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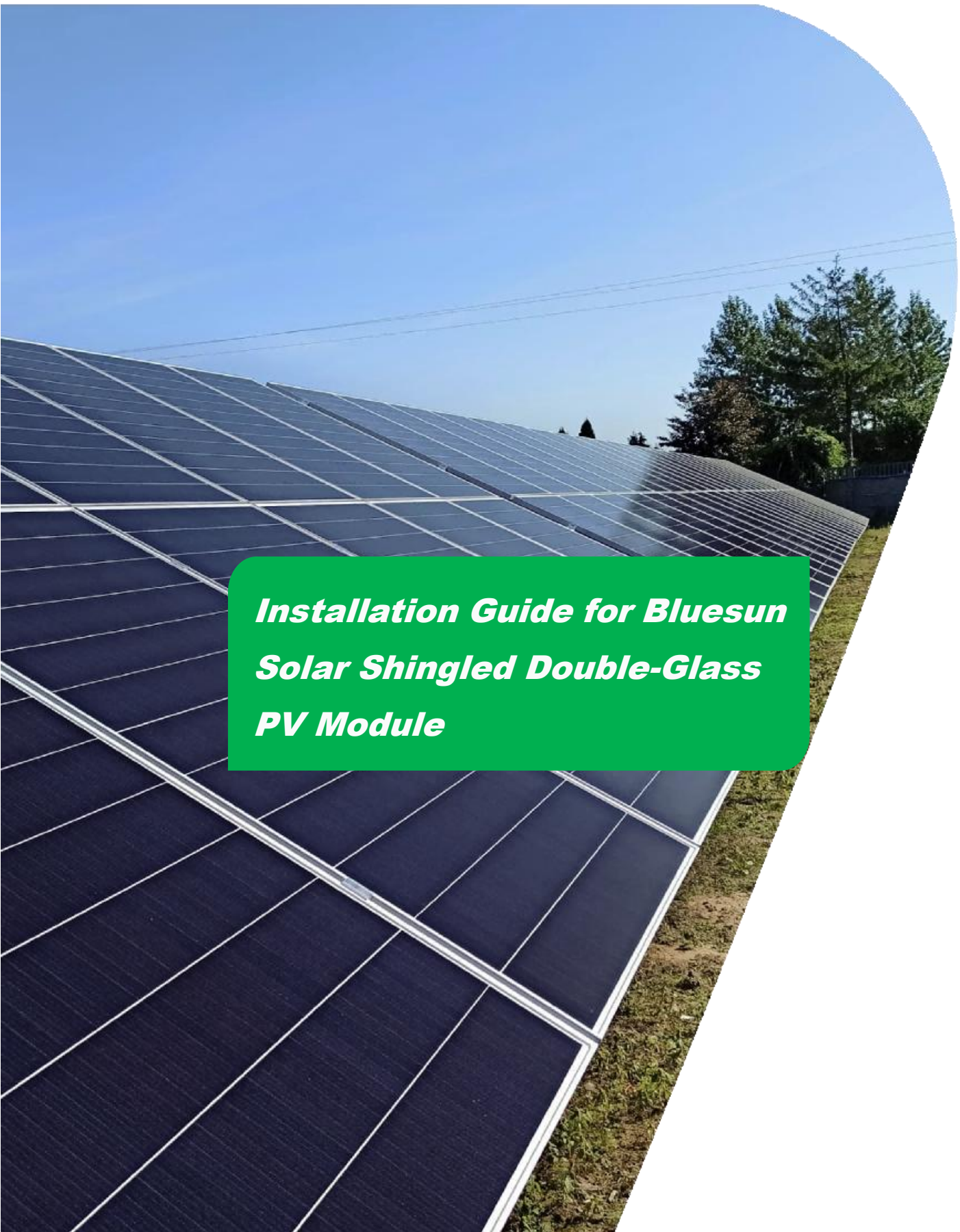


Installation Guide for Bluesun Solar Shingled Double-Glass PV Module

Contents

1 Scope

This installation manual specifies the installation and maintenance requirements for crystalline silicon PV double glass modules (hereinafter referred to as "modules") manufactured by Bluesun Solar Co.,Ltd. (hereinafter referred to as "Bluesun").

This installation manual is intended for the installation and maintenance of modules, and helps customers to correctly install the photovoltaic power generation system, so that the design system can realize its potential.

2 The introduction of installation manual

2.1 Overview

Thanks for choosing the crystalline silicon PV module of Bluesun Solar Co.,Ltd. This manual contains important electrical and mechanical installation information. For correct installation and stable power output, please install and maintain the modules Carefully read and understand all installation instructions in the manual, and keep this manual in a safe place for future reference (care and maintenance) and in case of sale or disposal of the modules.

This manual does not constitute a warranty, expressed or implied. Bluesun does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with installation, operation, use or maintenance of modules.

The PV modules should be installed in accordance with all safety precautions and local laws and regulations of this manual and should be installed and serviced by qualified personnel with knowledge of the mechanical and electrical requirements of the system.

The mechanical and electrical installation of the PV modules shall be made in accordance with applicable laws and regulations, including electrical, construction and electrical connection requirements. These regulations vary depending on the installation site, such as building roofs, surface mounts, in-vehicle applications, and so on. The requirements may vary depending on the installation system voltage, the use of DC or AC. Please refer to the relevant local laws and regulations.

Any questions, please contact with the salesman or customer service personnel of Bluesun solar for further explanations.

2.2 Applicable products

This manual is intended for use with the following modules:

Double glass modules: 72 version of the series, 60 version of the series(Where 'xxx' denotes power)
Horizontal double glass modules:

BSMxxxCM5-72SD BSMxxxCM5-60SD

BSMxxxPM5-72SD BSMxxxPM5-60SD BSMxxxPMB5-72SD BSMxxxPMB5-60SD

BSMxxxPM5-72SDA BSMxxxPM5-60SDA BSMxxxPMB5-72SDA BSMxxxPMB5-60SDA

BSMxxxPM5-72SDA-F BSMxxxPM5-60SDA-F BSMxxxPMB5-72SDA-F BSMxxxPMB5-60SDA-F

Vertical double glass modules

BSMxxxPMB6-57SDC, BSMxxxPMB6-68SDC

BSMxxxPMB6-54SDC, BSMxxxPMB6-65SDC

BSMxxxPMB6-58SDC, BSMxxxPMB6-69SDC

3 Product information

3.1 Profile structure and component description of the double glass modules

3.1.1 Double glass frameless modules

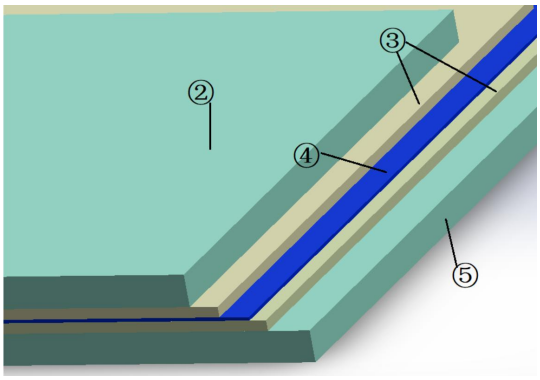


Figure 1 Double glass framelss modules cross section

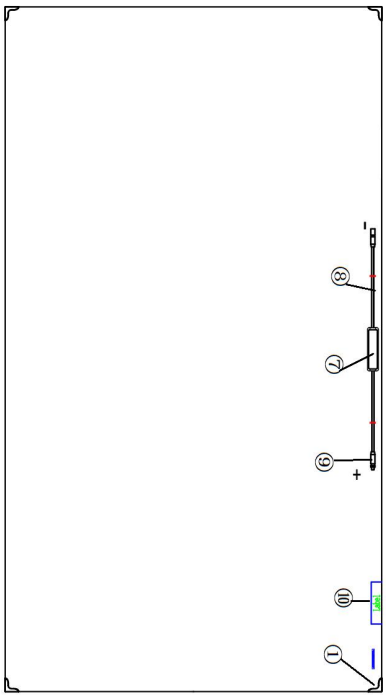


Figure 2 Fixture installation

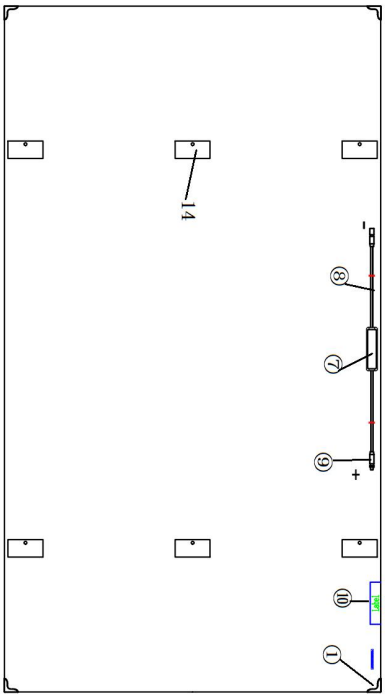


Figure 3 Installation of flexible

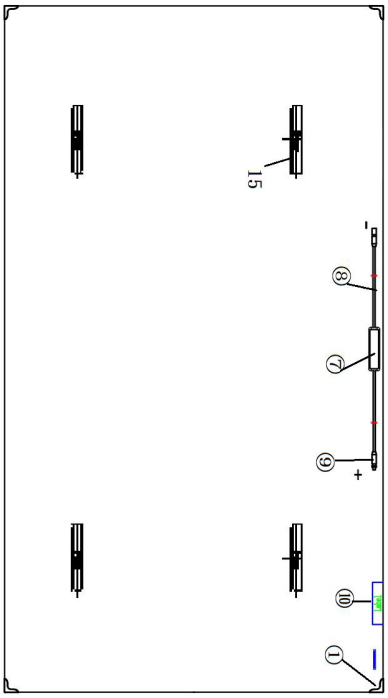


Figure 4 Back hook installation

back reinforcement

Table 1 Componets of double glass framelss modules

1、 corner protector	2、Glass	3、EVA/POE	4、Solar Cell
5、Backsheet	6、Adhsive	7、Junction box	8、Cable
9、Connector	10、Lable	14、back reinforcement	15、 Back hook

