



Photovoltaic modules user manual

Green Wing Solar Technology Co.,Ltd

☎ +84 0915663035
+84 222 2220 669
+86 13901645223

📍 Lot D1-1, Dai Dong – Hoan Son Industrial Zone, Hoan Son
Commune, Tien Du District, Bac Ninh Province, Vietnam
✉ hongyao.fan@greenwingsolar.com

Green Wing Solar Technology Co.,Ltd



Gratitude for choosing the products made by GWSolar.

Please read the instruction before installing.

Please keep it properly after reading so that you can check it at any time.

About us

Green Wing Solar Technology (GWSolar) is located in Dai Dong – Hoan Son Industry Park, Tien Du District, Bac Ninh Province. There are about 1000 employees. It is a younger, active, developing and more promising manufacturer of PV modules, who is rooted in Vietnam and is eyeing the world. GWSolar is constantly making effort to provide best high efficiency PV products and supreme value-added services to customers, to build up a good corporation focusing on the premium market as well as the low market in terms of maintenance demanding. Also most importantly we would like to devote our attentions to the matched customers.

Certification



Installation | Safety instructions | Maintenance

Photovoltaic modules user manual

Please carefully read the following installation and safety instructions.

Non-compliance with these instructions may void the module warranty.

Purpose of this guide

This guide contains information regarding the installation and safe handling of EP photovoltaic modules (hereafter referred to as "modules"). All instructions should be read and understood before attempting installation. If there are any questions, please contact your dealer or EP for further information.

The installer should conform to all safety precautions in the guide when installing modules. Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for photovoltaic systems. Keep this guide in a safe place for future reference.

General

Installing solar photovoltaic systems requires specialized skills and knowledge. The installer assumes all risk of injury, including risk of electric shock. Module installation should be performed only by qualified persons.

- All modules come with a permanently attached junction box and #12 AWG (4 mm²) wire terminated in PV connectors. Your dealer can provide additional extension cables to simplify module wiring.
- Exercise caution when wiring or handling modules exposed to sunlight.
- When disconnecting wires connected to a photovoltaic module that is exposed to sunlight, an electric arc may occur. Arcs can cause burns, start fires or otherwise create safety problems. Exercise caution when disconnecting wiring on modules exposed to sunlight.
- Photovoltaic solar modules convert light energy to direct-current electrical energy, and are designed for outdoor use. Proper design of support structures is the responsibility of the system designer and installer.
- Modules may be ground mounted, pole mounted, or mounted on rooftops. Roof installation need meet local security laws and regulations.



Do not attempt to disassemble the module, and do not remove any attached nameplates or components.

Doing so will void the warranty.

Do not apply paint or adhesive to the module.



Artificially concentrated sunlight shall not be directed on the module or panel.

When installing modules, observe all applicable local, regional and national codes and regulations. Obtain a building and/or electrical permit where required.

Safety precautions for installing a solar photovoltaic system

- Solar modules produce electrical energy when exposed to sunlight.
- Only connect modules with the same rated output current in series. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages.
- Only connect modules or series combinations of modules with the same voltage in parallel. If modules are connected in parallel, the total current is equal to the sum of individual module or series combination currents.
- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Completely cover all modules with an opaque material during installation to prevent electricity from being generated.



Do not wear metallic rings, watchbands, ear, nose, or lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.



Use appropriate safety equipment (insulated tools, insulating gloves, etc) approved for use on electrical installations.

- Observe the instructions and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, mounting hardware, inverters, etc.
- Use only equipment, connectors, wiring and mounting hardware suitable for use in a photovoltaic system.
- Always use the same type of module within a particular photovoltaic system.
- Under normal operating conditions, PV modules will produce currents and voltages that are different than those listed in the data sheet. Data sheet values are applicable at standard test data.
- Short-circuit current and open-circuit voltages should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacity, fuse sizes and size of controls connected to the module or system output. Refer to Section 690-8 of the National Electrical Code (NEC) for an additional multiplying factor of 125 percent (80 percent de-rating) which may be applicable.

For UL listed products only: Module Fire Performance: Type 2

For cUL listed products only: Fire class rating: C

Advising that artificially concentrated sunlight shall not be directed on the module.

"Rated electrical characteristics are within 10 percent of measured values at Standard Test Conditions of: 1000 W/m², 25°C cell temperature and solar spectral irradiance per ASTM E 892" or ... irradiation of AM1.5 spectrum."

"Under normal conditions, a photovoltaic module may experience conditions that produce more current and/or voltage than reported at Standard Test Conditions. Accordingly, the values of ISC and VOC marked on UL Listed modules should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output."

"Refer to Section 690-8 of the National Electric Code for an additional multiplying factor of 1.25 which may be applicable."

The recommended standoff height is 50 mm. If other mounting means are employed this may affect the UL Listing or the fire class ratings.

A minimum slope of 5 in/ft. for installation over a roof, is required to maintain the fire class ratings.

The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.

The System Fire Class Rating of the module or panel in a mounting system in combination with a roof covering complete with requirements to achieve the specified System Fire Class Rating for a non-BIPV module or panel. Any module or panel mounting system limitations on inclination required to maintain a specific System Fire Class Rating.

Installation Instructions shall specify that the modules have been evaluated by UL for a maximum positive or negative design loading of 30 lbs/ft².

The installation instructions shall specify that the modules have been evaluated by UL for mounting using the 4 provided mounting holes in the frame.

CNL model instruction manuals shall also include a statement that installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

If instructions are provided allowing modules to be installed in parallel electrically, the installation instructions shall specify that each module (or series string of modules so connected) shall be provided with the maximum series fuse as specified.

The installation instructions shall specify that Grounding is achieved through securement to the array frame. The array frame shall be grounded in accordance with NEC Article 250.

