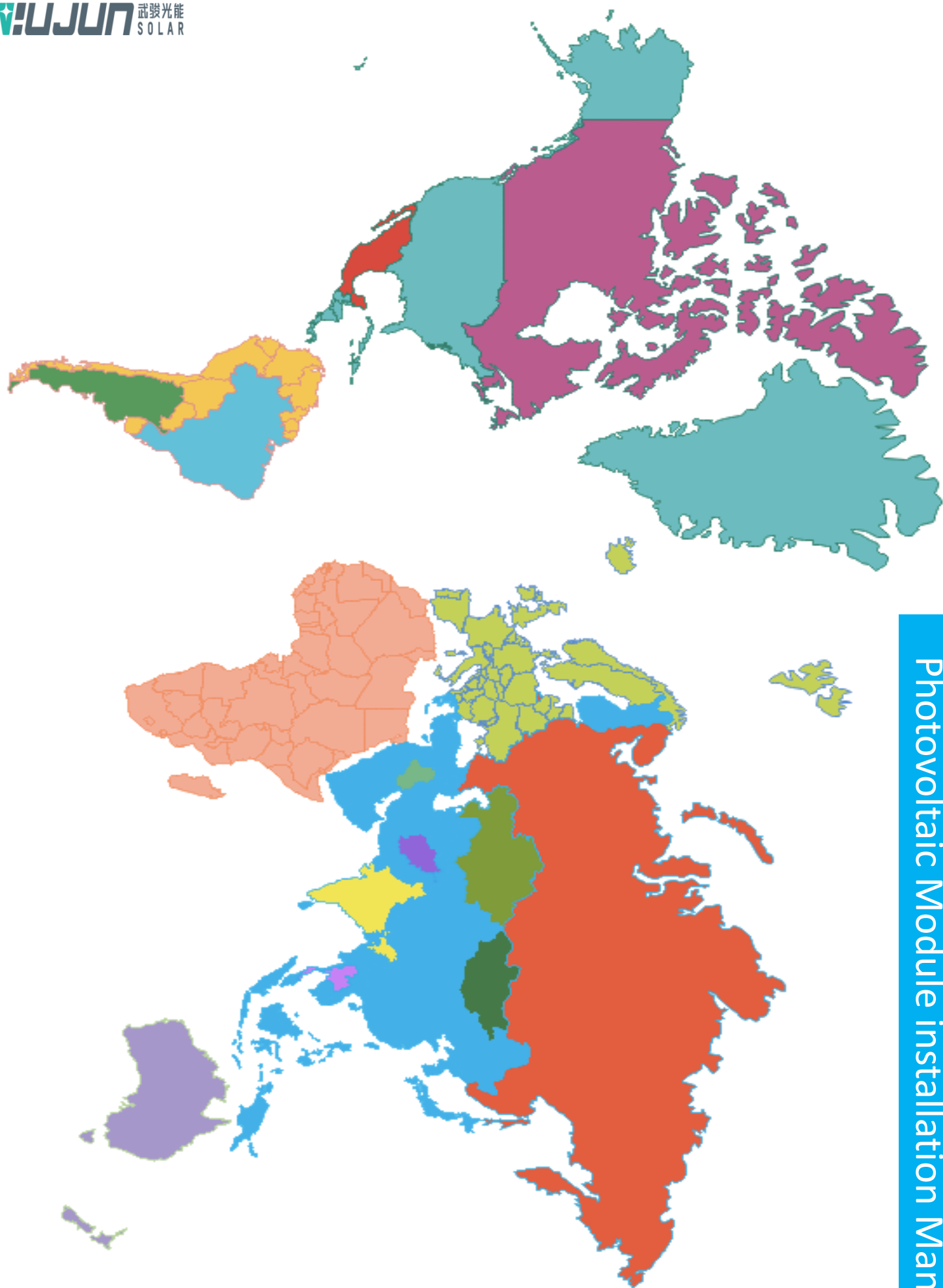




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This manual is for Wujun photovoltaic modules listed as the content,

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Please read this manual carefully before installing the modules. Non-compliance with these instructions may void the module warranty.

1. General Information

1.1 Overview

This manual contains information regarding the installation and safe handling of WUJUN photovoltaic (PV) modules. All instructions should be read and understood before attempting to install. If there are any questions, please contact your dealer or WUJUN for further information. The installer should conform to all safety precautions from the manual when installing modules. The installation work of the PV array can only be done under the protection of sun-sheltering covers or sunshades and only qualified person can install or perform maintenance work for the module.

If not otherwise specified, it is recommended that the requirements of the U.S. National Electrical Code (NEC) or respective European Code and other local regulations be followed.

Non-compliance with this installation instruction may result in property damage and/or physical injury, WUJUN will not be liable for compensation of any loss or injury caused by this type of non-compliance.

1.2 Codes and regulations

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

1.3 Module identification

Each module is pasted with 2 labels providing information as below:

- Nameplate: It describes product type, standard rated power, rated current, rated voltage, open circuit voltage, short circuit current under testing conditions, certification indicator, maximum system voltage, etc.
- Serial No.: Each module has a unique serial number which is laminated inside the module permanently and it can be seen from front top of the module. In addition, you can find the same serial number on the module nameplate.

1.4 General safety

The modules are qualified for Application Class A: Hazardous voltage (greater than 50 V DC) or hazardous power applications (greater than 240 W), where general contact access is anticipated. Modules qualified for safety under IEC 61730-1, IEC 61730-2 and within this application class are considered to meet the requirements for Safety Class II.

