the upper modules have higher light illumination than the under modules. In order to reduce the current mismatch, we advise the

second modules connection method. At the same time, connect the upper/under modules' array to the different MPPTs of the inverter individually. This is the best method of modules' array connection for photovoltaic system.

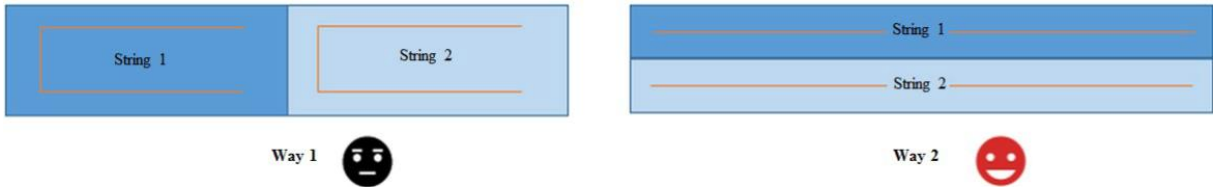



Figure 2 Optimization of module array connection

## 5.7 MODULE UNPACKING

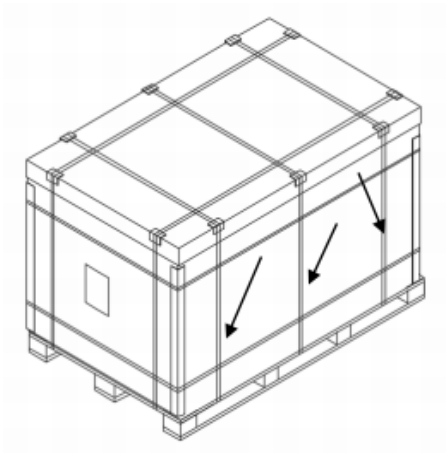
- Upon the module's arrival, avoid unpacking modules in humid and rainy weather.
- After unpacking, the modules should be placed horizontally. Avoid tilt, pressure, leaning on the wall of the modules. Avoid tilting, stacking or leaning the modules.


No Tilting No Stacking No leaning on the

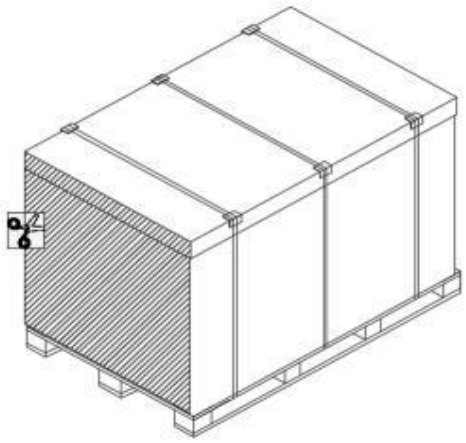
Figure 3: Module Stacking Illustration

- Modules from different batches should be stacked separately and neatly. When flat stacking loose modules after unpacking, do not stack more than 24 modules per pallet if the module weight is greater than 20kg. For modules heavier than 20kg, do not stack more than 20 modules per pallet.
- Follow the methods below for proper unpacking methods. Avoid rough handling or the use of tools such as a crowbar for unpacking.
- After unloading, the modules' box should be placed on dry and flat ground, without wet, muddy and/or uneven ground condition.
- Upon arrival, , the upper and lower module boxes should be separated and placed individually without stacking. If the modules cannot be installed immediately, ensure to protect the packaging of the module's boxes. Avoid any damage to the packaging from rain, snow, hail, typhoon, etc.