3.1.2 Double glass belt frame modules

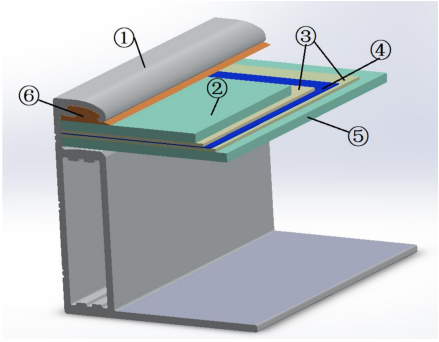


Figure 5 Double glass belt frame modules cross section

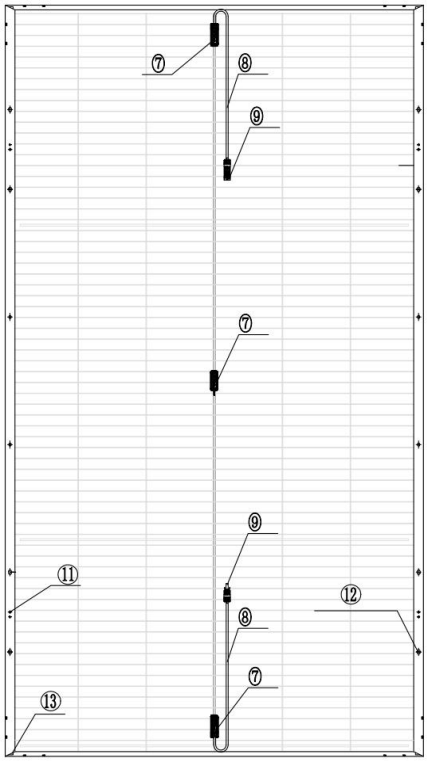


Figure 6 Vertical double glass belt frame modules

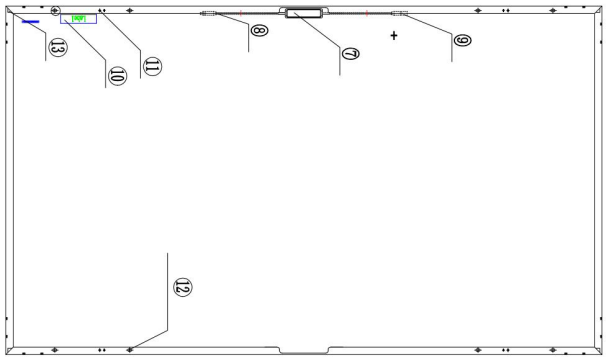


Figure 7 Horizontal double glass belt frame modules

Table 2 Componets of double glass belt frame modules

1、Frame	2、Glass	3、EVA	4、Solar Cell
5、Backsheet	6、Adhsive	7、Junction box	8、Cable
9、Connector	10、Lable	11、Ground hole	12、Mounting hole
13、Drainage hole			

3.2 Module tag information

Each PV module is affixed with two kinds of labels, providing the following information:

a) Label: Describes the product name, PV module model, nominal power, rated voltage, rated current, open circuit voltage, short circuit current, maximum system voltage, PV module size and weight under standard test conditions.

b) Series number: Each module has a unique bar code number, each bar code number has 18 letters and numbers. The bar code is permanently encapsulated inside the module, as can be seen clearly from the top right corner of the module. The bar code number allows you to trace information about the module production process.

3.3 Module electrical performance parameters

The electrical performance parameters of the module were measured under standard test conditions (irradiance of 1000 W / m², AM 1.5 spectra, ambient temperature of 25 ° C) with a test uncertainty of ± 3%. The maximum system module voltage is 1500V. Refer to technical specifications for electrical performance parameters.

4 Installation

4.1 General safety

4.1.1 Bluesun solar's modules have been evaluated by according to IEC61215 and IEC61730, Protection Class Ⅱ, modules rated for use in this protection class may be used in system operating at greater than 50V DC or 240W. The class of fire rating is Class C（According to the standard is UL790）.

4.1.2 The maximum rating of a fuse connected in series with an array string is typically 20A, but the actual module specific rating can be found on the product label and in the product datasheet.

4.1.3 The installer should abide by the relevant local laws and regulations when installing module. It is need to obtain the required certificates in advance when necessary, such as the building permit.

4.1.4 Installing solar systems require specialized skills and knowledge. Installation should be performed only by qualified person. Installers should assume the risk of all injuries that might occur during installation, such as electric shock.

4.1.5 PV modules are designed for outdoor use, modules may be mounted on ground, rooftops, vehicles or boats. Proper design of support structures is the responsibility of the system designers or installers. When modules are mounted on rooftops, fire-protection rating of the final structure should be considered, and also the later maintenance. The rooftops and support structure for PV system should only be certified by architectural experts or engineer, which have a formal complete structure analysis results.

4.1.6 For your safety, do not install the modules without safety precautions.

4.1.7 For your safety, do not install or handle the modules under wet or adverse environment, including but not limited to strong wind, gusty wind, frosted roof surfaces, wet environment.

4.1.8 Meaning of crossed –out wheeled dustbin:

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities.

Contact your local government for information regarding the collection systems available.

If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being.

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

4.2 Electrical properties safety

4.2.1 When a module is exposed to sunlight or other light sources, a direct current is present inside the module, and electrical contact with the module may result in an electrical shock hazard.

4.2.2 In order to avoid arc and electric shock, please do not disconnect electrical connections under load. Keep all electrical connectors dry and clean, and ensure that they are in proper working condition. Do not insert other metal objects into the connector, or in any other way.

4.2.3 Do not apply paint or adhesive to module surface. Do not wipe modules with corrosive chemicals.

4.2.4 Do not use mirrors or other magnifiers to focus sunlight on the modules. Do not expose the backside of modules directly to sunlight for a long time.

4.2.5 Do not change the configuration of the bypass diodes. Do not disassemble the modules.

4.2.6 Do not contact with module surface when the module is wet unless to clean the modules, please following requirements mentioned in this manual when cleaning.

4.3 Handling safety

4.3.1 Do not open the box until it reaches the installation location. Keep the package in a dry and dry place.

4.3.2 PV modules Unpacking Please refer to Unpacking manual of standard package of Bluesun solar photovoltaic modules. During all handling procedures, make sure that the modules are not subject to large vibrations, that the modules fall to the floor or that objects fall on the module, as this will Damage to the modules or solar cell. Special care must be taken not to bump, scrape, or press against the back of the module. Keep children and unauthorized person away from the modules while transporting or installing them. Improper transportation or placing may lead to glass breakage or power loss of the modules, resulting in the loss of the use value of modules.

4.3.3 Handle modules with care, lift and put down modules gently. It is forbidden to carry or lift the modules by grabbing the junction box or cables. Two or more people must hold the module with both hands.

4.3.4 Do not step on, stand or sit on the module, which can damage the module and create a risk to people.

4.3.5 Do not place any heavy objects on the front or back of the module, and do not place the module on a sharp object surface.

4.4 Installation safety

4.4.1 Abide by the safety regulations for all other modules used in the PV system, including wiring and cables, connectors, controllers, inverters, storage batteries, etc., and use suitable equipment, connectors, wiring and mounting system for a PV system. If the PV system is used in storage batteries, the configuration with the modules should follow the advice of the storage batteries manufacturer. The same size, the same specifications of the model can be connected in series.

4.4.2 Do not install or handle the modules when they are wet or during strong wind. Keep the junction box's cover closed.

4.4.3 Modules of the glass with the role of protection modules, unreasonable operation will cause glass broken. Damaged modules have the risk of electric shock and fire, such modules can not be repaired or repaired, should be replaced immediately.

4.4.4 When exposed to direct sunlight, one individual solar module may generate DC voltages greater than 30 volts. It is extremely dangerous to contact it.

4.4.5 To reduce the risk of electric shock or burning, you can install modules with opaque material on the surface of the module. The mounting of the array of modules must be carried out with an isolating solar installation. Do not wear metal rings, watches, earrings and other metal accessories when installing or servicing PV systems. Do not touch the electrical parts of the module directly by hand. Use an insulating tool to make electrical connections and keep the tool dry.

4.4.6 In order to reduce or avoid the mismatch effect of the array, it is suggested to connect the components with similar electrical performance on the same string.

4.4.7 The maximum system voltage indicated in the rating label is 1500V. During the system Installation, the maximum open circuit voltage in series cannot exceed the maximum system voltage.

4.4.8 During modules interconnection, ensure to fix the connecting cables to supporting bracket, so as to restrict the swing amplitude of the slack part of the cables.

4.4.9 Abide by the allowable minimum bending radius of the cables (suggest no less than 43mm).

4.4.10 Always protect the cable with conduit where animals or children can touch it.

4.4.11 Please use the connector which is specially designed for photovoltaic system, and assemble it with the tools recommended or specified by the manufacturer. In case that the connector applicable to the solar photovoltaic system is required, please contact the local supplier. Ban different connectors to plug each other.

4.4.12 Make sure that the polarity is correct when connecting the module with inverter, storage battery or combiner box to avoid the damage of bypass diodes in the modules due to incorrect polarity.

4.4.13 Ensure that other components in the system do not cause destructive mechanical or electrical performance impacts on components.

4.4.14 Modules can't be used to replace the roof and wall materials, partial replacement is not allowed.

4.4.15 Any part (including nameplate) of modules supplied by Bluesun Solar Co.,Ltd can't be dismantled without permission.

