

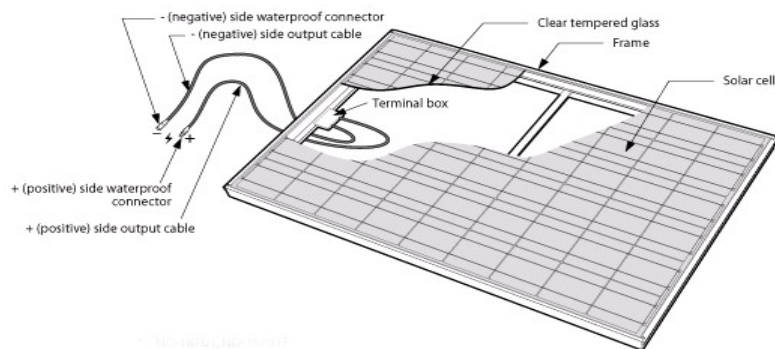
INSTALLATION AND GENERAL RECOMMENDATION FOR PV MODULE SERIES SPSxxx-60M-HySPSxxx-72M-Hy

1. INTROUDUCTION

- Before installation read carefully the following instructions and be sure to use SPSistem modules safely.
- All applicable national and local electrical codes should be followed during the installation.
- Failure to observe the following instructions may result in death or personal injury, and property damage.
- SPSistem warranty do not apply if the instructions indicated below are not observed.

• POWER MODULE

SPS istem Solar Photovoltaic modules consist of a series of electrically interconnected crystalline silicon solar cells. Which are permanently encapsulated between a tempered glass superstrate and substrate. The entire laminate is secured within an anodized aluminum frame for structural strength; ease of installation and to protect the cells from the most severe environmental conditions.



• LABEL

Each module has a label on its rear side providing the following information: the product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current, all as measured under standard test conditions, and weight, dimension, the maximum system voltage, maximum fuse rating and so on.

Each module has only one bar code as shown below:



SPSwwyyyyccccc (15 digits)

SPS	SPS istem srl (3 digits)
ww	week of production (2 digits)
yyyy	year of production (4 digits)
ccccc	counter (6 digits)

2. APPLICATIONS

SPS istem Solar PV modules are a highly reliable, virtually maintenance-free direct current (DC) power source, designed to operate most efficiently in sunlight. SPS istem series modules are ideal to power remote homes and other applications. The application level of SPS istem solar photovoltaic modules is class II: hazardous voltage, dangerous use power (higher than 240W). SPS istem solar photovoltaic modules are tested with IEC 61215-1(ed.1), IEC 61215-1-1(ed.1), IEC 61215-2(ed.1), IEC 61730-1(ed.2) and IEC 61730-2(ed.2).

3. PERMIT

Before installing your system, contact local authorities to determine the necessary permit, installation and inspection requirements.

4. CLIMATE CONDITION

Install the SPS istem Solar crystalline series modules in the following conditions:

- Ambient temperature: -20°C to +40 °C
- Operating temperature: -40°C to +85 °C
- Storage temperature: -40°C to +40 °C
- Humidity: below 85%RH
- Maximum altitude: 2000 m

- Fire safety class: Class C according to UL 790
- Corrosion resistance: Except for corrosive salt area and sulfurous area.
- Mechanical load tolerance is 2400Pa/1600Pa, safety factor 1.5.

5. WARNING AND NOTES FOR SAFE INSTALLATION WORK

This system shall be installed only by engineers who have completed the training course. Each solar panel has a junction box, can provide cable according to customer's requirement. Installers must know the possible danger of death or serious bodily injury.

