

# Content

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## 1. Disclaimer of Liability

This manual provides important safety and maintenance information. Failure to follow these instructions may result in severe injury, death, and/or property damage. Motech does not assume any responsibility for loss, damage, injury or expense resulting from the improper installation, handling, use or failure to follow MOTECH's operation or installation manual.

There is a risk of electric shock during installation. Module installation requires good technology and can only be installed by a licensed professional, including a licenses and an approved electrician.

The information contained herein is subject to change without prior notice.

## 2. Rules and regulations

Mechanical installation and electrical installation of PV modules should be in accordance with applicable regulations, including electrical, building, and electrical connection requirements. There regulations vary with the location of the installation, such as building roof installations, in-vehicle applications, and more. Requirements may also vary with system voltage, DC or AC. Please contact your local authorities for specific terms.

## 3. Important Safety Information



### Electric Shock and Burn Hazard

Photovoltaic modules produce electricity when exposed to the sun or other light sources. When handling the module, must be followed to avoid the fire and electric shock. Do not expose the artificially concentrated sunlight to a module or panel.



### Fragile

Photovoltaic modules are easily damage by mishandling. Do not apply bending or twisting forces to the module. Do not step on the module or strike the front or back; these actions may result in cracked solar cells. Do not lift or carry the module by the junction box cables.

For your safety and the safety of others, please read the entire Installation Manual carefully prior to product installation and retain this manual for future reference. Installing a photovoltaic system requires specialized knowledge; system design, module mounting and wiring should only be performed by trained, qualified and authorized personnel.

## 4. Safe Work Practices



Solar modules weight range from 19.3 to 27kg(cell quantity from 60 to 72 pcs). Multiple people or proper equipment should be used to transport the modules safely and without injury.

- 4.1 The Motech module design is based on the application requirements of Class A and Safety Class II in accordance with IEC 61215 and IEC 61730.
- 4.2 Be knowledgeable with the principles of electricity and electrical equipment. Use properly insulated tools and appropriate protective equipment. Do not disconnect during load connection for a removable connector. Cover module face(s) completely with opaque material to halt the production of electricity when working with module wiring. Disconnect module(s) from other sources of electricity, such as batteries and the electrical grid, before working on the system.
- 4.3 Solar modules have a tempered glass front and a polymeric back surface. Although robust materials are used in the construction, the solar cells, glass, and backsheets may be damaged if the module is not properly handled and installed. Always use the container and stacking device provided for transportation and storage. Please store the Modules before installation. Do not bend or distort solar modules. Do not step on or deliberately impact the modules. Do not lift or lift the

assembly by grasping the cable on the junction box. Do not attempt to install or use a module with broken front cover glass or a perforated backsheet as such damage represents an electrical safety hazard (electric shock and fire). Broken modules cannot be repaired and should be replaced immediately. Protective gloves should be always worn when handling solar modules. Especially for modules with AR glass, do not touch modules with bare hands. Gloves will protect against sharp objects and hot surfaces.

4.4 Please do not artificial gathered light on the surface of the module.

## 5. Fire installation needs

5.1 Motech modules qualified for safety through IEC 61730-2 within this application class are considered to meet the requirements for Fire Class C.

5.2 When the module is installed on the roof, the module bottom plate and the mounting surface must have sufficient ventilation distance. The distance between the module frame and the roof surface is at least 10 cm. The assembly is to be mounted over a fire resistant roof covering rated for the application. Before mounting the module, please consult your local building department to determine approved roofing materials.

## 6. Unpacking and storage

6.1 Always keep the package in a clean, dry room on horizontal or even ground with ambient temperatures between  $-20 \sim +40^{\circ}\text{C}$  and relative humidity between  $45 \sim 80\%$  RH.

6.2 The box can be stacked in 2 layers, but please do not put the unpacked box on the lower layer; the box after taking out several modules is not smooth, pay special attention to the box side roll.

6.3 When storing solar modules, do not bend the solar modules to maintain the same flatness; do not stack multiple modules.

