



BenQ  
Solar

A division of AU Optronics

# BenQ Solar Photovoltaic Modules

## Installation Guide

(IEC, ETL)

PM200M00

PM245P00

PM250M0I

PM300P00

PM318B00

PM318B0I

PM096B00

Version 1.1

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# BenQ Solar Photovoltaic Modules (IEC, ETL)

## Installation Guide for Users

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## Chapter I General Information

### 1.1 Introduction

The following is the product installation guide for the BenQ Solar photovoltaic modules. BenQ Solar modules should be installed by certified professionals only. This guide is designed to be used in combination with industry recognized best practices and all applicable rules and regulations.

Please read these instructions in entirety before handling or using this product in any way.

### **IMPORTANT**

**BenQ Solar modules and this guide are designed for use by certified professionals only. Failure to follow instructions in this guide AND observe industry best practices may result in dangerous conditions and could void the product warranty.**

### 1.2 Limited Warranty and Product Certifications

See BenQ Solar Limited Warranty document for full product warranty details and limitations. Product Warranty version is based on warranty note in effect at the time of product manufacturing date.

See individual Module Specifications sheet for more information about product certifications of the desired BenQ Solar module model.

The most up to date version of both of these documents can be found in the BenQsolar.com Document Center.

<http://www.benqsolar.com/?sn=1037&lang=en-US>

### 1.3 Disclaimer of Liability

It is each installer's responsibility to abide by all relevant rules and regulations when using this product. Always observe Industry Best Practices when handling, installing, and using this product. This guide is designed for use by trained and certified solar professionals only. BenQ Solar does not assume responsibility for loss, damage or expense resulting from installation, handling or use of this product.

## 1.4 Guidelines for Safe Handling and Installation



### **IMPORTANT**

**THIS PRODUCT IS DESIGNED FOR INSTALLATION BY QUALIFIED PERSONNEL ONLY.**

**ALL HANDLING AND INSTALLATIONS MUST BE PERFORMED IN COMPLIANCE WITH ALL APPLICABLE CODES, RULES AND REGULATIONS.**

In addition to the applicable rules and regulations, please follow all guidelines for safe handling and/or installation of BenQ Solar modules. In addition to the guidelines below, always observe industry best practices when handling and/or installing any BenQ Solar module. Save this Installation Guide for future reference.

### **LIFTING AND HANDLING**

- Do not lift the module or carry module by junction box or PV cables.
- Do not drill holes in the frame.
- Avoid scratching the frame. Scratches to the frame will compromise protective coating and can result in corrosion or weakened structure.
- Do not scratch or damage the module backsheet. Scratches to the backsheet could affect module performance.
- Do not stand on, drop, scratch or allow objects to hit modules (especially module glass).
- Do not install or handle the modules when wet or during periods of high wind.
- Do not install the modules where there may be flammable gases or vapors, since sparks may be produced.
- Save these instructions for future reference.

### **ELECTRICAL HANDLING AND INSTALLATION**

- **Modules interconnect points conduct direct current (DC) and are sources of voltage when the module is under load and when it is exposed to light.**
- **Direct current can arc across gaps and may cause injury or death if improper connection or disconnection is made, or if contact is made with module leads that are frayed or torn.**

- **Please use caution when handling any module.**
- Remove all metallic jewelry prior to installing this product to reduce the chance of accidental exposure to live circuits.
- Use properly insulated tools to reduce your risk of electric shock.
- Do not touch the terminals while the module is exposed to light.
- During installation use suitable protection prevent a discharge of at least 30 direct current volts to each person on crew.
- Do not connect or disconnect modules when current from the modules or an external source is present.
- Do not remove or misuse module connectors, this could void module warranty.
- Cover all modules in the PV array with an opaque material before making or breaking any connections.
- Use only the supplied locking connectors and safety clips in order to prevent untrained persons from disconnecting the modules once installed.
- There are no serviceable parts within the module. Do not attempt to change or repair any part of the module.
- Damaged modules (broken glass, torn back sheet, broken j-boxes, broken connectors, etc) can present electrical hazards as well as laceration hazards. Contact with damaged module surfaces or module frame can cause electric shock. The dealer or installers should remove the module from array and contact the supplier for disposal instructions.