The safety and protection measures must be taken to avoid electric shocks under the installation, operation, use, and maintenance of the Module. When installing modules at elevated positions, take appropriate safety and protection measures to prevent personnel, tools, or the Module

from falling from heights and causing damage.

When installing the Module on a roof, the roof and the entire structure must retain a certain level of fire resistance, and it must be evaluated by an architect or engineering experts to verify that the roof can withstand the pressure and weight of the photovoltaic system (including the Module).

For your safety, do not work in rain, snow or windy conditions.

1.5 Electrical safety

- Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the value of I_{sc} and V_{oc} marked on the module should be multiplied by 1.25 when determining PV system component voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the PV output. For example, a safety factor for V_{oc} and I_{sc} of 1.25 is recommended since irradiance is often higher than 1000 W/m² and temperature below 25°C may raise V_{oc} . Refer to Section 690-8 of the National Electrical Code of an additional multiplying factor of 125 percent (80 percent de-rating) which may be applicable.
- PV modules generate DC electrical energy when exposed to sunlight or other light sources. Do not touch live terminals with bare hands. Use insulated tools for electrical connections.
- Due to the risk of electrical shock, do not perform any work if the terminals of the PV module are wet.
- Broken solar module glass is an electrical safety hazard (may cause electric shock or fire). These modules cannot be repaired and should be replaced immediately.
- Do not disconnect any of the modules when under load.

1.6 Operating safety and general installation notes

- Keep the PV module packed in the carton until installation. Once the modules are removed from the packing box, they should be installed and connected in time. If they are not installed immediately, protective measures (such as adding rubber joint cover, etc.) should be taken on the connection head.
- Store packaging carton in ventilated, rain-proof and dry places before unpacking of modules.
- It is suggested that completely cover the module with an opaque material during installation to keep electricity from being generated.
- Do not lift the module by holding the junction box or wires at any time.
- Do not stand or walk on modules, otherwise it will result in unexpected permanent or impermanent module defects, such as cracks, snail trails and etc.
- Do not try to disassemble the modules or remove nameplate or parts of modules.
- Do not damage or scratch back film of modules.
- Always wear protective headgear, insulating gloves and safety shoes (with rubber soles) and other protective measures, use insulated tools and do not use wet tools during installation.
- When installing or maintaining the photovoltaic system, please do not wear metal rings, watches and other metal products, so as not to cause electric shock danger and damage the

modules.

- When installing PV modules, do not drop any objects (e.g., PV modules or tools).
- Do not brush paint or corrosive substances on the surface of the module.
- Do not clean the glass with chemicals. Only use tap water. Make sure the module surface temperature is cool to the touch. Cleaning modules with cool water when module surface temperature is high may result in glass breakage.
- All PV systems must be grounded to earth. If there is no special regulation, please follow the National Electrical Code or other national code.
- The junction box connector should not be in contact with oily substances, organic solvents and other corrosive materials to avoid damage to the connector. For example, alcohol, gasoline, lubricant, rust inhibitor, herbicides and so on.
- The maximum altitude to install the PV module is designed for $\leq 2000\text{m}$.
- Insert module connectors fully and correctly. An audible "click" sound should be heard. This sounds confirms the connectors are fully seated.
- The module leads should be securely fastened to the module frame, Wire Management should be done in a way to avoid the connector from scratching or impacting the back sheet of the module.
- During the installation or operation, don't use sharp tools to wipe the back sheet and glass. Scratches can appear on the module.
- Do not drill holes on the frame, which may reduce frame loading capacity or lead to frame corrosion.
- The irradiance reflected on the rear of the bifacial solar modules shall not exceed $300\text{W}/\text{m}^2$.
- Don't artificially concentrated sunlight producing current above value stated on label shall not be directed onto front and back side of module.

1.7 Fire safety

- WUJUN modules are tested for Class C of fire safety classification under IEC61730-2 standard. The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
- The fire safety of building may be affected by the roof construction and installations. Improper installation may cause hazards in the event of fire.
- Consult with local authority for requirements for building or structural fire safety.
- To use components such as earth ground fault circuit breakers, fuses and circuit breakers as required by local authority in the PV system for fire prevention.
- For roof installation, PV modules should be mounted over a fire-resistant roof covering which is rated for the application.
- In case of fire, the modules on the roof are likely to produce dangerous DC voltage and may have potential hazard, even in the case of:
 - a. Low light intensity
 - b. Modules being disconnected from the inverter

- c. Modules being partly or entirely destroyed
- When fire has been extinguished or for the duration of fire, stays away from all elements of the PV system. Have your installer perform the necessary steps to bring the PV system back into a safe condition.
- Confirm mounting slope is less than 5 inches(127mm) to maintain the fire class rating.

2. Installation

2.1 Installation condition

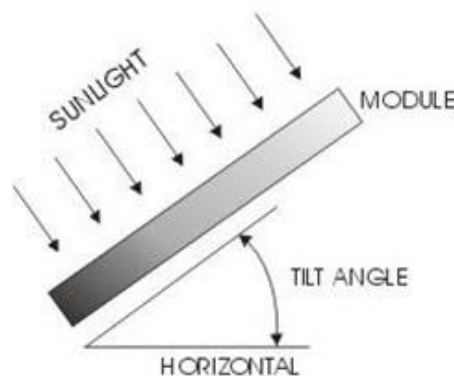
2.1.1 Installation site and working environment

- WUJUN suggests that modules be installed in the working environment with the temperature of -40°C to 40°C which is the monthly average highest and lowest temperature of the installation sites. The solar module's operating temperature range is $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$. About geographic limitations, installation sites covers with higher 98th percentile operating temperature.
- WUJUN modules shall be installed on proper buildings or other appropriate places (Such as ground, building outer wall, roof, PV tracking system) and shall not be installed on any vehicles.
- Do not install the PV module in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain etc.
- Make sure that installed modules do not suffer wind or snow pressure that exceeds the permissible maximum load limit.
- Modules shall be installed at locations free from shadows throughout the year. Make sure there are no light-blocking obstacles at the installation sites.
- Carry out lightning protection for modules installed in places with frequent lightning and thunder.
- Do not install modules at locations with possible flammable gas.
- Modules cannot be used in environments with too much hail, snow, flue gas, air pollution and soot or in places with strong corrosive substances such as salt, salt mist, saline, active chemical steam, acid rain, or other substances that may corrode modules and affect module safety or performance.

