

Solet Photovoltaic module (PV) Documentation and Installation Manual

Solet Standard Photovoltaic Modules (type designation “Solet”)

Please read carefully the following product documentation and safety instructions.

Non-compliance with these instructions may void the module warranty.

1. Purpose of this documentation

This guide contains basic information regarding MG AB “Precizika” Solet standard photovoltaic modules, their installation and safe handling. All instructions should be read and understood before attempting installation. If there are any questions, please contact your dealer or MG AB “Precizika” for further information.

This documentation refers to the PV-modules themselves and is not meant to be a complete installation manual for personnel not specifically trained to PV-modules. It serves as a general reference.


Generally, the installer must conform to all safety precautions in this documentation, as well as the applicable national codes and standards when installing Solet PV-modules. Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for photovoltaic systems. Keep this documentation in a safe place for future reference.

2. System components (modules and mounting system; standard scope of delivery)

- Solet standard photovoltaic modules (type designation Solet P60.6-WF-xxx, where xxx stands for nominal power values up to 420 W_p), IEC 61215ed. 2 and IEC61730 certified framed glass/foil laminates with crystalline solar cells, permanently attached junction box, and double insulated 4mm² wires terminated in touch safe specific PV DC-connectors.
- The mounting system does not form part of MG AB “Precizika” supply.
- The modules were tested with the “Alutec” mounting system, which holds the PV-modules on their short side.

3. General safety relevant aspects

Do not attempt to disassemble the module, and do not remove any attached nameplates or components. Doing so will void the warranty.

-  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.
- Installing solar photovoltaic systems requires specialized skills and knowledge. It should be performed only by qualified and specially instructed personnel. The installer assumes all risk of injury, including risk of electric shock.

- Use only equipment, connectors, wiring and mounting hardware specifically designed for use in a photovoltaic system.

3.1. Precautions for mechanical installation

- Solet modules are designed for installation with specific photovoltaic mounting systems. Other use lies within the full responsibility of the installer.
- The mounting system must be capable of securely fixing Solet modules exposed to uplift or load pressures of more than 2'400 N/m².
- The mounting structure and hardware must be made of durable, corrosion- and UV-resistant material.
- Observe all instructions and safety precautions included with the mounting system to be used with the module.
- If modules are installed on roofs (non-integral modules or panels), a fireproof underlay is needed. If modules are installed in roofs, all applicable local, regional and national codes and regulations have to be observed.
- The correct order to orient the module is vertical with the junction box on the higher side of it. The reason is the breather port in the junction box, that must be mounted facing downward and not be exposed to the rain.

3.2. Precautions for electrical installation

- Before any manipulation at an installed PV plant, switch it off first on AC-side after on DC-side of the inverter or the charge controller.
- When disconnecting wires connected to a photovoltaic module that is exposed to light, an electric arc may occur. Arcs can cause burns, start fires or otherwise create safety (up to lethal electric shock) problems.
- Check for remaining voltage before starting, and observe the local safety relevant regulations for such working conditions.
- Under normal conditions, a photovoltaic module can produce more current and/or voltage (here: 30V DC) than reported at standard test conditions.
- Accordingly, the values of I_{sc} and V_{oc} marked on this module should be multiplied by a factor of 1,25 when determining component voltage ratings, conductor current ratings, fuse sizes, and size of controls connected to the PV output. In the USA, refer to Section 690-8 of the National Electrical Code (NEC) for an additional multiplying factor of 125 percent (80 percent de-rating) which may be applicable.
- Contact with a DC voltage of 30 V or more is potentially hazardous. Exercise caution when wiring or handling modules exposed to sunlight.
- Only connect modules with the same rated output current in series. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages.
- Only connect modules or series combinations of modules with the same voltage in parallel. If modules are connected in parallel, the total current is equal to the sum of individual module or series combination currents.
- Always use the same type of module within a particular photovoltaic system.
- With a serial interconnection of the modules, the sum of the open circuit voltage at Standard Test Conditions (V_{oc} @ STC) must not pass over the maximal system voltage indicated, both indicated in the modules datasheet.
- If the sum of short circuit currents of the parallel connected modules passes over the reverse current

(indicated in the table of chapter 8), string diodes or fuses have to be used in each string of modules connected in parallel. These string diodes or fuses have to be qualified for the maximum expected current and voltage.

