

Instruction manual

McShine Monocrystalline Solar Panel, IP68

Dear customer

congratulations on the purchase your McShine WiFi Inverter for solar panel.

With this choice you have chosen a product, which combines appealing design and design and technical features.

Please read the following connection and and operating instructions carefully and follow them and follow them, in order to get the longest and safest from your product for as long as possible.

Please read the operating instructions carefully before carefully before using the device.

We wish you much pleasure with your new product!

Safety instructions

General Safety

- Modules falling under this application class can be used in systems with voltage higher than 50V DC or 240 W, where general access by touch is expected.
- The ambient temperature in which PV modules operate is between -40°C and 40°C with relative humidity less than 85%, while their operating temperature is between -40°C and 85°C.
- It is recommended to install PV modules at an altitude of less than 2000m.
- The installation of photovoltaic solar systems requires special skills and knowledge. Installation must be done by authorized and trained personnel only.
- Installers must assume all risks of injury that may occur during installation, including but not limited to the risk of electrocution.
- A single module can generate more than 30V DC when exposed to direct sunlight. Contact with a DC voltage is potentially dangerous and should always be avoided.
- Do not disconnect modules or other electrical parts under load.
- PV modules generate electricity when exposed to sunlight. Multiple modules strung together can cause fatal electric shock and burns. Only authorized and trained personnel should have access to the modules.
- The modules convert light energy into DC electrical energy. They are designed for outdoor use. The modules can be mounted on the ground or on roofs. System designers and installers are responsible for proper design of support structures.
- Comply with all local, state, and national codes when installing the system. Obtain a building permit if necessary.
- Electrical characteristics are within $\pm 3\%$ of the specified values for I_{sc} , V_{oc} , and P_{max} under standard test conditions (irradiance of 1000

W/m², AM 1.5 spectrum, and a cell temperature of 25°C).

- Use only equipment, connectors, cables and racks suitable for solar systems. Do not use mirrors, magnifying glasses or artificially concentrated sunlight on the modules.
- Always use fall protection when working at a height of 180cm or more. Follow the legal safety regulations for fall protection.
- Do not sit, stand, step or walk on any side of the module, including the frames.
- Ensure that no part of the module(s) is submerged or in constant contact with water, except for natural precipitation or regular cleaning.
- Do not allow the rear panel of the module to be constantly dewed.

Safety during handling

- Do not lift the module by the junction box or electrical wires.
- Do not place heavy or sharp objects on the module.
- Be careful when placing the module on a surface, especially when placing it in a corner. Improper transportation and installation may damage the module and void the warranty.
- Do not attempt to disassemble the modules and do not remove any attached nameplates or components from the modules.
- Do not apply paint or adhesive to the top or back panel of the module.
- To prevent damage to the back panel and cells, do not scratch, dent, or hit the back panel. Do not apply direct pressure to the backsheet or front glass during transport.
- Do not drill holes in the frame. This may affect the strength of the frame, cause corrosion of the frame, and void the warranty.
- Do not scratch the anodized layer of the frame (except for the grounding terminals on the grounding connector on the back of the module). This may cause corrosion of the frame or affect the strength of the frame.
- A module with broken glass or torn backsheet cannot be repaired and must not be used because contact with a module surface or the frame can cause electric shock.
- Work only under dry conditions and use only dry tools. Do not handle wet modules unless you are wearing appropriate protective equipment.
- When storing uninstalled modules outdoors for extended periods of time, always cover them and make sure the glass is facing down on a soft, flat surface to prevent water from collecting inside the module and damaging exposed connections.