## **STORAGE**

- When storing modules for any period of time, cover modules to ensure protection from the elements.
- When storing the modules, turn so that the glass is face down. Do not allow water to collect inside module, this can damage module connectors.
- When storing the modules, do not allow the anodized profiles (frames) to come into contact with contaminants such as cement or mortar, which will cause damage to the anodic oxide coatings.

**\*Always contact your module supplier for additional instructions if maintenance is necessary.\***

## Chapter 2 BenQ Solar Module Specifications

The module electrical ratings are measured under Standard Test Conditions (STC) of 1000W/m<sup>2</sup> irradiance with AM 1.5G spectrum and a cell temperature of 25°C. BenQ Solar modules electrical characteristics depend on module Series and Wattage. Please refer to the tables below to learn more about the characteristics of your module(s).

### 2.1 PM200M00 Series

**Module Dimensions (L x W x H):** 1318 x 983 x 40 mm (51.87 x 38.70 x 1.57 in)

**Module Weight:** 15.4 kg (33.5 lbs)

Module Type	P <sub>max</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mp</sub> (V)	I <sub>mp</sub> (A)
PM200M00_190	190	30.2	8.60	23.6	8.06
PM200M00_195	195	30.3	8.68	23.7	8.23
PM200M00_200	200	30.4	8.76	23.9	8.37
PM200M00_205	205	30.5	8.84	24.1	8.51
PM200M00_210	210	30.6	8.92	24.3	8.65
PM200M00_215	215	30.7	9.00	24.4	8.82
PM200M00_220	220	30.8	9.08	24.5	8.99

### 2.2 PM245P00 Series

**Module Dimensions (L x W x H):** 1639 x 983 x 40 mm (64.52 x 38.7 x 1.57 in)

**Module Weight:** 18.5 kg (41.1 lbs)

Module Type	P <sub>max</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mp</sub> (V)	I <sub>mp</sub> (A)
PM245P00_240	240	37.0	8.58	29.9	8.03
PM245P00_245	245	37.2	8.64	30.3	8.09
PM245P00_250	250	37.4	8.69	30.6	8.17
PM245P00_255	255	37.6	8.76	30.8	8.28
PM245P00_260	260	37.7	8.83	31.2	8.34

## 2.3 PM250M01 Series

**Module Dimensions (L x W x H):** 1639 x 983 x 40 mm (64.52 x 38.7 x 1.57 in)

**Module Weight:** 18.5 kg (41.1 lbs)

Module Type	P <sub>max</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mp</sub> (V)	I <sub>mp</sub> (A)
PM250M01_255	255	37.8	8.94	30.3	8.42
PM250M01_260	260	38.0	8.96	30.8	8.45
PM250M01_265	265	38.2	8.98	31.3	8.47
PM250M01_270	270	38.5	9.01	31.8	8.50
PM250M01_275	275	38.7	9.03	32.3	8.52

## 2.4 PM300P00 Series

**Module Dimensions (L x W x H):** 1956 x 983 x 50 mm (77.01 x 38.70 x 1.96 in)

**Module Weight:** 28 kg (61.73 lbs)

Module Type	P <sub>max</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mp</sub> (V)	I <sub>mp</sub> (A)
PM300P00_290	290	44.9	8.69	35.6	8.15
PM300P00_295	295	45.2	8.75	36.9	8.22
PM300P00_300	300	45.4	8.82	36.1	8.30
PM300P00_305	305	45.5	8.87	36.4	8.36

