

INSTALLATION AND OPERATION MANUAL

SUNRISE ENERGY CO., LTD



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DISCLAIMER
Technical parameters and the design are subject to change. The data sheets and customer information valid at the point in time when the relevant module was manufactured apply to the installation, mounting, and maintenance procedures for the respective solar modules. The installation techniques, handling and use of the product are beyond company control. Therefore, SUNRISE assumes no responsibility for loss, damage or expense resulting from improper installation, handling or misuse. SUNRISE module can be installed by many kinds of methods including, but are not limit to bolting, clamping and inserting as follow, but if you want to use an installation method which is not covered in this manual, please inform us before you install to make sure if our warranty will be covered or not.

With solar modules from Sunrise Energy Co.,LTD (hereafter referred to as "SUNRISE") you can directly transform the sun's limitless energy into environmentally-friendly solar electricity.
In order to ensure the maximum performance of your SUNRISE solar modules, please read the following instructions carefully and observe all guidelines. Non-compliance may result in damage and/or physical injury.


- This installation and operation manual (hereafter also referred to as the “Manual”) provides instructions for the safe installation and operation of crystalline solar modules.
- ➔ Please read these instructions carefully before proceeding with your installation.
 - ➔ Please retain these instructions for the life of the solar modules.
 - ➔ Please ensure that this Manual is available to the operator at all times.
 - ➔ This Manual should be given to all subsequent owners or users of the solar modules.
 - ➔ All supplements received from the manufacturer should be included.
 - ➔ Please observe all other applicable documents.
 - ➔ If your questions are not satisfactorily answered in the manual, please contact your system supplier.

Additional information can be found on our website at www.sunriseenergy.cn.

Intended Use
This manual is valid for Africa, Asia, Europe, Latin America, and South America. These instructions contain information regarding the safe handling and use of quality crystalline solar modules from SUNRISE and for their installation, mounting, wiring, maintenance and disposal.

Symbols and Labels
The following symbols and labels are used throughout the Manual for ease of use.

SYMBOL	DESCRIPTION
➔	Procedure with one or more steps.
•	Lists of items.
✓	Ensure that when carrying out a procedure, you check the results of said procedure.
⊘	Prohibited.



Beware of possible danger or damage. Categories:

- Danger: Risk of fatal injury
- Attention: Risk of serious injury or damage to property
- Note: Risk of damage to product

Safety Regulations
In particular the installer as well as the operator of a module is responsible for compliance with all applicable statutory requirements and regulations.

➔ Unless otherwise specified by any laws or regulations, the following stipulations must be upheld at all times during the installation, operation, and maintenance of the solar modules:

- This manual.
- Other applicable stipulations (such as country-specific regulations for pressure equipment, operational safety, hazardous goods, and environmental protection).
- Regulations and requirements specific to the system.
- Any applicable laws and requirements, in particular international, country specific, regional laws and stipulations governing the planning, installation, and operation of solar power systems and work on roofs.
- Any valid international, national and regional regulations governing work with direct current, especially those applicable to the installation of electrical devices and systems, and regulations issued by the respective energy provider governing the parallel operation of solar power systems.
- Any international, country specific and regional accident-prevention regulations.
- Other applicable stipulations provided by the relevant national institutions regarding safety in the installation and operation of electrical items.

Qualified & Skilled Personnel
Both, the installer and operator are responsible for ensuring that installation (including connection to the grid), maintenance and dismantling are carried out by trained and qualified specialists with approved training certificates (issued by a state or federal organization) for the respective specialist trade.
Electrical work may only be performed by an officially certified tradesperson in accordance with the stipulations applicable in the relevant country with regard to norm and regulations (in Germany e.g. DIN norms, VDE regulations) and the stipulations of the local grid operator and/or energy provider.

1 INTRODUCTION

Validity

These instructions are only valid for crystalline solar modules from the company SUNRISE. SUNRISE assumes no liability for damage resulting from failure to observe these instructions.

- ➔ Please observe the wiring and dimensioning of the system.
- ➔ The installer of the system is responsible for compliance with all necessary safety regulations during set-up and installation.

SUNRISE assumes no liability on the basis of these instructions. SUNRISE is only liable in the context of contractual agreements or in the context of accepted guarantees. SUNRISE accepts no other responsibility for the functionality and safety of the modules.

- ➔ Please observe the instructions for any other system components that may be part of the complete solar power system. It may be necessary to carry out a structural analysis for the entire project.

Additional information for the Operator

- ➔ Please keep this manual for the entire life of the solar power system.
- ➔ Please contact your system supplier for information concerning the formal requirements for solar power systems.
- ➔ Please be sure to contact the relevant local authorities and energy providers regarding regulations and permit requirements prior to installation of the solar power system. Your financial success depends on the fulfillment of these requirements.

Other applicable documents

In addition to this Manual following technical information are relevant:

DOCUMENT TYPE

Product data sheet

Packaging and transport information

2 PLANNING 2.1 Technical specifications

Additional information can be found in the currently valid data sheets available at www.sunriseenergy.cn.

PRODUCT LINE	SR-54MHLPRO	SR-60MHLPRO	SR-72MHLPRO
Type	Mono-Halfcut-M10 Wafer	Mono-Halfcut-M10 Wafer	Mono-Halfcut-M10 Wafer
Length	1723mm	1908mm	2278mm
Width	1133mm	1133mm	1133mm
Frame height	35mm	35mm	35mm
Weight	21.5kg	24 kg	28kg
Max. system voltage V_{sys} [V]	1500 (IEC)	1500 (IEC)	1500 (IEC)
Max. fuse rating [A]	25	25	25
Permissible temperature range	-40 °C to +85 °C		
Junction box protection class	IP68	IP68	IP68
Connector protection class	IP68	IP68	IP68
Fire protection class	C	C	C
Snow load [Pa ¹]	5400	5400	5400
Wind load [Pa ¹]	2400	2400	2400

