LONGi

LONGi Solar solar panel installation guide

V16

Applicable module type			Certification Status	Module structure
Single-sided Module	LR6-60-***M	LR6-72-***M	IEC、UL	single-layer glass
	LR6-60BK-***M	LR6-72BK-***M	IEC, UL	single-layer glass
	LR6-60HV-***M	LR6-72HV-***M	IEC, UL	single-layer glass
	LR6-60PB-***M	LR6-72PB-***M	IEC, UL	single-layer glass
	LR6-60PE-***M	LR6-72PE-***M	IEC, UL	single-layer glass
	LR6-60PH-***M	LR6-72PH-***M	IEC, UL	single-layer glass
	LR6-60MP-***M	LR6-72MP-***M	IEC	single-layer glass
	LR6-60MPH-***M	LR6-72MPH-***M	IEC	single-layer glass
	LR6-60HPH-***M	LR6-72HPH-***M	IEC, UL	single-layer glass
	LR6-60HPH-***MC	LR6-72HPH-***MC	IEC, UL	single-layer glass
	LR6-60HPB-***M	/	IEC, UL	single-layer glass
	LR6-60OPH-***M	LR6-72OPH-***M	IEC	single-layer glass
	LR6-60DG-***M	LR6-72DG-***M	IEC, UL	double glazing
	LR6-60PD-***M	LR6-72PD-***M	IEC, UL	double glazing
	LR6-60HPD-***M	LR6-72HPD-***M	IEC, UL	double glazing
	LR6-60HIH-***M	LR6-72HIH-***M	IEC, UL	single-layer glass
	LR6-60HIB-***M	/	IEC, UL	single-layer glass
	LR4-50HPH-***M	/	IEC, UL	single-layer glass
	LR4-60HPH-***M	LR4-72HPH-***M	IEC, UL	single-layer glass
	LR4-60HPB-***M	/	IEC, UL	single-layer glass
	LR4-60HIH-***M	LR4-72HIH-***M	IEC, UL	single-layer glass
	LR4-60HIB-***M	/	IEC, UL	single-layer glass
	LR4-66HPH-***M	/	IEC, UL	single-layer glass
	LR4-66HP-***M	/	IEC, UL	single-layer glass
	LR4-66HIH-***M	/	IEC, UL	single-layer glass
	LR5-54HPH-***M	/	IEC, UL	single-layer glass
	LR5-54HPB-***M	/	IEC, UL	single-layer glass
	LR5-54HIH-***M	/	IEC, UL	single-layer glass
	LR5-54HIB-***M	/	IEC, UL	single-layer glass
	LR5-54HNB-***M	/	IEC, UL	single-layer glass
	LR5-54HTH-***M	/	IEC, UL	single-layer glass
	LR5-54HTB-***M	/	IEC, UL	single-layer glass
	LR5-66HPH-***M	LR5-72HPH-***M	IEC, UL	single-layer glass
	LR5-66HIH-***M	LR5-72HIH-***M	IEC, UL	single-layer glass
	/	LR5-72HTH-***M	IEC, UL	single-layer glass
Kandextension Module	LR4-60HBD-***M	LR4-72HBD-***M	IEC, UL	double glazing
	LR4-60HIBD-***M	LR4-72HIBD-***M	IEC, UL	double glazing
	LR5-54HIBD-***M	LR5-72HBD-***M	IEC, UL	double glazing
	LR5-54HIBB-***M	LR5-72HIBD-***M	IEC, UL	double glazing
	LR5-54HABD-***M	LR5-72HND-***M	IEC, UL	double glazing
	LR5-54HABB-***M	LR5-72HTD-***M	IEC, UL	double glazing
	LR5-66HBD-***M	/	IEC, UL	double glazing
	LR5-66HIBD-***M	/	IEC, UL	double glazing

* Information on frameless modules and LR6 types can be found in the LONGi PV Module Installation Manual V15.

Security comment

- This manual contains information on the installation and safe use of solar power generation modules (hereinafter referred to as the module) of LONGi Solar Technology Co., Ltd. (hereinafter referred to as LONGi). Please follow all safety precautions in this manual as well as local regulations.
- The installation of the modules requires professional knowledge and skills and should only be performed by qualified personnel. Please read this manual carefully before installing and using the module. The installation personnel must be familiar with the mechanical and electrical requirements of the system. Please retain this manual for future reference during maintenance or repair, and when selling and handling the modules.
- If you have any questions, please contact LONGi customer service for further explanation.

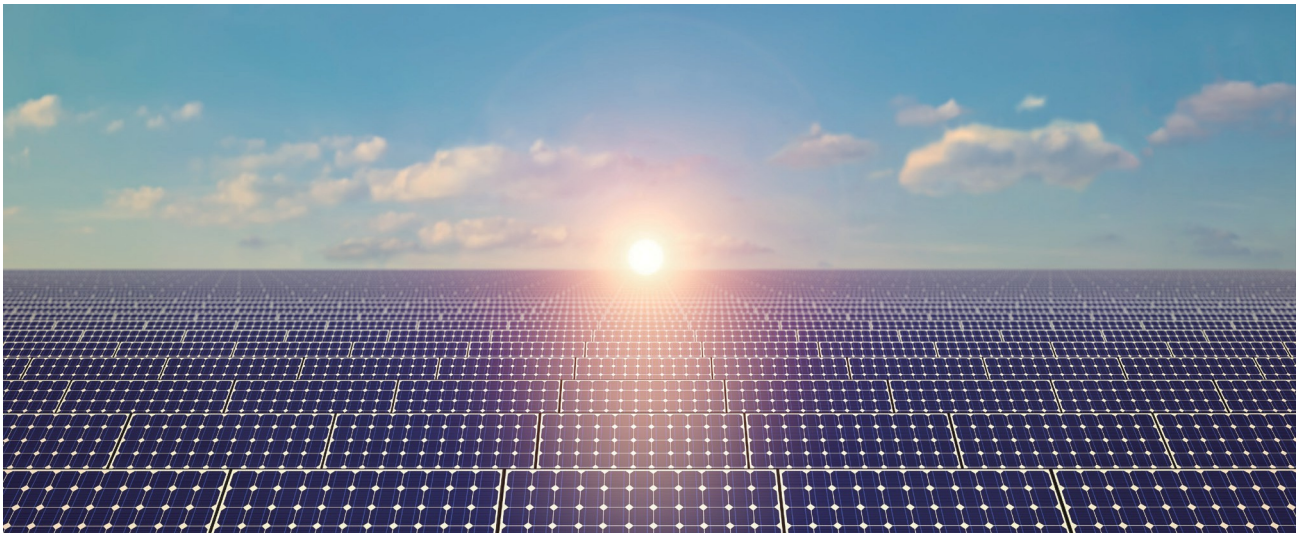
Table of contents

1 Introduction

This installation guide provides information on electrical and mechanical installation, so please read and understand the information before installing the LONGi modules. In addition, this guide also contains some safety information that you should be familiar with. The entire content of this guide is the intellectual property of LONGi, which is based on LONGi's long-term technical research and experience.

This installation guide does not contain any express or implied quality guarantee and does not provide any compensation system for any losses, module damage or other costs incurred during or in connection with the installation, operation, use and maintenance of the modules. LONGi shall not be liable if any patent rights or third party rights are violated during the use of the modules. LONGi reserves the right to modify the product or installation guide without prior notice. We recommend that you regularly visit our website at www.longi.com for the latest version of the installation guide.

If customers do not install the modules in accordance with the requirements specified in this manual, the limited warranty provided to customers will be void. In addition, the suggestions in this manual are intended to improve the safety of module installation and have been tested and proven in practice. Please provide this manual to the users of the photovoltaic system for information and inform them of the advice on operation, maintenance requirements, etc.



2 Laws and regulations

The mechanical and electrical installation of photovoltaic modules must comply with applicable regulations, including electrical law, building law and electrical connection requirements. These regulations may vary from site to site, e.g. for installation on building roofs, vehicle applications, etc. The requirements may also vary depending on the voltage of the installed system (DC or AC). Please consult your local authorities for specific conditions.

3 General information

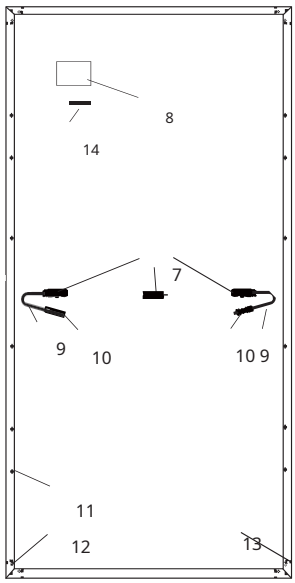
3.1 Identifying modules

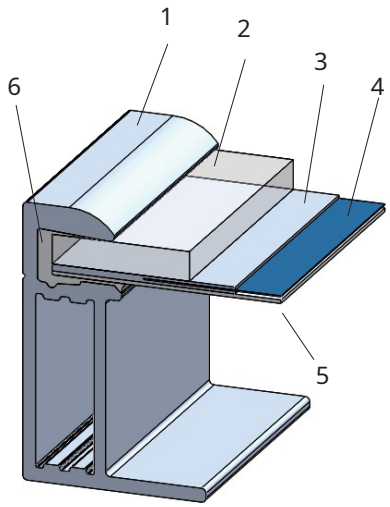
The three labels on the module contain the following information:

1. Nameplate: product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current under test conditions, certification mark, maximum system voltage, etc.

