

TM-Systems

Installation Manual

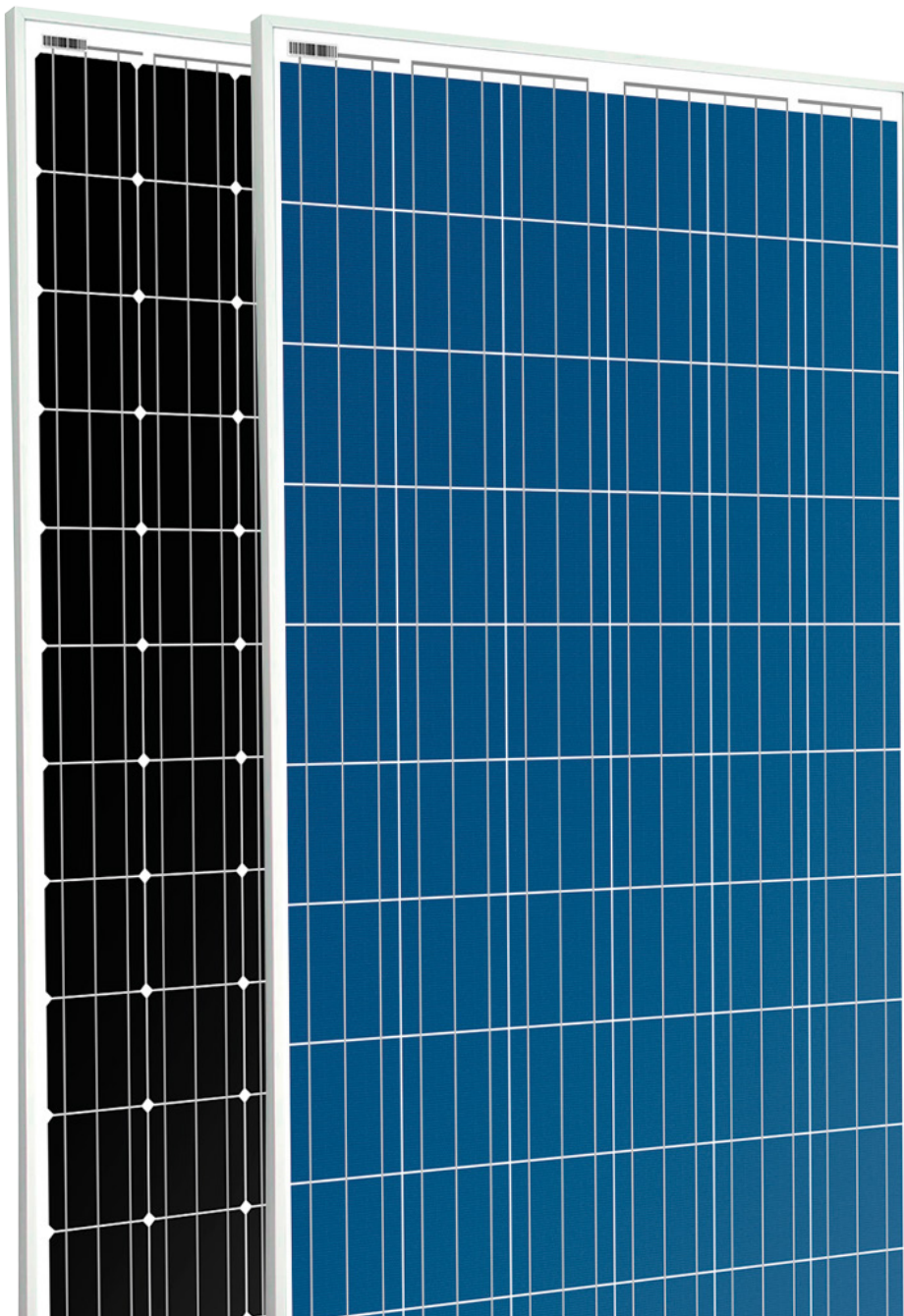
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1 General Installation

Installing solar photovoltaic systems may require specialized skills and knowledge. Installation should be performed only by qualified persons.

- The installer should assume the risk of all injury that might occur during installation, including, without limitation, the risk of electric shock.
- It is recommended to study the installation manual of each equipment of the kit (PV panel, inverter/variator, structure, batteries, pumps, etc. depending of the kit) and follow the manufacturer specifications.
- In the assembly phase (mechanical and electrical) and the commissioning, the authorized installer must benefit from local, regional and national legislation, both safety and prevention and electrical material (work with electrical risk, work at height, etc.). Get a building permit when necessary. Comply with local and national regulations when mounting on vehicles or boats.
- The modules are qualified for application class A: Hazardous voltage (IEC 61730: higher than 50V DC; EN 61730: higher than 120V), hazardous power applications (higher than 240W) where general contact access is anticipated (Modules qualified for safety through EN IEC 61730-1 and -2 within this application class are considered to meet the requirements for Safety Class II.
- The assembly is to be mounted over a fire resistant roof covering rated for the application.

2 Safety precaution

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 voltages. If modules are connected in parallel, the total current is equal to the sum of individual module currents. The following points must be observed when handling the solar modules to avoid the risk of fire, sparking and fatal electric shock.

- ✓ 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.
- ✓ 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 a solar electric system.
- ✓ Always use the same type of module within a particular photovoltaic system.

2.1 Warning



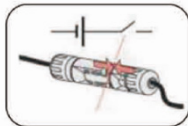
Do not insert any electrically conducting materials into the plugs or sockets.



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



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



Make sure that you do the connection when the circuitry is cut off.
Do not disconnect under load.



