



ASTROENERGY

Crystalline Silicon PV Module Installation Manual

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1 Introduction

First of all, thank you very much for using Chint Solar Technology Co., Ltd. (hereinafter referred to as Chint Solar) production of photovoltaic modules.

Please read all the instructions in this manual carefully before installation, as well as electrical and mechanical requirements.

The installation and operation of photovoltaic modules requires professional skills that only professionals can do. The installation process is strictly observed with all safety precautions in this manual and the manual is kept for further reference. At the same time, the installer must inform the end customer (or consumer) of the above accordingly.

1.1 Purpose

This manual provides detailed instructions and important safety precautions for the installation, electrical connection and maintenance of single-sided crystalline silicon photovoltaic modules (hereinafter referred to as photovoltaic modules) produced by Chint Solar. Covers photovoltaic module models such as Table 1.

Table 1 This manual applies to photovoltaic module types

CHSM6610M	CHSM6610M(BL)	CHSM6610M/HV
CHSM60M-HC	CHSM60M(BL)-H	CHSM6610P
C		

CHSM6610P/HV	CHSM60P-HC	CHSM6612M
CHSM6612M/HV	CHSM72M-HC	CHSM60M/LV-HC
CHSM6612P	CHSM6612P/HV	CHSM72P-HC
CHSM72M/LV-H	CHSM54M-HC	CHSM54M(BL)-H
C		C

1.2 Limitation of Liability

Since the use of this manual and the installation, operation, use and maintenance of photovoltaic modules are beyond the control of Chint Solar, this manual does not have any warranty meaning, whether express or implied. Chint will not be responsible for any form of injury, including, but not limited to, damage, damage, loss of life or additional expenses caused by incorrect installation, operation, use and maintenance of photovoltaic modules and systems.

Chint Solar reserves the right to update this manual without prior notice. If there are inconsistencies in the descriptions between different language versions of this manual, the Chinese version will prevail.

2 Regulations and regulations

The mechanical and electrical installation of photovoltaic modules should be carried out in accordance with applicable laws and regulations, including electrical law, building law and electrical connection requirements. These regulations vary depending on the installation location, such as the roof



of the building, the surface of the water, etc., or may vary depending on the installation system voltage, dc usage, or AC. Please contact your local authority for specific terms.

3 Safety measures

- Chint 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. Class C fire rating(IEC61730)and Category 4 fire rating (UL61730) are available

! warn

All safety rules should be read and understood before installing, wiring, etc. / maintaining photovoltaic modules. When the photovoltaic module is exposed to sunlight or other light sources, direct current is generated. Direct contact with the live part of the photovoltaic module, such as terminals, whether or not a photovoltaic module is connected, can result in loss of life.

3.1 General safety measures

- Before installation, please contact the relevant local authority to determine the installation permit and installation inspection requirements that meet the local

requirements. The installation process should comply with the safety rules applicable to all components in the system, including cables, terminals, charging monitors, batteries, inverters, etc.

- If you install or operate photovoltaic modules on a rainy day or in the morning with dew, you need to take appropriate protective measures to prevent water vapor from penetrating into the connector.
- Unauthorized personnel are prohibited from approaching the installation area or photovoltaic module storage area.
- It is forbidden to install or use damaged photovoltaic modules.
- It is forbidden to repair photovoltaic modules by yourself, including but not limited to replacing any components of photovoltaic modules (diodes, junction boxes, connectors, etc.).
- It is forbidden to plug in connectors of different types and models.
- It is forbidden for photovoltaic modules to be used or exposed to the following substances in an environment containing the following substances: grease or organic ester compounds (such as DOP, plasticizers), aromatics, phenols, ketones, halogenated



- substances, mineral oil, alkanes (Such as gasoline, cleaning lubricants, electronic resurrection agents), alcohol, certain drugs (white flower oil, active oil, bone-setting water, thinner), adhesive sheets that can generate oxime gas and potting glue (only for connectors) (Such as KE200, CX-200/chemlok, etc.)), TBP (plasticizer), detergent, etc., to avoid chemical damage and affect the electrical safety performance of photovoltaic modules.
- It is forbidden to install photovoltaic modules in windy weather.
 - It is forbidden to focus sunlight on photovoltaic modules.
 - It is forbidden to use photovoltaic modules in relevant places such as movable platforms (except for tracking brackets).
 - It is forbidden to disassemble and move any part of the photovoltaic module; if the connector of the photovoltaic module is wet, do not perform any actions to avoid the risk of electric shock.
 - Do not connect or disconnect the photovoltaic module when there is current or external current from the photovoltaic module.
 - The cover of the junction box should always be kept closed.
 - Avoid partial shading of photovoltaic modules for a long time. Otherwise, the temperature of the shaded solar cells will rise (hot spot effect), and in severe cases, the photovoltaic modules may be burned, or even a fire may occur.
 - For photovoltaic modules used in deserts or windy and sandy areas, it is recommended to use connector dust caps before installation, or take other measures to prevent sand and dust from entering the connectors, otherwise it may cause insertion problems or electrical safety hazards.