## 2.5 PM318B00/PM318B01/PM096B00 Series

**Module Dimensions (L x W x H):** 1559 x 1046 x 46 mm (61.38 x 41.18 x 1.81 in)

**Module Weight:** 18.6 kg (41.0 lbs)

Module Type	P <sub>max</sub> (W)	V <sub>oc</sub> (V)	I <sub>sc</sub> (A)	V <sub>mp</sub> (V)	I <sub>mp</sub> (A)
PM318B00/B01_315 PM096B00_315	315	64.6	6.14	54.7	5.76
PM318B00/B01_320 PM096B00_320	320	64.8	6.27	54.7	5.86
PM318B00/B01_325 PM096B00_325	325	64.9	6.39	54.7	5.94
PM318B00/B01_327 PM096B00_327	327	64.9	6.46	54.7	5.98

## 2.6 Performance of PV Modules

A PV module may produce more current and/or voltage than reported at STC. Sunny, cool weather and reflection from snow or water can increase current and power output. Therefore, the values of  $I_{sc}$  and  $V_{oc}$  shown below should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes, and size of controls connected to PV output. An additional 1.25 multiplier may be required by the NEC for sizing fuses and conductors as described in the NEC section 690.8.

While module current depends on solar irradiance, module voltage will vary depending on device temperature. This means overall production will vary depending on solar radiation, the temperature of the cells/module and the equipment to which they are connected.

## Chapter 3 Mounting Guidelines

Modules may be mounted at any angle from horizontal to vertical. Select the appropriate orientation to maximize sunlight exposure.

A gap between the module and system structure or ground is required to prevent wire damage and to allow air to circulate behind the module.

Take care to follow all applicable regulations, especially municipal and fire codes, when planning and executing your installation. Do not remove or alter the module frame. Additional mounting holes may damage the module and reduce the strength of the frame.



### IMPORTANT

**Modules should only be mounted using one of the following methods. Deviating from the mounting instructions below could affect max wind load and/or product warranty.**

### 3.1 Mounting with Screws

- Secure the module to the structure using only the factory drilled mounting holes.
- Do not drill any additional holes in module frame (doing so would void the warranty).
- Use corrosion-proof fastening materials.
- A torque wrench must be used for assembly. In the examples shown, the tightening torque must be 20N · m.
- Refer to product datasheet for the module dimensions and mounting hole locations.

#### **PM200M00 / PM245P00 / PM250M01 / PM300P00**

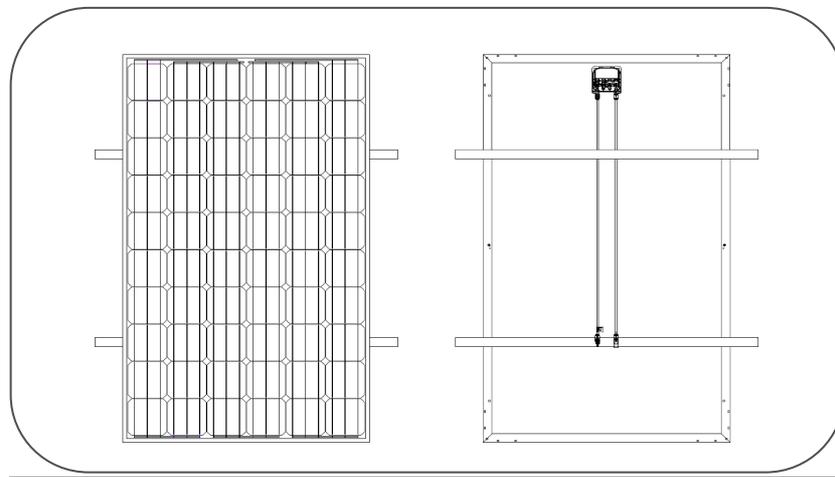
Secure the modules to the structure using four stainless steel bolts, with nuts, washers, and lock washers. Only the existing mounting holes (Diameter: **9mm**) that can be used for module to meet 5400Pa design strength under IEC 61215/ IEC 61730 and to meet 2400Pa design strength under UL 1703.