6.4 The place where the solar module is kept is basically indoor. If it has to be placed outdoors, please be careful to avoid water ingress or damage.

6.5 If there is a risk of electric shock and the solar module is being powered by sunlight or other light sources, do not touch the live parts such as the output wires and terminals with bare hands.

6.6 Damage to the glass may result in personal injury or electric shock. Do not subject the glass surface of the solar module to impact.

6.7 The back surface of the solar energy is a resin film. When damage occurs, the module board may be damaged, leaked, and deteriorated. Therefore, do not damage the back surface of the solar module.

## 7. Array Design Safety

7.1 Confirm local licensing, installation and inspection requirements before installation. Need to comply with national electrical codes and regulations.

7.2 Execution of IEC-61730 standard: Motech modules are limited to series connections up to a maximum system voltage of 1500 Vdc when approved junction boxes are used. Do not exceed the specified maximum system voltage value.

7.3 Motech modules can be used in series or in parallel to produce the desired output voltage and output current. When the modules are connected in series, the output voltage of the entire string is the sum of the voltages of each component; when the modules are connected in parallel, the output current of the entire string is equal to the sum of the currents of each of the branch components or component strings. If the maximum reverse current generated in parallel exceeds the maximum 15 A of the component string, each string of components must be equipped with a fuse or overcurrent protection. It is then connected to other string components to prevent the component strings from being affected and damaged by reverse current. If necessary, install a choke diode. Refer to local electrical regulations for parallel connection limits and overcurrent protection.

- 7.4 Under normal conditions, the current and voltage values generated by the modules may be higher than the standard test conditions of the component. Therefore, when designing PV power system components, such as rated voltage, wire capacity, fuse capacity or component power output related parameters, the corresponding short-circuit current and open circuit voltage should be amplified by 1.25 times.
- 7.5 Use limit: Do not install or use modules in corrosive areas, under abnormal environment conditions, or on mobile units (except solar tracking mounting systems are allowed). Should connect the negative pole (of the array) to ground, cause it can reduce the risk of PID. Doing so will void the product warranty.

## 8. Electrical and Physical Ratings

The electrical and physical properties of the Motech modules are detailed in the table below.

### 8.1 Module Electrical Ratings

Model Number	P <sub>mpp</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mpp</sub> (V)	I <sub>mpp</sub> (A)
XS60GB-315	315	39.33	9.56	33.55	9.39
XS60GB-310	310	39.19	9.53	33.26	9.32
XS60GB-305	305	39.05	9.50	32.97	9.25
XS60GB-315-S	315	39.33	9.56	33.55	9.39
XS60GB-310-S	310	39.19	9.53	33.26	9.32
XS60GB-305-S	305	39.05	9.50	32.97	9.25

### 8.2 Module Physical Properties

Model Number	No. Cells (PCS)	Dimension (mm)			Weight (kg)
		Length	Width	Frame Height	
XS60GB	60	1664	998	40	22.5±5%

The current and voltage characteristics of Motech modules are within -5%/+10% percent of the indicated values of I<sub>sc</sub> and V<sub>oc</sub> under standard test conditions (irradiance of 1000 W/m<sup>2</sup>, AM 1.5 spectrum, cell temperature of 25°C). The maximum power of each Motech module is within -0% / +3% of the indicated values of rated power under standard test conditions. Other tolerances may be available upon special request.

## 9. Bypass diode

- 9.1 Bypass diodes are pre-installed in the junction box of each Motech PV module. Depending on junction box type, each junction box model provides 3 Schottky diodes with a maximum current of SB3050DY of 30 Amps. Each bypass diode is rated at 50 Vdc reverse voltage.
- 9.2 Each bypass diode is connected to 1/3<sup>rd</sup> the total number of cells for a given module type. Bypass diodes are NOT user-serviceable components. DO NOT remove bypass diodes or operate a module without bypass diodes.

9.3 In solar battery-charging arrays, blocking diodes are required to prevent the solar module from discharging the battery bank at night. Motech modules do not include blocking diodes. It is recommended that a charge controller be used to prevent system batteries from being overcharged during the day and discharged at night.