* Note: The mechanical load bearing (include wind and snow loads) of the module is based on the approved mounting methods. The professional system installer must be responsible for mechanical load calculation according to the system design.

2.1.2 Tilt angle selection

- Include angle between module surface and horizontal surface, the module will obtain the maximum power output if directly facing sunlight.
- Modules are preferred to be south-facing in the northern hemisphere and north-facing in the southern hemisphere. Please refer to standard modules' installation guidelines or suggestions from experienced PV module installer, for the specific installation angle.
- It is recommended that module installation tilt angle be no less than 10° so module surface dust can be washed away easily by rainfall and times of cleaning can be reduced.
- The WUJUN modules connected in series should be installed with the same orientation and tilt angle. Different orientation and tilt angle may result in differences of solar irradiation received by the modules and result in loss of power output.



2.2 Mechanical installation

WUJUN modules usually can be mounted by using two methods: bolts and clamps.

* Note:

- All installation methods herein are only for reference, and WUJUN will not provide related mounting components, the system installer or trained professional personnel must be responsible for the PV system's design, installation, and mechanical load calculation and security of the system.
- Before installation, the following items should be addressed:
 - Visually check the module for any damage. Clean the module if any dirt or residue remains from shipping.
 - Check if module serial number stickers match.
- Modules can be installed horizontally or vertically. When installing the components, be careful not to block the drain hole of the frame.
- Modules will have thermal expansion and cold contraction effect. When installing, the interval between two adjacent conventional modules is recommended $> 10\text{mm}$. The minimum clearance between two adjacent double-sided modules is recommended $> 20\text{mm}$; If there are special requirements, please confirm with WUJUN and install it;
- When the modules are supported parallel to the surface of a building wall or roof, a minimum clearance of 10cm between the module frame and the surface of the wall or the roof is required to allow air to circulate behind the modules and to prevent wiring damage.

2.2.1 Mounting with Bolts

For mounting with bolts, the modules listed in table 1 are applicable.

- The frame of each module has 8 mounting holes (Length* Width: $14*9\text{mm}$) used to secure the modules to support structure.
- The module must be attached and supported at minimum 4 or 8 bolts through the indicated

mounting holes to fix module on the mounting rail.

- Depending on the local wind and snow loads, additional mounting points may be required.
- The frame must be attached to a mounting rail using appropriate corrosion-proof fastening materials (bolt/spring washer/flat washer/nut) in eight symmetrical locations on the PV module, all mounting hardware should be stainless steel M8 size. The applied torque value should be big enough to fix the modules steadily, we recommend to use a tighten torque of 16~20 N-m.

Please find detailed mounting information from figure 1.1, 1.2., 1.3.

Figure 1.1

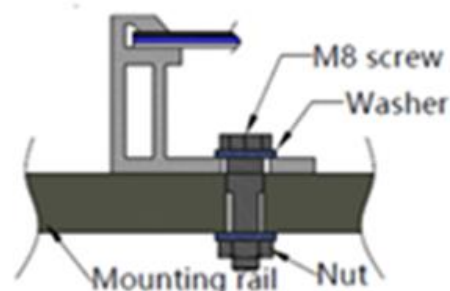
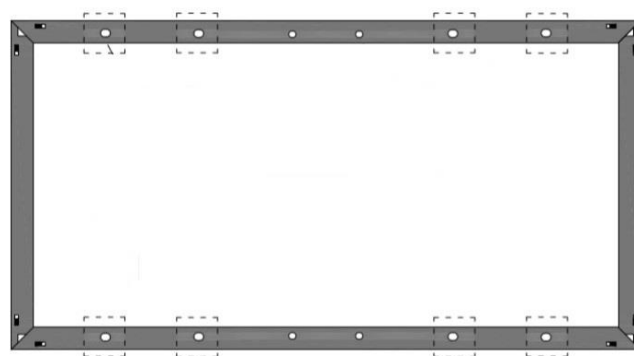


Figure 1.2 : Bolt mounting (4 mounting holes)



Figure 1.3 : Bolt mounting (8 mounting holes)