#### **PM318B00 / PM318B01 / PM096B00**

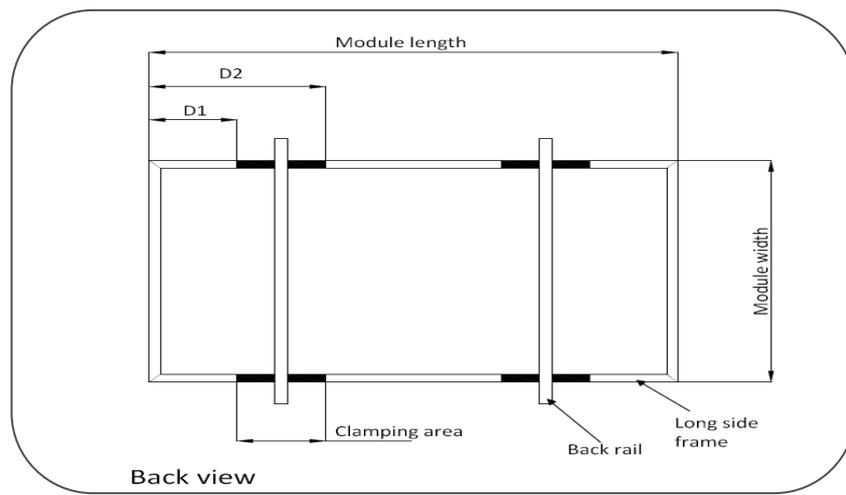
Secure the module to the structure using four **M6 (1/4")** stainless steel bolts, with nuts, washers, and lock washers per module. Only the mounting holes that are 322mm from the short end of the module can be used for the module to meet 5400 Pa design strength.

## 3.2 Mounting with Clamps

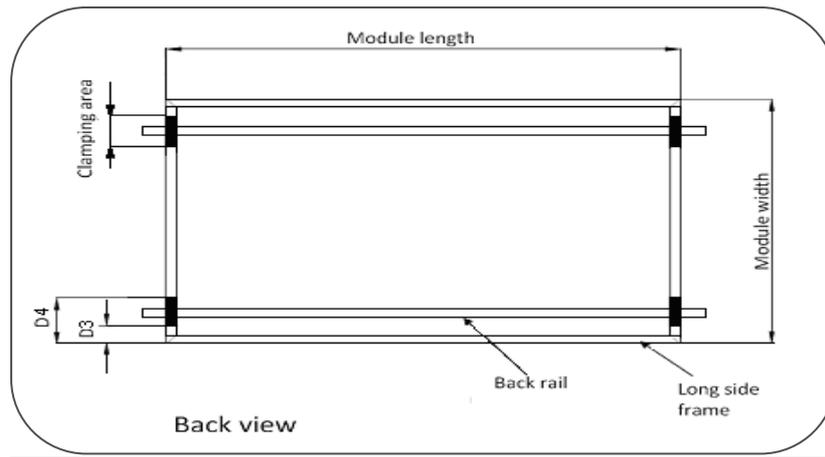
- The clamping clips on the side frame must be in parallel (see Figure 1).
- Ensure the clamps are of sufficient design strength to allow for the maximum design pressure of the module.
- Measurements of D1, D2, D3, and D4 below describe the centerline of the mounting clamp to the edge of the module frame.
- Clips and clamps are not provided by BenQ Solar.
- There are two clamping methods available (see below for specific measurements):
  - Clamp on the long side of the frame (see Figure 2, measurements below)
  - Clamp on the short side of the frame (see Figure 3, measurements below)



*Figure 1 Top view and back view of installed module*



*Figure 2 Long rail mounting clamp range (D1 and D2)*



*Figure 3 Short rail mounting clamp range (D3 and D4)*

### **PM200M00 Module Clamp Location Details**

- Long rail clamping for 5400 Pa design strength: clamp between **D1 – 227 mm (8.94 in)** and **D2 – 296 mm (11.65 in)** from the closest short side of the module.
- Short rail clamping for 2400 Pa design strength: clamp between **D3 – 50 mm (1.97 in)** and **D4 – 150 mm (5.91 in)** from the closest long side of the module.

