



JA Solar PV Single-glass Modules Installation Manual

JA Solar Technology Co., Ltd.

CONTENTS

3.1 Product Identification

3.2 Conventional Safety

3.3 Electrical Performance Safety

3.4 Operating Safety

3.5 Fire Safety

4.1 Installation position and working environment

4.2 Tilt Angle Selection

5.1 Conventional requirements

5.2 Installation methods

6.1 Electrical Property

6.2 Cables and Wiring

6.3 Connectors

6.4 Bypass Diodes

7.1 Grounding by using grounding bolt

7.2 Grounding by using unused mounting hole

8.1 Cleaning

8.2 The visual inspection of the modules

8.3 Inspection of the connector and the cable

3.1 Product Identification

Each module has three labels providing the following information:

1. Nameplate: describes the product type; Peak power, Max power current, Max power voltage, Open circuit voltage, Short circuit current, all as measured under standard test conditions; Certifications mark, the maximum system voltage etc.
2. Current sorting: modules are sorted out according to their Max power current, referred as a corresponding symbol "Current class X" attached, in which X takes the value H, M or L (H marks physically the highest current). To get optimal performance out of a string of modules it is recommended to connect only modules of the same "Current class X" class (for example only H modules) in one given string. We recommend the modules with and without LRF should not be installed in the inverter, even if they are the same current class. For the rest of modules with different current classes, the modules with adjacent current class can be installed in one given string.
3. Serial number: each individual module has a unique serial number. The serial number has 16 digits. The 1st and the 2nd digits are the year code, and the 3rd is the month code (A, B, C stands for October, November and December respectively). For example, 121XXXXXXXXXXXXXX means the module was assembled and tested in the January of 2012. Each module has only one bar code. It is permanently attached to the interior of the module and is visible from the top front of the module. This bar code is inserted prior to laminating. In addition, you can find the same barcode on the frame.

3.2 Conventional Safety

JA Solar modules are designed to meet the requirements of IEC 61215 and IEC 61730, application class A. Modules rated for use in this application class may be used in system operating at greater than 50V DC or 240W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and IEC 61730-2 and within this application class are considered to meet the requirements for safety class II equipment.

Solar modules are not suitable for installation on flammable surfaces such as hay or wood thatched roofs. Rooftop PV systems should only be installed on rooftops capable of handling the additional weighted load of PV system components, including modules, and have a complete analysis of the structure performed by a certified building specialist or engineer.

For your safety, do not attempt to work on a rooftop until safety precautions have been identified and taken, including without limitation: fall protection measures, ladders or stairways, and personal protective equipment.

For your safety, do not install or handle modules under adverse conditions, including without limitation strong or gusty winds, and wet or frosted roof surfaces.

3.3 Electrical Performance Safety

Photovoltaic modules can produce DC electricity when exposed to light and therefore can produce an electrical shock or burn. DC voltage of 30 Volts or higher is potentially lethal.

Modules produce voltage even when not connected to an electrical circuit or load. Please use insulated tools and electrically insulated gloves when working with modules in sunlight.

Modules have no on/off switch. Modules can be rendered inoperative only by removing them from sunlight, or by fully covering their front surface with cloth, cardboard, or other completely opaque material, or by working with modules face down on a smooth, flat surface.

In order to avoid arcs and electrical shock, please do not disconnect electrical connections under load. Faulty connections can also result in arcs and electrical shock. So please keep connectors dry and clean, and ensure that they are in proper working condition. Never inseontar

local authority.

Do not use modules where flammable gasses may be generated.

JA modules have not been tested for explosion protection. Please consult local regulations whether the modules can be used or not.

4

4.1 Installation position and working environment

JA Solar modules are intended for use on land, no outer space use.

Do not use mirrors or other magnifiers to concentrate sunlight onto the modules.

Modules must be mounted on appropriate mounting structures positioned on suitable buildings, the ground, or other structures suitable for modules (e.g. carports or PV trackers).

Modules must not be installed in locations where they could be submerged in water.

The recommended ambient temperature should be within -40°C (-40°F) to 40°C (104°F). The temperature limits are defined as the monthly average high and low of the installation site. **The limit operating temperature should be -40°C (-40°F) and 70°C (158°F). Temperature range from a lower limit of environmental**

If the operating temperature of the module exceeds 70°C (158°F) for more than 2% of the year, select the corresponding BOM that complies with IEC TS 63126 standard.