- Observe the instructions and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, inverters, etc.
- Use appropriate safety equipment (insulated tools, insulating gloves, etc) approved for use on electrical installations.

3.3. General prescriptions for installation

- Do not apply paint or adhesive to the modules.
- Do not use mirrors or other hardware to artificially concentrate sunlight on the module.
- When installing modules, observe all applicable local, regional and national codes and regulations. Obtain a building and/or electrical permit where required.
- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Do not wear metallic rings, watchbands, ear, nose, or lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.
- Do not drill holes in the glass surface of the module. Doing so will destroy the module and void the warranty.
- Do not drill additional mounting holes in the module frame. Doing so will void the warranty.
- Do not lift the module by grasping the module's junction box or electrical leads.
- Do not apply paint or adhesive to the module.
- ❖ **Do not stand or step on module. Danger of breaking the glass or slipping off with possibility of severe injury or death!**
- Do not drop the module or allow objects to fall on the module.
- Do not place any heavy objects on the module.
- Inappropriate transport and installation may damage the module glass or the solar cells inside the module.
- If module frame is with film, remove it before installation.

4. Mechanical Installation

4.1. Robustness of modules and mounting system

Solet modules have been tested to withstand snow loads of up to 5'400 N/m² and a wind pull of up to 2'400 N/m². The tests were conducted with a static load for one hour. The modules must not be mounted in regions, where higher wind- and snow loads are expected than 2'400 N/m². The whole support structure needs to be strong enough to cope with above loads. Load calculations to check for the applicability for the actual installation are within the responsibility of the system planner or installer.

4.2. Selecting the location

- Select only suitable locations for installation of the modules.
- In most cases, optimum performance is achieved if the modules face true south in northern latitudes and true north in southern latitudes.
- For detailed information on optimal module orientation, 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 day.
- Do not install the module near equipment or in locations where flammable gases can be generated or collected.

4.3. Mounting methods

4.3.1. Mounting with bolts

- The module must be attached and supported by at least four bolts M6 or M8 (depending on the situation) through the indicated mounting holes (Figure 1).
- Most installations will use the four inner mounting holes on the module frame.
- Depending on the local wind and snow loads, additional mounting points may be required.

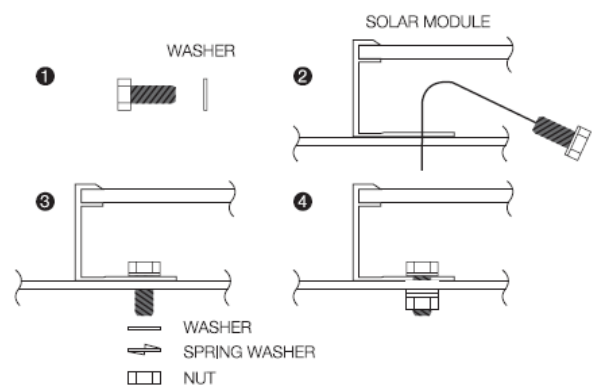


Figure 1. Mounting using bolts.

4.3.2. Mounting with clamping hardware

- If module clamps are used to secure the module, the torque on the clamp bolt should be around 8–10 Nm (Figure 2).
- A minimum of four module clamps should be used, two on each long frame side, in the general clamping areas denoted by the wide arrows on the drawing (Figure 3).
- Depending on the local wind and snow loads, additional module clamps may be required.

