



## **Safety and Installation Instructions**

This document applies to the following UL-listed Gloria Solar Standard Modules:

**GSM6- series**

**GSS6- series**

Rev: 1.2

Release Date: September 03, 2009

**Gloria Solar Co., LTD.**

## Revision History

Rev. 1.1 (April 08, 2009)

- Page 6: Number of bolts recommended for module mounting revised from 8 to 4.
- Page 6: Recommended torque for module mounting added

Rev. 1.2 (September 03, 2009)

- Page 5: Modify the load requirement to  $30\text{lb/ft}^2 (=146.5\text{kg/m}^2 =2155\text{Pa})$  and up to  $5400\text{Pa}$
- Page 6: Remove the number of mounting holes due to the various design of each model

## Production Certification and Warranty

This manual provides safety and installation instructions for UL-listed Gloria Solar photovoltaic (PV) modules carrying the UL logo on the product label (Figure 1).



Figure 1, UL logo

***Important!*** *The entire instruction shall be read and understood before installing, wiring, operating, or maintaining the photovoltaic module. Failure to comply with these instructions may result in bodily injury or damage to property and the modules.*

### ***Underwriters Laboratories (UL) Listing Information***

This product complies with the requirements set forth by UL 1703 for Flat-Plate Photovoltaic Modules and Panels. These requirements cover flat-plate photovoltaic modules and panels intended for installation on or integral with buildings, or to be freestanding (that is, not attached to buildings), in accordance with the National Electrical Code, NFPA 70, and Model Building Codes. This product is not designed for use under artificially concentrated sunlight.

### ***Disclaimer of Liability***

The actual installation process and handling of this product by installers are beyond Gloria Solar's control. Therefore, Gloria Solar does not assume responsibility for loss, damage or expense resulting from improper installation, handling or use.

### ***Limited Warranty***

Module limited warranties are described in the Gloria Solar "Limited Product Warranty" obtainable at [www.gloriasolar.com](http://www.gloriasolar.com).

## Safety Precautions

Read all safety instructions carefully before installing this product.

***Danger!*** Photovoltaic modules generate or pass direct-current (DC) electrical energy when exposed to light or connected with other electrical-power sources. Contact with electrically active parts of the module such as terminals or torn wire can result in lethal shock or burn. Do not connect or disconnect modules when current from the modules or an external source is present.

- Follow the National Electrical Code (NEC) and all applicable regional and local codes and regulations for installation.
- Installation should be performed only by qualified and licensed professionals.
- Do not wear metallic jewelry while performing mechanical or electrical installation.
- Use dry and insulated tools to reduce your risk of electric shock.
- Do not install or handle the modules when they are wet or during periods of strong wind.
- Do not work on a module if its front glass is broken, or the back sheet is torn. Contact with its surface or frame can cause electric shock.
- There are no user serviceable parts within the module. Do not disassemble or remove any part installed by the manufacturer. Any disassembly or removal of any parts will void this product warranty.
- Contact your module vendor if maintenance is necessary.
- Save the instructions for future reference.

## Storage, Unpacking, and Handling

These modules shall be handled with extreme care when storing, unpacking, and transporting them. If it is necessary to store the module temporarily, a dry ventilated room should be used. Leave modules in packaging until they are to be installed. Carry modules with both hands by their frame. Do not carry a module by its wires or junction box. Do not put weight or stand on them. Do not drop. Do not mark or scratch them with sharp objects. Do not leave a module unsupported or unsecured. Keep all electrical contacts clean and dry.

## **Module Mounting**

### ***Site selection***

Even partial shading can cause a significant drop in power generation of a photovoltaic module. Gloria Solar modules should be installed where there is no shading by neighboring obstacles like buildings, trees, or nearby modules, and there should be as less chance as possible of foreign objects, e.g. tree leaves, falling onto them. A module is shade free when the entire surface is shade free all year round.

Gloria Solar modules should not be immersed in water or in constant exposure with water spray.

Long term exposure to corrosive or abrasive materials in the environment can cause damage to the modules, and should be prevented. These materials include, but not limited to, sea water and salt, sand and dust, sulfur, acid rain, soot, chemically active vapor, ...etc..

### ***Ventilation***

Module performance degrades as temperature increases. Make sure to provide adequate ventilation for the backside of modules to keep them cool. For rooftop application, keep an appropriate clearance between the roof surface and the modules for air circulation.

### ***Orientation and tilt angle***

Electricity generated by a photovoltaic module varies throughout the day and the year as the intensity and the incident angle of the sunlight changes. Therefore, the overall yield depends on the installation orientation and the tilt angle. Optimal orientation and tilt angle depend on the location and application. To avoid performance loss due to mismatch, make sure that all modules connected in series have the same orientation and tilt.

To avoid dust and water accumulation on the front-side glass, install the modules with a minimum tilt of 5 degrees from the horizontal position.

### ***Mechanical strength***

Gloria Solar modules are designed to meet a load requirement of  $30\text{lb}/\text{ft}^2 (=146.5\text{kg}/\text{m}^2 =2155\text{Pa})$  and up to  $5400\text{Pa}$  when they are mounted following this instruction. Make sure the mounting structure meets the required load as well.