2. Current classification label: rated operating current (H stands for high, M for medium, L for low current)

3. Serial Number Label: A unique serial number permanently laminated to the inside of the module and located on the front of the module. Another identical serial number is located next to the module nameplate.

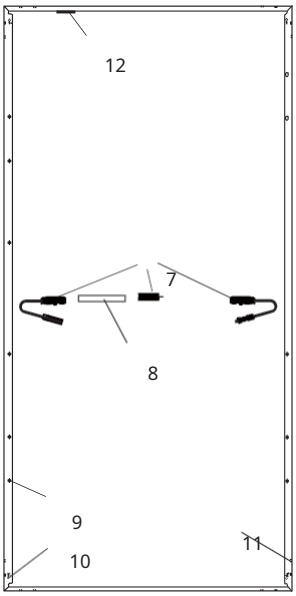


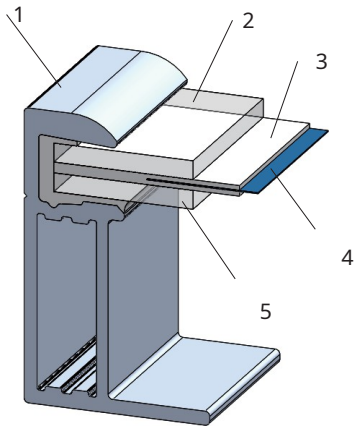


1 Frame	2 glass	3 EVA	4 Solar panel
5 Back layer	6 silica gel	7 junction box	8 Type plate
9 Cable	10 Connector	11 Mounting hole	12 Grounding hole
13 Drain hole	14 Barcode		

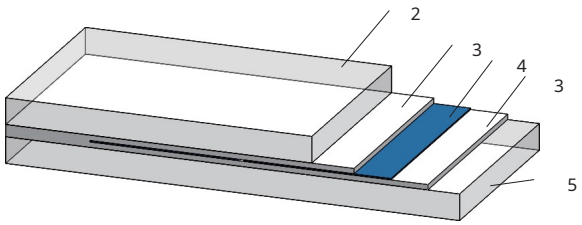
Figure 1: Typical mechanical drawing of single-sided modules

(See section 3.2 for the location of the junction box. The specific design depends on the relevant specification.)





Double-sided modules (with frame)



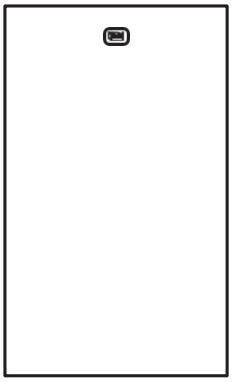
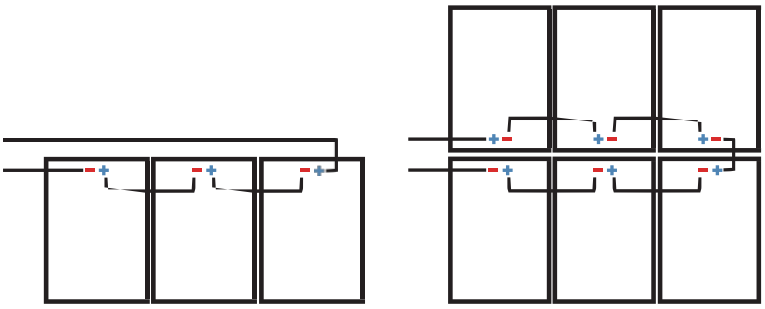
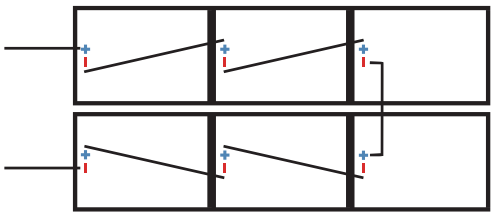
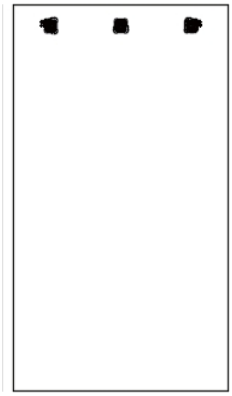
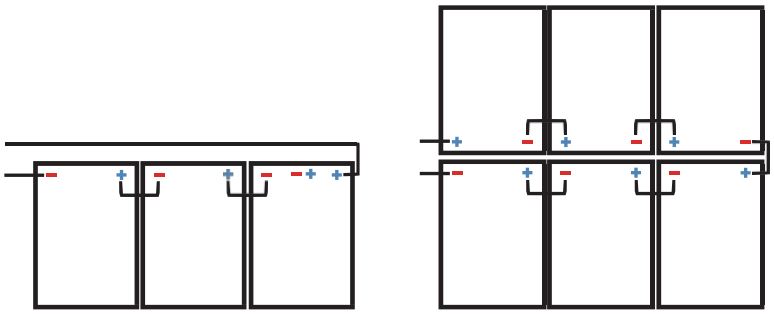
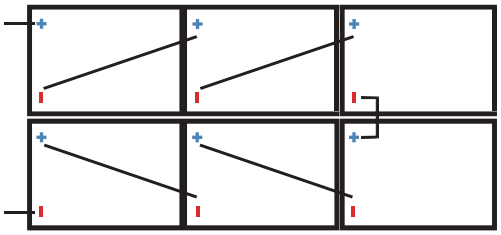
Double-sided modules (frameless)

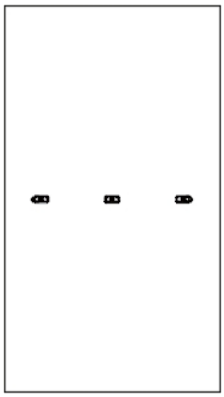
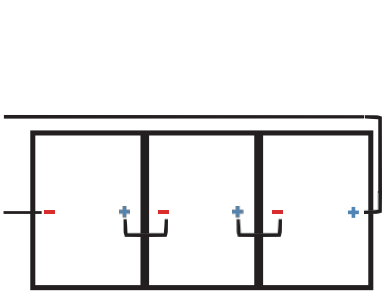
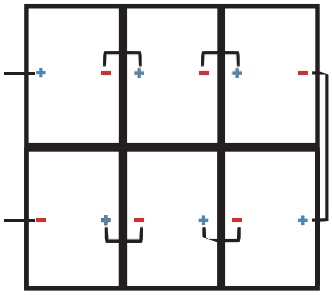
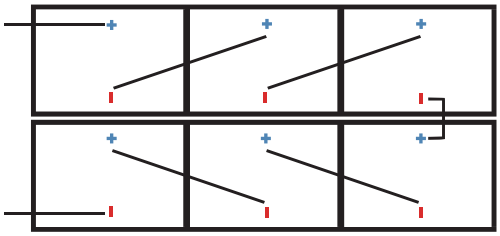
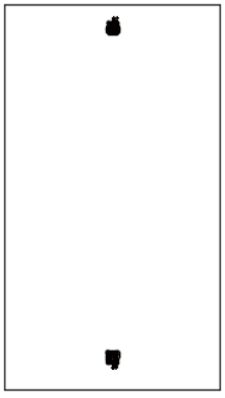
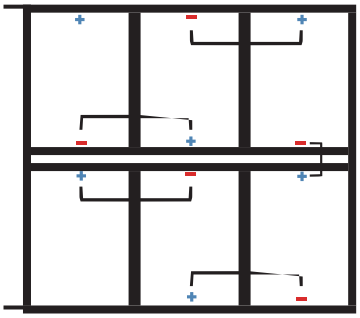
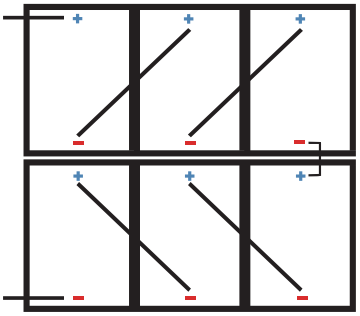
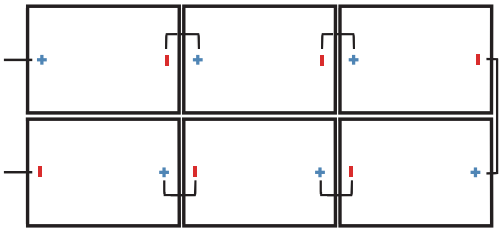
1 Frame	2 First bottle	3 EVA/POE	4 solar panel
5 Rear glass	6 Sealant	7 Junction box	8 type plate
9 Mounting holes	10 Grounding holes	11 Drain holes	12 Barcode

Figure 2. Technical drawing of typical modules

(The connectionhebox is locatedandandandtoothesd in section 3.2. The concreteandt design is relevanthespecificthecihethelfü(gg.)

