



# Installation Guide for America Solar Wholesale Photovoltaic Modules



**Mono Module**



**Poly Module**

# Installation guide for American Solar Wholesale

## Photovoltaic modules

### **Purpose of this Guide**

This guide contains information regarding the installation and safe handling of photovoltaic modules made by American Solar Wholesale (hereafter referred to as “modules”). American Solar Wholesale hereafter is referred to as “ASW”.

All instructions should be read and understood before installation commences. If there are any questions, please contact our sales department for further assistance. The installer should conform to all the safety precautions in the guide when installing the module. Local standards should also be followed in such installations.

Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for such a system. Keep this guide in a safe place for future reference (maintenance) and in case of disposal of the module.

### **General safety**

- ◇ Installation of solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified individuals.
- ◇ All modules come with a permanently attached junction box. The modules have UL certificate use #12 AWG wire terminated in Multi-contact connectors. ASW can provide customers with fitted cables for easy installation, if desired.
- ◇ The installer assumes all risk of injury that might occur during installation, including, but not limited to, the risk of electric shock.
- ◇ One individual module may generate DC voltages greater than 30 volts when exposed to direct sunlight. Contact with a DC voltage of 30V or more is potentially hazardous.
- ◇ When disconnecting wires connected to a photovoltaic module that is exposed to sunlight, an electric arc may result. Such arcs may cause burns, may start fires and may otherwise create problems. Therefore, be extremely careful!
- ◇ Photovoltaic solar modules change light energy to direct-current electrical energy. They are designed for outdoor use. Modules may be ground mounted, or mounted on rooftops. Proper design of support structures are the responsibility of the system designer and installer.
- ◇ Do not attempt to disassemble the module, and do not remove any attached nameplates or components.
- ◇ When installing the system, abide with all local, regional and national statutory regulations. Obtain a building permit where necessary.

## **Safety precautions for installation of solar photovoltaic systems**

- ◇ Solar modules produce electrical energy when light shines on their front surface. The DC voltage may exceed 30V. If modules are connected in series, the total voltage is equal to the sum of the individual module voltage. If modules are connected in parallel, the total current is equal to the sum of individual module current.
- ◇ Keep children well away from the system while transporting and installing mechanical and electrical components.
- ◇ Completely cover the module with an opaque material during installation to keep electricity from being generated.
- ◇ Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.
- ◇ Only use approved insulated tools for electrical installation work.
- ◇ Abide with the safety regulations for all other components used in the system, including wiring and cables, connectors, charging regulators, inverters, storage batteries and rechargeable batteries, etc.
- ◇ Use only equipment, connectors, wiring and support frames suitable for use in a solar electric system. Always use the same type of module within a particular photovoltaic system.
- ◇ Rated electrical characteristics are within  $\pm 10$  percent of the indicated values of  $I_{sc}$ ,  $V_{oc}$ , and  $P_{max}$  under standard test conditions (irradiance of  $100\text{mW}/\text{cm}^2$ , AM 1.5 spectrums and a cell temperature of  $25^\circ\text{C}$  ( $77^\circ\text{F}$ ))
- ◇ Under normal outdoor conditions, the module will produce current and voltages that are different than those listed in the data sheet. All values from the datasheet are from standard test conditions. Accordingly, during system design, values of short-circuit current and open-circuit voltage marked on UL series modules 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 (United States) or equivalent for an additional multiplying factor of 125 percent (80 percent derating) which may be applicable.

## **Mechanical Installation**

### **Selecting the location**

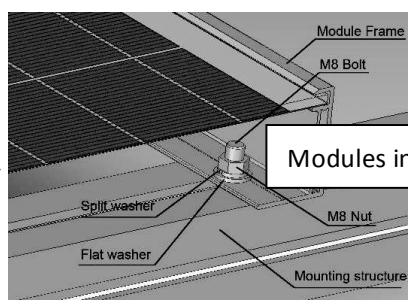
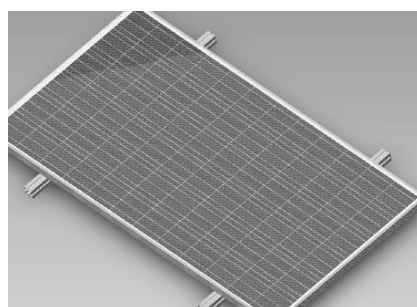
- ◇ Select a suitable location for installation the module.
- ◇ The module must be facing true south in northern latitudes and true north in southern latitudes.
- ◇ For detailed information on the best elevation tilt angle for the installation, refer to standard solar photovoltaic installation guides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