3.2 Operational safety measures

- During transportation and storage, avoid damage or fall of the packaging; ensure that the packaging box is ventilated, rain-proof and dry; after arriving at the installation site, carefully open the outer packaging to prevent scratches and bumps on the photovoltaic modules due to improper unpacking Such phenomena; when stacking photovoltaic modules, the stacking requirements must be strictly followed.
- Avoid impact or scratches on any part of the photovoltaic module, otherwise the reliability and safety of the photovoltaic



- module will be affected; standing or walking on the photovoltaic module is prohibited; at the same time, in order to avoid glass damage, it is forbidden to apply excessive load or Distorted photovoltaic modules.
- Do not install or carry photovoltaic modules by one person. It is forbidden to pick up, drag, or move photovoltaic modules by grabbing the junction box (including the box body, cables, and connectors); when placing a photovoltaic module on a flat surface, It must be operated carefully and be aware of bumps in the corners.
 - When installing or repairing the photovoltaic system, do not wear any metal accessories to avoid the risk of electric shock; if it is installed far above the ground, please wear a seat belt.
 - When operating photovoltaic modules in the sun, please use insulated tools, and wear rubber gloves and protective clothing. At the same time, in order to avoid the risk of arc and electric shock, do not directly touch the junction box and the end of the output cable (connector) with your hands.
 - When the photovoltaic modules are electrically connected, choose a dry and weak morning or evening; or use opaque materials to completely cover the surface of the photovoltaic modules to prevent current generation.
 - A certain distance between the photovoltaic module and the installation surface should be kept to prevent the installation surface from touching the junction box.
 - When installing on the roof, comply with the fire protection requirements of the building. It is recommended to install photovoltaic modules on a fireproof and insulated roof covering, and ensure adequate ventilation between the photovoltaic modules and the installation surface. In order to ensure the fire rating on the roof, the minimum distance between the frame of the photovoltaic module and the roof surface is 10 cm.
 - The connector must be fully mated when wiring. If the cable is too long, it is recommended to fix the cable to the installation system with a UV resistant nylon cable tie. When fixing the cable to the bracket, the bending radius of the cable should not be less than 60mm.
 - Avoid directly exposing cables and connectors to sunlight. Please use anti-ultraviolet cables.
 - Do not disconnect the electrical connection



when there is a load.

- It is strictly forbidden to try to disassemble the photovoltaic module, and it is strictly prohibited to remove the nameplate of the photovoltaic module or other parts on the photovoltaic module; it is strictly forbidden to paint or apply any adhesive on the surface of the photovoltaic module;
- It is strictly forbidden to drill holes in the frame of the photovoltaic module.
- It is strictly forbidden to scratch the anodized layer on the surface of the aluminum alloy frame, except when it is connected to the ground. Scratches may cause corrosion of the frame, affecting the frame's load-bearing capacity and long-term reliability.
- If the photovoltaic module glass or other packaging materials are damaged, please wear personal protective equipment to separate the photovoltaic module from the site or the circuit. It is strictly forbidden to touch wet photovoltaic modules, unless you are wearing electric shock protection equipment that meets the requirements.
- When professionals replace or repair photovoltaic modules, do not damage the surrounding photovoltaic modules or their

support structures.

- When cleaning photovoltaic modules, you must follow the cleaning requirements of photovoltaic modules.
- The connectors must be kept dry and clean to ensure that they are in good working condition. Do not insert other metal objects into the connector or make electrical connections in any other way.

4 Handling and unpacking

If the photovoltaic module is not in use, please do not open the product packaging. The goods should be stored in a dark, dry and ventilated place. If the photovoltaic modules are stored in an uncontrollable environment, the storage time must be less than 3 months when the outer packaging of the photovoltaic modules is kept intact.

It is recommended to take appropriate amount of photovoltaic modules for unpacking according to the project progress every day, and the unpacked photovoltaic modules should be installed within a day. After unpacking, the photovoltaic modules are stacked on the ground. In severe weather such as heavy rain, the photovoltaic modules may be immersed in water for a long time and affect the reliability of the product. In severe weather such as typhoons, photovoltaic modules that have not been installed may also be scraped away.



4.1 Transport

When the photovoltaic modules are transported to the project site, they must be transported in the packaging box provided by Chint Solar, and should be stored in the original packaging box before installation. Please protect the packaging from damage.

It is necessary to protect the safety of photovoltaic modules when unloading, especially when hoisting roof projects. It is forbidden to use lifting straps directly on the pallet for hoisting. The photovoltaic modules should be placed in a protective device and then hoisted to the roof to prevent the packing box from deforming and bumping against the wall during the hoisting process.

! Special instructions

Due to the limitation of the height of the container, when the photovoltaic modules are removed from the container, the distance between the upper surface of the forklift tines and the ground should be less than 80mm, otherwise collisions may easily occur, which may damage the photovoltaic modules.