Safety during installation

- Never disconnect electrical connections or unplug connectors while the circuit is under load.
- Contact with electrically active parts of the modules, such as terminals, can cause burns, sparks, and fatal shocks, whether the module is connected or not.
- Do not touch the PV module unnecessarily during installation. The glass surface and frame may be hot; there is a risk of burns and electric shocks.
- Do not work in the rain, snow or wind.
- Avoid exposing cables and connectors to direct sunlight and scratches or cuts to prevent insulation deterioration.
- Use only insulated tools approved for work on electrical equipment.
- Keep children away from the system during transport and installation of mechanical and electrical components.
- Cover the module completely with an opaque material during installation to prevent electricity from being generated.
- Do not wear metallic rings, bracelets, earrings, nose rings, lip rings or other metallic objects during installation or troubleshooting of photovoltaic systems.
- Follow safety regulations (e.g., safety regulations for work on electrical power plants) for your region and for all other system components, including wires and cables, connectors, charge controllers, inverters, batteries, accumulators, etc.
- Under normal conditions, it is likely that a photovoltaic module will be exposed to conditions that produce a higher current and/or voltage than specified in the standard test conditions. Accordingly, the I_{sc} and V_{oc} values specified on this module should be multiplied by a factor of 1.25 when determining component voltage values, conductor current values, minimum fuse size factor, and the size of controls connected to the PV output.
- Use only the same connectors to connect modules into a string or to connect to another device. Removing the connectors will void the warranty.

Fire Safety

- Check with your local authority for guidelines and requirements for structural fire safety.
- Roof structures and installations can affect the fire safety of a building. Improper installation can lead to hazards in the event of a fire.
- Use components such as ground fault circuit interrupters and fuses as required by local authorities. Do not use modules near equipment or in locations where flammable gases may be generated.
- Modules rated for module fire protection type must be installed on a roof that has appropriate fire resistance. Before installing on the roof, contact your local building authority

to ensure that the roofing materials are approved.

- A minimum slope of 12.5cm per 30cm is required for installation on a roof to maintain the fire rating. Each module or panel mounting system has limitations on the slope required to receive a specific system fire rating.

Mechanical installation

Selection of the location

- Select a suitable location for installing the modules.
- Modules should face south at northern latitudes and north at southern latitudes.
- For detailed information on the best installation angle, refer to standard photovoltaic installation manuals or consult a reputable solar installer or system integrator.
- Modules should not be shaded at any time. If a module is shaded or even partially shaded, it will not reach ideal conditions, resulting in lower power output. Permanent and/or regular shading of the module will void the warranty.
- This installation manual applies to all PV systems located 500m or more from the coast.
- Do not use the modules near equipment or in locations where flammable gases may be generated or collected.

Before installation

- Check for visual discrepancies before installing the modules. Any visual discrepancy found after the system is installed may void the warranty. Any labor, material or other costs, such as for documentation, safety or the performance of the (de-/ re)installation, will not be covered.
- The mounting structure of the module must be made of durable, corrosion and UV resistant material.
- Always use a tested and certified mounting structure that is approved for your system design.
- In regions with heavy snowfall in winter, adjust the height of the mounting system so that the bottom edge of the module is not covered by snow. Also, ensure that the bottom of the module is not shaded by plants or trees or damaged by soil moving through the air.
- For ground mounting systems, a minimum distance from the ground to the bottom edge of the module of 60cm is recommended.
- Modules must be securely fastened to the mounting structure. For clamp system installation methods, the recommended maximum compressive force for each clamp is 2900PSI (20 MPa) to avoid possible damage to the module frames. Follow the clamping system manufacturer's instructions.
- Ensure adequate ventilation under the modules according to local regulations. A minimum distance of 10 cm between the roof level and the module frame is generally recommended.