The installation instructions shall specify that the use of the following hardware is required in order to provide a reliable grounding connection to the module frame:

The following UL Listed grounding Clips / Lugs in combination with the following model number PV modules.

Module	Grounding Clip / Lug	
	Manufacturer	Type
All series	TYCO ELECTRONICS CORP	1954381-2

The installation instructions shall specify that the modules shall be mounted so that the junction box shall be in the uppermost position to minimize the ingress of water.

Connectors type C-01(female and male), Manufactured by JIANGSU WINTERSUN ENERGY SAVING TECHNOLOGY CO LTD, using in modules, is only to be mated to connector type C-01(male and female).

General installation notes

- Drainage holes must not be covered with parts of the mounting system. The junction box has a breather port which must be mounted facing downward and cannot be exposed to the rain. The junction box should be on the higher side of the module when it is mounted in order to orient the breather port correctly.
- Do not lift the module by grasping the module's junction box or electrical leads.
- Do not stand or step on module.
- Do not drop the module or allow objects to fall on the module.
- Do not place any heavy objects on the module.
- Inappropriate transport and installation may damage the module glass or frame.

Mechanical Installation Selecting the location

- Select a suitable location for installation of the module.
- For optimum performance, the module must be facing true south in northern latitudes and true north in southern latitudes.
- For detailed information on optimal module orientation, refer to standard solar photovoltaic installation guides or a reputable solar installer or systems integrator.
- The module should not be shaded at any time of the day.
- Do not install the module near equipment or in locations where flammable gases can be generated or collected.

Selecting the proper mounting structure and hardware

- Observe all instructions and safety precautions included with the mounting system to be used with the module.
- Do not drill holes in the glass surface of the module. Doing so will void the warranty.
- Do not drill additional mounting holes in the module frame. Doing so will void the warranty.
- Modules must be securely attached to the mounting structure using four mounting points for normal installation. If heavy wind or snow loads are anticipated, additional mounting points should also be used.
- Load calculations are the responsibility of the system designer or installer.
- The mounting structure and hardware must be made of durable, corrosion- and UV-resistant material.
- The modules have been evaluated by TUV for mounting using the 8 provided mounting holes in the frame.
- Each module (or series string of modules so connected) shall be provided with the maximum series fuse as specified.

