



CRYSTALLINE SILICON PV MODULE INSTALLATION GUIDE

THE POWER OF ASTRONERGY



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A **CHNT** COMPANY

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1. Introduction

1.1 About this installation manual

1.1.1 Subject of this manual

This installation manual describes the procedures for installation and electrical connection of the solar module in a grid-connected photovoltaic system. Further solar modules are installed in the same way.

1.1.2 User group

The installation manual is intended to be used by the installer, the operator and a group of people possessing technical skills and basic electrical, electronic and mechanical knowledge who have been trained by the operator.

1.2 Standards and technical directives

The solar modules comply with the following standards:

- IEC 61215 ed. 2, IEC 61730

1.3 Intended use

The solar modules are designed for use in photovoltaic systems. Any other use is considered improper use. The solar modules do not comply with the technical regulations for overhead glazing and may not be used for such applications.

The solar modules are not intended for use in mobile applications (e.g. vehicles) or marine applications (e.g. boats). Intended use also includes compliance with the specifications stated in this installation manual.

ASTRONERGY shall not be held liable for damages arising from a failure to observe and follow the installation manual, particularly the safety instructions contained in it, or from any improper use of the product.

2. Safety

2.1 Responsibilities of the owner/operator

The system operator has safety-related responsibilities.

It shall be ensured that:

- the locally applicable standards and directives are complied with;
- the installation is only carried out by individuals with specialist technical knowledge and basic knowledge of mechanical engineering;
- the electrical connection is only established by an electrically qualified person;
- Persons commissioned to perform the work can evaluate their assigned tasks and recognize possible risks;
- those commissioned to perform the work are familiar with the system components;

- as part of the product, the installation manual is available at all times during the installation;
- the installation manual, and in particular the safety instructions, have been read and understood by the relevant personnel before installation;
- lifting equipment and tools suitable for use during installation are used;
- if replacements are required, only ASTRONERGY components are used and repairs are only carried out by technicians authorized by ASTRONERGY, as otherwise the warranty will expire;
- only components (cable, plugs, mounting parts, etc.) that are suitable for use in photovoltaic systems are used;
- the solar module is not installed near to highly flammable gases or vapours because sparks could be generated;
- the solar modules are installed over a fireproof roof covering when installed on a roof;
- artificially concentrated sunlight shall not be directed on the module or panel;
- the junction box and the cable are not exposed to the sun's rays for long periods of time,
- the solar module is not immersed in water or exposed to moisture for long periods of time,
- the solar module is not subjected to any extreme chemical loads (e.g. emissions from production operations),
- the solar module is not subjected to mechanical loads higher than the approved levels,
- the solar module is only used in the specified ambient temperature range,
- no paint, coatings or adhesives are applied to the solar module;
- the solar module is not dismantled and none of the parts provided on delivery are removed.
- the solar modules are only transported in their original packaging.

2.2 Basic safety instructions

The following safety instructions and warnings form an essential part of this installation manual and are of fundamental importance when handling this product.

- Consider all loads generated by the solar modules in the static calculation for the overall structure.
- To avoid damage (e.g. broken glass) do not leave solar modules unsecured.
- Check the mechanical integrity of the solar modules prior to installation. Only use undamaged solar modules.
- Only use mounting systems that can withstand the expected loads for snow, wind, etc.

- Make sure no other system components impair the mechanical or electrical function of the solar modules.
- Only work in dry conditions with dry solar modules and dry tools.
- Do not drill any holes into the module frame or the glass surface and do not carrying out any welding work on or in the direct vicinity of the solar module.
- To avoid burns do not touch solar modules under load without wearing gloves.
- Never touch solar modules with cracked or broken cover glasses or damaged back sheets without wearing gloves.
- Comply with the applicable occupational health and safety regulations (e.g. regarding protective clothing).
- Carry out the entire installation in the presence of a second person so that assistance can be provided in case of an accident.
- Keep a copy of this installation manual in the immediate vicinity of the system.