## 10. Equipment Ground

In order to use safety and avoid damage to components by lightning and static electricity, all solar photovoltaic module borders and mounting brackets must be properly grounded in accordance with relevant national electrical regulations. Grounding wires can be copper, copper alloys, or other materials that can be used as conductors and comply with electrical regulations. When grounding, the grounding device must be fully in contact with the aluminum alloy inside the aluminium frame, to penetrate the oxide film on the border surface, each grounding hole on the frame of the assembly is marked. All grounding devices must comply with relevant national regulations and usage requirements.

## 11. Module Mounting

- 11.1 Please do not artificial gathered light on the surface of the module.
- 11.2 The ambient temperature of the module installation is recommended to be between -20°C and +46°C Celsius. Maximum operating temperature range -40°C ° Celsius to +85°C.
- 11.3 The minimum safe distance between the module and the module is recommended for 1 cm when the solar panel is installed.
- 11.4 To ensure proper module mounting and a robust mounting system that allows the module to withstand all predetermined loads, the bracket installer must provide its warranty.
- 11.5 The maximum power is 315W. It is recommended that the number of series not exceed 28 and the maximum number of parallels should not exceed 1.
- 11.6 Each module has several drain holes to prevent water from accumulating in the aluminum frame. When installing, keep the drain holes unobstructed. The drain holes should not be blocked by the fixture to avoid water or ice in the frame after the cover, which may cause the frame to fail.
- 11.7 The module is fixed to the mounting bracket as shown in Figure 2. The module can be bolted to the bracket or the fixture can be mounted using a clamp. If the fixture is used to secure the module to a bracket, the recommended fixture width is  $\geq 38\text{mm}$  and thickness is  $\geq 4.5\text{mm}$ . It is required that the fixture can not touch the glass or deform the frame of the component. The contact surface between the fixture and the frame must be smooth and smooth, otherwise the frame will be damaged and the components will be damaged.
- 11.8 The solar module has passed the static mechanical test with a back load of 2400Pa and a front load of 5400Pa. Refer to Figure 1 and Figure 2 below for the fixture installation method:

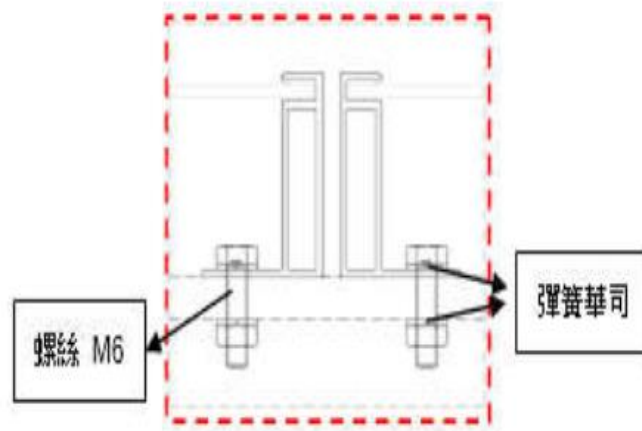
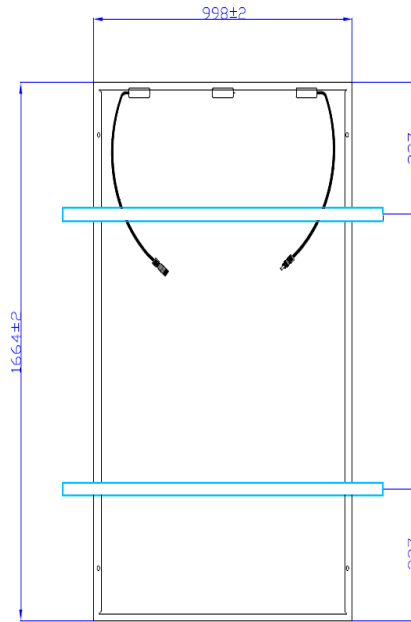