2.2.2 Mounting with clamps

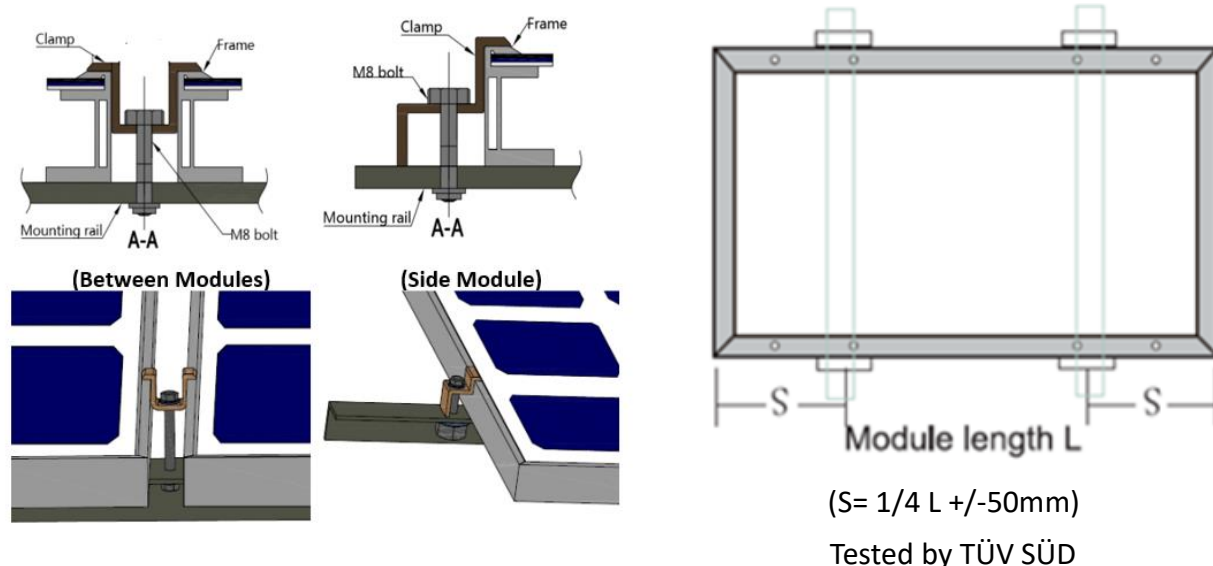
For mounting with clamps, the modules listed in tables 1 are applicable.

- When choosing clamp mounting method, please be sure to use at least four clamps on each module, two clamps should be attached on each long sides of the module. Depending on the local wind and snow loads, if excessive pressure load is expected, additional clamps or support would be required to ensure the module can bear the load. The applied torque value should be big enough to fix the modules steadily, we recommend the applied torque is about 16 ~ 20 N-m. (Please consult with the clamp or support's supplier for the specific torque value)
- The clamps must be fastened to supporting structure using M8 stainless steel hardware (all fitting components must be corrosion-proof material).

Please find detailed mounting information in figure 2.1, 2.2.

Figure 2.1 : Mounting by Clamps

Figure 2.2 Mounting by Clamps



2.2.3 Installation position and static loads

- WUJUN modules are designed to meet a maximum positive (or downward) pressure of 3600Pa and negative (or upward) pressure of 1600Pa. This design load was then tested with a safety factor of 1.5 times. So WUJUN modules are tested under a maximum downward pressure of 5400Pa and upward pressure of 2400Pa. When mounting modules in snow-prone or high-wind environments, special care should be taken to mount the modules in a manner that provides sufficient design strength while meeting local code requirements.

Table 1: Mechanical dimensions for bolt and clamp installation

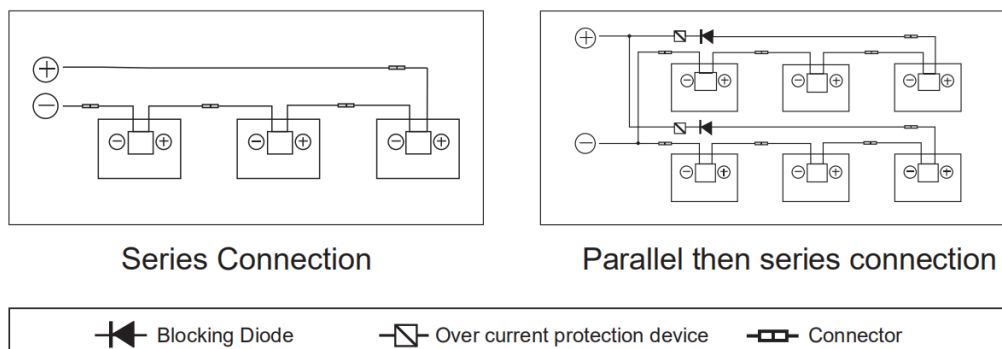
Module series	Cell type	Cell No.	Model series	Module Dimension Length x width x height (mm)	Installation methods			
					Bolt mounting		Clamp mounting	
					4 or 8 mounting holes	Bolt/Nut/Washer type	on long side of the frame	Clamp length
Double glass module	182mm	156	WJM78D30 xxxW/10BH	2465 x 1134 x 30	V	M8, Stainless steel (8 mounting holes)	V	≥50mm
		144	WJM72D30 xxxW/10BH	2279 x 1134 x 30				
	182mm	156	WJM78D31 xxxW/16BH	2465 x 1134 x 33	V	M8, Stainless steel (8 mounting holes)	V	≥50mm
		144	WJM72D31 xxxW/16BH	2278 x 1134 x 33	V	M8, Stainless steel (8 mounting holes)	V	≥50mm

2.3 Electrical installation

2.3.1 Electrical Performance

- Module electric performance parameters such as I_{sc} , V_{oc} and P_{max} nominal values have $\pm 3\%$ deviation with those under standard testing conditions of: irradiance of 1000 W/m², cell

temperature of 25℃ and air mass of AM1.5. While modules are in series connection, the final voltage is sum of that of the single module. When modules are in parallel connection, the final current is sum of the single module as below. Modules with different electric performance models cannot be connected in series.