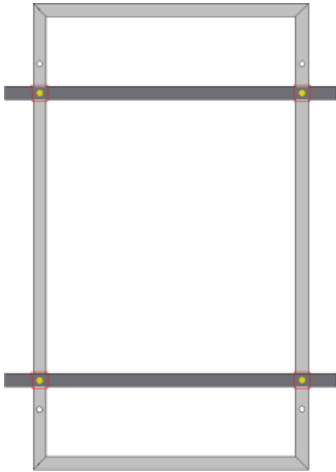
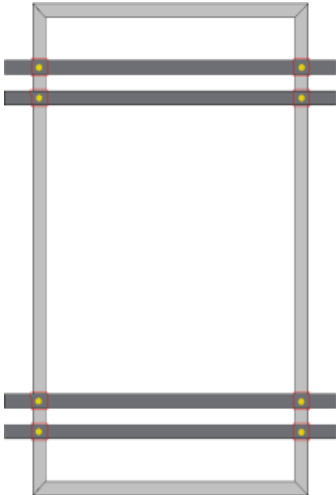
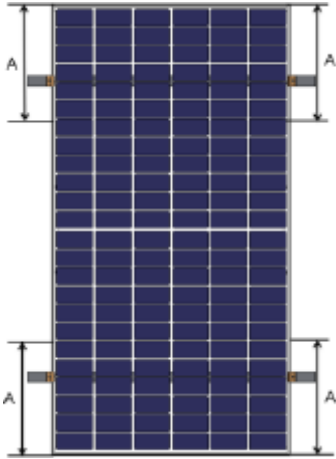
- Always follow the instructions and safety precautions included in the module support frames.
- Always make sure that the roof structure is suitable before installing modules on a roof. In addition, all roof penetrations required to mount the module must be properly sealed to prevent leaks.
- Dust that accumulates on the surface of the module can affect the performance of the module. Modules should be installed with a tilt angle of at least 10 degrees so that dust can be more easily removed by rain. If the angle is shallow, more frequent cleaning is required.
- Note and take into account the linear thermal expansion of the module frames (the recommended minimum distance between two modules is 2cm).
- Always keep the front and back of the module free of foreign objects, plants and vegetation, and structural elements that could come into contact with the module, especially if the module is mechanically loaded.
- If installing a module on a pole, select a pole and module mounting structure that is robust enough to withstand the expected wind and snow loads in the area.
- Ensure that the modules are not subjected to wind or snow loads that exceed the maximum allowable values, and that they are not subjected to excessive forces due to thermal expansion of the support structures. Ensure that the modules do not overlap or exceed the roof. Refer to the following installation methods for more information.


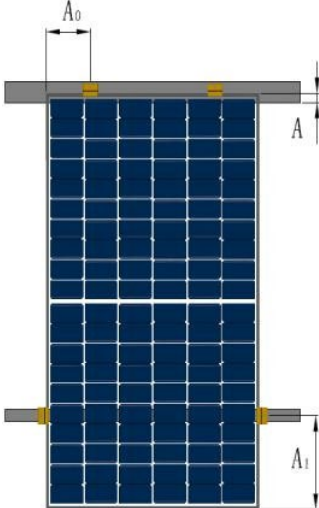
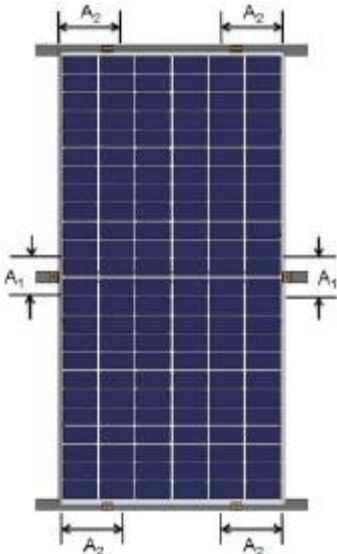
Mounting

- Select an appropriate installation method based on the required load (see below for more information).
 - All installation methods listed here are for reference only and the manufacturer does not supply appropriate mounting components. The system installer or trained professional must be responsible for the design, installation, mechanical load calculation and safety of the system.
 - In any installation, modules may be installed in either portrait or landscape orientation.
- * Do not allow the module clamps to contact the front glass or deform the frame in any way. Avoid shading effects from clamps or insertion systems. Drainage openings in the module frame must not be closed or covered by the clamps