### **PM245P00 / PM250M01 Module Clamp Location Details**

- Long rail clamping for 5400 Pa design strength: clamp between **D1 – 281 mm (11.06 in)** and **D2 – 375 mm (14.76 in)** from the closest short side of the module.
- Short rail clamping for 2400 Pa design strength: clamp between **D3 – 198 mm (7.8 in)** and **D4 – 298 mm (11.73 in)** from the closest long side of the module.

### **PM300P00 Module Clamp Location Details**

- Long rail clamping for 5400 Pa design strength: clamp between **D1 – 127 mm (5.0 in)** and **D2 – 427 mm (16.81 in)** from the closest short side of the module.
- Short rail clamping for 2400 Pa design strength: clamp between **D3 – 221 mm (8.7 in)** and **D4 – 271 mm (10.67 in)** from the closest long side of the module.

### **PM318B00/PM318B01/PM096B00 Module Clamp Location Details**

- Long rail clamping for 5400 Pa design strength: clamp between **D1 – 250 mm (9.84 in)** and **D2 – 400 mm (15.75 in)** from the closest short side of the module.
- Short rail clamping for 2400 Pa design strength: clamp between **D3 – 160 mm (6.3 in)** and **D4 – 400 mm (15.75 in)** from the closest long side of the module.

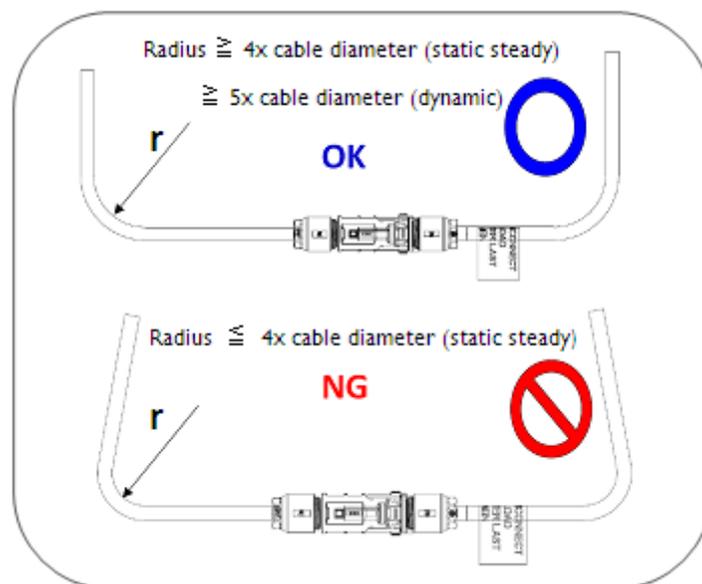
## Chapter 4 Electrical Installation: Wiring and Grounding

### 4.1 Wiring

DO NOT do any change or adjustment on the cable of Junction Box.  
DO NOT disconnect cable by yourself!

#### IMPORTANT

The cable must not be bent or crushed on the direct exit of the cable screw joint. A minimum bending radius  $r \geq 4x$  (static steady),  $r \geq 5x$  (dynamic) cable diameter must be maintained. The cable must be routed in a way that tensile stress on the conductor or connection(s) is prevented.



*Figure 4 Minimum bending radius of cable*

Pay attention to the following when wiring:

#### 1. Correct wiring scheme

Check that the wiring is correct before commissioning the system. If the measured open circuit voltage differs from the specifications, then there is a wiring fault. Ensure that the polarity is correct.

#### 2. Correct DC plug connection method

Make connections only in dry conditions. Ensure that connections are secure and tight.