- The number of modules in series connection in each strand shall be calculated according to relative regulations. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value stipulated for modules and other values required by DC electric parts. (WUJUN modules maximum system voltage is DC1500V---actual system voltage is designed based on the modules model used and inverter.) The Voc factor can be calculated with the following formula. $C_{Voc} = 1 - \beta_{Voc} \times (25 - T)$

T: The expected lowest temperature of the installation site.

β : Voc temperature coefficient (% /℃) (please refer to below table for the detail)

If there is reverse current exceeding the maximum fuse current flowing through the module, use overcurrent protection device with the same specifications to protect the module; if parallel connection strands are more than 2, there shall be an overcurrent protection device on each strand of module.

Product Series	NOCT (℃)	Temperature Coefficient [%/℃]		
		I _{sc} [α]	V _{oc} [β]	P _{max} [δ]
WJM78D30 xxxW/10BH 、 WJM72D30 xxxW/10BH 、	45±2	0.048	-0.28%	-0.35%
WJM78D31 xxxW/16BH 、 WJM72D31 xxxW/16BH	45±2	0.045	-0.25%	-0.29%

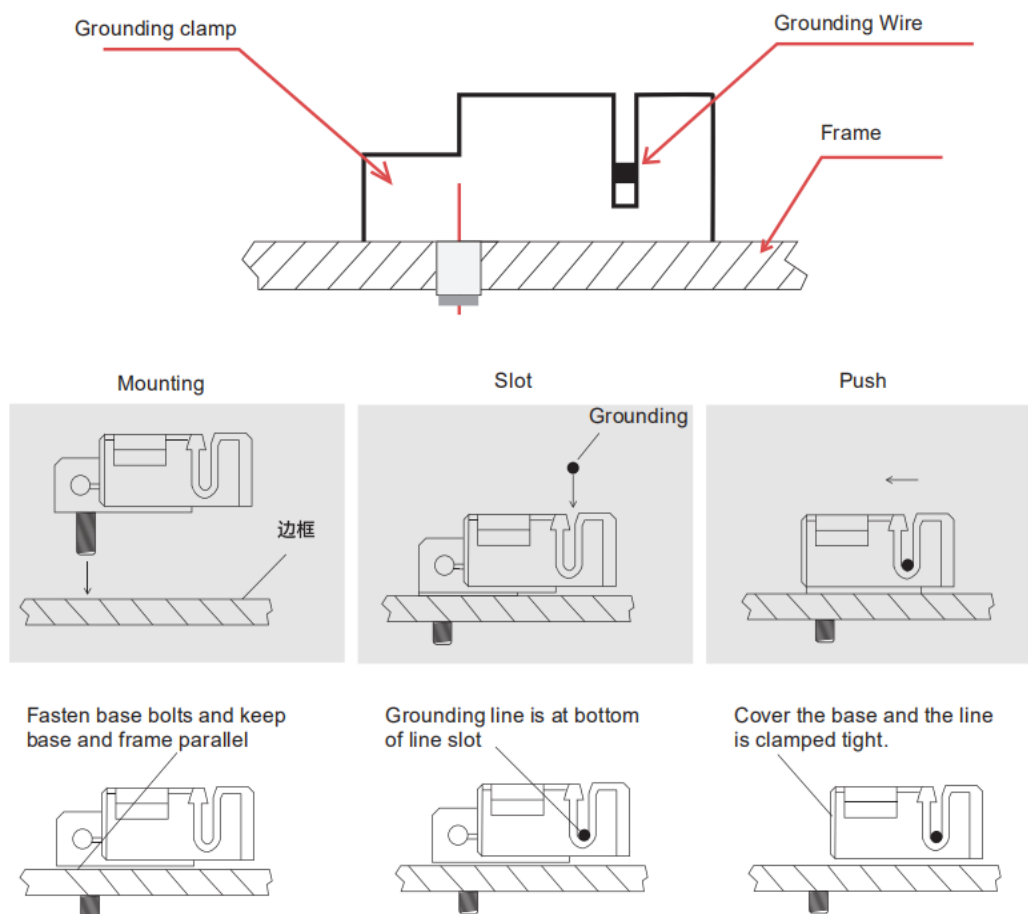
2.3.2 Grounding

- All module frames must be properly grounded. Please connect grounding in accordance with IEC Standards or NEC article 250 or the electrical codes and regulations of the site/country of installation to ensure that the Module is correctly grounded.
- The grounding device shall be in full contact with inner side of the aluminum alloy and penetrate the frame surface oxide film. Please use the grounding holes on the Module frame for grounding. It is strictly forbidden to drill additional holes that may damage the frame.
- Observe all local electric codes and regulations.
- A bonding or toothed washer is required to make proper and reliable electrical grounding

connection with the anodized aluminum frame.

- Devices listed and identified for grounding metallic frames of PV modules are permitted to ground the exposed metallic frames of the module to grounded mounting structures.
- Consider using a lay-in lug, rated for outdoor use, if the module grounding conductor is to be larger than #10 AWG.
- For optimal performance, WUJUN recommends the DC cathode(-) of the module's array is connected to ground. Failure to comply with this requirement may reduce the performance of the system.
- The grounding between components must be confirmed by qualified electricians, and the grounding device must be made by a qualified electrical manufacturer. The proposed torque value of bolt is 1.5 ~2.2N-m with minimum No. 12 AWG (4 mm²) grounding wires. The following Listed grounding Clips (E69905) in combination with the following model number PV module(s), used with a stainless steel, 8-32 machine screw for mounting, approx. 0.5 in long with an 11/32 (8-32) in. hex nut.