- Do not cut the connection wire under the loading.
- Do not modify solar panel, move any labels or other parts.
- Do not use chemicals on solar panel surfaces.
- Do not expose solar panels to sunlight that is concentrated with mirrors, lenses or similar means.
- Solar panel installation must obey the local law, even it should get the Construction License.
- Do not wear the things, such as rings, metal jewelry, diamond jewelry or tools. which can damage the surface of module during the installation process.
- Do not install PV modules in a location where they will be immersed in water or continually exposed to water from a sprinkler or fountain, etc.
- If solar modules (except for smart module) on the same installation are mounted at different angles or orientations then energy production can normally be optimized by connecting the different orientations to different inverters (or different MPPT if the inverter has more than one MPPT). Refer to inverter manufacturers for further guidelines

6. SAFETY REGULATIONS REGARDING INSTALLATION OF SOLAR POWER SYSTEMS

- **Take the following precautions before starting work**

Plan the job and visit the site before starting work. On site, do not work alone. Always work with at least one other person. Inspect power tools before using them

- **Observe safety regulations during installation**

Keep the back side of solar panel surfaces free of foreign objects

Completely cover solar panel with opaque materials when wiring to halt productions of electricity.

7. REQUIRED INFORMATION

Artificially concentrated sunlight shall not be directed on the panel.

"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 AM 1.5 spectrum.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce higher current and/or voltage than reported at standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this PV module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output.

- The maximum voltage of the system must be less than the maximum certified voltage 1500V DC typically and the maximum input voltage of the inverter and of the other electrical devices installed in the system. To ensure that this is the case, the open circuit voltage of the array string needs to be calculated at the lowest expected ambient temperature for the location. This can be done using the following formula.

$$\text{Max System voltage} \geq N * V_{oc} * [1 + TC_{voc} * (T_{min} - 25)]$$

Where

N No modules in series

V_{oc} Open circuit voltage of each module (refer to product label or data sheet)

TC_{voc} Thermal coefficient of open circuit voltage for the module (refer to data sheet)

T_{min} The lowest ambient temperature

8. POINTS TO CHECK WHEN SELECTING THE INSTALLATION LOCATION

- The direction toward the equator to install solar modules, if possible. Installations facing east and west are also possible, although the amount of power generated will be lower.
- Install in a location that has good sun exposure throughout the year. Less power is generated in shaded locations.
- The output of a series string of solar panels is connected to the input of the inverter. Always install solar panels so that all elements of the array receive the same amount of sunlight.
- It may not be possible to install solar panels in regions where maximum snow accumulation exceeds the maximum allowable load.

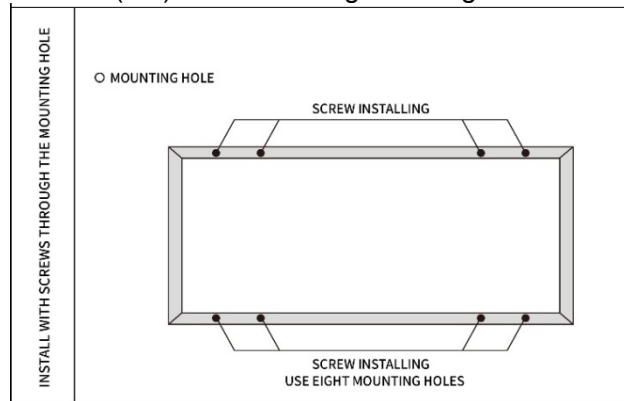
9. MOUNTING AND NOTES

The module frame is made of anodized aluminum, and therefore corrosion can occur if the modules

