

**§ 1. APPLICABILITY**

The following General Terms & Conditions (hereinafter "GTC") in its most updated version at the time of the sales confirmation exclusively and automatically applies to the business and legal relationship between Seller and Buyer, even if Buyer fails to sign the GTC, on the condition that Buyer merely acknowledges its expression of consent to the GTC. Seller does not accept any other variant terms, unless Seller expresses his approval to these terms in written form explicitly. Buyer accepts this GTC when concluding a contractual relationship with Seller without any objection to the GTC.

The substantial laws of the People's Republic of China shall apply to this General Terms & Conditions and to the entire business and legal relationship between Seller and Buyer.

UCP600, URDG758 and INCOTERMS in its most updated version at the time of the conclusion of the contractual relationship apply as well.

**§ 2. CONCLUSION OF CONTRACTUAL RELATIONSHIP**

1. Offers and/or quotations from Seller are non-firm unless they are accepted by Buyer without any material changes in explicit terms.

2. The orders and/or indents from Buyer are binding offers. For the digital orders issued by Buyer via electronic way, the digital orders shall be binding upon Buyer even there is no signature of the Buyer on the digital orders. A contractual relationship of the order comes into existence and effect when i) an order confirmation is sent out by Seller and/or ii) a commercial contract is executed by the Parties and/or iii) delivery or shipment is made by Seller and the earliest date is prevail.

3. All contractual liabilities and obligations shall be governed by this GTC and any additional terms and conditions agreed by the Parties. Information about the goods as shown by samples and/or in any marketing materials such as brochures serves only illustrative purposes and shall not constitute binding obligations on Seller unless Seller has otherwise agreed explicitly in writing. Likewise, public praise or advertisement establishes no contractual obligations of Seller.

4. Seller reserves the right to make changes after the order confirmation has been sent out, so long as these changes do not contradict materially with the sales confirmation or the specifications of the goods. Buyer will consent to the consequential changes as long as these changes are not unreasonable to Buyer. For the reason of continuous technical innovation, the Seller shall be entitled to adjust the specification, index, illustration, datasheet and installation manual of the goods at any time without any further notice. The Buyer shall request the latest version for such as contract and make it a consisting and binding part of lawful documentation duly signed by both Parties.

5. All documents, e.g., calculations, designs, etc., which have been delivered to Buyer for the purpose of placing an order, remain the property and confidential information of Seller, who also reserves the copyright thereof. These documents or information may not be duplicated or made accessible to any third party by Buyer without explicit written consent of Seller. The Seller reserves the right to request the Buyer to return these documents to Seller immediately if Buyer fail to make an order within two weeks from the date of sending documents by Seller or if Seller rejects the order of Buyer.

6. Any electronic communication between Seller and Buyer shall be considered to be a "writing" and/or "in writing". The electronic communication system used by Seller will serve as sole proof for the content and the time of delivery and receipt of such electronic communication.

**§ 3. PRICE & PAYMENT TERMS**

1. The price shall be based on the Incoterm set forth in the order confirmation or commercial contract.

2. Any special package required by Buyer shall be subject to Seller's approval and such extra cost shall be borne by Buyer. The price is exclusive of all applicable federal, state, provincial, and local sales, use, value added, or similar taxes or charges (the "Applicable Taxes"). If Seller is required by law to pay or collect from Buyer the Applicable Taxes, Seller will separately invoice Buyer for such Applicable Taxes. In case the goods purchased from Seller are for resale, Buyer shall provide Seller a valid resale/exemption certificate before delivery.

3. The payments to be made by Buyer shall be the full amount and within the deadline specified in the order confirmation/commercial contract and the invoice. The time of payment shall be the time when the value of payment is remitted into the bank account of the Seller. Any sub-charges or commission charged by the transmitting banks will be taken by the Buyer.

4. If Buyer delays on payment, Seller may, without prejudice to any other rights of Seller, charge interest on any overdue

payment at the rate of twelve percent (12%) per annum or the maximum interest rate permitted under applicable law, from the due date computed on a daily basis until all amounts outstanding are paid in full. Buyer shall also compensate Seller for all costs and expenses incurred by Seller with respect to collection of overdue payments (including, without limitation, reasonable attorney's fees, expert fees, court costs, arbitration fees, and other expenses of litigation). Should Buyer delay the whole or a part of the payment, all payment obligations are thus immediately due. Any late payment will cause the corresponding delay in delivery of goods and Seller shall not be liable for such late delivery of goods. In the case of late delivery due to late payment by Buyer, Buyer shall be liable for any additional costs incurred thereby such as warehouse charges, demurrage charges and/or any fees charged by the customs and shall bear all the risk of damages or customs detainment of the goods. For any open amount payment, Seller will perform delivery subject to a granted credit limit such as a bank guarantee or a credit insurance. In case the credit limit is not available or insufficient to Buyer, Seller may require Buyer to prepay any credit overage before goods delivery without any liability.

5. Defective or delayed deliveries do not relieve Buyer from payment obligations.

6. Buyer is not entitled to offset or retain any payment without written consent of Seller.

**§ 4. DELIVERY**

1. Delivery deadlines and periods are agreed upon by Seller and Buyer order by order in writing. Unless expressly stated otherwise in order confirmation or commercial contract, any dates for delivery of the goods are estimates. If the date of delivery is the weekend day or holiday, the date of delivery shall be postponed to the next working day after the lapse of the period.

2. In the event of a delivery delay due to the reasons beyond reasonable control of Seller, including but not limited to any acts of customhouse, failure of cargo vessel or suspended docking in the port of departure on the part of shipping company, Seller shall notify Buyer by sending a Written Delay Notice within 2 working days after the date of occurrence, and the delivery deadline shall be extended on a day-for-day basis to accommodate such delay.

3. Buyer's wrongful non-acceptance or rejection of goods or cancellation or repudiation of a confirmed order/commercial contract or Buyer's delay in taking delivery shall entitle Seller to recover from Buyer, in addition to any other damages caused by such action: (i) in the case of goods which cannot be resold by Seller to a third party, the price of such goods; or (ii) in the case of goods which can be resold by Seller, damages equal to the differences between the sales price to a third party and the price agreed by Seller and Buyer; and (iii) any reasonable costs incurred due to Buyer's wrongful non-acceptance or delay in taking delivery, including but not limited to the storage costs, demurrage fee, container fees, transportation costs, liquidated damages, etc.

6. The Seller is entitled to expedite the delivery of the Goods if any shipment, lot or batch is delayed. Both the Seller and the Buyer admit that the main purpose of the Contract or PO is to deliver the sufficient commodities to the Buyer. From the principle of "No harm, No remedy", it will be considered not delayed if the Goods can be able to expedite before or on the time when the Goods is planned to arrive at the place of destination or it will be considered to be slightly and trivially delayed if the Goods delayed will cause no harm to the Buyer.

**§ 5. INSPECTION OF GOODS**

1. Buyer shall immediately inspect the delivered goods for the quantity and any apparent damage or visible defect upon receiving the goods.

2. Complaints about the goods shall be made in writing with reasonable evidence and must reach Seller no later than fourteen (14) days from the date of goods arrival in respect of any defect, default or shortage which would be apparent from a reasonable inspection on delivery; otherwise, goods shall be deemed to have been accepted by Buyer. Use, installation or processing of the goods shall be deemed to be an unconditional acceptance of the goods and a waiver of all claims in respect of the quantity or apparent defects of goods.

3. Upon receiving the complaints from Buyer, Seller shall have the right within a reasonable period to confirm that such goods should be rejected. Any damaged goods so confirmed shall be deemed rejected and Seller shall promptly repair or replace the rejected goods in accordance with Seller's Limited Warranty for PV Modules.

4. Seller's Limited Warranty for the Goods is excluded or

precluded if the Buyer fails to perform its obligations.

**§ 6. RISK TRANSFER**

1. Risk of loss or damages of the goods shall pass to Buyer upon delivery no matter who bears the transportation costs.

2. If Buyer delays in taking delivery or wrongfully rejects acceptance, the risk of loss or damages of the goods shall pass to Buyer at the time Seller completes delivery no matter whether the goods are accepted by Buyer or not.

**§ 7. RESERVATION OF PROPRIETARY RIGHTS**

1. The goods remain the property of Seller until the complete settlement of all outstanding payments owed by Buyer to Seller. The Seller is entitled to claim back the Goods at Buyer's expense if the Buyer fails to pay off the total payments.

If the goods are mixed, blended or connected with other objects which do not belong to Seller, Seller acquires thus joint ownership of these new objects in an amount proportional of the goods delivered by Seller to the objects not belonging to him, with which the goods of Seller have been mixed, blended or connected. The goods, of which Seller has a joint ownership, will also be designated as goods subject to retention of title hereafter.

Buyer shall use reasonable scrutiny in the processing and storage of these objects with joint ownership and shall at all times keep such objects covered by commercially reasonable insurance policies against damages and destruction. In the event of damages or destruction, Seller shall be entitled proportionately to the proceeds of the insurance policy, but in no event shall such amount be lower than the outstanding payments owed by Buyer to Seller.

