

# Installation Guide (IEC)

Design  
Safety  
Maintenance



Hanwha SolarOne



Hanwha SolarOne is a leading manufacturer of silicon ingots, wafers, cells, and modules, delivering reliable products at competitive pricing, globally. We provide world-class PV technology, efficient manufacturing, and local customer support.

This guide contains important information regarding the installation, safe handling, and maintenance of photovoltaic modules made by Hanwha SolarOne. The word “module” as used in this guide refers to one or more PV modules.

All instructions should be read and understood prior to installing the modules. The installer should conform to all the safety precautions in this guide, as well as local standards and regulations. Before installing a photovoltaic system, the installer must be familiar with the mechanical and electrical requirements. Keep this guide in a safe place for future reference.

**We are committed to providing  
technical and installation support  
for our customers, worldwide.  
This guide outlines the safe  
implementation of our modules.**



# System Design



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Before installing your photovoltaic system, contact local authorities to determine the necessary permit, installation, and inspection requirements that must be followed.

The system should be installed by qualified personnel only. The system involves electricity, and can be dangerous if the personnel are not familiar with the appropriate safety procedures.

PV modules should be mounted in a location where they will receive maximum sunlight throughout the year. Specifically, in the Northern Hemisphere, the modules should face South. In the Southern Hemisphere, the modules should face North.



The 11.48 MW ground-mounted installation in Valverde de Mérida, Spain.

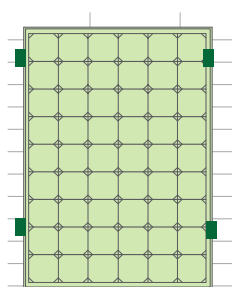
1. In order to achieve maximum annual yield, optimum orientation and tilt of PV modules is necessary. Sunlight shining vertically and completely onto the PV module is the best condition to generate maximum power. Artificially concentrated sunlight should not be directed on the module.
2. Very hot module(s) can reduce power output performance. Ensure the module has good ventilation conditions to prevent overheating.
3. Site-specific environment loads, such as wind and snow, should be taken into account to avoid exceeding the maximum load.
4. When designing the system, please pay attention to the total voltage (if modules are connected in series) and current (if modules are connected in parallel). We recommend the maximum number of modules in parallel should be no more than four (4), and while in series, do not exceed the ratio of the module's maximum system voltage to open circuit voltage. Maximum system voltage: 1000V for IEC product.
5. The module must not be installed close to fire or flammable materials.

**For optimal performance, position the modules in accordance with the directions in this guide.**

# Mechanical Mounting



Approved mounting configuration for Hanwha SolarOne modules can sustain loads up to 5.4kN/m<sup>2</sup>.



Standard Mounting

|                  |                  |
|------------------|------------------|
| SF160 Mono       | SF190 Poly       |
| SF220 Poly       | SF260 Poly       |
| SF160 Mono X-tra | SF190 Poly X-tra |
| SF220 Poly X-tra | SF260 Poly X-tra |

The basis for durable and safe mounting is an assembly frame which corresponds to the appropriate structural requirements; is securely anchored to the ground, to the roof, or to a façade; and whose long-term stability is guaranteed. The mounting structure and the module attachments must be designed in accordance with the anticipated local wind and snow loads. Ensure that the modules are mounted over a fire-resistant roof covering rated for the application.

To prevent bending, vibration, mechanical stress, or warpage, mount the module onto a flat contact surface. Secure the module along the long edges with the correct number of clamps. The minimal distance between mounted modules should be no less than 20mm. Use all the mounting points provided and avoid direct contact between glass and metal (e.g. mounting rails).

The junction box should be located in the upper or lateral area of the module and the cables should hang downwards.

## MOUNTING METHODS FOR HANWHA SOLARONE MODULES

### Method 1: Clamp mounting

All modules are to be clamped only in the permitted clamping areas on the long side of the frame, never on the short side of the frame (see diagram at left for details). The module clamps must not overlap the glass or shade the module surface. Recommended tightening torque: 5Nm.

### Method 2: Bolt mounting

Use the existing installation holes instead of drilling additional holes for installation. Drilling additional holes will hinder reliability and void the module's warranty. The installation and attachment materials (nuts, bolts, etc.) must be corrosion-resistant. Recommended tightening torque: 5Nm.