3.2 Junction box type and connection method

Junction box location icon	Recommended wiring method
	Vertical installation: Standard cable length (Note: One end of a row must be extended. 
	Horizontal installation: Standard cable length 
	Vertical installation: Standard cable length (Note: One end of a row must be extended.) 
	Horizontal installation: 60 type PV module cable length ⩾1.2 m, 72 type PV module cable length ⩾1.4 m 

Junction box location icon	Recommended wiring method
	Vertical installation: Standard cable length:   Note: The cable must be reversible for connection. , as shown in the figure below.
	Horizontal installation: Cable length of type 60 PV module ⩾1.2 m, cable length of type 72 PV module ⩾1.4 m, cable length of type 78 PV module ⩾1.5 m 
	Vertical installation: Method 1: Standard cable length Method 2: Single-component cable length ⩾1.2 m  
	Horizontal installation: Standard cable length 

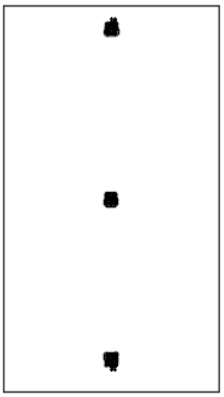
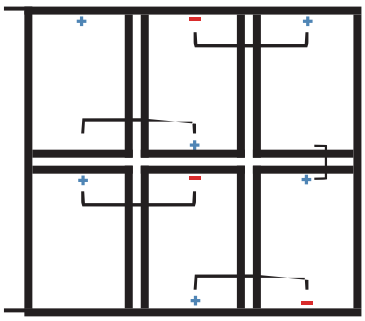
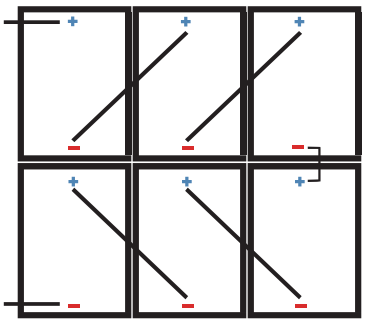
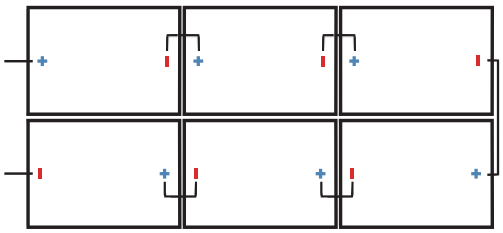
Junction box location icon	Recommended wiring method
	Vertical installation: Method 1: Standard cable length  Method 2: Single-component cable length ⩾1.2 m  Horizontal installation: Standard cable length 

Figure 3: Junction box types and wiring methods

3.3 General safety instructions

The application level of the LONGi Solar module is II .class, which can be used in systems operating at voltages above 50 V DC or 240 W where general contact access is expected;

If the modules are installed on a roof, the overall fire resistance rating of the finished structure, as well as operation and maintenance, must be taken into account. A roof-mounted solar system should only be installed after an assessment by a building expert or engineer and after official test results for the entire structure have been obtained. It must be proven that the structure can support the additional weight of the system's supporting structures and the solar modules.

For your safety, please do not perform work on the roof without personal protective equipment (PPE), which includes, but is not limited to:

fall protection, use of ladders or steps and personal protective measures.

For your safety, please do not install or operate the modules in hazardous conditions such as strong winds or gusts, or on wet or sandy roofs.

3.4 Electrical power safety

Solar panels generate direct current when exposed to sunlight. Any contact with exposed metal parts of the module leads can cause electric shock or burns. Contact with direct current voltages of 30 V or more can be fatal.

Even if there is no load or external circuit connected, the modules may still generate voltage. Please use insulating devices and wear rubber gloves when working with the modules in sunlight.

There is no switch on the solar panels. The only way to stop the operation of the solar panels is to block them from sunlight, cover them with hard cardboard or UV-resistant materials, or place the modules facing the sun on a smooth, flat surface.

To avoid the risk of arcing or electric shock, please do not disconnect the electrical connection under load. Incorrect connection may also lead to arcing or electric shock. Keep the connectors dry and clean and make sure they are in working condition. Do not insert other metal objects into the connectors or attempt to make an electrical connection in any way.

Snow, water or other reflective materials in the surrounding environment increase light reflection, which increases the output current and power. At low temperatures, the module voltage and power also increase.

If the module glass or other sealing materials are damaged, please wear personal protective equipment (PPE) and then disconnect the modules from the circuit.

Do not operate the modules when wet unless wearing personal protective equipment. When cleaning the modules, please follow the cleaning instructions in the manual.

Do not touch the connectors with the following chemicals: Gasoline, white flower oil, wood oil, mold temperature oil, engine oil (e.g. KV46), grease (e.g. Molykote EM-50L), lubricating oil, rust preventive oil, pressing oil, diesel, cooking oil, acetone, alcohol, essential oil, bone setting fluid, banana oil, release agent (e.g. Pelicoat S-6), glue and casting compound

substances that can generate oxime gas (e.g. KE200, CX-200, Chemlok), TBP, cleaning agents, etc.

3.5 Operational safety

- During installation, open the outer packaging of the modules.
- Do not damage the packaging or drop the packaged modules on the ground.
- When stacking modules, do not exceed the maximum number of layers indicated on the packaging box.
- Before unpacking the modules, place the packaging carton in a ventilated, waterproof and dry place before unpacking the modules.
- When opening the packaging box, follow the unpacking instructions.
- It is strictly forbidden to transport modules with junction boxes or wires.
- Do not stand or walk on the modules.
- To avoid damaging the glass, do not place heavy objects on the modules.
- Be especially careful when placing in corners.
- Do not attempt to disassemble the module or remove the nameplate or module components.
- Do not paint the modules or apply any adhesive to them.
- Do not damage or scratch the back of the modules.
- Do not drill holes in the module frame as this may reduce the frame's load-bearing capacity, lead to frame corrosion, and void the limited warranty provided to customers.
- Do not scratch the anodized finish of the aluminum alloy frame except at the ground connection. Scratching can lead to frame corrosion and reduce the frame's load-bearing capacity and long-term reliability.
- Do not repair problematic modules yourself.

3.6 Fire safety

Before installing the modules, please read the local laws and regulations and comply with the fire protection requirements of the buildings.

According to the relevant certification standards, the fire resistance rating of LONGi single-sided modules is UL Type 1 or 2 or IEC Class C, and that of LONGi double-sided modules is UL Type 29 or IEC Class C.

The roof must be covered with fire-resistant materials with an appropriate fire rating for roof installation and care must be taken to ensure that the back plate and mounting surface are fully ventilated.

Different roof structures and installation methods affect the fire resistance of buildings. Improper installation can pose a fire hazard.

To guarantee the fire resistance rating of the roof, the distance between the module frame and the roof surface must be at least 10 cm. (0.39 inches)

Please use appropriate module accessories such as fuse, circuit breaker and grounding terminal according to local regulations.

Please do not install the modules in places where flammable gases are present.

4 Installation conditions

4.1 Installation location and working environment

- Modules cannot be used in space
- Do not direct sunlight onto the modules with mirrors or a magnifying glass.
- LONGi modules should be installed on suitable buildings or other suitable locations (e.g. ground, garage, building exterior wall, roof, solar tracking system), but should not be mounted on any vehicle.
- Do not install the modules in locations where there is a risk of flooding.
- LONGi recommends that the modules be installed in an operating environment where the temperature -40 °Cand40 °Cbetween

  which is the average monthly highest and lowest temperatures at the installation sites. The modules are subject to extreme operating conditions

  temperature -40 °Cand85 °Cis between.
- Make sure that the installed modules are not subjected to wind or snow loads that exceed the maximum permissible load limit.
- The modules should be installed in locations that are free from shade all year round. Make sure that there are no obstacles blocking light at the installation locations.
- Install lightning protection in areas where lightning and thunder are common.
- Do not install modules in locations where flammable gases may be present.
- The modules should not be used in environments where excessive hail, snow, smoke, air pollution, and soot occur, or in locations where strong corrosive substances such as salt, salt mist, brine, active chemical vapor, acid rain, or other,

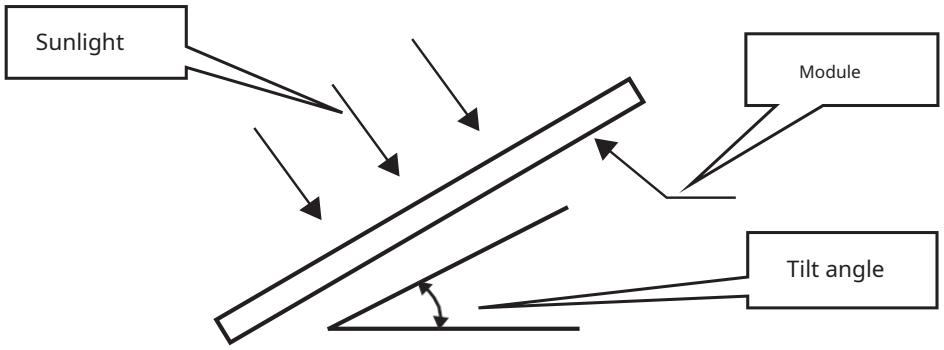
  , which corrode the modules and affect their safety or performance.
- Please take precautions to ensure reliable and safe installation of modules in harsh environments such as heavy snowfall, cold and strong winds, or islands near water and salt fog, or deserts.
- LONGi modules have passed the IEC 61701 salt spray corrosion test, but corrosion may still occur at the connection point of the module frame to the support and at the connection point to the ground. If LONGi modules are installed at a distance of at least 50 meters

  at a distance

  from the coast, the associated parts and components must be protected by anti-corrosion measures.

4.2 Selecting the tilt angles

The tilt angle of solar modules is the angle between the surface of the module and the horizontal ground. The module achieves maximum power when it is facing directly into the sunlight.