2. Buyer is entitled to handle, dispose of and sell the goods subject to retention of title upon Seller's prior written consent.

3. Buyer hereby transfers to Seller the rights to the account receivables together with all incidental rights from the re-selling of the goods subject to retention of title.

4. Seller is authorized to collect the account receivables transferred to him, so far as Buyer has not fulfilled his payment obligations.

5. Buyer is obliged to provide Seller with all information necessary to collect the transferred receivables, and to allow the examination of these information.

6. Buyer shall not pledge or create any security interest on the goods subject to retention of title and/or on the account receivables transferred to Seller without Seller's prior written consent. Any pledge or security created in violation of this clause is void.

**§ 8. SUSPENSION AND TERMINATION**

1. Either party may terminate the contractual relationship, only if (a) the other party is in default of performance of its obligations and fails to cure such default within thirty (30) days after receiving a written notice of default, or (b) if either party has reasonable doubts with respect to the other party's performance of its obligations and such party fails to provide adequate assurance of its performance within thirty (30) days of demand for such assurance; or (c) if the other party becomes insolvent or unable to pay its debts as they mature, or goes into liquidation (otherwise than for the purposes of a reconstruction or amalgamation) or any bankruptcy proceeding shall be instituted by or against the other party or if a trustee or receiver or administrator is appointed for all or a substantial part of the assets of the other party or if the other party enters into a deed of arrangement or makes any assignment for the benefit of its creditors.

2. In case termination by Seller according to the above paragraph 1., without prejudice to any other rights of Seller, Seller may by written notice forthwith (i) demand re-delivery and take repossession of any delivered goods which have not been paid for, for which purpose Buyer hereby grants an irrevocable right and license to Seller to enter upon all or any of the premises where the goods are or may be located; and/or (ii) suspend its performance for outstanding delivery of goods unless Buyer makes such payment for goods on a cash in advance basis or provides adequate assurance of such payment for goods to Seller; without any intervention of courts being required.

In any such event of (i) and/or (ii), all outstanding claims of Seller shall become due and payable immediately with respect to the goods delivered to Buyer and not re-possessed by Seller.

**§ 9. LIABILITY EXCLUSIONS**

1. THE LIABILITY OF SELLER FOR ANY AND ALL CLAIMS FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE GOODS AND THE USE THEREOF SHALL UNDER NO CIRCUMSTANCES EXCEED THE SUM OF PAYMENTS ACTUALLY RECEIVED BY BUYER FOR THE GOODS THAT ARE THE SUBJECT OF THE CLAIM. UNDER NO

CIRCUMSTANCES SHALL ANY PARTY BE LIABLE TO THE OTHER PARTY OR ANY OTHER PERSON FOR ANY KIND OF SPECIAL, INCIDENTAL, INDIRECT, CONSEQUENTIAL OR PUNITIVE DAMAGE OR LOSS, COST OR EXPENSE, INCLUDING WITHOUT LIMITATION, DAMAGE BASED UPON LOSS OF GOODWILL, LOSS OF SALES OR PROFITS, WORK STOPPAGE, PRODUCTION FAILURE, IMPAIRMENT OF OTHER GOODS OR OTHERWISE, AND WHETHER ARISING OUT OF OR IN CONNECTION WITH BREACH OF WARRANTY, BREACH OF CONTRACT, TORT, MISREPRESENTATION, NEGLIGENCE OR OTHERWISE.

2. The liability exclusions or limits depicted in this Section § 9 do not apply to damages resulting from the injuries of life, of bodies or health, which are caused by the negligent breach of a Party or any person for whose actions a Party is legally liable, nor to damages caused by the gross negligence, willful misconduct or fraud of a Party or any person for whose actions a Party is legally liable.

#### **§ 10. GUARANTEE ON CONFORMITY OF GOODS TO CONTRACT**

1. The warranty for PV Modules shall refer to Seller's Limited Warranty for PV Modules as set forth in the Exhibit.

2. Under justified complaints, Seller will repair the goods or deliver faultless replacements at his own expense. Buyer may withdraw from the contract, if Seller fails to remove the faults he acknowledges within the permitted proper extended period. In case of shortages of delivery, Seller may deliver additional goods or refund accordingly.

3. Guarantee on conformity of goods to contract is not applicable in case of natural wear, of damages resulting from incorrect or careless handling, excessive load, inappropriate operating materials and nonobservance of the operating instructions, and of damages as a result of modification or repairing work of Buyer or any third party unauthorized by Seller.

#### **§ 11. IP INFRINGEMENT**

Seller shall defend, at its own expense, any suit or claim that may be instituted against Buyer for an alleged infringement of patents, trade secrets, copyrights or other intellectual property rights relating to the goods, provided that such suit or claim is based on intellectual property (i) under the law of the country where the goods will be resold or used, if it was contemplated by the Parties at the time of conclusion of contractual relationship that the goods would be resold or otherwise used in that country; or (ii) in any other case, under the law of the country where Buyer has its place of business. Seller shall, at its own expense and option, either (a) settle or defend the claim or any suit or proceeding against Buyer, or (b) modify or supply the substitute goods (or an infringing individual component thereof) under the same trade terms as agreed in the PO or Commercial Contract so that it becomes non-infringing, in either case in a commercially reasonable manner and time period.

#### **§ 12. FORCE MAJEURE**

1. Seller shall not be liable in any way for any damage, loss, cost or expense arising out of or in connection with any delay, restriction, interference or failure in performing any obligation towards Buyer caused by any circumstance beyond its reasonable control, including, without limitation, acts of God, laws, statutes, ordinances, regulations, legislative measures, acts of governments or other administrative measures, orders or decrees of any court, any orders or decrees of any authority, earthquake, flood, fire, explosion, war, terrorism, riot, sabotage, accident, epidemic, strike, lockout, slowdown, heavy rain, heavy wind, heavy fog, traffic jamming, labor disturbances, difficulty in obtaining necessary labor or raw materials, lack of or failure of transportation, refusal of access by freight forwarder or ship carrier, breakdown of plant or essential machinery, emergency repair or maintenance, breakdown or shortage of utilities, delay in delivery or defects in goods supplied by suppliers or subcontractors ("Force Majeure").

2. If the abovementioned hindrance lasts longer than a month, both parties are entitled to withdraw himself from the unaccomplished contractual parts. Claims for compensations for losses on the part of Buyer against Seller are excluded in these cases of force majeure. Seller may refer to these circumstances if and only if he has immediately notified Buyer of these instances upon their presence.

3. For the avoidance of doubt, no Force Majeure Event shall excuse any payment obligation hereunder except to the extent that, and only for so long as, the affected Party's ability to effectuate a payment due hereunder is curtailed by a Force Majeure Event.

#### **§ 13. DISPUTE RESOLUTION**

Any controversy, dispute or claim whatsoever arising out of or in connection with this contractual relationship or the breach thereof shall be referred to and finally resolved by

arbitration under the rules of China International Economic and Trade Arbitration Commission (CIETAC), which rules are deemed to be incorporated by reference into this clause. The seat for Arbitration shall be Beijing, China. If the dispute in question amounts to no more than US\$ 1 million, the Arbitration Panel shall consist of one arbitrator; otherwise of three (3) arbitrators, one to be appointed by each Party and one by the two arbitrators so appointed. Any award rendered by the Arbitration Panel shall be final and binding upon both Parties.

#### **§ 14. SEVERABILITY**

In the event any provision of these General Terms and Conditions shall be held to be invalid or unenforceable, the same shall not affect in any respect whatsoever, the validity or enforceability of the remaining provisions between the parties and shall be severed therefrom. The pertaining provisions held to be invalid or unenforceable shall be reformed to provisions satisfying the legal and economic intent of the original provisions to the maximum extent permitted by law.

#### **§ 15. DATA PROCESSING AND PROTECTION**

1. The parties will, in the processing of each other's personal data, be required to comply with the applicable laws and regulations, including but not limited to the General Data Protection Regulation (GDPR) in EU.

2. The parties will process each other's personal data only if and to the extent necessary for the provision of the agreed services or in order to comply with legal obligations.

3. The parties will not retain each other's personal data any longer than is necessary for the realization of the foregoing purposes or any longer than is required or permitted pursuant to legal (including tax) provisions.

4. The parties will implement appropriate technical and organizational measures in order to provide optimum protection for personal data against unlawful use.

5. The parties will provide personal data to third parties only if necessary, for the performance of the agreement, or in order to comply with a legal obligation. The employees and third parties engaged by the parties will be required to respect the confidentiality of the personal data.

6. Either party may request the other party to grant access to, or to provide a copy of, such personal data collected from that party, to rectify or to delete such personal data, or to restrict the processing of such personal data.