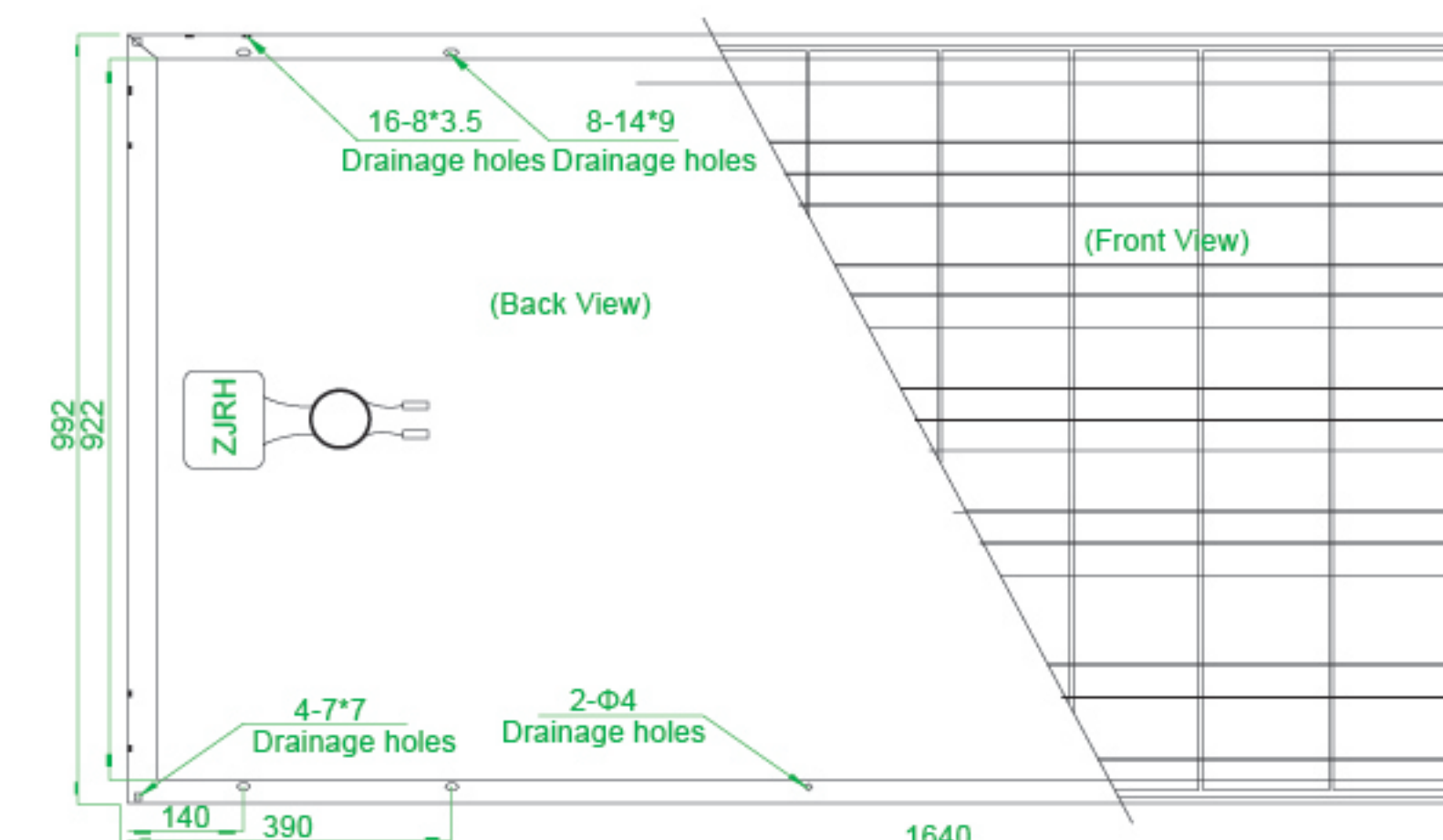
Mounting methods

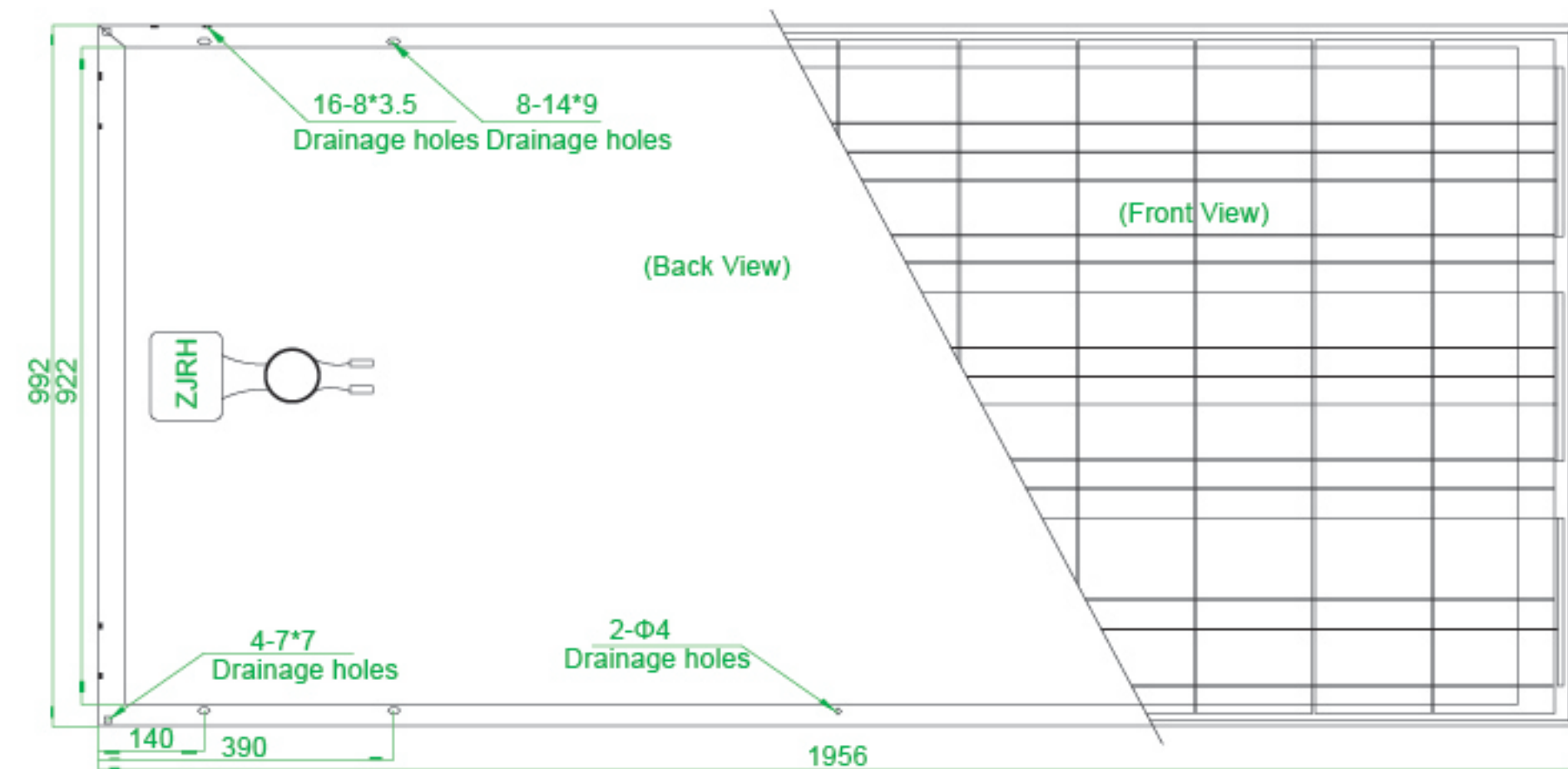
1. Mounting with Bolts

- The module must be attached and supported by at eight bolts through the indicated mounting holes. The eight slots are 140mm to the edges of the short frames.
- Depending on the local wind and snow loads, additional mounting points may be required. The all mount slots must be fastened.
- The modules by mechanical load test 5400pa for TUV only.

For UL listed, module maximum positive or negative design loading of 30 lbs/ft².