Model Series	Grounding Clip / Lug		
	Manufacturer	Type	Wire Size
WJM78D30 xxxW/10BH 、 WJM72D30 xxxW/10BH	TYCO ELECTRONICS CORP.	1954381-2	12 AWG
WJM78D31 xxxW/16BH 、 WJM72D31xxxW/16BH			



2.3.3 Wire

- The junction box on each PV module has two wires that terminate in a male and a female connector. When the modules are to be connected in series, the male connector should be plugged into the female connector of the neighboring module while the female connector should be plugged into the male connector of the other neighboring module.
- When connecting parallel module's strings to the distribution box, use proper third-party PV system connectors with suitable cable which are qualified for EN50618(or IEC62852). All field wiring cables must have large enough cross-sectional areas approved for use at the maximum short-circuit current of the PV module. WUJUN recommends that installers use only sunlight resistant cables for direct current (DC) wiring in PV systems. The recommended minimum wire size should be 4 mm²(12AWG) and must be subject to the local national codes and regulations.
- The connecting cables must not cross each other and must be kept away from direct sunlight, heat source and any static pool of water. The cables should be secured by the modules mounting structure and should maintain a distance of at least 25 mm from one another with no possibility of coming into contact.

2.3.4 Connectors

- The connectors should be kept dry and clean. Do not attempt to make electrical connections between wet, soiled which will lead to faulty connectors. Faulty connections can result in

electrical shock and arc.

- Only compatible connectors can be mated, i.e., from the same vendor and model shall be used.
- The main types and corresponding manufacturer of connectors used by WUJUN are as below :

WUJUN Model	Manufacturer	Connector type
WJM78D30 xxxW/10BH 、 WJM72D30 xxxW/10BH、 WJM78D31 xxxW/16BH 、 WJM72D31xxxW/16BH	QC Solar (Suzhou) Corporation	QC4.10-cds
	Staubli Electrical Connectors AG	PV-KST4-EVO2/XY_UR , PV-KBT4-EVO2/XY_UR

2.3.5 Bypass Diodes

WUJUN module junction boxes contain bypass diode which is parallel connection with the PV cell strings. if hot spot occurred, the diode will come into operation to stop the main current from flowing through the hot spot cells in order to prevent module over-heated and performance loss. Notice, bypass diode is not the overcurrent protection device. If the diode is suspected to be defective, the installer or system providers shall contact WUJUN. Please do not try to open the junction box by yourself.

Each junction box has 3 bypass diodes. Bypass Diode manufacturers are as below.

WUJUN's model name	By pass diode manufacturer	Type
WJM78D30 xxxW/10BH 、 WJM72D30 xxxW/10BH、 WJM78D31 xxxW/16BH 、 WJM72D31xxxW/16BH	QC Solar (Suzhou) Corporation	Type: QCM2545 or 20SQ050 for 20A QCM3045 for 22A, QCM4045 or 30SQ050A for 25A QCM5045 or QCM5045B for 30A

2.3.6 General electrical installation

- Do not use modules with different configuration in the same system.
- The module is supplied with connector for electrical connection.
- Refer to local code to determine appropriate types and temperature ratings of conductors. Wiring should be 4 mm²(minimum), and must be temperature rated at 90 °C (minimum).

- Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- Refer to local code to determine over current, conductor ampacity and size requirements.
- Installation shall be in accordance with local code.
- For best performance, ensure that positive and negative DC wires run closely together to avoid loops.



WARNING!

Electrical shock hazard!

Do not touch bare conductors or other potentially energized parts.

3. Operation and Maintenance

It is required to perform regular inspection and maintenance of the modules, especially during the period of warranty.

WUJUN recommends the following maintenance items to ensure optimal performance of the module.

3.1 Cleaning

- The dust or dirt accumulated on the module(s) front face will result in a decreased energy output. Clean the module(s) preferably once per annum if possible (depend on site conditions). Using a soft cloth dry or damp, as necessary. Water with high mineral content may leave deposits on the glass surface and is not recommended. It is recommended to use neutral water to clean the glass to avoid strong acid and alkali, so as not to cause damage to the glass coating layer.
- It is suggested to use damp clean water sponge or soft cloth to wipe the glass surface. Do not use acid and alkaline detergents to clean modules. Do not use tools with rough surfaces to clean in any case.
- In order to avoid potential risk of electrical shock or burn, WUJUN suggests to clean the module during early morning and evening with less solar irradiation and lower module temperature especially area with high average temperature.
- In order to avoid potential risk of electrical shock, do not try to clean the modules with glass damage or exposed wires.

3.2 Module Appearance Inspection

- Check whether the module glass is broken.
- Check whether there are traces of burning on the module back plate and grounding condition.
- Check if any obstacles shading the PV modules.
- Check for any loose or damage screws between the module and bracket. If so, adjust and fix as soon as possible.

3.3 Inspection of connectors and cables

It is suggested to carry out the following preventive inspection once every 6 months:

- Check connector sealing and cable connection.
- Look for gaps on the sealant of the terminal box and confirm whether it is cracking.

4. Disclaimer of Liability

WUJUN shall not be liable for any loss, damage, destruction, and expenses as a result or arising from inappropriate installation, operation, use or maintenance. No responsibility is assumed by WUJUN for any infringement of patents or other rights of third parties, which may result from use of the PV product. No license is granted by implication or otherwise under any patent or patent right.

The information in this manual is based on WUJUN's knowledge and experience and is believed to be reliable, but such information including product specification (without limitations) and suggestions does not constitute a warranty, expressed or implied. WUJUN reserves the right to change the manual, the product, the specification, or product information sheet without prior notice.