4.2 Unpack

When unpacking, you need to tear the stretch film first, then use a knife to cut the binding tape, and remove the packing box cover.

If the inner packaging is fixed with anti-falling tape, a group of two should hold the frame with both

hands in the same direction to take out the photovoltaic module one piece/time, and remove the photovoltaic module by tearing off a piece of fixing glue. The photovoltaic modules in the box are dumped; if the internal packaging is fixed by the internal packing belt, first cut the internal packing belt, use anti-inverted sticks and other non-sharp and reliable items to hold one side of the long side frame, and then cut the other side. Two people move and take out the photovoltaic modules one by one around the frame; the whole handling process needs to be handled with care, and must not collide with hard objects or any part of the frame touches the ground and drags.

4.3 Stacking of photovoltaic modules

When taking out the photovoltaic module from the packing box, you need to lay the cardboard on the ground first to prevent the photovoltaic module from colliding and scratching with the cement surface/hard object on the ground, color steel tile, metal corrugated, etc.

When the photovoltaic modules are stacked, they must be neatly and stably stacked on a horizontal surface, and stacked with the glass side facing down and the back side facing up. At the same time, there must be cardboard bedding under the photovoltaic modules. For example, when installing photovoltaic modules on the roof, the number of piles should not exceed 20. For roofs with poor load-bearing capacity,



it is recommended that the designer or installer evaluate the load-bearing capacity of the roof and reduce the load-bearing unit area of the roof by reducing the number of piles. At the same time, avoid installation tools and other objects on the surface of the photovoltaic module.

Chint PV modules adopt high and low current bins, and the handlers need to place them separately and mark them according to the markings on the power list of the PV module outer packaging (for example, 270W-L means low current gear; 270W-H means high current Gear position; the current division method required by other customers is similar); According to the system design requirements, the same current gear position is usually required in the same array during installation.

If the customer requires PV modules to be distinguished by color, the outer packaging box shall be marked accordingly, and the PV modules shall be marked to prevent confusion when they are taken out of the packaging box and stacked. According to the system design requirements, the color of photovoltaic modules in the same row or square array should be the same.

5 Mechanical installation

5.1 Installation conditions

- Recommended ambient temperature: -20 ℃ to +50 ℃; extreme working environment

temperature of photovoltaic modules: -40 ℃ to +85 ℃.

- Photovoltaic module mechanical load: Under standard installation conditions, the maximum test snow/wind load is 5400Pa/2400Pa, and the design load (considering a safety factor of 1.5) is 3600Pa/1600Pa. For specific installation methods and mechanical load values of photovoltaic modules, please refer to **Table 2** for detailed installation instructions for photovoltaic modules.
- Photovoltaic modules are strictly prohibited to be installed and used in excessive environments such as hail, snow, hurricane, sandstorm, dust, air pollution, and soot. It is strictly forbidden to install or use photovoltaic modules in a closed environment with strong corrosive substances (such as salt, salt spray, salt water, active chemical vapor, acid rain, strong steam, or any other substances that will corrode photovoltaic modules and affect the safety or performance of photovoltaic modules.) In the environment.
- If photovoltaic modules will be installed in special environments such as high temperature and high humidity environment, wet salt fog environment (C3 and above areas specified in ISO 9223), water and breeding farms, etc., the purchaser or user must inform Chint in advance. The types of photovoltaic modules, BOM, and



quality assurance issues shall be decided by the two parties through a joint re-agreement.

- If the above precautions are not followed, the Chint Solar Warranty will be invalid.

5.2 Installation angle selection

- The tilt angle of the modules is measured between the surface of modules and a horizontal grounding face, as shown in figure 1. The modules generate 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. Dust building up on the surface of the modules can impair module performance, Chint 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. At the same time, it is conducive to the flow of accumulated water on the surface of the module, and avoids long-term large amounts of accumulated water leaving marks on the glass surface, thereby affecting the appearance and performance of the module.

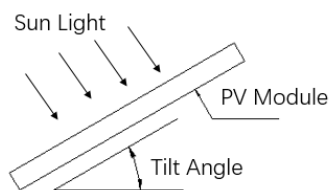


Figure a Schematic diagram of tilt angle

- PV modules connected in series should be installed in the same orientation and angle. If the orientation and angle are different, the solar radiation received by each module may be different, resulting in power loss.

5.3 Installation Method

- The photovoltaic module mounting bracket must be made of durable, corrosion-resistant, and UV-resistant materials. The mounting bracket must be inspected and tested by a third-party testing organization with static mechanical analysis capabilities to meet the country, region, or corresponding international standards.
- The photovoltaic module must be firmly fixed on the mounting bracket. If the photovoltaic module is installed in a snow-covered area, the height of the support should ensure that the lowest point of the photovoltaic module will not be covered by snow. In addition, it should be ensured that the lowest point of the photovoltaic module will not be blocked by surrounding trees or other plants.
- When the photovoltaic module is installed on a bracket parallel to the roof, the minimum gap between the frame of the photovoltaic module and the roof is 10cm, and air circulation is required to prevent damage to the wiring of the photovoltaic module.
- The frame of the photovoltaic module will have



the effect of thermal expansion and contraction, and the spacing between the two adjacent photovoltaic module frames should not be less than 10mm during installation.