#### **§ 16. INTERNATIONAL SANCTIONS**

The Parties hereby represent and warrant to each other that as of signing of the GTC by the Parties and for the future, the Party, directly or indirectly, is not under sanctions regime imposed by the Office of Foreign Assets Control of the U.S. Department of the Treasury, the Bureau of Industry and Security of the U.S. Department of Commerce, the U.S. Department of State, the European Union, the United Kingdom or any other country or organization whose decisions, programs and acts (the "Sanctions") are legally binding.

Buyer shall comply with all applicable export control and trade embargo laws, rules and regulations (including but not limited to the U.S. Export Administration Regulations), and shall not resell export, re-export, distribute, transfer or otherwise dispose of materials, directly or indirectly, without first obtaining all necessary written consents, permits and authorizations and completing such formalities as may be required by any such laws, rules and regulations.

Last update: [June 2019]

Buyer hereby expressly acknowledges to have agreed the content of this GTC, and have caused this GTC to be executed by its duly authorized officers or representatives:

## Limited Warranty for Solar Modules

**(PERC Monofacial series of Single Glass)**

This Limited Warranty is suitable for the following LONGI Modules model	
LR6-60PE-xxxM	LR6-72PE-xxxM
LR6-60PH-xxxM	LR6-72PH -xxxM
LR6-60PB-xxxM	LR6-72PB -xxxM
LR6-60HP-xxxM	LR6-72HP-xxxM
LR6-60HPH-xxxM	LR6-72HPH-xxxM
LR6-60HPB-xxxM	LR6-72HPB-xxxM
LR6-66HP-xxxM	LR6-78HP-xxxM
LR6-66HPH-xxxM	LR6-78HPH-xxxM
LR6-66HPB-xxxM	LR6-78HPB-xxxM
LR6-60OP-xxxM	LR6-72OP-xxxM
LR6-60OPH-xxxM	LR6-72OPH-xxxM

Supplier is committed to the following quality performance warranty for solar modules (hereinafter referred to as “modules”). The Product Warranty Term starts as of the delivery date or 6 months after the modules are shipped out of the production plant, which the earlier date shall be effective (hereinafter short as the “Warranty Effective Date”).

### **1. Limited Product Warranty-Repair or Replacement within 10 years**

Supplier assures that under the conditions for regular application, installation, use and service, the integral module (including attached DC connectors, cables) can meet the demand of regular application, use and installation and have no defect caused by material and process within 120 months as of the Warranty Effective Date. If the modules get out of order or fail to operate due to material or process defects within 120 months as of the Warranty Effective Date, Supplier provides remedy, only repairing and replacing the failed modules after verification and confirmation by an independent testing institution agreed by Supplier and the customer in advance. The remedy of repair or replacement is the exclusive measure within this “Limited Product Warranty”, which does not involve assurance for the module power output. The power output assurance is to be specially elaborated in the Section 2 “Limited Warranty for Peak Power” below.

### **2. Limited Warranty for Peak Power - Limited Compensation**

Supplier provides power output loss assurance within 25 years as of the Warranty Effective Date. Power output loss is calculated by comparing the minimum “module nominal power under standard testing conditions” (short as nominal power) marked on the nameplate with the actual power output under standard testing conditions.

With respect to Hi-MO1 series of module, the annual attenuation is less than 2% within the 1<sup>st</sup> year from the Warranty Effective Date and is less than 0.55% from the 2<sup>nd</sup> year to the 25<sup>th</sup> year within the peak power warranty period. The output power can reach 84.8% in the last year of the 25-year peak power warranty period.

Supplier assures that any qualified module sold out can meet the power guarantee value mentioned above within 25 years of power warranty period from the Warranty Effective Date. If any power loss exceeds the guaranteed value verified by Supplier, and Supplier attributes such power loss to its material or process defects, or such power loss is further (required by customers) verified by the third party testing institution (agreed

by both the customer and Supplier), Supplier will make judgment at its discretion and take either remedial measures as (1) provide extra modules to make up for power loss as above; or (2) repair or replace the defected modules and provide the shipment free of charge to the initial delivery location.

The above-mentioned compensations in “Limited Warranty for Peak Power” are the sole and exclusive remedy measures.

Note: If any customer finds that the defective modules need to be returned before the treatment, the freight shall be borne on the customer. If the third party testing institution confirms that it is the responsibility within the scope of Supplier quality warranty, the shipping cost can be compensated as per the freight or related invoice provided by the customer.

### **3. Exceptions and Restrictions**

(a) All quality warranty claims shall be submitted to Supplier or Supplier authorized distributors in written form within but not beyond the warranty period in any cases.

(b) “Limited Product Warranty” and “ Limited Warranty for Peak Power” do not apply to modules in situations below:

- Improper use, misuse, negligence, intentional damage or accidents;
- Fabrication without permission, improper installation or application;
- Fail to follow the repair and recovery instructed by the producer;
- Fail to follow the Supplier maintenance instructions;
- Power failure, power surge, lightning, fire and flood, accidental damage or force majeure.

(c) “Limited Product Warranty” and “Limited Warranty for Peak Power” do not compensate costs as, any costs related to module installation, demounting and re-installation (except for those stated in the last part of Section 5) or custom clearance costs and other costs related to return and replacement of modules.

(d) Claims will be rejected if the module model and serial number labels are falsified, removed or blurred without written authorization by Supplier.

### **4. Quality Warranty Scope**

Unless Supplier agrees on and signs and recognizes other obligations and liabilities

in written form, the warranty clauses in this quality warranty will replace and exclude other explicit or implied assurances including but not limited to the merchantability assurance, or assurance for special purposes or applications, and other obligations and liabilities undertaken by Supplier. Supplier shall not be responsible for human injury or property losses nor for other losses or injuries caused by modules or module-related problems (including but not limited to any module defect or any defect caused by use and installation). Supplier shall not compensate any collateral damages, derived damages or special damages by any cause. Losses such as profit loss, production loss or revenue loss caused by product faults are excluded hereby. If Supplier makes compensation for customers, the accumulated compensation amount shall not exceed the invoicing price for a single module paid by the customer.

## **5. Quality Warranty Performance**

If any customer proposes legitimate quality warranty requirements in accordance with the “Limited Product Warranty”, they shall send a written notice by registered letter to Supplier at the address below or send email to Supplier email address. The customer shall attach proof of quality warranty herewith, corresponding module serial number and purchasing date and provide the invoice marked with clear purchasing date, price, module model and Supplier seal or signature.

If modules need to be shipped to Supplier for testing, repair or replacement, Supplier shall provide the return merchandise authorization (RMA) to the customer. Supplier will not accept returned modules without RMA. With approval of the customer service department, the reasonable, normal and proved shipping cost (including return cost and re-shipping cost of repaired and replaced modules) of modules related to “Limited Product Warranty” and “Limited Warranty for Peak Power” will be compensated by Supplier to customers.

## **6. Transferability**

The clauses of this “Quality Warranty” will cover end users and can be transferred to any successive owners if the module’s installation position is unchanged and the inheritance or transferring relations can be sufficiently proved.

## **7. Severability of Clauses**

Should a part or a clause of the “Quality Warranty” is considered invalid or

ineffective or not executable, or this part or clause to some people or some conditions is deemed invalid or ineffective or not executable, this situation shall not affect effectiveness of other parts or clauses of the “Quality Warranty”. In this case, the other parts or clauses in this “Quality Warranty” or the applicability of this “Quality Warranty” are considered independently effective.

## **8. Dispute Resolution**

If any dispute occurs with quality warranty claims, one of the domestic first-class testing institutions such as TÜV SUD, Intertek, UL, CQC and CGC shall be invited for verdict of the final claim. All the cost shall be borne by the losing party unless otherwise stipulated in the verdict. Supplier reserves the right for the final interpretation.

Further dispute resolutions shall be executed by the applicable legal jurisdiction agreed upon in the sales contract signed by both parties.

## **9. Alteration**

The repair, replacement or the provision of extra modules does not mean that the warranty period is renewed and the original warranty period shall not extend. Any replaced modules are possessed by Supplier and shall be treated or disposed of at its own discretion. In case Supplier has stopped producing the same model as the defective modules which the claim is made against, Supplier shall keep the right to provide the modules of other models (different sizes, color, shape or power), either new brand or original brand.

## **10. Force Majeure**

If Supplier fails to perform or postpone performing sales articles or this “Quality Warranty” in the event of fire, flood, storm, typhoon, lightning, natural disaster, change of public policies, terrorism, war, riot, strike, or unavailability of proper and sufficient labor and materials or due to any other reasons or situations out of control of Supplier, Supplier shall not take any responsibilities for customers or any third party. In this case, Supplier shall not take any responsibilities for end users or any third party in any form.

Note: “Peak power” is the maximum power of solar module under the standard testing conditions (STC). Standard testing conditions refer to as:

- (a) Spectrum amplitude AM1.5
- (b) 1000W/m<sup>2</sup> irradiance

(c) Irradiance at the correct angle and the cell temperature is 25°C.