5 Installation condition

5.1 Working environment

Bluesun solar's PV module should operate in the following environmental conditions:

5.1.1 Ambient temperature: -20℃ to +45℃

5.1.2 Operating temperature of the module: -40℃ to +85℃

5.1.3 Humidity: ≤85%RH

5.1.4 Mechanical load pressure the modules have passed the mechanical load test of wind pressure of 1200Pa and snow pressure of 5400Pa; at the same time, they have passed the mechanical load test of wind pressure of 2400Pa and snow pressure of 3600Pa. (Only limited to the PV module models mentioned in this manual).

Note: The module mechanical load is based on the installation method and installation site, in the calculation of mechanical load by the professional installer according to the system design requirements to calculate.

5.2 Installation position

5.2.1 In most applications, PV modules should be installed in a location where they will receive maximum sunlight throughout the year. In the northern hemisphere, modules should typically face south, and in the southern hemisphere, modules should typically face north.

5.2.2 The module shall be installed in the place where the sunshine is adequate. the module surface shall not be partly shaded by trees, building, clothes, tools, packaging materials, etc. because these objects will form shadow in the module surface leading to loss of system output power.

5.2.3 The module shall be installed in the well-ventilated place; meanwhile, enough space for airiness shall be sated at the back and sides of the module, so that the heat generated during operation can be radiated in time.

5.2.4 Modules can not be used in other excessive and harsh environments, such as hail, snow, sand, smoke, air pollution, soot, flammable gases, near open flames, and highly corrosive substances (such as acid rain) , As this will affect the module's safety and performance. If the installation environment is special, such as farm, high humidity or wind and other large environment, please consult your local dealer for professional support and confirmation. If you need to be installed at a high altitude, the altitude should not exceed 2000m.

5.2.5 Bluesun PV modules have passed IEC61701 salt-mist,but galvanic corrosion can occur between the aluminum frame of the modules and mounting or grounding hardware if such hardware is comprised of

dissimilar metals. Bluesun modules can be installed at seaside locations 50m to 500m from the sea, but the components should be protected against corrosion. For locations ⩾500m from the sea, it is low risk with salt-mist corrosion, only annual preventive maintenance is required.

5.2.6 Modules should be installed in suitable buildings, or other suitable place to install modules (such as the ground, garage, building facades, roof).

5.2.7 If modules are installed in locations with frequent lightning activity, the modules must be protected against lightning strikes.

5.2.8 Do not install the modules in this location with water immersion or near the sprinkler.

5.2.9 The pressure of the wind or snow after installation of the modules must not exceed the maximum allowable load.

5.3 Tilt angle selection

5.3.1 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, as shown in figure 8.

5.3.2 Modules each element in series with the same array must be oriented in the same direction and angle. Different installation directions and angles will cause the modules to absorb the total solar radiation difference, causing the loss of output power, thus reducing the operating efficiency of the system.

5.3.3 The maximum power is generated when the sun is directed to the module, select the best installation angle should be considered when the winter module power output. But external or otherwise artificially concentrated sunlight shall not be directed onto the front or back face of the PV module.

5.3.4 In order to facilitate the cleaning modules and modules in the rain when the surface dust is easily washed away by rain. For detailed installation angles, follow the advice given by the experienced PV module installer.

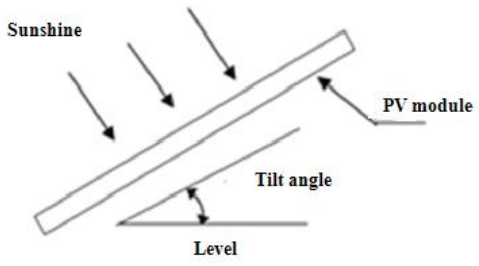


Figure 8 Module tilt angle

6 Mechanical installation

All of the installation methods described here are for reference only. Bluesun Solar Co.,Ltd is not responsible for providing the relevant installation parts and module installation services.

6.1 Conventional requirement

6.1.1 Ensure that the installed modules and supporting rail of modules are strong enough, the entire PV system consisting of modules must be able to withstand anticipated mechanical pressure. The installer must provide the guarantee. The installation supporting rail must be tested by the third-party organization with the analysis ability of Static Mechanical according to the local national or international standards.

6.1.2 The supporting rail must be made of environmental corrosion, anti-rust and UV-resistant materials.

6.1.3 Modules must be securely fastened to the supporting rail.

6.1.4 Drilling holes on the surface of module glass may void the warranty.

6.1.5 Forces generated during thermal expansion and contraction of the supporting rail may influence the performance and use of the module, so make ensure that the minimum distance between two neighboring frames is 10mm, but in order to ensure good ventilation. Suggest this distance between two neighboring frames is 30mm.

6.1.6 In areas with large snow cover in winter, select a higher mounting bracket so that the lowest point of the module will not be covered by snow for long periods of time. In addition, the lowest point of the module is high enough to prevent the module from being obstructed by vegetation or trees.

6.1.7 The bearing surface of the supporting system must be smooth without any twist or deformation, and all of them shall be at the same height without dislocation.

6.2 Three kinds of Mounting

6.2.1 Roof mounting

6.2.1.1 It is necessary to provide a special supporting rail for the roof mounting. When installing a module on a roof or building, ensure that it is securely fastened and cannot fall or be damaged as a result of strong winds or heavy snow. During roof mounting, check the building codes being used to ensure that the building and its structure where the module is installed have adequate bearing and sealing capacity. The roof when penetrated during module installation shall be properly sealed to avoid rainwater leakage.

6.2.1.2 To be suitable for operation, reduce steam condensation and facilitate the ventilation & heat dissipation of the module during tile installation, the module shall be parallel to the wall or roof surface of the building, and the distance between module and surface of the wall or roof shall be at least 50mm to prevent wiring damage and to allow air circulation, ventilation and heat dissipation behind the module. For stacking type installation, the module shall be installed on the fire-resistant roof. The Fire Resistance Rated Class of the modules is Class C, and the modules are suitable for mounting on an above Class A roof. Do not install modules on a roof or building during strong wind.

6.2.1.3 For the roof system installed in the area with relatively heavy snowfall or snow cover in the meteorological records, the installer shall reinforce the supporting system at the lower frame of the module, in order to prevent the lower frame from being pressed and damaged by the falling snow or freezing of the melt

ed snow. Bluesun solar suggests selecting the support reinforcing mechanism shown in figure 9.

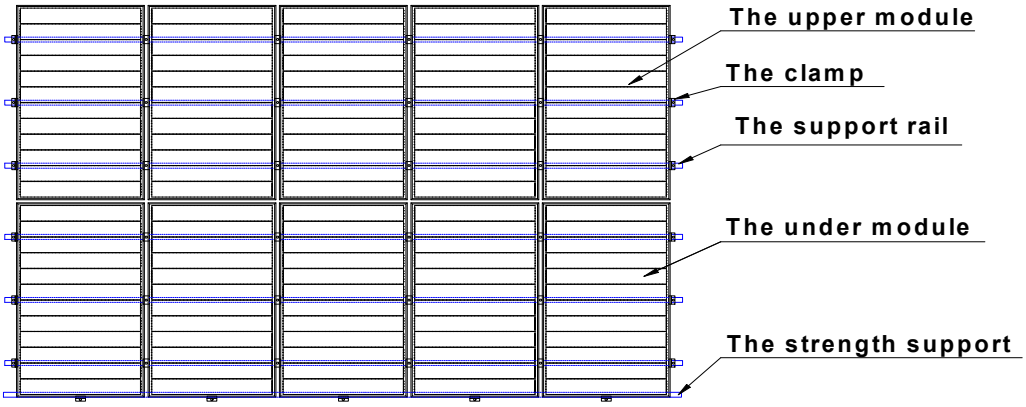


Figure 9 Schematic diagram of reinforcement mounting of module

6.2.2 Pole mounting

When installing a module on a pole, choose a pole and supporting rail that will withstand the anticipated wind power of the local area. The pole must be constructed on a solid foundation.

6.2.3 Ground mounting

Select the height of the mounting system to prevent the lowest edge of the module from being covered by snow for a long time in winter in areas with heavy snowfalls. The module shall be installed on the supporting rail with appropriate height instead of being directly laid on the ground. In addition, the lowest portion of the module shall be high enough (≥900 mm) from ground, so that it is not shaded by plants and trees, or damaged by sand and stone driven by wind, or not shaded by the mud splashed by rain water.

6.3 Module installation

6.3.1 General rules

6.3.1.1 The connection between the module and the system bracket can be installed by fixture or bracket hooks, or by flexible special hooks between the module and the tightwires. If customers have special clamping and installation schemes that are not included in this manual, please consult local distributors for professional support. module installation must be carried out in accordance with the following methods, otherwise the quality assurance will fail.

6.3.1.2 Bluesun modules have reached the IEC standard on the mechanical load requirements. Bluesun module can withstand the wind pressure of 2400Pa and the snow pressure of 5400Pa (Only the module models covered in this manual are available ） , it is recommended that the system designer or installer perform the load calculations.

6.3.1.3 The supporting rail and other materials required (such as screw) shall be made of durable, resistance to

environmental corrosion, anti-rust and UV-resistant materials.

6.3.2 Fixture installation（frameless modules）

6.3.2.1 Fixture installation is suitable for modules without hook as shown in Figure 10. Fixture recommended aluminum alloy material or with the performance of metal material. A suitable cushion is required between the fixture and the module glass. EPDM rubber is recommended.

