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PV MODULES INSTALLATION MANUAL



SUMMARY

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ELECTRIC CURRENT GENERATOR. ELECTRIC SHOCK HAZARD.

Solarday Photovoltaic modules are designed to produce continuous electric power from solar radiation. Main information is contained in this manual with respect to the safety, fitting and operating mode to be aware of prior using Solarday modules.

1.Introduction

Solarday has been the first Italian manufacturer of photovoltaic panels for years, always characterized by its top quality and reliability.

Made in Italy monocrystalline and polycrystalline solar panels production restarted in an Italian primary manufacture, which can guarantee advanced and high performing products. Solarday, which has acquired ownership of the brand, produces and

exclusively sells the entire line of Solarday photovoltaic panels.

We are a group of professionals who decided to put together their working knowledge in order to create a lean and responsive organization capable to catch the best market opportunities turning them into solutions for its customers.

2.Range of products

The range of the products being marketed can be defined as follows:

- **SERIES PX:** modules assembled with polycrystalline M2 (156,75 x 156,75 mm)
- **SERIES SDM:** modules assembled with monocrystalline M2 (156,75 x 156,75 mm)
- **SERIES B2P [Back2Power]:** modules assembled on revamping
- **SERIES BPM:** modules assembled with monocrystalline M3 (158,75 x 158,75 mm)
- **SERIES RL [Ray Light]:** double glass pv module
- **SERIES MPS:** modules assembled with monocrystalline M6 (166 x 166 mm)
- **SERIES MPS HC:** monocrystalline modules with half cells M6 (166 x 83 mm)
- **SERIES TEN HC:** monocrystalline modules with half cells M10 (182 x 91 mm)
- **TX24:** photovoltaic roof tile

Photovoltaic modules mentioned above can be supplied as laminates too or with protective aluminium frame. Among Solarday modules, there is also the RL SERIES (modules assembled with double glass) and the photovoltaic tile where dedicated user ma-

nuals are available.

Modules can also be customized as per customer's requirements: the modifications can be aesthetical, of the dimensions and/or of the power output.

2.1 SUMMARY DATA OF SOLARDAY MODULES

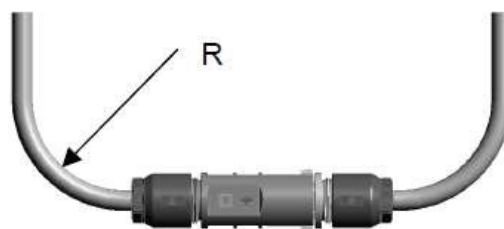
Product	Wp	Dimensions LxLxS	Kg	Technology	N° of cells	Typology
PX60	280-290	1640x992x40	18	POLY	60	STANDARD
PX72	330-350	1956x992x40	22,5	POLY	72	STANDARD
SDM60	310-315	1640x992x40	18	MONO	60	STANDARD
SDM60 ALL BLACK	300-310	1640x992x40	18	MONO	60	ALL BLACK
SDM72	360-370	1956x992x40	22,5	MONO	72	STANDARD
MX72	180-200	1580x808x35	14	MONO	72	REVAMPING
PX48	190-210	1312x992x40	14	POLY		REVAMPING
PX54	230-260	1640x992x40	17	POLY	54	REVAMPING
RL SDM60	300	1681x992x35	18	MONO	60	GLASS-GLASS
RL BPM60	330	1700x1000x35	19	MONO	60	GLASS-GLASS
RL BPM72	400	1979x1002x40	22	MONO	72	GLASS-GLASS
BPM60	325-335	1665x1002x40	19	MONO	60	STANDARD
BPM60 ALL BLACK	320-325	1665x1002x40	19	MONO	60	ALL BLACK
BPM60 RED	290	1665x1002x40	19	MONO	60	RED
BPM60 GREEN	290	1665x1002x40	19	MONO	60	GREEN
BPM72	390-400	1979x1002x40	22	MONO	72	STANDARD
BPM72 RED	350	1979x1002x40	22	MONO	72	RED
BPM72 GREEN	350	1979x1002x40	22	MONO	72	GREEN
MPS60	350-360	1730x1048x40	20	MONO	60	STANDARD
MPS60 ALL BLACK	345-350	1730x1048x40	20	MONO	60	ALL BLACK
MPS72	420-430	2071x1048x40	24	MONO	72	STANDARD
MPS HC	360-375	1755x1038x30/35	20	MONO	120	HALF CUT
MPS HC	440-455	2094x1038x30/35	25	MONO	144	HALF CUT
TEN HC	390-410	1722x1134x30/35	22,5	MONO	108	HALF CUT
TEN HC	530-550	2278x1134x30/35	31	MONO	144	HALF CUT
TEN HCD	530	2278x1134x30/35	31	MONO	144	GLASS-GLASS

3. Safety recommendations

Here below several safety recommendations to be considered while fitting photovoltaic modules.

