LONGi User Manual

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1 Introduction

This User Manual provides information on the LONGi modules identified in Table 1 and is intended for use by system designers, installers, and maintenance personnel.

Modules are intended to be used only by qualified professionals. Unintended use of the products may void the warranty and subject you to liability.

Modules are designed to have a long operating life and high energy yield when installed, operated, and serviced in accordance with the instructions in this User Manual. Read this User Manual thoroughly before beginning any work related to installation, operation, or maintenance.

Please refer to your LONGi Module Warranty Terms & Conditions for module warranty terms and product return policies. Failure to follow this User Manual may void your warranty.

Keep this User Manual for future reference and provide to all subsequent owners or users of the solar modules. Updates may be found at www.longi.com.

Table 1 Applicable Module Type

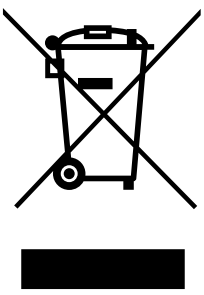
Applicable Module Type							
Serial number	Product Series	Mono-facial Module			Bifacial Module		
		Module Type	Certification Status	Note	Module Type	Certification Status	Note
1	Hi-MO7	/	/		LR7-54HGBB-xxxM*	IEC、UL	
2		/	/		LR5-72HGD-xxxM*	IEC、UL	
3		/	/		LR7-72HGD-xxxM*	IEC、UL	
4		/	/		LR8-66HGD-xxxM*	IEC、UL	
5	EcoLife	LR7-54HVB-xxxM*	IEC		LR7-54HVBB-xxxM*	IEC	
6		/	/		LR7-54HJBB-xxxM*	IEC	
7		/	/		LR7-54HJD-xxxM*	IEC	
8	Hi-MOX10	LR7-54HVH-xxxM*	IEC		LR7-54HVD-xxxM*	IEC	
9		LR7-72HVH-xxxM*	IEC		LR7-72HVD-xxxM*	IEC	
10		LR7-72HVHF-xxxM*	IEC		LR7-60HVD-xxxM*	IEC	
11		LR7-60HVH-xxxM*	IEC		LR8-66HVD-xxxM*	IEC	
12	Hi-MOS10	/	/		LR7-72HJD-xxxM*	IEC	

*xxx represents module power bin rating.

2 Laws and Regulation

PV modules should comply with national laws, local regulations and industry standards, including the requirements of the Safety Production Law, Environmental Protection Law, national standards and electricity specifications, to ensure the human safety of people and the photovoltaic module system. The specific implementation standards are mainly based on the requirements of the authority where the project is located.

LONGi PV modules comply with the following regulations and requirements in European market.

	Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new ones, the retailer is legally obligated to take back your old appliance for disposals at least free of charge. For more information, please contact LONGi under the following Email address

	Longi.WEEE.EU@longi.com
	Do NOT throw it in general waste, use the special collection points for PV panels: www.quefairedemesdechets.fr
CE	CE mark signifies that LONGi PV modules have been assessed for compliance with high standards of safety, health, and environmental protection. LONGi PV module is granted on a voluntary basis in accordance with the Low Voltage Directive 2014/35/EU, concerning electrical equipment designed for use within specified voltage limits.
UKCA	UKCA symbol indicates that LONGi PV module complies with the applicable legal, regulatory, and conformity assessment requirements on the Great Britain market.
	The double insulation symbol indicates that the LONGi PV module is designed with double or reinforced insulation to provide protection against electric shock.
	The high voltage warning symbol indicates the presence of electrical components that can pose serious risks such as electric shock and electrocution.

3 General Information

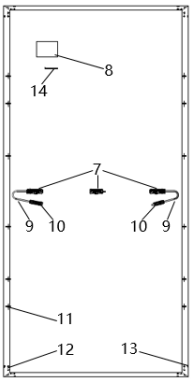
3.1 Modules Identification

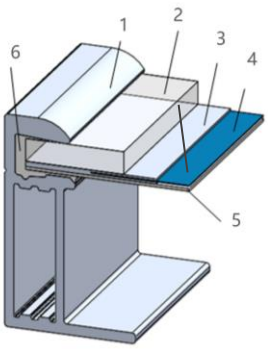
Three labels on the module contain the information below:

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

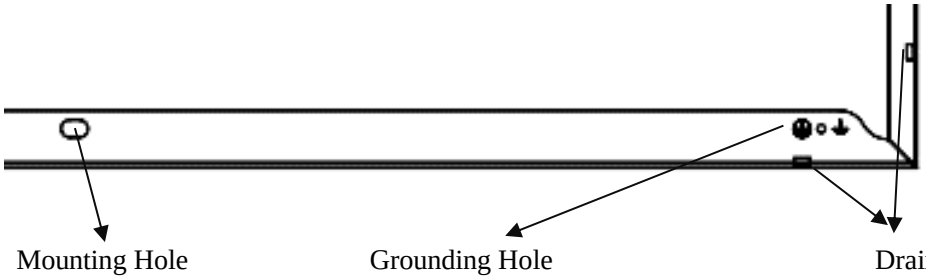
2. Current classification label: Rated working current. (H indicates High, M indicates Medium, L indicates Low)

3. Serial Number label: A unique serial number which is laminated inside the module permanently which can be found in the front of the module. There is another same serial number beside the module nameplate.