Testing is done at the terminal of the junction box according to IEC61215 (equivalent to GB/T 9535). Supplier's calibration and testing standard are effective on the manufacturing date of the solar modules. Supplier's calibration standards are consistent with the approved standards by international institutions. During the period of 'Limited Warranty for Peak Power', measurement uncertainty shall be counted when determining module's output power, according to standard IEC 60904.

The 25-year performance Product Warranty Term is made according to Technical Standards for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules edited by the Technical Research Department.

Block B, No.8989 Shangji Road, Xi'an Economic and Technological Development Zone, Xi'an, Shaanxi, China.

Tel: +86- 4009696199

Fax: +86-29-86686228

Postal code: 710018

Official website: [en.longi-solar.com](http://en.longi-solar.com)



# Installation Manual for LONGi Solar Modules

## 1000V Photovoltaic Modules



### Safety Notes

- ✧ *This manual elaborates on installation and safety use information for Solar power generating modules (hereinafter referred to as module) of LONGi Green Energy Technology Co., Ltd.. (hereinafter referred to as LONGi Solar). Please abide by all safety precautions in this guide and local regulations.*
- ✧ *Installation of modules requires professional skills and knowledge and is to be carried out by qualified personnel. Please read this manual carefully before installing and using this module. Installation personnel shall get familiar with mechanical and electrical requirements of this system. Please keep this manual properly as reference for future maintenance or upkeep, or for sales and treatment of modules.*
- ✧ *If you have any questions, please contact LONGi global quality and customer service department for further interpretation.*



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## 1 Introduction

### **Thank You for Choosing LONGi Solar PV Modules!**

This installation manual includes important electric and mechanical installation instructions. Please understand these instructions before installing LONGi modules. In addition, this manual also contains some safety instructions that you have to know. All contents in this manual are intellectual properties of LONGi Solar which originates from the long-term technical exploration and accumulated experience.

This installation manual does not entail any explicit or implicit quality warranty and does not stipulate on compensation schemes for losses, module damages or other costs caused by or related to module installation, operation, utilization and maintenance process. If patent rights or the third party rights are infringed by use of modules, LONGi Solar shall not take any responsibility. LONGi Solar reserves the rights for modifying the product manual or installation manual without notice in advance.

If customers fail to install modules as per the requirements set forth in this manual, the quality warranty provided for customers during sales shall become invalid. In addition, suggestions in this manual are to improve safety of module installation, which are proved by tests and practices. Please provide this manual to owners of the solar PV power systems for reference and instruct them in the requirements and suggestions relevant to safety, operation and maintenance.

## 2 Laws and regulations

Mechanical and electrical installation of Solar PV Modules shall be carried out as per the relevant laws and regulations such as electric law, building law and electric connecting requirements. These laws and regulations vary in accordance with different installation sites, such as building roof installation, vehicle-mounted application. The relevant requirements may also vary in accordance with installation system voltage, DC or AC electricity. Please contact



the local authorities for specific clauses.

## 3 General Information

### 3.1 Module Identification

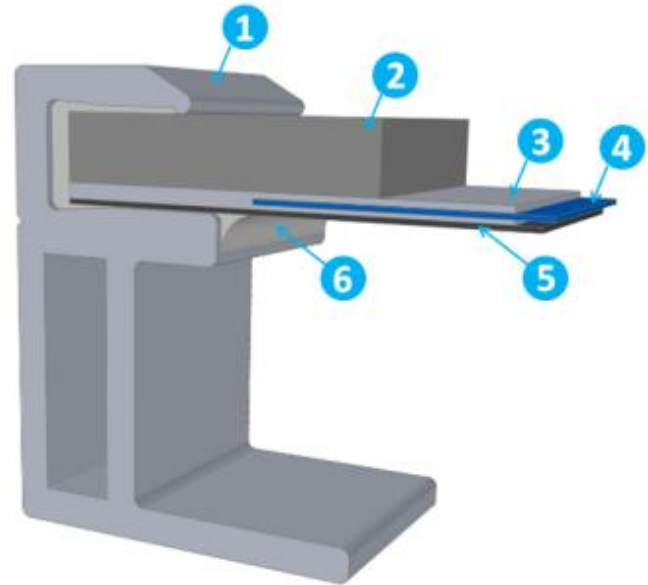
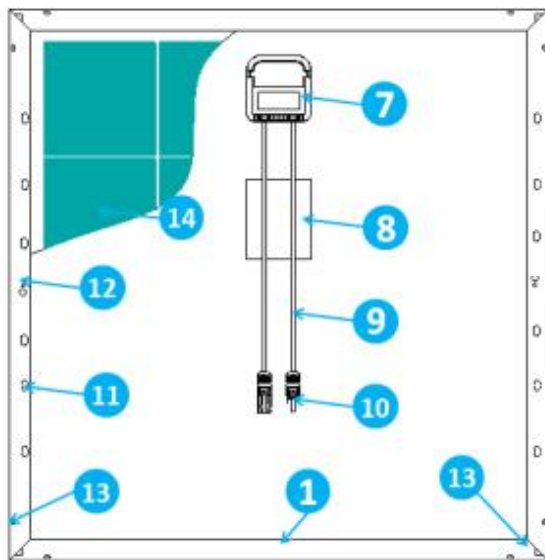
Each module is pasted with 3 labels providing information as follows:

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

2. Current Level Label: Divide modules as per the maximum current into 3 levels: H, M or L (H is the highest current level). The most recommended practice is to install modules with the same current level (such as H) in a string during the installation.

3. Serial Number: Each module has a unique serial number which is solidified inside the module permanently and it can be seen at the front top of the module. This serial number is put in before lamination of the module. In addition, you can find the same serial number on the module nameplate.





- |                   |                      |                   |                    |
|-------------------|----------------------|-------------------|--------------------|
| 1. Aluminum Frame | 2. PV Tempered Glass | 3. EVA            | 4. Solar Cell      |
| 5. Back Sheet     | 6. Silica Gel        | 7. Junction Box   | 8. Nameplate       |
| 9. Cables         | 10. Connector        | 11. Mounting Hole | 12. Grounding Hole |
| 13. Drainage Hole | 14. Solar Cell       |                   |                    |

**Figure 1. Module Section Structure and Components**

### 3.2 Regular Safety

The design of LONGi Solar modules conforms to the IEC 61215 and IEC 61730 standards and its application level is rated as Class A. The modules can be used for the solar PV power systems above DC 50V or 240W which the people may access to. And the modules pass IEC61730-1 and IEC61730-2, meeting requirements of Safety Class II.

When the modules are mounted on rooftop, it is necessary to take into account the overall fire-proof rating of the final structure as well as overall maintenance. The roof-mounted solar PV power systems shall be installed after assessment by building experts or civil engineers and with the formal analysis of the entire structure. The roof structure shall be proved to be able to undertake the additional mounting systems, including solar module weight.

For your safety, please do not work on the roof without safety measures, including but not limited to fall protection, ladder or stair and personal safety devices.

For your safety, please do not install or handle modules in unfavorable conditions, including



but not limited to strong wind or gust, damp or sandy rooftops.

### **3.3 Electric Performance Safety**

Solar modules produce DC electricity in the sunlight, so there will cause hazards such as electric shock or burning when the module cables or metals are touched by human or animals. 30V DC voltage or higher voltage can be fatal to human or animals.

In case that no load or external circuit is connected, the modules will also produce voltage. Please use insulation tools and wear rubber gloves when you handle the modules in the sunlight.

Solar PV Modules do not have switch. Solar PV Modules can only stop work when they are kept from sunlight or covered by cloth, carton board or light-proof materials or when front sides of modules are placed on smooth and flat surface.

To avoid electric arc or electric shock, please do not break down electric connection in loaded conditions. Wrong connections will also lead to electric arc or shock. Keep connectors dry and clean and make sure that they are in good condition. Do not insert other metal objects into the connectors or carry out electric connection by any other means.

Snow and water in surrounding environments will intensify light reflection and lead to increase of current and output power. And the module voltage and power will increase at a low temperature.

If module glass or encapsulating materials are damaged, please wear personal safety devices and isolate modules from the circuit.

Work shall be only carried out in dry conditions with dry tools. Do not operate the modules when modules are wet unless you wear the proper protection devices against electric shock. Please clean modules as per the relevant instructions in this manual.

### **3.4 Operation Safety**

Do not open LONGi module's package during transportation and storage, unless the modules arrive at the installation site.

Protect the package well and avoid any damage to the package. Do not make packaged modules on pallet fall directly.



Do not exceed the tier limitation indicated on the packaging cartons when stacking up modules.

Put packaging cartons in the ventilated, rain-proof and dry places before unpacking modules.

Open LONGi's packaging carton as per unpacking instructions provided by LONGi Solar.

Do not hold the junction box or cables to lift the entire module in any case.

Standing or walking on modules is strictly prohibited.

Do not drop one module onto another module.