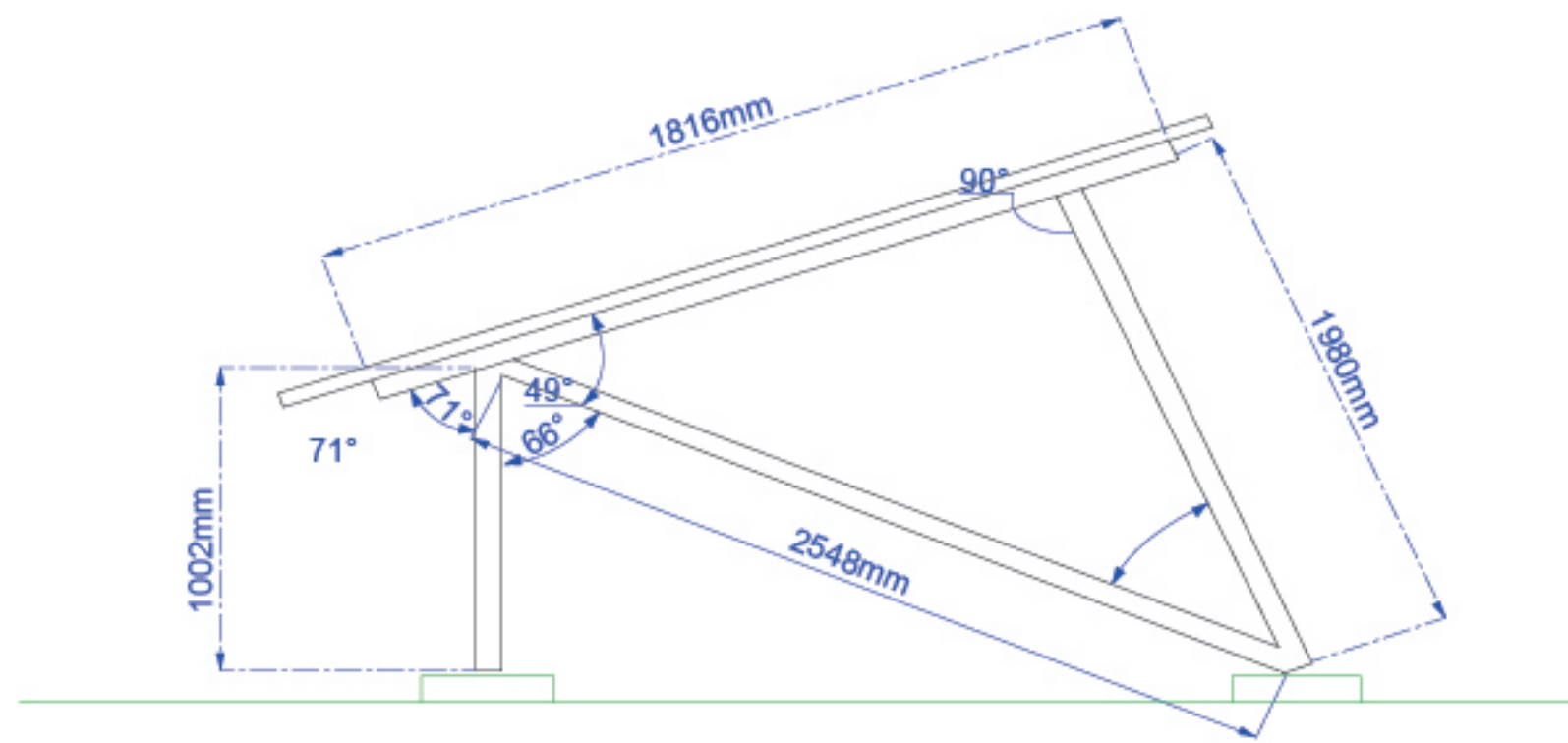
Poly-crystalline Cell Module



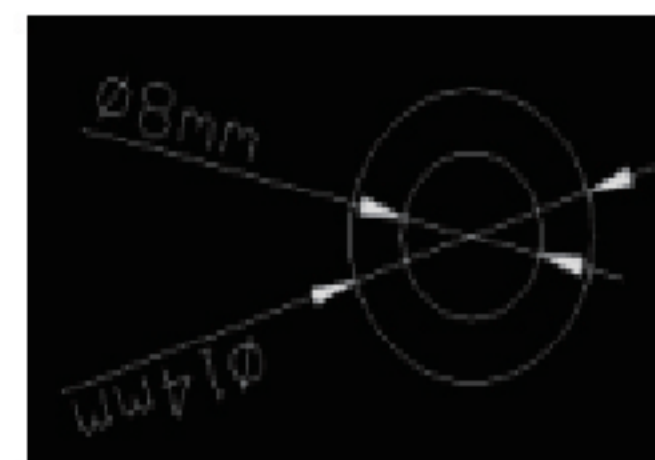
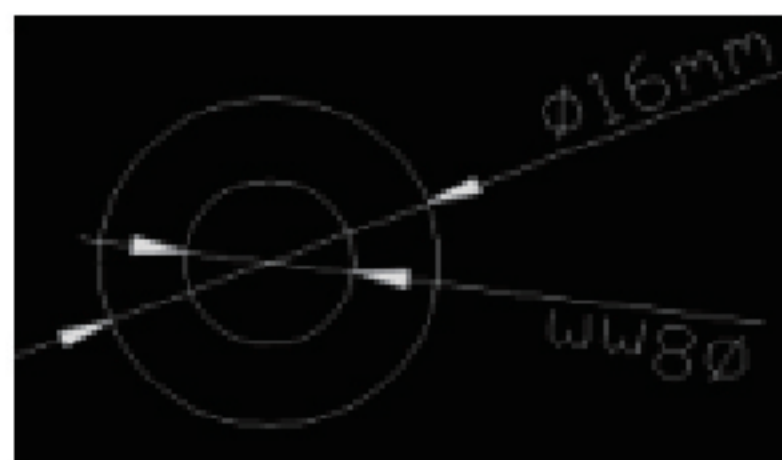