Ensure modules are not subject to wind or snow loads exceeding the maximum permissible loads.

The m

Lightning protection is recommended for PV systems that are to be installed in locations with high probability of lightning strikes.

Do not use modules near equipment or in locations where flammable gasses may be generated or collected.

Modules cannot be installed or used in extreme areas or weather conditions, and highly corrosive areas should be considered carefully.

Please adopt appropriate measures to ensure the performance and safety of the modules when they are installed or operated in areas with heavy snow, extremely cold, strong wind, or near an island or desert that is prone to produce salt fog, or near water.

For areas with high wind speeds and snow loads, it is recommended to use a fixed bracket installation method. A tracking bracket installation method is not recommended, to avoid damage to modules caused by the firmness of the tracking bracket.

For areas with high wind load and snow load, it is recommended to use the fixed mounting system, rather than trackers, which can facilitate the stability and protect of the solar system from high loads. If solar modules are installed with trackers, it is recommended from safety side to use 2.5mm thickness and 60mm height and above purlin installation with 790mm, 1200mm, 1400mm holes in the module frames, not 400mm installation hole to fasten the rails.

The module frame will deform to a slight extent at low temperatures, and the maximum deformation at the frame center is generally within 15mm, which does not affect the normal installation and application of the

module.

The modules with LRF can have some light reflections at certain angles and light pollution if there are provisions in place, an assessment by the planner might be needed.

Modules cannot be applied for some special requirements, e.g. for marine and vehicle applications. Please refer to local law and regulations for details.

If the module is installed in the dusty environment, the ash layer on the module surface shall be cleaned regularly and immediately to prevent the ash layer from accumulating and forming hot spots on the surface and causing damage to module.

4.2 Tilt Angle Selection

The tilt angle of the modules is measured between the surface of the modules and a horizontal ground surface. The modules generates maximum power output when it faces the sun directly.

In the northern hemisphere, modules should typically face south, and in the southern hemisphere, modules should typically face north.

For detailed information on the best installation angle, please refer to standard solar photovoltaic installation guides or consult a reputable solar installer or systems integrator.

Dust building up on the surface of the modules can impair module performance. JA solar recommends installing the modules with a tilt angle of at least 10 degrees, making it easier for dust to be washed off by rain.

5

5.1 Conventional requirements

Ensure the installation method and supporting system of modules is strong enough to withstand all the load conditions. The Installer must provide this guarantee. The installation supporting system must be tested by the third-party organization with the analysis ability of Static Mechanical, according to the local national or international standards.

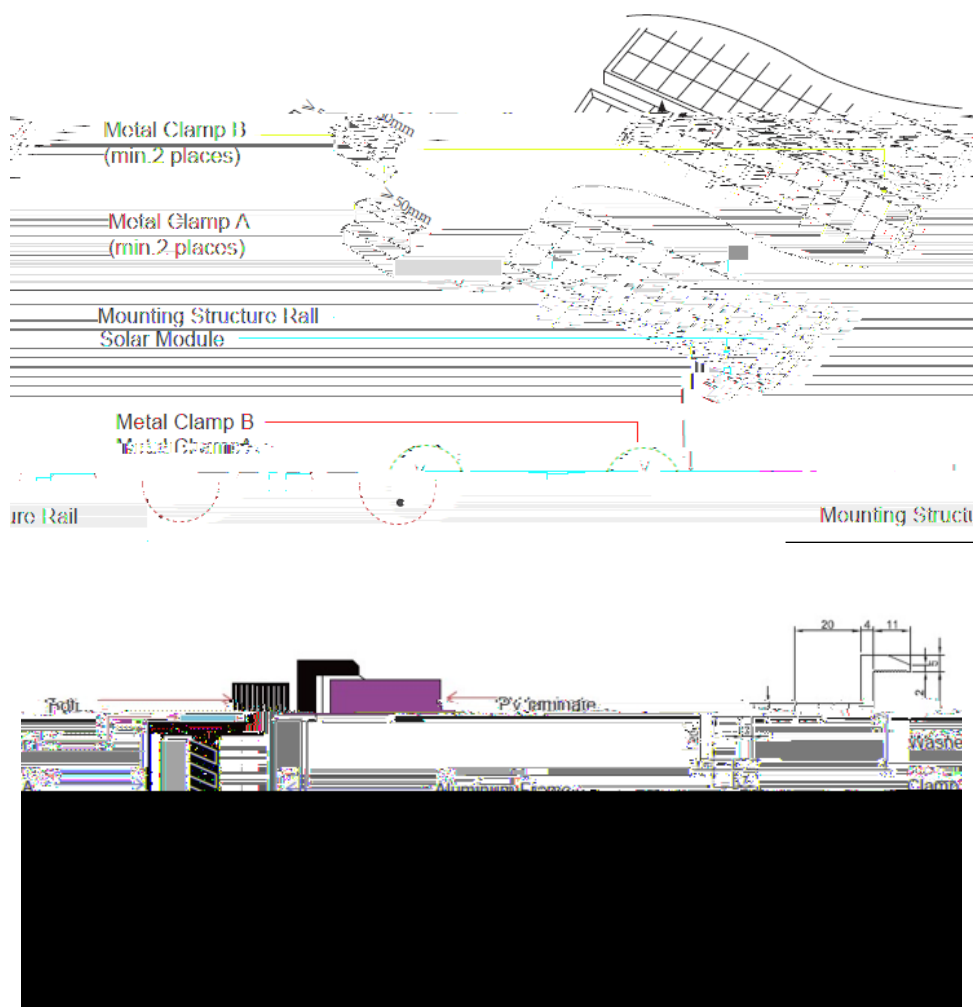
The modules mounting structure must be made of durable, corrosion-resistant and UV-resistant material. Modules must be securely attached to the mounting structure.