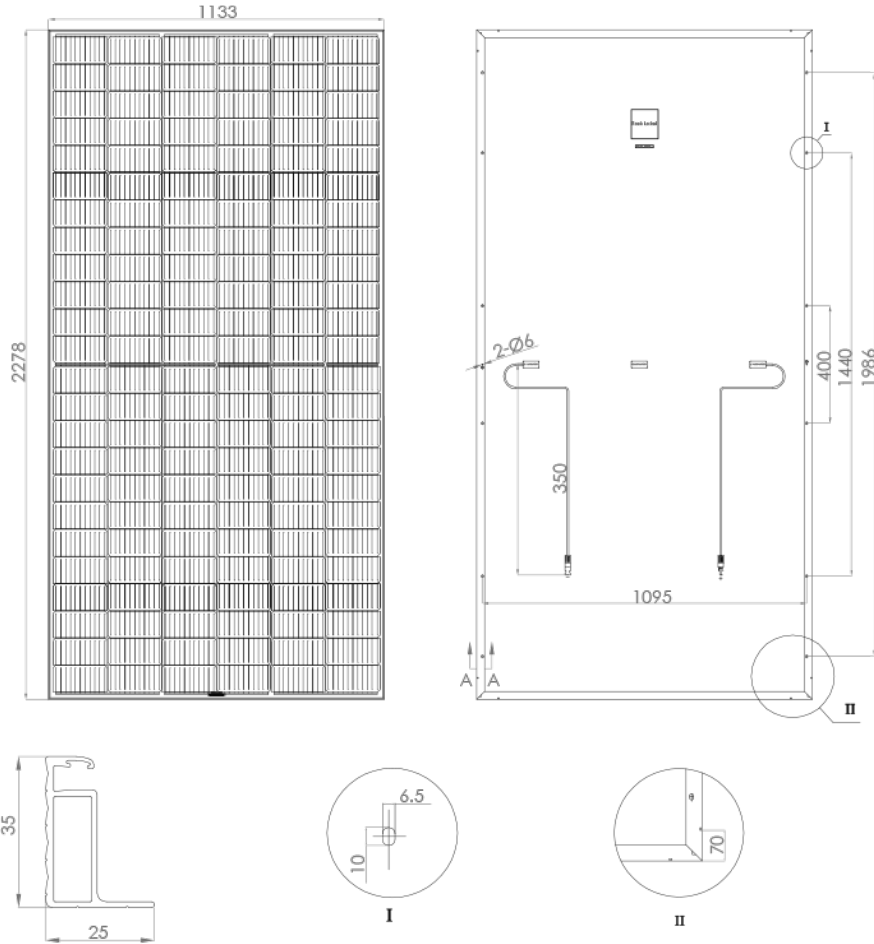


Fig. 1: External dimensions (in mm) and components for SR-72MHLPRO

Installation Site

Please note the following guidelines that apply to the installation site:

- The modules have been tested according to IEC 61215 for operation in a temperate climate.
- Solar modules are not explosion-proof and are not suitable for use in explosive environments.
- ➔ Do not operate solar modules near highly flammable gas and vapors.
- ➔ Do not install modules in enclosed space.
- ➔ Do not install modules in locations where they may be submerged in water for lengthy periods (e.g. floodplains).
- ➔ Do not use modules as a substitute for the normal roofing (e.g. modules are not rainproof).
- ➔ Do not install modules under any shadow areas.

- ➔ Do not install modules above 4000 m (13.120 ft) altitude above sea level.
- ➔ Do not bring any chemical substance (e.g. oil, solvent etc.) into contact with any part of the panel. Only substances, which are released by SUNRISE, are allowed to be used during installation, operation and maintenance.
- ➔ If the place of installation is very close to some special environments including, but are not limit to seaside, desert, high altitude, chemical plant. Please inform us before you install to make sure if our warranty will be covered or not.

The solar modules are designed for the following applications:

- Operating temperatures from -40°C to $+85^{\circ}\text{C}$.
- Wind loads up to max. 2,400 Pa and snow loads up to max. 5,400 Pa (Test-load in accordance with IEC 61215, see chapter 2.3 mounting options).
- Installation using a mounting frame for solar modules.

Prevention of Shadowing Effects

Optimal solar irradiation leads to maximum energy output:

- ➔ For this reason, install the modules so that they face the sun.
- ➔ Avoid shadowing (due to objects such as buildings, chimneys or trees).
- ➔ Avoid partial shading (for example through overhead lines, dirt, snow).

Mounting Frame Requirements

The Modules shall be installed and operated on mounting frames that comply with any applicable laws and stipulations as well as with the following:

- Conform to the necessary structural requirements.
- Compliant with local snow and wind loads.
- Properly fastened to the ground, the roof, or the facade.
- Forces acting on the module are relayed to the mounting substructure.
- Ensures sufficient rear ventilation of the module.

- Guarantees long-term stability.
- Avoid the usage of different metals to prevent contact corrosions.
- Allows for stress-free expansion and contraction due to temperature fluctuations.
- ➔ Ensure that no mechanical stresses (e.g., caused by vibrations, twisting, or expansion) are generated on the module.
- ➔ Ensure that the clamps and the mounting frame are compatible.

Clamp System Requirements

Use customary clamps that satisfy the following requirements:

- Clamp width: $\geq 38\text{ mm}$.
- Clamp height compliant with a 35 mm frame height.
- Clamp depth: 11-13 mm.
- Recommended tightening torque 5-10 Nm.
- Clamps are not in contact with the front glass.
- Clamps do not deform the frame.
- Clamps that satisfy the structural requirements of the installation site.
- Long-term stable clamps that securely affix the module to the mounting frame.

Module Orientation Requirements

- Vertical or horizontal installation is permitted.
- ➔ Ensure that rain and melting snow can run off freely. No water accumulation.
- ➔ Ensure that the drainage holes in the frame are not covered. No sealing.

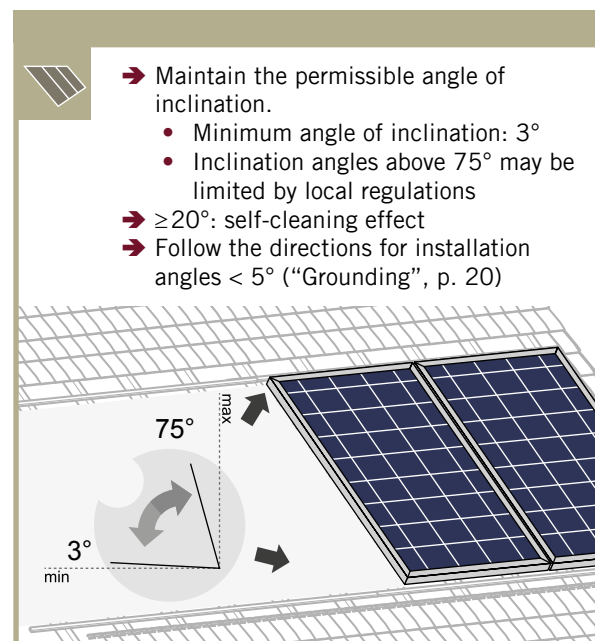


Fig. 3: Installation options for crystalline SUNRISE modules. All dimensions are given in mm. Also observe the allowed static loads and clamping range as specified on the following page. The illustrated installation options apply for both horizontal and vertical module orientation.

Module Clamp Subconstruction Mounting profile

TYPE OF MODULE TYPE INSTALLATION	LONG SIDE	SHORT SIDE
INSTALLATION WITH CLAMPS SR-54MHLPRO SR-60MHLPRO SR-72MHLPRO	 CL1	 CL3
INSTALLATION ON MOUNTING POINTS SR-54MHLPRO SR-60MHLPRO SR-72MHLPRO	 FB1	
INSTALLATION WITH INSERTION PROFILES SR-54MHLPRO SR-60MHLPRO SR-72MHLPRO	 IP1	 IP2

- If you need to use mounting holes for installation, you must install them according to the position and quantity of the component mounting holes.
- Use mounting holes for installation, and the location of the mounting holes must be protected by gaskets.
- When using mounting holes for installation, the bolt size must match the mounting hole size.