For specific installation methods, please refer to the following installation specifications.

5.3.1 Bolting through the mounting holes

All modules must be securely fastened with at least 4 bolts (As shown in Figure 2, Figure 3, Figure 4 , Figure 5 and Figure 6).

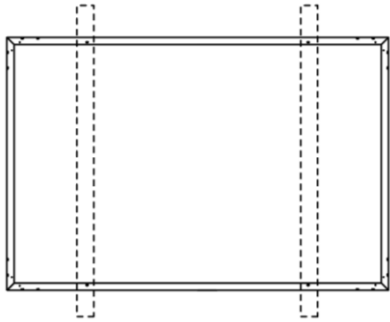


Fig 2 Bolt installation for 54cell

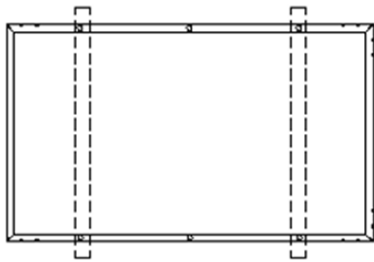


Fig 3 Bolt installation for 60cell

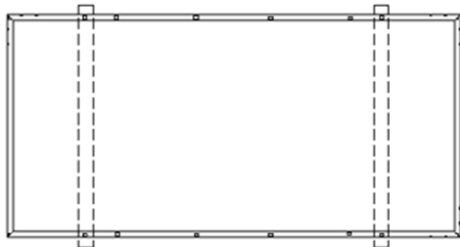


Fig 4 Outer four-hole bolt installation for 72cell

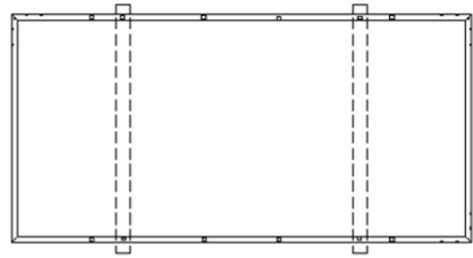


Fig 5 Internal four-hole bolt installation for 72cell

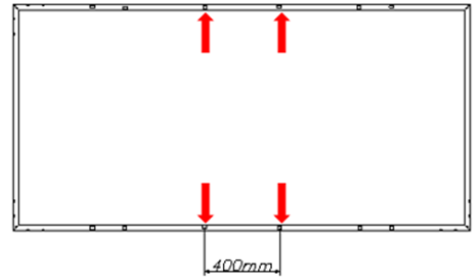


Fig 6 400mm pitch bolt installation for 72cell

! note : In order to achieve maximum safety precautions against wind and snow loads, it is recommended that all available mounting holes should be used. Bolts are inserted as described in the process below (Sketch figure 7).

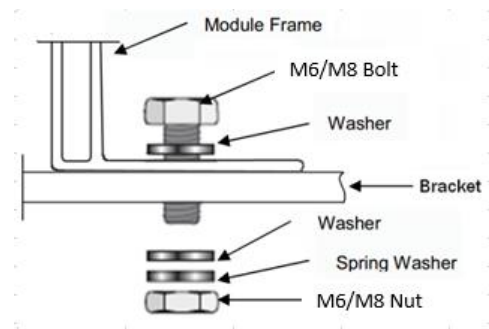


Figure 7 Schematic diagram of bolt installation process

- ① Place the module on the supporting bars underneath.
- ② Insert the four stainless-steel bolts (M6) through the holes (7x11.5mm) or stainless-steel bolts (M8) through the holes (9x14mm) in the frame according to the Figure 2, Figure 3 & Figure 4. The 400mm pitch mounting hole size is 7x10mm,



and 4 M6 stainless steel bolts are required (Figure 5).

- ③ Secure each bolt to the frame with stainless-steel washers, one for each side of the mounting structure; and screw on either a stainless-steel spring washer or a toothed lock washer. Finally, secure with a stainless steel nut.
- ④ The reference value of tightening torques should be within 9~12Nm & 17~23 Nm respectively for M6 & M8 bolts, depending on bolt class. For the bolt grade, the technical guideline from the fastener suppliers should be followed. For the torque value, recommendations from specific clamping hardware suppliers should prevail.

5.3.2 Clamping on the frame surface

Photovoltaic modules can be installed across the support frame (Figure 8) or parallel to the frame of the photovoltaic module (Figure 9). When using clamps to install, each photovoltaic module must be fixed with at least 4 clamps.