- In case of works on the roof (if the height is more than 3 m), it is mandatory to wear proper safety equipment conforming to the normative in force in the fitting country;
- Keep children away from dangerous zones;
- During fitting on the roof, be aware of the risk that equipment, assembling material or even photovoltaic modules may fall and injury persons. While carrying the modules on the roof, do not stress too much the frame avoiding thus jeopardizing module integrity;
- Do not use the junction box or the cables to move or transport the modules;
- Damaged modules must be handled with care and stored separately. Broken glass can cause injury if not handled with care with the proper equipment;
- Do not drop anything on the module, protect the front side of the glass as well as the rear from scratches or other damages;
- Do not paint, glue or put other product neither on the module front nor rear;
- Double check the integrity of cables and the connectors prior fitting the modules, protect them from excessive mechanical stress during fitting;
- Do not dismount, modify, adjust or remove any part installed by Solarday;
- Never install damaged modules;
- Do not stack modules outside, store them instead in dry and sheltered place;
- Do not leave the modules without any support;
- Do not step on the modules;
- It is forbidden the use of lens or mirrors to focus solar radiation on the modules;
- Electrical connexions are to be effected by qualified installer of PV systems only;
- **DANGER OF DEATH** - Never open the junction box for any reason, there is a risk of electric shock;
- Opening and/or tampering the junction box, substituting even partially the original component of the module will invalidate the warranty;
- Protect the connectors from dirt;
- Modules and connectors in particular must be dry during installation;
- Do not disconnect or connect the module while it is operating;
- Carry installation only when the modules are covered. Working with DC connectors may cause electric arcs;
- Modules are generators of electric power with their potential hazard. Even at low radiation take care of the charging voltage to avoid risks;
- A module with broken glass cannot be repaired: it cannot be in contact with other modules as the frame may cause electric shocks;
- When connecting lightning protection system, observe and respect the regulations in the country;
- After installing the modules, verify whether the cables in the junction box are under tension.

CLASS OF APPLICATION



Solar day modules are certified to be of A class: this is to say Hazardous voltage (IEC 61730: higher than di 50V DC; EN61730: higher than 120 V), hazardous power applications (higher than 240 W).

Modules classified as per the normative IEC 61730-1 and IEC 61730-2 are conforming to the safety class II.

4. Recommended installations

4.1 GENERAL INSTRUCTIONS

Before illustrating the various recommended types of fitting, a series of technical considerations regarding the choice of the best configuration are proposed in this chapter.

Remember that:

- The operating temperature of the modules is ranging between -40° and $+85^{\circ}$ C;
- The modules may output a power higher than the nominal power and the ambient conditions (such as snow, body of water or other reflective areas) may increase the power generated by the module;
- It is not recommended the use of modules in areas with high saline and sulphurous concentration (despite the panels are also certified for this use);

- To install the system on the roof, it is necessary to provide adequate air flow on the rear distancing the module from the roof (10 cm are recommended);

- Do not fit the modules in areas where they are immersed in water or continuously exposed to water such as irrigator or fountain;

- It is recommended to use only components and equipment suitable for a photovoltaic system for a correct installation and to ensure the durability of the system;

Photovoltaic modules are classified and sold according the watt peak output under standard conditions (STC): this means a solar radiation of 1000 W/m^2 , air mass spectrum of 1,5 and cell temperature of 25° C. As the real operating conditions of the module are different from the standard ones, eventual problems should be validated by parameterising the data in a laboratory.

4.2 TIPS FOR A CORRECT INSTALLATION

- Modules must be installed in a way to maximize exposure to the direct beam of the sun in order to eliminate or minimize shaded areas;
- Even partial shading will reduce the module output;
- Modules must be firmly fixed via the support structure or the installation kit properly sized for photovoltaic applications;
- Modules can be installed with any tilt angle – horizontally or vertically;
- Care should be taken to avoid low modules inclination which may cause dirt accumulation (above 15°);

4.3 ELECTRICAL INSTALLATION

Solar module is an electrical component, to ensure the correct functioning it is essential to pay particular attention to the electrical installation of photovoltaic modules.

Please remember to:

- To protect cables from direct sunlight;
- Avoid large coils of conductors;
- To fix cables using UV-resistant cable ties;
- The over-current value of the device must not exceed the maximum value of the protection fuse;
- A module with a suspected electrical problem must be reported to Solarday, according to the procedures in place, to allow inspection and/or repair by qualified personnel;
- The contact with a continuous voltage of 30 V or more is potentially dangerous;

4.4 CABLES AND CONNECTORS

The modules are always supplied with pre-assembled MC4 or compatible cables and connectors.

- The accumulation of dirt on module surface may cause cells shading and then jeopardize module electrical performance;
- It is necessary a distance of at least 7 mm between the modules to allow thermal cooling of the frame;
- Keep the rear module area free of any object or structural element that may come into contact with the module in particular when it is operating;
- Make sure the modules are not subject to excessive wind or snow load above the values indicated in the technical datasheet neither to excessive force due to thermal expansion of the support structure.
- The maximum sustainable overload current from a Solarday panel is 20A;
- Do not use panels of different electrical or physical configurations in the same system;
- The maximum open-circuit voltage of the system shall not exceed the maximum system voltage specified for the panel (e.g. 1000Vdc);
- For the wiring of strings there is an obligation to use the same model of connector mounted on the panels, any compatible models will be authorized by Solarday. In case of difficulty in finding the material it is recommended to request it directly to Solarday;
- It is recommended to use cable of appropriate section and type "solar";
- Checking the polarity of cables and terminals when connections are made, otherwise the panel could be damaged.

4.5 FITTING METHODOLOGY

Fitting instructions written in the next part of this manual are not binding, they however must be followed to obtain the best result from the modules. Other configurations are allowed as far as they do respect the minimum permitted indications of wind and snow tests of the normative in force.

Modules are designed for a maximum allowable pressure of 5400Pa which corresponds to a wind speed of 130 km/h. The maximum allowable wind speed depends on the type of the module, on the fitting configuration, on the position or other factors. However, in no case modules can be exposed to high wind pressure or snow or any evenly distributed load.

It is not recommended to connect more than 20 modules in series.