Specifications

MODULE TYPE	MOUNTING OPTION	CLAMPING AREA ¹ [MM]	TEST-LOAD ACC. IEC 61215 PUSH/PULL [PA]
SR-54MHLPRO	CL1 (4 point clamping on long side)	182-432	5400/2400
	CL1 (4 point clamping on long side)	0-1292	2400/2400
	CL3 (4 point clamping on short side)	0-280	2400/2400
	FB1 (4 screws mounting on long module side)	432	5400/2400
	IP1 (Slide-in / long module side)		5400/2400
	IP1 (Slide-in / short module side)		2400/2400
SR-60MHLPRO	CL1 (4 point clamping on long side)	234-754	5400/2400
	CL1 (4 point clamping on long side)	0-1154	2400/2400
	CL3 (4 point clamping on short side)	0-28	2400/2400
	FB1 (4 screws mounting on long module side)	754	5400/2400
	IP1 (Slide-in / long module side)		5400/2400
	IP1 (Slide-in / short module side)		2400/2400
SR-72MHLPRO	CL1 (4 point clamping on long side)	292-419	5400/2400
	CL1 (4 point clamping on long side)	0-1339	2400/2400
	CL3 (4 point clamping on short side)	0-280	2400/2400
	FB1 (4 screws mounting on long module side)	1339	5400/2400
	IP1 (Slide-in / long module side)		5400/2400
	IP1 (Slide-in / short module side)		2400/2400

¹ Distance between outer edge of module and middle of the clamp.

DISTANCE BETWEEN MODULES

- ➔ Maintain an interval of at least 10mm between two modules along the short side
- ➔ Maintain an interval of at least 5mm between two modules along the long side

MOUNTING OPTIONS CL1

- ➔ Ensure, that the subconstruction does not run below the junction box.
- ➔ Ensure, that the connection cables of the junction box don't run between laminate and substructure.

MOUNTING OPTION FB1

- ➔ Use M8 corrosion-proof screws and washers (min. diameter 16 mm).
- ➔ Ensure, that the connection cables of the junction box don't run between laminate and substructure.
- The fastening points are located on the backside of the module frame.

Module Selection

For detailed key electrical data, please refer to the actual data sheet referring to the relevant Module (available at www.sunriseenergy.cn).

- ➔ Only connect modules of the same type and the same power class.

Safety Factor

During normal operation, a module may generate a greater current and/or higher voltage than that determined under standardized test conditions. Please use a safety factor of 1.25 for the following:

- Calculating the voltage measurement values (V_{oc}) of components
 - Calculating the current measurement values (I_{sc}) of conductors
 - Sizing of control systems connected to the outlets of the solar modules
- ➔ Please follow the valid national guidelines for the installation of electrical systems.

Series Connection

Connection of modules in series is only permitted up to the maximum system voltage as listed in the applicable data sheet of all the relevant modules to be installed.

- ➔ Take into account all possible operating situations and all relevant technical norms and regulations when designing the system. It has to be ensured that the maximum system voltage, including all necessary safety margins, is not exceeded.
- ➔ Take the voltage limit of the inverter into account when determining the maximum number of modules in the string.

Parallel Connection

Modules may be damaged by the occurrence of reverse currents (caused by module defects, ground leaks, or defective insulation).

- ➔ Ensure that the maximum reverse current load capacity indicated in the data sheet is met.

In order to limit reverse currents that may occur, we recommend using the following safety options:

1) Layout with a limited number of parallel connected strings:

Without undertaking further current blocking measures, a maximum of two module strings may be operated in parallel on an inverter or MPP tracker.

2) Layout with string fuses:

place fuses for each string of modules at the plus and minus ends. Observe the maximum permitted number of strings as indicated in the specifications provided by the respective string fuse manufacturer and the technical guidelines.

NOTE!

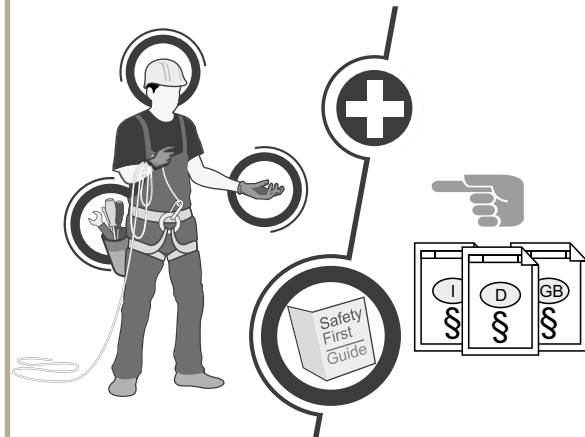
When installing different product versions, the lowest minimum permitted reverse current load capacity applies.

Inverters

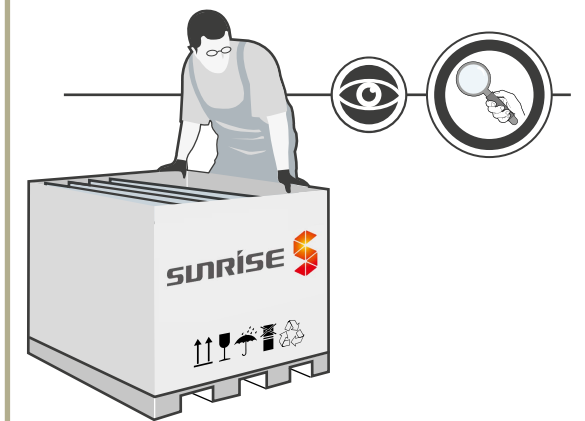
Inverters with or without transformers may be used.



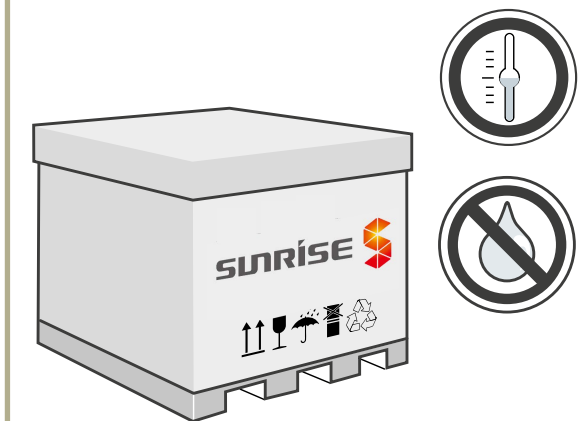
- Ensure that all personnel are aware of and adhere to accident-prevention and safety regulations.
- While working wear clean gloves.



- Inspect the packaging for damages.
- Contact the transport company regarding any damage to the packaging.
- Follow any instructions on the packaging.

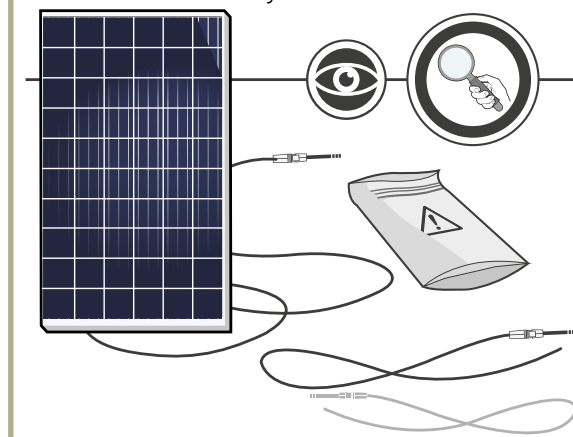


- Leave modules in their original packaging until installation.
- Store the modules securely in cool and dry rooms. The packaging is not weatherproof.



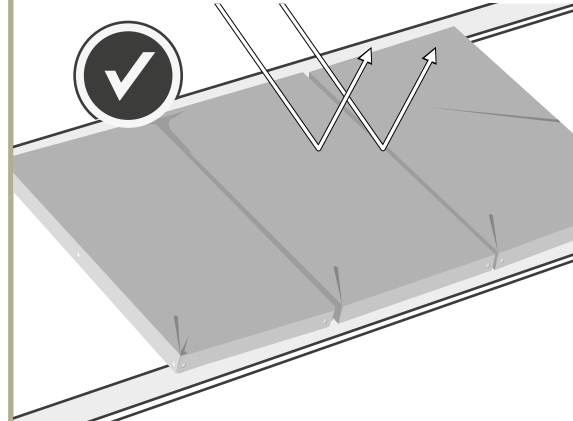
DANGER! Risk of fatal injury due to electric shock!