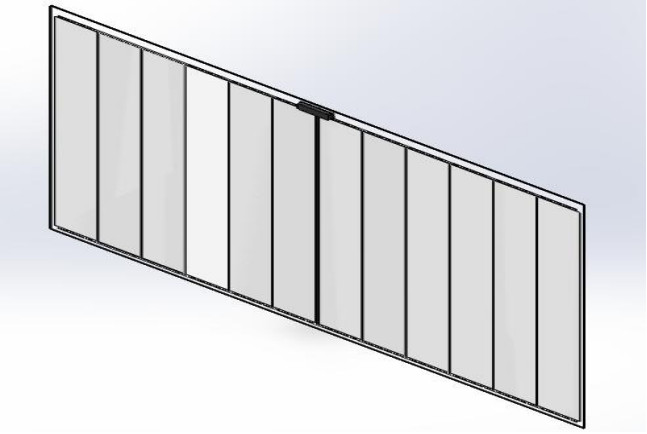


Figure 10 Double glass module suitable for fixture installation

6.3.2.2 Each module is recommended to be fixed with 4 or 6 clamps, 2 or 3 clamps on each side of the module. According to local Environment (depending on wind power and snow loads), additional clamps may be required to ensure modules and PV system to withstand anticipated mechanical pressure. We recommends using the following clamps（as shown in Figure 11, Figure 12）,or approved by reputable solar installer or systems integrator.

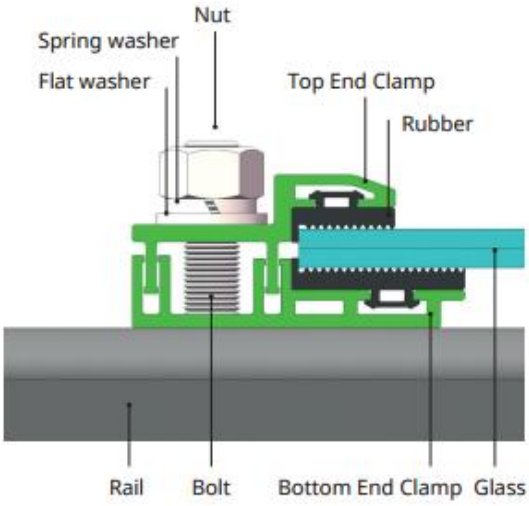


Figure 11 Fasten the Fringe modules

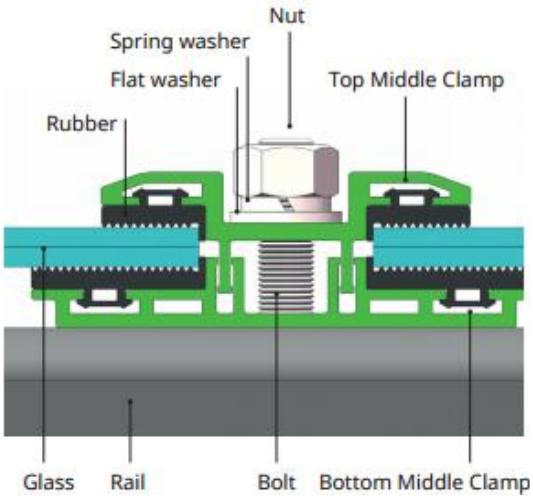


Figure 12 Fasten the Middle modules

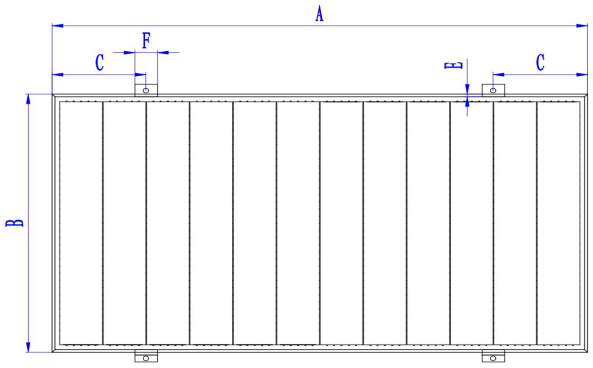
6.3.2.3 The fixed clamp is clamped on the long side of the module, use the spring washers, flat washers and bolts to fix the modules to the mounting bracket. Note that both ends should be in the center symmetrical position. It is recommended to use the M8/ bolts and the matching screws to fix the screws. Tightening torque of the size of 17 ~ 23N • m.

6.3.2.4 Do not bend the modules while installing the modules. The mounting parts can not block the cells, do not scratch the glass surface of the module. It is recommended that the overlapping part of the module and the clamp should be 11-15mm in width, the length of the fixture should be at least 200mm, and the minimum thickness of the fixture should be at least 3mm.

6.3.2.5 The position of the clamp is critical to the reliability of the installation. The recommended clamping range is shown in Table 3:

Table 3 The clamping range of the fixture

Module type	Design Mechanical Loading/Pa Safety factor= 1.5 (Positive/ Negative)	A/mm	B/mm	C/mm	E/mm	F/mm
BSMxxxCM5-72SD BSMxxxPM5-72SD BSMxxxPMB5-72SD	3600/1600	1959	1076	392±50	11～15	≥200
BSMxxxPM5-72SDA BSMxxxPMB5-72SDA	3600/1600	1983	1096	400±50	11～15	≥200
BSMxxxCM5-60SD BSMxxxPM5-60SD BSMxxxPMB5-60SD	3600/1600	1639	1076	329±50	11～15	≥200
BSMxxxPM5-60SDA BSMxxxPMB5-60SDA	3600/1600					



Note:
A: Length of this type of module.
B: Width of this type of module.
C: The distance of clamp center1 from the edge of this type of module.
E: Clamped width of the module by the clamp of this type of module.
F: length of the clamp.

*Tips: Bluesun does not guarantee the consequences caused by incorrect installation methods without following this installation manual. When you take fixture installation, please pay attention to the following points:
(a) The fixture is mounted on the long side of the modules. (b) The fixture shall not produce shadow on the glass surface of the modules. (c) The guide rail and the long side of the modules are installed vertically.

6.3.3 Hook installation （Suitable for single side double glass modules）

6.3.3.1 Modules can be attached through the hook on the back side of the module,by fixing the module to the support rails with M8 bolt(for 60 version of the series) and M10 bolt(for 72 version of the series).The module backside has 4 hooks. (Figure 13)The minimum distance between two modules is 10mm. The hex nut cannot the fixed on the head of the insert place. The connecting surface of the support must keep smooth. (Figure 14)

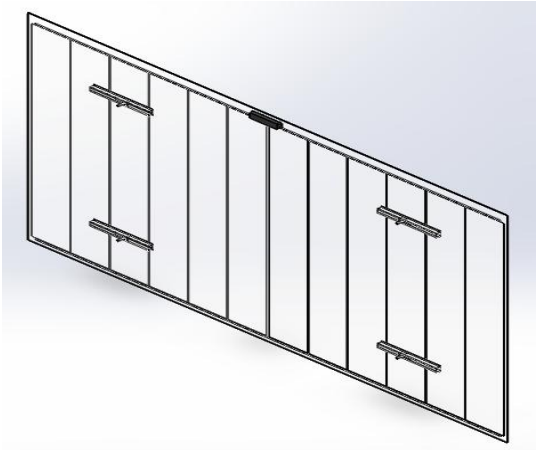


Figure 13 Single side double glass modules installad with hook

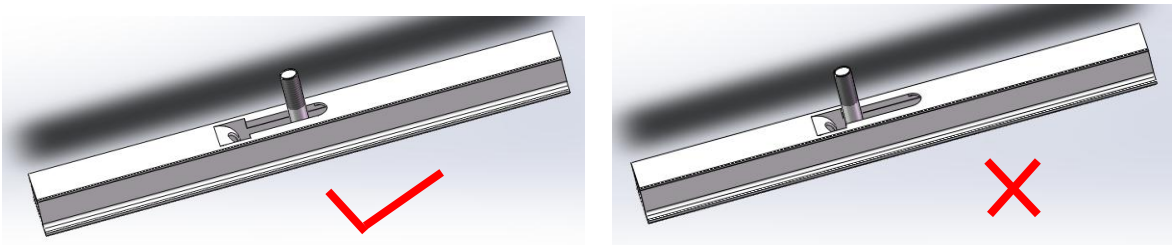


Figure14 The hex nut cannot the fixed on the head of the insert place

6.3.3.2 The hook must be vertical with rails,the supporting rails need change when horizontal installation (add 2 rails).

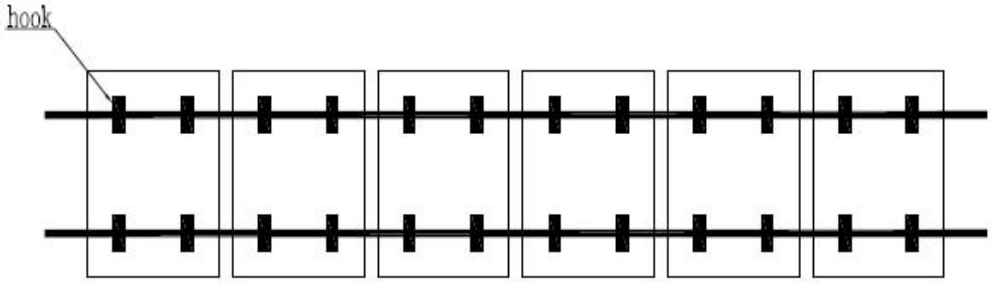


Figure 15 Vertical installation

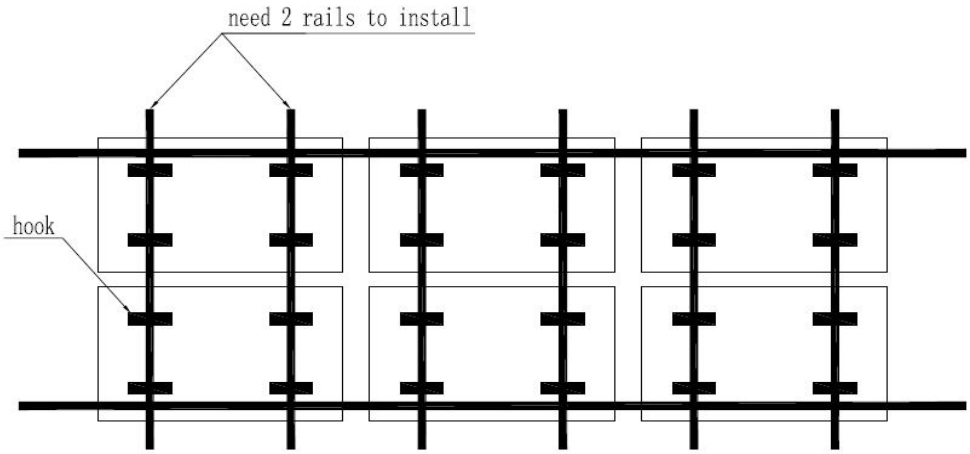


Figure 16 horizontal installation

6.3.4 installation of flexible system（Suitable for double glass modules）

6.3.4.1 the installation of flexible system is applicable to the components with flexible backbars as shown in