To avoid any damage to the front glass of a module, do not put heavy objects on it.

Handle carefully when placing modules on a surface and especially at corners.

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

Do not brush paints or apply any adhesive on the surface of modules.

Do not damage, carve or scratch back film of modules.

Do not drill on the frames of modules, which may reduce the frames' loading capacity or lead to corrosion of the frames.

Do not scratch anodized coating of aluminum frame except for grounding connection.

Scratch may lead to corrosion of the frame and reduce its loading capacity.

Do not on your own repair glass or modules which the back film is damaged.

### **3.5 Fire Safety**

Please consult local laws and regulations before installing modules and abide by requirements about the fire safety of buildings. The fire-proof rating of LONGi Solar modules is Class C in accordance with IEC61730-2 standard.

The rooftop shall be coated with a layer of fireproof materials conforming to such rating for before the roof-mounted installation is carried out. Make sure that the back sheet and the mounting surface are fully ventilated.

The difference between rooftop structures and installation methods will affect fireproof performance of buildings. Improper installation may cause fire hazards.

To guarantee the fire-proof rating, the module frame shall be at least 10cm from the rooftop.

Please choose proper module accessories such as fuses, circuit breakers and grounding  
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connectors as per local laws or regulations.

Please do not use modules if there are exposed inflammable gases nearby.

## **4 Installation conditions**

### **4.1 Installation site and working environments**

The modules can only be used on earth but not in outer space.

Do not focalize the sunlight with mirrors or magnifying glass onto modules.

LONGi Solar modules shall be installed on proper buildings or other appropriate places (such as ground, garage, building outer wall, rooftop, solar tracking system) but shall not be installed on any mobile vehicle.

Do not install modules at the places that may be submerged by water.

LONGi Solar recommends that modules are installed in the environment with the ambient temperature of  $-20^{\circ}\text{C}$  to  $46^{\circ}\text{C}$  which is the monthly average highest and lowest temperature of the installation sites. The extreme ambient temperature for modules ranges from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

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

Modules shall be installed in a place free from shades throughout the year. Make sure there are no obstacles blocking sunlight at the installation site.

Lightning and thunder protection shall be provided for modules installed in places with frequent lightning and thunders.

Do not install modules in places where inflammable gases are possibly emitted.

Modules shall not be used in the environment with frequent hail, snow, blowing sand, smoke dust, polluted air and soot or in places with strong corrosive substances such as salt, salty mist, saline, active chemical steam, acid rain, or other substances corroding modules, affecting module safety or performance.

Please take protective measures to make reliable and safe installation of modules in harsh environments such as heavy snow, freezing cold and strong wind or places close to waters and islands with salty mist or deserts, etc.





LONGi Solar modules have passed IEC61701 salty mist corrosion test, but the corrosion may occur at the joints connecting the module frame and the mounting system or grounding joints. LONGi modules can be installed less than 500mm but more than 50m from the seaside but stainless steel or aluminum shall be applied to contact solar PV Modules. And anti-corrosion protection shall be furnished for installation joints. See the installation requirements in Seaside Installation Instructions by LONGi Solar.

## 4.2 Selection of Tilt Angles

Tilt angle of module: the included angle between module surface and horizontal surface. The module will obtain the optimal power output when its front surface is in direct sunlight.

Modules shall be mounted towards the south in the north hemisphere and towards north in the south hemisphere.

A specific installation angle shall be determined as per the installation guide for standard solar PV modules or advices from solar PV module installers.

LONGi suggests that the tilt angle for the module installation shall not be less than 10° so that the dust on the module surface can be flushed away easily by rainfall and times of cleaning module can be reduced accordingly. And it also facilitates the drainage of collected water on the module surface and avoids water print on the glass due to long time water collection which may further affect module appearance and performance.

## 5 Mechanical Installation

### 5.1 Regular Requirements

Make sure that module installation methods and mounting system are solid enough to bear the estimated load, which is the assurance that the mounting system installer must provide. The mounting system shall be inspected and tested by a third party testing institution with static mechanics analysis capacity in accordance with local national or international standards such as DIN1055 or its equivalent.

The mounting system shall be made from durable, corrosion-resistant, ultraviolet-proof



materials.

Modules shall be fixed on the mounting system firmly.

Use the elevated mounting systems in places with heavy snow so the lowest point of modules shall not be covered by snow for a long time. In addition, make the lowest point high enough so as to avoid shading of plants and plants or damage by blowing sands and stones.

If modules are installed on mounting systems parallel to the rooftop or wall, the minimum spacing between the module frame and the rooftop or wall shall be 10cm for ventilation so as to prevent the damage of the module's cables.

Drilling holes on the glass or frame of modules is strictly prohibited.

Make sure that the building is suitable for installation before modules are mounted on rooftop. Moreover, seal the permeable positions of rooftop properly to prevent leakage of rainwater.

The module frame has thermal expansion and cold contraction so the frame interval between two adjoining modules shall be no less than 10mm.

Make sure that the back sheet of the module will not contact the mounting system behind the module or any building structure, especially when the module surface bears pressure.

The maximum static load of modules is: 2400Pa (equal to wind load) for backside and 5400Pa or 2400Pa (equal to snow load or wind load) for front side. This depends on the installation type (please refer to the installation method below).

Module installation methods cannot cause electrochemical corrosion between module aluminum frame and other metals. The electric potential difference of contacting metals shall not exceed 0.6V as is recommended in the Appendix of UL1703 *Flat Plate Photovoltaic Modules and Panels*.

Modules can be installed horizontally or vertically.

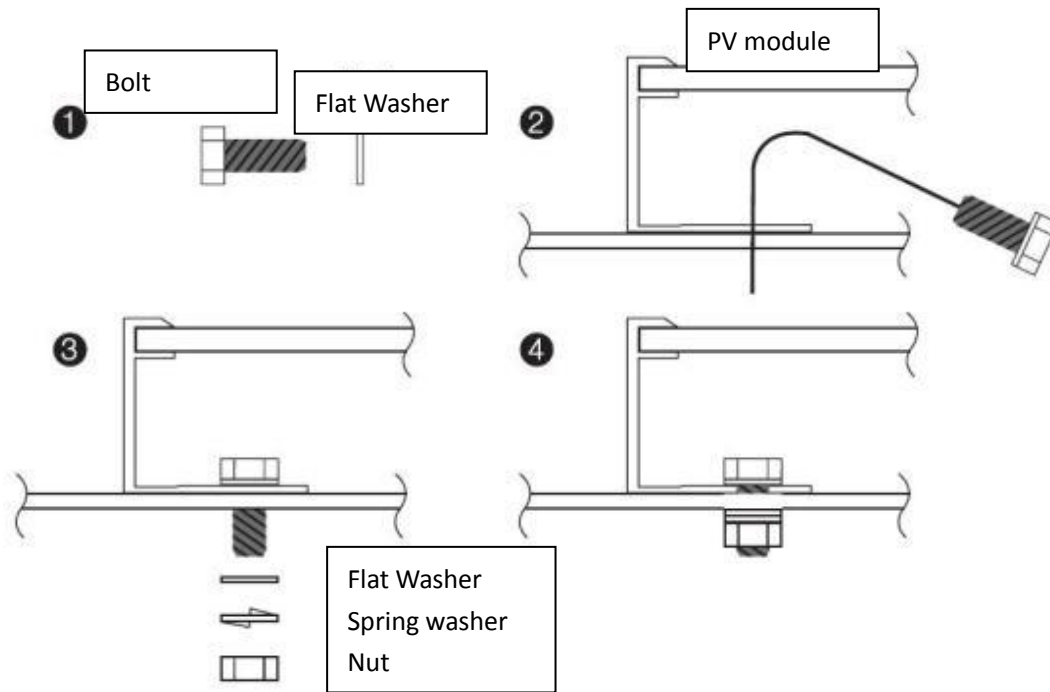
## 5.2 Installation Methods

Module and mounting system can be fixed by mounting holes, clamps or embedded systems. The installation shall be carried out as the following illustrations and suggestions. If the installation methods is different, please consult LONGi Solar and obtain approval of LONGi Solar. Otherwise, the modules may be damaged and the quality warranty is deemed null and void.



### 5.2.1 Install Modules through Mounting Holes

Make use of bolts to fix modules on the mounting system through mounting holes on the back of the frame. See details in Figure 2.



**Figure 2 Installation Method**

Accessories recommended as follows:

- |   |  |
|---|--|
| <p>1. Bolt<br/>Material: stainless steel<br/>Dimension and length: M6*16mm, M8*16mm</p> <p>3. Spring washer<br/>Material: stainless steel<br/>Dimension: M6,M8<br/>Torque for fastening bolts: 14N•m to 20N•m</p> | <p>2. Washer<br/>Material: stainless steel<br/>Dimension: M6,M8</p> <p>4. Nut<br/>Material: stainless steel<br/>Dimension: M6,M8</p> |
|---|--|

### 5.2.2 Install Modules with Clamps

Use the special clamp to install modules. See Figure 3.