- Do not install damaged modules.
- Inform your distributor of any damages immediately.



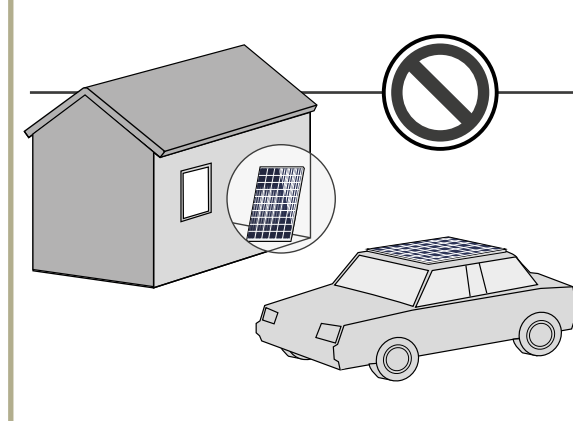
DANGER! Risk of fatal injury due to electric shock!

- Cover the modules with an opaque material during installation.



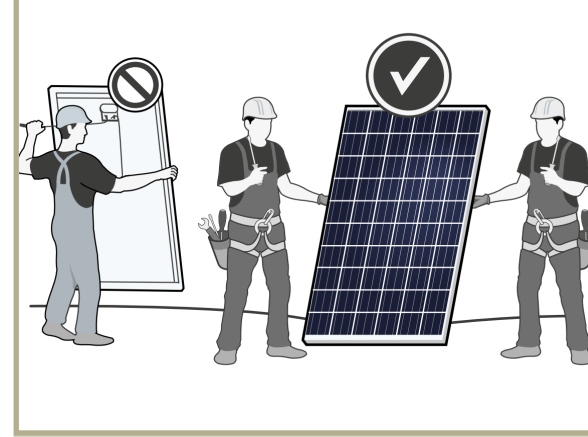
WARNING! Fire Risk!

- Do not install modules indoors.
- Do not install modules on moving objects.



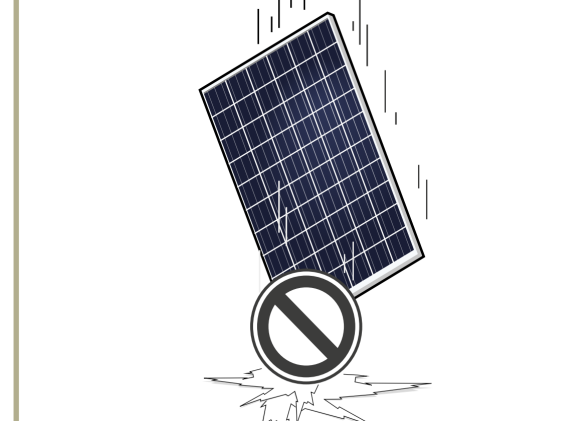
NOTE! Module damage may occur!

- Never lift or move the module with the connection cables or junction box.
- Carry modules upright and horizontally as shown.



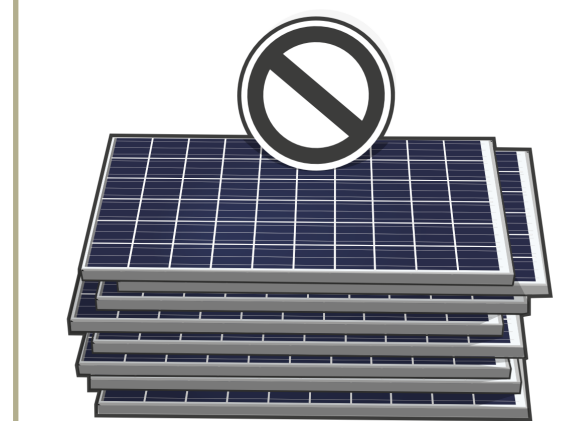
NOTE! Module damage may occur!

- Do not drop modules.



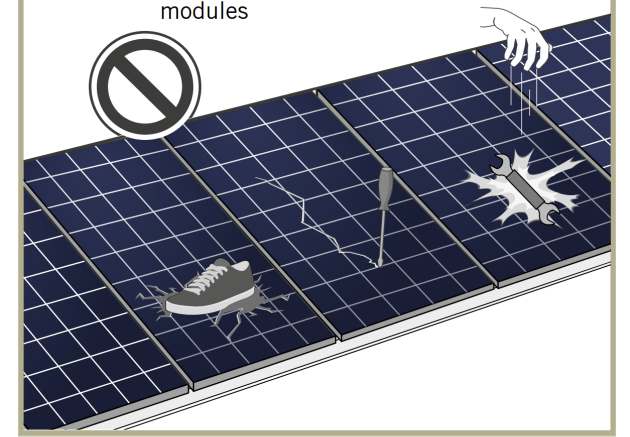
NOTE! Module damage may occur!

- Do not stack modules.



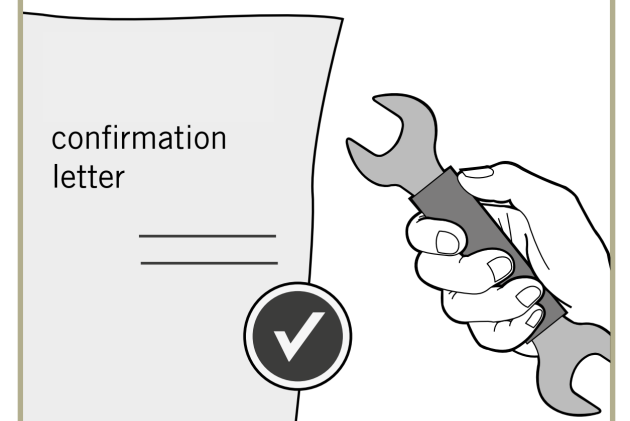
NOTE! Module damage may occur!

- Never step on modules.
- Do not subject modules to any mechanical stress.
- Do not allow any objects to fall onto modules



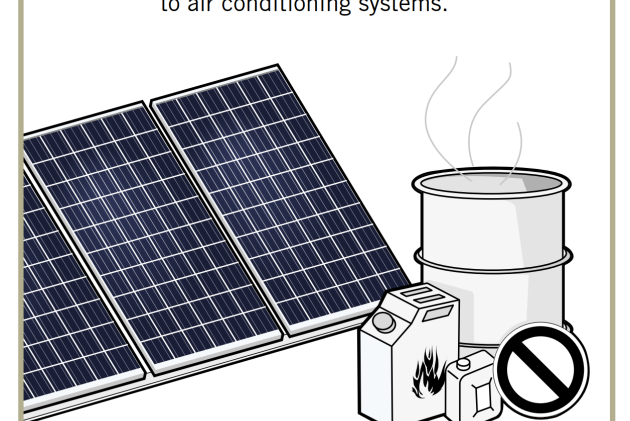
NOTE! Module damage may occur!

- Only make modifications to the module which have been confirmed in writing by SUNRISE.