1480-004: 160W, IP68, 890x880x25mm

1480-005: 300W, IP68, 1640x880x35mm

| Recommended Mounting method | Mechanical load | Installation location |
|---|--|---|
| Fastening with four bolts and beams underneath | Test load: positive 3800Pa negative 2400Pa Safety factor: 1.5 |  |
| Fastening with eight bolts and beams underneath | Test load: positive 5400Pa negative 3800Pa Safety factor: 1.5 |  |
| Four clamps with supports underneath | Test load: positive 2400Pa negative 2400Pa Safety factor: 1.5 |  <p>A = 1/4 long frame length ±50mm</p> |

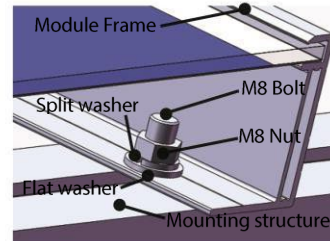
| custom mounting method | Mechanical load | Installation location |
|--|--|---|
| Four clamps end fixing with beams parallel to long frame | Test load: positive 2400Pa negative 800Pa Safety factor: 1.5 |  <p>$A_0 = 1/4 \text{ short frame length } \pm 50\text{mm}$</p> |
| Four clamps mixed mounting with beams underneath | Test load: positive 1600Pa negative 1000Pa Safety factor: 1.5 |  <p>$A \geq 40\text{mm}$; $A_0 = 1/4 \text{ short frame length } \pm 50\text{mm}$; $A_1 = 200 \sim 450\text{mm}$.</p> |
| Six clamps with beams underneath | Test load: positive 5400Pa negative 3800Pa Safety factor: 1.5 |  <p>$A_0 = 1/4 \text{ short frame length } \pm 50 \text{ mm}$; $A_1 = 100 \text{ mm}$</p> |

General installation

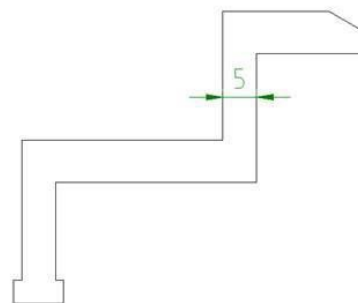
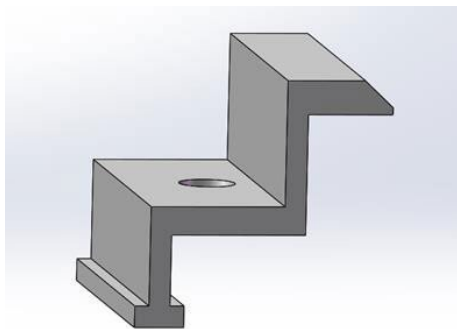
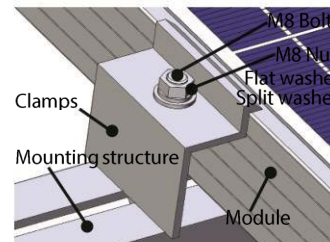
The modules can be installed using mounting holes, clamps* or an insertion system. The recommended torque is 20Nm - 25Nm. The modules must be installed according to the following examples. Strictly follow the guidelines during installation, otherwise the warranty will be affected.

- The module can be installed in either landscape or portrait orientation.
- The modules must be properly secured to their mounting bracket to withstand the positive and negative loads for which they have been certified. The installer must ensure that the clamps used to secure the modules are robust enough.

Module installed with bolts



Module installed with clamps



* The required length for each clamp is at least 50 mm, and the wall thickness of the upper part is at least 5 mm.