Mono-facial Modules (With Frame)

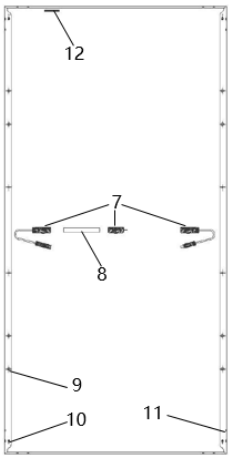


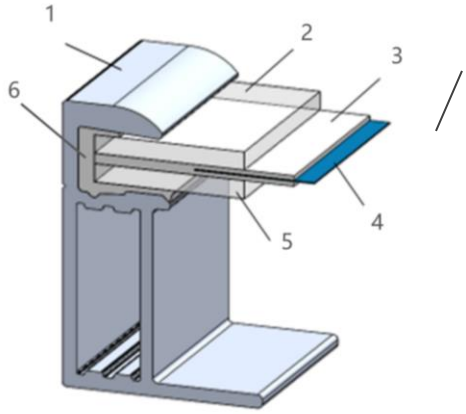
1	Frame	2	Glass	3	Encapsulant	4	Solar Cell

5	Backsheet	6	Silica Gel	7	Junction Box	8	Name Plate
9	Cable	10	Connector	11	Mounting Hole	12	Grounding Hole
13	Drain Hole	14	Bar Code				

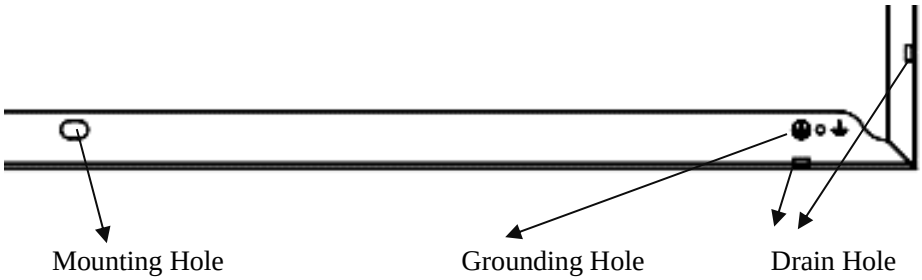
Figure 1 Typical Mechanical Drawing of Mono-facial Modules Frame details

（Please refer to section 3.2 for the location of the junction box. The specific version is subject to the corresponding specification.）





Bifacial Modules (With Frame)



1	Frame	2	Front Glass	3	Encapsulant	4	Solar Cell
5	Back Glass	6	Silica Gel	7	Junction Box	8	Name Plate
9	Mounting Holes	10	Grounding Holes	11	Drain Holes	12	Bar Code

Figure 2 Typical Mechanical Drawing of Bifacial Modules Frame details

（Please refer to section 3.2 for the location of the junction box. The specific version is subject to the corresponding specification.）

3.2 Junction box style and wiring method

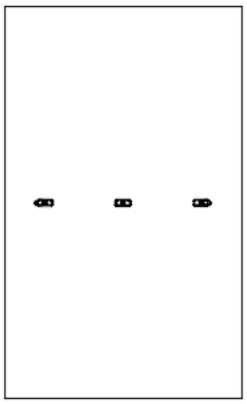
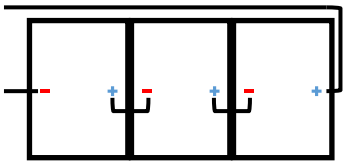
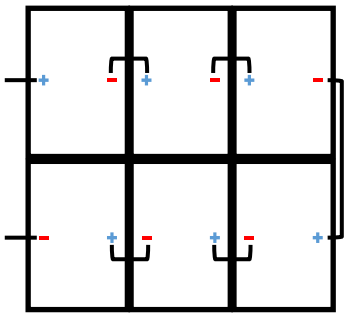
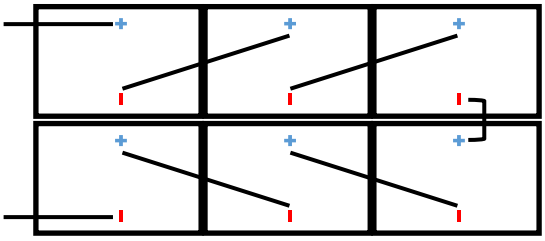
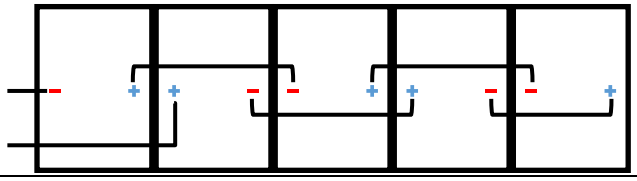
Junction Box Location	Recommended Wiring Method
	Portrait Installation: Standard Cable length   Note：The extra extended cable is required for connection at the turn-back corner of wiring as shown below.
	Landscape Installation：Cable length ≥ the length of the long cable recommended in the product datasheet 
	Portrait installation: The adjacent modules in the same row need to be rotated 180 degrees for Leap-frog installation. Cable length ≥ the length of the long cable recommended in the product datasheet 

Figure3 Junction Box Style and Wiring Method

4 Safety

4.1 Regular Safety

The application level of LONGi Solar module is Class II, which can be used in systems operating at > 50 V DC or >240 W, where general contact access is anticipated;

When the modules are for rooftop application, it is necessary to take the overall fire rating of the finished structure as well as operation and maintenance into account. The roofing PV system shall be installed after being evaluated by construction experts or engineers and with official analysis results for the entire structure. It shall be proved capable of supporting extra weight of system racking structures and PV modules.

For your safety, please do not work on the roof without required safety PPE(Personal Protective Equipment) which includes but not limited to fall protection, ladder or stair and personal protective measures.

For your safety, please do not install or handle modules in unsafe conditions including but not limited to strong wind or gust, damp or sandy roofs.

4.2 Electrical Safety

PV modules can produce DC current under sunlight. Any contact of exposed metal at module's wiring parts may result in electrical shock or burn. Any contact of 30 V or larger DC Voltage can be fatal.

In case of no connected load or external circuits, modules can still produce voltage. Please use insulation tools and wear rubber gloves when operating modules in the sunlight.

No switch is on the PV modules. Operating of PV modules can only be stopped when they are kept from sunlight or covered by hard board or UV-proof materials.

To avoid electric arc or electric shock hazards, please do not break down electric connection in loaded conditions. Incorrect connections will also lead to electric arc or shock. Keep connectors dry and clean and make sure that they are in good operating condition. Never insert other metals into the connectors or carry out electric connection by whatever means.

Snow, water or other reflective medium in surrounding environments that intensify light reflection will increase output current

and power, and module voltage and power will increase under low temperature condition.

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

Do not operate when modules are wet unless you wear PPE(personal protective equipment). Please follow the cleaning requirements in this manual when cleaning modules.