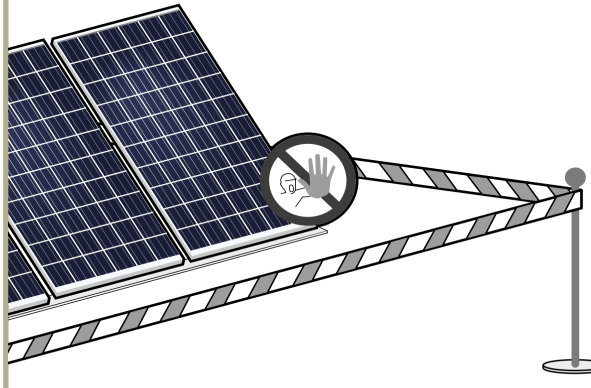
NOTE! Module damage may occur!

- Do not install modules near flammable gas/vapors.
- Do not install modules in close proximity to air conditioning systems.

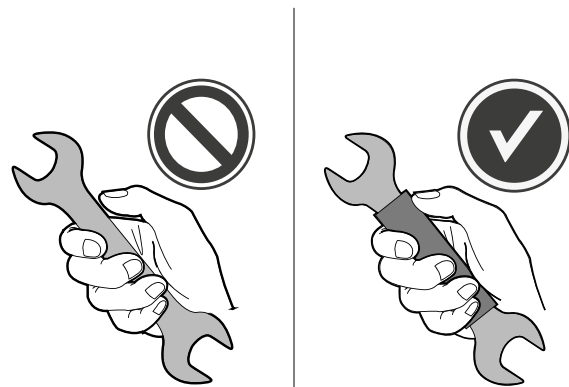



DANGER! Risk of fatal injury due to electric shock!

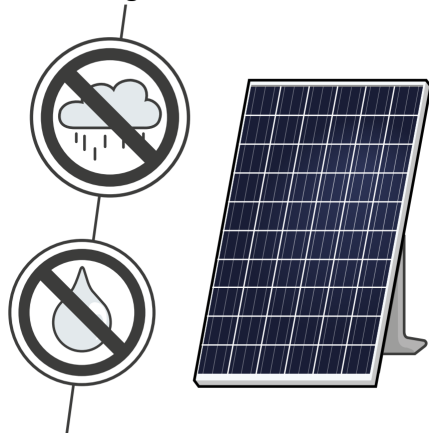
- ➔ Block off the installation zone.
- ➔ Keep children and unauthorized individuals away from the solar power system.


DANGER! Risk of fatal injury due to electric shock!

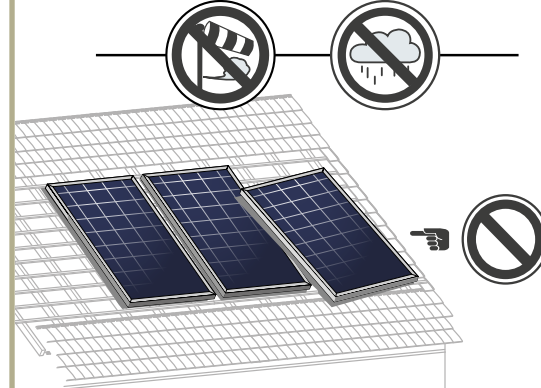
- ➔ Only use dry, insulated tools.


DANGER! Risk of fatal injury due to electric shock!

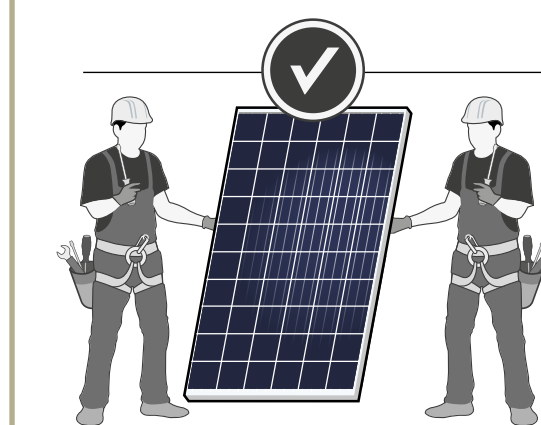
- ➔ Ensure that modules and tools are not subject to moisture or rain at any time during installation.


WARNING! Risk of injury due to falling modules!

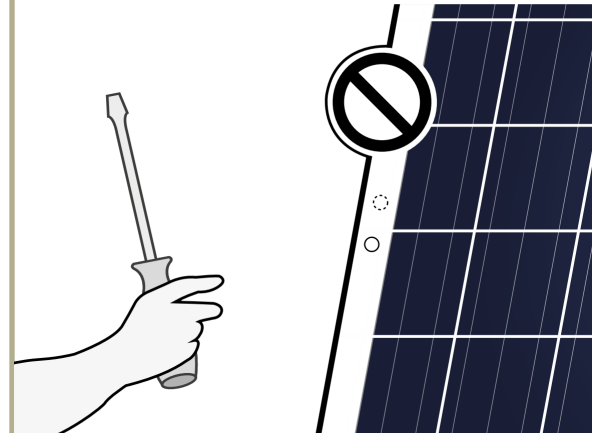
- ➔ Secure modules during installation.
- ➔ Do not install modules in windy or wet weather.



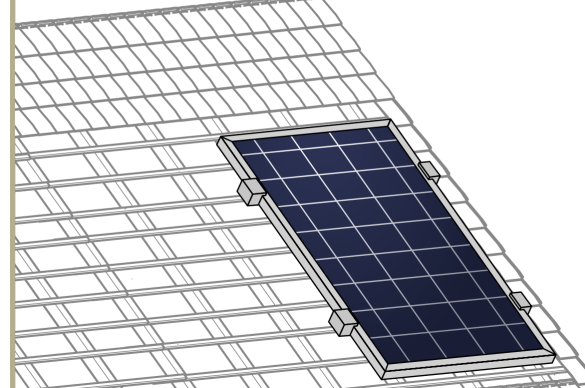
- ➔ Do not carry out the installation alone.



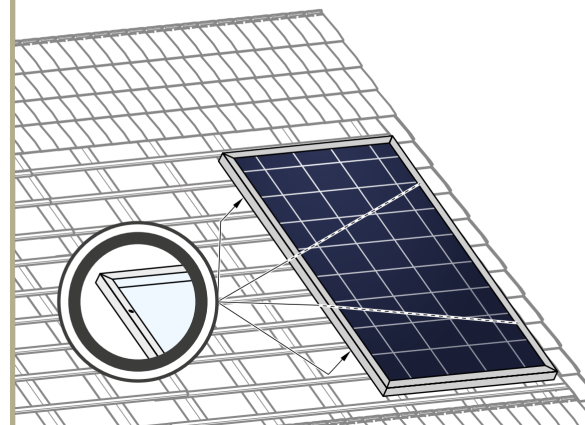
- Only install undamaged modules and components.
- ➔ Do not modify the module (e.g. do not drill any additional holes).


Option 1:

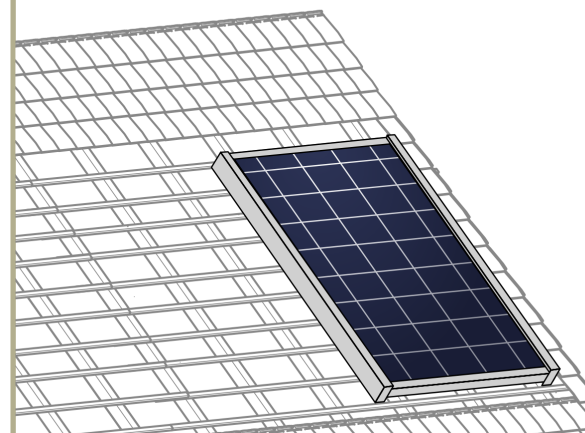
- ➔ Fasten the module with 4 clamps in the specified clamping range, see Fig. 3, p. 8 - p. 9.
- ➔ Tighten clamps according to manufacturer's instructions.