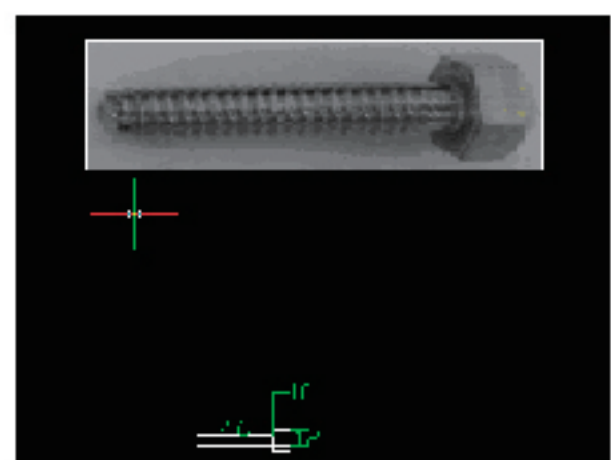
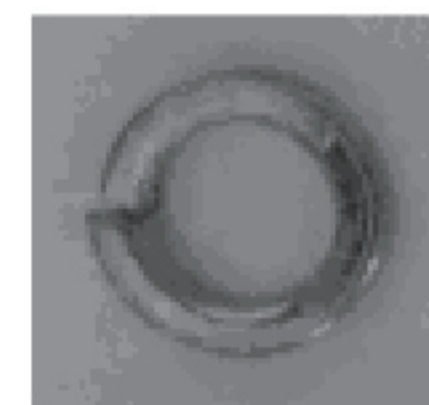
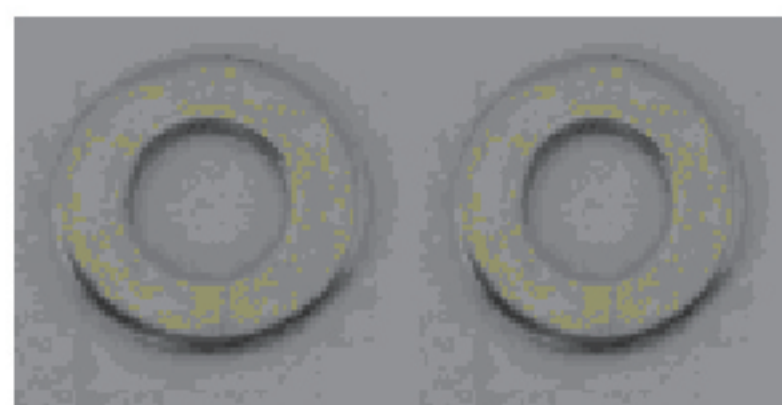
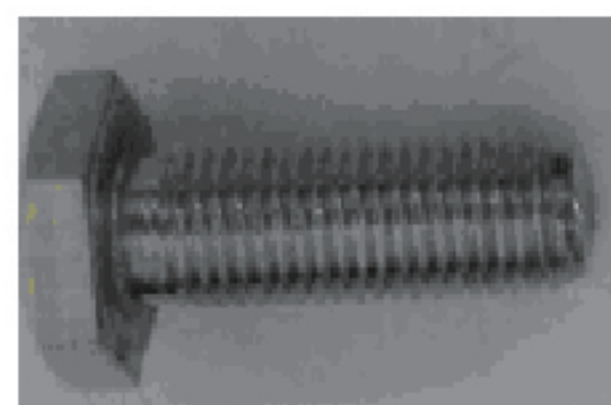