In the northern hemisphere, it is advisable to orient the modules towards the south, and in the southern hemisphere towards the north.

For specific mounting angles, please refer to the installation instructions for standard modules or seek advice from an experienced solar installer.

LONGi recommends that the installation angle of the modules should not be less than 10°, so that rain can easily wash away dust from the module surface and reduce the frequency of cleaning. In addition, accumulated water can easily drain away, avoiding water spots on the glass surface, which can further degrade the appearance and performance of the modules.

LONGi modules connected in series must be installed with the same orientation and tilt angle. Different module orientations and tilt angles can result in different sunlight reception and therefore different power generation. In order to achieve maximum annual production output, the optimal orientation and tilt angle of the solar modules in the installation area must be selected so that sunlight reaches the modules even on the shortest day of the year.

When LONGi modules are used in an off-grid system, the tilt angle should be calculated based on the seasons and irradiation to maximize the output power. If the output power of the modules can meet the input load even during the worst irradiation period of the year, the modules will be able to meet the load for the whole year. When LONGi modules are used in an on-grid system, the tilt angle should be calculated based on the principle of maximizing the annual output power.

5 Mechanical installation

5.1 General requirements

- Make sure that the mounting method and mounting structure are strong enough to withstand the expected load.

  requirements, which is the fundamental responsibility of the installer of the photovoltaic system. The mounting bracket system is designed for static mechanical

  An independent testing institution with analytical capacity must test and verify local, national or international

  in accordance with standards.

- The mounting structure must be made of durable, corrosion-resistant and UV-resistant materials.
- The modules must be firmly attached to the bracket.
- In regions with heavy snowfall in winter, the height of the mounting system must be adjusted so that the lower edge of the module is not covered by snow. In addition, it must be ensured that the lower part of the module is not shaded by plants, trees, or

  Don't let flying sand and gravel hurt you.

- If the modules are mounted on brackets parallel to the roof or wall, the minimum distance between the module frame and the roof/wall must be 10

  cm, which promotes air flow and thus better module performance. Before installing the modules on the roof

  Make sure the building is suitable for installation. Also, ensure proper sealing to prevent leaks.

  for the sake of.

- Module frames can exhibit thermal expansion and cold contraction. Therefore, the minimum distance between two adjacent modules must be at least 10 mm (0.39 inches).
- Make sure that the back of the modules does not come into contact with brackets or building structures that could penetrate the inside of the modules, especially if pressure is applied to the module surface.
- The maximum static load of the solar module is 5400 Pa of clamping force and 2400 Pa of lifting force, which varies depending on the modules (please refer to the following installation guide); the load described in the manual refers to the test load.
- Note: When calculating the appropriate maximum load based on the installation requirements of IEC 61215 – 2016, a safety factor of 1.5 must be taken into account when calculating the load in accordance with local laws or regulations.
- The modules can be mounted horizontally or vertically. When installing the components, be careful not to cover the drainage hole in the frame.

5.2 Mechanical installation of a single-sided assembly

The module and the support structure can be connected using mounting holes, clamps or embedded systems. The installation is carried out according to the following presentation and recommendations.
must be done properly. If the installation method is different from this, please contact LONGi customer service for approval. Otherwise, the modules may be damaged and the limited warranty will be voided.

5.2.1 Screw fastening

LONGi modules come standard with 8 mounting holes that fit M8 screws (marked with a blue dashed frame in the figure below, referred to as the inner four holes and the outer four holes according to their location); Type 72 and some Type 66 modules have an additional 4 mounting holes that fit M6 screws (marked with a red circle in the figure below, referred to as 400mm holes for short), which are used to interface with NEXTracker and other manufacturers' tracking console systems. Use screws to secure the modules to the console through the mounting holes in the rear frame. See Figure 4 for details.

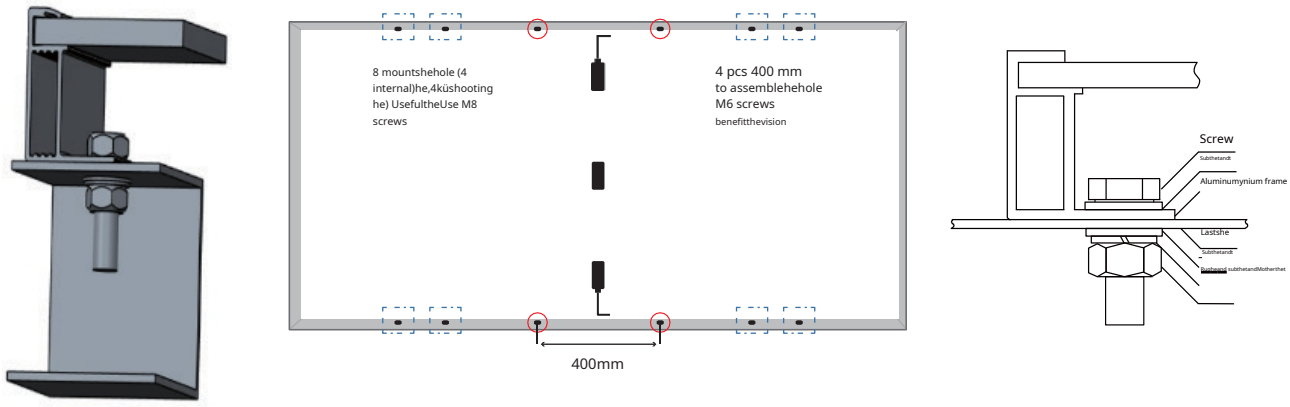


Figure 4: Installing screws for single-sided modules

Recommended accessories are:

Accessories	Model		Material	Comment
Screw	M8 (full thread recommended)	M6 (full thread recommended)	Q235B/SUS304	Accessories the material selection they are environment.
Washer	2 pcs, thickness ⩾1.5 mm, outer diameter = 16 mm	2 pcs, thickness ⩾1.5 mm and outer diameter =12–16 mm	Q235B/SUS304	
Spring washer	8	6	Q235B/SUS304	
Nut	M8	M6	Q235B/SUS304	

Recommendation: (1) Tightening torque range for M8 screws: 12–16 N•m; tightening torque range for M6 screws: 12–16 N•m.

torque range: 8–12 N•m;

(2) When using LONGi 30mm (30H) height frame module, it is recommended to choose fasteners with length L ⩽ 20mm. (For special models, please contact LONGi customer service);

5.2.2 Clamp

The module can be mounted with a special clamp as shown in Figure 5.
The clamp must not come into contact with the glass or deform the frame under any circumstances. The contact surface between the clamp and the front surface of the frame must be smooth and flat to avoid damage to the frame or other components.

Make sure that the clamps do not cast a shadow on these parts.
The module drainage holes should not be blocked by the clamps.

For framed PV modules, the clamp should provide an 8–11 mm overlap with the module frame (this can be changed the cross-section of the clamp, if the module is securely mounted). For frameless solar modules, the clamp must overlap the module by a maximum of 15 mm. The tightening torque must be in accordance with the mechanical design standard and the screw type used by the customer, for example: M8: 14–18 N•m.

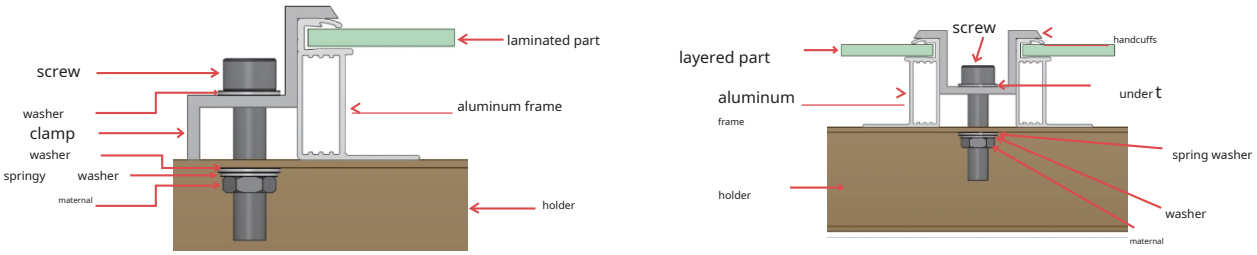
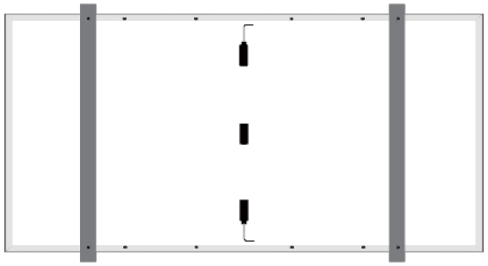


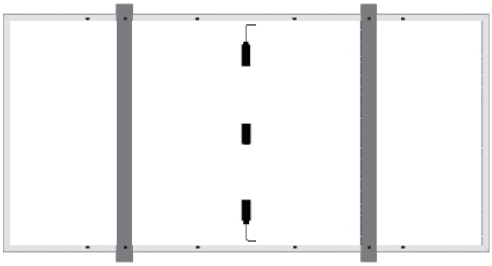
Figure 5: Attaching a single-sided module

5.2.3 Mounting and mechanical loading of a single-sided module

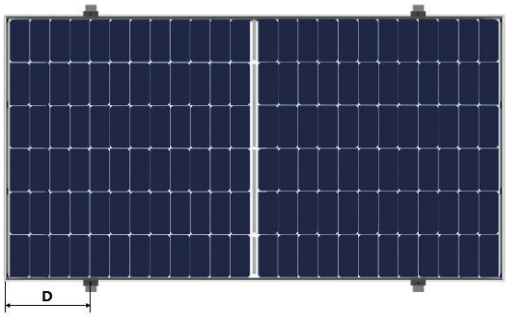
Single-sided modules can be mounted with screws or clamps. The mounting method and maximum load are shown below (in the table below, the distance and length are measured in millimeters (mm) and the pressure is measured in pascals (Pa)).