#### 3. Use correctly rated materials

Use PV rated solar cable for wiring and suitable connectors only. Ensure that they are in perfect electrical and mechanical condition. Use only single wire cables. Select a suitable conductor diameter to minimize voltage drop.

#### 4. Cable protection

Secure the cables to the mounting system using UV-resistant cable ties. Protect exposed cables from damage using suitable precautions. Avoid direct and extended exposure to sunlight.

#### Wiring and Installation Guidelines

Please note the following instructions:

- To ensure the correct orientation of the module, the module should face southwards in the northern hemisphere and northwards in the southern hemisphere.
- The module must be installed so that air can freely circulate around it. The cells' working temperature will thus be reduced and, consequently, the module's performance will be enhanced.
- Do not install modules in systemic and ongoing shade; this can cause the temperature of exposed cells to rise, reducing output, and may stress conductive bonds in module.
- The cross section for the conductors must be ensured that the voltage drop during the installation does not exceed 2% of its nominal voltage.
- BenQ Solar PV modules are supplied with or without cables, according to where they are ordered. Should they be supplied without cables, it is recommended that cables with cross sections between 4 and 10 mm<sup>2</sup> be used.
- The cables, which allow easy handling while providing high protection against overloads and short-circuits, are formed by flexible Cu conductors, cross linked insulated polyethylene and coated with polyvinyl chloride or similar insulation. The insulation should be flame, acid and alkali resistant and should be stored in an area free of any corrosive gases.

#### Wiring and Installation Warnings

- The modules should be installed and handled by qualified persons only.
- Do not climb up or walk on the module.
- Do not drop the module or throw objects on the module.
- Use the module only for the purpose to which it is designed.
- Do not dismantle the module or remove any part, label, or piece assembled by the manufacturer without the manufacturer's authorization.
- Do not concentrate sunlight or other artificial light sources onto the module.
- Use tools duly coated with insulating material while working with the modules.
- Always work under dry conditions.
- Do not install the modules where there may be flammable gases or vapors, since sparks may be produced.
- Take care to avoid electric discharges when installing, wiring, starting up or carrying

out maintenance work on the modules.

- Do not touch the terminals while the module is exposed to light.
- Install with suitable protection to redirect a discharge of 30 or more direct current volts to if delivered any person on the installation team.
- Please prevent adherent of oil such as paraffin liquid, animal oil and vegetable oil form molding parts. It may be cracked or broken and loose the performance of Junction Box and connectors.

## 4.2 System Grounding (Negative)

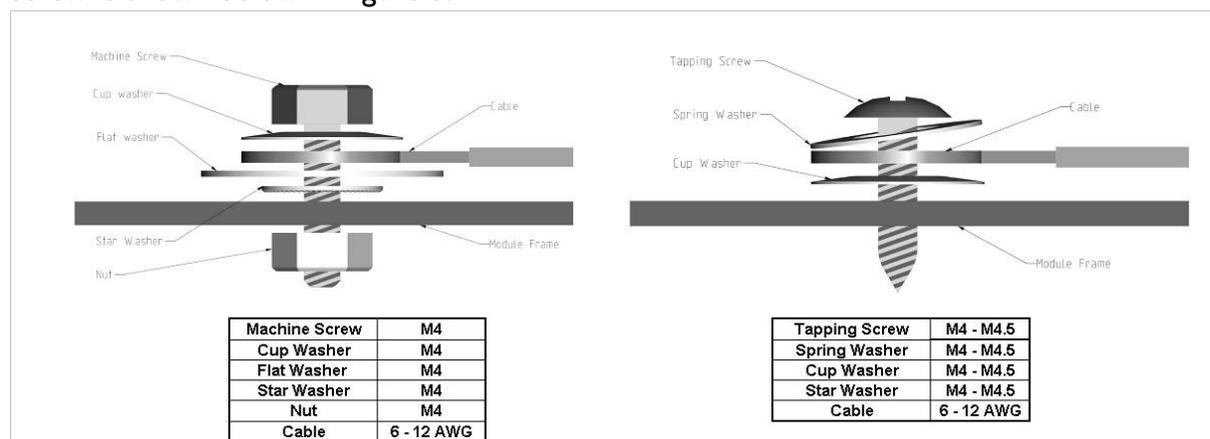
### PM200M00/PM245P00/PM250M01/PM300P00

BenQ Solar PV modules have a clearly marked grounding hole on each side of the frame for inserting the ground contact. The grounding screw and bolt are separately used from the mounting parts of the module.