Option 2:

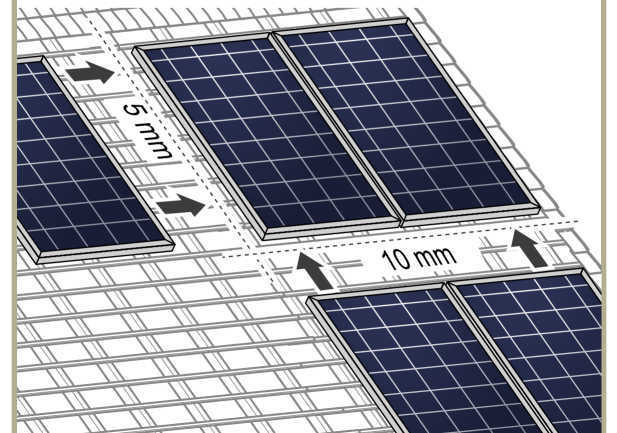
- ➔ Install the module at the 4 mounting points, see Fig. 3, p. 8 - p. 9.
- ➔ Tighten clamps according to manufacturer's instructions.


Option 3:

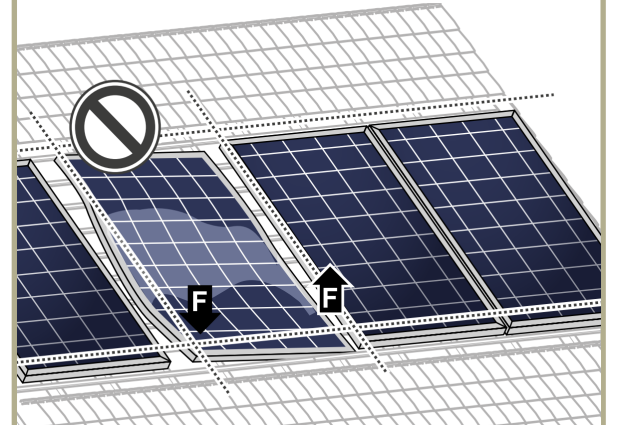
- ➔ Install the module using mounting profiles, see Fig. 3, p. 8 - p. 9.



- ➔ Maintain an interval of at least 10 mm between two modules along the short side and 5 mm along the long side.


NOTE! Module damage may occur!

- ➔ Do not subject modules to mechanical tension. Max. torsion 10 mm/m.





DANGER! Risk of fatal injury due to electric shock!

When disconnecting an electric circuit carrying direct current, electric arcs can occur that may result in life-threatening injuries.

- ➔ Do NOT unplug the cable when under load.
- ➔ Do NOT connect any exposed cable ends.
- ➔ Do NOT touch the poles at the same time.

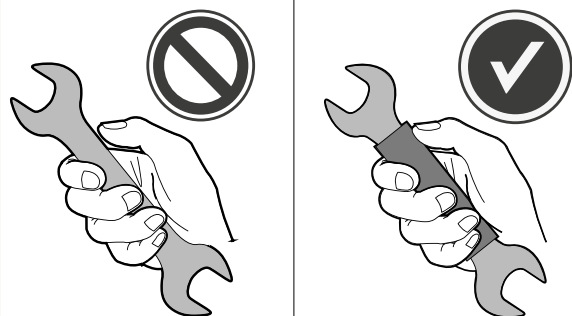
A solar module generates electrical current and voltage even at a low intensity of illumination. Sparks and electric arcs may result from the separation of a closed circuit. These can result in life-threatening injuries. The danger increases when several modules are connected in series.

- ➔ Please be aware of the entire open circuit voltage is active even at low levels of solar irradiation.
- ➔ Please follow the valid national regulations and safety guidelines for the installation of electrical devices and systems.
- ➔ Please make sure to take all necessary safety precautions. With module or phase voltages of more than 120 V, the extra-low voltage range is exceeded.
- ➔ Carry out work on the inverter and the wiring with extreme caution.
- ➔ Ensure that the modules are disconnected at the inverter prior to separation.
- ➔ Be sure to observe the specified time intervals after switching off the inverter. High-voltage components need time to discharge.



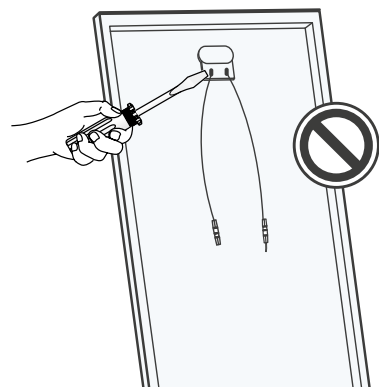
DANGER! Risk of fatal injury due to electric shock!

- ➔ Only use dry, insulated tools for electrical work.



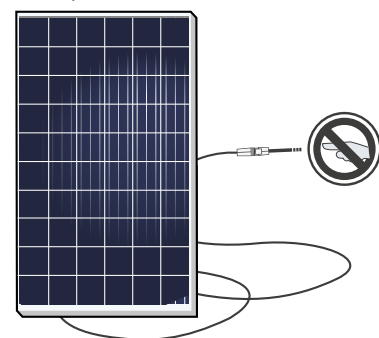
DANGER! Risk of fatal injury due to electric shock!

- ➔ Never open the junction box.
- ➔ Change of bypass diodes is only allowed by qualified and trained personnel in disconnected and covered state.



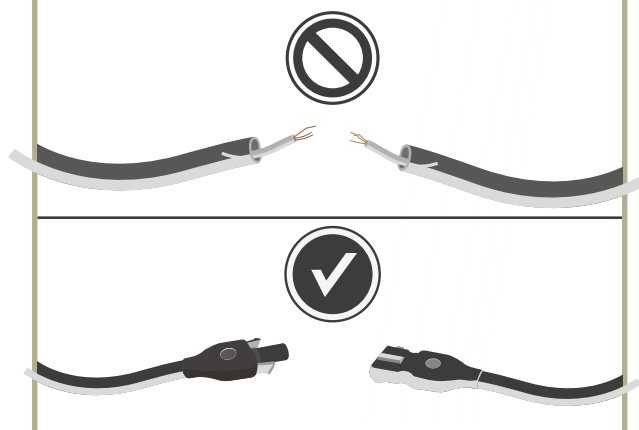
DANGER! Risk of fatal injury due to electric shock!

- ➔ Never touch live contacts with bare hands.
- ➔ Do not touch the poles at the same time.
- ➔ Cover connectors by suitable protective caps until installation.



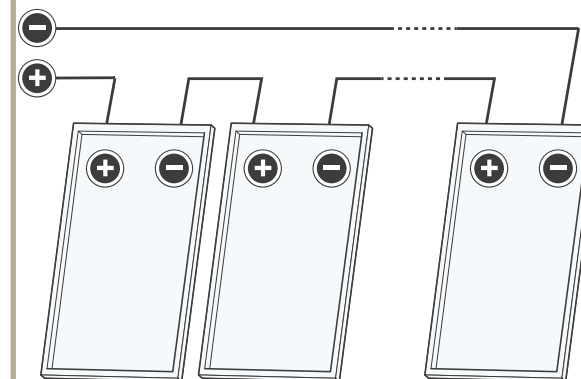
DANGER! Risk of fatal injury due to electric shock!