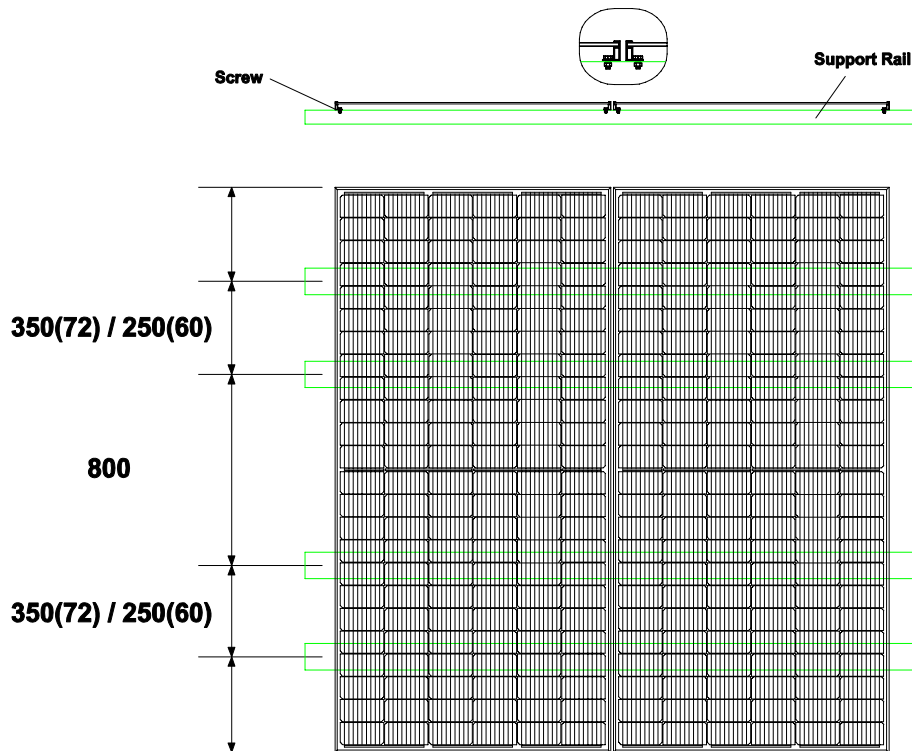
is subject to a salt water environment with contact to a rack of another type of metal (Electrolysis Corrosion). If required, PVC or stainless steel washers can be placed between the module frame and support structure to prevent this type of corrosion. Module support structures that are to be used to support modules at correct tilt angles should be wind and snow load rated for use by the appropriate local and civil codes prior to installation. SPS istem modules can be mounted as following methods:

- Ground PV system (module front and back visible)

Using corrosion-proof screws (M8) on the existing installing holes in the module frame.



Mounting Drawing 1

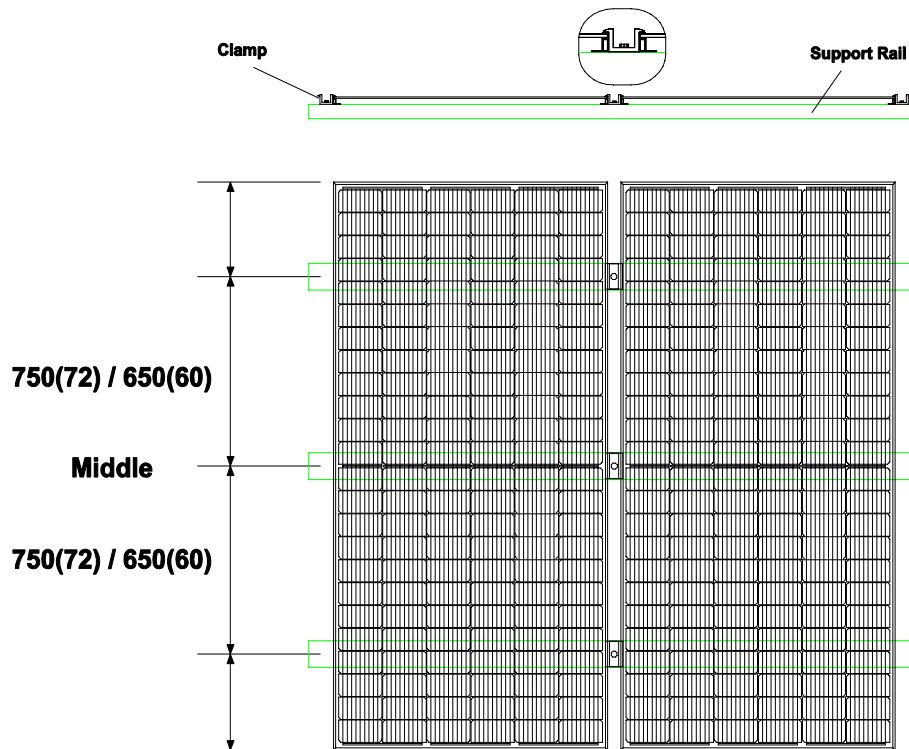


Mounting Drawing 2

The frame of each module has 8 mounting holes (14mm*9mm) used to secure the modules to 4 supporting rails. The module frame must be attached to a supporting structure using M8 stainless steel hardware together with spring washers and flat washers in eight places symmetrical on the SPS istem module. The applied torque is about 8 Newton-meters. Recommended distance between 2 solar modules is 5mm considering linear thermal expansion of the module frames.