5. PV module handling instructions

5.1 Unloading

- At receipt of PV modules, verify the product details as it had been ordered. Packing list pasted outside the box contains all details including the serial no of modules.
- It is recommended to unload the packing box by using forklift only.
- Always move full bulk pack solution via forklift or jack entering from the short side.

In the process of loading and unloading, the forklift should be selected according to the size and weight of the goods. If the fork length is less than 3/4 of the size of the goods, extension sleeves should be fitted on the forks before the assembly is forked, in order to avoid the packing container dumping when moving the forklift.

- When the forklift is loaded with modules, the spacing between the two forks should be adjusted as required to ensure the load of the two forks is balanced without deflection. One side of the assembly box should be close to the retainer.



Fig: Packing Box – Forklift Handling Images

- Avoid sharp objects (such as forklift pallet fork) contact or collision with module box body parts, so as not to damage the internal modules.

5.1.1. Attention in loading and unloading with hoisting

- The hoisting rope of crane unloading needs to choose a longer nylon sling - wire rope is not allowed.
- Before lifting, the length of the sling should be evenly distributed on both sides to avoid the case body tilting to one side during lifting, which causes the sling to be too tight and the assembly to explode.
- When lifting, the box should be kept balanced to avoid tilting.
- In order to minimize the impact of sling on the safety of goods in the process of hoisting, the box should be supported during loading and unloading. For example, wooden plank, boards or other fixtures of the same width as the outer packing cases should be used on the upper part of the box to reduce the pressure of the contact position on the box.



Fig: Packing Box – Adjusting Sling rope for Hoist Handling (Separator – Pallet)

- Once unloaded from the container the packing box should always be kept on a flat and even surface.
- The modules should be placed neatly with a safe distance between the boxes. The spacing between boxes should be greater than 30cm.
- Do not stack packing boxes /pallets more than 2 boxes high. If pallets are stored temporarily outside, then the external protective cover to be placed.

5.2 Unpacking & Storage

- Unpacking of PV modules should always be done in the vertical manner by two persons as shown in the diagram. Also care should be taken for falling over one module to the other inside the packing box.

- Modules should be stored in a dry and ventilated environment to avoid direct sunlight and moisture. If modules are stored in an uncontrolled environment, the storage time should be less than 1 month and extra precautions should be taken to prevent connectors from being exposed to moisture or sunlight.

5.2.1 Standard packing box -1

- Remove the plastic strip using the correct cutting device and Lift the box lid- making sure the inside strip is not cut.
- Cut the inner straps and push the modules towards a well build wall or pole for supporting the modules, so that don't fall towards the unloading side.



Fig: Cutting of the packing strip



Fig: Opening the lid of Standard Packing box - 1

5.2.2 Standard packing box -2

- Remove plastic strip using the correct cutting device and Lift the box lid.
- Remove the inner plastic strip; making sure the inside strip is not.
- Cut the inner straps and push the modules towards a well build wall or pole for supporting the modules, so that don't fall towards the unloading side.



Fig: Opening the lid of Standard Packing box - 2

5.2.3 Special packing box

- Remove plastic strip using the correct cutting device and Lift the box lid.
- Place the module in a safe place to avoid damage.
- PV module surfaces may get damaged/scratched if not handled carefully.
No paint or adhesive to be applied to any of the surfaces including frame.
- Do NOT connect male & female connectors of the Junction box cable of the module.



Fig: Opening the lid of Special packing box

- Do NOT use a knife to cut the zip-ties, but use wire cutting pliers.
- Do NOT place module directly on top of each other.
- Never lift the modules by the Connecting leads or the Junction Box.
- Pallets should be handled using forklift trucks.
- For safety reasons pallets should not be piled more than specified layers as shown on the outer carton box tube , and they should only be moved using the correct mechanical equipment.
- Pallets should be placed one on top of the other so that corners are flush and there is no overhang.

5.3. Module representation

Each module has a unique serial number, which is laminated behind the glass. Please record the serial numbers during an installation for your future records. A nameplate containing model name, electrical and safety characteristics of the module is also affixed to the back side.

6. Installation

This section contains electrical and mechanical specifications needed before using your PV modules.

- Modules should be firmly fixed in place in a manner suitable to withstand all expected loads, including wind and snow loads. Module mounting holes are provided for easy installation and proper mechanical loading.
- Appropriate material should be used for mounting hardware to prevent the module frame, mounting structure, and hardware itself from corrosion.
- To maximize the annual yield, please calculate the optimum orientation and tilt for PV modules in that specific installation site. The highest yields are achieved when sunlight shines perpendicularly onto the PV modules.
- Install modules where they are not shaded by obstacles like buildings and trees. Especially pay attention to avoid partially shading the modules by objects during the daytime.
- Even minor partial shading (e.g. dirt deposits) reduces yields. A module can be considered to be unshaded if its entire surface is free from shading all year round. Sunlight should be able to reach at least the module

even on the shortest day of the year.

- Constant shading conditions can affect module service lifetime, due to accelerated ageing of the encapsulation material and thermal stress on the bypass diodes.
- According to UL 1703, any other specific clearance required for maintaining a system fire rating should prevail. Detailed clearance requirements pertaining to system fire ratings must be provided by your racking supplier.
- Minimum distance between each Solar PV Module should be 7.0 mm.
- PV modules are not to be subjected to wind or snow loads exceeding the maximum permissible loads and should not be subjected to excessive forces due to the thermal expansion of support structures; careful consideration has to be shown during system design and installation.
- Clearance between the module frame and the mounting surface 4 inches is required to allow cooling air to circulate around the back of the module. This also allows any condensation or moisture to dissipate. The module should never be sealed to the mounting surface with sealant that prevents air from circulating under the module.
- Insert interconnect connectors fully and correctly. Check all connections. The interconnect cable should be securely fastened to the module frame, Cable support should be done in a way to avoid the connector from scratching or impacting the back sheet of the module.
- The connectors should be rigidly fastened to the module or any rigid structure to ensure that the wires are not hanging or that the connectors are not exposed to any direct flow of water and debris.
- It is a must to remove the transparent plastic film coming along with the frame before Installation of modules.