Do not contact connectors with the following chemicals: Gasoline, White Flower oil , woodlock oil, Mold temperature oil, Engine oil （such as KV46）, Grease（such as Molykote EM-50L）, Lubricating oil, Rust-proof oil, Stamping oil, Diesel, Cooking oil, Acetone, alcohol, release agent（such as Pelicoat S-6）, adhesive sheets that can generate oxime gas and potting glue（such as KE200、CX-200、chemlok）, TBP, cleaning agent etc.

4.3 Operation Safety

Open modules outer package when installation.

Do not damage the package and do not drop packaged modules on the ground.

Do not exceed the indicated maximum layer limit on the packaging carton when piling stacking modules up.

During the reversing handling of the module, make sure that the module connector is always on the inside of rear frame to prevent the connector from being squashed.

Before unpacking, please place the modules in a ventilated, dry, and rainproof site, avoid direct outdoor exposure and accompany with shading/rain shelter facilities. If it require a long term storage, please do not remove the original packaging and ensure that the original packaging is intact.

Standard storage is recommended; Especially for long-term storage, standard warehouses should be used.

Outdoor storage: waterproof facilities are required。Associate with waterproof and moisture-proof materials.

The storage environment should be kept away from water sources and weeds, and the ground should be kept

dry and well drained. On rainy days, use a rain cloth to completely cover the outer packaging of the module;

Remove the rainproof cloth when there is sunlight or wind to dry the outer packaging as soonas possible to

avoid long-term moisture.

The aluminum alloy frame of the bracket or module of the photovoltaic system may has sharp edges, so the

staff should wear appropriate protective clothing and safety helmets to avoid bumps or scratches to the

personnel. Avoid hooks, straps, threads, and other parts that can cause stumbling on the clothing or tools you

are wearing.

Follow unpacking instructions when opening packaging carton.

Carrying modules with the junction box or wires are strictly forbidden.

Do not stand or walk on modules.

To avoid glass damage, heavy objects are not allowed on modules.

Be careful when placing modules at corners in particular.

Do not try to dismantle the module or remove nameplate or parts of modules.

Do not paint or apply any other adhesive on modules.

Do not damage or scratch backsheet of modules.

Do not drill holes on the frame of module, which may reduce frame loading capacity and lead to frame corrosion and invalidation of the limited warranty provided for customers

Do not scratch anodic coating of aluminum alloy frame except for grounding connection. Scratch may lead to frame corrosion and reduce frame loading capacity and long-term reliability.

Do not repair problematic modules on your own.









4.4 Fire Safety

Please refer to local laws and regulations before installing modules and abide by requirements on building fire protection.

The roof should be coated by a layer of fireproof materials with suitable fire protection rating for roofing installation and make sure that the back sheet and the mounting surface are fully ventilated.

Different roof structures and installation modes will affect fireproof performance of buildings. Improper installation may lead to the risk of fire.

If once a PV module is on fire, the inverter should be cut off urgently to reduce the spreading. Professionals should wear insulating boots and insulating gloves with corresponding protection levels, and use a photovoltaic connector removal wrench to cut off the wires connecting the terminals of the firing modules. Notify the all people to evacuate urgently, and at the same time call the fire department for help. Before waiting for the fire department to arrive, a simple extinguishing can be carried out with a dry powder or fire sand.

To guarantee roof fire rating, the minimum distance between module frame and roof surface must be at least 10cm .(3.9 inch)

Adopt proper module accessories such as fuse, circuit breaker and grounding connector according to local regulations.

Please do not apply modules in where exposed inflammable gases are nearby.

5 Installation Conditions

5.1 Installation Site and Working Environment

The modules cannot be used in space

Do not manually focus sunlight with mirrors or magnifying glass onto modules.

LONGi modules shall be installed on proper buildings or other appropriate places (such as ground, garage, building outer wall, roof, PV tracking system) but shall not be installed on any vehicles.

Do not install modules at places that are possible to be flooded.

LONGi suggests that modules be installed in the working environment with the temperature of -40 ℃ to 40 ℃. These modules are suitable for operation under such conditions, and the operating temperature of 98% of the modules does not exceed 70 °C.

Make sure that installed modules do not suffer wind or snow pressure that exceeds the permissible maximum load limit.

Modules shall be installed in places free from shadows throughout the year. Make sure there are no light-blocking obstacles in the installation sites.

Carry out lightning protection for modules installed in places with frequent lightning and thunder.

Do not install modules in places with possible inflammable gases.

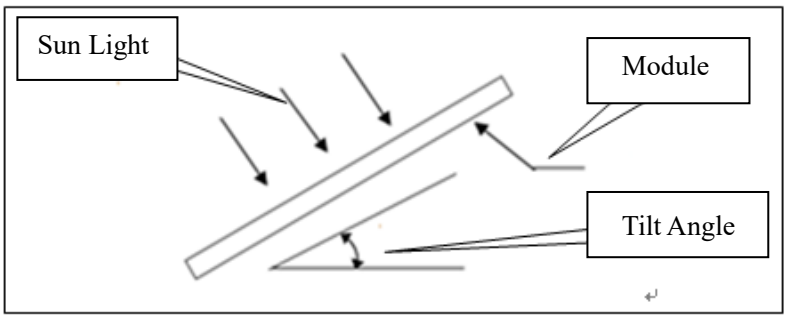
Modules cannot be used in environments with too much hails, snows, flue gas, air pollution and soot or in places with strong corrosive substances such as salt, salt mist, saline, active chemical steam, acid rain, or other substances corroding modules, affecting modules' safety or performance.

Please take protective measures to ensure reliable and safe installation of modules in severe environments such as heavy snow, cold and strong wind or islands close to water and salt mist or deserts.

LONGi modules passed the IEC 61701 salt spray corrosion test, but the corrosion may still occur where the modules frame is connected to the bracket or where the grounding is connected. LONGi modules can be installed ≥50 m away from the ocean side.

5.2 Selection of Tilt Angles

Tilt angle of PV modules refer to the included angle between module surface and horizontal ground. The module will obtain the maximum power output when directly facing the sunlight.



Modules are preferred to be south-facing in the north hemisphere and north-facing in the south hemisphere.