Solarday makes available his experience and that of his technical office for any clarification for the fitting of modules not written in this manual. To avoid any problem, communication is required in case of use of alternative system mostly in case of the use of photovoltaic laminates.

Here below the fixing method most used for the installation of photovoltaic modules with frame:

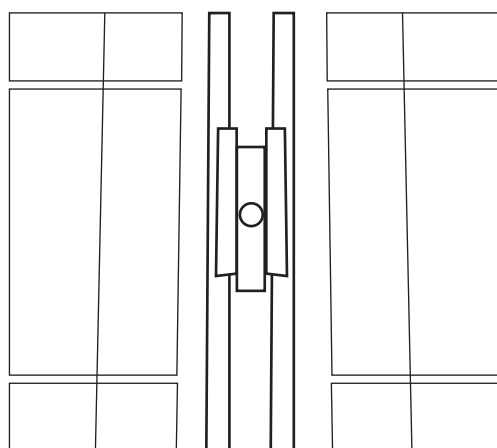
1. Fit the module on the aluminium profile.
2. Insert the plate to fix the appropriate support.
3. Put the fixing plate in correspondence of the module to be installed.
4. Put the clamp as described in the picture below according to the need and the type of the fitting.
5. Fix the clamp using the specific screw.
6. Make sure the screw is firm and that the installation is carried out correctly (a pressure of 8 Newton-meter is recommended).

The module is best fixed via special aluminium clamps fixed on the profile with hexagonal steel nuts and special fixing plates. More details are given in the next page with the description of the necessary distance during the installation.

AT LEAST 4 FIXING POINTS ARE REQUIRED FOR EVERY MODULE

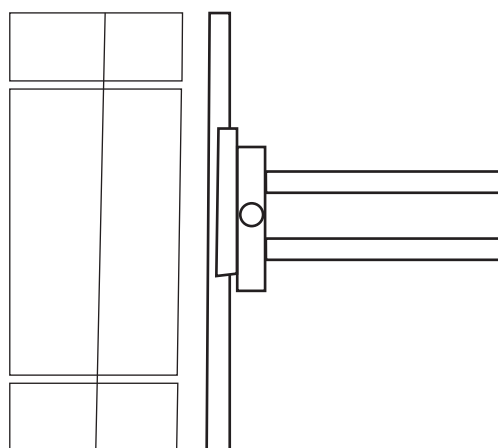
Clamp type: OMEGA

For this clamp type, it is necessary to use screws which characteristics are: Ø 8mm, length 35mm

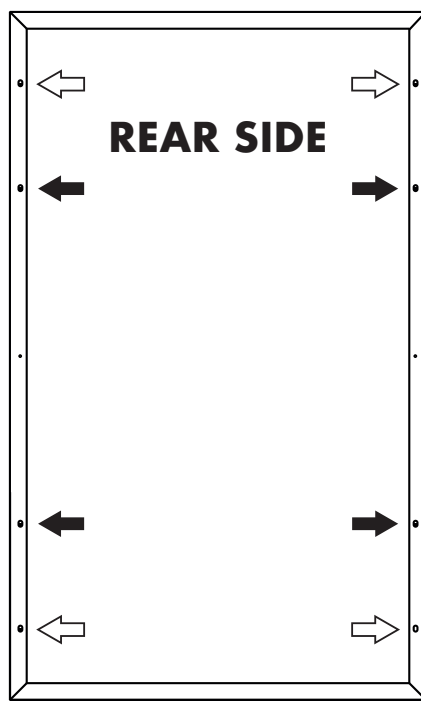


Clamp type: ZETA

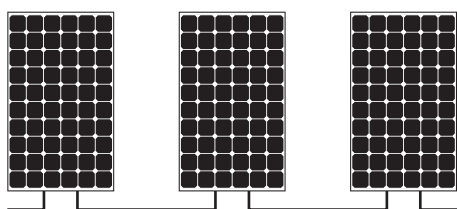
For this clamp type, it is necessary to use screws which characteristics are : Ø 8mm, length 25mm



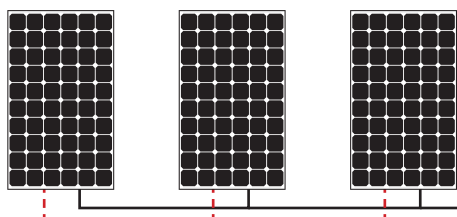
IN CASE OF DIRECT INSTALLATION THROUGH THE SLOTS ON THE FRAMES OF PHOTOVOLTAIC MODULES, USE THE SLOTS HIGHLIGHTED BELOW IN BLACK IN ORDER TO ENSURE A BETTER SEAL OF THE MODULES.



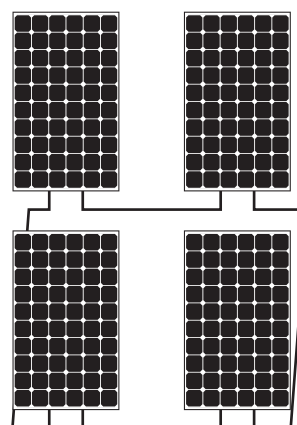
PV MODULES PRODUCE DIRECT CURRENT WHEN EXPOSED TO LIGHT, WHILE VOLTAGE IS ALWAYS PRESENT ON THE MODULE.



Single module can produce only low-level voltage. When several modules are connected in series, the voltage increases. Summation of voltage takes effect.



When modules are connected together in parallel, summation of current takes effect.