Mounting solar modules with bracket on flat roof and ground

- Fasten bracket on flat roof or ground first, fasten solar modules on bracket, use nuts to fasten bracket.
- The bracket would endure 20 years, and is made of anticorrosive material. Temperature zinc steels and Stainless steel is recommended.
- The bracket should be solid enough to resist continuous load, pressure from wind, snow, earthquake and other outside force.
- Use insulation materials to isolate different metal like stainless steel, aluminum. This would prevent corrosion.



- Insert screw into flat gasket, insert screw into installation hole both on the modules and supporting frame.
- Insert screw into flat gasket and spring gasket, then apply nut on the screw fasten it.



A2-70, M8SCREW

FLAT GASKET

SPRING GASKET

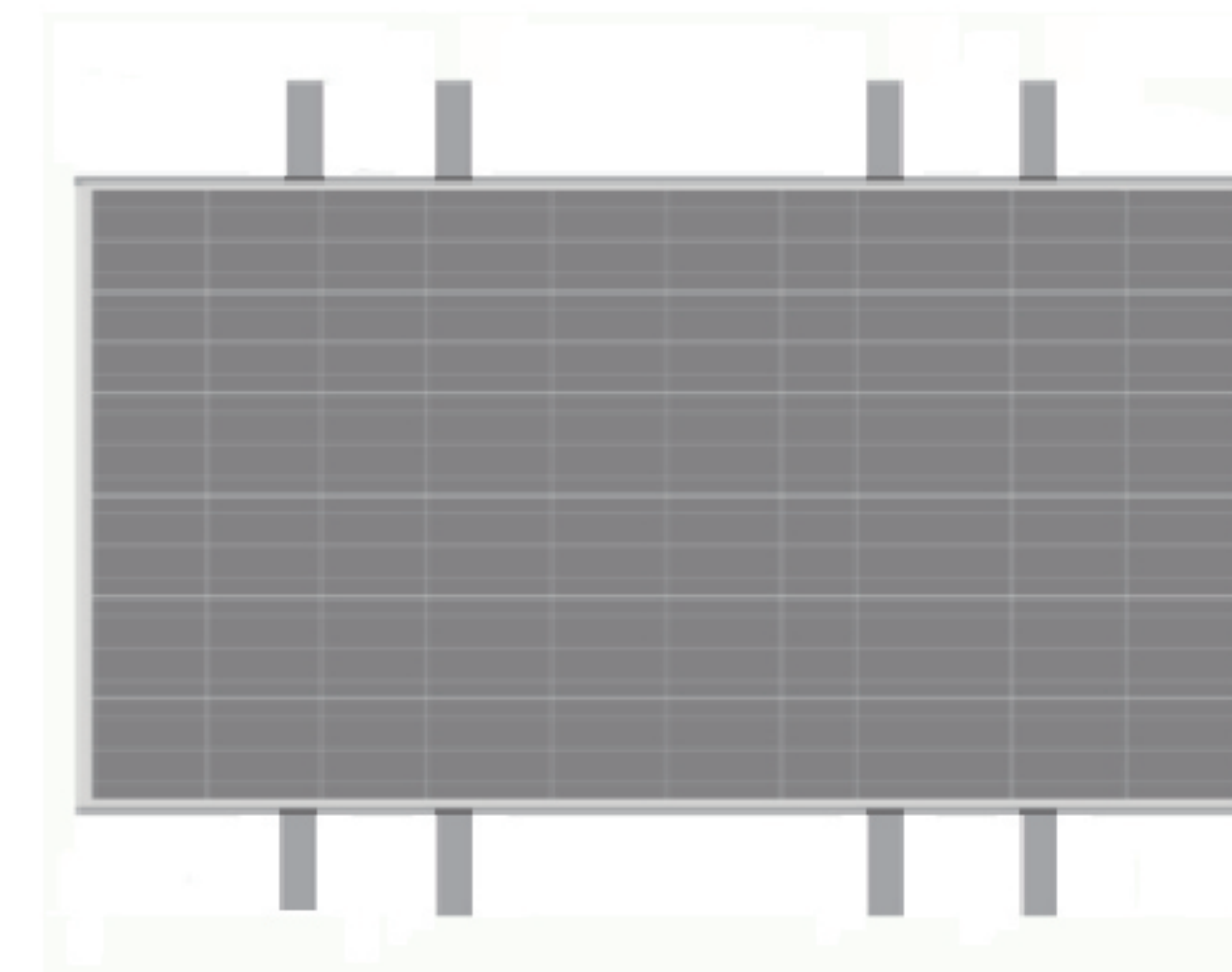
M8 NUT



Refer to the following form for supporting bracket's slope angle

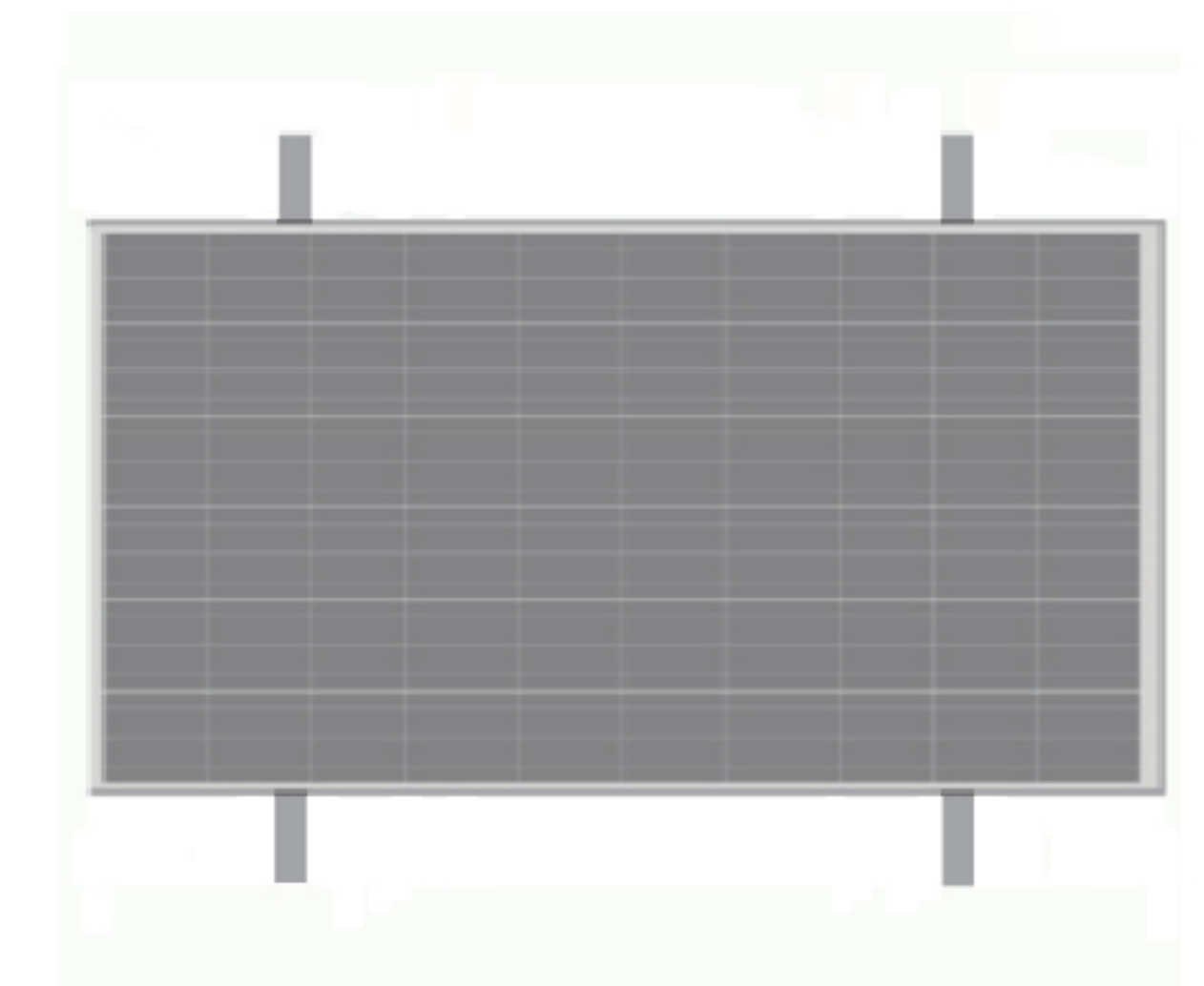
RECOMMENDED TILT ANGLES FOR A FIXED SYSTEM	
SITE LATITUDE IN DEGREES	FLXED TILT ANGLE
0° TO 15°	15°
15° TO 25°	SAME AS LATITUDE
25° TO 30°	LATITUDE+5°
30° TO 35°	LATITUDE+5°
35° TO 40°	LATITUDE+5°
40° +	LATITUDE+5°

For model GW-P156-72-xxx series



Using 8 mounting holes (4 holes each side frame) with M8 screw sets to fasten.

For model GW-P156-60-xxx series



Using 4 mounting holes (2 holes each side frame) with M8 screw sets to fasten.

