



Solar Modules SLN-72G1 Mono PERC-XXX

Installation Guide and User Manual



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Purpose of This Manual

Thanks for choosing Solaron Photovoltaic Modules (hereafter referred to as “PV module”) produced by Profpanel LLC (Armenia). Profpanel LLC referred below to as Solaron.

This Installation Guide and User Manual (hereafter referred to as “Manual”) is to give information on how to apply Solaron PV modules properly.

Installers must read and understand this Guide prior to installation. For any questions, please contact with our technical support group (support@solaron.am) for further information. Installers should follow all safety precautions described in this Manual as well as local codes when installing a module.

Keep this Document in a safe place for future reference (care and maintenance) and in case of sale or disposal of the PV modules.

Applicable Products

This document applies to 72-G1 (158.75x158.75mm) cell mono PERC series PV modules which we designate as SLN-72G1 Mono PERC – XXX, where XXX stands for panel power under standard test condition (see page 5).

Disclaimer of Liability

- Because the use of this Manual and the conditions or methods of installation, operation, use and maintenance of PV modules are beyond of Solaron control, Solaron does not accept responsibility for loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance including bodily harm, injury or damage to property.
- The information in this manual is based on Solaron’s knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not constitute a warranty, expresses or implied. Solaron reserve the right to change this manual, and the PV module's specifications, or product data sheets without prior notice.

Safety precautions

General Safety

PV module connectors pass direct current (DC) when exposed to sunlight or other light sources. Contact with electrically active parts of the module, such as terminals, can result in injury or death, irrespective of whether or not the module and the other electrical equipment have been connected.

- Installing solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified personnel.
- The installer should assume the risk of all injury that might occur during installation, including, without limitation, the risk of electric shock.
- One individual module may generate DC voltages greater than 30V when exposed to direct sunlight. Contact with a DC voltage of 30V or more is potentially hazardous. When disconnecting wires connected to a PV 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, do not connect or disconnect the modules or any electrical part under load
- PV Modules may be ground mounted, mounted on roof, vehicles or boats. Proper design of support structures is the responsibility of the system designer and installer.
- PV module does not contain any serviceable parts so do not attempt to disassemble the module, or repair any part of it.
- Do not use external or otherwise artificially concentrated sunlight directly on the module.
- The maximum altitude for which this PV module is designed is 2000 m.
- When installing the system, abide with all local, regional and national regulations. Obtain a building permit where necessary. Abide with any local and national regulations when mounting on vehicles or boats. Abide safety precaution for installing a solar photovoltaic system.

- Keep children 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.
- Use only insulated tools that are approved for working on electrical installations.
- 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 solar electric systems. Always use the same type of module within a particular photovoltaic system.

Product Identification

Each module is equipped with two identical barcodes (one inside the laminate under the front glass, the second on the rear side of the module) and nameplate. So, each module has a unique serial number, that act as a unique identifier. The serial number has 18 digits, where the 4th and 5th digits are the year code and 6th and 7th digits are the month code.



Figure 1: Barcode of 72 cell monocrystalline module produced in 23 Of June, 2022.

Do not remove nameplate or barcode. If any label is removed the product warranty will no longer be honored by Solaron.


Nameplate and technical specifications

Nameplate describes the product type, rated power, rated current, rated voltage, open circuit voltage, short circuit current, all as measured under standard test conditions STC; weight, dimension etc.

Standard Test Condition STC : $W = 1000 \text{ Wt/m}^2$; $AM 1.5$; $25^{\circ}C$

The electrical characteristics of I_{sc} and V_{oc} under standard test conditions are within $\pm 3\%$ of the indicated values.

Atmospheric conditions can increase the module's current and/or voltage to higher levels than those reported in STC

Caution ! 	Under normal conditions, a PV module is likely to experience conditions that produce higher current and/or voltage than reported at the standard test conditions. Accordingly, the values of I_{sc} and V_{oc} marked on this PV module should be multiplied by a safety factor of 1.25 when determining component voltage ratings, conductor current ratings, and size of controls (e.g. inverter) connected to the PV output. Safety factor may vary according to local conditions
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Additional information can be found in the currently valid module datasheets available at www.solaron.am

Solar Module Type	SLN-72G1 Mono PERC - XXX
Length	1979mm
Width	1002mm
Frame height	40mm