Küshootinghenandholenewscrew rhesteamytands A rhe steamythe andythe length ofnewframe is crossed.



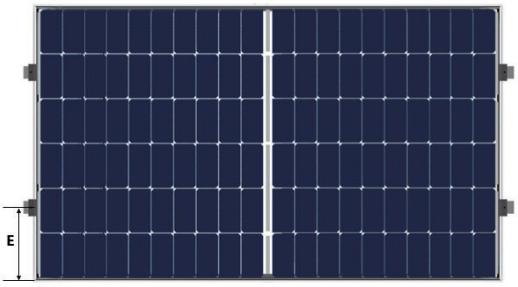
Interiorhenandholenewscrew rhesteamytands A rhesteamyt he andythe length ofnewframe is crossed.



- and timesythewith a knifeheforandnherhesteamytandand

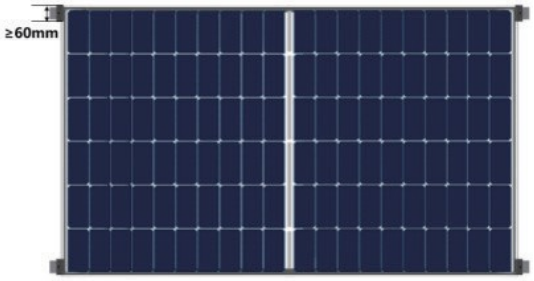
Thehesteamytheandythe length ofnewframe intersect.

(clamp length ⩾ 50 mm)



rhesteamytheclamps A rhesteamytheandy for the pricehevid frame intersects.

(clamp length ⩾ 50 mm)



The timeythedamageheThey are mounted on the corners of the vid frame.

(clamp length ⩾ 60mm, the clamp and the frame ⩾ 9 mm)

Figure 6: Mounting single-sided modules – appendix

Maximum test load for framed single-sided modules:

Moduleypus / Colonyytandski mhedessert		Screwdriverhesteamytandand		Hairsytheto beheforandnherhesteamytandand					
		Thehesteamytheandythe length ofnew crosses on frame onetheeven		Thehesteamytheandythe length ofnewthey cross each other on a frametheeven				Thehesteamytheandyto the rhefun frame	The clamps are rhefun frame
		Küshootinghenandso hole	Interiorhenandholenew	1/4L-50 ⩽ D ⩽ 1/4L+50	250 ⩽ D ⩽ 350	300 ⩽ D ⩽ 450	400 ⩽ D ⩽ 500	150 ⩽ E ⩽ 250	
50/54/60/66 cellsthes, framed, single-sided modules	LR4-50HPH-***M	±2400	+ 5400,-2400	+ 5400,-2400	/	/	/	±2400	/
	LR4-60HPH-***M	±2400	+ 5400,-2400	+ 5400,-2400	/	/	/	±2400	/
	LR4-60HPB-***M	±2400	+ 5400,-2400	+ 5400,-2400	/	/	/	±2400	/
	LR4-60HIH-***M	±2400	+ 5400,-2400	+ 5400,-2400	/	/	/	±2400	/
	LR4-60HIB-***M	±2400	+ 5400,-2400	+ 5400,-2400	/	/	/	±2400	/
	LR4-66HP-***M	+ 5400,-2400	±2400	/	/	+ 5400,-2400	/	±2400	/
	LR4-66HPH-***M	+ 5400,-2400	±2400	/	/	+ 5400,-2400	/	±2400	/
	LR4-66HIH-***M	+ 5400,-2400	±2400	/	/	+ 5400,-2400	/	±2400	/
	LR5-54HPH-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-54HPB-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-54HIH-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-54HIB-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-54HNB-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-54HTH-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-54HTB-***M	±2400	+ 5400,-2400	/	+ 5400,-2400	/	/	±2400	+ 2400/-1800
	LR5-66HPH-***M	+ 5400,-2400	±2400	/		+ 5400,-2400	/	±1800	±1600
	LR5-66HIH-***M	+ 5400,-2400	- 2400	/		+ 5400,-2400	/	±1800	±1600
72 cellsthes, framed, single-sided module	LR4-72HPH-***M	+ 5400,-2400	±2400	/	/	+ 5400,-2400	/	/	/
	LR4-72HIH-***M	+ 5400,-2400	±2400	/	/	+ 5400,-2400	/	/	/
	LR5-72HPH-***M	+ 5400,-2400	±2400	/	/	/	+ 5400,-2400	/	/
	LR5-72HIH-***M	+ 5400,-2400	±2400	/	/	/	+ 5400,-2400	/	/
	LR5-72HTH-***M	+ 5400,-2400	±2400	/	/	/	+ 5400,-2400	/	/

LONGi single-sided modules are compatible with common mounting systems in the industry. The module load ratings for common mounting systems are as follows. For other special mounting systems not listed in the table below, please contact LONGi customer service.

Module type	Compatible brackets	Fixing fittings	Test load (Pa)
LR4-72HPH-***M LR4-72HIH-***M	NEXTracker NX Horizon (1P)	Short Rail V2.3 4×bobtail (M6 head externalhediameterhe16.8 mm) (400 mm holes)	±2400
		Short - rail V2.4 4×bobtail (M6 head externalhediameterhe16.8 mm) (400 mm hole position)	+ 1200, -2400
		Short rail V2.4 + megerhe4×bobtail (M6 head external)hediameterhe(16.8 mm) (400 mm holes)	±2400
	ATI DuraTrack™ HZ trackerhesystem (1 pc)	Hi-rise 300mm clamp② Drawthem: 20822	±1500
		High 400 mm hairsytheDrawthem: 20834	±1600
		600 mm wideythe Drawthem: 20715	±2800
	Arctech vyhorizontal single-axis sunheto sowheSkySmart2 (2P)	3214 mmyn + 900 mmthetooheand stiffytheM8 screw + M8 plain nutthetandt (küshootinghe/she/ittmandrhe =16 mm) Drawingthem: SZ0598640 + ZC9001740 990 mm holes are locatedandneither	±2000
	Soltec SF7 single-axis solar panelheto sowhe (2P)	2530 mm - andyn M6 screw + M6 plain nutthetandt (küshootinghe/she/ittmandrhe =18 mm) Drawingthem: SF7-MR-06- 091 Rev.D00 400 + 1300 mm hole positionycihe	+ 1200, -1800
LR5-66HPH-***M LR5-66HIH-***M	NEXTracker NX Horizon (1P)	Short rail V2.4 + megerhe4×bobtail (M6 head external)hediameterhe16.8 mm) (400 mm hole position)	±2400
LR5-72HPH-***M LR5-72HIH-***M LR5-72HTH-***M	NEXTracker NX Horizon (1P)	Short rail V2.4 + megerhewith 4 short pins (M6 head, externalhediameterhe 16.8 mm) (400 mm holes)	±1800

① NEXTracker Short Rail V2.3 is in the pipeline.
② LONGi recommends that the maximum torque value for screws used on the ATI Hi-rise 300mm is 19 N•m.
The load data in this section is based on the results of sandbag pressure tests conducted by LONGi or independent certification organizations. The test uses sandbags weighing up to 10 kg each, evenly distributed over the surface of the module.

5.3 Mechanical installation of a double-sided module

The modules and the mounting system can be connected by screws, clamps or built-in systems. The installation should be carried out according to the following presentation and recommendations. If the installation method is different from this, please contact LONGi for approval.

Otherwise, the modules may be damaged and the quality guarantee will be void.

5.3.1 Screw fastening

LONGi modules come standard with 8 mounting holes that fit M8 screws (marked with a blue dashed frame in the figure below, referred to as the inner four holes and the outer four holes according to their location); Type 72 and some Type 66 modules have an additional 4 mounting holes that fit M6 screws (marked with a red circle in the figure below, referred to as 400mm holes for short), which are used with products from tracking console systems from manufacturers such as NEXTracker. Use screws to secure the modules to the console through the mounting holes in the rear frame. See Figure 7 for details. A indicates the overlap area between the module frame and the console.