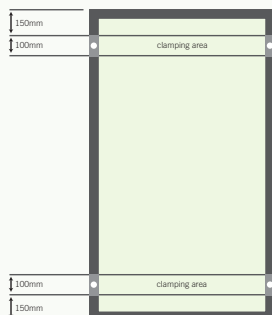
**Our modules are designed  
to be installed in moderate or  
temperate climate conditions.**

# Mounting Instructions

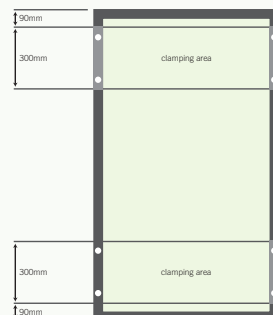
## Clamp Mounting

### Module type:

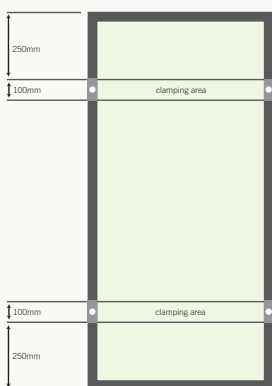
SF160 Mono  
SF190 Poly  
SF220 Poly  
SF260 Poly  
SF160 Mono X-tra  
SF190 Poly X-tra  
SF220 Poly X-tra  
SF260 Poly X-tra



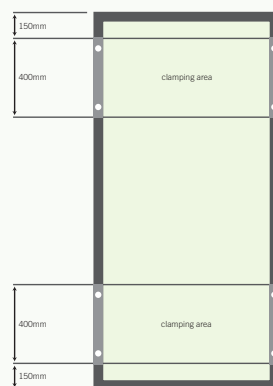
SF160 Mono, SF190 Poly, and SF220 Poly



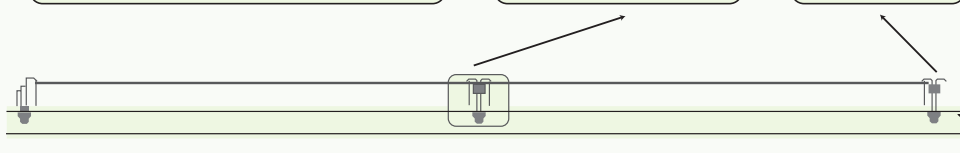
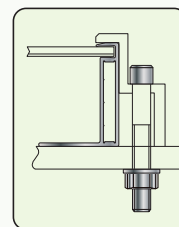
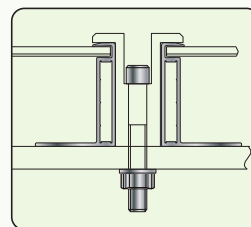
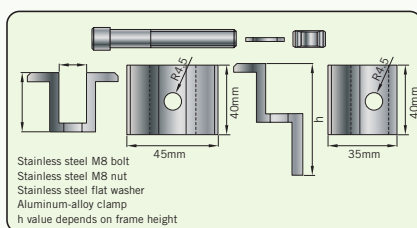
SF160 Mono X-tra, SF190 Poly X-tra, and SF220 Poly X-tra



SF260 Poly



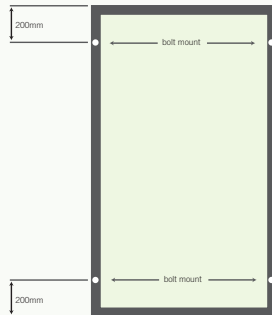
SF260 Poly X-tra



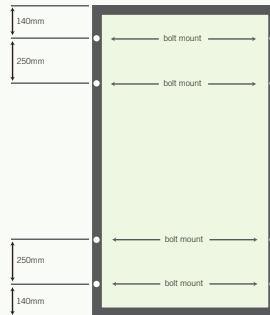


Mount modules on a flat surface at least 20mm apart from one another.