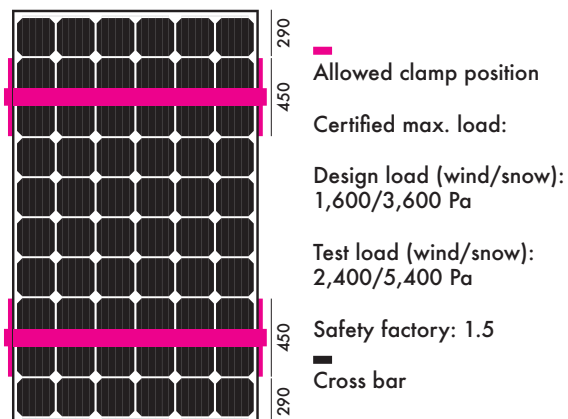


When parallel and serial connection combine, summation of current and voltage takes effect.

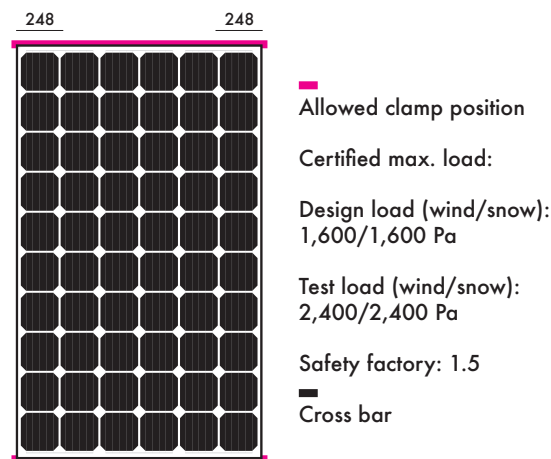
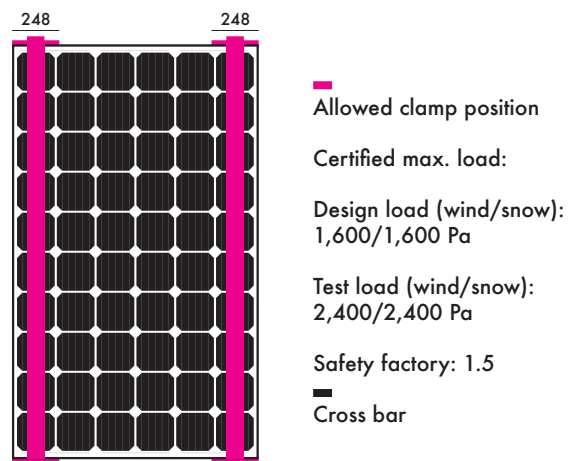
4.6 RECOMMENDED DISTANCE FOR FITTING THE MODULES

60 CELL PV MODULES

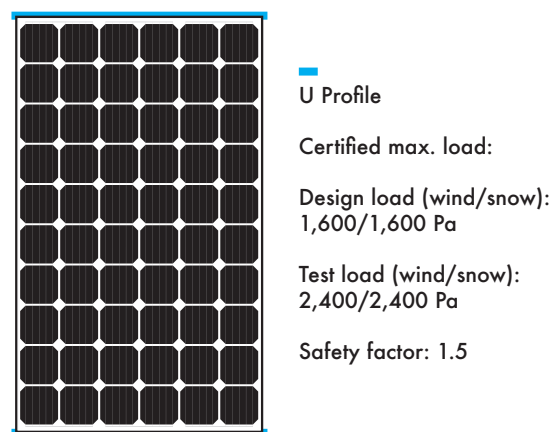
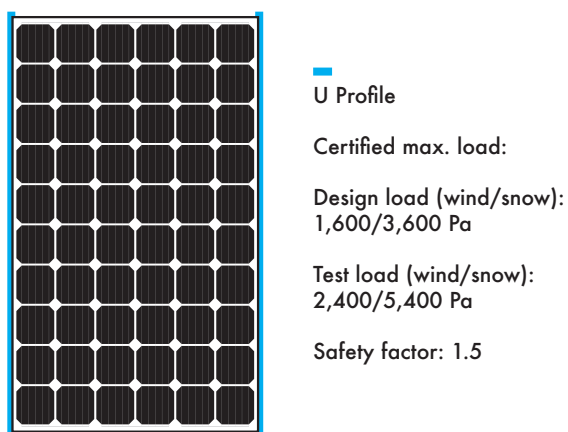
CLAMPING SYSTEM ATTACHMENT TO THE LONG SIDES OF THE PV MODULES