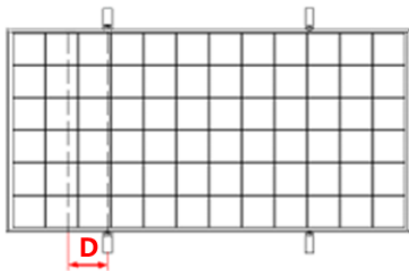


Figure 8 Rail vertical long frame installation

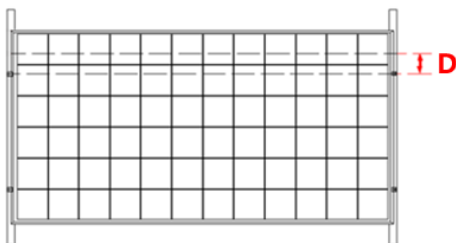


Figure 9 Installation of rails coincident with short frame

! note:

- The length of supporting bars must be longer than the length of module frame, otherwise please confirm with our product team to get approval.
- The above two diagrams show the installation method using aluminum clamps (also called fixtures). "D" indicates the allowable installation range of the aluminum press block. Please refer to 4.3.3 for the specific recommended installation location and corresponding load ("---" indicates that the photovoltaic module does not apply to the above installation methods).
- Each aluminum pressure block is equipped with an M8 bolt, a flat washer, a spring washer and an M8 nut. The fixing steps are as follows:
 - ① Place the module on the two supporting bars (not provided). The bars should be made with stainless material and treated with an anti-corrosion process (e.g., hot dipped galvanizing). Each PV module needs at least four clamps to fix. Do not make the clamp contact the glass directly or make the aluminum frame deformation in the installation process, and avoid the shadow of solar PV modules, otherwise may break the modules.
 - ② Be sure to avoid shadowing effects from the module clamps. Weep holes on the module frame must not be closed or obscured by the clamps. The clamp must overlap the module frame by at least



8mm but no more than 11mm (The clamp section can be changed under the premise of ensuring the reliable installation of the components).

- ③ The bar's top surface contacted with module frame should come with grooves compatible with an M8 bolt.
- ④ If the bars do not come with grooves, holes of a suitable diameter may need to be drilled to allow bolts to be attached to the bars at the same locations as mentioned above.
- ⑤ Secure each clamp by attaching plain washer, spring washer, and nut, in that order.
- ⑥ Both of close-ups of Figure 10, indicating the middle clamps and Figure 11, indicating the side clamps for reference. Suggest the dimensions for middle clamps are: $a \geq 40\text{mm}$, $b \geq 26\text{mm}$, $c \geq 5\text{mm}$, $d \geq 28\text{mm}$, and $\phi = 9\text{mm}$. The torque for tightening the nut and bolts are recommended 17~23Nm when the property class of bolts and screws is Class 8.8.

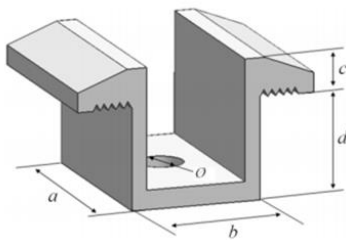


Figure 10 Schematic diagram of intermediate pressing block

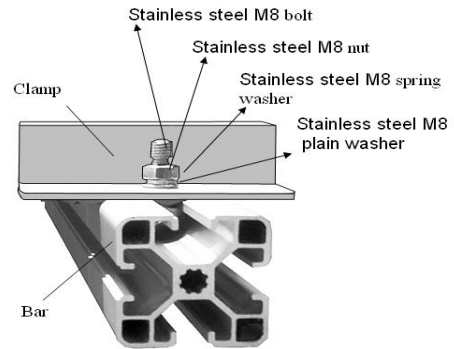


Figure 11 Schematic diagram of side pressing block

- ⑦ For the installation method shown in Figure 9, the modules need to be fixed with professional solar pressure blocks (as shown in Figure 12), and the overlap between the C surface of the module and the guide rail should be $\geq 15\text{mm}$. If improper fixtures or incorrect installation methods are used, the Chint Solar limited warranty will be invalid.

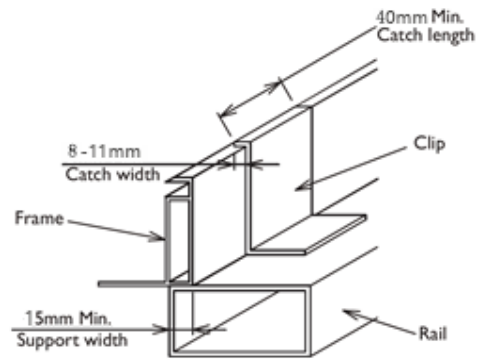


Figure 12 Requirements for mounting clamps when the guide rails coincide with the long frame