Solar Module Type	SLN-72G1 Mono PERC - XXX
Weight	23 kg
Class of protection against electrical shock	II
Maximum system voltage	1500 V
Maximum fuse rating	15 A
Permissible environmental conditions	Panels by default tested for operation in an environmental temperature range -40°C to +40°C, and up to 100% relative humidity as well as rain.
Junction box protection class	IP 68
Connector protection class	IP 68
Snow load [Pa]	1600 Pa
Wind load [Pa]	1600 Pa

Unpacking and Storing

Module should be stored in a dry and ventilated environment to avoid direct sunlight and moisture. If modules are stored in an uncontrolled environment, the storage time should be less than 3 months and extra precautions should be taken to prevent connectors from being exposed to moisture or sunlight.

Unpack module pallets carefully, making sure to follow all directions on the pallet.

- Do not step, walk, stand, or jump on any modules. Localized heavy loads may cause variances of microcracks on the cells which will ultimately compromise module reliability.
- Do not carry modules on your head or carry modules through the wires or Junction Box
- Do not use sharp instruments on the modules, especially the sensitive backsheet
- Do not leave modules unsupported or unsecured
- Keep all electrical contacts clean and dry

Mechanical and Electrical Installation

Installation Condition

Mechanical Load

The mechanical load bearing (include wind and snow loads) of the module is based on the mounting methods. The professional system installer must be responsible for mechanical load calculation according to the system design.

Site selection

In most applications, PV modules should be installed in a location where they will receive maximum sunlight throughout the year. In the Northern Hemisphere, the module should typically face South, and in the Southern Hemisphere, the modules should typically face North. Modules facing 30° away from true South (or North) will lose approximately 10% to 15% of their power output. If the module faces 60° away from true South (or North), the power loss will be 20% to 30%. When choosing a site, avoid trees, buildings or obstructions, which could cast shadows on the solar PV modules especially during the winter months when the arc of the sun is lowest over the horizon. Shading causes loss of output, even though the factory fitted bypass diodes of the PV module will minimize any such loss.

- Do not install the PV module near naked flame or flammable materials.
- Do not install the PV module in a location where it would be immersed in water or continually exposed to water from a sprinkler or fountain etc.

Tilt angle selection

The tilt angle of the PV module is measured between the surface of the PV module and a horizontal ground surface. The PV module generates maximum output power when it faces the sun directly.

Please refer to suggestions from experienced PV module installer, for the specific installation angle.

NOTE

We suggest that module installation tilt angle be no less than 10° so module surface dust can be washed away easily by rainfall. And it makes easy to avoid water print on the glass due to long time of water ponding which may further affect module appearance and performance.

NOTE

Solaron modules connected in series should be installed with the same orientation and tilt angle. Difference orientation and tilt angle may result in differ received solar irradiation and result in output power loss.

For standalone systems with batteries where the PV modules are attached to a permanent structure, the tilt angle of the PV modules should be selected to optimize the performance based on seasonal load and sunlight. In general, if the PV output is adequate when irradiance is low (e.g., winter), then the angle chosen should be adequate during the rest of the year. For grid-connected installations where the PV modules are attached to a permanent structure, PV modules should be tilted so that the energy production from the PV modules will be maximized on an annual basis.

Reliable ventilation

Sufficient clearance (at least 10 cm) between the module frame and the mounting surface is required to allow cooling air to circulate around the back of the module. This also enables condensation or moisture to dissipate.

Mechanical Installation

General Installation Principles

Each Solaron PV module can be installed in both landscape and portrait modes in two different ways: with bolts and with clamps.

- Appropriate installation structures shall be chosen to meet required mechanical load.
- In heavy snow areas in winter, please select the high mounting stand. Thus, the lowest point of the module will not be covered by snow for long time
- Do not drill additional holes in frame. Doing so will void the warranty
- Before installing module on the roof, please make sure the building is suitable for roof installation.
- It is recommended to keep minimum 2cm- gap between PV modules for thermal expansion of materials.
- Make sure the backsheet of modules will not be touched by the mounting stand or building structures.