Other

- The recommended standoff height is 5 cm. If other mounting means are employed this may affect the TUV Listing.
- Direction of module installation: PV module are rectangle shaped; PV module array longitudinal installation (the way that installs the module by long side longitudinal) is mostly used because the transverse installation (the way that installs the module by long side transversely) has less rain cleaning ability.
- For distance between the modules, longitudinal distance (along the roof gradient) should be enough for installation and disassembly; transverse distance should be 3-10cm.
- Other mounting methods are acceptable as long as the minimum requirements as described above. Above requirements are only basic instructions.

For example, on slant roof, mounting must comply with local safety code and regulations.

Mono-crystalline Cell Module



Poly-crystalline Cell Module



Electrical Installation

Grounding

SolKlip ground clips are designed for solar panel grounding applications using solid un-insulated copper 10 AWG or 12 AWG wire.

APPLICATION TOOLING

No special tooling required - only flathead screwdrivers and channel lock pliers (optional) standards and specs UL 467 approved, a requirement for UL 1703 solar panel listing

MATERIALS

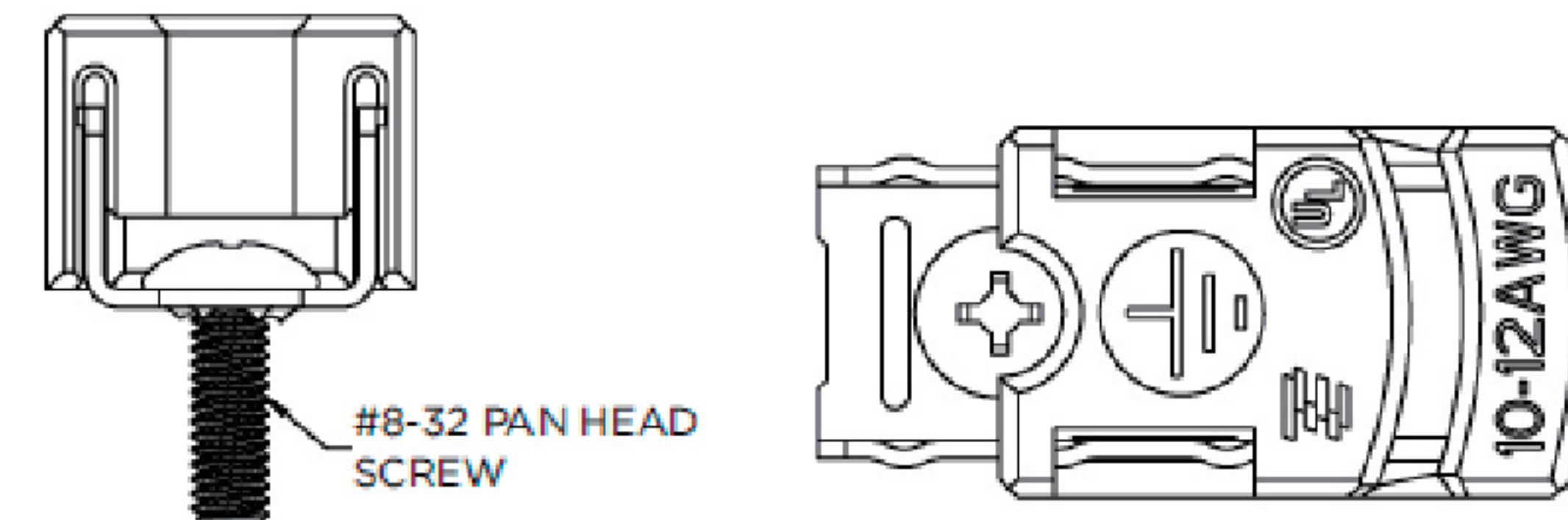
Housing: Durable PBT 30% glass filled polyester. Material is outdoor, UV rated

Contact: High conductivity, copper

MECHANICAL

The mechanical properties of this product will meet the tough requirements for grounding applications.

12 AWG applications will withstand 70 lbs. pull while the 10 AWG applications will



General electrical installation

- Do not use modules of different configurations in the same system.
- This module is supplied with Multi Contact connectors for electrical connections.
- Refer to Section 690.31 of the NEC to determine appropriate types and temperature ratings of conductors. Wiring should be #12 AWG, 4 mm² (minimum) and must be temperature rated at 90°C (minimum).
- Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- Refer to Sections 690.8 and 310 of the NEC to determine overcurrent, conductor ampacity and size requirements.
- In Canada, installation shall be in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.
- For best performance, ensure that positive and negative DC wires run closely together avoiding loops.

WARNING!

Electrical shock hazard! Do not touch bare conductors or other potentially energized parts.

Maintenance

EP recommends the following maintenance items to ensure optimum performance of the module:

- Clean the glass surface of the module as necessary. Use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used if necessary. Do not use dishwasher detergent.
- Electrical and mechanical connections should be checked periodically by qualified personnel to verify that they are clean, secure and undamaged.
- Check the electrical and mechanical connections periodically to verify that they are clean, secure and undamaged.
- Problems should only be investigated by qualified personnel.
- Observe the maintenance instructions for all other components used in the system.
- Artificially concentrated sunlight shall not be directed on the module.

Shutting down the system

- Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- The system should now be out of operation and can be dismantled. In doing so, observe the all safety instructions as applicable to installation.

Informations of the concerned modules:

Application class A

Class A: General access, hazardous voltage, hazardous power applications Modules rated for use in this application class may be used in systems operating at greater than 50 V DC or 240 W, where general contact access is anticipated. Modules qualified for safety through IEC 61730-1 and this part of IEC 61730 within this application class are considered to meet the requirements for safety class II.

Maximum overload protection current

Maximum overload protection current of the module is 15A for 6" cells modules.

Maximum overload protection current of the module is 10A for 5" cells modules.

Over-current protection device for the bypass diode.