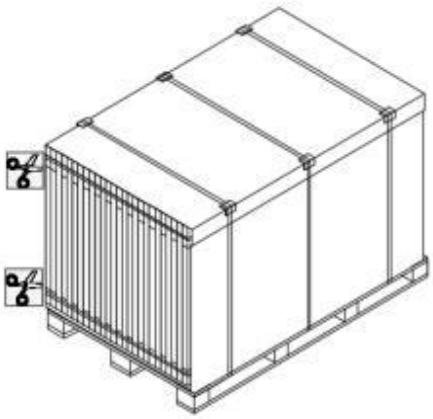
**Unpacking Process（Method 1）**



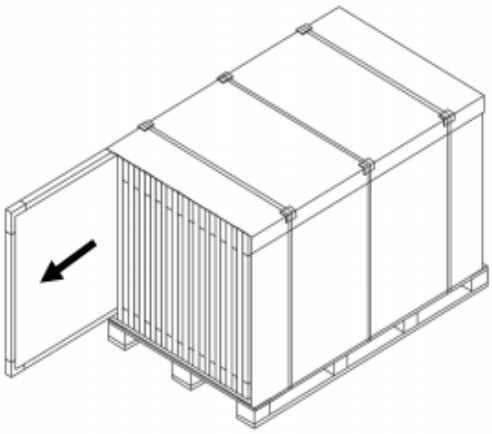
1. Do not remove the three (3) vertical straps (indicated by the arrows). Remove all remaining straps from the packaging as shown in step 2 image.



2.Remove one side of the packaging (shaded part).

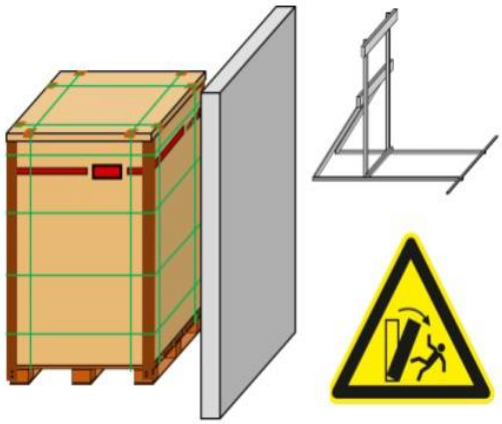


3.Cut the two horizontal packing straps on the carton.

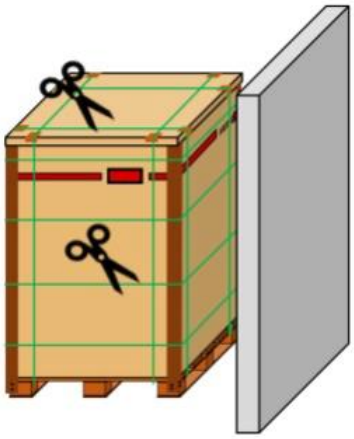


4. Remove modules from the side. Depending on surroundings, take steps to prevent modules from tipping over or sliding during unpacking.

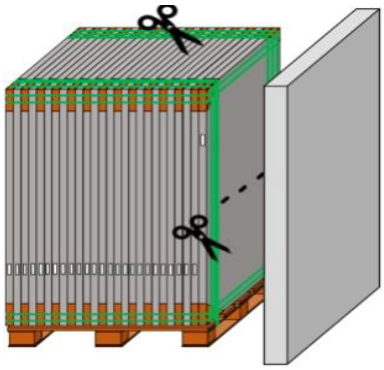
**Unpacking Process（Method 2）**



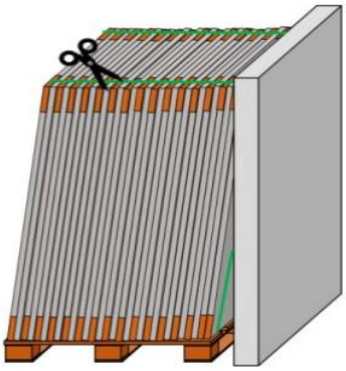
1. Place the pallet on a flat ground next to a solid wall or other support



2. Remove strapping and packaging box (There are Velcro strips on the diagonal of the packing case to facilitate quick unpacking).

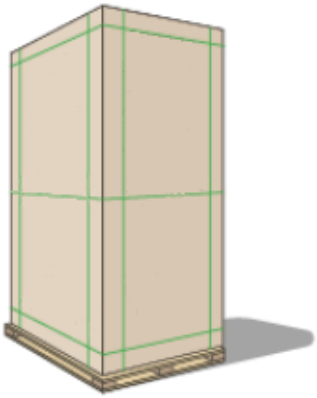


3. Remove strapping from modules (leave two straps on the module package, see next picture).

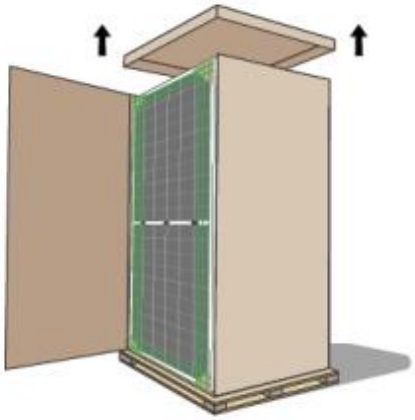


4. Lean the banded module package against the support / wall. Remove last strapping. Modules can be taken individually from the pallet.