Table 2 Installation range and corresponding values

Module type	Dimensions L*W*H (mm)	Installation method				
		Fig b & Fig C	Fig d	Fig g	Fig h	Fig e
CHSM6610M CHSM6610M/HV CHSM6610P CHSM6610P/HV CHSM6610M(BL)	1648*990*35	+5400Pa	---	+5400/-2400Pa	+2400/-2400Pa	---
	1648*990*40	-2400Pa		Installation scope	Installation scope	
				198~408mm	50~200mm	
	1650*992*35	+5400Pa	---	+5400/-2400Pa	+2400/-2400Pa	---
1650*992*40	-2400Pa	Installation scope		Installation scope		
			198~408mm	50~200mm		
CHSM60M-HC CHSM60P-HC CHSM60M(BL)-HC CHSM60M/LV-HC	1666*992*35	+5400Pa	---	+5400/-2400Pa	+2400/-2400Pa	---
		-2400Pa		Installation scope	Installation scope	
				207~408mm	50~200mm	
	1675*992*35	+5400Pa	---	+5400/-2400Pa	+2400/-2400Pa	---
		-2400Pa		Installation scope	Installation scope	
				215~415mm	50~200mm	
1692*1002*35	+5400Pa	---	+5400/-2400Pa	+2400/-2400Pa	---	
	-2400Pa		Installation scope	Installation scope		
			350±50mm	50~200mm		
1755*1038*35	+5400Pa	---	+5400/-2400Pa	+1800/-1800Pa	---	
1765*1048*35	-2400Pa		Installation scope	Installation scope		
			400±50mm	200±50mm		
1755*1038*30	+5400Pa	---	+5400/-2400Pa	+1800/-1800Pa	---	
	-2400Pa		Installation scope	Installation scope		
			350±50mm	200±50mm		
CHSM54M-HC CHSM54M(BL)-HC	1708*1133*30	+5400Pa	---	+5400/-2400Pa	+1400/-1400Pa	---
		-2400Pa		Installation scope	Installation scope	
				359±50mm	200±50mm	



Table 2 (continue)

Module type	Dimensions L*W*H (mm)	Installation method				
		Fig b & Fig C	Fig d	Fig g	Fig h	Fig e
CHSM6612M CHSM6612M/HV CHSM6612P CHSM6612P/HV	1954*990*40	+5400Pa	+5400Pa	+5400/-2400Pa	---	+2400Pa
	1954*990*35	-2400Pa	-2400Pa	Installation scope 299~498mm		-2400Pa
	1960*992*40	+5400Pa	+5400Pa	+5400/-2400Pa	---	+2400Pa
	1960*992*35	-2400Pa	-2400Pa	Installation scope 299~498mm		-2400Pa
CHSM72M-HC CHSM72P-HC CHSM72M/LV-HC	1986*992*40	+5400Pa	+5400Pa	+5400/-2400Pa	---	+2400Pa
	1986*992*35	-2400Pa	-2400Pa	Installation scope 315~505mm		-2400Pa
	2000*992*40	+5400Pa	+5400Pa	+5400/-2400Pa	---	+2400Pa
	2000*992*35	-2400Pa	-2400Pa	Installation scope 315~505mm		-2400Pa
	2018*1002*40	+5400Pa	+2400Pa	+5400/-2400Pa	---	+2400Pa
	2018*1002*35	-2400Pa	-2400Pa	Installation scope 350±50mm		-2400Pa
	2108*1048*35	+5400Pa	+2400Pa	+5400/-2400Pa	---	+2400Pa
	2094*1038*35	-2400Pa	-2400Pa	Installation scope 400±50mm		-2400Pa
	2256*1133*35	+5400Pa	+2400Pa	+5400/-2400Pa	---	+1800Pa
		-2400Pa	-2400Pa	Installation scope 400~450mm		-1800Pa

6 Electrical Installation

6.1 Electrical properties

For details of the electrical performance parameters of Chint Solar PV modules, please refer to the PV module product manual.

Rated electrical characteristics such as I_{sc} is within $\pm 5\%$ and V_{oc} within $\pm 3\%$ and P_{mpp} within

$\pm 3\%$ of tolerance values at Standard Test Conditions.

Standard Test Conditions: 1000W/m² Irradiance, 25°C

Cell Temperature and 1.5 Air Mass.

The IEC & UL standard maximum system voltage for the regular module series is 1000V, the 1500V standard products are also available according to the requirements. The IEC & UL standard



maximum system voltage for half-cell module series is 1500V (except for black modules). The maximum voltage of the system must be less than the maximum certified voltage and the maximum input voltage of the inverter and of the other electrical devices installed in the system. To ensure that this is the case, the open circuit voltage of the array string needs to be calculated at the lowest expected ambient temperature for the location. This can be done using the following formula.

$$\text{Max System voltage} \geq N * \text{Voc} * [1 + \text{TCvoc} \times (\text{Tmin} - 25)]$$

Among them: N-the number of photovoltaic modules in a single string; Voc-the open circuit voltage of each photovoltaic module (refer to the photovoltaic module nameplate or product brochure); TCvoc-the temperature coefficient of the photovoltaic module open circuit voltage (refer to the photovoltaic module product brochure); Tmin -Minimum ambient temperature.