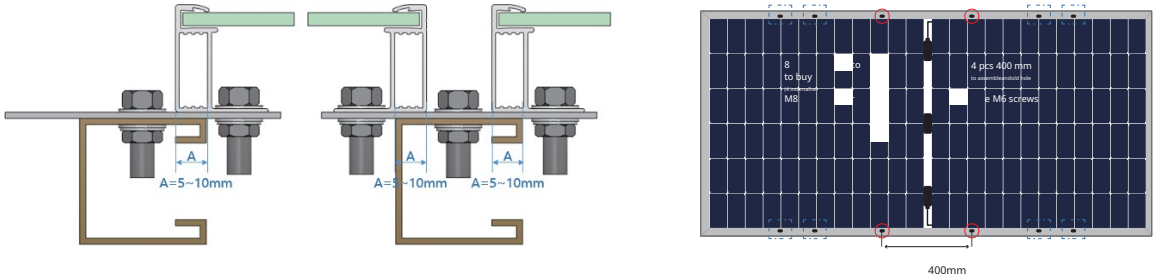


Figure 7: Screw mounting of a double-sided module

The recommended accessories are as follows:

Accessories	Model		Material	Comment
Screw	M8 (full thread recommended)	M6 (full thread recommended)	Q235B/SUS304	Accessories the material selection they are environment.
Washer	2 pcs, thickness ⩾1.5 mm and outer diameter = 16 mm	2 pcs, thickness ⩾1.5 mm and outer diameter =12–16 mm	Q235B/SUS304	
Spring washer	8	6	Q235B/SUS304	
Nut	M8	M6	Q235B/SUS304	

Recommendation: (1) Tightening torque range for M8 screws: 12–16 N•m; tightening torque range for M6 screws: 12–16 N•m.

torque range: 8–12 N•m;

（2）When using LONGi 30mm (30H) height frame module, it is recommended to choose fasteners with length L ⩽ 20mm. (For special models, please contact LONGi customer service);

5.3.2 Installing clamps

Special clamps are used to mount the modules, as shown in Figure 5. The clamp must not come into contact with the glass or deform the module frame. The mating surface of the clamp and the front side of the frame must be flat and smooth to prevent damage to the frame and module.

Make sure that there are no shadows caused by the mounting clips on these.

The module drainage holes must not be blocked by the clamps. For framed solar modules, the clamp must overlap the module frame by at least 8 mm (0.32 in) and no more than 11 mm (0.43 in). The cross-section of the clamp can be adjusted if the

module is securely fastened. For frameless PV modules, the clamp should overlap the module frame by a maximum of 15 mm (0.59 in). The torque value used should be based on the mechanical design standard and the screw type used by the customer, for example: M8: 14–18 N•m.

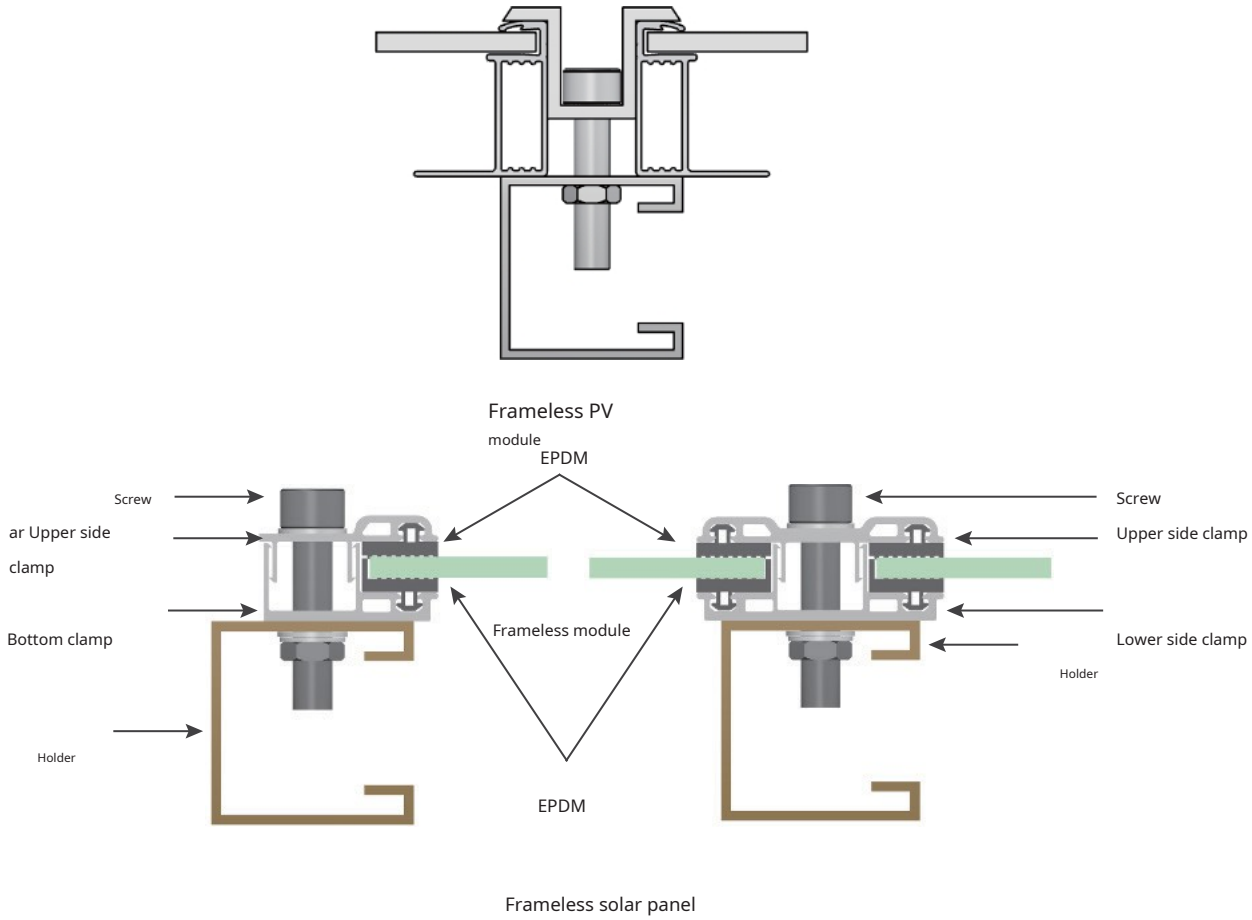
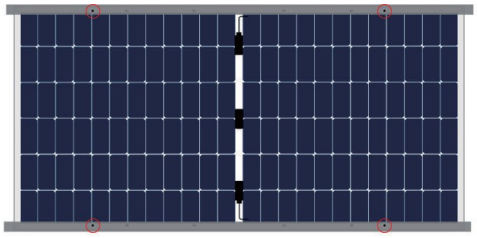


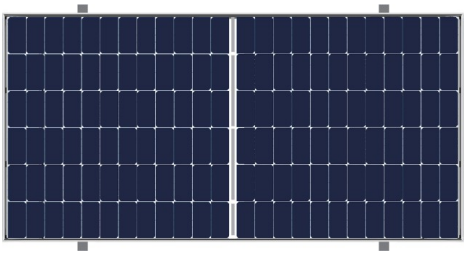
Figure 8: Attaching a double-sided module

5.3.3 Mounting and mechanical loading of a double-sided module

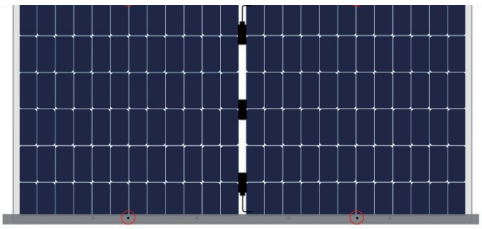
Double-sided modules can be mounted with screws or clamps. The mounting method and maximum load are shown below. (In the table below, the distance and length are measured in millimeters (mm), and the pressure is measured in pascals (Pa)).



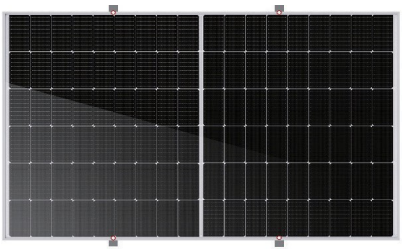
External four-hole screw mounting The mounting rails are parallel to the long frame.



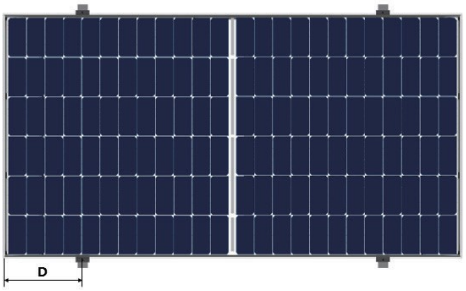
External four-hole screw mounting The mounting rails run crosswise on the long frame.



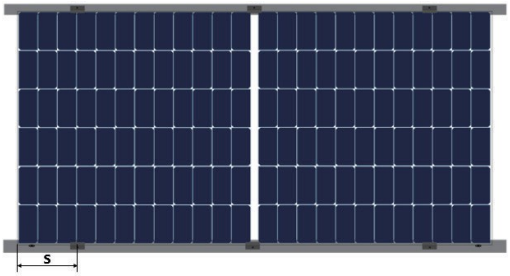
Internal four-hole screw fixing The fixing rails are parallel to the long frame.



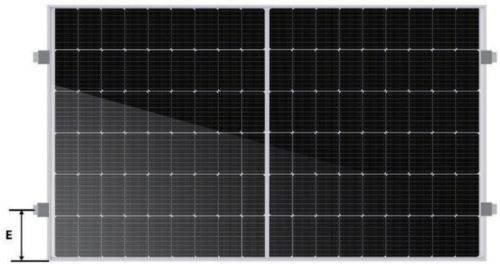
Interiorhenandholenewscrew rhesteamytands A rhesteamyt he andythe length intersectsnewframe.