Electrical installation

General electrical connection

- All hardware used must be compatible with all other materials used to prevent galvanic corrosion. Defects caused by corrosion will void the warranty.
- It is not recommended to use modules with different configurations (grounding, wiring) in the same system.
- Excess cables must be tidied or fixed in a suitable way, e.g. with non-metallic cable ties to the mounting structure. Solar cables, connectors and junction boxes should not be exposed to water, snow, rain or submersion for extended periods (IP65/67/68).
- For applications requiring a high operating voltage, several modules can be connected in series to form a module string. The system voltage is then equal to the sum of the voltage of the individual modules.
- For applications requiring high operating currents, several module strings can be connected in parallel. The system current is then equal to the sum of the currents of the individual module strings.
- Depending on the product family, the maximum system voltage is 600 volts, 1000 volts or 1500 volts DC according to the standards. The maximum number of modules connected in series depends on the system design, the type of inverter used and the environmental conditions.
- Ensure that the PV solar modules are equipped with the appropriate string fuse to protect the circuit. This depends on the maximum series fuse rating of the module and local electrical codes.
- There is no specific limit to the number of modules that can be connected in parallel, the number of modules is determined by the system design parameters such as current or power.
- To avoid overheating of the cables and the connectors, the cross-section of the cables and the capacity of the connectors must be selected according to the maximum short-circuit current of the installation. PV wire with a cross-section of at least 4mm² is recommended as the cable.
- Caution: Do not fasten the cables too tightly. Cable damage caused by the cable management system is not covered by the manufacturer's warranty.
- Always observe the bending radius of the cable manufacturer, which also includes the radius directly behind the connectors.
- When planning large groups of modules connected to a single inverter, always consider the resulting insulation resistance (Riso), which decreases as the number of modules in the group increases. A too low Riso can lead to inverter faults. Please refer to the legal standards to determine the size, type and temperature of the system cables.

- The PV modules are supplied with connectors for the electrical connection of the system.
- To ensure a reliable electrical connection and prevent possible moisture ingress, two connectors must be plugged together and locked until a click is heard.
- Prolonged exposure of the connectors to humid environments may result in poor connectivity, which in turn will cause leakage currents and poor conductivity, voiding the warranty. It is recommended to use proper connector/cable/cord management to prevent moisture ingress. Depending on the moisture content, it is recommended to perform periodic inspections of the installation system to maintain optimal performance of the modules.
- Direct current generated by photovoltaic systems can be converted to alternating current and fed into a public power grid. Local utility guidelines for connecting renewable energy systems to the power grid vary from region to region. Always consult a qualified system designer or integrator for advice. Building permits, inspections and approvals are usually required by the local utility.
- It is recommended that lightning protection be installed in accordance with local requirements and codes, especially for larger systems.
- Upon completion of the installation and after connection to the electrical grid, a professional handover to the owner with an installation report is required. Provide the owner with clear documentation of the system that includes the following minimum data: User Manual, system layout, data sheets, performance expectations, electrical system data, a copy of the installation test report.

Electrical properties

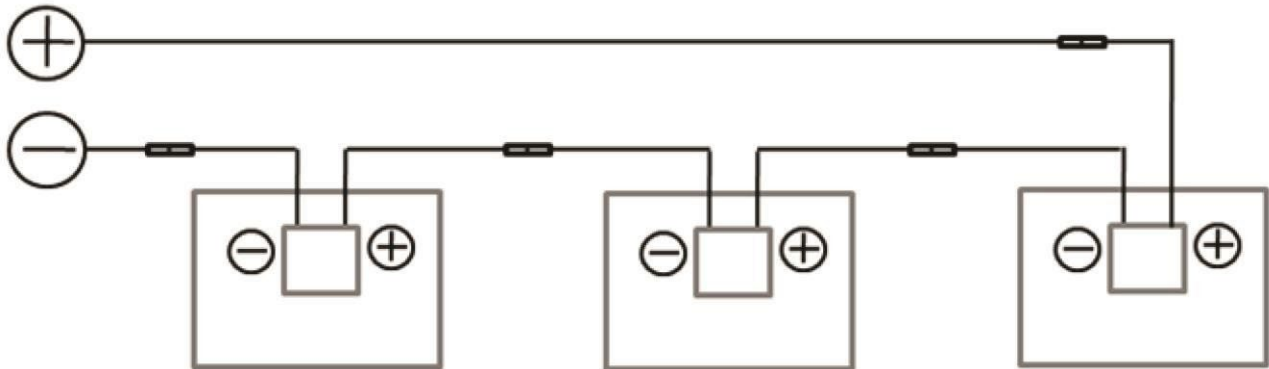
- Module under standard test conditions: Irradiance of 1000W/m², cell temperature of 25°C and air mass of AM 1.5.
- Normally, a module is likely to generate more current and/or voltage than specified under standard test conditions. Accordingly, the values for Isc and Voc specified on this module should be multiplied by a factor of 1.25 when determining the rated voltage of the components, the current rating of the conductors, the size of the fuses, and the size of the controls connected to the PV output.
- The voltages add up if the modules are connected in series, and the currents add up if the modules are connected in parallel.
- Modules with different electrical characteristics must not be connected directly in series.