In ground PV systems modules can't be installed using clamps.

- Roof PV system (module front visible, back not visible)
Using corrosion-proof clamps on the module frame



Mounting Drawing 3

Clamps are used to secure the modules to 3 supporting rails. The module frame must be attached to a supporting structure using L- or Omega clamps in six places symmetrical on the SPS istem module. The applied torque is about 8 Newton-meters.
In roof PV systems modules can be installed using method of Ground PV system.

It is not permitted to modify the module frame under any circumstances. Clearance between the module frame and mounting surface may be required to prevent the junction box from touching the surface, and to circulate cooling air around the back of the module.

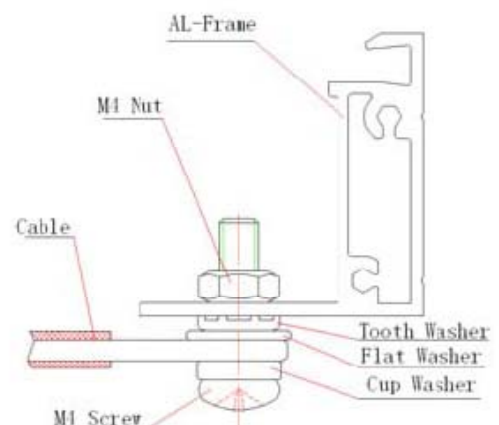
10. GROUNDING

All module frames and mounting racks must be properly grounded in accordance with the appropriate respective national electrical code. Proper grounding is achieved by connecting the module frame(s) and structural members contiguously one to another using a suitable grounding conductor. The grounding conductor or strap may be copper, copper alloy, or other material acceptable for use as an electrical conductor per respective National Electrical Codes. The grounding conductor must then make a connection to earth using a suitable earth ground electrode.

Attach a separate conductor as grounding wire to one of the 4 mm diameter grounding marked



on the module frame with a set of M4 screw, cup washer, flat washer, tooth washer, and M4 nut. This is to ensure positive electrical contact with the frame.



11. INSTALLATION WORK

- Using corrosion-proof screws (M8) on the existing installing holes in the module frame.
- Secure the supporting structure according to the mounting holes in the frame of each module.
- The module frame must be attached to a supporting structure using M8 stainless steel hardware

together with spring washers and flat washers in eight places symmetrical on the module.

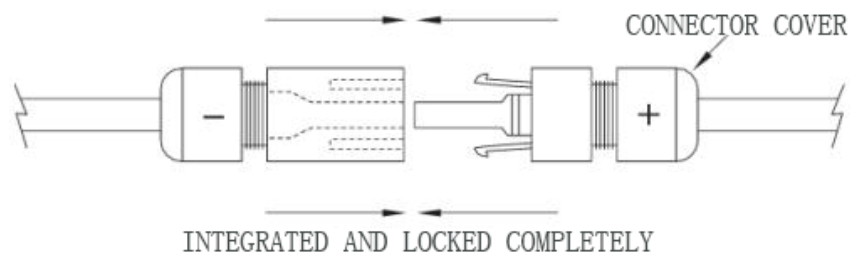
- Clearance between the module frame and mounting surface may be required to prevent the junction box from touching the surface, and to circulate cooling air around the back of the module.
- Connecting the solar panels.