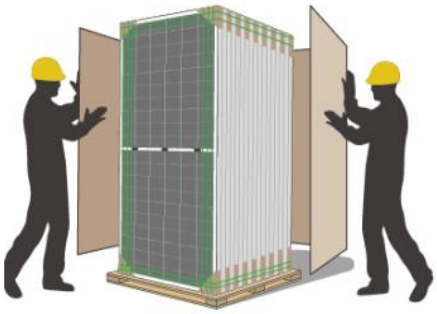
**Unpacking Process（Method 3）**



1. Cut the packing tape and remove the wrapping film

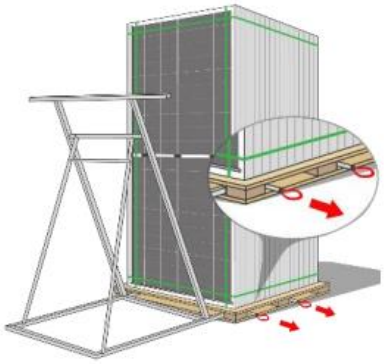


2. Remove the top cover and remove the sealing tape



3. Remove the cardboard box

4. Insert the unpacking bracket into the bottom of the tray from the component glass surface or back panel surface



6. Pull out 4 anti-retreat bars from the foot support positions on both sides of the tray.

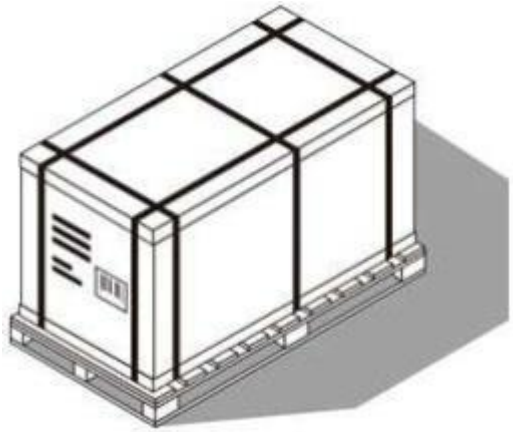
7. Cut off all horizontal packing straps

8. When there are 1-2 remaining vertical packing belts, slowly push the components towards the support frame; Cut off the remaining packing tape and lean against the support frame