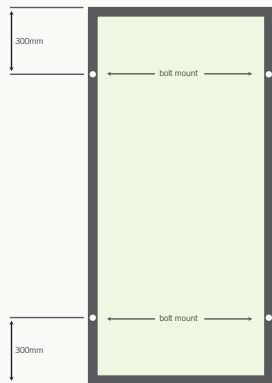
## Bolt Mounting



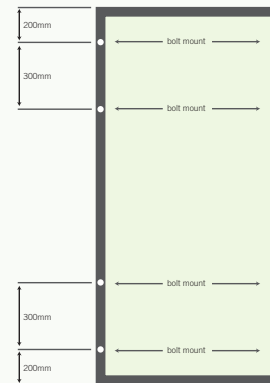
SF160 Mono, SF190 Poly, and SF220 Poly



SF160 Mono X-tra, SF190 Poly X-tra, and SF220 Poly X-tra



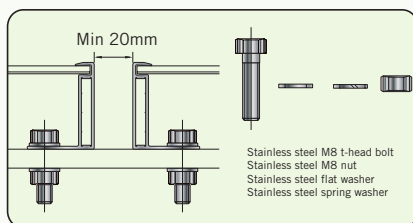
SF260 Poly



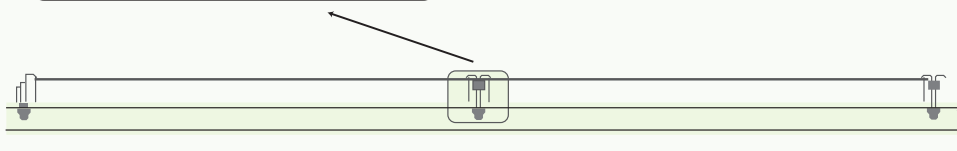
SF260 Poly X-tra

## Module type:

SF160 Mono  
SF190 Poly  
SF220 Poly  
SF260 Poly  
SF160 Mono X-tra  
SF190 Poly X-tra  
SF220 Poly X-tra  
SF260 Poly X-tra



Stainless steel M8 t-head bolt  
Stainless steel M8 nut  
Stainless steel flat washer  
Stainless steel spring washer



# Electrical Installation

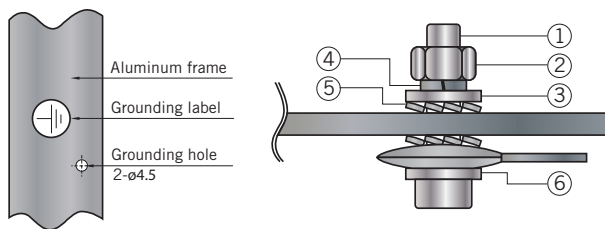


## Grounding

To avoid the risk of electrical shock or fire, the module frame should be grounded before the electrical connection of the modules is operated.

The frame shall be grounded in accordance with local electrical requirements.\* A good connection between the grounding hardware is essential for an effective ground. The anodization on a module frame provides a coating to minimize the corrosion due to weather and it acts as a barrier that reduces the effectiveness of the grounding connection. For an adequate ground, the grounding hardware should penetrate the anodization layer.

\* Only UL listed equipment should be used for bonding to ground. For USA: National electrical code (NEC) Article 250; for Canada: CEC



The following hardware is recommended for grounding:

1. Stainless steel bolt M4 x 30mm
2. Stainless steel nut M4
3. Stainless steel flat washer M4
4. Stainless steel spring washer M4
5. Stainless steel lock-toothed washer M4
6. Stainless steel slotted washer M4

## Correct wiring scheme

To minimize the risk of an indirect lighting strike, avoid forming closed loops when designing the system. Check that wiring is correct before starting the generator. If the measured open-circuit voltage ( $V_{OC}$ ) and short-circuit current ( $I_{SC}$ ) differ from the specifications, there may be a wiring fault.

## The connection plug

All PV modules are equipped with 900mm cables serving a temperature range of  $-40^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ . The connectors have specified polarities. Be sure that the connection is safe and tight. Connectors should only be used to connect the circuit, but never used to turn the circuit on or off.

## Use of proper components

Use cable extensions and connector plugs (with one conductor) that are designed for outdoor PV applications and are in good electrical and mechanical condition. Ensure that all materials meet the requirements of the system's maximum voltage, current, moisture, and temperature when they are exposed to sunlight.

Under normal conditions, a PV module is likely to produce more current and/or voltage than that reported under Standard Test Conditions. Accordingly, the values of  $I_{SC}$  and  $V_{OC}$  marked on the module should be multiplied by a factor of 1.25 when selecting electrical components voltage ratings, conductor capacities, fuse type, and type of control components.

**For USA:** Refer to Section 690-8 of the U.S. National Electric Code for an additional multiplying factor of 1.25, which may be applicable.

The maximum series fuse rating is 10A for modules with 125x125 cells; 15A for modules with 156x156 cells. The maximum reverse current is the series fuse rating multiplied by a factor of 1.35. Each module (or series string of modules so connected) shall be provided with the specified maximum series fuse.

## Other

During installation, tie the cable from the junction box to the mounting substructure. This will avoid direct contact of the cable with the back surface of the module. All modules are equipped with factory-installed bypass diodes. The factory-installed diodes provide proper circuit protection for the system to avoid heating and array current problems.

# Additional Information





**Our modules are certified  
to international safety  
and quality standards.**

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### **DISCLAIMER OF LIABILITY**

Ensure that the module is used only in applications for which it is suitable. All work on a photovoltaic system (installation, setup, maintenance) must be carried out only by appropriately qualified and authorized personnel. The appropriate local standards, construction, rules, and safety instructions must be followed during installation.

### **IEC/EN61730 INFORMATION**

Hanwha SolarOne modules are designed to fulfill the criteria of Application Class A requirements according to IEC/EN61730-part1.