Please refer to standard modules installation guideline or suggestions from experienced PV module installer, for the specific installation angle.

LONGi suggests that the modules be installed at a large angle, so module surface dust can be washed away

easily by rainfall and frequency of cleaning can be reduced; For small Angle installation, it is recommended

to increase the cleaning frequency according to the actual situation to avoid long-term accumulation of large

amounts of dust, which will affect the appearance and performance of the modules.

LONGi modules connected in string should be installed with the same orientation and tilt angle. Different module orientation and tilt angle may result in different levels of solar irradiation and also power generation. In order to achieve the maximum annual generating capacity, the optimal orientation and inclination of PV modules in the installed area should be selected to ensure that sunlight can still reach to modules even on the shortest day of the year.

If LONGi modules are used in off-grid System, the tilt angle should be calculated based on seasons and irradiation to maximize the output power. If the modules output power meets the acquired load under the period of the worst irradiation in the year, the modules should be able to meet the load of the whole year. If the LONGi modules are used in grid-connected system, the tilt angle should be calculated based on the principle to maximize the yearly output power.

6 Mechanical Installation

Make sure that installation method and mounting structure are solid enough to meet the expected load-bearing requirement, which is requisite assurance from PV system installer. Installation bracket system shall be tested and inspected by the third party testing institution with static mechanical analysis capacity in accordance with local national standards or international standards.

Mounting structure shall be made from durable, corrosion resistant, UV-proof materials.

Modules shall be fixed on the bracket solidly.

In regions with heavy snowfall in winter, adjust the height of the mounting system so that the lower edge of the module is not covered by snow. Also, in order to reduce the risk of hot spots caused by flying sand and rocks damaging the module and shading, the lowest point of the module should be at a certain height to avoid the module being blocked by weeds and shrubs growing on the ground.

If modules are installed on brackets parallel to the roof, the minimum gap between the module frame and the roof/wall shall be 10cm which is good for air circulation to achieve better performance of module. Make sure the building is suitable for installation before installing modules on roof. Moreover, seal properly to prevent leakage.

The module frames can encounter thermal expansion and cold contraction. So the minimum distance between two adjoining modules shall be no less than 10 mm. The specific space interval can be calculated according to the actual installation tolerance and deformation of the mounting bracket.

Ensure that the backsheet, the front and rear glass of the module will not directly touch the mounting bracket, building structure, and environmental foreign objects (such as stones), especially under the action of external force, which will cause damage to the packaging backsheet and glass, and therefore the product warranty is invalid.

The maximum static test load that the modules can pass depends on the installation type of the modules. Please refer to the following installation methods for details. The loads described in this manual are test loads.

Note: on the basis of IEC 61215-2016 installation requirements, when computing the corresponding maximum design load, a safety factor of 1.5 need to be considered in compliance with the local laws or regulations. (Test load = design load *1.5 times safety factor)

The modules can be installed in either landscape or portrait orientation. When installing the modules, be cautious not to block the drain hole of the frame.

7 Electrical Installation

7.1 Electrical Performance

There are tolerances between the rated values of the electrical performance under STC and measured values. Including Isc, Voc and Pmax under STC (1000 W/m^2 Irradiance, a cell temperature of 25 ℃ and an AM1.5).

When modules are in series connection, the string voltage is sum of every individual module in one string. When modules are in parallel connection, the current is sum of the individual module as shown in below figure 9. Modules with different electric performance models cannot be connected in the same string.

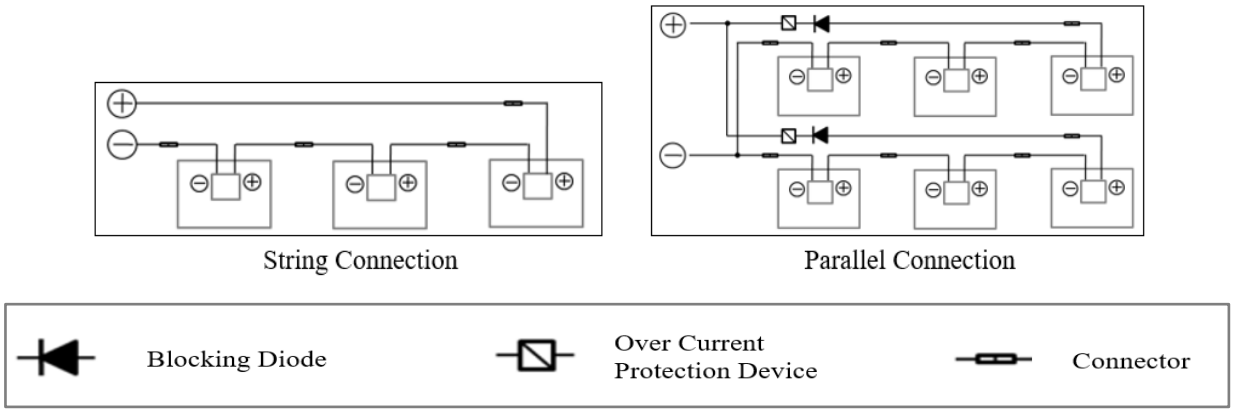


Figure 9: Series Connection and Parallel Connection Circuit Diagram

The maximum allowed quantity of modules in string connection shall be calculated according to relative regulations. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value allowed by

modules and other values required by DC electric parts. (LONGi modules maximum system voltage is DC1000 V/DC1500 V---actually system voltage is designed based on the selected module and inverter model)

The correction value of V_{OC} can be calculated by the following formula.

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

T: The expected lowest temperature of the installation site.

β: V_{OC} temperature coefficient (% /℃) (Refer to module datasheet for further detail)

If there has reverse current exceeding the maximum fuse current flowing through the module, use overcurrent protection device with the same specifications to protect the module. If quantity of parallel connection is more than 2, there must be an overcurrent protection device on each string of module.

7.2 Cables and Wiring

PV Module's junction boxes with the IP68 protective level, can provide the safety protection for cable and wiring connection, also for contact protection of non-insulating electric parts. Each module has two individual wires connecting the junction box, one is negative pole and the other is positive pole. Two modules can be in series connection by inserting the positive pole at one end of wire of one module into the negative pole of the adjoining module.