Photovoltaic mounting system is the important part of PV solar systems and it plays a key role in solar system safety and electricity power generation. In order to ensure the stability and safety of photovoltaic modules, and to prevent the potential risk on PV modules, Photovoltaic mounting system design must strictly follow the photovoltaic system design specifications, and ensure the quality and system strength

For your reference, please use the components specified below:

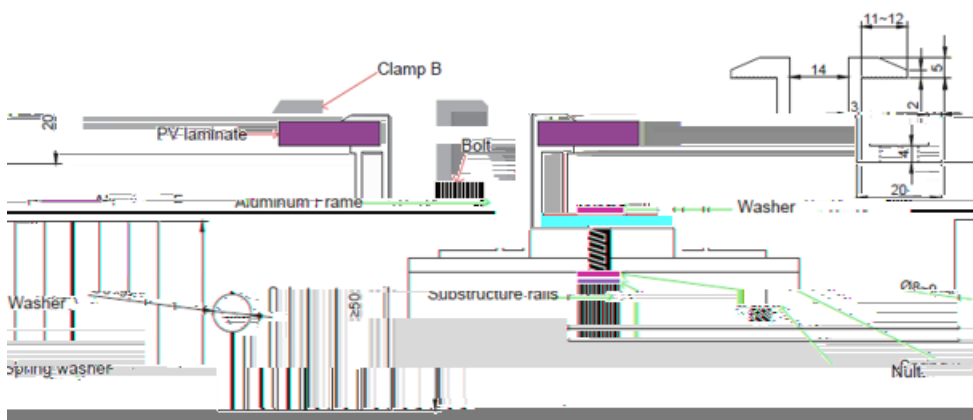
1. Bolt
2. Washer

Material: Q235B/SUS304



The module frame surface overlaps with the guide rail by at least 20mm

Clamp A The clamp used on the sided module (X=The height of module frame)



Clamp B The clamp used on the middle module

Figure 3 Clamp Details (Units: mm)

The JA limited warranty will be invalid if the substandard block is used (such as block height mismatch with module frame height) or if an incorrect installation method is used.

5.2.3 Installation position and corresponding static loads

The low/normal level of load condition is applicable to the installation in most of environmental conditions: the maximum static load on the back of the modules is 2400 Pa (i.e. wind load), and the maximum static load on the front of modules is 2400 Pa (i.e. wind and snow load).

The high level of load condition is applicable to the installation in harsher environmental conditions such as storm, heavy snow, etc: the maximum static load on the back of the modules is 2400 Pa (i.e. wind load), and the maximum static load on the front of modules is 5400 Pa (i.e. wind and snow load), depending on the pressure level that it would endure according to IEC standard.