6.1. For bifacial modules

In addition to the above points, the below points are also to be taken care.

- For optimizing the power generation of the rear side of bifacial modules, obstacles between modules and the mounting ground should be avoided.
- Bifacial modules use direct, reflected, or diffuse sunlight on the backside to generate additional power. Therefore, bifacial modules are not suggested to be used in building attached photovoltaic systems (BAPV). If BAPV, or similar mounting is still required, sufficient clearance of at least 10 cm (3.94 in) between the module and the mounting surface needs to be provided to allow cooling air to circulate around the back of the module. This also allows condensation or moisture to dissipate.
- Bifacial module cables should always be fastened on module frames or mounting rails, in order to avoid shading on module rear side.

7. Operating conditions

Modules should be operated under Standard Operating Conditions (SOC). An installation location with conditions exceeding SOC or with other Special Conditions, below should be avoided. SOC of these modules is as follows:

- The modules should be operated only in terrestrial applications. No space or other Special Conditions.
- When modules have been pre-installed, but the system has not been connected to the grid yet, each module string should be kept under open-circuit conditions and proper actions should be taken to avoid dust and moisture penetration inside the connectors.

- Do not connect different connectors (brand and model) together.
- Please refer the respective technical datasheet of the solar module for the operating conditions related to Ambient temperature & Relative humidity.
- Make sure that all connections are safe and properly mated. The PV connector should not be subject to stress from the exterior. Connectors should only be used to connect the circuit. They should never be used to turn the circuit on and off.
- Connectors are not waterproof when unmated. When installing modules, connector should be connected to each other as soon as possible or appropriate measures (like using connector endcaps) should be taken to avoid moisture and dust penetrating into the connector.
- Do not place connectors in locations where water could easily accumulate.
- Do not drill any extra ground holes for convenience as this will void the modules warranty.
- Protect exposed connectors from weathering damage by taking appropriate precautions. Avoid exposure to direct sunlight.
- Do not clean or precondition the connectors using lubricants or any unauthorized chemical substances.

8. Electrical Ratings

Appendix 1 : Electrical Ratings for modules with 166mm cell type

Rated electrical characteristics are within 3 percent of measured values at Standard Test Conditions of: 1000 W/m², 25°C cell temperature and solar spectral irradiance per IEC 60904-3" or irradiation of AM1.5 spectrum.

Appendix 2 : Electrical Ratings for modules with 182mm cell type

Model (182mm cell type)	Voc (V dc) ±3%	Vmp (V dc)	Maximum System Voltage (V dc)	Imp (A dc)	Isc (A dc) ±3%	Pmax (Watts) ±3%	Maximum Series Fuse (A)	Protection Class
WJM78D30 580/10BH	53.11	44.35	1500	13.08	13.84	580	30	Class II
WJM78D30 585/10BH	53.20	44.56		53.20	44.56	585		
WJM78D30 590/10BH	53.30	44.80		13.17	13.93	590		
WJM78S30 595/10BH	53.40	45.05		13.21	13.98	595		
WJM78D30 600/10BH	53.50	45.30		13.25	14.03	600		
WJM72D30 540/10BH	49.73	41.13		13.13	13.89	540	25	Class II
WJM72D30	49.92	41.32		13.19	13.95	545		

Model (182mm cell type)	Voc (V dc) ±3%	Vmp (V dc)	Maximum System Voltage (V dc)	Imp (A dc)	Isc (A dc) ±3%	Pmax (Watts) ±3%	Maximum Series Fuse (A)	Protection Class
545/10BH								
WJM72D30 550/10BH	50.11	41.51		13.25	14.01	550		
WJM72D30 555/10BH	50.30	41.70		13.31	14.07	555		
WJM72D30 560/10BH	50.49	41.89		13.37	14.13	560		
WJM72D31 580/16BH	52.5	43.88		13.22	13.95	580	30	Class II
WJM72D31 585/16BH	52.7	44.02		13.29	14.01	585		
WJM72D31 590/16BH	52.9	44.17		13.36	14.07	590		
WJM72D31 595/16BH	53.1	44.25		13.43	14.13	595		
WJM78D31 625/16BH	55.72	46.10	1500	13.56	14.27	625	30	Class II
WJM78D31 630/16BH	55.86	46.27		13.62	14.35	630		
WJM78D31 635/16BH	56.00	46.44		13.68	14.43	635		
WJM78D31 640/16BH	56.14	46.61		13.74	14.51	640		
WJM78D31 645/16BH	56.28	46.78		13.79	14.58	645		

Module Fire Performance:

Module Series	Module Fire Performance
WJM78D30 xxxW/10BH 、WJM72D30 xxxW/10BH	Type 2
WJM78D31 xxxW/16BH 、WJM72D31xxxW/16BH	Type 2

“The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.”

The System Fire Class Rating of the module or panel in a mounting system in combination with a roof covering complete with requirements to achieve the specified System Fire Class Rating for a non-BIPV module or panel.

Any module or panel mounting system limitations on inclination required to maintain a specific System Fire Class Rating.