According to local fire protection, building and electrical regulation, apply proper cable and connector; ensure the electrical and mechanical property of the cables (the cables should be put in a catheter with anti-UV aging properties, and if exposed to air, the cable itself should have anti-UV aging capability).

The installer can only use single-wire cable, ≥ 4 mm^2 (12 AWG), 90 ℃ , with proper insulation capability to withstand the maximum open circuit voltage (such as EN50618 approval). Need to select appropriate wire specifications to reduce voltage drop.

LONGi requires that all wiring and electrical connections comply with the appropriate National Electrical Codes.

When cables are fixed on the bracket, avoid mechanical damaging cables or modules. Do not press cables by force. Adopt UV resistant cable ties and clamps to fix cables on the bracket. Though cables are UV resistant and water proof, it is still necessary to prevent cables from direct sun light and water immersion.

The minimum allowed bending radius of cables should be 43 mm. (1.69 inch)

7.3 Connector

Please keep connectors clean and dry. Make sure connector caps are fastened before connection.

Avoid foreign objects such as moisture, dust, and organisms from entering the connector, which may cause the connector to fail to work properly or be damaged.

If the connector is wet, it is forbidden to connect.

If the connector is contaminated, it is forbidden to connect it.

If the connector is not connected positive with negative, the connector is not waterproof.

The components need to be connected as soon as possible after installation, and the connectors should meet the requirements of IP68 (IEC60529) after the connection. If the connector cannot be connected on time or the installation place is rainy and foggy, it is recommended to add a connector protection device.

Avoid connectors from direct sun light and water immersion.

Avoid connectors falling onto ground or roof. Incorrect connection may lead to electric arc and electric shock. Please make sure that all electric connection is reliable. Make sure all connectors are fully locked.

Do not connect different connectors (brand and model) together.

7.4 Bypass Diode

LONGi solar module junction box contains bypass diode which is in parallel connection with the cell string. If hot spot occurred, the diode will come into operation to stop the main current from flowing through the hot spot cells in order to prevent module over-heated and performance loss. Note, a bypass diode is not the overcurrent protection device.

If the diode is definite or suspected to be defective, the installer or system maintenance supplier shall contact LONGi. Please do not try to open the module junction box on your own.

7.5 PID Protection and Inverter Compatibility

LONGi Solar PV modules pass the most stringent PID tests before leaving the factory, and the negative electrode of the module usually does not need to be grounded, so it can be compatible with isolated (with transformer) or non-isolated inverters.

PV modules may appear Potential Induced Degradation (PID) under high humidity, high temperature and high voltage condition. Modules may appear Potential Induced Degradation (PID) under the conditions below:

1) PV modules install under hot and humid weather condition.

2) PV modules installation site is under long-term humid environment such as water floating application.

To reduce the risk of PID, on the modules DC connection site, it is recommended to connect the negative to ground. The PID

protection measures on system level are recommended as follow

1) For isolated PV inverter, it is recommended to use the negative electrode potential lift scheme (PV/PE), the AC voltage neutral point potential lift scheme (N/PE) or the reverse bias recovery scheme.
2) For non-isolated PV inverter, isolated transformer is needed to be equipped before applying virtual grounding method for inverter.

8 Grounding

In design of modules, the anodized corrosion resistant aluminum alloy frame is applied for rigidity support. For safety consideration and to protect modules from lightning and electrostatic damage, the module frame must be grounded.

The grounding device must be in full contact with inner side of the aluminum alloy and penetrate surface oxide film of the frame.

Do not drill additional grounding holes on module frame.

The grounding conductor or wire may be copper, copper alloy, or any other material acceptable for application as an electrical conductor per respective National Electrical Codes. The grounding conductor must then make a connection to ground with a suitable ground electrode.

There are grounding holes with the diameter of Ø4.2 mm at the edge location of module's back-side frame. The grounding hole on the frame is marked with typical grounding symbol (⏚) according to IEC 61730-1 standard, which can only be used for grounding, not for module installation.

Grounding between modules shall be confirmed by qualified electricians and grounding devices shall be manufactured by qualified electric manufacturer. The copper core wire used for the grounding clamp is recommended to be 12 AWG. And copper wires cannot be pressed during installation in case of damaging.

The following is one of the recommended grounding methods of LONGi modules:

a) Align grounding clamp to the frame grounding hole. Use grounding bolt to go through the grounding clamp and frame.
b) Put the tooth side of the washer on the other side and fasten the nuts.
c) Put grounding wires through the grounding clamp and grounding wire material and dimension shall meet requirements in local national and regional law and regulations.
d) Fasten bolts of grounding wires and then installation is completed.

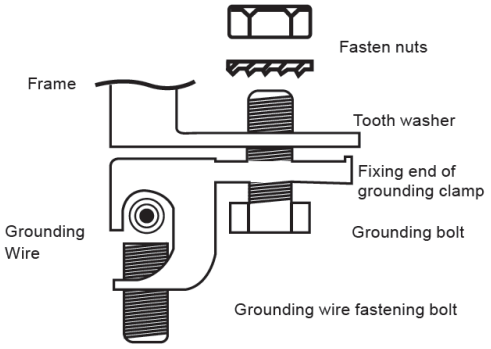


Figure 10 Bolt Grounding Method of PV Module

Mounting holes on modules that are not occupied can be used for installing grounding devices.

The third party grounding device can be used for grounding of LONGi modules but such grounding method shall be proved to be reliable. Grounding device shall be operated in line with stipulations of the manufacturer.

9 Operation and maintenance

It is the users' responsibility to carry out regular inspection and maintenance for modules, especially during the period of limited warranty. To inform the LONGi customer service personnel within two weeks when modules are found broken or other significant abnormality.

Refer to the《LONGi PV Module Operation and Maintenance Manual》for details on module maintenance.

9.1 Cleaning

Accumulated contaminants on module surface glass will reduce the power output and lead to local hot spot, such as dust, industrial wasted water and birds' droppings. The severity of influence is determined by transparency of wastes. Small amounts of dust will affect the intensity and evenness of received solar irradiation but are not dangerous and power will not be reduced remarkably generally.