12. EACH ARRAY ACCORDING TO THE SOLAR ARRAY CONNECTION EXAMPLES

- The cable must not be bent or crushed on the direct exit of the cable screw joint include connector and junction box. The minimum bending radius cables should be 43mm (1.69 in). The cable must be routed in a way that tensile stress on the conductor or connections is prevented. For field connections, use at least 4mm² copper wires insulated for a minimum of 90°C and sunlight resistance with insulation designated as PV Wire The cable must meet EN 50618.



- There is a cable (+) and a cable (-) on the rear side of each solar panel. Connect the waterproof connectors on these cables, making sure to push the connectors all the way in.



- On the first solar panel, connect the positive home run cable to the positive array output cable, and connect the negative cable to the positive cable of the second solar panel. On the second solar panel, connect the negative cable to the positive cable of the third solar panel. Continue until you have series connected the appropriate number of panels for the desired voltage.
- When you have made direct connections between the specified number of solar panels, use a digital multimeter to measure the voltage and current output of the array.
- Organize the cables between solar panels.

13. DAILY MAINTENANCE INSTRUCTIONS

- Do not clean the modules without professional authorized, and ensure the appropriate facilities to conduct security operations and aerial work with high-altitude awareness of the danger.
- Checking the glass for cracks and damage before cleaning the module. If the modules have been broken, do not be cleaned, and immediately inform the installer or maintainer.
- Do not use cleaning components of a strong type of chemical or abrasive detergent and disinfectant operations. To prevent serious pollution will reduce the output power. We recommend using water to clean modules. If the animals that produce the dirt, a mild soapy water and neutral disinfectant will be recommended. If necessary use a soft sponge or cloth to wipe the modules, do not force or scratch the modules hard. Over scratches cause power attenuation, and void your warranty policy.
- When the module of the tilt angle is more than 15 degrees, the modules can self-clean naturally; when the component's angle less than 15 degrees, regular cleaning is necessary. Regular inspection mounting bracket corrosion or not, if we find evidence of corrosion, please consult installers; Regularly check the integrity of the ground terminal, but do not try to change the electrical connection, if you suspect a loose connection, please contact the installer.

Date sheet for all module types of the family

Product Electrical Ratings:				
Module type	SPS425-78M-HF; SPS425-78M-HFD	SPS430-78M-HF; SPS430-78M-HFD	SPS435-78M-HF; SPS435-78M-HFD	SPS440-78M-HF; SPS440-78M-HFD
Voc [V] / Tolerance	52.9±5%	53.2±5%	53.5±5%	53.8±5%
Vmp [V]	43.4	43.6	43.8	43.9
Isc [A] / Tolerance	10.28±5%	10.40±5%	10.48±5%	10.57±5%
Imp [A]	9.79	9.86	9.93	10.02
Pmp [W] / Tolerance	425±5%	430±5%	435±5%	440±5%
Module type	SPS445-78M-HF; SPS445-78M-HFD	SPS390-72M-HF; SPS390-72M-HFD	SPS395-72M-HF; SPS395-72M-HFD	SPS400-72M-HF; SPS400-72M-HFD
Voc [V] / Tolerance	54.1±5%	49.2±5%	49.4±5%	49.7±5%
Vmp [V]	44.1	40.3	40.4	40.6
Isc [A] / Tolerance	10.64±5%	10.14±5%	10.24±5%	10.31±5%
Imp [A]	10.09	9.68	9.78	9.85
Pmp [W] / Tolerance	445±5%	390±5%	395±5%	400±5%
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	15			

Product Electrical Ratings:				
Module type	SPS405-72M-HF; SPS405-72M-HFD	SPS410-72M-HF; SPS410-72M-HFD	SPS325-60M-HF; SPS325-60M-HFD	SPS330-60M-HF; SPS330-60M-HFD
Voc [V] / Tolerance	49.9±5%	50.2±5%	41.3±5%	41.6±5%
Vmp [V]	40.8	41.0	33.6	33.8
Isc [A] / Tolerance	10.40±5%	10.47±5%	10.23±5%	10.3±5%
Imp [A]	9.93	10.00	9.67	9.76
Pmp [W] / Tolerance	405±5%	410±5%	325±5%	330±5%
Module type	SPS335-60M-HF; SPS335-60M-HFD	SPS340-60M-HF; SPS340-60M-HFD	SPS345-60M-HF; SPS345-60M-HFD	SPS410-78M-H; SPS410-78M-HD
Voc [V] / Tolerance	41.8±5%	42.0±5%	42.3±5%	52.0±5%
Vmp [V]	34	34.2	34.4	43.0
Isc [A] / Tolerance	10.39±5%	10.48±5%	10.57±5%	10.04±5%