The max static approved design load is 1600Pa on the back side to simulated wind load, and 1600Pa on the front side, to simulate snow load and wind load. The load resistivity depends on the module installation method (please refer to "Positions for clamping and fixing" on page 10)

Mounting with bolts

The frame of each PV module has 8 mounting holes (shown on Figure 3), ideally placed to optimize the load handling capability, to secure the module to supporting structure. For standard installation, fix the module on mounting structure with the 4 holes on the module frame. In areas with strong wind or heavy snow, please use all 8 holes for fixing the module frame in order to strengthen the construction.

The module frame must be attached to a mounting rail using M8 corrosion-proof screws together with spring washers and flat washers in symmetrical locations on the PV module. It's recommended to use torque wrench to install modules. In the process of tightening, the torque is recommended to be with 15-20N.m. The schematic drawings of the installation are shown below.

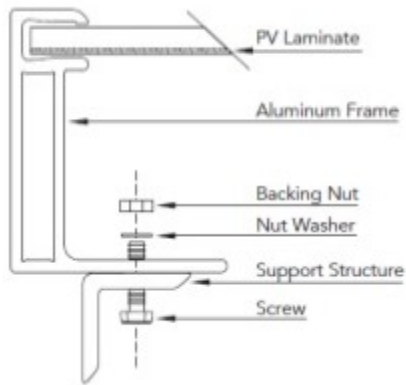
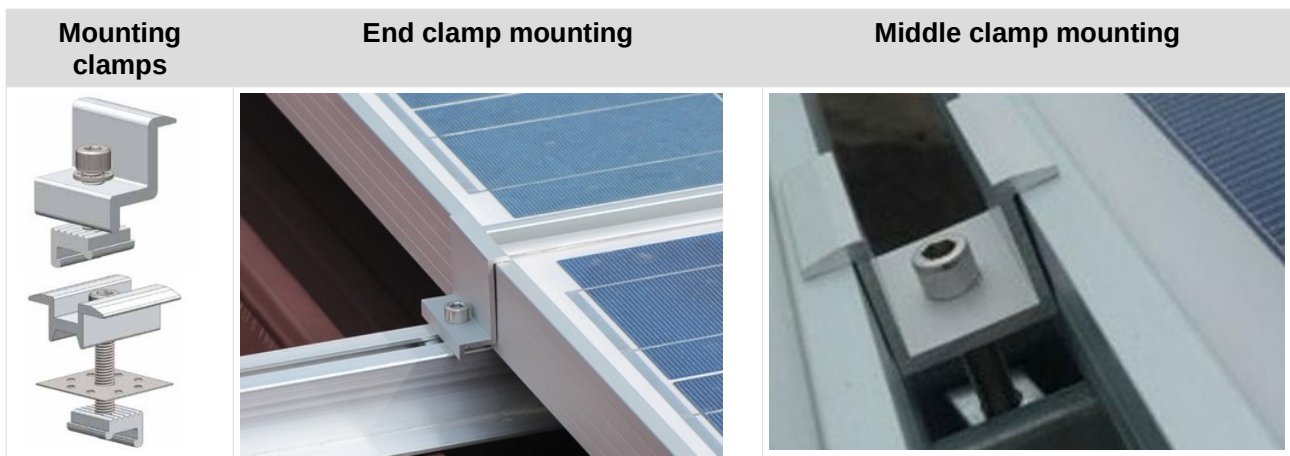


Figure 2: Solar module bolting

Mounting with clamps

- Use at minimum 4 clamps to attach modules to the mounting rails.
- Modules clamps should not come into contact with the front glass and must not deform the frame.
- Be sure to avoid shadowing effects from the module clamps.
- When choosing clamp-mounting method, use at least four clamps on each module, two clamps should be attached on each long sides of the module (for portrait orientation) or each short sides of the module (for landscape orientation). Depending on local wind and snow loads, additional clamps may be required to ensure that modules can bear the load.
- The mounting details are shown in the following figures