Please make sure the grounding screw removes the anodizing from the surface of the grounding holes, or scratch off the anodizing before the grounding connection is made since the frame is fully insulated by anodizing.

An anti-oxidation compound should be applied to the bare aluminum surface for protection. Using a layer of insulation is an especially critical step if the material of support structure is different with the material of frame (aluminum).

If the support structure be a non conductor, a ground cable must be connected by means of a suitable fastening system. The fastening system will be joined to a cable with a minimum 2.5mm<sup>2</sup> cross section, together with all the grounding conductors from each module. Please make sure that each module is grounded properly. The recommended assembly of grounding screw is shown below in Figure 5.



**Figure 5** Recommended grounding connection

Per NEC 250.136, electrical equipment secured to and in electrical contact with a metal rack or structure provided for its support and grounded by one of the means indicated in 250.134 shall be considered effectively grounded.

### 4.3 System Grounding (Positive)

#### **PM318B00/PM318B01**

For optimal performance, BenQ Solar modules must only be used in configurations with galvanically insulated inverters where the positive (+) polarity of the PV array is connected to ground protected by a fuse.

In addition, the module frame should be grounded. **Failure to comply with this requirement will reduce the performance of the system and invalidate BenQ solar Limited Power Warranty for PV Modules.**

Grounding of the module frame can be achieved through use of clamps that penetrate the anodization in conjunction with grounding of the mounting system or through direct grounding of the frames by attaching a copper wire to a grounding hole of each module (bolt size, M6 × 1.0 × 50).

### 4.4 System Grounding (Transformer less)

#### **PM096B00**

Comply with the local regulations for earthing the modules and the PV array.

Grounding of the module frame can be achieved through use of clamps that penetrate the anodization in conjunction with grounding of the mounting system or through direct grounding of the frames by attaching a copper wire to a grounding hole of each module.

### 4.5 Limitation in Connection

#### **IEC**

The IEC 61730 certificate of these modules guarantees their insulation up to a DC voltage of 1000V. (IEC 61730 Standard).

#### **ETL**

The UL 1703 certificate of these modules guarantees their insulation up to a DC voltage of 1000V. (UL 1703 Standard).

Both standards apply to all module series described in this manual, however, a cable with a suitable cross section must be used for conducting the sum of the currents as generated by the modules. A series protection fuse of 15A is recommended for each string when module strings are wired in parallel.

BenQ Solar recommends the PV conductor, which cross section is 4 mm<sup>2</sup>. External connection boxes can be used to enable greater cable cross section area for long distance transmission.

The modules are qualified for the application class A: Hazardous voltage (IEC 61730: higher than 50V; EN 61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated.

## Chapter 5 Maintenance

- Inspect all modules annually for safe electrical connections, sound mechanical connection, and corrosion.
- BenQ Solar PV module may use anti-reflective coating (ARC) glass to enhance power output.
- Do not touch glass surface unless wearing clean gloves in order to prevent fingerprints or smudges on the ARC. Fingerprints may be removed with standard glass cleaner.
- Periodically clean glass and the module surface only with a soft cloth or sponge using mild detergent and water.
- Do not use harsh cleaning materials such as scouring powder, steel wool, scrapers, blades, or other sharp instruments to clean the glass surface of the module. Use of such materials will void the product warranty.