Guarantee the clean connectors have not been polluted, and the electrical connection and the mechanical joint is good, to avoid the generation of electric arc effectively.

2.2 Warnings

Before starting the installation process it is necessary to carefully study the manual and manufacturer's instructions for each equipment to avoid possible incidents.

3 Location

- Select a suitable location for installation of the module.
- The module should be facing true south in northern latitudes and true north in southern latitudes for best power production. 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 daytime.
- The modules are to be installed with tilt angle from zero degree to 70 degrees.

4 Structure

Always observe the instructions and safety precautions included with the support frames to be used with the modules.

Modules must be securely attached to the mounting structure using all eight (8) mounting points or four (4) mounting points clamping method of mounting system approved by CEC (clean energy council). The module assembly must use the pre-drilled mounting holes in the frame or mounting clips. The most common mounting is achieved by mounting the module with the four points of symmetry near the inner side in the module frame.

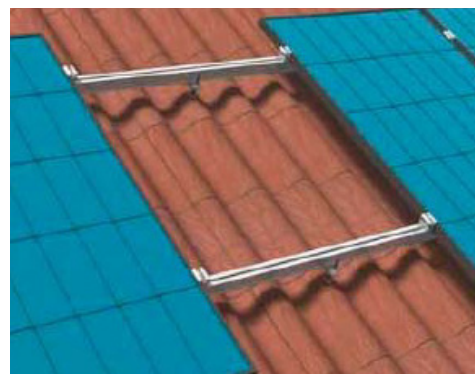
The modules shall be secured with M8 stainless steel or equivalent bolts with washers and nuts. The applied torque is about 8 Newton-meters.

When installing a module on a roof or building, ensure that it is securely fastened and cannot fall as a result of wind or snow loads. Provide adequate ventilation under a module for cooling (100mm minimum air space between module and mounting surface).

When installing module on a roof, ensure that the roof construction is suitable. In addition, any roof penetration required to mount the module must be properly sealed to prevent leaks. In some cases, a special support frame may be necessary. The roof installation of solar modules may affect the fireproofing of the house construction. The modules are rated fire Class C, and are suitable for mounting over a class A roof. Do not install modules on a roof or building during strong winds in case of accidents.

4.1 Slope roof

For pitched roofs, the profiles are mounted to install the panels on them using clips. The profiles are attached to the cover with the mechanism designed according to the type of material.



4.2 Flat roof

For this type of roof, installation of an additional structure for optimal inclination of the panels is required by geography installation situation. For the inclination necessary, additional triangles are mounted. These are installed on the profile of the structure is subject to the floor as the cover material.



5 Mechanical Installation

5.1 Panels Connection

The connection of the modules is done by MC4 connectors. The connection of the modules completing a serial (string) defined in the design phase. Each terminal is marked with corresponding polarity. The female connector is the negative pole which is black (-) and the male connector is the positive which is red (+).

Normally, when several panels are connected forming a string wiring does not reach the position where the inverter is located. Must be connected extension wiring using solar cable 4 mm² and MC4 connectors. Use the right tools for a successful connection.

Note that in the event that the inverter has a single DC input and it is need to connect more than one string, you have to install a junction box. In this box, all the strings are connected with the respective protections. The output cables (positive and negative) are connected to the inverter.

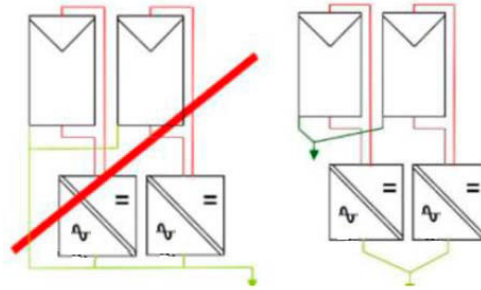
5.2 On-grid electric system

Note that public service policies on connecting renewable energy systems vary from one region to another.

Consult a qualified system installer to design a system of this type. They are usually necessary permits for the installation of a system of this type and should be approved by an inspection system before it can be connected to grid.

5.3 Grounding

The grounding of modules and investors should be separate. The modules shall be connected to the frame and the inverter to the grounding connection. Ensure good electrical contact.



5.4 Batteries

In a system with batteries, place batteries in a compartment protected from the outdoor. Place them on a sturdy bench to the electrolyte to insulate the floor. In the battery connections, all must be equal, in series (same current) and parallel (same voltage) for connection to the inverter or regulator. Note that the polarity on all connections, also the voltage and current accepted by the investor or regulator.

These type of connections must be made by a qualified installer to ensure a good and safe connection of the equipment.

5.5 General Installation

- Typically electrical work for PV systems requires building permits. The installer is responsible to understand the permits and codes that must be obeyed for electrical hook up.
- Do not short the positive and the negative. Do not disconnect under load. Be sure connectors have no gap between the insulators. In case there is a gap, a fire and/or an electrical shock may occur.
- The installer must size the array wiring so that maximum voltage drop from the module to the inverter is less than 2%. Locate the equipment as close as possible to minimize losses.
- 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. All modules must have the same amperage in order to have optimal power output.
- The cross section area of cable and the capacity of connector must be selected to suit the maximum system short circuit current, otherwise the cable and connector will be overheated under large current.

6 Commission and Maintenance

Tamesol® recommends that all work in commissioning and maintenance of a system must be performed by a qualified solar PV technician.

6.1 Maintenance

Tamesol® recommends the following maintenance in order to ensure optimum performance of the module:

- Clean the glass surface of the module as necessary. Always use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used to remove stubborn 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. Observe the maintenance instructions for all components used in the system, such as support frames, charging regulators, inverters, batteries, etc.

7 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 Tamesol® control, Tamesol® 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.

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