! note

- 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 Isc marked on this module should be multiplied by a factor of 1.25 when determining component conductor ampacities, fuse sizes, and size of controls connected to the PV output.
- Refer to Section 690-8 of the National Electrical Code for an additional multiplying factor of 125% (80% derating) which may be applicable. That means, when determining the voltage rating,

conductor capacity, fuse rating, and photovoltaic output control size, the parameters need to be multiplied by the square of 1.25.

- According to the max fusing rate of modules and local electrical installation standard, the parallel connection of PV module arrays should use the proper fuse to protect the circuit.

6.2 Electrical connection

In order to ensure the normal operation of the system, when connecting photovoltaic modules or connecting loads (such as inverters, batteries, etc.), observe to ensure that the polarity of the cable is connected correctly. If the PV module is not connected correctly, the bypass diode may be damaged. Figure 12 shows the connection of photovoltaic modules in series and parallel. PV photovoltaic modules can be wired in series to increase the voltage. The series connection is to connect the wiring from the positive terminal of one photovoltaic module to the negative terminal of the next photovoltaic module. PV photovoltaic modules can be connected in parallel to increase current. Parallel connection is to connect the wiring from the positive terminal of one photovoltaic module to the positive terminal of the next photovoltaic module. If the PV module is not connected correctly, the bypass diode may be damaged.

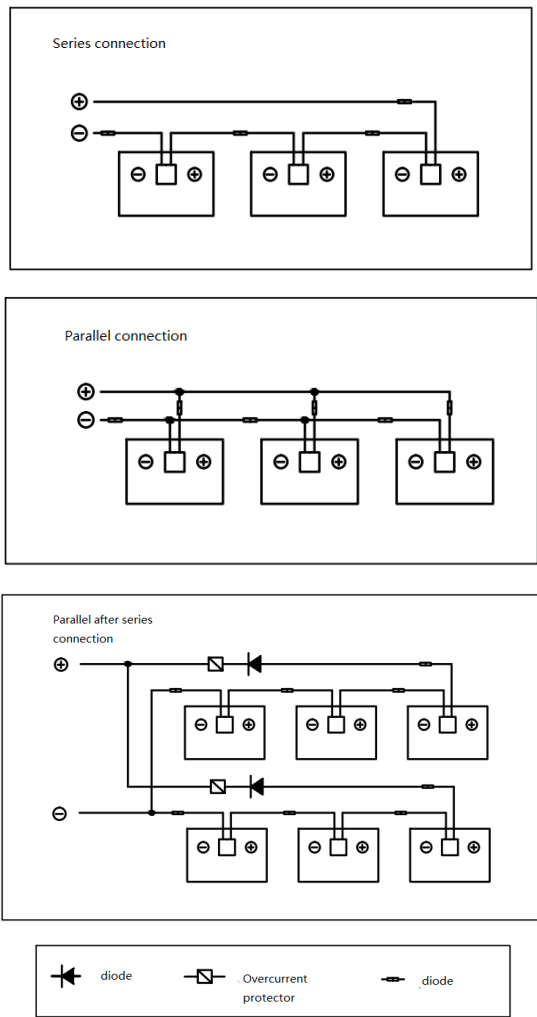


Figure 12 Schematic diagram of electrical connection

! note

- If one set of arrays is connected to another with the opposite polarity, it will cause irreparable damage to the product. Before connecting in parallel, be sure to confirm the voltage and polarity of each column. If the measurement finds that the polarity between the columns is reversed or the voltage difference is greater than 10V, you must check the structure and configuration before making the

connection.

- The number of photovoltaic modules in series and parallel must be designed reasonably according to the system configuration.
- Photovoltaic modules of different electrical performance models cannot be connected in a string.
- Special solar cables and connectors should be used in the system, and all connections should be securely tightened. The cable size should be 4mm² (12 AWG) and must be able to withstand the maximum open circuit voltage of the photovoltaic system.
- When the cable is fixed on the bracket, it is necessary to avoid mechanical damage to the cable or photovoltaic module, and do not press the cable with force. To fix the cable through the proper way, a specially designed tying coil and wire clip must be used to fix it on the bracket. Avoid direct sunlight and water soaking cables.
- Please keep the connector dry and clean, and make sure that the nut of the connector is tightened before connecting. Do not connect the connector when it is found that the connector is wet, dirty, or in other bad conditions. Avoid direct sunlight and immersion of the connector in water. Avoid the connector falling on the ground or roof.
- When the photovoltaic module is in a live state,



please do not plug or unplug the connector. When it is necessary to open the connector, ensure that the photovoltaic module is in a non-working state, and must use professional unlocking tools and safety protection measures. It is forbidden to pull or damage the locking structure.

- The junction box of the photovoltaic module contains bypass diodes connected in parallel to the battery string of the photovoltaic module. The bypass diode in the junction box can avoid the degradation of photovoltaic module performance caused by shading or covering. Please refer to the junction box diode specifications provided in the relevant product specifications.
- When a local hot spot phenomenon occurs due to partial shading or covering of the photovoltaic module, the diode in the junction box will start to work, so that the photovoltaic module current will no longer flow through the hot spot cell, thereby limiting the heating and performance loss of the photovoltaic module. When you suspect or find that the diode is malfunctioning, please contact Chint, please do not try to open the junction box cover by yourself.