During operation of modules, there shall be no environmental factors to shade modules fully or partially. These environment factors including other modules, module mounting system, birds dwelling, dust, soil or plants. These will significantly reduce output power. LONGi suggests that the module surface should not be shadowed in any case.

Frequency of cleaning depends on dirt accumulation speed. In normal situations, rainwater will clean the module surface and reduce the cleaning frequency. It is suggested to use sponge dipped with clean water or soft cloth to wipe the glass surface. Do not use acid and alkaline detergents to clean modules. Do not use tool with rough surface to clean in any case.

In order to avoid potential risk of electrical shock or burn, LONGi suggests cleaning the modules during early morning or evening with low irradiance and low modules temperature especially for the hot regions.

In order to avoid potential risk of electrical shock, do not try to clean the modules with glass damage or expose wires.

9.2 Module Appearance Inspection

Check module cosmetic defects with naked eyes, especially:

a) Module glass cracks. Special attention: avoiding rolling up sand and gravel to break the glass during the inspection of the operation and maintenance vehicles; Avoiding defects or breakage of glass caused by splashing of hard objects such as sand and gravel when using a lawn mower for weeding operations;

b) Corrosion at welding parts of the cell main grid (caused by moisture into the module due to damage of sealing materials during installation or transportation).

c) Check whether there are traces of burning mark on the module back sheet.

d) Check PV modules if any signs of aging including rodent damage, climate aging, connectors tightness, corrosion and grounding condition.

e) Check if any sharp objects in contact with PV modules' surface

f) Check if any obstacles shading the PV modules

g) Check if any loose or damage screws between the modules and mounting system. If so, adjust and fix in time.

h) Whether the component color has changed. The module uses a reflective film technology, if observed from different angles, it is a normal phenomenon that there is a color difference in the module."

i) It is normal for the module to have slight depressions due to their own weight and the effects of thermal expansion and contraction.

j) It is normal for the frame to have slight bends due to the effects of thermal expansion and contraction.

9.3 Inspection of Connectors and Cables

It is suggested to carry out the following preventive inspection twice a year:

a) Check the tightness of the connectors and cables.

b) Check if any crack or gap of silicone nearby the junction box.

10 Handling & Storage

10.1 Basic Information

LONGi PV modules shall be transported in their original packaging and in accordance with the applicable transport instructions, product labels, and project requirements. During transportation, all applicable national laws, local regulations, and relevant transport and safety standards shall be observed.

Transport personnel shall be properly trained in the handling of PV modules and shall follow the instructions in this manual to avoid module breakage, packaging damage, or other safety risks.

Table 2 PV Module Pallet and Container Loading Configuration

Module		Pallet		20GP Container		40HQ Container	
Type	Dimension (mm)	Module QTY	Dimension LWH (mm)	Pallet QTY	Total module QTY	Pallet QTY	Total module QTY
54 Cell	1800×1134×30	36	1820×1110×1246	6	216	24	864
60 Cell	1990×1134×30	36	2001×1120×1246	5	180	22	792
66 Cell	2382×1134×30	36	2396×1120×1246	4	144	20	720
72 Cell	2382×1134×30	36	2396×1120×1246	4	144	20	720

*QTY: Quantity

*GP: 20-foot general purpose container

*HQ: 40-foot-high cube container

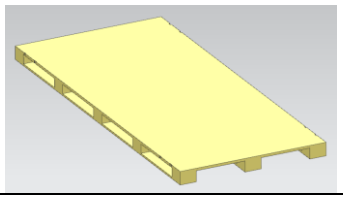
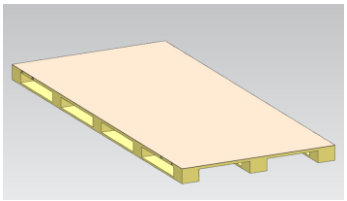
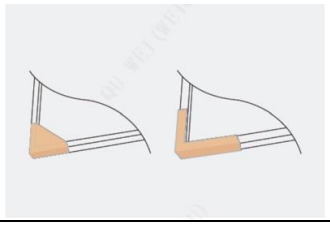
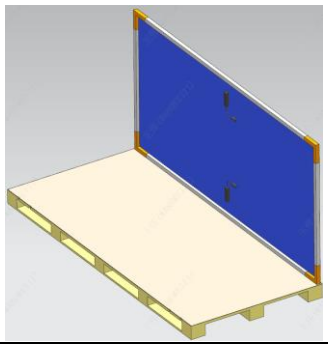
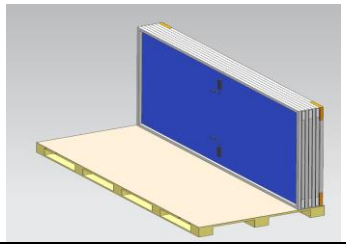
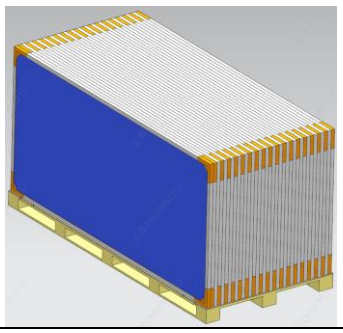
10.2 Packaging and Container Stacking Solution