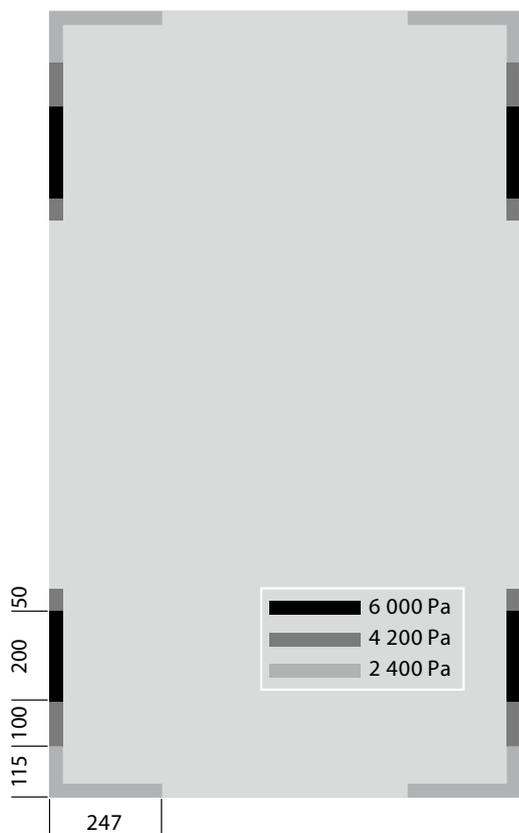


Figure 1: Clamping locations according to released loading levels

3. Installation

3.1 General installation instructions

Make sure that all locally applicable standards, construction regulations and accident prevention regulations are complied with.

- Select an installation location with the maximum sunlight at all times of the year. Avoid shaded areas.
- In northern latitudes, orient the solar modules to the south. Determine the ideal setting angle according to the latitude of the installation location. Request this information from your specialist solar energy dealer or find it in the official tables.
- Always mount the solar modules with the same orientation and tilt angle. Otherwise you will have to use a separate inverter or separate DC input.
- Maintain an adequate distance between adjacent solar modules to allow for expansion in case of changing thermal conditions.
- Maintain an adequate distance between the solar module and the mounting surface to ensure sufficient rear ventilation.

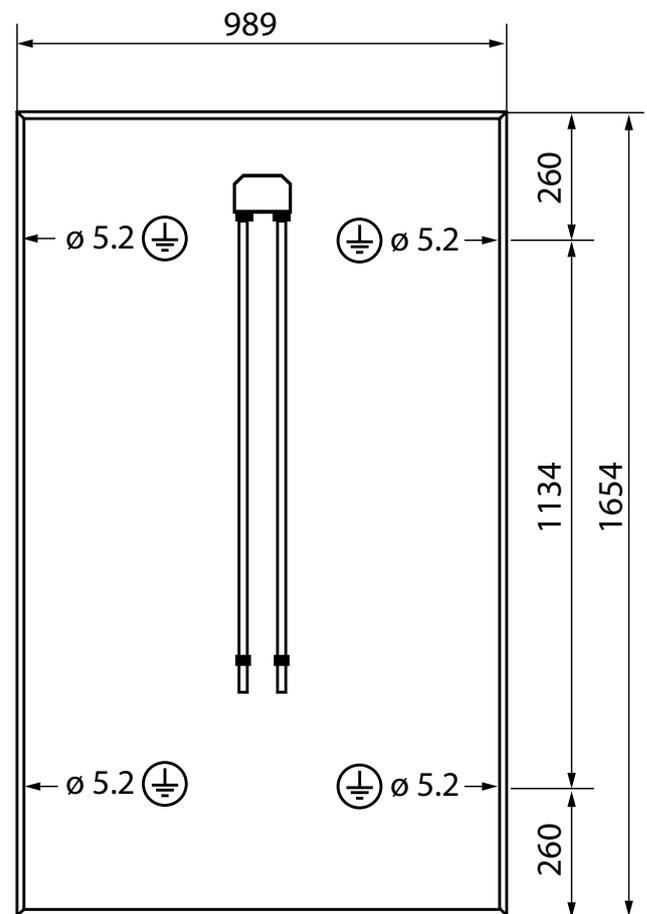


Figure 2: Module drawing

- The solar modules can be mounted both vertically and horizontally. Respect the range of clamping.
- You can find further installation instructions in the installation manual for the respective installation system.
- The mounting system must be made from material that is resistant to corrosion and atmospheric conditions and able to withstand the loads required.
- Installation of cable has to follow the best demonstrated available technology. Avoid abrasion of wire insulation caused by e.g. wind. Do not lay cable on sharp edges. Respect minimum required bend radius.

3.2 Mounting solar modules on installation system

The solar modules can be damaged if the proper procedure is not followed

Secure the solar modules against slipping and falling.