Module type	Inner four holes	Outer four holes	Clamps, mounting rails cross the long frame 66: 400mm ≤ S ≤ 500mm; 77: 450mm ≤ S ≤ 550mm; 66S42LR: 450mm ≤ S ≤ 550mm; 72S42LR 550±50mm;	Mounting by clamps on the long frame	Clamps, mounting rails parallel the long frame 66: 400mm ≤ S ≤ 500mm; 77: 450mm ≤ S ≤ 550mm; 66S42LR: 450mm ≤ S ≤ 550mm; 72S42LR 550±50mm;
JAM66S30 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM66S30 MR Series (35mm frame)	+5400/-2400	N/A	+5400/-2400	±1200	±2400
JAM72S30 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S30 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM78S30 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM78S30 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S40 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S40 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S40 LR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S42 LR Series (30mm frame)	+5400/-2400	N/A	+5400/-2400	±1200	±2400

Installation methods	Inner four holes	Outer four holes	Clamps, mounting rails cross the long frame 66: 400mm ≤ S ≤ 500mm; 77: 450mm ≤ S ≤ 550mm; 66S42LR: 450mm ≤ S ≤ 550mm; 72S42LR 550±50mm;	Mounting by clamps on the long frame	Clamps, mounting rails parallel the long frame 66: 400mm ≤ S ≤ 500mm; 77: 450mm ≤ S ≤ 550mm; 66S42LR: 450mm ≤ S ≤ 550mm; 72S42LR 550±50mm;
JAM66S30 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM66S30 MR Series (35mm frame)	+5400/-2400	N/A	+5400/-2400	±1200	±2400
JAM72S30 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S30 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM78S30 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM78S30 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S40 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S40 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S40 LR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1200	±2400
JAM72S42 LR Series (30mm frame)	+5400/-2400	N/A	+5400/-2400	±1200	±2400
JAM60S42 LR Series (30mm frame)	+5400/-2400	+2400/-2400	+5400/-2400	±1200	±2400
JAM66S45 LR Series (30mm frame)	N/A	N/A	+5400/-2400	N/A	N/A
JAM72S40 GR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1000	±2400
JAM72S40 MR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1000	±2400
JAM72S40 LR Series (30mm frame)	+5400/-2400	+5400/-2400	+5400/-2400	±1000	±2400
JAM72S42 LR Series (30mm frame)	+5400/-2400	N/A	+5400/-2400	N/A	±2400

Note: Test load= Design load security coefficient

Note: 1. "N/A" means not applicable; "--" means in verification

2. * This is 400mm mounting holes of 1P single axis tracking system 2.0mm thickness and above 60mm height purlin ,

please consult with tracker companies about the workable installation solution if the required test load is over 2400Pa.

3. The mechanical loading data for the installation methods in the manual are based on the third-party certification or JA internal results.

4. For the maximum loads that do not appear in the table for certain installation methods, and for the other installation

the power station.

The length and height of different purlins of the tracking bracket correspond to different wind pressure



Figure 5: Electrical diagrams of series and parallel wiring

The maximum number of modules that can be connected in a series string must be calculated in accordance with applicable regulations in such a way that the specified maximum system voltage (The maximum system voltage of JA Solar modules is DC 1000V/1500V according to the safety appraisal of the IEC61730) of the modules and all other electrical DC components will not be exceeded in open-circuit operation at the lowest temperature expected at the PV system location.

Correction factor for the open-circuit voltage can be calculated based on the following formula: $C_{Voc} = 1 - \alpha_{voc} \times (25 - T_{min})$
 coefficient of the selected module V_{oc} (refer to corresponding datasheet).

An appropriately rated over-current protection device must be used when the reverse current could exceed the value of the maximum fuse rating of the modules (25A or 30A).

$$\text{Maximum system voltage} \geq N \times V_{oc} \times [1 - \alpha_{voc} \times (25 - T_{min})]$$

Where:

N —— number of modules connected in series

V_{oc} ——open circuit voltage of each module (refer to product nameplate or specification) [V]

α_{voc} —— thermal coefficient of open circuit voltage for the module (refer to the specification) [$^{\circ}\text{C}^{-1}$]

T_{min} —— lowest ambient temperature [$^{\circ}\text{C}$]

6.2.1 Cables and Wiring

These junction boxes have been designed to be easily interconnected in series for their well-connected cable and the connector with IP68 protection grade. Each Module has two single-conductor wires, one positive and one negative, which are pre-wired inside the junction box. The connectors at the opposite end of these wires allow easy series connection of adjacent modules by firmly inserting the positive connector of a Module into the negative connector of an adjacent Module until the connector is fully seated.