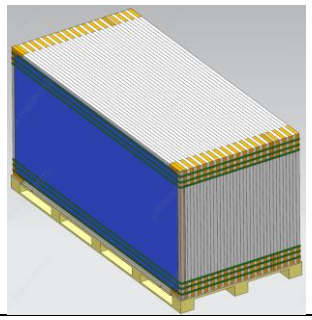
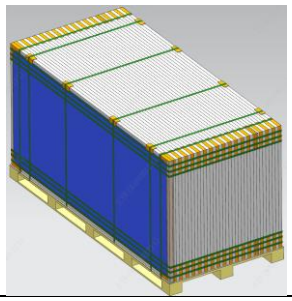
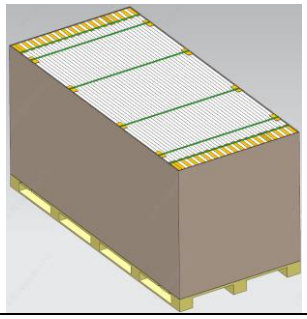
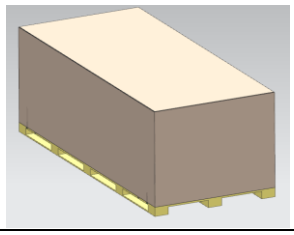
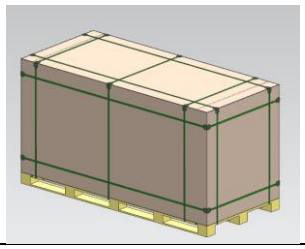
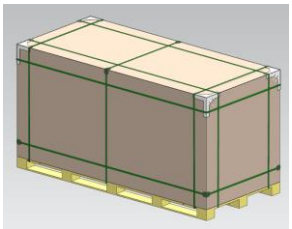
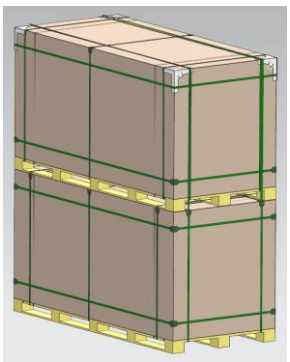
Module pallets shall be stacked strictly in accordance with LONGi packaging instructions and pallet-marking requirements.

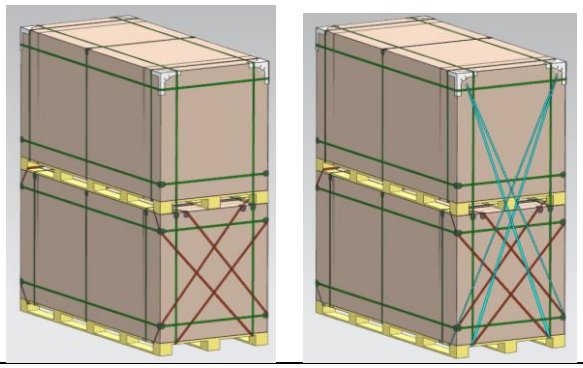
The following rules apply:

- Do not exceed the maximum permitted stacking quantity.
- Pallets shall be placed on a flat, solid, and stable surface.
- Stacked pallets shall remain vertical and stable.
- Damaged or deformed pallets shall not be stacked.
- Mixed stacking with unsuitable goods shall be avoided.

Table…PV Module Packaging and Container Stacking configuration

Step 1 Prepare the pallet	
Step 2 Cover a carton bottom panel	
Step 3 Put on the four corner protectors for modules	
Step 4 Place the first module on the pallet vertically, with the glass surfaces of facing outwards	
Step 5 Place subsequent modules one by one in the same side & direction on the pallet vertically	
Step 6 The modules on both sides have their glass surfaces of facing outwards	

Step 7 Fasten the modules with six strapping bands horizontally	
Step 8 Fasten the modules with six strapping bands vertically	
Step 9 Place the cardboard box	
Step 10 Cover the lid, and stick the shipping list and other document according to customer requirement	
Step 11 Bottom Packing: place the protector, and put more strapping bands	
Step 12 Pile up pallets, but no more than 2 layers	
Step 13 Pack upper and lower package together, and fix the lower connecting plate of the upper pallet and the lower pallet firmly with packing straps	

Step 14 Pack in “X" shapes in two short side after the stack is finished	

10.3 Loading and Unloading Requirements

Loading and unloading shall be carried out carefully using suitable equipment and trained personnel.

The following precautions shall be observed:

- Do not step, sit, stand, or place heavy objects on the module pallets or packaging.
- Do not throw, drop, drag, or roll the packaged modules.
- Use forklifts, pallet trucks, cranes, or other suitable handling equipment with adequate load capacity.
- Forklift forks shall be inserted fully and evenly to support the pallet securely.
- During lifting, the load shall remain balanced and stable at all times.
- Sudden impact, collision, or severe vibration shall be avoided.

Manual handling shall be minimized. Where manual handling is required, the packaging shall be lifted and moved carefully to prevent deformation or damage.

10.4 Transport Conditions

During transportation, LONGi PV modules shall be protected from improper mechanical stress, moisture ingress, and adverse environmental conditions.

The following conditions shall be maintained:

- The cargo shall be securely fixed to prevent movement, sliding, tipping, or collapse during transport.
- The transport vehicle or container shall be clean, dry, and structurally suitable for the cargo.
- The modules shall be protected from prolonged exposure to rain, snow, standing water, corrosive substances, and severe environmental contamination.
- Excessive vibration, strong impact, and improper stacking shall be avoided.
- Transport shall be arranged so that the packaging is not compressed, bent, or otherwise deformed.

Where sea transport is used, appropriate measures shall be taken to prevent moisture damage, salt-mist exposure, and cargo displacement.

11 Limited Warranty

The warranty starts date of the Solar Modules stipulated under this Limited Warranty for Solar Modules (hereinafter referred to as “Limited Warranty”) is the date of delivery to the Initial Customer or 6 months after the modules are shipped out of the production plant, whichever is earlier (hereinafter referred to “Warranty Start Date”). For the avoidance of doubt, the Initial Customer means the Buyer or Purchaser as identified in the Sales Contract for the purchase of the Solar Modules, regardless of whether they are the end-user of the modules or not.

11.1 Limited Product Warranty

The Supplier warrants that for the Limited Product Warranty period since the Warranty Start Date that the Solar Modules (including the DC connectors and cables) will be free of defects in material or workmanship which affects the performance of the Solar Modules, provided that the Solar Modules are installed, utilized and maintained according to the stipulations of the Installation Manual provided by the Supplier, which may be updated from time to time by Supplier at its sole discretion. The Limited Product Warranty does not include changes in appearance or normal wear and tear of the Solar Modules that occur after installation. Performance warranty for the power output is not included here but it shall be specifically elaborated in the " Limited Performance Warranty" section below.

A. Modules are only applicable to the following module types that a period of 15 years since the Warranty Start Date, regardless of any change in ownership or transfer of the warranty to a different party. LR7 series: LR7-54HVH-xxxM, LR7-54HVD-xxxM, LR7-60HVH-xxxM, LR7-60HVD-xxxM, LR7-72HVH-xxxM, LR7-72HVD-xxxM, LR7-72HVHF-xxxM, ,LR7-72HJD-xxxM. LR8 series:LR8-66HVD-xxxM.