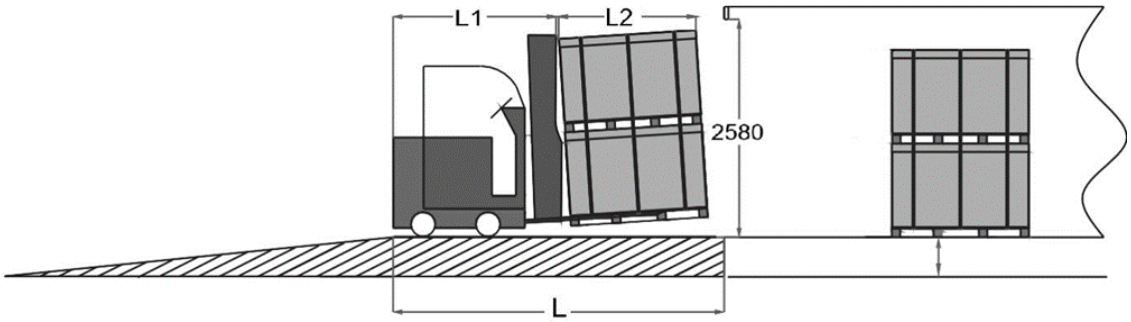
9. Transport components in order

## 5.8 TRANSPORTATION

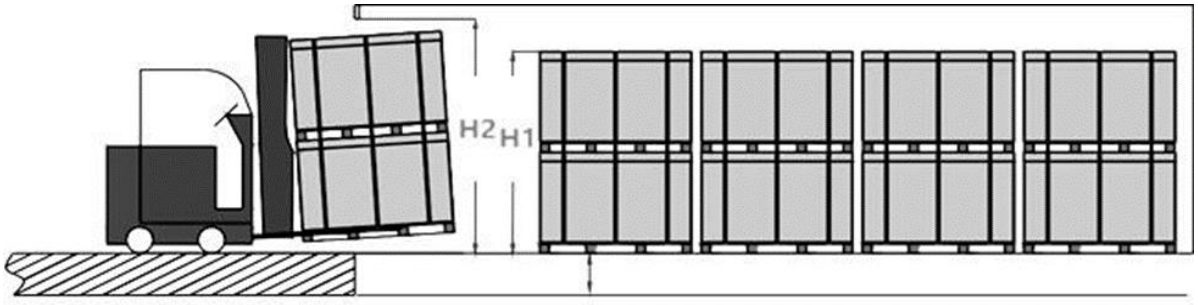
Do Not remove the original packaging if the modules require long-distance transportation.



The finished package can be transported by land, sea or air. During transport, make sure that the package is fixed to the shipping platform without moving, stacking no more than two layers by truck

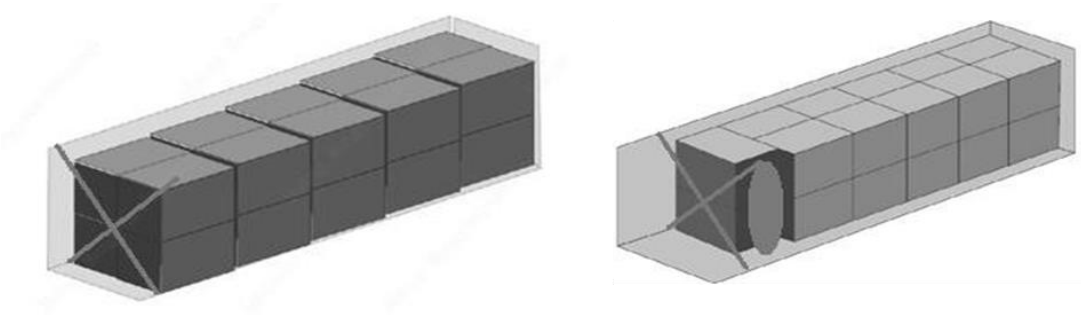


L≥L1+L2; L: Length of the horizontal extension of the unloading platform or unloading tooling
L1: Length of unloading forklift
L2: Length of the module packing box




H1: Height of the module packing box H2: Height of the container door

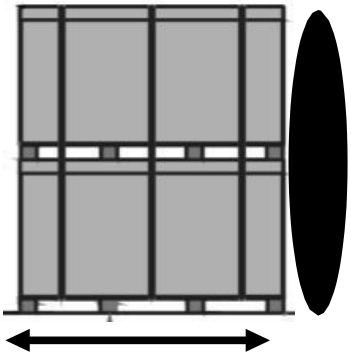
If modules do not fill the container, then you must secure the front stacked pallets with polyester fiber packing tape.



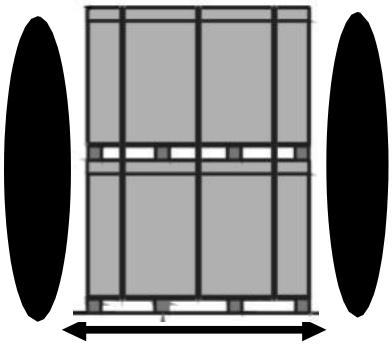
If the width of the module pallet is W1≥1120mm, there is no need to place the air bags between the two pallet stacks.

For double-stacked pallets with width (W2) ≥ 1800 mm (1.8 m), place the stack on one side of the container with an airbag positioned on the opposite side for protection.

For single-stacked or smaller pallets (width W2 < 1800 mm or 1.8 m), place the pallet in the center of the container, with airbags on both sides and one at the end to secure it in place.