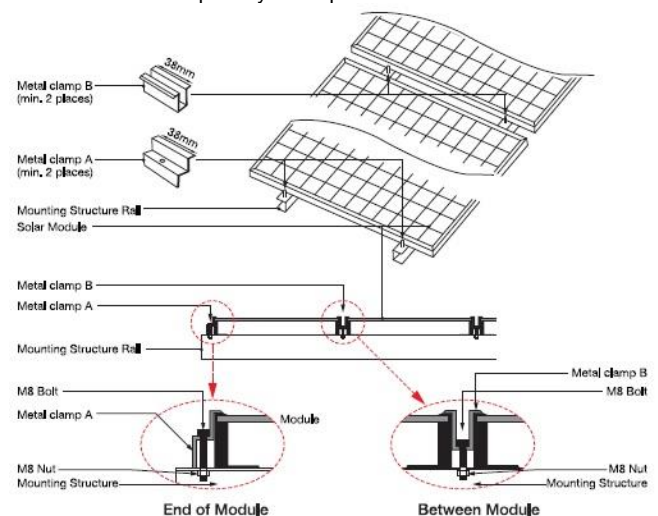


Figure 2. Mounting using clamps.

4.3.3. Other

- Other specific photovoltaic mounting methods are acceptable as long as the minimum requirements as described in chapter 4.1 are met.

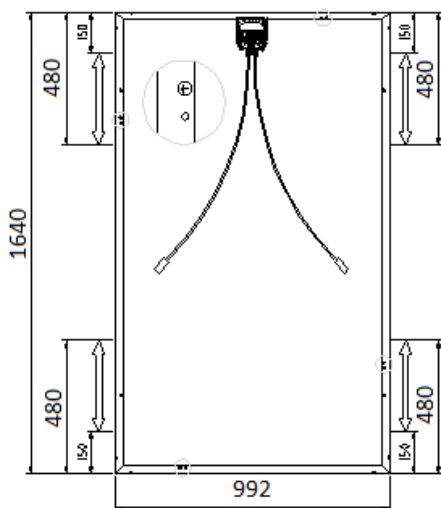


Figure 3. Dimensions of the module.

5. Electrical Installation

5.1. Grounding

- All module frames must be properly grounded in countries, where grounding of modules is mandatory. Observe all local electric codes and regulations.
- A bolted or screwed connection is required, it incorporates:
 - a screw size of M4 at least;
 - a star washer under the screw head or a serrated screw must penetrate nonconductive coatings like anodized frame;
 - screw and star washer in stainless steel;
 - 2 or more screws or 2 full threads of a single screw shall engage the metal.
- Devices listed and identified for grounding metallic frames of PV modules are permitted to ground the exposed metallic frames of the module to grounded mounting structures.
- Functional grounding is not foreseen for the Solet modules. If it is performed, local electric codes and regulations have to be observed, and used grounding means have to be isolated from live parts by reinforced insulation.
- In any case the grounding screws, bolts or other parts have to be used separately from mounting parts of the module.

5.2. General electrical installation

WARNING! Electrical shock hazard! Do not touch bare conductors or other potentially energized parts.

- Photovoltaic modules convert light energy to direct-current electrical energy. **They are designed for outdoor use.**
- Do not use modules of different configurations in the same system.

- Solet modules are supplied with IEC certified cables and connectors for serial electrical connections.
- Use only additional cables which are qualified for the expected maximum current, maximum voltage and environmental conditions. Minimum cross section 4mm² (#12 AWG).
- The PV-DC-connectors must never be disconnected under load! Stick to the first rule of chapter 3.2.
- Refer to the relevant standards in your country to determine over current, conductor ampacity and size requirements.
- For best performance, ensure that positive and negative DC wires run closely together avoiding loops, which will also reduce the strength of inductive impacts of nearby lightning strikes.
- Following the installation of a module string, its performance is checked to ensure proper functioning. At least, I_{SC} and V_{OC} need to be checked with appropriate equipment and circuit breakers.

6. Maintenance

MG AB “Precizika” recommends the following maintenance items to ensure optimum performance of the module:

- Clean the glass surface of the modules as necessary. Use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used if necessary. Do not use dishwasher detergent.
- Electrical and mechanical connections and the general condition of an installed PV-system should be checked periodically by qualified personnel to verify that they are clean, secure and undamaged.
- Eventually occurring problems must only be investigated by qualified personnel.
- Observe also the maintenance instructions for all other components used in the system.