A. Fix modules on the mounting system with metal clamps. The following clamps or those clamps recognized by the solar PV system installer are recommended.

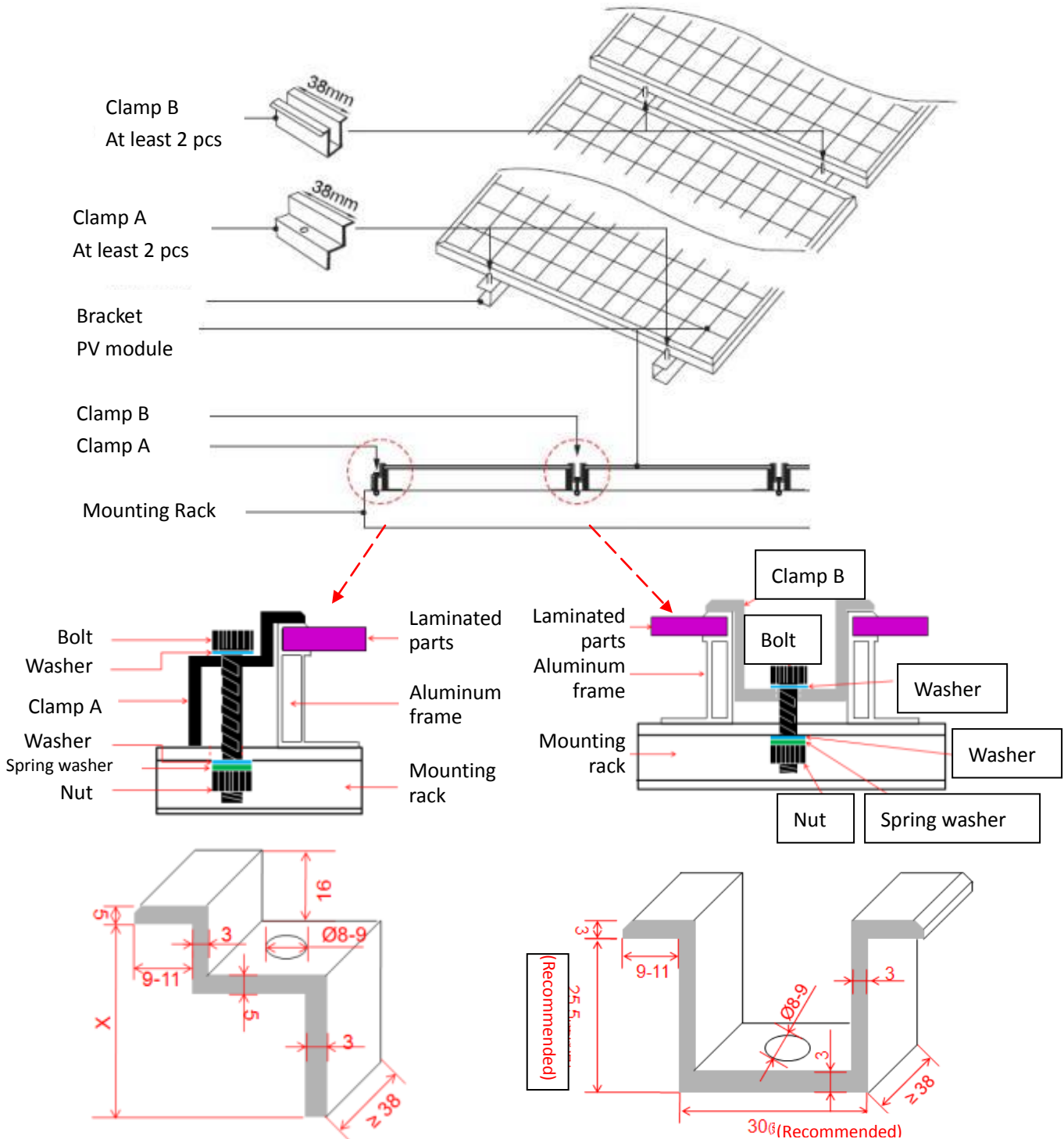
- Width: no less than 38mm;
- Thickness: no less than 3mm;
- Material: aluminum;
- Bolt: M8.

B. Torque for fastening bolt: 18N•m to 24N•m

C. The clamp shall not contact glass or make module frame deformed in any case. The contacting



surface of the clamp contacting the front side the frame shall be even and smooth. Otherwise, the frame and module may be damaged. Make sure that the clamp will not produce any shading effect. Drain holes shall not be blocked by the clamp.



Clamp A for the Ends of a String (X=module frame thickness)    Clamp B for Middle Modules of a String

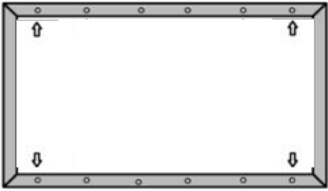
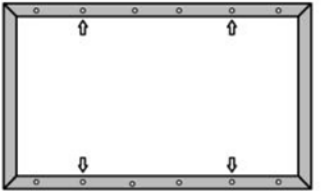
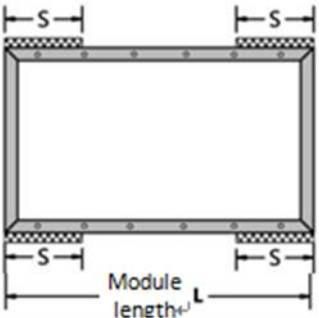
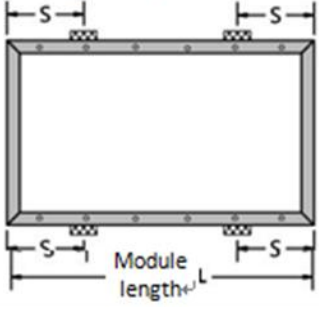

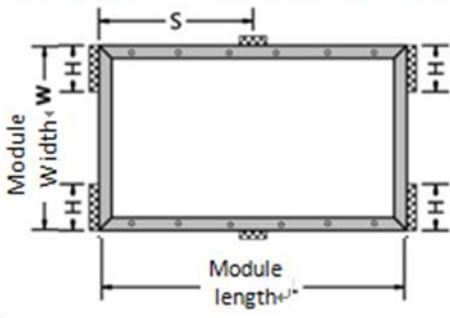
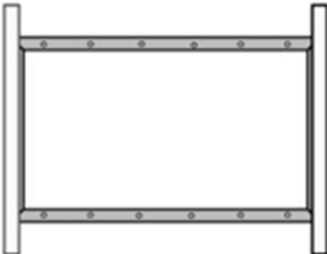
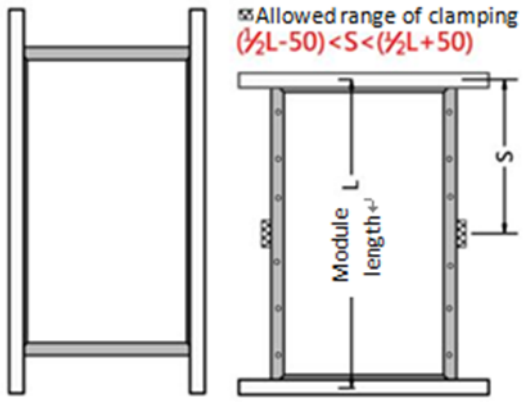
**Figure 3 Clamp Illustration (unit: mm)**



### 5.2.3 Positions of Fixing Points

- ✧ Low/normal loading conditions apply to most environments: the maximum static pressure on the backside of the module is 2400pa (equal to wind load) and the maximum static pressure on the front side is 2400pa (equal to wind load and snow load).
- ✧ High loading conditions apply to severe environments (such as wind storm, heavy snow): the maximum static pressure on the backside of the module is 2400pa (equal to wind load) and the maximum static pressure on the front side is 5400pa (equal to wind load and snow load), which is the highest requirement on pressure in the IEC standards.
- ✧ For dynamic loads such as gust, it needs to triple the safety coefficient. That is that the maximum gust pressure is  $\pm 800\text{Pa}$  and the wind speed is less than 130 Km/hour.