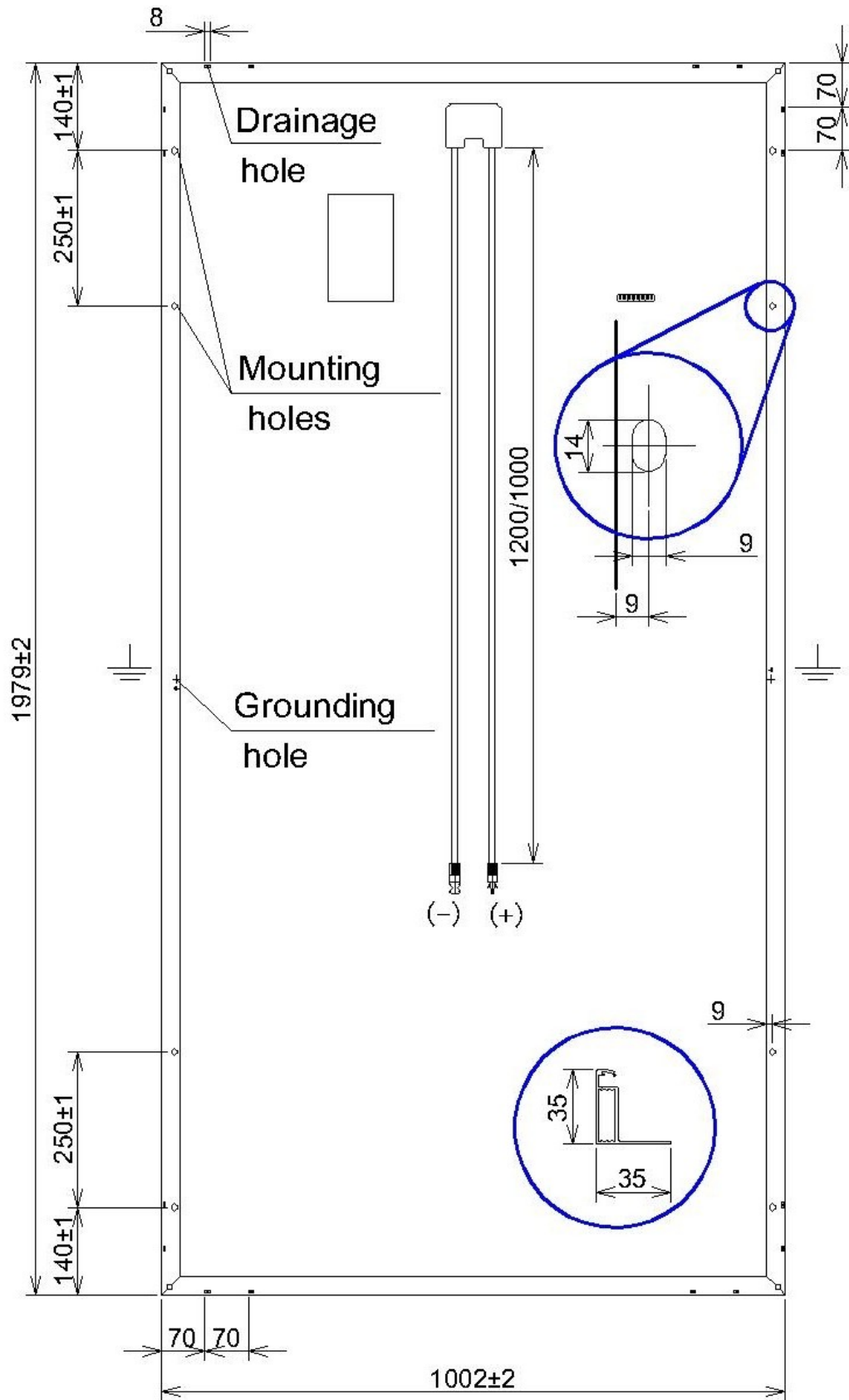
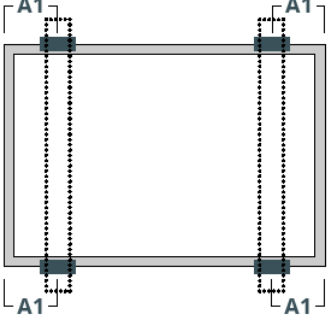
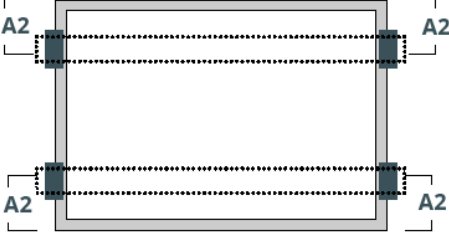
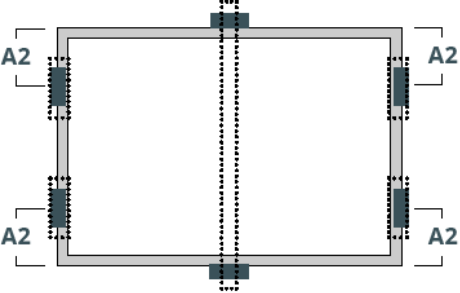
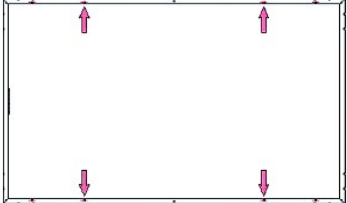
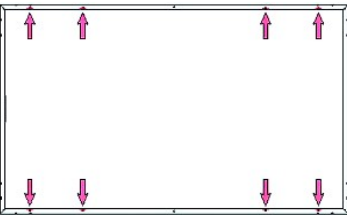