7. Shutting down the system

- Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- The PV-DC-connectors must never be disconnected under load! Use switches designed for being disconnected under the prevailing DC-load or stick to the first rule of chapter 3.2.
- The system should now be out of operation and can be dismantled. In doing so, observe all safety instructions as applicable to installation.

8. Typical electrical ratings of the concerned modules:

| Parameters | Solet P60.6-WF-250 | Solet M60.6-WF-260 |
|--|--------------------|--------------------|
| Maximum Power (P _{MPP}) | 250 Wp | 260 Wp |
| Rated Voltage (U _{MPP}) | 31,3 V | 32,2 V |
| Rated Current (I _{MPP}) | 8,06 A | 8,2 A |
| Open Circuit Voltage (U _{OC}) | 38.4 V | 37.9 V |
| Short Circuit Current (I _{SC}) | 8,6 A | 8,8 A |
| Maximum System Voltage | 1'000 V | 1'000 V |
| Fire Class (UL 790) | C | C |
| NOCT °C | 48,3 | 48,3 |
| Maximum reverse current | 15 A | 15 A |

The electrical characteristics are within ±3 % of the indicated values of I_{SC}, U_{OC}, and P_{MPP} under Standard Test Conditions (irradiance of 1000 W/m², AM 1.5 spectrum, and a cell temperature of 25°C / 77°F).

9. Disclaimer of liability

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Please consult your dealer or the manufacturer concerning the warranty of your modules. If you have any further questions, your dealer will gladly assist you.

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Solet P60.6 – 250/265 Solar Photovoltaic Module

Working Conditions

| | |
|-------------------------------|----------------|
| Maximum System Voltage | DC 1000V (TUV) |
| Operating temperature | -40°C ÷ +85°C |
| Maximum reverse current | 15 A |
| Max. wind load/max. snow load | 2400Pa/5400Pa |
| Grounding conductivity | <0,1Ω |
| IP protection level | 65 |
| Safety class | II |
| NOCT | 48,3°C |

Mechanical Parameters

| | |
|---|----------------|
| Cell (mm) | Poly 156 x 156 |
| Glass, mm | Tempered 3,2 |
| Weight (kg) | 18,2 |
| Dimensions (LxWxH)* | 1640x992x40 |
| Cable length (m) | 1,0 |
| Cable cross section size (mm ²) | 4 |
| Number of cells and connections | 60 (10x6) |
| Number of diodes | 3 |
| Packing configuration | 25 pcs./pallet |

Guarantee

| | |
|------------------------------|--|
| Module guarantee | 12 years |
| Module performance guarantee | 10 years at 90 % max output 25 years at 80 % max output |

Temperature Coefficients

| | |
|-------------------------------------|-----------|
| Voltage temperature coefficient (β) | -0,37 %/K |
| Current temperature coefficient (α) | +0,06 %/K |
| Power temperature coefficient (γ) | -0,47 %/K |

Electrical Parameters

| Type | Solet P60.6-250 | Solet P60.6-255 | Solet P60.6-260 | Solet P60.6-265 |
|--|-----------------|-----------------|-----------------|-----------------|
| Maximum Power** (P _{MPP}) | 250,1-255,0 Wp | 255,1-260,0 Wp | 260,1-265,0 Wp | 265,1-270,0 Wp |
| Rated Voltage (U _{MPP}) | 31,3 V | 31,9 V | 32,6 V | 33,2 V |
| Rated Current (I _{MPP}) | 8,06 A | 8,09 A | 8,12 A | 8,14 A |
| Open Circuit Voltage (U _{OC}) | 38,4 V | 38,5 V | 38,6 V | 38,7 V |
| Short Circuit Current (I _{SC}) | 8,6 A | 8,6 A | 8,64 A | 8,65 A |
| Efficiency at STC | 15,37% | 15,67% | 15,98% | 16,29% |
| Power tolerance | 0+3% | | | |

* Tolerance L/W=+/-0,3 mm

**Irradiance 1000 W/m², module temperature 25°C, spectrum at air-mass AM 1.5



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 IEC 61730
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