	Low/normal loading conditions apply to most environments:	High loading conditions apply to severe environments (such as wind storm, heavy snow):
Mounting by bolts through mounting holes	<p>Mounting hole</p>  <p>Use 4 Mounting holes</p>	<p>Mounting hole</p>  <p>Use 4 Mounting holes</p>
Clamping on long side	<p>☒ Allowed range of clamping+ <math>0 &lt; S &lt; \frac{1}{4}L</math></p> 	<p>☒ Allowed range of clamping+ <math>(\frac{1}{4}L - 50) &lt; S &lt; (\frac{1}{4}L + 50)</math></p> 
Clamping on short sides	<p>☒ Allowed range of clamping+ <math>0 &lt; H &lt; \frac{1}{4}W</math></p> 	<p>☒ Allowed range of clamping+ <math>0 &lt; H &lt; \frac{1}{4}W</math>    <math>(\frac{1}{2}L - 50) &lt; S &lt; (\frac{1}{2}L + 50)</math></p> 
Embedded mounting of frame		<p>☒ Allowed range of clamping <math>(\frac{1}{2}L - 50) &lt; S &lt; (\frac{1}{2}L + 50)</math></p> 

**Figure 4 Position of Fixing Points**



## 6 Electric installation

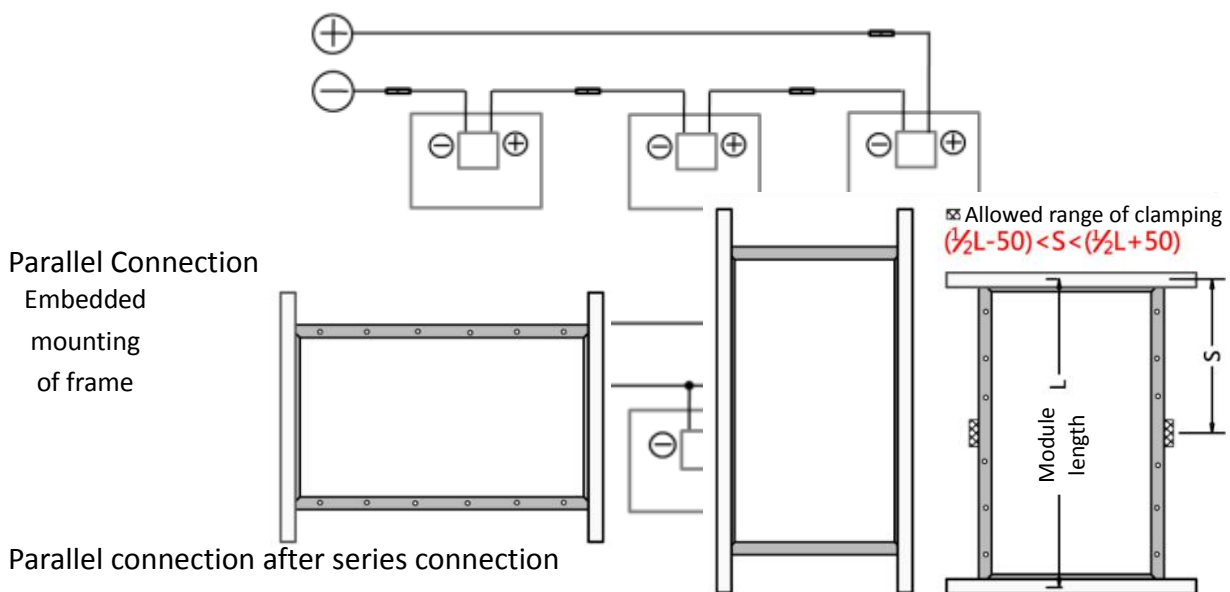
### 6.1 Electric performance

The electric performance parameters of the module, such as  $I_{sc}$ ,  $V_{oc}$  and  $P_{max}$  (nominal values) have  $\pm 3\%$  tolerance with those under the standard testing conditions: irradiance of  $1000 \text{ W/m}^2$ , cell temperature of  $25^\circ\text{C}$  and AM (air mass) 1.5;

In normal conditions, the current and voltage values produced by the module are a little bit higher than those under standard testing conditions. Therefore, when you determine the accessories of solar PV power system, such as rated voltage, cable capacity, fuse capacity and the parameters relevant to the module power output, it shall be 1.25 times the current of short circuit ( $I_{sc}$ ) and voltage of open circuit ( $V_{oc}$ ) before the use of the accessories.

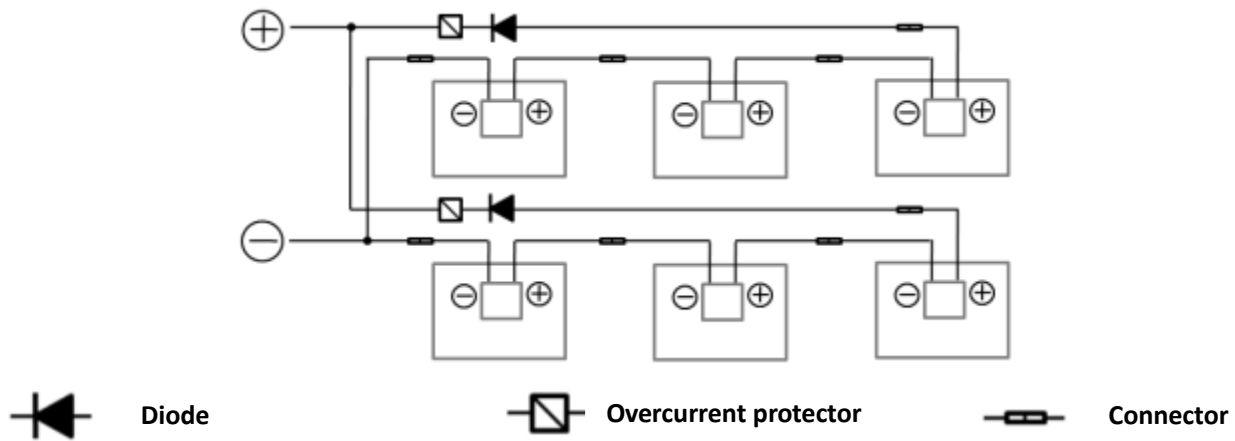
When the modules are connected in series as a string, the final voltage is the sum of the single module's  $V_{oc}$ . Allowed range of clamping es are connected in parallel, the final current is the sum of the single module's current, as shown in Figure 5.

Modules with different electric performance models cannot be connected in one series.  
Series Connection



**Figure 4 Position of Fixing Points**





**Figure 5: Series Connected and Parallel Connected Circuit Diagrams**

The number of modules in series connection in each string shall be calculated as per the relevant regulations. The  $V_{oc}$  value at the lowest estimated temperature shall not exceed the maximum system voltage stipulated for modules (LONGi Solar module's maximum system voltage is DC1000V according to IEC61730 safety test) and the values required by other DC electric parts.

The  $V_{oc}$  correction factor can be calculated as per the formula below:  $C_{V_{oc}} = 1 - \beta_{V_{oc}} \times (25 - T)$ .  $T$  is the lowest estimated ambient temperature in the installation position.  $\beta_{V_{oc}} (\%/^{\circ}\text{C})$  is the  $V_{oc}$  temperature coefficient of the selected module (refer to the technical specification of the module).

If there is reverse current exceeding the maximum fuse current flowing through the module, use overcurrent protection device with the same specification to protect the module; if there are more than 2 parallel connected strings, an overcurrent protection device shall be provided on each string of modules, as shown in Figure 5.

## 6.2 Cables and Connecting Wires

In module design, the sealed junction boxes with the IP67 protection are applied for on-site connection to provide the ambient protection for cables and connecting wires and contacting protection for non-insulated electric parts. The junction box includes the well connected cables and connectors with the IP67 protection. These designs facilitate series connection of modules. Each module has two cables connecting the junction box, one is negative electrode and the other is positive electrode. Two modules can be series connected by plugging the positive connector of one module into the negative connector of another adjoining module.





The module connecting cables shall withstand the maximum short circuit current of the module. The special sunlight resistant cables for solar PV systems shall be used.

The minimum standards of module connecting cables are as:

Testing Standards	Cable Diameter	Temperature Range
TÜV 2 PFG 11694	4mm <sup>2</sup>	-40°C to +90°C

When cables are fixed on the mounting system, it shall avoid mechanical damage to cables or modules. Do not press cables with force. Use and wire clamps to fix the special designed sunlight resistant cables on the mounting system. Though the cables are sunlight resistant and water proof, it is still necessary to prevent cables from direct sunlight and water immersion.

### 6.3 Connector

Please keep connectors dry and clean. Make sure that the connector nuts are fastened before connection. Do not plug in connectors when the connectors are damp or dirty or under other status. Protect connectors from direct sunlight and water immersion. Avoid dropping connectors onto the ground or rooftop.

Wrong connections may cause electric arc and electric shock. Please make sure that all electric connection is made firm and steady. Make sure that all connectors with locks are completely locked.

### 6.4 Bypass Diode

LONGi Solar module's junction box contains bypass diodes in parallel connection with the cell strings. If hot spot occurs partially in the module, the diodes will come into operation to stop the main current from flowing through the hot spot cells, so as to restrain module heating and performance loss. But bypass diodes are not the overcurrent protection device.

If the diode is found or suspected to be faulty, the installer or system maintenance providers shall contact LONGi Solar. Please do not try to open the module junction box on your own.



## 7 Grounding

In design of modules, the anodized corrosion resistant aluminum frame is used for rigid support. For safety and protecting modules from damage by lightning and static electricity, the module frame shall be grounded.

The grounding device shall be in full contact with inner side of the aluminum frame and penetrate the oxidized coating on the frame surface.

Do not drill additional grounding holes on the module frame.