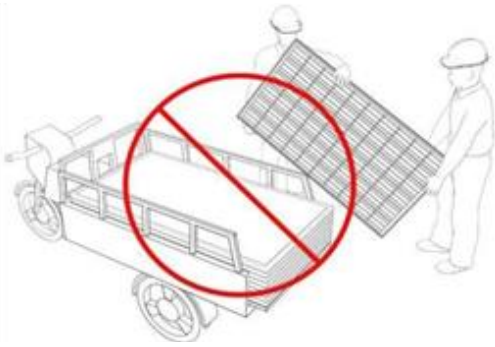


W2 ≥ 1800mm

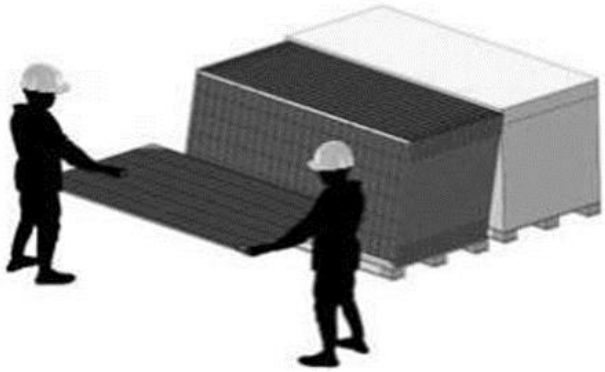


W2 < 1800mm

One-layer stacking for transport is only allowed at project site; No transport or handling by pedi-cab



Modules must not be carried by one person.



## 5.9 INTRODUCTION OF INSTALLATION METHOD

The modules can be installed in clamp and bolt methods.

1. All installation methods described in this manual are only for reference. MSE is not responsible for providing relevant installation parts, design or installation of component system. Mechanical loading and safety should be finished by a professional photovoltaic system installer or PV system technicians.
2. Before installation, the following important items need to be confirmed:
    a. Before installation, it is necessary to check if there is are any defects or other foreign matter which is related with appearance and the safety performance of the junction box.
    b. Please make sure that the serial number of the module is correct.
    c. If the modules are installed in harsh environments, such as snow or high wind, extra measures are needed to protect the modules.
    d. The safety factor of mechanical load is 1.5 times. payload = design load * mechanical load safety factor multiple (1.5).
    e. Modules may have thermal expansion and contraction effects, and the spacing between adjacent modules during installation should not be less than 10mm.

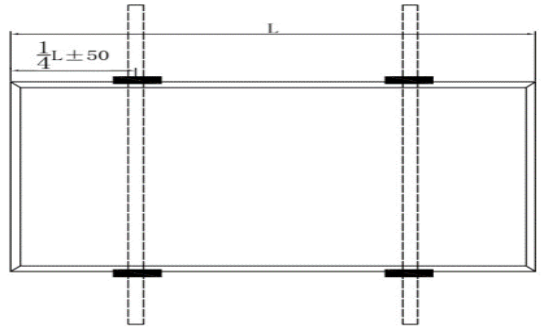
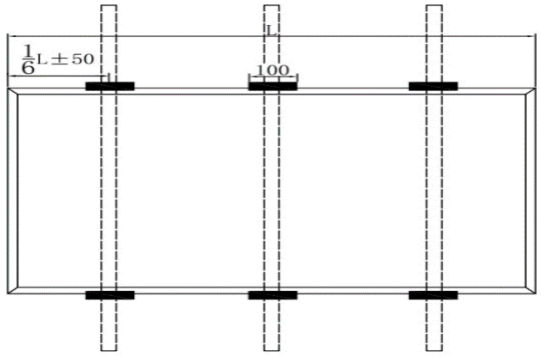
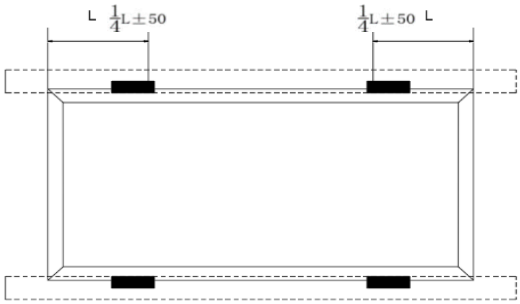
## 5.10 INSTALLATION CLAMPS