fig.9. Each component has 6 backbars on the back, and the minimum distance between the two components is 20mm. This component is applicable to the 1*7 (7-core) low-relaxation hot-dip galvanized or low-relaxation Galfan steel cables with a diameter of 12.7mm.This assembly is not intended for epoxy or PE protected cables or other construction (such as 1*19) cables.Cables shall meet the specification GB/T 5224-1995.This installation manual has no specific requirements for the bearing capacity of steel cables;However, the axial tensile elastic modulus (E) of the steel cable shall not be less than 170GPa.

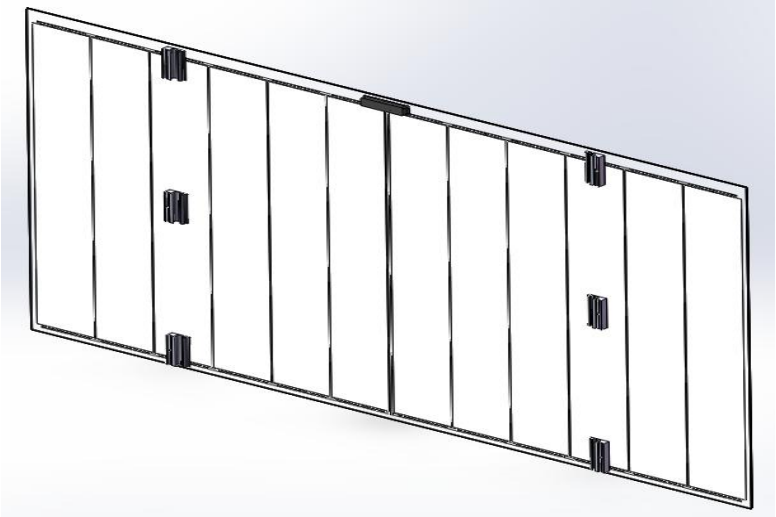
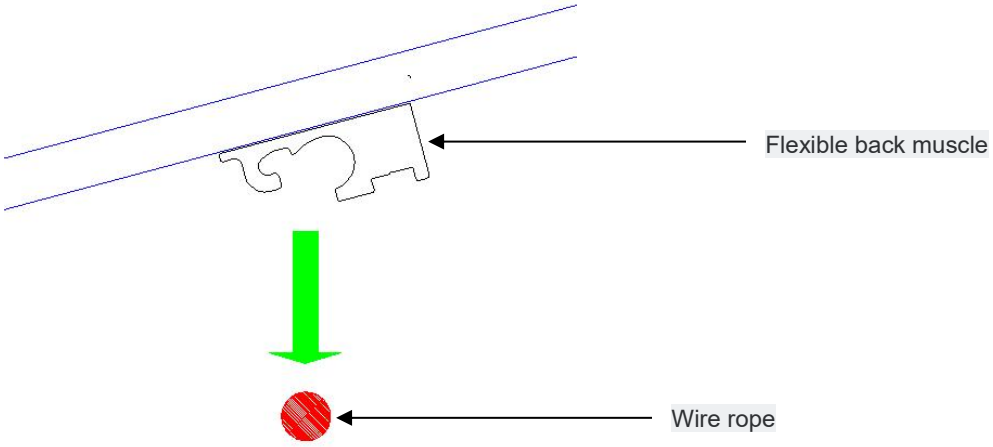


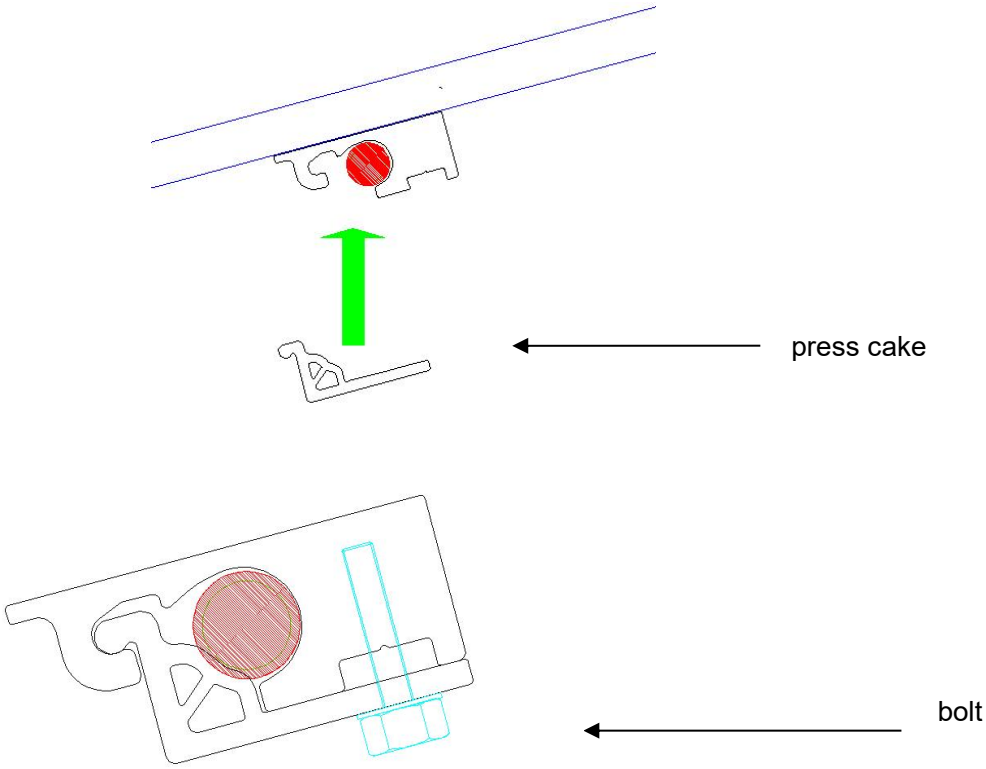
Figure17 Suitable for the imbricated double glazing assembly with flexible backing

6.3.4.2 installation steps:

A) carry the components to the installation position (do not slide along the cable), and install a clamp under the groove on the back to the parallel cable;



B) mounting and pressing:



C) install locking bolt (tightening torque: 50 5N•m (about 5kg force))

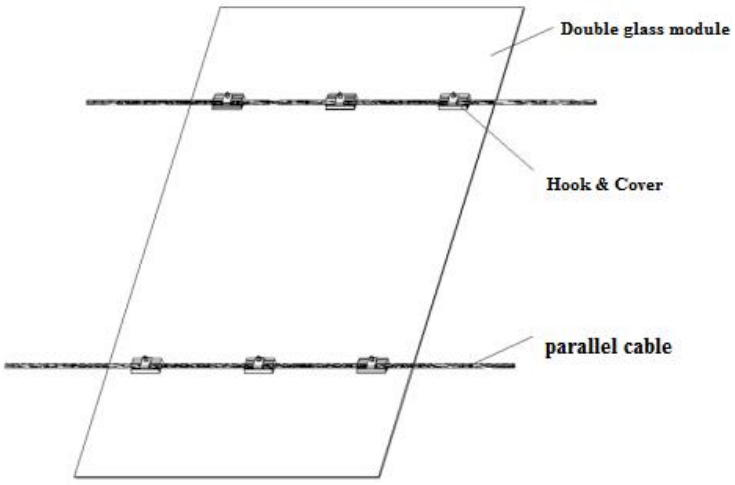


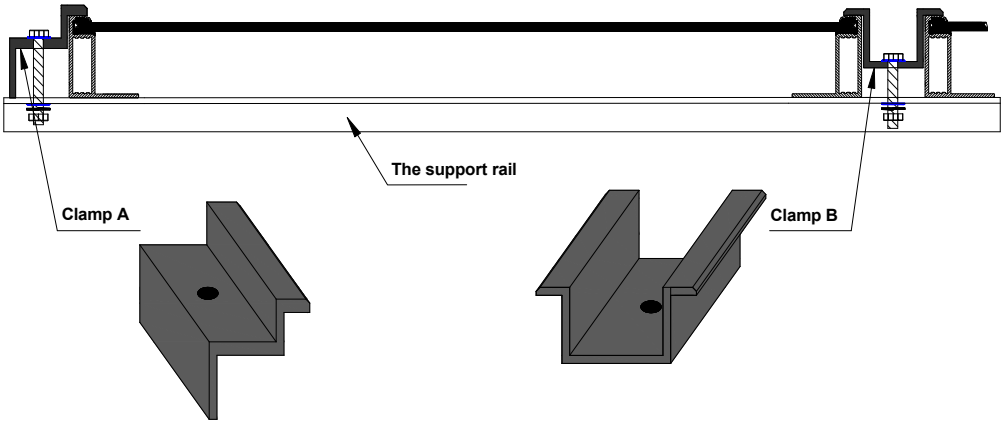
Figure 18 Installation diagram of single block components