**To get the optimal power output, LONGi Solar suggests that DC negative pole of the solar PV array shall be grounded during the installation. Otherwise, the system's output power may be decreased.**

The grounding methods of modules shall not cause electrochemical corrosion between the aluminum frame and other metals. The electric potential difference of contacting metals shall not exceed 0.6V as is recommended in the Appendix of UL1703 *Flat Plate Photovoltaic Modules and Panels*.

The grounding holes on the frame are already drilled in advance and marked with grounding signs. These grounding holes are only used for grounding but not for module installation.

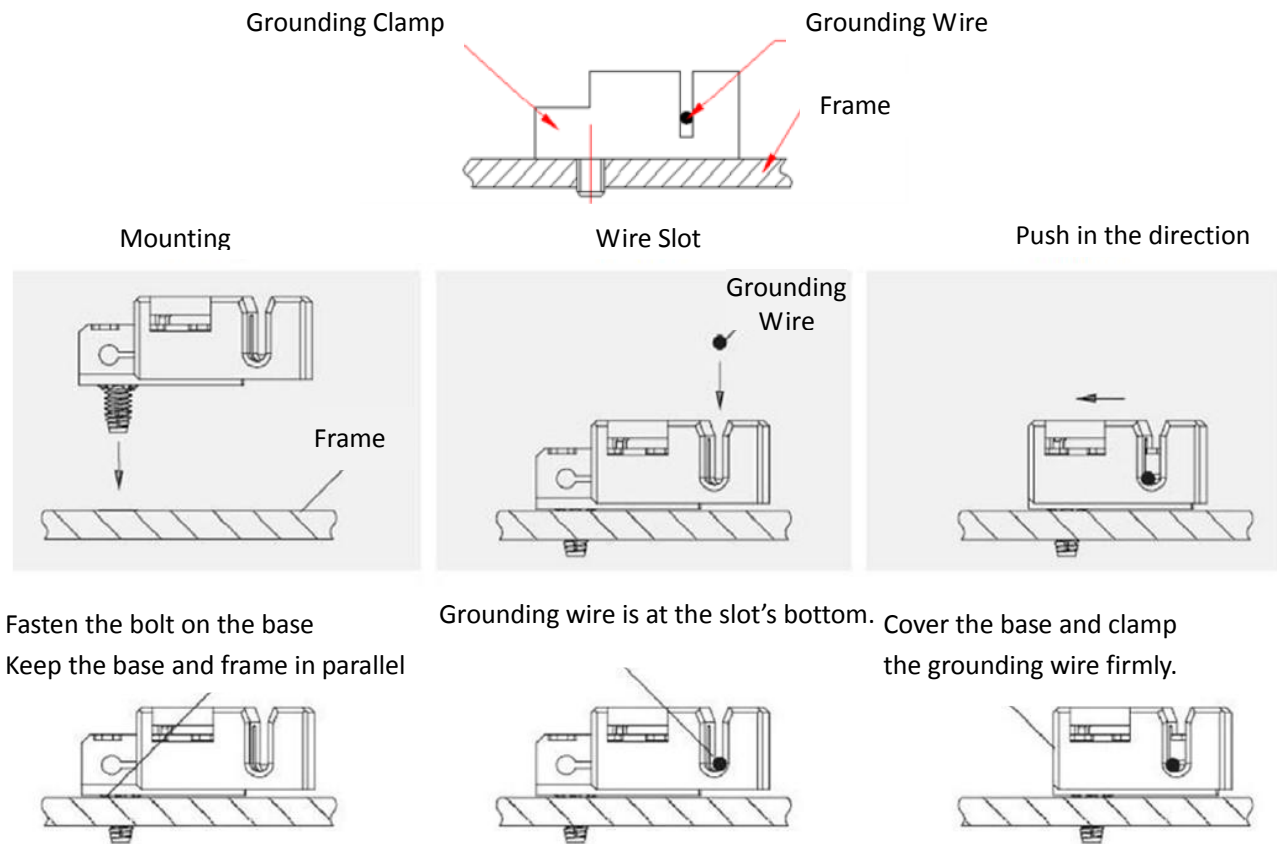
**The grounding methods as follows are allowed:**

### 7.1 Grounding by grounding clamp

There is a grounding hole with the diameter of  $\varnothing 4.2\text{mm}$  at the edge of the module's back frame. The central line of the grounding sign and that of the hole overlaps and is in the same orientation with the frame length.

The grounding between modules shall be confirmed by qualified electricians and grounding devices shall be manufactured by qualified electric manufacturers. The recommended torque is  $2.3\text{N}\cdot\text{m}$ . The grounding clamp is installed with a 12 AWG copper core wire. And the copper wire cannot be squeezed and damaged when the installation is being carried out.





**Figure 6 Installation of Grounding Clamp**

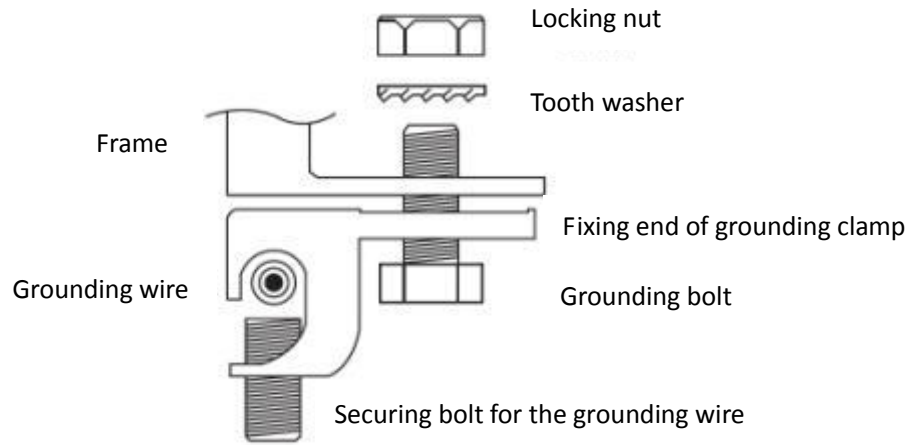
Note: TYCO. 1954381-1 (recommended) is used in the above figures

## 7.2 Grounding by Unoccupied Mounting Holes

The mounting holes on the module that are not occupied can be used for installing grounding devices.

1. Align the grounding clamp to the frame mounting hole. Use the grounding bolt to get through the grounding clamp and the frame.
2. Put the tooth side of the tooth washer on the other side and fasten the locking nut. The recommended torque for fastening the nut is 2.0Nm to 2.2Nm.
3. Put grounding wires through the grounding clamp (the grounding wire material and size shall meet requirements of the local national and regional laws and regulations).
4. Fasten the securing bolt of grounding wires. Then installation is over.





**Figure 7 Installation Method**

### 7.3 Other Third Party Grounding Devices

The third party grounding devices can be used for grounding of LONGi Solar modules but such a grounding installation shall be proved to be reliable. The grounding devices shall be operated as per instructions of the manufacturer.

## 8 Operation and Maintenance

Carry out regular inspection of and maintenance for the modules, which is the user's responsibility and obligation particularly within the quality warranty period. The user shall inform the supplier in written form within two weeks when the modules are found to be faulty or damaged.

### 8.1 Cleaning

The accumulated dust on the module surface glass will decrease the power output and lead to the hot spot on the partial module, so will the industrial waste water and bird droppings. The degree of influence is determined by transparency of wastes. Small amounts of dust will affect sunlight strength and evenness but is not dangerous and the output power will not be reduced remarkably.

During operation of a module, there shall be no other objects projecting shades on the partial or the entire module, including other modules, mounting system, bird droppings, dust, dirt or plants. These will reduce output power extremely. LONGi Solar suggests that the module surface shall not be sheltered or blocked at any time.

The frequency of cleaning depends on the rate of dust accumulation. Normally, the rainwater will clean the module surface and the cleaning frequency is reduced therefore. It is suggested to



use wet sponge or soft dust cloth containing water to wipe the glass surface. Do not use cleanser containing acid and alkaline to clean modules.

## 8.2 Inspection of Module Appearance

Check module appearance defects visually, especially:

1. Cracks on the module glass.
2. Corrosion at welding joints of the solar cells' bus bar: it is caused by water vapor ingress into the module due to damage of encapsulating materials during transportation or installation.
3. Check whether there is burning traces on the module's back sheet.

## 8.3 Inspection of Connectors and Cables

It is suggested to carry out a preventive inspection once every 6 months:

1. Check the seal of connectors and firmness of cable connection.
2. Check whether the sealant of the junction box cracks or have any gap.

### **LONGi Green Energy Technology Co., Ltd.**

Block B, No.8989 Shangji Road, Xi'an Economic and Technological Development Zone, Xi'an, Shaanxi, China.

Tel: +86- 4009696199

Fax: +86-29-86686228

Postal code: 710018

Official website: [en.longi-solar.com](http://en.longi-solar.com)