3. CDF of System parts and Junction box

1)

Object	Manufacturer	Type	Technical data
Hexagon Self-locking Bolt	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory	M8*35	
Hexagon Nut	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory	M10	
Spring Washer	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory	M10	
Flat Washers	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory	M10	
Nonstandard Nut	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory	M10*35	25(L)*20(D)
Pressure Plate	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory		
Crossbeam	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory		50(L)*50(D)
Crossbeam Foundation	Jiangsu yangzhong zhengda mechanical equipment manufacturing factory		60(L)*30(D)*34(H)88°(Degree)
Cable	Cixi Renhe Photovoltaic Electrical Appliance Co.,Ltd	PV1-F 4 mm ²	Max. Voltage = 1800V Max. Current =N/A

2) combination1

Combination2

Junction box Type: PV-BET1201-3, 1000 V DC, 16 A, -40 to +85 °C,Suzhou bright Photovoltaic Electronic Technology Co.,Ltd.

Module	GW-P156-72-340	GW-P156-72-335	GW-P156-72-330	GW-P156-72-325	GW-P156-72-320	GW-P156-72-315
open-circuit voltage [V]:	46.6	46.3	46.1	45.9	45.8	45.6
short-circuit current [A]:	9.46	9.39	9.38	9.25	9.10	9.08
voltage at max. power [V]:	37.9	37.6	37.3	37.2	37.1	37.2
current at max. power [A]:	8.97	8.91	8.87	8.76	8.63	8.47
max.power (with tolerance) [W]:	340	335	330	325	320	315
Module	GW-P156-72-310	GW-P156-72-305	GW-P156-72-300	GW-P156-72-295	GW-P156-72-290	GW-P156-72-285
open-circuit voltage [V]:	45.4	45.2	45.0	44.9	44.4	44.4
short-circuit current [A]:	8.99	8.91	9.13	9.05	8.49	8.42
voltage at max. power[V]:	37.0	36.8	36.2	36.1	36.4	36.3
current at max. power [A]:	8.38	8.29	8.28	8.17	7.97	7.85
max. power (with tolerance) [W]:	310	305	300	295	290	285
Module	GW-P156-72-280	GW-P156-72-275	GW-P156-60-285	GW-P156-60-280	GW-P156-60-275	GW-P156-60-270
open-circuit voltage [V]:	44.3	44.3	38.9	38.7	38.5	38.4
short-circuit current [A]:	8.36	8.28	9.42	9.34	9.25	9.18
voltage at max. power [V]:	36.3	36.2	31.7	31.4	31.1	30.9
current at max. power [A]:	7.72	7.60	9.01	8.92	8.84	8.73
max. power (with tolerance) [W]:	280	275	285	280	275	270
Module	GW-P156-60-265	GW-P156-60-260	GW-P156-60-255	GW-P156-60-250	GW-P156-60-245	GW-P156-60-240
open-circuit voltage [V]:	38.3	37.9	37.7	37.5	37.2	36.9
short-circuit current [A]:	9.10	9.09	8.98	8.86	8.48	8.35
voltage at max. power [V]:	30.8	30.8	30.6	30.4	30.1	30.0
current at max. power [A]:	8.61	8.44	8.33	8.22	8.14	7.98
max. power (with tolerance) [W]:	265	260	255	250	245	240
Module	GW-P156-60-235	GW-P156-60-230	GW-P156-60-225	GW-P156-60-220	GW-P156-60-215	GW-P156-60-210
open-circuit voltage [V]:	36.8	36.8	36.7	36.5	36.3	36.1
short-circuit current [A]:	8.35	8.34	8.29	8.14	7.98	7.83
voltage at max. power [V]:	30.0	29.9	29.9	29.8	29.8	29.7
current at max. power [A]:	7.84	7.68	7.53	7.40	7.23	7.07
max. power (with tolerance) [W]:	235	230	225	220	215	210

The electrical characteristics are within ±10 percent of the indicated values of ISC, VOC, and Pmax under standard test conditions (irradiance of 100 mW/cm², AM 1.5 spectrum, and a cell temperature of 25°C (77°F)).

4. Electricity rated of module

The electrical characteristics ISC, VOC, and Pmax under Standard Test Conditions (irradiance of 1000 W/m², AM 1.5 spectrum, and a cell temperature of 25°C/77°F).

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at standard test conditions. Accordingly, the values of ISC and VOC marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, and relay controls connected to the PV output. The series/parallel over-current protection device for relay.

Recommended maximum series/parallel module configurations:

GW-D/P156-72-XXX:series 17, parallel 2

GW-D/P156-60-XXX:series 20, parallel 2

Disclaimer of liability

Because the use of this manual and the conditions or methods of installation, Operation, use and maintenance of photovoltaic products are beyond Green wing's control; Green wing does not accept responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance. No responsibility is assumed by Green wing's for any infringement of patents or other rights of third parties, which may result from use of the PV product. No license is granted by implication or otherwise under any patent or patent rights. The information in this manual is based on EP's knowledge and experience and is believed to be reliable, but such information including product specification (without limitations) and suggestions does not constitute a warranty, expressed or implied. Green wing reserves the right to change the manual, the product, the specifications, or product information sheets without prior notice.

Information about manufacturer:

Green Wing Solar Technology Co.,Ltd.

Lot D1-1 Dai Dong- Hoan Son Industrial Zone Hoan Son Commune, Tien Du District
999100 Bac Ninh Province VIETNAM

Customer service department:

☎ +84 0915663035
+84 222 2220 669
+86 13901645223

✉ hongyao.fan@greenwingsolar.com

📍 Lot D1-1, Dai Dong – Hoan Son Industrial Zone, Hoan Son Commune, Tien Du District, Bac Ninh Province, Vietnam

Please consult your dealer or the manufacturer concerning the warranty of your modules. If you have any further questions, your dealer will gladly assist you. Subject to technical modifications without notice.