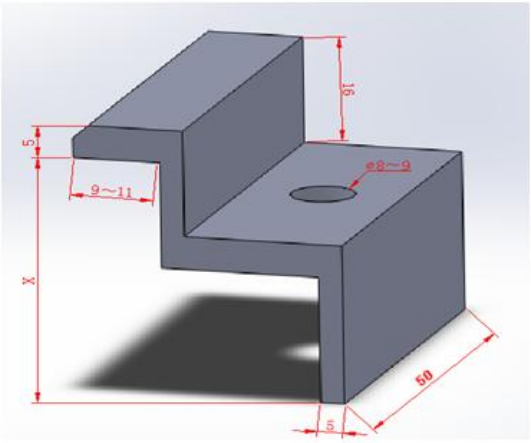
6.3.6 Fixture installation

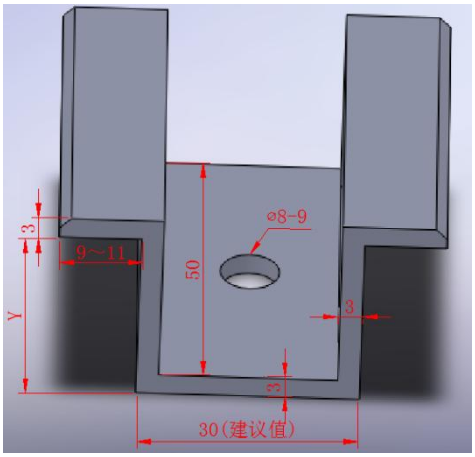
6.3.6.1 Use a certain number of clamps to fix the modules on the mounting bracket. Bluesun recommends that the clamps be clamped on the long frame of the module. The area of the A side of the module frame held by each fixed clamp is not less than 400mm2 (clamp length: ≥50mm, The width of the contact between the fixture and the A surface of the frame: 9～11mm).

6.3.6.2 When installing the fixing jig, do not touch the front glass, and do not scratch or deform the aluminum frame during installation. At the same time, the jig cannot affect the normal operation of the module. Make sure that the drain hole and ground hole are not blocked during installation.

6.3.6.3 Each module needs to be fixed with at least four fixtures, and each long frame is equipped with at least two fixtures. According to the local application conditions (actual conditions of wind and snow), additional fixtures may be required to ensure modules and systems are subjected to corresponding loads. Fixtures with the following conditions are recommended (as shown in Figure 19) or approved by the module system installer.







Fixture A: Fixture for edge module

For the 30 frame, the recommended value of X is 29mm

For the 35 frame, the recommended value of X is 34mm

For the 40 frame, the recommended value of X is 39mm

Fixture B: Fixture for intermediate modules

For the 30 frame, the recommended value of X is 20mm

For the 35 frame, the recommended value of X is 25mm

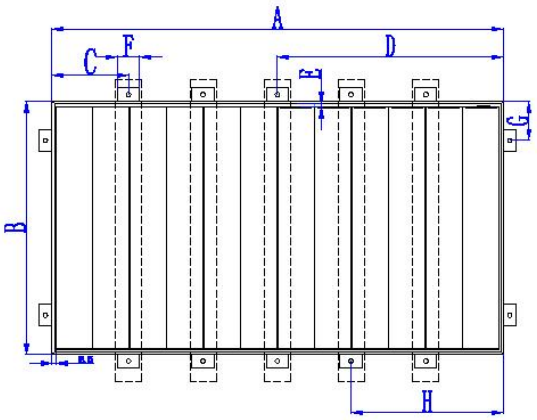
For the 40 frame, the recommended value of X is 30mm

Figure 19 Assembly fixture installation method

6.3.6.4 When clamping the fixture to the frame of the module, use spring washers, flat washers and bolts to fix the module on the mounting frame. Note that both ends should be clamped in a symmetrical position in the center. M8 bolts and matching The screw is fixed, and the torque of the screw is from 18N·m to24N.m .

6.3.6.5 If there is large snowfall or snow pressure in the module installation area and large wind pressure, it is recommended that the customer adopt a 5400Pa reinforced installation solution to clamp the fixed module (as shown in Table 4 recommendations) to increase the front of the module Resistant to static snow pressure and dynamic wind pressure on the back, improving the system's pressure resistance.

Table 4 The clamping range of the fixture



Note:

A: Length of this type of module.

B: Width of this type of module.

C: The distance of clamp center1 from the edge of this type of module.

D: The distance of clamp center 2 from the edge of this type of module.

E: Clamped width of the module frame by the clamp of this type of module.

F: Clamped length of the module frame by the clamp of this type of module.

G: The distance of clamp center 3 from the long edge of this type of module.

H: The distance of clamp center 4 from the edge of this type of module.

Bolt beam: width * height * length 40mm*40mm* 1500mm

* Note: Bluesun limited warranty will be void in cases where improper clamps or installation methods deviating from this manual are used. When using clamps to fasten the modules, pay attention to the following requirements:

(a) Take care of the module frames, not to twist or deform them.

(b) Avoid the clamps' shading influence the module.

(c) Not to damage the surface of module frame.

(d) Make sure that the module's drainage holes not be plugged.

Module Type	Installation method	Design load*safety factor(1.5)/Pa	A/mm	B/mm	C/mm	D/mm	E/mm	F/mm	G/mm	H/mm
BSMxxxPM5-72SDA-F BSMxxxPMB5-72SDA-F	Long side Installation	5400/2400	1989	1101	398±50	/	9～11	≥50	/	
BSMxxxPM5-72SDA-F BSMxxxPMB5-72SDA-F	Long side Installation	5400/2400	1665	1101	333±50	/	9～11	≥50	/	
BSMxxxPMB6-57SDC	Long side Installation	5400/2400 Or 3600/2400	2355	1090	570±50	/	9～11	≥50	/	425±50
BSMxxxPMB6-68SDC	Long side Installation	5400/2400 Or 3600/2400	2355	1303	570±50	/	9～11	≥50	/	425±50
BSMxxxPMB6-54SDC	Long side Installation	Positive5400 negtive2400 Or Positive3600 negtive2400	2253	1096	545±50	/	9～11	≥50	/	405±50
BSMxxxPMB6-58SDC	Long side Installation	Positive5400 negtive2400 Or Positive3600 negtive2400	2384	1096	575±50	/	9～11	⩾50	/	430±50
BSMxxxPMB6-65SDC	Long side Installation	Positive5400 negtive2400 Or	2253	1303	545±50	/	9～11	≥50	/	405±50

		Positive3600 negtive2400								
BSMxxxPMB6-69SDC	Long side Installation	Positive5400 negtive2400 Or Positive3600 negtive2400	2384	1303	575±50	/	9～11	≥50	/	430±50

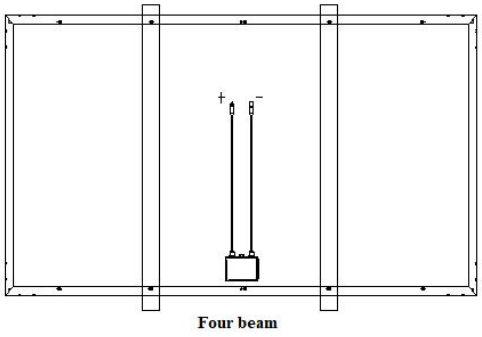
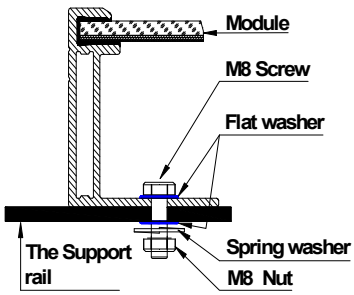
6.3.6.5 For matters concerning clamp or installation not mentioned in this manual, contact the local dealer for professional support

6.3.7 Screw installation

6.3.7.1 Use anti-corrosion M8 bolts to fix through the mounting holes on the module frame. Each module needs to be fixed on 8 mounting holes （Screw installation only applies to THxxxPMB6-57SDC and THxxxPMB6-68SDC PV modules）, as shown in Table 2 Schematic diagram of mounting holes for fixed modules. If you need to strengthen the installation, it is recommended to use the 6.3.2 fixture installation method.