CLAMPING SYSTEM ATTACHMENT TO THE SHORT SIDES OF THE PV MODULES

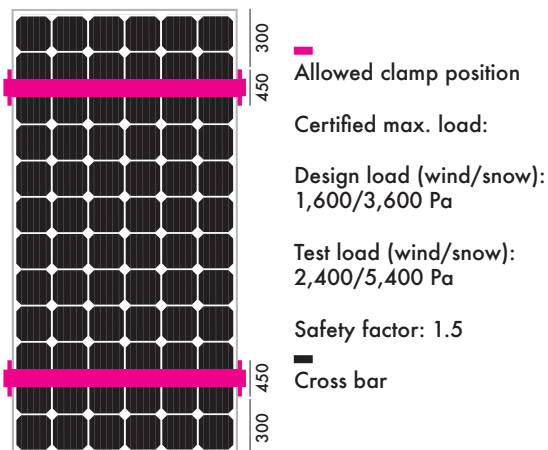


INSERTION SYSTEM

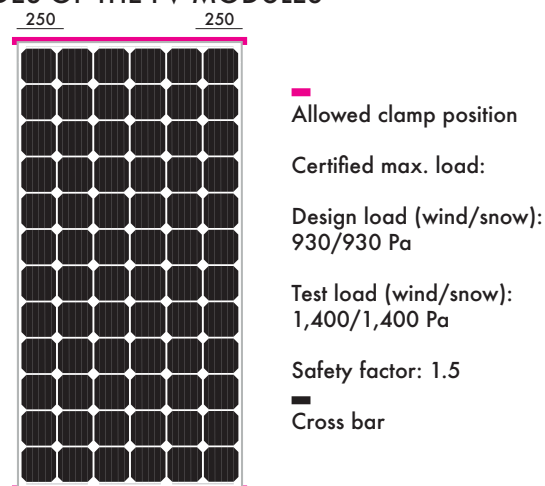
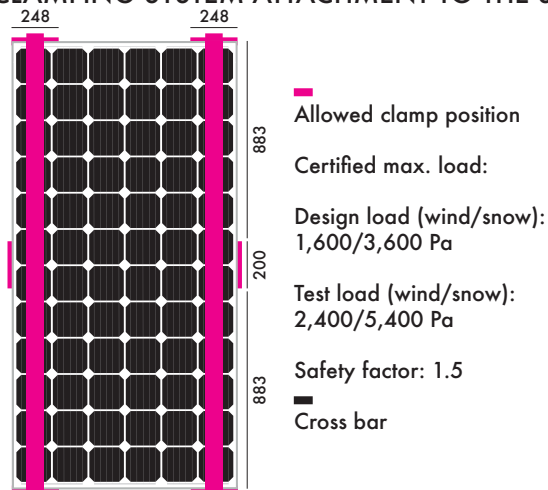


72 CELL PV MODULES

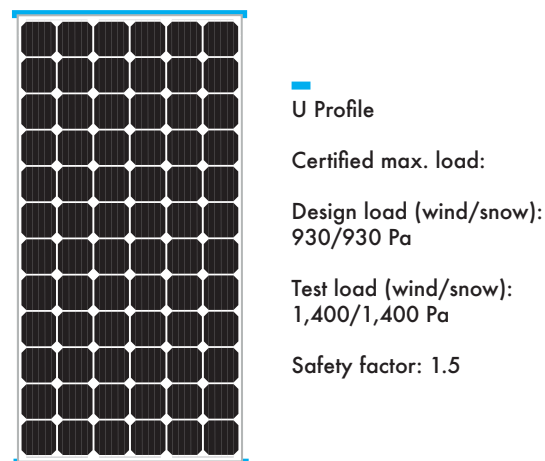
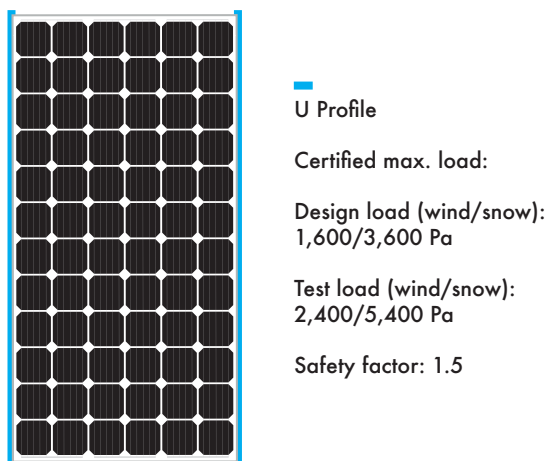
CLAMPING SYSTEM ATTACHMENT TO THE LONG SIDES OF THE PV MODULES



CLAMPING SYSTEM ATTACHMENT TO THE SHORT SIDES OF THE PV MODULES

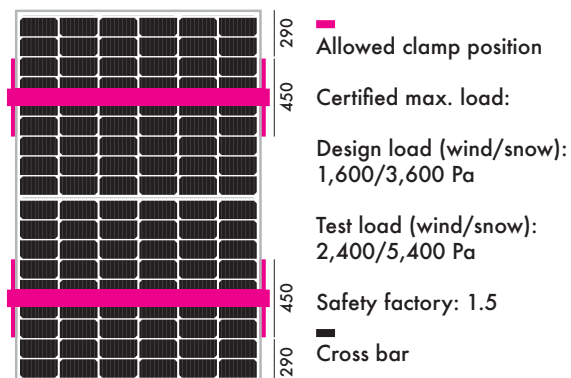


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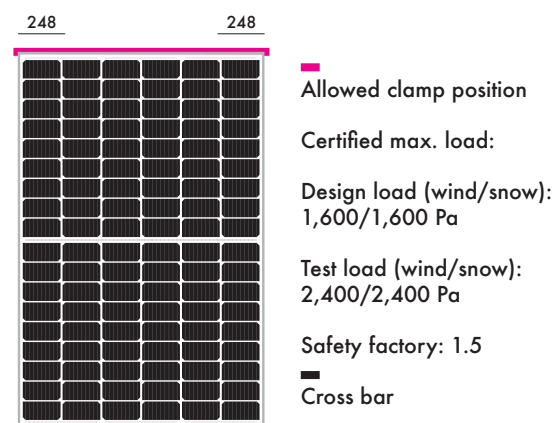
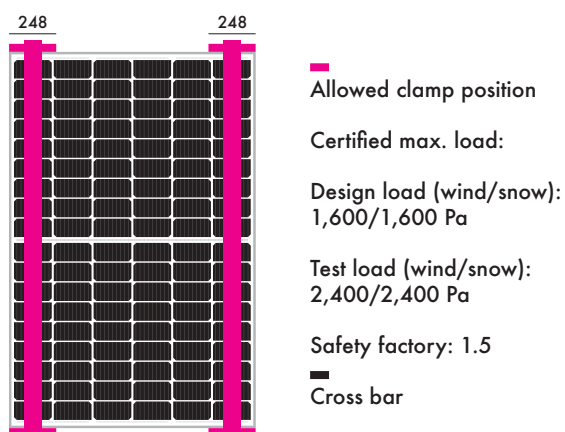