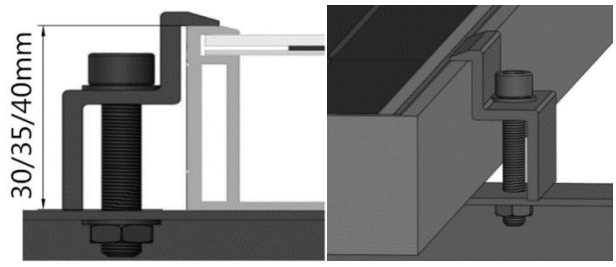
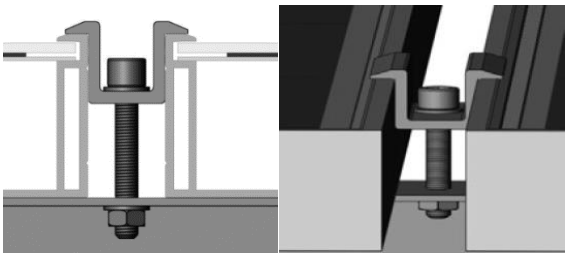
It is suggested to use M8 bolts for module installation. The clamp or belt used for module installation should overlap the aluminum frame. The width of overlap is at least 10 mm (0.4 in) and the clamp thickness is at least 3 mm (0.12 in). All the installation methods described herein are only for reference. MSE is not responsible for the design of installation part and photovoltaic system installation. Mechanical load and safety of photovoltaic system must be performed by a professional system installer or someone with special certification.

- Use more than 4 clamps to fix modules on the support.
- Module clamps, used for module installation, must not shade the front surface glass or distort module's frame.
- Avoid shading of the surface of modules.
- The module frame is not to be modified under any circumstances.
- The mounting bracket shall not be installed directly below the junction box.

When choosing this type of clamp-mounting method, each module needs 4 clamps at minimum. Depending on local weather, such as wind and snow condition, additional clamps may be required to ensure that modules have enough support. In case of severe environment such as storm and heavy snow, it is recommended to use at least 6 clamps for installation. Please contact with our technical support for further information.

Under no circumstances should the fixture come into contact with glass or deform the module's frame. The torque applied during fixture installation should be large enough to firmly secure the module. The applied torque should refer to mechanical design standards and depend on the bolts used by the customer (please consult the installer or support supplier for specific torque values), such as: M8 16-20 N · m (reference value)

| **Clamp Installation Methods** | |
|---|---|
|  | Installation of long side pressing block, payload ≤ 5400 Pa (front), 2400 Pa (back)<br><br>(Use 4 clamps- length of blocks ≥ 50 mm) |
|  | Installation of long side pressing block, payload ≤ 5400 Pa (front),2400 Pa (back) for Single glass module<br><br>Installation of long side pressing block, payload ≤ 5400 Pa (front),3600 Pa (back) for Dual-glass module<br>(Use 6 clamps- length of blocks ≥ 50 mm) |
|  | Installation of long side pressing block, payload ≤ 3000 Pa (front), 2400 Pa (back)<br><br>(Use 4 clamps- length of blocks ≥ 50 mm) |
| **Notes:** L is the length of PV module. W is the wide of module. The black shadow is the area of installation. | |

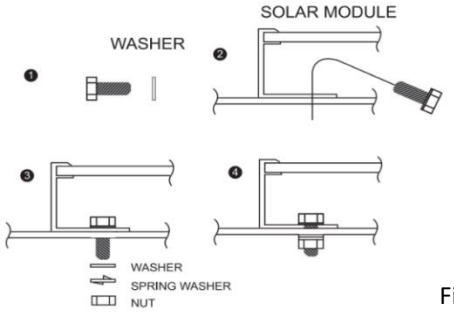
| End clamp installation (40/35/30 mm optional) | Middle clamp installation |
|---|---|
|  |  |
| PV module installed with clamp fitting method. | |

## 5.11 INSTALLATION BOLTS

The frame of each module has several 14×9 mm mounting holes. Ideally, the position of holes has the ability to optimize the load distribution.