Series connection and parallel connection

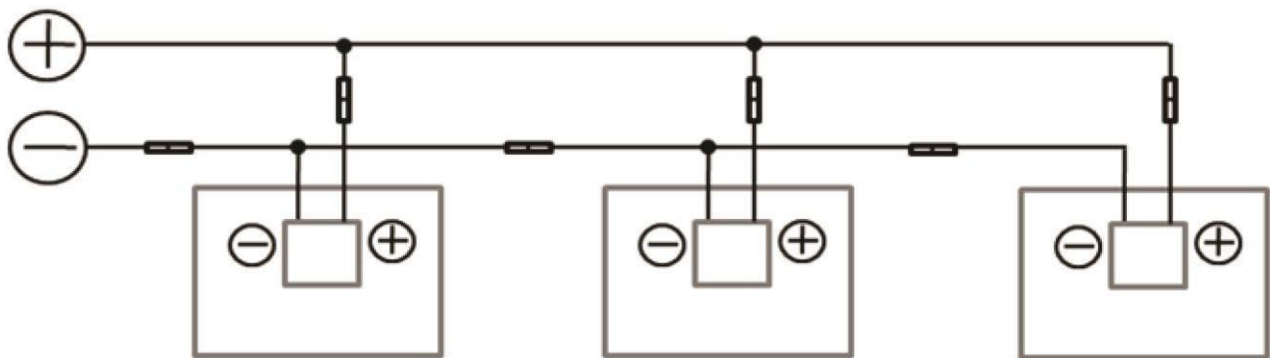
- The maximum number of modules that can be connected in series in a string must be calculated in accordance with applicable regulations so that the specified maximum system voltage of the modules and all other DC

electrical components is not exceeded during no-load operation at the lowest temperature expected at the PV system site.

- Recommended maximum series configuration: $\text{system voltage} / (1.25 \cdot V_{oc})$.
- Recommended maximum parallel configuration: $\text{Overcurrent withstand} / (I_{sc} + 1)$