Figure 3: 72 G1 cell solar modules mounting holes

Positions for clamping and fixing

Fixing With Clamps		<p style="text-align: center;">$350 < A1 < 550$</p> <p style="text-align: center;">Test Load: positive 2400Pa/negative 2400Pa Design Load: positive 1600Pa/negative 1600Pa</p>
		<p style="text-align: center;">$200 < A2 < 250$</p> <p style="text-align: center;">Test Load: positive 2400Pa/negative 1800Pa Design Load: positive 1600Pa/negative 1200Pa</p>
		<p style="text-align: center;">$200 < A2 < 250$</p> <p style="text-align: center;">Test Load: positive 5400Pa/negative 2400Pa Design Load: positive 3600Pa/negative 1600Pa</p>
Fixing With Bolts		<p style="text-align: center;">Test Load: positive 2400Pa/negative 1600Pa Design Load: positive 2400Pa/negative 1600Pa</p>
		<p style="text-align: center;">Test Load: positive 4000Pa/negative 2400Pa Design Load: positive 2667Pa/negative 1600Pa</p>

Electrical Installation and PV Modules Wiring

Solaron PV modules have been designed to be easily interconnected. Each module comes with one positive (+) cable with a QC4.10 male plug and one negative (-) cable with a QC4.10 female connector. Both wires are connected inside of the junction box.

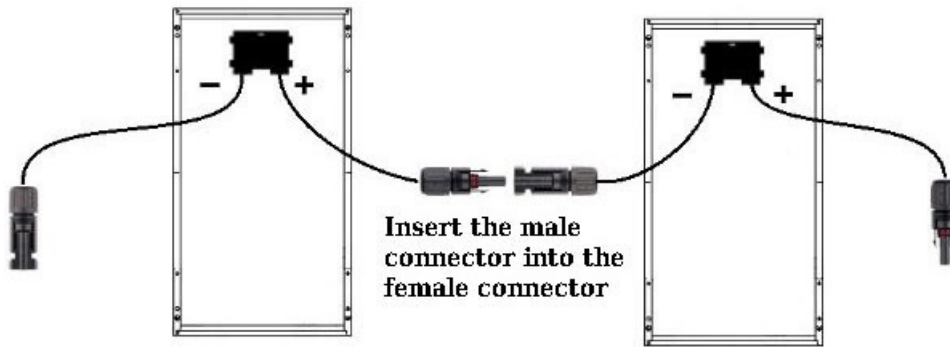


Figure 4: PV modules interconnection

Modules are interconnected by inserting the + plug from one module into the – plug of the next module in the array string. Secure the plugged connector pair to the module frame or mounting structure to protect it from damage. We must warn that the QC4.10 connectors are not compatible with any other connector type. The junction boxes with IP67 protection class have been designed to be easily interconnected in series by the connectors. The junction boxes used with Solaron PV modules contain bypass diodes wired in parallel with the PV cell strings. In the case of partial shading, the diodes bypass the current generated by the non-shaded cells, thereby limiting module heating and performance losses. Bypass diodes are not over-current protection devices. Bypass diodes divert current from the cell strings in the event of partial shading. See Figure 5 for a diagram showing how the cell strings are electrically connected with the diodes. For good weather protection all of Solaron PV modules junction boxes are potted with special protective seal.