6.3.7.2 When fixing with M8 bolts, spring washers and flat washers must be added to 4 symmetrical mounting holes. See Table 1 for bolt fixing diagrams. The recommended torque for tightening screws is 16N • m . The recommended accessories are shown in Table2:

Table 2 Bolt fixing assembly

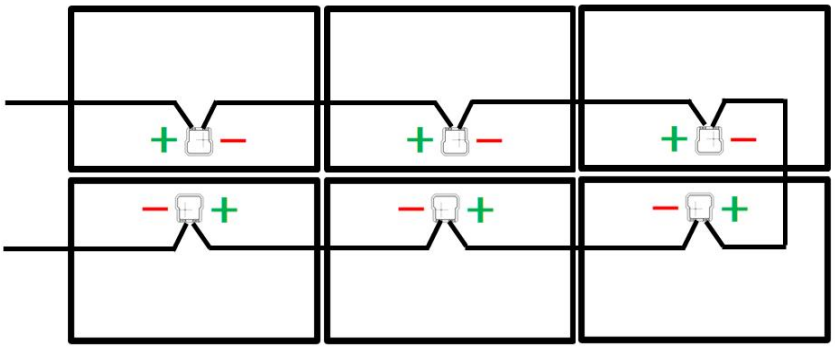
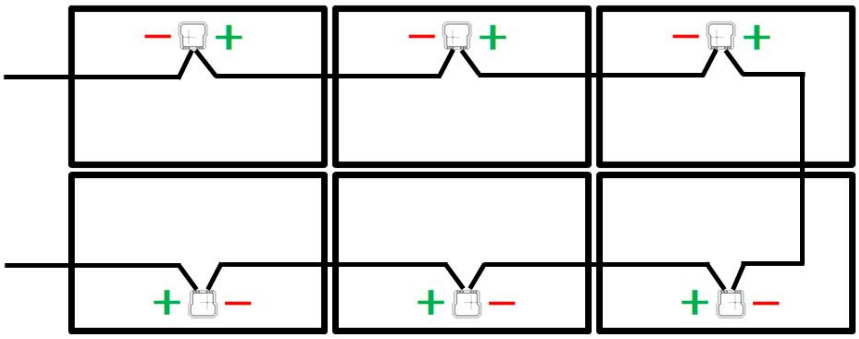
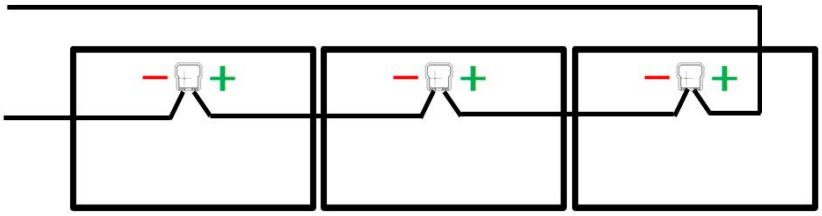
<table>
<tr><th>Mounting holes location</th><th>Screw bolts fasten method</th><th colspan="3">Recommend accessories</th></tr>
<tr><td rowspan="6"> 
</td><td rowspan="6"> 
</td><td>Part name</td><td>material</td><td>Dimension</td></tr>
<tr><td>Screw</td><td>Stainless steel</td><td>M8× 16mm</td></tr>
<tr><td>Spring washer</td><td>Stainless steel</td><td>M8</td></tr>
<tr><td>Flat washer</td><td>Stainless steel</td><td>100*25mm</td></tr>
<tr><td>Nut</td><td>Stainless steel</td><td>M8</td></tr>
<tr><td colspan="3">Bolt beam: width * height * length
40mm*40mm* > 2000mm</td></tr>
</table>

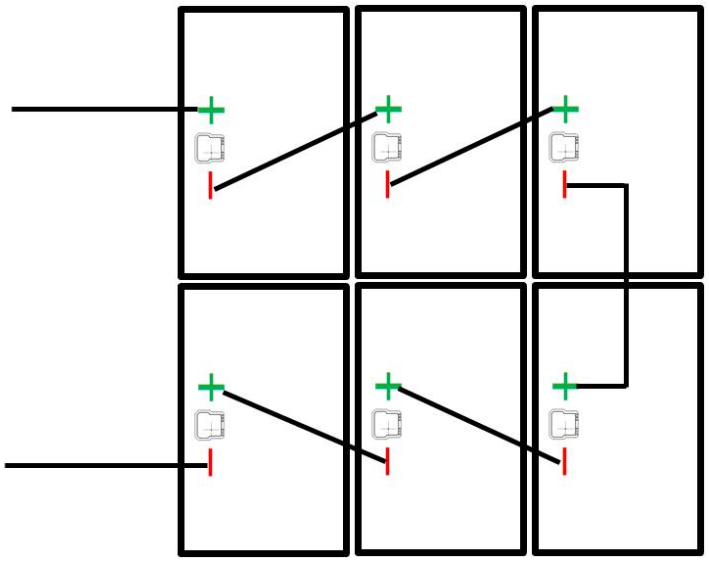
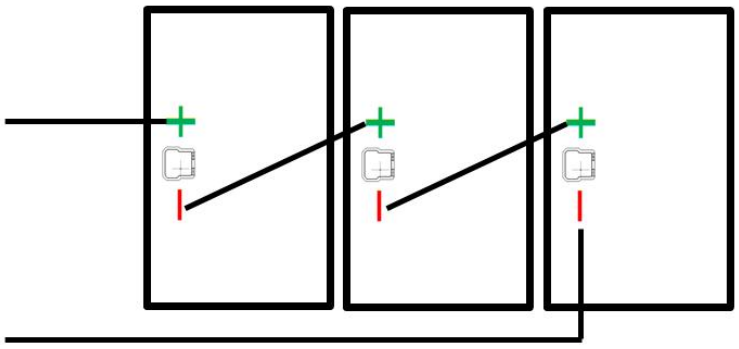
Module Type	Installation method	Design load*safety factor(1.5)/Pa
BSMxxxPMB6-68SDC	Long side Installation	positive5400/negtive2400
BSMxxxPMB6-57SDC	Long side Installation	positive5400/negtive2400
BSMxxxPMB6-54SDC	Long side Installation	positive5400/negtive2400
BSMxxxPMB6-58SDC	Long side Installation	positive5400/negtive2400
BSMxxxPMB6-65SDC	Long side Installation	positive5400/negtive2400
BSMxxxPMB6-69SDC	Long side Installation	positive5400/negtive2400

6.4 Wiring method

6.4.1 Wiring method of horizontal modules

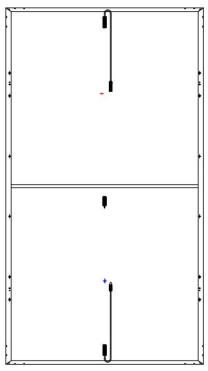
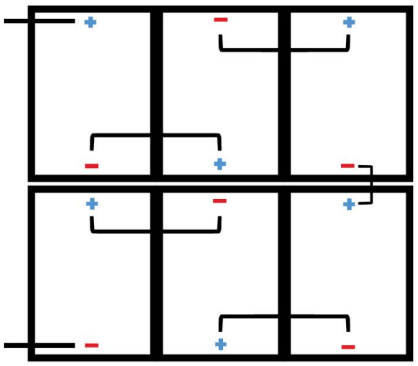
Table 5 Wiring method of horizontal modules

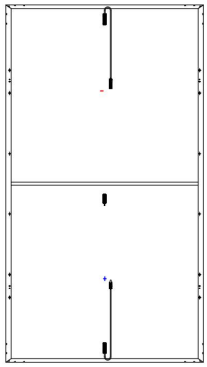
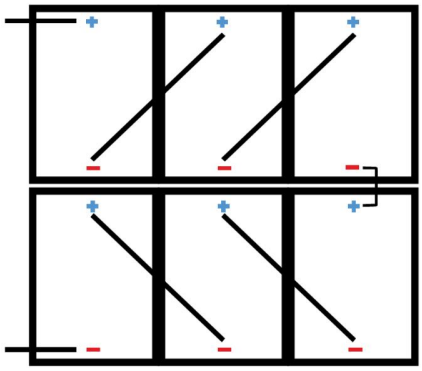
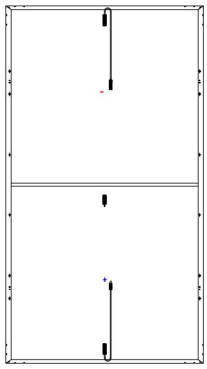
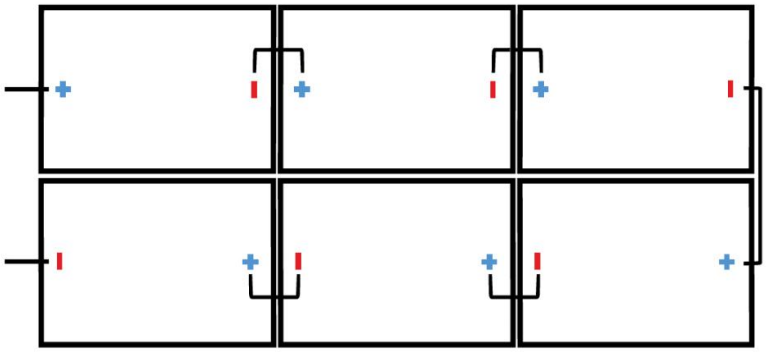
Horizontal Installation （Double row ， The junction box is inside）	 The wire length of 72 / 78 is not less than 1200mm, and that of 60 / 66 is not less than 1000mm.
Horizontal Installation （Double row ， The junction box is on the outside）	 The wire length of 72 / 78 is not less than 1200mm, and that of 60 / 66 is not less than 1000mm.
Horizontal Installation （Single row）	 The wire length of 72 / 78 is not less than 1200mm, and that of 60 / 66 is not less than 1000mm.

Vertical Installation （Double row）	 The wire length of 72 / 78 is not less than 700mm, and each string needs to add a jumper wire not less than 900mm. The wire length of 60 / 66 is not less than 700mm, and each string needs to add a jumper wire not less than 500mm.
Vertical Installation （Single row）	 The wire length of 72 / 78 is not less than 700mm, and that of 60 / 66 is not less than 700mm.

6.4.2 Wiring method of vertical modules

Table 6 Wiring method of vertical modules

Head to tail connection 	 The wire length of this connection mode is not less than 800mm. During installation, attention should be paid to the positive and negative pole positions of the modules, and the next module need to be turned around .

	 The wire length of this connection mode is not less than 1400mm.
	 In this connection mode, the wire length is the shortest, the wire length is required to be 300 mm, and each string needs to add a 1000 mm jumper wire.

7 Electrical Installations

7.1 General With Regard to Electrical Installation

7.1.1 Under normal outdoor conditions, a module is likely to produce different current and voltage than the values measured under STC in the specification of Bluesun solar's module. Therefore, when determining the parameters (for example, nominal voltage, conductor capacity, fuse capacity and controller capacity, etc.) related to the power output of the PV system, the values of short-circuit current and open circuit voltage of the modules should be multiplied by a factor of 125% during design and installation.