108 CELL PV MODULES HALF CUT

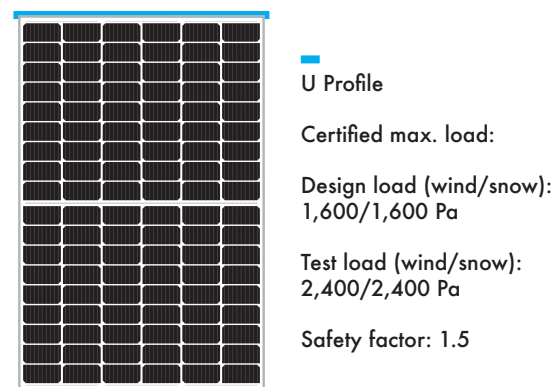
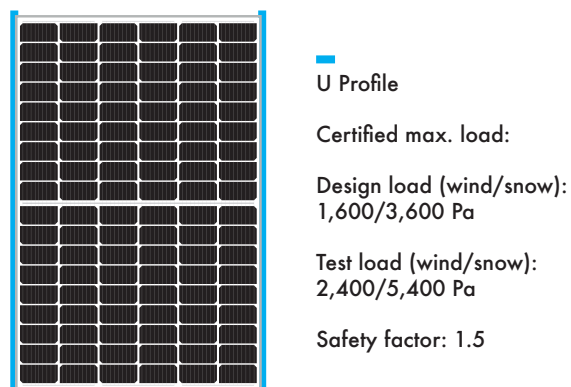
CLAMPING SYSTEM ATTACHMENT TO THE LONG SIDES OF THE PV MODULES



CLAMPING SYSTEM ATTACHMENT TO THE SHORT SIDES OF THE PV MODULES

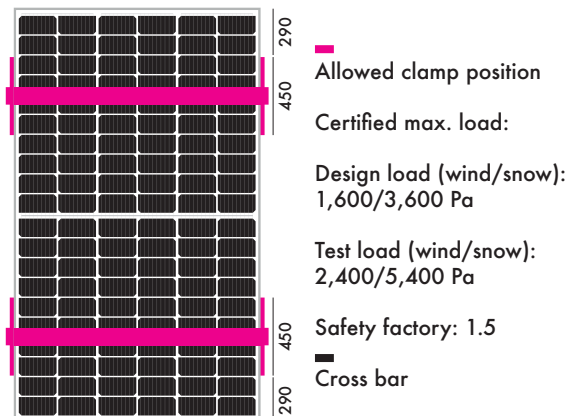


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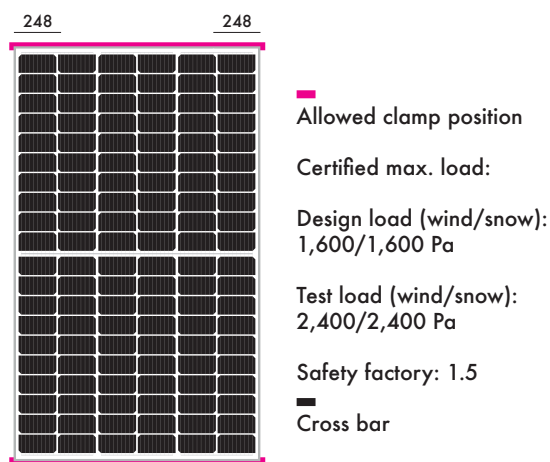
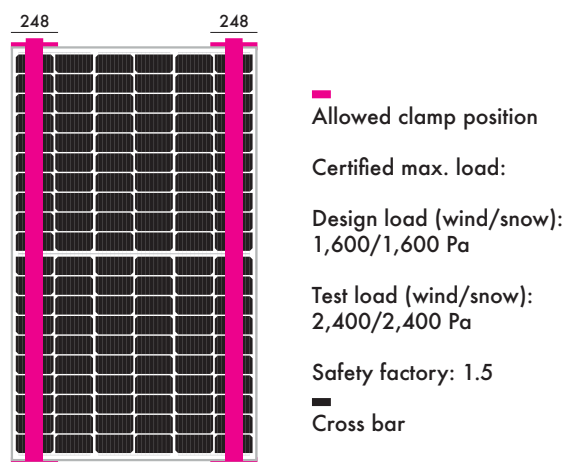


120 CELL PV MODULES HALF CUT

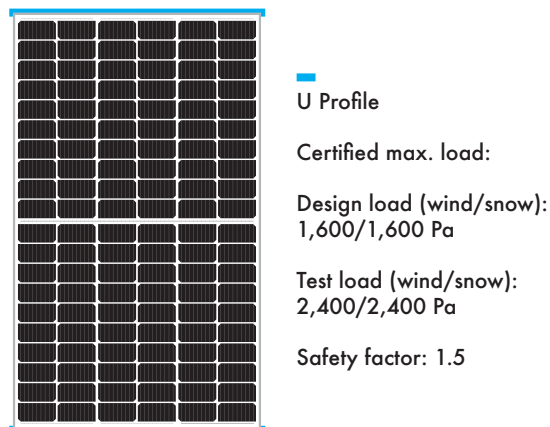
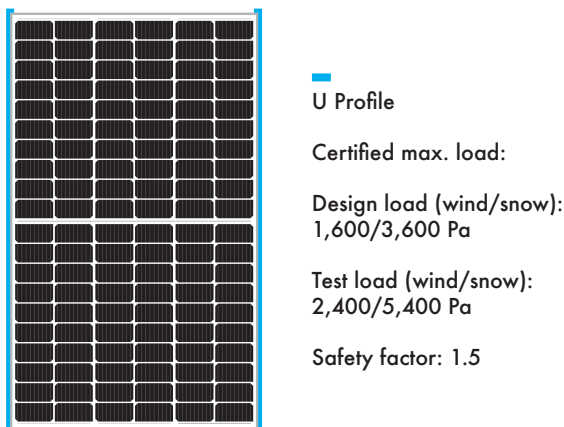
CLAMPING SYSTEM ATTACHMENT TO THE LONG SIDES OF THE PV MODULES