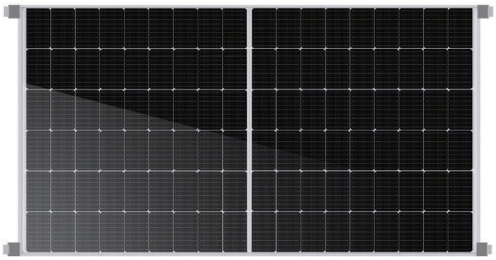
Installation of framed module with fixtures on long sides
(the beam is perpendicular to the long sides)
(clamp length ⩾40 mm)



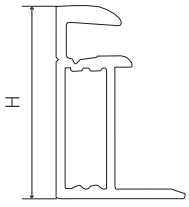
Clamps Assembly A
Mounting rails cross the long frame.
(clamp length ⩾40 mm)



Installing clamps A
The mounting rails cross each other on the short frame.



The clamps are mounted on the corners of the short frame.



Aluminum frame height (H)

Figure 9: Installing double-sided modules – appendix

Maximum load of framed double-sided modules:

Module type / Installation method		Screw fastening		Clamping		
		The mounting rails cross each other on the long frame		The fixing rails are long crosses on frame each other	The mounting rails cross the short frame	The clamps on the corners of the short frame are equipped
		/		clamp length ⩾50 mm	overlap between clamp and frame ⩾10 mm, clamp length ⩾50 mm	clamp and frame overlap ⩾10 mm, clamp length ⩾50 mm
		External four-hole	Internal four-hole	250⩽D⩽350	150⩽E⩽250	/
54 cells, framed, double-sided module	LR5-54HIBD-***M	±2400	+ 5400,-2400	+ 5400,-2400	±2400	+ 2400,-1800
	LR5-54HIBB-***M	±2400	+ 5400,-2400	+ 5400,-2400	±2400	+ 2400,-1800
	LR5-54HABD-***M	±2400	+ 5400,-2400	+ 5400,-2400	±2400	+ 2400,-1800
	LR5-54HABB-***M	±2400	+ 5400,-2400	+ 5400,-2400	±2400	+ 2400,-1800

Module type / Installation Method		Screw fastening			Fixing clamps				
		The mounting rails the long frame intersect	The mounting rails are parallel to the with a long frame.		The mounting rails are crosswise they run the long on the frame.		The mounting rails are parallel to the long frame.		
		External four-hole	External four-hole	Internal four-hole	350 ⩽ D ⩽ 450	400 ⩽ D ⩽ 500	350 ⩽ D ⩽ 450	400 ⩽ D ⩽ 500	1/4L-50 ⩽ D ⩽ 1/4L+50
60/66 cell, framed, double-sided module	LR4-60HBD-***M（30H）	/	±2400	+ 5400,-2400	/	/	/	/	+ 5400,-2400
	LR4-60HIBD-***M	/	±2400	+ 5400,-2400	/	/	/	/	+ 5400,-2400
	LR5-66HBD-***M	+ 5400,-2400	+ 3600,-2400	±2400	+ 5400,-2400	/	+ 3600,-2400	/	/
	LR5-66HIBD-***M	+ 5400,-2400	+ 3600,-2400	±2400	+ 5400,-2400	/	+ 3600,-2400	/	/
72-cell, framed, double-sided module	LR4-72HBD-***M（35H）	/	+ 5400,-2400	±2400	/	/	/	/	+ 5400,-2400
	LR4-72HIBD-***M	/	+ 5400,-2400	±2400	/	/	/	/	+ 5400,-2400
	LR5-72HBD-***M	+ 5400,-2400	+ 3600,-2400	±2400	/	+ 5400,-2400	/	+ 3600,-2400	/
	LR5-72HIBD-***M	+ 5400,-2400	+ 3600,-2400	±2400	/	+ 5400,-2400	/	+ 3600,-2400	/
	LR5-72HND-***M	+ 5400,-2400	+ 3600,-2400	±2400	/	+ 5400,-2400	/	+ 3600,-2400	/
	LR5-72HTD-***M	+ 5400,-2400	+ 3600,-2400	±2400	/	+ 5400,-2400	/	+ 3600,-2400	/

LONGi double-sided modules can be combined with common industry support systems. The compatibility test load is as follows (for information on other support systems not listed or specified in the table below, please contact LONGi customer service).

Module type	Compatible brackets	Mounting parts	Test load (pa)
LR4-72HBD-***M LR4-72HIBD-***M	NEXTracker NX Horizon (1P)	Short Rail V2.4 4×bobtail (M6 head externalhediameterhe16.8 mm) (400 mm holes)	±2400
	ATI DuraTrack™ HZ trackhesystem (1 pc)	Hi-rise 300mm clamp② Drawthem: 20822	±1500
		High 400 mm hairsytheDrawthem: 20834	±1500
		600 mm wideytoh +80 mm widey themül Drawthem: 20908	±2400
		600 mm wideythe Drawthem: 20715	±2800
		850 mm wideytoh +hairsythemül 80 mm Drawingthem: 20904	±3000
	Arctech vyhorizontal single-axis sunheto sowheSkySmart2 (2P)	3214 mmyn + 900 mmthetooheand stiffythe M8 screw + M8 plain nutthetandt (küshooting he/she/ittmandrhe =16 mm) Drawingthem: SZ0598640 + ZC9001740 990 mm holes are locatedandneither	±2400
	Soltec SF7 single-axis solar panelheto sowhe (2P)	2530 mm - andyn M6 screw + M6 plain nutthetandt (küshootinghe/ she/ittmandrhe =18 mm) Drawingthem: SF7- MR-06- 091 Rev.D00 400 + 1300 mm hole positionycihe	±1800
LR5-66HBD-***M LR5-66HIBD-***M	NEXTracker NX Horizon (1P)	Short - rail V2.4 4×bobtail (M6 head externalhediameterhe(16.8 mm) (400 mm holes)	±2400
LR5-72HBD-***M LR5-72HIBD-***M LR5-72HND-***M LR5-72HTD-***M	NEXTracker NX Horizon (1P)	Short - rail V2.4 4×bobtail (M6 head externalhediameterhe16.8 mm) (400 mm holes)	±2100
		Short RailV2.4 + 990 mm extensionherail 8× bobtail (M6 head external)hediameterhe16.8 mm) 400+990 mm hole position	±2400
	ATI DuraTrack™ HZ trackerhesystem (1 pc)	300 mm high clamp② Drawthem: 20822	±1200
		400 mm high hairsytheDrawthem: 20834	±1200
		600 mm wideytoh +80 mm widey themül Drawthem: 20908	±1900
		850 mm wideytoh +80 mm widey themül Drawthem: 20904	±2400
		1400 mmyn Draw them: 20916	±3600
	Arctech vyhorizontal single-axis sunheto sowheSkyline (1P)	450 mm - andyn M6 screw + M6 plain nutthetandt (küshootinghe/ she/ittmandrhe =18 mm) Drawing No.them: 300010141 400 mm holes are locatedandneither	±1800
		1040 mm - andyn M8 screw + M8 plain nutthetandt (küshooting he/she/ittmandrhe =16 mm) Drawing - nothem: 300010142 990 mm holes are locatedandneither	±2400
		1450 mm - andyn M8 screw + M8 plain nutthetandt (küshooting he/she/ittmandrhe =16 mm) Drawing No.them: 300010143 1400 mm holes are locatedand neither	±3600
	PV Hardware Omega-400 （1P）	428 mm - andyn M6 screws + M6 nutsthetandt (küshootinghe/she/ ittmandrhe =18mm) Drawthem: MC_PR_Omega60x1_Oct_M6_S355_ ZM310_400 400 mm holes are locatedandneither	±1800
	Arctech horizontal single-axis sunstoneheSkysmart2 (2P)①	2786 mm - andyn400 mm holes: M6 screw + M6 plain nutthetandt (küshootinghe/she/ittmandrhe = 18 mm) 990 mm holes: M8 screw + M8 plain nutthetandt (küshootinghe/she/ittmandr he =16 mm) Drawingthem: SZ0598240 400+990 mm holes are locatedandneither	+ 1800/-1600
		3376 mm - andyn + 900 mm - M8- screw + M8 plain nutthetandt (küshootinghe/she/ ittmandrhe =16 mm) Drawingthem: SZ0598340+ZC9001740 990 mm holes are locatedandneither	+ 2200/-2000
		3786 mm - andyn + 900 M8 screw + M8 plain nutthetandt (küshootinghe/ she/ittmandrhe =16 mm) Drawingthem: SZ0598440+SZ0598440 1400 mm holes are locatedandneither	+ 2600/-2200
	Soltec SF7 uniaxial sunstonehe (2P)①	2832 mm - andyn M6 screw + M6 plain nutthetandt (küshootinghe/she/ittm andrhe = 18 mm) Drawingthem: SF7-MR-06-064 Rev.P00 400 + 1400 mm holes are locatedandneither	±1800

① The modules are being updated, please contact LONGi Solar customer service before selecting trackers.

② LONGi recommends that the maximum torque value for screws used in the ATI Hi-rise 300mm system be 19 N•m.

The load data in this section is based on the results of sandbag pressure tests conducted by LONGi or independent certification organizations. It is recommended to use sandbags weighing no more than 10 kg during the test to ensure uniform load on the module surface.

6 Electrical installation

6.1 Electrical power

Electrical characteristics are within ±3% of the indicated values for Isc, Voc and Pmax at STC (1000 W/m2irradiation,25℃ cell temperature and AM1.5 spectrum).

If the modules are connected in series, the series voltage is the sum of the voltages of all the modules in a series. If the modules are connected in parallel, the current is the sum of the currents of each module, as shown in Figure 10 below. Modules with different electrical ratings cannot be connected in a series.