### Selecting the proper support frame

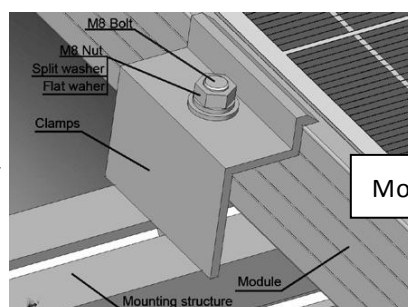
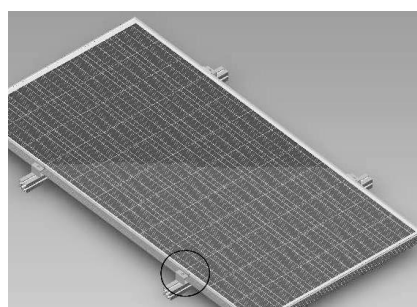
- ◇ Always observe the instructions and safety precautions included with the support frame to be used with the module.
- ◇ No attempt must be made to drill holes in the modules. To do so will void the warranty.
- ◇ Do not drill additional mounting holes in the glass surface of the module or in the frame of the module. Doing so will void the warranty.
- ◇ Modules must be securely attached to the mounting structure using four mounting points for normal installation. If additional wind or snow loads are anticipated for this installation, additional mounting points are also used. Load calculations shall be done by the system designer or installer.
- ◇ The support module mounting structure must be made of durable, corrosion-resistant and UV-resistant material.

### General installation

- ◇ Module mounting must use the pre-drilled mounting holes in the frame.
- ◇ The most common mounting is achieved by mounting the module using the four symmetry points close to the inner side on the module frame.
- ◇ If excessive wind or snow loads are expected, all eight mounting holes must be used.
- ◇ Do not lift the module by grasping the module's junction box or electrical leads.
- ◇ Do not stand or step on the module.
- ◇ Do not drop the module or allow objects to fall on the module.
- ◇ To avoid breakage of module glass, do not place any heavy objects on the module.
- ◇ Do not set the module down hard on any surface.
- ◇ Inappropriate transport and installation may break the glass portion of the module.



Modules installed with mounting holes



Modules installed with clamps

## Electrical Installation

### Grounding

- ◇ The module frame must be properly grounded (refer to NEC clause 250). The grounding wire must be properly connected to the module frame to ensure good electrical contact. Use the recommended type, or an equivalent, connectors for this wire.
- ◇ For metal support frames, the surface of the frame must be electroplated and have excellent conductivity.
- ◇ We recommend the lay-in lugs when grounding.
- ◇ Taking care to avoid nicking or cutting the conductors, then insert the wire to the base of the lug, and screw down the slotted screw. Second, insert the stainless steel bolt (M3, or equivalent, is recommended by ASW) into the hole of the lug, the grounding hole on the frame, the toothed washer. The toothed washer is required in order to prevent loosening of the screw over time.

### General installation

- ◇ Do not use modules of different configurations in the same system.
  - ◇ Several modules are connected in series and then in parallel to form a PV array, especially for application with a high operation voltage. If modules are connected in series, the total voltage is equal to the sum of individual voltages.
  - ◇ For applications requiring high currents, several photovoltaic modules can be connected in parallel; the total current is equal to the sum of individual currents.
  - ◇ Modules are supplied with Multi-contact connectors to use for system electrical connections. Use the National Electric Code (United States) or equivalent local wiring regulations to determine system wiring size (refer to NEC clause 310), type and temperature rating of conductors to be connected to the module's connectors. Wiring connected to the modules should be #12 AWG, LAPP 4mm<sup>2</sup> (minimum) and must be temperature rated at 90°C (minimum).
  - ◇ The cross sectional area of the cable and the capacity of the connector must be selected to suit the maximum system short circuit current, otherwise the cable and connector will be overheated under large current. Refer to NEC for details.
  - ◇ A DC rated fuse (with maximum capacity 15A) should be used.
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- ◇ The junction box has a breather port. The breather port must be mounted facing down and must not be exposed to the rain. Therefore, the junction box should be on the higher side of the module when it is mounted.

## Maintenance

**ASW recommends the following maintenance measures in order to ensure optimum**

### **Performance of the module:**

- ◇ Clean the glass surface of the module when necessary. Always use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used to remove dirt.
- ◇ Check the electrical and mechanical connections every six months to verify that they are clean, secure and undamaged.
- ◇ If any problem arises, have them investigated by a competent specialist.

In addition, the maintenance instructions for all other components used in the system, such as support frames, charging regulators, inverters, batteries etc. should be followed accordingly.

### **Testing and replacing bypass diodes**

Removing the bypass diodes should be done only by a competent PV technician and after the module has been disconnected from the system.