B. Modules are only applicable to the following module types that a period of 30 years since the Warranty Start Date, regardless of any change in ownership or transfer of the warranty to a different party. LR7 series 54cell: LR7-54HVB-xxxM, LR7-54HVBB-

xxxM, LR7-54HJD-xxxM, LR7-54HJBB-xxxM.

11.2 Limited Performance Warranty

The Supplier warrants for a period of 30-year performance warranty (“Performance Warranty Period”) from the Warranty Start Date with details as below: during the first year of the Performance Warranty Period, the actual power output (performance) of the modules will reach at least 99% of the nominal power output; and from the second year, the actual power output will decline annually by no more than 0.35% for a period of 29 years; by the end of the 30th year, an actual output of at least 88.9% of the nominal power output is guaranteed. For the avoidance of doubt, this limited performance warranty only applies to the actual power output of the front-side of the modules.

Actual Power Output (Year=1) ≥ Nominal Power * (1 – 1%)

Actual Power Output(Year=N, 2≤N≤30）≥ Nominal Power *(1 –(1% + 0.35% *(N-1)))

Modules are only applicable to the following module types that a period of 30 years since the Warranty Start Date, regardless of any change in ownership or transfer of the warranty to a different party.

LR7 series: LR7-54HVH-xxxM, LR7-54HVD-xxxM, LR7-60HVH-xxxM, LR7-60HVD-xxxM, LR7-72HVH-xxxM, LR7-72HVD-xxxM, LR7-72HVHF-xxxM, LR7-72HJD-xxxM. LR7-54HVB-xxxM, LR7-54HVBB-xxxM, LR7-54HJD-xxxM, LR7-54HJBB-xxxM. LR8 series:LR8-66HVD-xxxM.

The actual power output is to be measured under standard testing condition (“STC” or “Standard Test Conditions”) in an independent testing lab accepted by the Supplier or previously designated by the Supplier, and when measuring the actual power output, measurement equipment tolerance is to be taken into consideration, as per IEC60904 Standard Test Conditions, more specifically: Air mass 1.5, wind speed 0m/s, irradiance 1000W/㎡, cell temperature 25°C

11.3 Warranty Claim Procedure

In any case, any and all warranty claims shall be submitted to the Supplier or its authorized distributor in writing or by mail within the corresponding warranty period. The customer shall provide necessary evidence documents for its claim. If the customer believes that the Solar Module does not meet the requirements of the “Limited Warranty”, the customer should notify the sales team or global technical service department of the Supplier in writing or submit the notice via email through "Contact LONGi" button on the Supplier's global official website page (the website is www.longi.com) within 30 days after the claim is identified. The notice should include the following information: (a) the claimant; (b) a detailed description of the claim; (c) supporting materials, including photos or data; (d) serial number of affected module; (e) evidence for purchase of the affected module; (f) model of the affected module; (g) project location; (h) other supplementary information required by the Supplier.

In the event the customer fails to notify the Supplier and provide the relevant information of (a)-(h) as described above within the time required by the Supplier, the Supplier is entitled to refuse to process the relevant claim demand without any liability until the customer has provided the relevant information as required by the Supplier.

The Supplier will review and evaluate alleged claims after receipt of the claim and full information as stipulated herein. If the Supplier at its sole discretion considers it necessary, the Supplier can request the module be shipped back to the Supplier’s factory for testing, in which case, the Supplier will provide the customer with a Return Merchandise Authorization (“RMA”). In the absence of such RMA, any returned module will not be accepted by the Supplier. In the event the customer returns the Solar Modules without written agreement of the Supplier, the risks (including but not limited to damage and loss of the Solar Modules) and expenses related to the Solar Modules shall be borne by the customer. Subject to the approval of the Supplier’s technical service department, the necessary and documented shipping costs related to the Limited Product Warranty or the Limited Performance Warranty will be compensated by the Supplier to the customer.

The Supplier is entitled to decide whether to send a representative to investigate the alleged claims on site at its own cost and expenses shall be borne by the Supplier. In the event that the Supplier decides to send a representative to the product installation site for verification, the customer shall fully actively cooperate for such investigation. If the customer refuses the Supplier to enter the site for investigation without a proper and appropriate reason, the Supplier has the right to extend the claim process until necessary evidence is provided; if the customer requires the concerned modules to be sent to an independent third-party testing agency for test (the lab must be approved by both parties), the customer will pay for the reasonable costs incurred by such test in advance. If the test results from the third-party testing agency determines that the existence of a module failure and the cause of such failure lies with the Supplier, then the reasonable and direct and documented costs incurred due to such test can be passed on to the Supplier, i.e shipping freight, transportation insurance, and laboratory testing costs.

11.4 Limitation of Liability

The Supplier assumes no warranties, express or implied, other than the warranties expressly made herein and specifically disclaims all other warranties, including but not limited to, merchantability or fitness for a particular purpose, usage or application, or other obligations and responsibilities assumed by the Supplier, unless the Supplier expressly recognizes other obligations and responsibilities in a duly signed written document. The customer understands and agrees that to the extent permitted by law, Supplier shall not be liable for personal injury or property damage, and shall not be liable for other losses or injuries caused by or related to the module(s) (including but not limited to any module defect, or any defect arising from improper use and installation of the module(s)). The Supplier excludes all liabilities for any collateral, consequential or special damages. Any indirect and/or consequential losses caused by module defect, including but not limited to, loss of profit, loss of power, loss of business opportunity, loss of goodwill, increase of the operating cost or loss of income are clearly excluded here. If the Supplier is liable for compensation to the customer, the total amount of compensation shall not exceed the invoice price of the defective module(s) paid by the customer.

12 Release & Execution

This manual is implemented and published by product management department, The final execution and interpretation upon the assessment team. LONGi reserves the right to modify and revise this manual in any time without prior notice. For information regarding LONGi Solar and its products, please visit www.longi.com.

Global: (https://www.longi.com/eu/contact-us/)

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