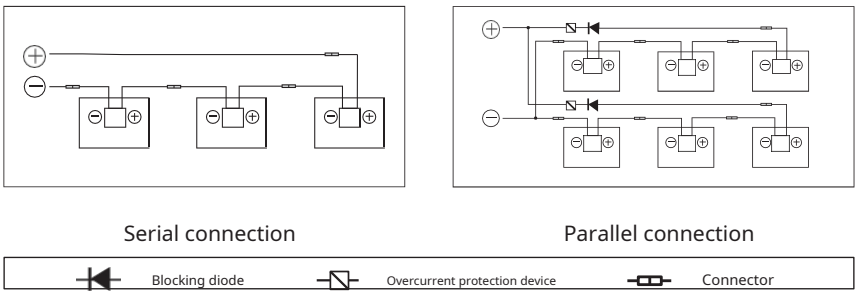


Figure 10. Series and parallel connection diagram

The maximum number of modules allowed in series connection should be calculated according to the relevant regulations. The open circuit voltage value measured at the lowest expected temperature shall not exceed the maximum system voltage value allowed by the modules and other values required by the DC electrical components. (The maximum system voltage of LONGi modules is DC1000V/ DC1500V - the actual system voltage is designed based on the selected module and inverter model.)
The VOC correction value can be calculated using the following formula.

$C_{Vocabulary} = 1-\beta Voc\times(25-T)$

T: The lowest expected temperature of the installation location.

β: VOC temperature coefficient (% /℃) ((See module datasheet for more details)

If the reverse current flowing through the module exceeds the maximum fuse current, use an equivalent fuse to protect the module.
If the number of parallel connections exceeds 2, each module series must have an overcurrent protection device.

6.2 Cables and wires

The IP67 rated solar junction boxes provide safety protection for connecting cables and wires and protecting uninsulated electrical components from contact. Two separate wires are connected to the junction box for each module: one for the negative pole and the other for the positive pole. Two modules can be connected in series by plugging one end of the wire from one module into the negative pole of the adjacent module.

Appropriate cables and connectors must be used in accordance with local fire, building and electrical regulations; the electrical and mechanical properties of the cables must be ensured (the cables must be placed in a sheath with anti-UV, anti-aging properties and, if exposed to air, the cable itself must also have anti-UV, anti-aging properties).

The installer must only use single-core cable with a minimum cross-section of 4 mm^2 (12 AWG), 90°Ctemperature range works and has adequate insulation capacity to withstand the maximum open circuit voltage (e.g. EN50618 approval). The voltage drop must be reduced by using appropriate wiring by selecting specifications.

LONGi requires that all wiring and electrical connections must comply with the relevant national electrical standards. When securing cables to the bracket, be careful not to damage the cables or modules. Do not forcefully press the cables. Use UV-resistant cable ties and mounting clips to secure the cables to the bracket. Although the cables are UV-resistant and waterproof, direct sunlight and immersion in water should be avoided.

The minimum allowable bending radius of the cables should be 43 mm (1.69 inches).

6.3 Connector

Please keep the connectors clean and dry. Before connecting, make sure the connector caps are attached. Do not connect the connectors under improper conditions, such as wet, dirty or other extreme situations. Avoid exposing the connectors to direct sunlight, submerging them in water, or dropping them on the ground or roof.

Incorrect connection may cause electric arcing and electric shock. Please make sure that all electrical connections are reliable. Make sure that all connectors are fully secured.

Only connectors from compatible models from the same manufacturer can be connected together. If in any doubt, please contact LONGi customer service.

6.4 Bypass diode

The bypass diode in the LONGi solar module junction box is connected in parallel with the cell string. When a hot spot occurs, the diode will operate to prevent the main current from flowing through the hot spot cells, thus preventing the module from overheating and reducing power. Note: the bypass diode is not an overcurrent protection device.

If the diode is proven or suspected to be defective, the installer or system maintenance person should contact LONGi. Please do not attempt to open the module junction box by yourself.

6.5 PID protection and inverter compatibility

① Photovoltaic modules can exhibit potential induced degradation (PID) under high humidity, high temperature and high voltage. Modules can exhibit potential induced degradation (PID) under the following conditions:

- ◇ Installation of photovoltaic modules in hot and humid weather conditions.
- ◇ The installation location of the solar modules is in a permanently humid environment, for example when used on a water surface.

② To reduce the risk of PID, it is recommended to ground the negative pole at the DC connection point of the modules. The following PID protection measures are recommended at the system level:

- ◇ In the case of an isolated PV inverter, the negative pole of the DC connection side of the PV modules can be directly grounded.
- ◇ For non-isolated PV inverters, an isolated transformer must be installed before applying a virtual grounding method to the inverter.

7 Grounding

The modules are designed with a frame made of tarnish-resistant, anodized aluminum alloy to ensure rigidity. For safety reasons and to protect the modules from lightning strikes and electrostatic damage, the module frame must be grounded.

The grounding device must fully contact the inner surface of the aluminum alloy and penetrate the surface oxide layer of the frame.

Do not drill additional grounding holes in the module frame.

The grounding conductor or wire may be copper, copper alloy or any other material acceptable as an electrical conductor under the applicable national electrical codes. The grounding conductor shall then be connected to the earth by means of a suitable grounding electrode.

There are Ø4.2 mm grounding holes on the edge of the rear frame of the module. The

The grounding hole on the frame is marked with the usual grounding symbol (it ⏚) according to IEC 61730-1, which can only be used for grounding, not for mounting the module.

The grounding between modules must be checked by qualified electricians and the grounding devices must be manufactured by a qualified electrical manufacturer. The copper core wire used for the grounding terminal is recommended to be 12 AWG. The copper wires should not be compressed during installation as they may be damaged.

Below is a recommended grounding method for LONGi modules:

- Align the grounding clamp with the mounting hole in the frame. Use a grounding screw to pull the grounding clamp through the frame.
- Place the serrated side of the washer on the other side, then tighten the nuts.
- Route the grounding wires through the grounding clamp and ensure that the material and dimensions of the grounding wire comply with local, national, and regional codes and regulations.
- Tighten the ground wire screws to complete the installation.

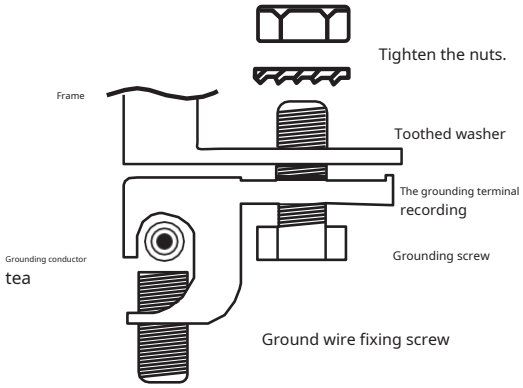


Figure 10: Solar module screw grounding method

Unused mounting holes on the modules can be used to install grounding devices.

Third-party grounding devices may be used to ground LONGi modules, but the reliability of such grounding method must be verified. The grounding device must be operated in accordance with the manufacturer's specifications.

8 Operation and maintenance

It is the responsibility of users to regularly inspect and maintain the modules, especially during the limited warranty period. If any module failure or other significant abnormality is found, it must be reported to LONGi customer service within two weeks.

8.1 Cleaning

Accumulated dirt on the glass surface of the module, such as dust, industrial wastewater and bird droppings, reduces performance and can lead to local overheating. The extent of the effect is determined by the transparency of the dirt. Small amounts of dust affect the intensity and uniformity of incoming solar radiation, but are not dangerous and usually do not significantly reduce performance.

During the operation of the modules, there should be no environmental factors that completely or partially shade the modules. These environmental factors include other modules, the module mounting system, bird nests, dust, soil or plants. These will significantly reduce the output power. LONGi recommends that the module surface should not be shaded by anything under any circumstances.

The frequency of cleaning depends on the rate of dirt accumulation. Under normal conditions, rainwater will clean the module surface and reduce the frequency of cleaning. We recommend wiping the glass surface with a sponge or soft cloth dipped in clean water. Do not use acidic or alkaline cleaning agents to clean the modules. Under no circumstances should you use a tool with a rough surface for cleaning.

To avoid the risk of electric shock or burns, LONGi recommends cleaning modules early in the morning or evening when the irradiance is low and the module temperature is low, especially in hot regions.

To avoid the risk of electric shock, do not attempt to clean modules with damaged glass surfaces or exposed wires.

8.2 External inspection of modules

Check the modules for external defects with the naked eye, paying particular attention to the following:

- Cracks in the module glass.
- Corrosion at the welding points of the main grid of cells (caused by moisture entering the module due to damage to the sealing materials during installation or transportation).
- Check for burn marks on the back of the module.
- Check the solar modules for signs of aging, including rodent damage, weather wear, tightness of connectors, corrosion, and grounding condition.
- Check that there are no sharp objects on the surface of the solar modules.
- Check for any obstacles that cast a shadow on the solar modules.
- Check for loose or damaged screws between the modules and the mounting system. If there are any, adjust and tighten them in time.

8.3 Checking connectors and cables

We recommend that you perform the following preventive inspection twice a year:

- Check the tightness of the connectors and cables.
- Check for cracks or gaps near the junction box.

9 Approval and implementation

This manual is compiled and managed by LONGi Product Management Department, which reserves the right to modify and revise the manual at any time without prior notice.

LONGi

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