The modules are qualified for Application Class A: Hazardous voltage (IEC61730: higher than 50V DC; EN61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated. 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.

### **UL LISTING INFORMATION**

1. Rated electrical characteristics are within 10% of measured values at Standard Test Conditions of: 1000W/m<sup>2</sup>, 25°C cell temperature and solar spectral irradiance per ASTM E892 or irradiance of AM 1.5 spectrum.
2. The standoff height should be at least 7.9 in. If other mounting means are employed, this may affect the UL listing.
3. The modules have been evaluated by UL for a maximum positive or negative design loading of 30 lbs/ft<sup>2</sup> and for mounting using the four (4) provided mounting holes in the frame.
4. Wiring methods should be in accordance with the NEC.
5. For installations in Canada, the installation shall also be in accordance with CSA C22.1, Safety Standards for Electrical Installations, Canadian Electrical Code, Part 1.
6. The use of the following stainless steel hardware is required in order to provide a reliable grounding connection to the module frame: slotted washer, lock-toothed washer, spring washer, flat washer, a nut M4, and bolt M4x30mm (see Grounding section for details).



This Installation Guide covers the following modules:

### Standard Modules

SF160 Mono  
SF190 Poly  
SF220 Poly  
SF260 Poly  
SF160 Mono X-tra  
SF190 Poly X-tra  
SF220 Poly X-tra  
SF260 Poly X-tra

### WARNING!

PV modules generate electricity as soon as they are exposed to sunlight. One module generates a safe, extra-low voltage level, but multiple modules connected in series (summing the voltage) or in parallel (summing the current), represent a danger. The following points must be noted when handling the solar modules to avoid the risk of fire, sparking, and fatal electric shock.



Do not insert any electrically conductive materials into the plugs or sockets.



Do not fit PV modules and wiring with wet plugs and sockets.



Make sure to use proper safety equipment (insulated tools, insulated gloves, etc.) when wiring.



Make sure that the connection is made when the circuit is cut off. Do not disconnect under load.



To avoid the generation of an electric arc, ensure the connectors are clean and have not been contaminated, and that the electrical connection and mechanical joint are good.

### UNPACKING AND STORING MODULE

Utmost attention is required when handling module(s). The following guidelines should be followed with caution while unpacking, transporting, and storing the modules:



Do not strike or physically damage the module.



Carry modules with both hands. Do not use the connection socket as a handle.



Do not stand on the module.



Do not twist the module.



Do not mark the rear of the module using sharp objects.

## NORMAL OPERATING CONDITIONS FOR HANWHA SOLARONE MODULES

### Operating conditions

The operating temperature of PV module should be within -40°C to 85°C (-40°F to 185°F).

Ensure adequate ventilation behind the module, especially in hot environments.

Module should be installed at least 500m from the sea to avoid corrosion due to exposure to salt. Other sources of corrosion, including sulfur (from sulfur sources such as volcanoes), can also lead to performance degradation and should be avoided.

### Location conditions

The following location conditions should be avoided when installing a module:

1. Location with potential for extreme sand and dust damage.
2. Location with extreme air pollution, chemical vapors, acid rain, and/or soot, etc.
3. Location with extreme hail and/or snow.
4. Location with potential extreme salt damage.

## MAINTENANCE AND CARE

Dirt on the surface of the solar module may decrease power generation. Modules mounted at an angle of at least 15° will (under normal conditions) self-clean due to natural weather conditions (such as rain). If soil build-up on the module glass becomes excessive, use a soft cloth and water for cleaning.

### CAUTION: DO NOT USE ABRASIVE DETERGENTS

Please consult with system designer to decide the cleaning frequency according to local environmental conditions. Once a year, check the electrical and mechanical devices to ensure every connection is tight. The system must be periodically inspected.

**Our Limited Warranty is based upon modules being mounted in accordance with conditions outlined in this guide.**



## CERTIFICATIONS

### International Product Safety Certifications



TÜV, CE, UL, and Safety Class II certifications ensure that Hanwha SolarOne's products operate safely and comply with electrical and fire safety codes around the world.

### International Product Performance Certifications



IEC Certification ensures our products' performance and reliability.

### International Quality Manufacturing Certifications



ISO 9001, OHSAS 18001, and TÜV factory inspections confirm that Hanwha SolarOne's manufacturing is carried out under proven quality control and manufacturing processes.

### Environmentally Responsible Manufacturing



ISO 14001 Certification and PV Cycle membership ensure that Hanwha SolarOne's manufacturing is performed with respect for the environment.

Hanwha SolarOne provides local technical and sales support via its international network of regional offices. Visit us at [www.hanwha-solarone.com](http://www.hanwha-solarone.com) to contact the local office most convenient for you.

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