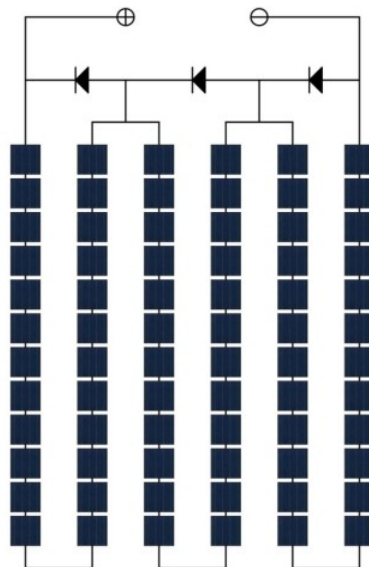


Figure 5: Electrical construction of PV module.
Bypass diodes and solar cells

Always use cables and connection techniques consistent with the anticipated environmental conditions and applicable codes related to the installation. For wiring that is exposed to weather, select conductor cable that is sunlight (UV) resistance and that offers a minimum rating of 90°C. We recommend that all wiring be double insulated, use flexible copper (Cu) conductors at least 4mm in diameter (AWG 12) and rated as PV Wire. The module cables should also be attached and supported to ensure adequate strain relief. If cables are installed within a building then they should be installed in metallic tubes or any fire protect corrugated cable tubes.

Caution !

**Risk of serious injury or death from electric shock or electric arc flash!
Do not connect or disconnect modules under load!**

Although the modules are protected against accidental contact, under adverse conditions during installation, dangerous voltages may occur (several hundred volts). Therefore, the installation and maintenance of the modules, as well as the connection to the main power supply, can only be carried out by authorized and qualified personnel. Before connecting the system to the grid, the PV system must be approved for proper installation by responsible engineers of local power company.

The design of the PV system must be carried out by qualified personnel familiar with the design of the PV system.

The system design is the responsibility of the PV system designer.

PV Module wiring

Series and Parallel Wiring

The modules may be wired in series to produce the desired voltage output in the range of maximum system voltage and input voltage of the required inverter. Connect the modules in series electrically by connecting the positive (+) connector of one module to the negative (-) connector of another. Only use modules of the same type for series connections. An arrangement of several solar modules which are connected in series is often referred to as a "module string".

PV modules in portrait orientation can be wired by two different way with return cable (Daisy Chain Wiring) and without return cable (Leapfrog Wiring) shown bellow:

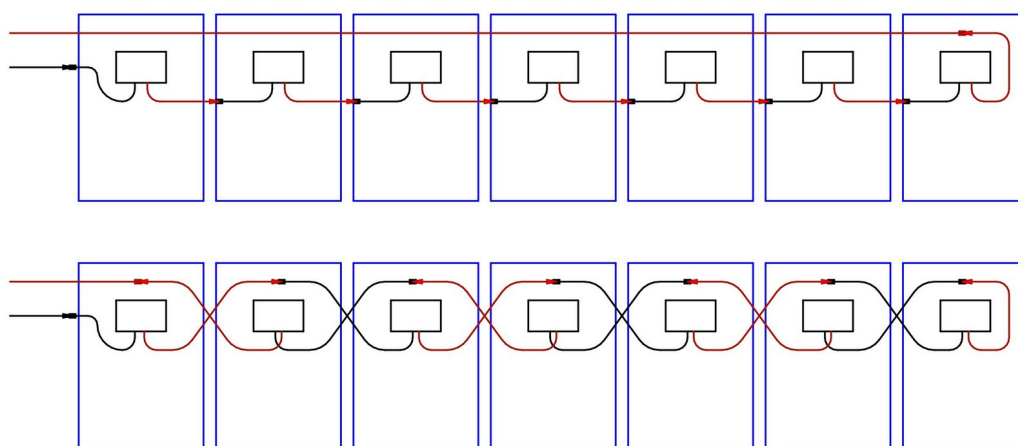


Figure 6: Standard "Daisy Chain Wiring" and "Leapfrog Wiring"

Solaron PV modules are provided with standard copper cables with a 4mm² cross-sectional area and are rated at 1500V (TUV)

The maximum voltage of the system should be less than the maximum input voltage of the Inverter but in any case it should be less than the certified system voltage 1500V for the panels.