CLAMPING SYSTEM ATTACHMENT TO THE SHORT SIDES OF THE PV MODULES

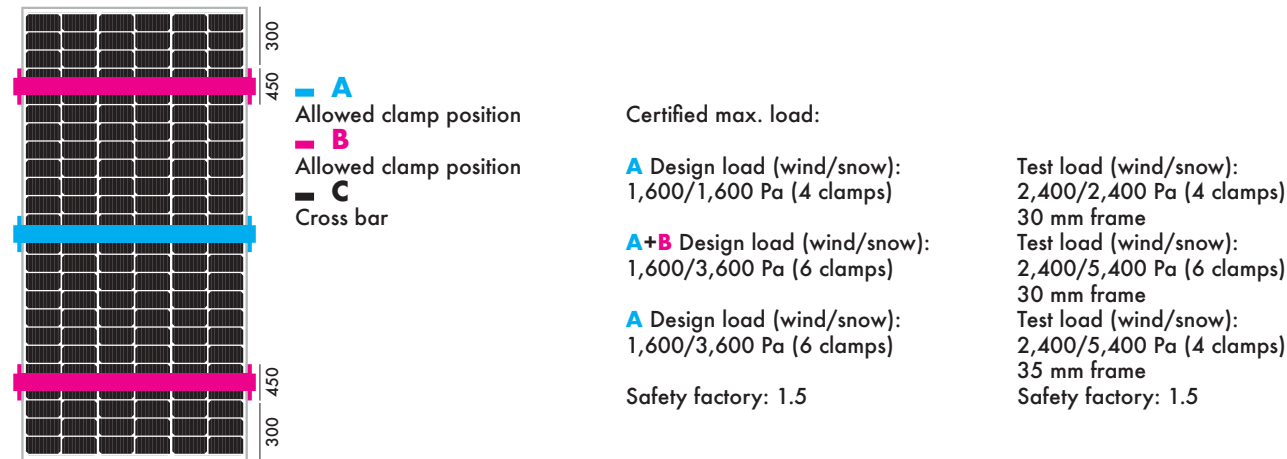


INSERTION SYSTEM

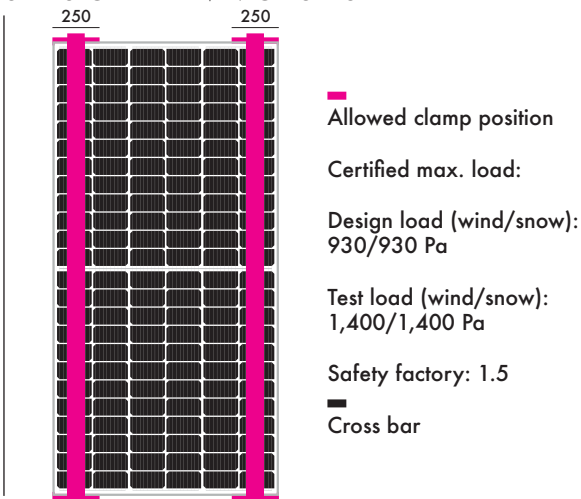


144 CELL PV MODULES HALF CUT

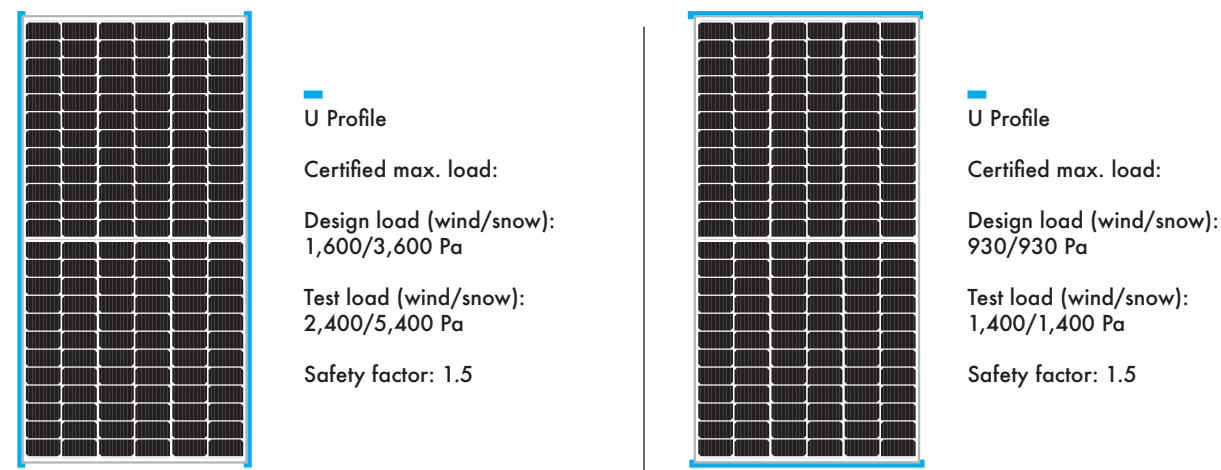
CLAMPING SYSTEM ATTACHMENT TO THE LONG SIDES OF THE PV MODULES



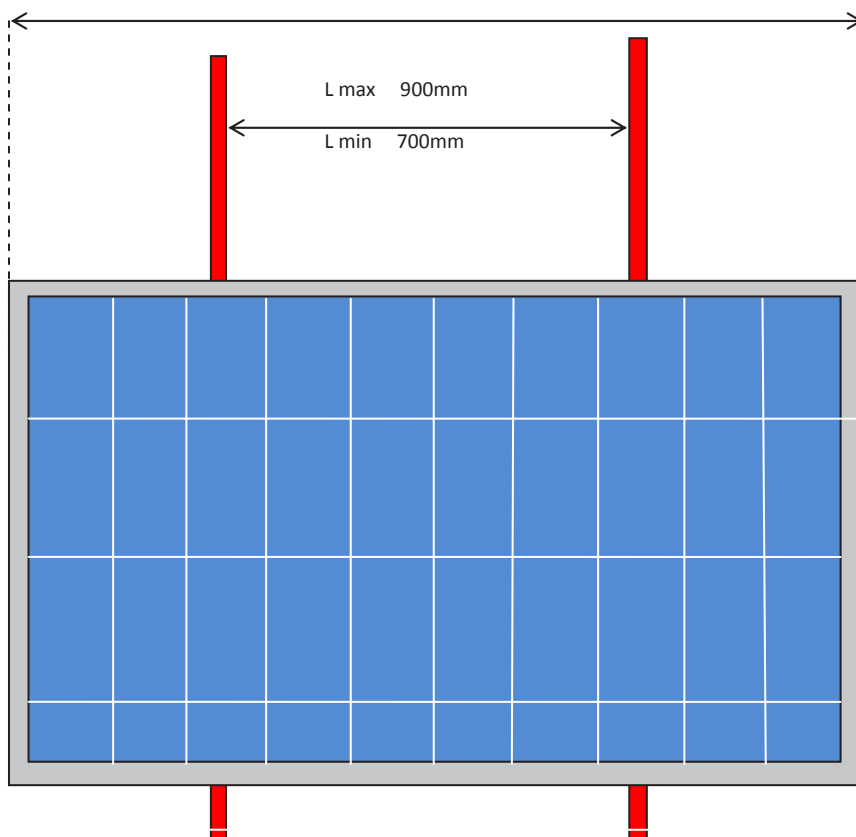
CLAMPING SYSTEM ATTACHMENT TO THE SHORT SIDES OF THE PV MODULES



INSERTION SYSTEM



THE SUMMARY SCHEME IS REPORTED BELOW, TAKING FOR EXAMPLE A 60-CELLS MODULE:

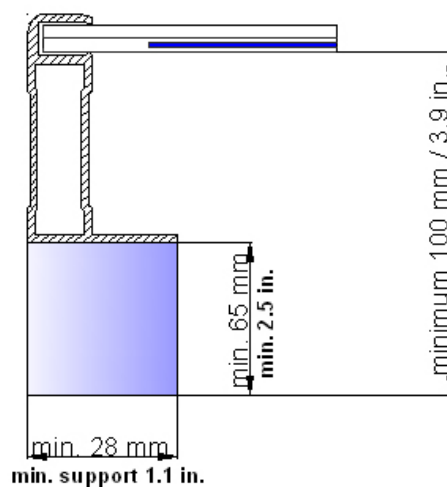


For installations requiring fixing points along the short side of the module it is advisable to keep a distance of 400 mm (± 100 mm) between the two bars.

It is advisable to consult our technical office in case of doubt or uncertainties info@solarday.it

IT IS ADVISABLE A DISTANCE OF 7mm BETWEEN MODULES TO ALLOW THERMAL EXPANSION OF THE FRAME

In case of installation on a pitch, it is advisable to keep a distance of at least 10 cm from the underlying area to allow adequate ventilation of the rear of the module.



5. Maintenance

Herewith some basic instructions to respect during the maintenance of photovoltaic modules.

- No ordinary maintenance is required on the module. However it is advisable a periodical inspection on the modules (once a year) to control glass damage if any, the rear of the module, the frame, the junction box or the external connectors;
- Periodically check the electrical connections as they may become loose;
- Photovoltaic modules can still operate efficiently without ever being washed although it is preferable to remove the dirt of the glass using water and soft sponge to increase energy production;
- Solar day modules are made with a textured tempered front glass designed to improve energy productivity;
- Aggressive and abrasive cleaners or chemicals should never be used neither on the front nor the rear of the module;
- Alkaline-based chemicals must never be used, including solutions based on ammonia;
- Always wear insulated rubber gloves when washing and cleaning the modules;
- Do not scrape dirt, snow or ice from the modules.

DISCLAIMER LIABILITY

Solar day is not liable directly or indirectly connected to the use of the information contained in this manual.

Solar day is not liable for any infringement of patents or other third party that may arise from the use of the photovoltaic module no license is granted implicitly or under patent rights. The information contained in this manual - to be considered as reliable - is based on the knowledge and the skills acquired by Solar day; this information however (including data of the products and suggestions) does not constitute neither an explicit nor implicit guarantee.

The information may vary any time, the amendment(s) will be promptly published in the company website and/or communicated directly to the customer.