- ➔ Insulate any exposed cable ends.
- ➔ Only connect cables with plugs.



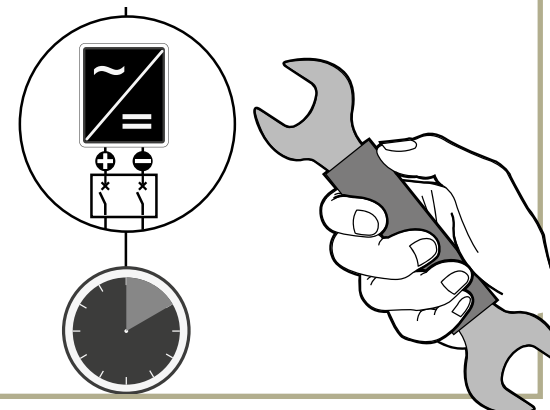
DANGER! Risk of fatal injury due to electric shock!

- ➔ Ensure correct polarity.



DANGER! Risk of fatal injury due to electric shock!

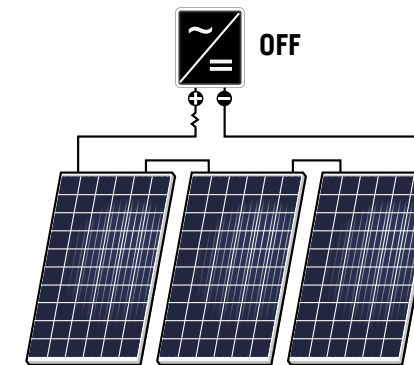
- ➔ Be sure to maintain the time intervals as specified by the inverter manufacturer between switching off the inverter and beginning any further work.



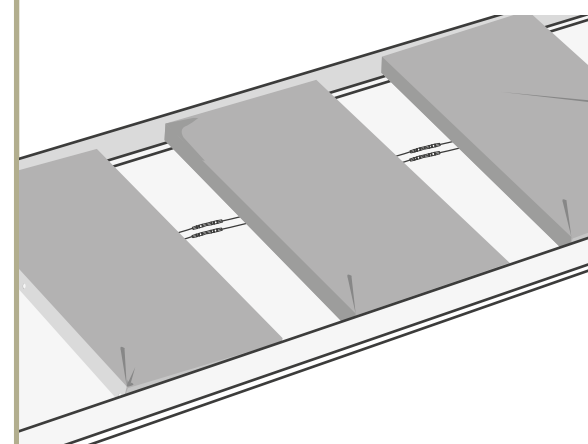
DANGER! Risk of fatal injury due to electric shock!

- ➔ Never unplug the cable when under load.

1. Switch off the inverter.

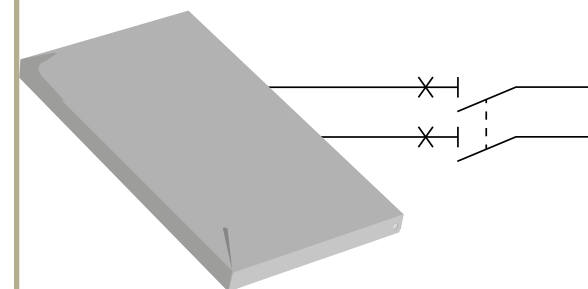


2. Cover the modules to be disconnected.



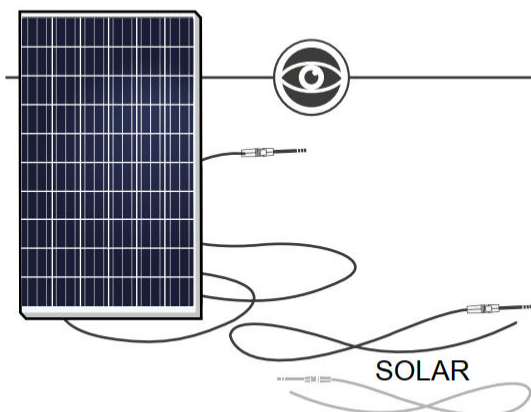
3. Switch off the DC circuit breaker.

- ➔ Disconnect plugs by the use of appropriate and qualified tools of the manufacturer Tyco, Amphenol or Multi-Contact.



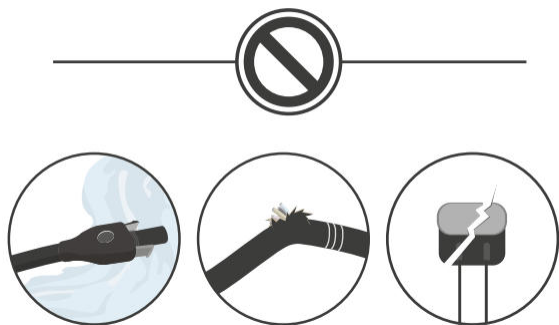


- Use solar cables for the connection at the junction box outlet.
- Use the same, inverter-compatible plugs.

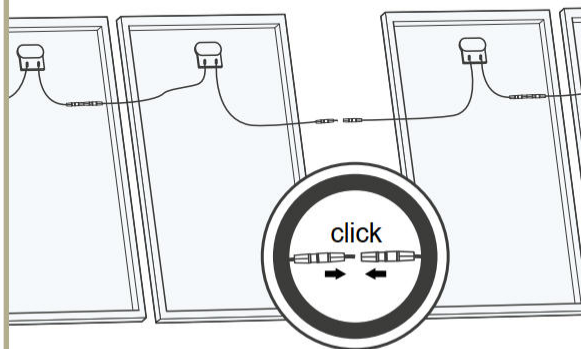


DANGER! Risk of fatal injury due to electric shock!

- Ensure that all electrical components are in a proper, dry, and safe condition.

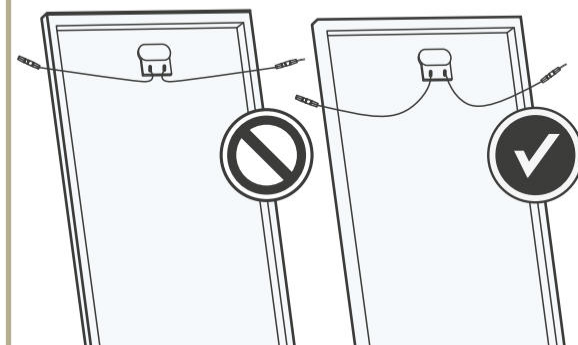


- Ensure for a tight connection between the plugs. Plugs click together audibly.
- To avoid contamination, male and female connectors shall be connected within one week after the modules are placed on the racks of the plant

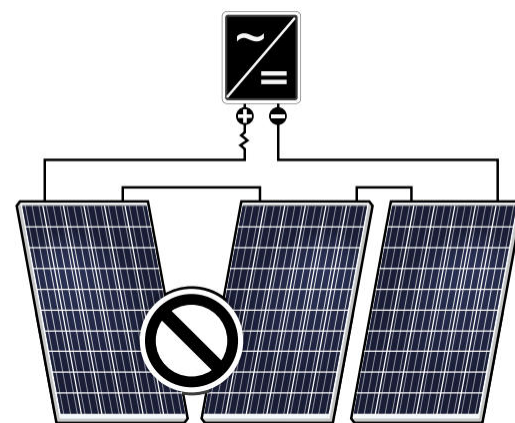


NOTE! Module damage may occur!