6.3 Grounded

Chint Solar modules use an anodic oxidized aluminum frame to resist corrosion. So the frame of modules should be connected to the equipment

grounding conductor to prevent thunder and electrical shock. The grounding device should fully contact with the inside of the aluminum alloy, and penetrate the surface of the frame oxidation film.

The following is the specific grounding method, as shown in Figure 13.

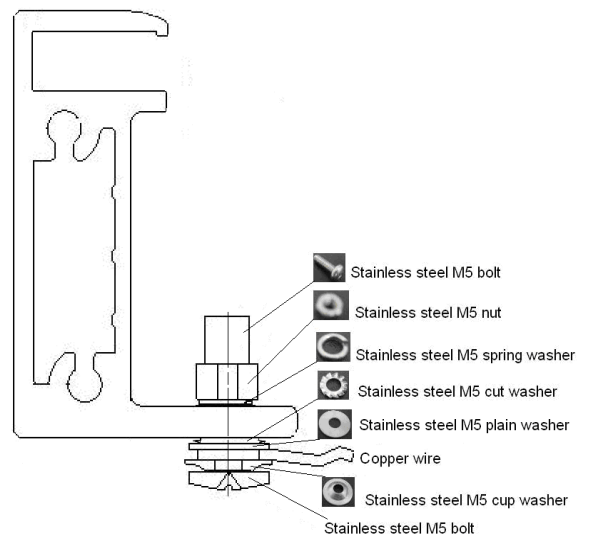


Figure 13 Use copper cables to ground the aluminum frame

- The grounding requirements must be checked in accordance with the applicable regulations and standards before work is started.
- Use the marked 5.5 mm grounding holes to ground the anodized frame. Use one M5 nut, two M5 cut washers, one M5 plain washer, one M5 spring washer, and one M5 bolt and the copper wire. All nuts, bolts, and washers are type M5 and should be made of stainless steel.
- Put the bolt through the cup washer and wrap the copper wire around the bolt. (Note that the copper wire cannot be attached directly to the aluminum.)
- Put the bolt through the cut washer and then



through the hole in the aluminum frame.

- Add the spring washer and nut on the other side of the bolt and tighten to secure all parts. The tightening torque should be 4~4.5 N•m.

! note

- Approve the use of UL-467 certified bonding and grounding devices, including Burndy (formerly Wiley Electronics) Washer Electrical Equipment Bonding (WEEB) and similar devices, such as barbed washers, that meet the requirements of UL-467 as suitable for electrical bonding and grounding PV modules to PV mounting systems.
- Other grounding methods may be allowable when tested with the racking system per UL 2703 requirements.
- Please don't drill any additional grounding hole on the frame of the modules.
- The frame rails have pre-drilled holes marked with a grounding sign. These holes should be used for grounding purposes and should not be used for mounting the modules.

7 Maintenance

It is required to perform regular inspection and maintenance of the modules, especially within warranty scope. It is the user's responsibility to the report to the supplier regarding the damages found in time.

7.1 Routine inspection

Regular inspections should be made to see if the photovoltaic modules in the photovoltaic array are

damaged, such as glass breakage, cable breakage, junction box damage, cell damage, backplane breakage and other factors that lead to functional and safety failures of photovoltaic modules. When the above problems occur, the supplier must be notified in time to replace the same type of photovoltaic modules.

It is recommended to perform a preventive inspection every 6 months, and do not replace the components of the photovoltaic module without authorization. If electrical or mechanical performance inspection or maintenance is required, it is recommended that qualified professionals perform the operation to avoid electric shock or personal injury.

Routine maintenance measures should be taken to keep the photovoltaic modules free of snow, bird droppings, seeds, pollen, leaves, branches, dust, stains, etc.

7.2 Photovoltaic module cleaning

If the PV module has a sufficient tilt angle (at least 15 °), it is usually not necessary to clean the PV module (rain will have a self-cleaning effect). If there is a lot of dirt on the surface of the photovoltaic module, which has seriously affected the power generation, use water without detergent and a soft sponge or brush to rinse the photovoltaic module array when it is cool throughout the day. Do not scratch or wipe the dust when it is dry, otherwise it will cause



tiny scratches. If there is snow, you can use a brush with soft bristles to clean the surface of the photovoltaic module.

For more detailed instructions related to cleaning and maintenance, please refer to the "Photovoltaic

Module Cleaning Manual".

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ASTRONERGY

CHINT SOLAR (ZHEJIANG) Co., Ltd.

Add: 1335 Bin'an Rd, Binjiang District, Hangzhou, China 310053

Tel: 86-571-5603 1888

Fax: 86-571-5603 2333

<http://energy.chint.com/>