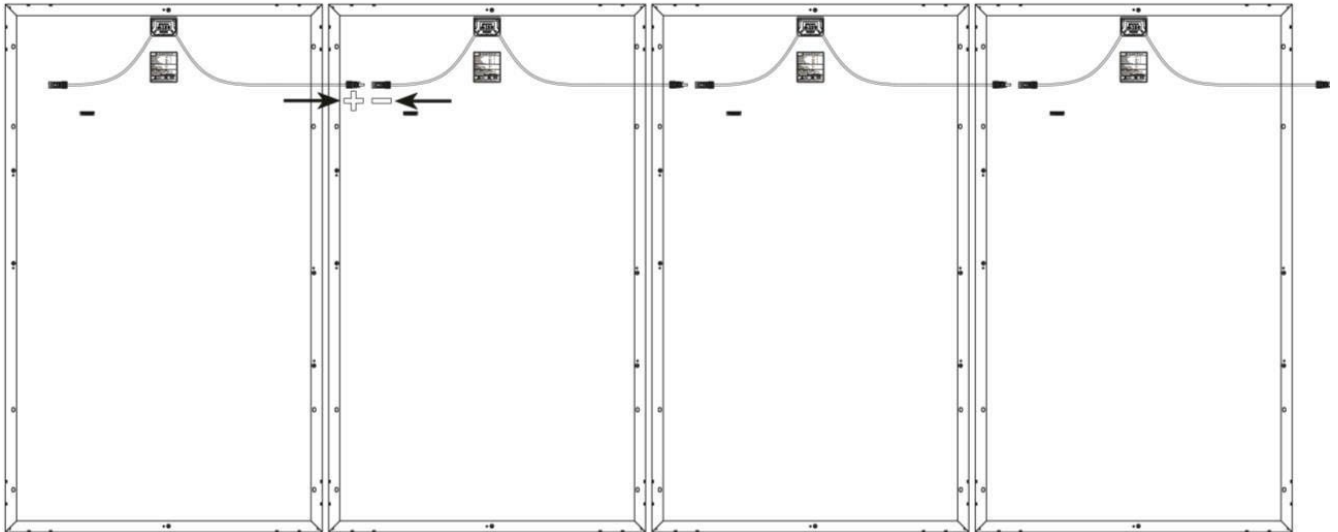
Series connection



Parallel connection

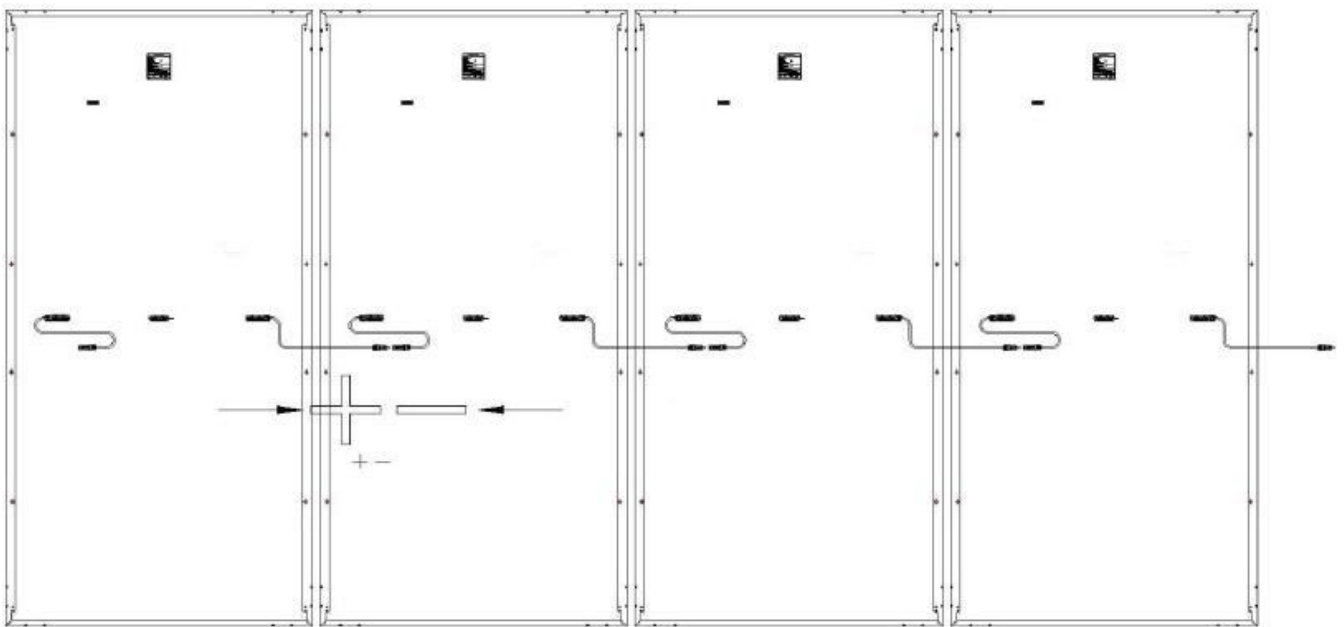
Recommended installation method for full cell solar modules:

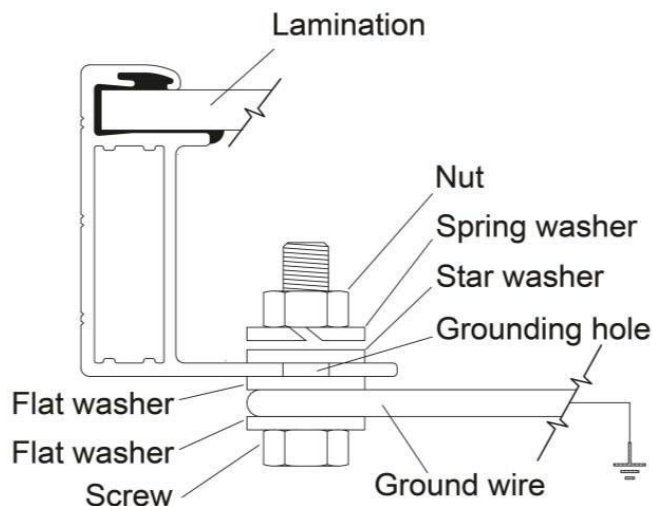
It is recommended to connect the modules in the PV system in portrait orientation, and the cable length should not be less than 0.7m.



Recommended mounting method for half-cell solar modules:

The head and the end of the modules in the PV array are arranged in portrait orientation, and the cable length is not less than 0.65m.





Grounding

- Refer to regional and national safety and electrical standards for grounding and connection requirements. If grounding is required, use a recommended type of plug for the grounding cable.
- These instructions refer to grounding the module frame. If grounding is required, ensure that the module frames (touchable metal) are always grounded.
- Follow the standards and regulations for grounding PV modules.
- It is recommended to use negative grounding if allowed.
- When attaching grounding elements and wires to the frame, they must be attached according to the location marked with the grounding symbol to ensure proper electrical connection.
- Grounding screw:
 - 1) Use an M5 bolt and washer to connect the ground wire and aluminum frame through the ground hole (as shown below). The tightening torque is 3-7Nm. All nuts and washers should be made of stainless steel. Exposed copper wire of 4-14mm² (AWG 6-12) is recommended as the ground wire.
 - 2) To connect solar modules to module brackets.
 - 3) Use Schletter clamps to connect solar modules to module brackets.

Maintenance

To ensure optimal module performance, Amso solar recommends the following maintenance procedures:

- Clean the module at least once a year or more often depending on the degree of contamination.

- Remove all organic contaminants from the surface. Modules with dirt or contamination can reduce the power generation of the system.
- Always use clean water and a soft, non-abrasive sponge or cloth for cleaning. A mild, non-abrasive detergent may be used to remove stubborn dirt.
- Uncontrolled soiling or failure to clean the modules in a timely manner will void the warranty. Inspect electrical, grounded and mechanical connections every six months to ensure they are clean, safe, undamaged and free of corrosion. Failure to do so may void the warranty.
- In the event of a ground fault, never wash or spray the modules with water until the ground fault has been identified and repaired by an authorized solar inverter service technician and the inverter is fully operational. This may result in electric shock or a serious safety problem.
- Contact a professional solar service provider for suggestions if problems arise.
- Caution: Follow the solar manufacturer's maintenance instructions for all components used in the system, such as racks, charge controllers, inverters, batteries, etc.

Disposal instructions

According to the European WEEE Directive, electrical and electronic devices must not be disposed of with household waste. Their components must be recycled or disposed of separately, because toxic and hazardous components can cause lasting damage to health and the environment if disposed of improperly. As a consumer, you are obliged under the Electrical and Electronic Equipment Act (ElektroG) to return electrical and electronic equipment free of charge at the end of its service life to the manufacturer, the point of sale or to public collection points set up for this purpose. Details are regulated by the respective state law. The symbol on the product, the operating instructions and/or the packaging indicates these regulations. By separating, recycling and disposing of old equipment in this way, you are making an important contribution to protecting our environment. Packaging can be disposed of free of charge at the appropriate collection points - paper in the paper garbage can, plastics in the yellow bag and glass in the used glass container.