### 5.1 Module Cleaning Guidelines

Dirt piled up on the module's transparent surface reduces its performance and may cause the module hot spot effect. This problem may become serious in the case of industrial waste and bird droppings collecting on the module surface.

Thin layers of dust (normal soiling) that reduce the sun's intensity evenly are not dangerous and the power reduction is not as significant as other debris.

Clean the module array regularly to address reduced production due to soiling. The frequency of cleaning depends on how quickly material accumulates. Mounting the module at or above a 15 degree angle will help prevent dust and debris from collecting on the module.

In many cases, rainfall may reduce or remove the need to clean the modules. It is best to clean the module during early morning, late afternoon or cloudy day. Do not clean module during high temperature, temperature lower than zero degrees Celsius, or any time when there is a large temperature difference between module and cleanser.

If it is necessary to clean back side of module, do not damage any components. Avoid allowing any oily liquids such as paraffin liquid, animal oil, or vegetable oil contacting with junction box, cable and connector. BenQ Solar PV modules can withstand snow pressure of 2400 Pa.(UL 1703) Please use soft brush lightly removing snow pileup. Do not try to remove frozen snow and solid ice on the module (it will eventually melt off).

## 5.2 Module Cleaning Instructions

**Solution Mixture:** clean water with low mineral amount, non-abrasive/ non-caustic detergent, weak acid/weak alkalescent solution, or solution of PH < 10. Do not use high pressure spray.

**Cleaning Tool:** soft brush, non-conductive brush, non-abrasive sponge, non-abrasive cloth, seamless cloth

1. Clean module and glass surface with solution and tool described as above.
2. If dirty area on glass surface which is hard to be cleaned such as oily substances, try to use commercial glass detergent, alcohol, isopropanol (IPA), or sodium bicarbonate solution.
3. Use clean water to rinse glass clean of all cleaning solution. Dry wet modules using a clean and dry cloth. Do not leave stagnant water on glass surface.

## 5.3 Cleaning the Frame

BenQ Solar module frames include an anodic oxide coating to increase produce life. The cleaning cycle for regular anodic oxide coatings is generally every six months. When cleaning, be sure not to damage or scratch this coating.

Dirt can generally be cleaned off using a suitable lubricant or warm, mild soapy water, and a fiber brush may be used to clean any dust that may also stick to the surface. Do not use abrasive cleaning tools like steel wool or acidic/ alkaline chemicals to clean. (Reference : GB 5237.2, Wrought aluminum alloy extruded profiles for architecture)

## 5.4 Visual inspection of the module

During regular cleaning cycles, be sure to visually inspect each module. The purpose of visual inspection is to detect possible faults or damage. Specifically:

- Possible broken glass.
- Rust on the circuits and soldering of the PV cells. Normally this is due to moisture entering the module through a breakage in the encapsulating layer during installation or transport.

## 5.5 Inspecting connections and cabling

While performing preventive maintenance every 6 months, carrying out the following operations:

- Check the tightness and condition of the connection cable junctions.
- Check the junction box sealing. Should sealing faults be observed, the items which have been affected should be replaced and cleaned. Contact BenQ Solar for additional information about resolving faults in module seal.

## Chapter 6 Certifications

### 6.1 IEC Certification

- The PV modules provided by BenQ Solar all pass the design qualification and type approval standard IEC 61215 edition 2.
- The PV modules provided by BenQ Solar all pass the safety qualification standard IEC 61730 certified for application class A.
- Modules qualified for safety through EN IEC61730.1 and EN IEC61730.2 within this application class are considered to meet the requirements for Safety Class II.

### 6.2 ETL Certification

- This product meets or exceeds the requirements set forth by ULI703 for PV Modules.
- This ULI703 Standard covers flat-plate PV modules intended for installation on buildings and those intended to be freestanding.
- To satisfy the listing for this product the modules must be mounted with a rack or standoff structure.
- It does not include integration into a building surface because additional requirements may apply.
- This product is not intended for use where artificially concentrated sunlight is applied to the module.

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