When mounting modules in snow prone or high wind environments, special care should be taken to provide sufficient structural support while meeting local code requirements.

### ***Mounting Configurations***

Please see Gloria Solar's product datasheet, available at [www.gloriasolar.com](http://www.gloriasolar.com), for specific information on module dimensions and the location of mounting and grounding holes.

The module is UL Listed only when its factory frame is fully intact. Do not remove or alter the module frame. Drilling additional mounting holes may damage the frame structure and reduce the strength of the frame.

The fire safety of a building may be affected when photovoltaic modules are installed on roof. When installed on a roof, the module shall be mounted over a fire-resistant roof-covering rated for the application.

Keep an appropriate clearance between the module frames and structure or ground to prevent wiring damage and to allow air circulation behind the module.

Modules should be mounted using one of the following two methods only:

- 1) **Mounting Holes:** The mounting holes are available on the long sides of the frame. Use the set of holes closer to the center for standard mounting. Fasten the modules to the mounting structure using these holes. 5/16 (or M8) stainless steel bolts, with nuts, washers, and lock washers tightened to 140 lbf-in (or 20 N-m for M8 bolts) are recommended per module. The other holes can be used for reinforcement if necessary. Refer to Gloria Solar's product datasheet, available at [www.gloriasolar.com](http://www.gloriasolar.com), for the module dimensions and mounting-hole locations.
- 2) **Pressure Clamps:** Mount and secure the module with clamps at the mounting-hole locations along the long sides of the frame. Installers should ensure that the clamps can provide sufficient strength to allow for the maximum design pressure of the module. Clamps are not provided by Gloria Solar.

### ***Water draining***

There are draining holes at the corners of the back side of the frame. Make sure that these holes are not obstructed after installation.

## **Electrical Connections**

### ***Electrical Characteristics***

Electrical characteristics of specific Gloria Solar PV modules are listed on their respective product labels and the product datasheet available at [www.gloriasolar.com](http://www.gloriasolar.com). The characteristics are measured under Standard Test Conditions (STC) of 1 kW/m<sup>2</sup> irradiance with AM 1.5G spectrum and a cell temperature of 25° C.

Under normal conditions, a photovoltaic module may produce more current and/or voltage than reported at STC. Therefore, the values of I<sub>sc</sub> and V<sub>oc</sub> marked on the module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacities, fuse sizes, and size of controls connected to the module output to comply with NEC Article 690-8(A). An additional 1.25 multiplier for a total of 1.5625 may be required as specified in NEC Article 690-8(B), for sizing fuses and conductors.

### ***General Wiring***

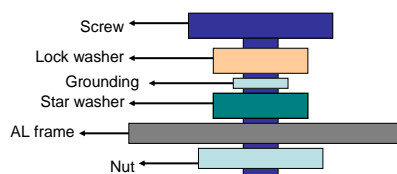
Each Gloria Solar module is supplied with a junction box with a bypass diode of maximum over current protection rated at 16 A and sunlight resistant #12 AWG (4 mm<sup>2</sup>) 90 °C temperature rated cables terminated in connectors ready for most installations. Under no circumstances should the junction box be opened. All modules wired in series and/or parallel should be of the same model number and/or type and the wiring should be carried out in accordance with applicable regional and local codes.

### ***Equipment Grounding***

Ground the frames of the PV modules or arrays before wiring the circuit. Refer to NEC Article 690 to determine the necessary grounding.

To meet the UL-listing requirements, Gloria Solar PV modules shall be grounded using UL-certified grounding hardware that meets the requirements in UL467, UL1703, and UL1741 on anodized aluminum frame.

Attach a grounding wire no smaller than #14 AWG to a grounding lay-in lug. Use one of the two grounding holes or any unused mounting holes for grounding. Fasten the grounding wire and lay-in lug to aluminum frame with stainless steel bolts, lock washers, star washers, and nuts according to the scheme shown in Figure 2. The star washer is needed to breakthrough the anodized layer on the aluminum frame to establish electrical contact with the aluminum. The lock washer is needed to maintain the tension of the assembly.



**Figure 2**, Grounding scheme

### ***Series Connection***

Modules may be wired in series for a desired voltage output. Do not exceed the maximum system voltage, listed in the product datasheet available at [www.gloriasolar.com](http://www.gloriasolar.com), when connecting modules in series.

### ***Parallel Connection***

Modules may be wired in parallel for a desired current output. When combining modules in parallel each module may be fused prior to the combining with the maximum allowed fuse size listed in the product datasheet available at [www.gloriasolar.com](http://www.gloriasolar.com). Please refer to NEC Article 690 for additional fusing requirements and limitations on the maximum number of modules in parallel.

### **Maintenance**

Check all modules at least annually to make sure the electrical and mechanical connections are safe, tight, and free from corrosion. Clean the module glass surface to remove dirt build-up only with a soft cloth or sponge using water and/or mild detergent as the product warranty will be voided if any other cleaning material is used to result in any damage to the product. Do not damage back sheet when cleaning the back surface of the module.