In order to extend the life of module support, we advise to use anti-corrosion bolts or clamps (stainless steel)

Use M8 bolt and flat washer, spring washer and nut as shown in Figure 4 in each block. Tighten the bolts until the torque reaches 16-20 N·m. This is the reference value, and the applied torque should refer to the mechanical design standards. Please consult the installer for specific torque values.




| For your reference, please use the components specified below: | |
|---|---|
| 1. Bolt | 2. Washer |
| Material: Q235B/SUS304 | Material: Q235B/SUS304 |
| Size: M8 | Size: M8 |
| 3. Spring Washer | 4. Nut |
| Material: Q235B/SUS304 | Material: Q235B/SUS304 |
| Size: M8 | Size: M8 |

Recommendations:
M8 screw tightening torque size range: 16-20N·m

Figure 4

| **Bolt Installation Method** | |
|---|---|
|   | Payload ≤ 5400 Pa (front), 2400 Pa (back) Use 4 installation holes with P holes<br><br>payload ≤ 5400 Pa (front), 3600 Pa (back) Use 8 installation holes with S and P holes |

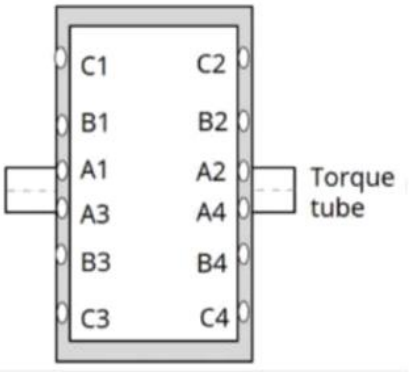
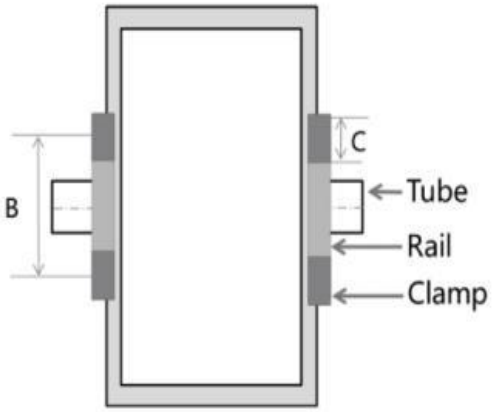
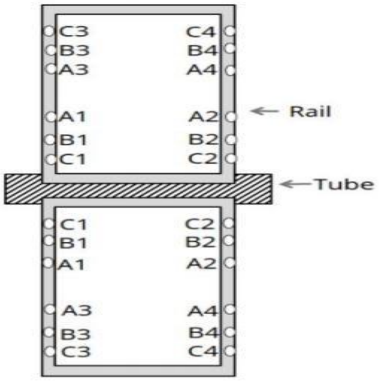
## 5.12 INSTALLATION OF SINGLE-AXIS TRACKING SYSTEM

The bolts and clamps used in this section should follow the requirements in 5.10 and 5.11.

Under any conditions the junction box should not become in contact with the subjacent racking structure except for the torque tube under high loading. For any single axis tracker installation method with portrait one row, bearing house cannot be allowed to locate in junction box position.

If any racking structures, especially bearing house, have to be positioned under the modules. Any racking structure should not be higher than the module frame on the C side. If your tracker design cannot meet the above distance requirement, please contact the technical department in writing for advices.

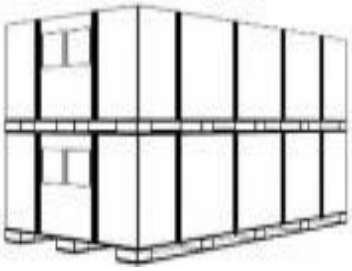
Install and tighten the module clamps to the mounting rails using the torque stated by the mounting hardware manufacturer. M6 or M8 bolt and nut are used for this bolting method. Tighten the bolts until the torque reach 16-20 N·m (0.63-0.79 in). The modules connected with single-axis tracking system need special stainless-steel washers with a minimum thickness of 1.5 mm and an external diameter of 16-20 mm (0.63-0.79 in).