Imp [A]	9.85	9.94	10.03	9.53
Pmp [W] / Tolerance	335±5%	340±5%	345±5%	430±5%
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	15			

Product Electrical Ratings:				
Module type	SPS415-78M-H; SPS415-78M-HD	SPS420-78M-H; SPS420-78M-HD	SPS425-78M-H; SPS425-78M-HD	SPS430-78M-H; SPS430-78M-HD
Voc [V] / Tolerance	52.3±5%	52.6±5%	52.9±5%	53.2±5%
Vmp [V]	43.2	43.3	43.4	43.6
Isc [A] / Tolerance	10.12±5%	10.22±5%	10.28±5%	10.40±5%
Imp [A]	9.61	9.70	9.79	9.86
Pmp [W] / Tolerance	430±5%	430±5%	430±5%	430±5%
Module type	SPS435-78M-H; SPS435-78M-HD	SPS375-72M-H; SPS375-72M-HD	SPS380-72M-H; SPS380-72M-HD	SPS385-72M-H; SPS385-72M-HD
Voc [V] / Tolerance	53.5±5%	48.5±5%	48.7±5%	48.9±5%
Vmp [V]	43.8	39.7	39.9	40.1
Isc [A] / Tolerance	10.48±5%	9.89±5%	9.97±5%	10.08±5%
Imp [A]	9.93	9.45	9.52	9.60
Pmp [W] / Tolerance	435±5%	375±5%	380±5%	385±5%
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	15			

Product Electrical Ratings:				
Module type	SPS390-72M-H; SPS390-72M-HD	SPS395-72M-H; SPS395-72M-HD	SPS400-72M-H; SPS400-72M-HD	SPS310-60M-H SPS310-60M-HD
Voc [V] / Tolerance	49.2±5%	49.4±5%	49.7±5%	40.3±5%
Vmp [V]	40.3	40.4	40.6	33.0
Isc [A] / Tolerance	10.14±5%	10.24±5%	10.31±5%	9.96±5%
Imp [A]	9.68	9.78	9.85	9.40
Pmp [W] / Tolerance	390±5%	395±5%	400±5%	310±5%
Module type	SPS315-60M-H; SPS315-60M-HD	SPS320-60M-H; SPS320-60M-HD	SPS325-60M-H; SPS325-60M-HD	SPS330-60M-H; SPS330-60M-HD
Voc [V] / Tolerance	40.6±5%	41±5%	41.3±5%	41.6±5%
Vmp [V]	33.2	33.4	33.6	33.8

Isc [A] / Tolerance	10.05±5%	10.14±5%	10.23±5%	10.30±5%
Imp [A]	9.49	9.58	9.67	9.76
Pmp [W] / Tolerance	315±5%	320±5%	325±5%	330±5%
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	15			
Module type	SPS335-60M-H; SPS335-60M-HD	-	-	-
Voc [V] / Tolerance	41.8±5%	-	-	-
Vmp [V]	34.0	-	-	-
Isc [A] / Tolerance	10.39±5%	-	-	-
Imp [A]	9.85	-	-	-
Pmp [W] / Tolerance	335±5%	-	-	-
Maximum system voltage [V]	1500			
Maximum Over-Current Protection Rating [A]	15			

Temperature coefficient	
Temp. Cofe. Of Isc	0.041 % / °C
Temp. Cofe. Of Voc	-0.264 % / °C
Temp. Cofe. Of Pmax	-0.346 % / °C