Recommended maximum number of modules in series connections

$$N_{max} = \frac{\text{System Voltage}}{1.25 V_{oc}}$$

Alternatively, a more accurate correction factor for the open-circuit voltage can be calculated using the following formula: $C_{V_{oc}} = 1 - \alpha_{V_{oc}} \times (25 - T)$

where T is the lowest expected ambient temperature at the system installation site $\alpha_{V_{oc}}$ (%/°C) is the temperature coefficient of the selected module (refer to corresponding datasheet).

$$N_{max} = \frac{\text{System Voltage}}{C_{Voc} V_{oc}}$$

Parallel string connection

The number of module strings connected in parallel without protective fuses should be limited to two. If more than two strings are to be connected in parallel, then a series fuse is required for each string in each non-earthed pole. Only DC fuses rated at the maximum system voltage should be used. Minimum fuse size, can be calculated as $1.56 \times I_{sc}$ and equal to 15A.

$$N_{(\text{Max. Strings in Paralell})} = \frac{\text{Maximum overcurrent protection rating}}{1.25 I_{os}} + 1$$

Equipotential bonding

Solaron PV modules use anti-corrosion and oxidation resistance aluminum frame as rigid supporting. In order to protect the module from lightning strike, electrostatic damage, and personnel safety, all module frames and mounting racks must be properly grounded, as shown in Figure 7:

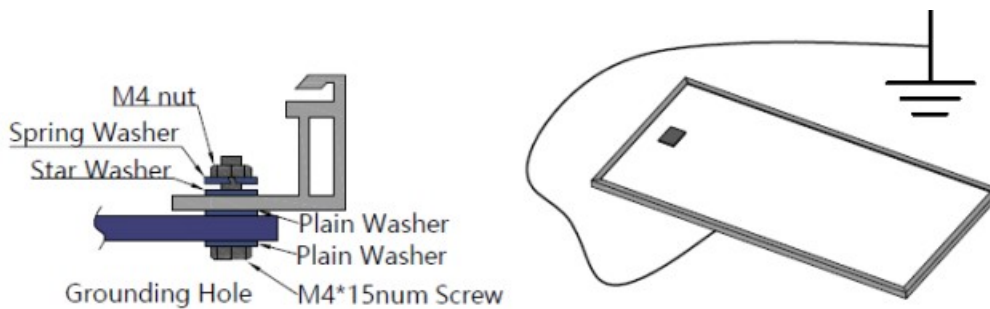


Figure 7: PV module equipotential bonding

- The frames have pre-drilled holes marked with equipotential bonding symbols, these holes should be only used for these purposes, but not for mounting the modules. Do not drill any additional holes on the frames of the module, which may void the warranty.
- Connect module frames together using adequate cables: we recommend using 4-14 mm² (AWG 6-12) copper wire equipped with lugs.
- If the supporting system is made of metal, the surface must be electroplated and have excellent conductivity.
- All bolts, nuts, flat washers, lock washers and other relevant hardware should be made of stainless steel, unless otherwise specified.
- The equipotential bonding cables must be fully contact with inside of the aluminum alloy, and the connection terminal must penetrate the oxidation coating of frame. Connecting the module frames and supporting beams using suitable conductors can achieve good equipotential bonding.
- The equipotential bonding cables must be connected to the earth through a suitable electrode.

Maintenance

Module Cleaning Instructions

- Solaron recommend the following maintenance to ensure the best performance of the modules:

- Clean the surface of the glass if necessary. Cleaning by soft sponges or clothes with water.
- It's recommended to use mild, non-abrasive cleaning detergent to remove stain.
- Do not use abrasive powder, abrasive cleaners, scrubber cleaners, polishers, sodium hydroxide, benzene, nitro-thinners, acid or alkali and other chemical substances.
- Regular mechanical and electrical inspection in every 6 months to ensure that the module connectors clean and the connection is reliable.
- If any problem arises, consult a professional for suggestions.

Cleaning the Frame

Solaron PV module frames include an anodize oxide coating to increase produce life. The cleaning cycle for regular anodic oxide coatings is generally every six months. When cleaning, be sure not to damage or scratch this coating.

Dirt can generally be cleaned off using a suitable lubricant or warm, mild soapy water, and a fiber brush may be used to clean any dust that may also stick to the surface. Do not use abrasive cleaning tools like steel wool or acidic/ alkaline chemicals to clean.

Caution !



Observe the maintenance instructions for all components used in the system, such as support frames, charging regulators, inverters, batteries etc.