Use field wiring with suitable cross-sectional areas that are approved for use at the maximum short-circuit

current of the modules. JA Solar recommends installers use only sunlight resistant cables qualified for direct current (DC) wiring in PV systems. The minimum wire size should be 4mm²(12AWG).

After connecting onsite cables, ensure that the cables are long enough and not tight. Otherwise, the

During the construction of the power plant, the connector shall not be exposed to the outdoor environment under unconnected state for a long time, so as to avoid the invasion of dust, sand, insects, etc. in the environment to drill into the connector, resulting in the reliability decline of connector connection.

The mating of factory-installed connectors must be performed exclusively with connectors of the same manufacturer and type.

6.4 Bypass Diodes

The junction boxes used with JA Solar modules contain bypass diodes wired in parallel with the PV cell strings. In the case of partial shading, the diodes bypass the current generated by the non-shaded cells, thereby limiting modules heating and performance losses. Bypass diodes are not over-current protection devices.

In the event of a known or suspected diode failure, installers or maintenance providers should contact JA Solar. Never attempt to open the junction box by yourself.

Please pay attention to guard against inductive lightning, backflow and wrong connection.

JA Solar modules use an anodic oxidized aluminum frame or steel frame to resist corrosion, so the frame of modules should be connected to the equipment grounding conductor or protective bonding conductor to provide



Figure 6: Installation Methods

7.2 Grounding by using unused mounting hole

The existing mounting holes which have not been used can be used for grounding.

- A) Direct the grounding clamp to the mounting holes in the frame. Thread the grounding clamp and the frame with grounding bolt.
- B) Put the toothed gasket into the other side, then tighten and lock the nut. The recommended torque of locking the nut is 2.0 N·M-2.2 N·M.
- C) Thread the grounding clamp with grounding wire. The material and size of grounding wire should meet the relevant requirements of the national, regional and local code, law and standard.
- D) Finish the mounting with tightening the binding bolt of grounding wire

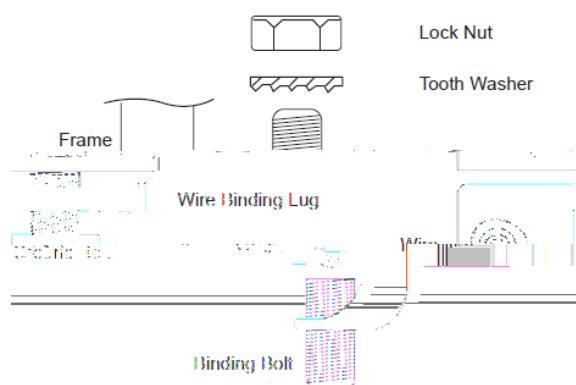


Figure 7: Installation Methods

It is required to perform regular inspection and maintenance of the modules, especially within warranty

Pay attention to prevent impact damage from occurring to solar modules (like stones thrown up during lawn mowing for example).

8.1 Cleaning

The dust accumulated on the front transparent substrate may reduce the power output, and may even cause regional hot-spot effect. Industrial effluents or bird drops may be a serious case, and the extent of the severity reduce the sunshine, because the light intensity is still homogeneous and the power reduction usually is not obvious.

When modules are operational, there may exist environmental factors that cast, dust, plants and so on, that may distinctly reduce the power output. JA Solar advises that there should be no obstructed object over the surface at any time.

Standing on the module or bracket for cleaning works is forbidden.

The cleaning frequency depends on the accumulating velocity of the fouling. In many instances the front substrate is cleaned with the rain, and we can decrease the cleaning frequency. It is recommended to wipe the glass surface with wet sponge or soft cloth. Please do not clean the glass with cleaning agent which contains acid or alkali. Please refer to "cleaning manual" for specific contents.

8.2 The visual inspection of the modules

Inspect the modules visually to find if there are appearance defect, the following three types need more attention especially:

A) Whether the glass is broken; When the glass of the module is broken: The module should be removed in time due to glass breakage or penetrating damage to the backsheet .Unauthorized use will cause the module to burn down and affect the operation of the power station.

B) -bar.

The corrosion is caused by the dampness infiltrated into the modules when the surface encapsulation material is damaged during the installation or transportation.

C) If there is burning vestige on the backsheet.

8.3 Inspection of the connector and the cable

maintenance every 6 months:

A) Check the encapsulation of the connector with the cable.

B) Check the sealing gel of the junction box to ensure it is not cracked or creviced.

The installation manual applicable module types are as follows. The module types are subject to changes without prior notice due to continuous product innovation, research and development.