- Do not drop the solar modules.
- Do not hold the solar module by its socket or connection cables.
- Always grasp the solar modules simultaneously at two opposite points on the module frame when lifting. Never carry solar modules by just one part of the frame.
- Do not expose the solar modules to mechanical impact.
- Do not touch the solar modules with sharp or pointed objects.
- To prevent lasting marks on the glass, only touch the solar modules with clean, soft and silicone-free protective gloves. Do not wear leather or powdered gloves.
- Make sure the rear of the mounted solar module is not damaged even in the case of deflection due to mechanical stress (e.g. due to snow loads).
- Do not drop any objects on the solar module and do not step on it.
- The clamping elements must not protrude past the edge of the frame on the glass side.
- Use corrosion-resistant stainless steel bolts only.
- Make sure the clamping elements do not damage the frame surface or bend the frame.

3.3 Electrical installation

3.3.1 Electrical values

All relevant electrical values are specified on the sticker on the reverse of the solar module.

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage 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.

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 reverse current loadability of the solar modules is 20 Ampere.

3.3.2 General safety instructions

- Carry out the cabling in accordance with the applicable regulations.
- Make sure that the cables and connections are not damaged. Protect the cables from damage.

Risk of electric shock.

Risk of fire and injury from electric arc.

- Do not disconnect connectors under load.
- Ensure sufficient protection against contact with live parts.
- Only use insulated tools.
- Do not insert any electrically conducting parts into the connectors.
- Never open the junction box.
- Make sure there is no tension in the cable when positioning and follow the specified minimum bend radius.
- Avoid large conductor loops.

3.3.3 Parallel and serial connection

Solar modules of the same type can be connected in parallel. The solar modules in this series are fundamentally designed for series connection.

- Only use solar modules of the same type and output for parallel connection. Take measures for overcurrent protection (e.g. line fuse) if necessary. Never exceed the specified reverse current loadability of the solar modules. Maximum number of module strings that are allowed to be switched in parallel: $2 \cdot (\text{fuse rating} / (\text{short-circuit current} \cdot 1.25) + 1)$
- Make sure that only solar modules with the same amperage (I_{mpp}) are interconnected for series connection and make sure that the voltages of lines connected in parallel are the same. Even at low temperatures, never exceed the maximum permissible system voltage of the solar modules. Maximum number of modules that are allowed to be switched in series: $\text{maximum system voltage} / (\text{open circuit voltage} \cdot 1.25)$, with respect to the temperature coefficient.
- Make sure that the number and connection of the solar modules match the electrical values specified by the devices connected to the photovoltaic system.
- Make sure that the polarity is correct.

3.3.4 Connecting solar module

On the rear of the solar module, there is a connection box with the connection cables, the plug and the socket.

Connection cable length	1.000 mm
Connection cable cross section	4 mm ²
Allowable ambient temperature range for cables	from - 40 °C to + 85°C

3.3.5 Grounding

The grounding cable can be mounted on one of the holes in the module frame. Please see fig. 1.

Avoid contact corrosion when using different metals and observe electro-chemical insulation rating. As an option, stainless-steel terminals with pins can also be used for grounding the solar modules, which penetrate the anodised layer of the module frame during installation. These stainless-steel terminals are available together with grounding terminals (for the connection of the installation frame to the earth) from several manufactures. Observe the applicable regulations.

Use a suitable stainless-steel bolt together with a stainless-steel spring lock washer between bolt head and module frame, a self-cutting stainless steel serrated lock washer between ring terminal end and module frame, a suitable ring terminal end and a suitable nut.

4. Maintenance and care

The solar modules are low-maintenance modules. However, ASTRONERGY recommend that a visual inspection of the mechanical and electrical connections be performed once a year to detect any damage. Dirt on the solar modules reduces the output and the yield. If the solar modules are installed with an inclination angle of more than 15°, they will generally be adequately cleaned by the rain.

Damage to the solar module surface by scratching or extreme differences in temperature.

- Only use pH neutral liquid cleaner, even if there is excessive dirt build-up.
- Do not use cleaning agents with abrasive constituents.
- Only use cleaning solutions that are at roughly the same temperature as the solar module surface.
- Wipe the solar module surface with water and a soft cloth.
- Never attempt to rub or scratch off dirt particles.

5. Removal

Risk of electric shock.

- Do not touch any bare connection parts.
 - Only use insulated tools.
1. Disconnect the inverter from the supply network on the AC side so that the photovoltaic system has no load.
 2. Disconnect the photovoltaic system from the inverter at the cut-off point on the DC side.
 3. Make sure that the system is not supplied with voltage.
 4. Remove the photovoltaic system in the same way as it was installed; observe the safety instructions.

6. Disposal

Do not dispose old or defective solar modules with normal household waste.

Please ask your installer, dealer or ASTRONERGY Solarmodule GmbH. about disposal.

Pictures and drawings in this installation guide are only for illustration and might differ from reality.



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