- ◇ Place module face down on a soft, flat surface. Insert a 3mm flat screwdriver into the slot on the junction box cover. (The cover has a sign of screwdriver). Gently pull up the four slots until the cover has been opened.
- ◇ Insert the 3mm flat screwdriver into a hole alongside of diode and near one mounting hole of the diode, pry the screwdriver in the opposite direction of diode and gently pull the diode up until the lead comes free. Do the same in the other mounting hole of the diode, and repeat until the diode is free.
- ◇ Note the orientations of the polarity markings on the diodes.
- ◇ Check the resistance of the diodes by using the digital multimeter's ohms scale. Resistance should be low in one direction, and then when leads are reversed on the diode's terminals the resistance should be high. If a diode has a low resistance in both directions, it is probably shorted. If it has high resistance in both directions it is probably open. In either case it should be replaced.
- ◇ Replace a defective diode with a diode of the same type, and ensure that its polarity marking is oriented the same way as the original diode.
- ◇ Finally, check the open-circuit voltage ( $V_{oc}$ ) of the module, as described previously, and replace both covers.

## Disclaimer of Liability

Because the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) product are beyond ASW's control, ASW 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 ASW 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 modification or otherwise under any patent or patent rights.

Dimension 1580mm\*808mm\*35mm: 72 cells of 125mm\*125mm

Type	ASW-180M	ASW-185M	ASW-190M
Rated Maximum Power (Pmax) at STC,(Watts)	180 W	185 W	190 W
Open Circuit Voltage (Voc) at STC,(V dc)	44.6V	44.8V	46.55V
Short Circuit Current (Isc) at STC,(A dc)	5.57A	5.68A	5.73A
Rated Voltage (Vmax) at STC,(Vdc)	36.2V	36.5V	37.85V
Rated Current (Imax) at STC,(A dc)	4.97A	5.07A	5.09A
Maximum System Voltage, (V dc)	600V	600V	600V
Maximum Series Fuse, (A)	15	15	15

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Dimension 1650mm\*990mm\*50mm: 60 cells of 156mm\*156mm

Type	ASW-235M	ASW-240M	ASW-250M
Rated Maximum Power (Pmax) at STC,(Watts)	235 W	240W	250 W
Open Circuit Voltage (Voc) at STC,(V dc)	44.6V	44.8V	46.55V
Short Circuit Current (Isc) at STC,(A dc)	5.57A	5.68A	5.73A
Rated Voltage (Vmax) at STC,(Vdc)	36.2V	36.5V	37.85V
Rated Current (Imax) at STC,(A dc)	4.97A	5.07A	5.09A
Maximum System Voltage, (V dc)	600V	600V	600V
Maximum Series Fuse, (A)	15	15	15

Dimension 1650mm\*990mm\*50mm: 60 cells of 156mm\*156mm

Type	ASW-230P	ASW-235P	ASW-240P
Rated Maximum Power (Pmax) at STC,(Watts)	230 W	235W	240 W
Open Circuit Voltage (Voc) at STC,(V dc)	44.6V	44.8V	46.55V
Short Circuit Current (Isc) at STC,(A dc)	5.57A	5.68A	5.73A
Rated Voltage (Vmax) at STC,(Vdc)	36.2V	36.5V	37.85V
Rated Current (Imax) at STC,(A dc)	4.97A	5.07A	5.09A
Maximum System Voltage, (V dc)	600V	600V	600V
Maximum Series Fuse, (A)	15	15	15

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Dimension 1954mm\*990mm\*50mm: 72 cells of 156mm\*156mm

Type	ASW-260P	ASW-270P	ASW-280P
Rated Maximum Power (Pmax) at STC,(Watts)	260 W	270W	280 W
Open Circuit Voltage (Voc) at STC,(V dc)	44.6V	44.8V	46.55V
Short Circuit Current (Isc) at STC,(A dc)	5.57A	5.68A	5.73A
Rated Voltage (Vmax) at STC,(Vdc)	36.2V	36.5V	37.85V
Rated Current (Imax) at STC,(A dc)	4.97A	5.07A	5.09A
Maximum System Voltage, (V dc)	600V	600V	600V
Maximum Series Fuse, (A)	15	15	15

Dimension 1954mm\*990mm\*50mm: 72cells of 156mm\*156mm

Type	ASW-260D	ASW-270D	ASW-280D
Rated Maximum Power (Pmax) at STC,(Watts)	260 W	270W	280 W
Open Circuit Voltage (Voc) at STC,(V dc)	44.6V	44.8V	46.55V
Short Circuit Current (Isc) at STC,(A dc)	5.57A	5.68A	5.73A
Rated Voltage (Vmax) at STC,(Vdc)	36.2V	36.5V	37.85V
Rated Current (Imax) at STC,(A dc)	4.97A	5.07A	5.09A
Maximum System Voltage, (V dc)	600V	600V	600V
Maximum Series Fuse, (A)	15	15	15

Flash Test Data is supplied by ASW for all modules shipped. Strings should contain compatible modules to optimize performance.