Figure 1. White iron screw mounting hole



XS60GB

Figure 2, module installation diagram

11.9 The maximum power generated by direct sunlight onto the solar components is the highest. In order to achieve the best output power of the components, the first is to select an unobstructed location for the whole year, and the second is to select the appropriate installation angle. A rough estimate is that the installation of the optimal tilt angle is basically the same as the local latitude at the installation location. If the component is mounted on a roof or building wall for heat dissipation, a fixed bracket must be used to maintain a 51mm gap between the roof or wall and the component. Do not install directly on the roof or wall. The mounting bracket is required to have sufficient strength to withstand all possible stress loads, including wind and snow.

## 12. Field Wiring



Keep connectors clean and dry prior to installation. Dirt and moisture may inhibit proper latching of the connector, which may lead to reduced system performance or failure of the connector.

Each Motech module is factory equipped with two lengths of 4.0mm<sup>2</sup> UL-Recognized “PV Wire” (90°C rated, sunlight resistant). Factory cables are terminated with UL/TUV Recognized electrical connectors. Always use mating connectors of the same manufacturer to ensure compatibility. DO NOT modify or replace the connectors provided with the module; doing so will void the product warranty. The waterproof gasket between the wire and the junction box is effective to prevent moisture from entering the junction box. To prevent moisture from entering the junction box from the wire, the deformation of the waterproof gasket should be reduced to improve its life.

## 13. Connector

The wires on the connector and the junction box are not tortuous or crimped. The corner radius of the wire must be greater than 40mm. The installation method is shown in Figure 3. Avoid keeping the wires or connectors in tension. Improper installation causes the connector to burn out - the terminal crimping is not loose with standard tools and wires.

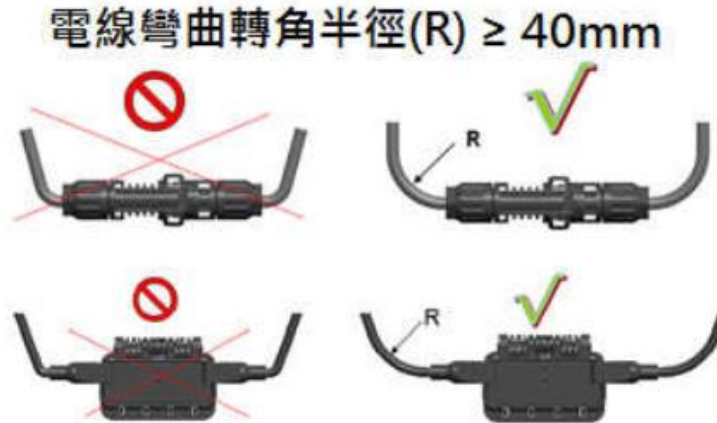


Figure 3, the wrong connection method and the correct measurement method

## 14. Maintenance



There are no user-serviceable parts in the junction boxes. Do not open the junction box or change intra-module wiring as all wiring connections are performed in the factory. The electrical connectors cannot be used as a live disconnect. Modules may only be connected and disconnected when current is not flowing (open circuit voltage conditions). Always observe proper precautions when connecting or disconnecting modules exposed to light since hazardous voltage may be present.

Modules should be inspected annually for loose electrical connections, poor grounding connections, and loosened mechanical fastening to the racking structure. A module tilt of at least 10 degrees will help rainfall clean the modules naturally. Should cleaning of the modules become necessary, wet the glass surface before wiping with a soft sponge to prevent micro-scratches. Snowfall may be cleared using a soft bristle brush. If hand cleaning is not possible, pressure washer cleaning of module glass is permitted only when complying with all of the following restrictions:

1. Cleaning fluid: water at normal ambient temperature
2. Machine pressure rating:  $\leq 13.1$  MPa
3. Machine flow rating:  $\leq 7$  L/min
4. Output nozzle distance to solar panel:  $\geq 30$  cm
5. Spray tip water divergence:  $\geq 15^\circ$
6. Do not clean it with chemical.
7. Do it in the morning or in the evening.