- Ensure that the cabling is not under stress.
- Ensure that the cables do not run between module and subconstruction (danger of pinch).

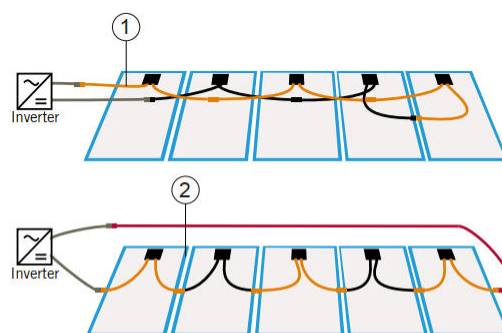


- Do not connect modules with different orientations or angles of inclination in the same string.



- The 60-cell modules with min. $\geq 1,000$ mm and for the 72 cell modules with min. $\geq 1,200$ mm long cable in portrait orientation can be wired as a "2nd next neighbor"

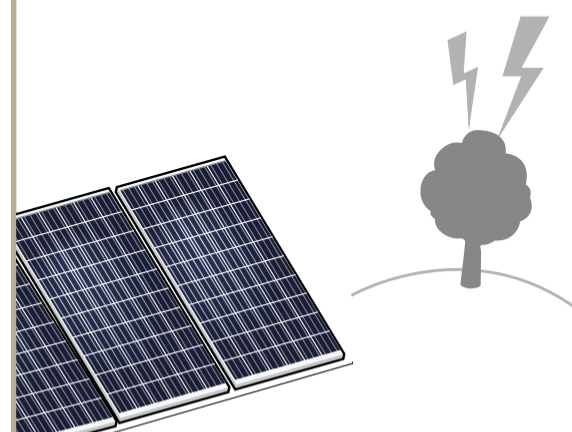
- ① "2nd next neighbor" - Wiring without a return cable.
- ② Standard wiring with a return cable



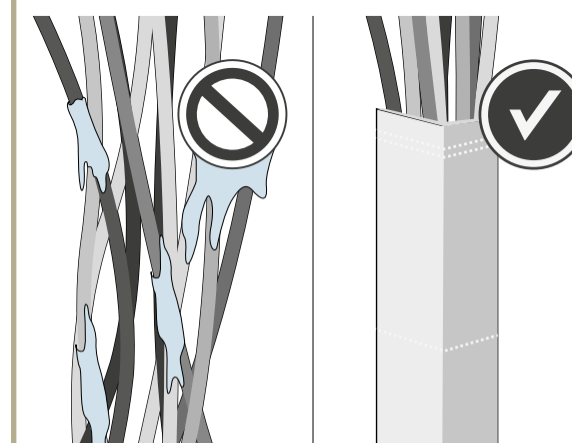
- Ensure that all necessary safety and functional tests have been carried out according to current industry standards.



- Integrate the system into the existing lightening protection system in accordance with the applicable local regulations.

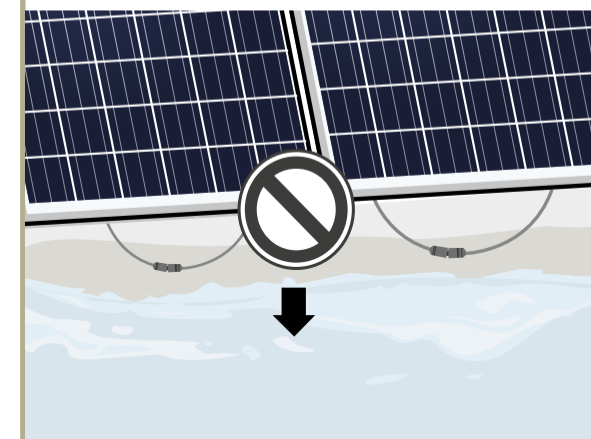


- Ensure that the cabling is not exposed and/or hanging and is protected from dirt and moisture.



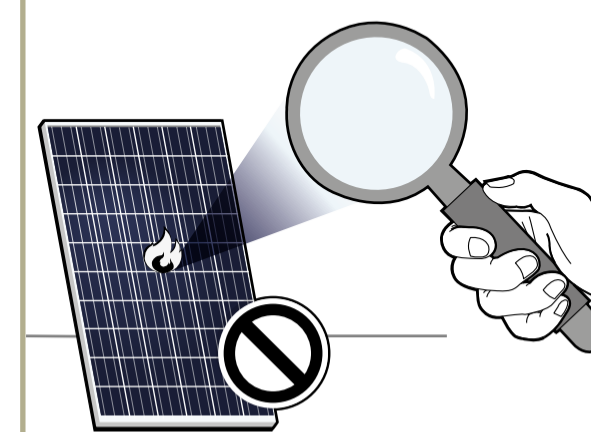
NOTE! Module damage may occur!

- Ensure that the plug connections are secured away from any water-channelling surface.



WARNING! Fire Risk!

- Do not use light concentrators (e.g. mirrors or lenses).



5

GROUNDING

Protective Grounding

➔ The modules must be grounded in accordance with the local statutory regulations.

Functional grounding

- When using an installation tilt of <5° a functional grounding at the negative generator connction must be implemented.
- ➔ Ensure that the difference of potential between the negative generator connection and the PE(N) of every MPP tracker of the respective inverters is 0 V.
- ➔ Follow the directions of the inverter manufacturer.
- ➔ Only use inverters which include lincensed grounding kits.
- ➔ For an adequate ground, the grounding hardware should penetrate the anodized layer.

If a PV system will be installed in warm and humid climates or close to a source of continual moisture (waterfall, reservoir, etc.), these situations may cause PID reducing the performance of the PV system. To reduce the risk of PID, we strongly recommend installers to have such protections:

- PV module grounding of negative pole
- Using Isolated Transformer inverter
- Using an off-set box or relevant technology units

6

FAULTS AND DEFECTS





DANGER!
Risk of fatal injury due to electric shock!

- ➔ Do not attempt to fix any problems yourself (e.g., glass cracks, damaged cables).
- ➔ Please contact an installer or SUNRISE Technical Customer Service Department.

7

DISPOSAL

- ➔ Do not disconnect modules by yourself.
- ➔ Please contact an installer or SUNRISE Technical Customer Service Department.
- ➔ Dispose of modules in accordance with the local disposal regulations.



➔ The symbols on the products, packaging, and/or accompanying documents mean that end of life photovoltaic modules should not be mixed with general household waste. For proper treatment, recovery and recycling of end of life photovoltaic modules, please take them to applicable collection points in accordance with your national legislation. If you wish to discard end of life photovoltaic modules, please contact your local authorities or dealer and ask for the correct method of disposal.

8

MAINTENANCE

SUNRISE solar modules are known for a long operating life and minimal maintenance effort and expense. Dirt and grime are usually washed away by rain. If the module is fully or partially shaded by dirt or debris (e.g., plants, bird droppings), it needs to be cleaned to prevent a loss of performance.

Maintenance

- ➔ The system should be inspected by an installer annually to check the following:
 - all system components sit securely and are corrosion free.
 - the connection is secure and all electrical components are clean and undamaged.

9

NOTE

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