7.1.2 Try to use the modules with the same configuration in the same PV system. If the modules are connected in series, the total voltage is the sum of voltages of all the modules. The maximum voltage of string does not exceed the maximum system voltage of the modules (the maximum system voltage of Bluesun solar's modules is 1500V), the maximum number of modules that can be connected in a series string must be calculated in accordance with applicable regulations, make sure the open circuit voltage of string does not exceed the maximum system voltage of the modules and the other electrical DC components required at the minimum temperature at the PV system location. Using the following formula:

System voltage=N*Voc*[1+λvoc (25-Tmin)]

N number of modules in series

Voc open circuit voltage at STC (refer to product label or data sheet)

λvoc Thermal coefficient of Voc of each module (refer to product data sheet)

Tmin Minimum ambient temperature at the PV system location

7.1.3 If the PV system requires the installation of high current, several PV modules can be connected in parallel, and total current is the sum of current of all the modules. The maximum parallel number of the modules N= Imax (fuse rating) /Isc,

7.1.4 An over-current protection device with appropriately rated must be used when reverse current could exceed the value of the maximum fuse rating of the module, an over-current protection devices is required for each series string if more than two series strings are connected in parallel.

7.1.5 When installing the module, place the end with the junction box up and try to avoid the rain.

7.1.6 Do not carry out installation in rainy weather, because humidity will void the insulation protection, Thus cause safety accidents.

7.2 Cables and wiring

7.2.1 The junction boxes with IP67 protection class have been designed to be easily interconnected in series by the connectors. Each module has two single-conductor wires, one positive and one negative, which are pre-wired inside the junction box. Installers can connect two modules by firmly inserting the positive connector of a module into the negative connector of the other module.

7.2.2 Never perform pretreatment to modules including connector, junction box and cable with lubricating oil or cleaning agent made of alkanet materials during installation.

7.2.3 The cross section area of the cable and connector capacity selected must satisfy the maximum short-circuit current of the system (It is recommended that the cross section area of the cable used for the single module is 4mm2, Please note that the temperature limit range of the cable is -40℃～+90℃).

7.2.4 When fastening the cables to the supporting system, pay attention to avoiding mechanical damage to the cables or modules, and also making a special design to protect the cables from environmental corrosion and direct sunshine, for example, put the cable into the supporting beam or special pipes with UV-resistant materials.

7.2.5 The cables designed are sunlight resistant and waterproof, but also to avoid direct sunlight exposure and water immersion of the cables.

7.3 Connectors

7.3.1 When connecting modules, make sure that the connectors of the same series module shall come from the same manufacturer or totally be compatible with each others, and the same requirements shall go to the connection terminals of series string and PV system, because the connectors from different manufacturers may

not be compatible with each others, which easily leads to mismatch risk.

7.3.2 Ensure that connector caps are tightened before connecting the modules, keep connectors dry and clean. Do not attempt to make an electrical connection when the connectors are wet, soiled, or otherwise faulty conditions. Avoid sunlight exposure and water immersion of the connectors.

7.4 Bypass diodes

The junction boxes of Bluesun Solar's modules contain bypass diodes wired in parallel with the PV cell strings. In case of partial cell shading or damaged, the parallel diodes will bypass the current generated by the non-shaded cells, thereby limiting modules heating and performance losses. Take care, the bypass diodes are not over-current protection devices.

7.5 Grounding

7.5.1 The double glass frameless module has no exposed conductors, so grounding is not required in accordance with the National Electrical Code (NEC).The mounting bracket is a conductor, so it needs to be grounded, make sure that the entire system is installed to meet local electrical codes and regulations.

7.5.2 Modules use anodized aluminum alloy frame as a rigid support, in order to avoid modules by lightning and electrostatic damage, as well as the protection of personal safety, all module frames and mounting racks must be grounded. If there is no special provision, please follow the International Electrotechnical Commission standards or other international standards. Use the recommended connection terminals to connect the grounding cable to the module frame. Use 12 AWG copper wire for the grounding wire. As shown in Figure 20 on the module ground hole and its label, Figure 21 shows the module grounding method.

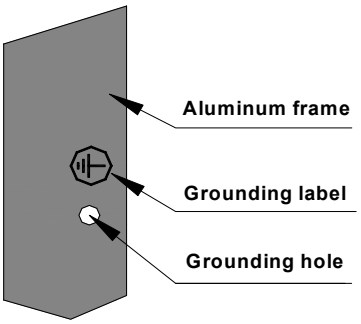


Figure 20 Grounding hole and ground label

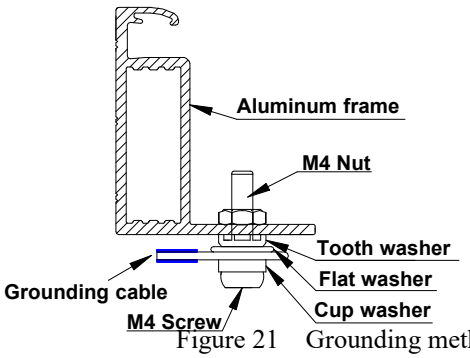


Figure 21 Grounding method

7.5.3 The frames have pre-drilled grounding holes and brand with signs, these holes should be only used for grounding purposes, but not for mounting the modules. And do not drill any additional grounding holes on the frames of the module, which may void the warranty.

7.5.4 For optimum power output, it is recommended to ground the DC negative pole of the module array.

7.5.5 The grounding cables must be fully contact with inside of the aluminum alloy, and the connection terminal must penetrate the oxidation coating of frame during grounding. Connecting the module frames and supporting beams using suitable grounding conductors can achieve good grounding. If the supporting system is

made of metal, the surface must be electroplated and have excellent conductivity.

7.5.6 The grounding cables must be connected to the earth through a suitable grounding electrode. Recommend to use the grounding accessories (lugs) to connect the cables. Welding grounding cable to the jack of lugs, then inserting M4 screws into the ring of the lugs and the grounding holes of module frames, fastening with M4 nuts. Spring washers should be used to prevent the screws from loosening and lead to poor grounding.

7.5.7 If the module is used in high-temperature and high-humidity environment,Bluesun solar suggest the customer configure the inverter which allows negative grounding and contains isolation transformer (as shown in figure 22).

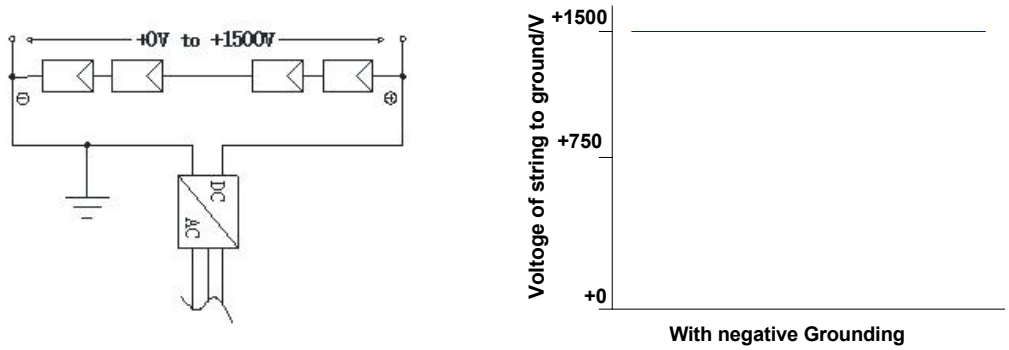


Figure 22 Schematic diagram for grounding potential of the inverter

7.5.8 Bluesun modules may be grounded using a third-party earthing device, provided that the earthing must be reliable. The earthing device is operated in accordance with the manufacturer's requirements.

8 Maintenance

8.1 Usual maintenance

8.1.1 In the warranty period，the user must carry out regular inspection and maintenance of the modules，which is the user's responsibility. And the user must inform the supplier within one week when founding the damages modules.

8.1.2 When modules are working. There should not be environmental influence factors to cast shadows in the modules, such as other modules, supporting system, plants, large number of dust etc., which may distinctly reduce the power output and may even cause regional hot–spot effect. Therefore clean the glass surface on a regular basis, clean modules take measures so as:

1. In general, normal rainfall can keep the glass surface clean， if the dirt accumulated too much, using water and a soft sponge or cloth for cleaning. If necessary, a mild, non-abrasive cleaning agent can be used to remove stubborn dirt.

2. Avoid pressing part of the module hard during cleaning, which may cause glass deformation, cell damage and reduction of the module's life.

3. Remove the snow covered on the module in time to avoid the module damage caused by long-term accumulation of snow cover and freezing of melted snow.

4. Do not clean module with cold water when the module temperature is highest in the daytime, and the thermal shocks might damage the module.

5.when cleaning the back of the module needs to avoid piercing back-sheet, module needs to be often cleaned for horizontal installation（the cleaning frequency depends on the degree of dirt）.

8.2 Visual inspection of modules

Inspect the modules visually to find whether there are appearance defects, the following need special attention:

1. Check whether the module glass is broken；

2. Check whether there is burning vestige or back up on the back-sheet；

3. Check whether there is corrosion along the cell bus–bar or damaged of encapsulation materials or a large area of the bubbles etc.

4. Check aluminum frame holes are normal; the screws of installation are tightness and electrical cables are situation.

8.3 Check cables and connectors

8.3.1 Carry out regular inspection of mechanics and electric, ensure the cleaning of the connector and be reliable connected.

8.3.2 Check weather all electrical connections are tight or corrosion free.

8.3.3 Maintenance should be carried out at least once a year.

8.3.4 Completely cover the module with an opaque material during repairing the module to prevent electric shock. When exposed to direct sunlight, one individual PV module may generate high DC voltages, so please caution of repairing. And repairing modules must be disposed properly by professional.

* If any problem arises, have it investigated by a competent specialist.

* If the maintenance measures are not included in this manual, please contact the local dealer for professional support.

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