| **Single-axis Tracker Installation Methods** | |
|---|---|
|  | 1P bolting method (Single-axis Tracking):<br><br>Installation of long side pressing block, payload ≤ 2000 Pa (front), 1800 Pa (back)<br><br>**Notes:**<br>1. Using 4 installation holes (400 mm holes)<br>2. Test load =γm * design load (γm =1.5)<br>3. Mounting hole space (A1-A3): 400 mm |
|  | 1P clamp method（ Single-axis Tracking ）:<br><br>Installation of long side pressing block, payload ≤ 2400 Pa (front), 1800 Pa (back) for Single glass module.<br><br>Installation of long side pressing block, payload ≤ 2400 Pa (front), 2400 Pa (back) for Dual-glass module<br>(Use 4 clamps- length of blocks ≥ 50 mm).<br><br>**Notes:**<br>1. Using 4 clamps installation method. B is the module installation distance ≥ 400 mm. The black shadow is the area of installation (C).<br>2. Test load =γm * design load (γm =1.5)<br>3. Overlap width between clamp and frame: Frame topside ≥ 10 mm, Frame bottom side ≥ 15 mm |
|  | 2P bolt method（Single-axis Tracking):<br><br>Installation of short side pressing block<br>Design load ≤ 1800 Pa (front), 1800 Pa (back)<br>(Use 4 clamps- length of blocks ≥ 50 mm)<br><br>**Notes:**<br>1. Using 4 installation holes, Mounting hole location; (B1 B2 A3 A4)/(B1 B2 B3 B4)<br>2. Test load =γm * design load (γm =1.5)<br>3. Mounting hole space (A1-A3): 400 mm; (B1-B3): 990 mm |

### 5.13 STORAGE

Do not remove the original packaging if the module requires long-distance transport or long-term storage.

Do not expose the modules to rain or moisture. Store the finished product in a ventilated, waterproof and dry place.



Storage at project site warehouse should have humidity of < 85% and temperature range of -20°C to +50 °C (-20°F to +122°F). Different photovoltaic modules should be stacked into two (2) separate stacking groups.

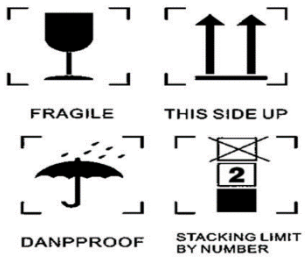
The modules storage areas should be kept dry, leveled with the ground and horizontal angle less than 10 °.

Due to the environment and climate of the project site, it is recommended to leave the pallets single-stacked after down stacking to ensure safe storage of the modules on site. When removing the outer packing bad connecting the two pallets, separate the upper pallet and store it as single stack.

Make sure that all modules with the same current class are installed in the same area centrally (square matrix, combiner box).

The modules should be placed neatly with a safe distance between the boxes. The spacing between boxes should be greater than 13.78 in (30 cm).

Do not stack other items on the modules or boxes.




## 6.0 ELECTRICAL CONNECTION

### 6.1 PRECAUTIONS FOR ELECTRICAL CONNECTION

1. Please read the electrical wiring drawings carefully before wiring. The wiring should be in accordance to local law and be operated by certificated electricians. The maximum voltage of the system must be lower than the maximum certified voltage and the maximum input voltage of the inverter and other electrical devices installed in the system.

1. The module is connected with the junction box by the DC cable. The cross-sectional area of the cable and the connector capacity must be compatible with the system's short circuit current. The cable's cross-sectional area for a single module is recommended to be 4mm$^2$. The fuse current and the rated current of the connector should be ≥ 25A there is potential bypass diode failure. Please test the bypass diode performance.

It's recommended to adopt the following maintenance to ensure that the modules maintain the best performance:

1. Check whether the modules have any appearance defect such as surface damage, abnormal or shadow.
2. Make sure that the module support system is stable without any loose parts. If any issues are found contact professionals to adjust or repair.
3. Clean modules at least once a year, depending on local conditions. If the surface of the module becomes dirty, the power generation of the modules can be affected. In this situation, you can use a soft sponge or water to clean the module's glass surface. Mild, non-abrasive chemical cleaners can be used to wash the modules. Avoid using any corrosion chemical cleaners. In order to reduce electric shock or burns, it is recommended to clean modules in the morning or evening.

Check mechanical and electrical property properties of the modules every six (6) months to ensure the module's connectors are clean and reliable to ensure good electrical connection and no corrosion.

If you have any questions, please contact with professionals and arrange further check.

Please note that all maintenance instructions, such as brackets, charging rectifier, inverters and batteries, should be complied compliant with manufacturer requirements.

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 in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being.

When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposals.