WINAICO®

Power to Perform

Installation Manual

Crystalline module series WSP and WST

From July 2014, this document applies to the WINAICO WSP and WST series and takes the place of all previous versions of the installation and mounting instructions for these modules.

No responsibility is accepted for the correctness of this information. We reserve the right to technical changes. The documentation in place at the time the module was manufactured applies when undertaking installation, mounting and maintenance work.

1. Introduction

Specialist dealers and installation engineers should read through these instructions carefully prior to the installation, maintenance and operation of our WINAICO WSP and WST series. Carefully adhering to the instructions will ensure that the photovoltaic system delivers the maximum yield during operation on a long-term basis. Failure to observe these instructions can lead to personal injury and damage to property. WINAICO only sells its high-quality modules to specialist companies and installation engineers through direct sales. WINAICO solar modules may only be installed by such specialists. During the mounting process it is necessary to adhere to the applicable valid standards (VDE, VDEW, DIN, TAB, building regulations, accident prevention, etc.). All work on photovoltaic systems requires the appropriate specialist knowledge and must therefore be undertaken by authorised specialist personnel exclusively. Unqualified persons must be kept at a distance, in particular children. Please keep the mounting instructions on hand at all times.

Information for operators
Keep these instructions available for the duration of the module's life. Pay particular attention to the chapters on cleaning and maintenance, and troubleshooting.

Before installing the solar system, be sure to contact your local authorities and energy suppliers for the relevant guidelines and approval requirements. You will only ensure the conditions required for long-term system operation if you take these requirements into account.

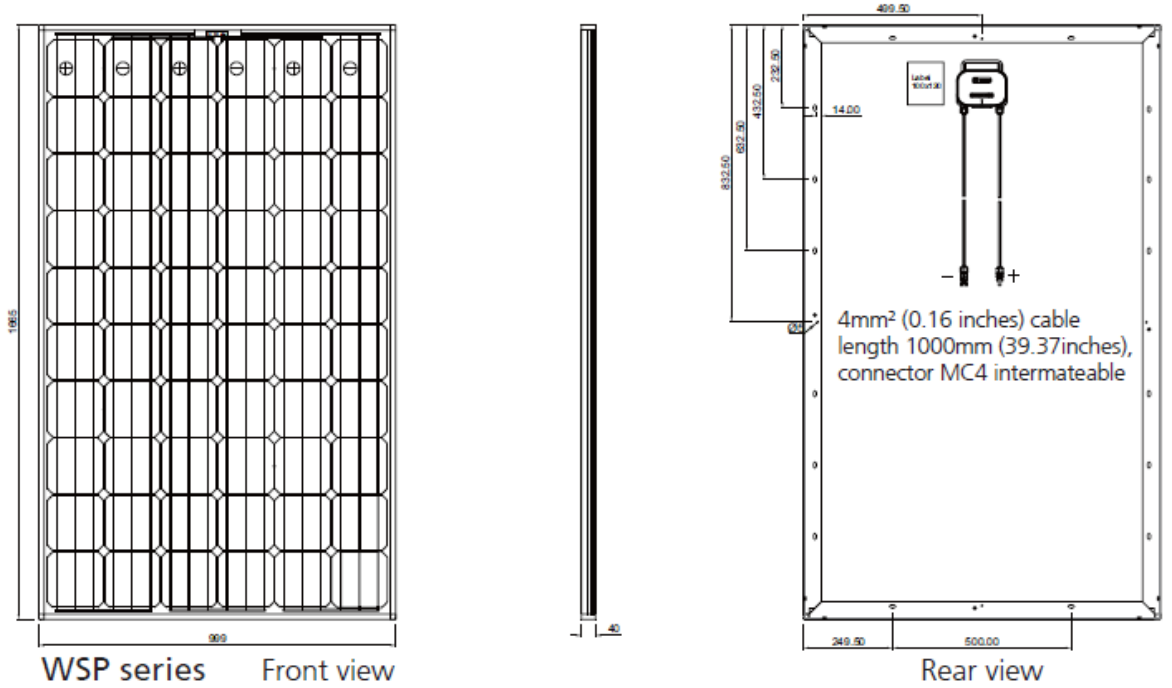
We recommend that you insure your WINAICO photovoltaic system from natural hazards (e.g. lightning strikes).

Exclusion clause
These instructions only apply to WINAICO products. WINAICO does not accept liability for any damage resulting from failure to observe the requirements listed. Please note that the person mounting the system is responsible for connecting and sizing the system as well as compliance with all the safety specifications applicable to configuration and installation. WINAICO assumes no responsibility beyond the proper function and safety of the modules. Also note the installation instructions for other system components which may form part of the overall system. A structural analysis may have to be produced for the entire project. Please consult our website www.winaico.com for more details.

2. Product description

Module series	WSP-P6	WSP-M6 WSP-M6 PERC	WSP-P6 Blackline	WST-P6
Dimensions (mm)	1.665 x 999 x 40	1.665 x 999 x 40	1.347 x 999 x 40	1.665 x 999 x 35
Cell type	Polycrystalline	Monocrystalline	Polycrystalline	Polycrystalline
Area (m²)	1.63	1.63	1.34	1.63
Weight (kg)	19.8	19.6	16.6	18.7
Max. system voltage (VDC)	1.000	1.000	1.000	1.000
Max. reverse current rating (A)	15	15	15	15
Connection type	WINAICO connection socket/ plug MC4 intermateable	WINAICO connection socket/ plug MC4 intermateable	WINAICO connection socket/ plug MC4 intermateable	WINAICO connection socket/ plug MC4 intermateable
Protection class	IP 65	IP65	IP65	IP65
Fire class	C	C	C	C
Wind/snow load (N/m²)	2.400 / 5.400	2.400 / 5.400	2.400 / 5.400	2.400 / 5.400

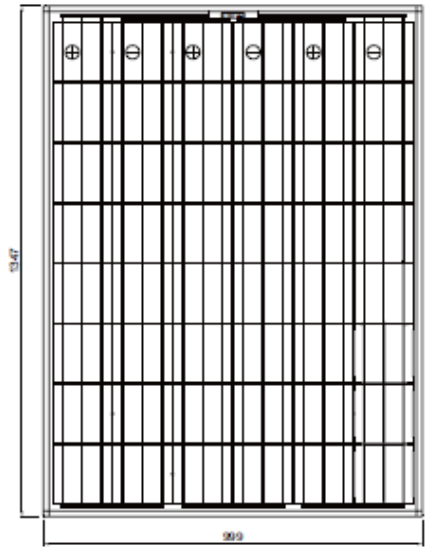
WSP-P6 / WSP-M6 / WSP-M6 PERC

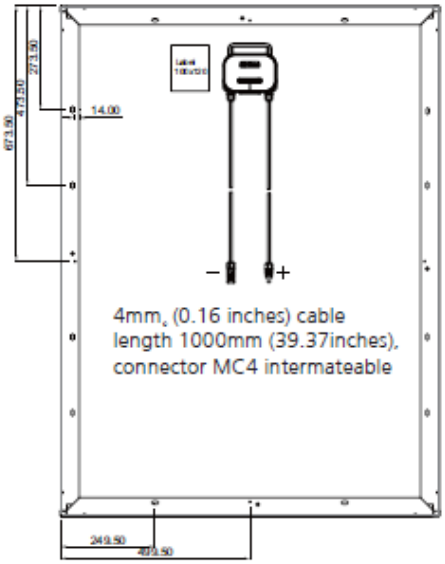


WSP series Front view

Rear view

WSP-P6 Blackline

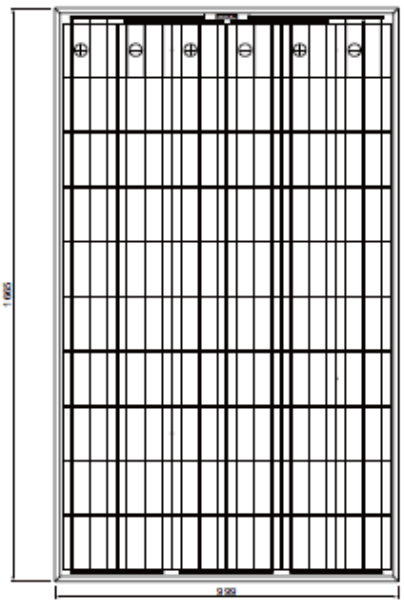


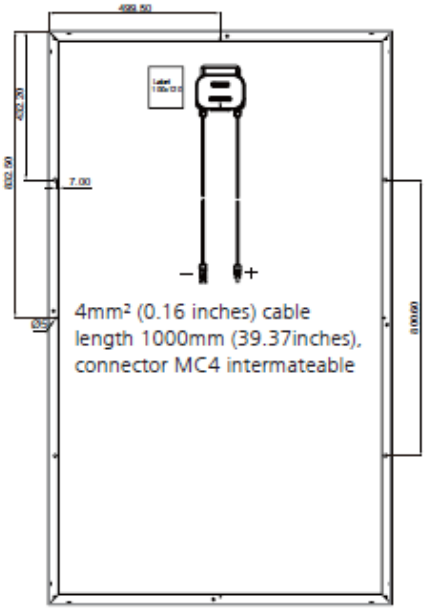


WSP series (Blackline) Front view

Rear view

WST-P6





Front view

Rear view

3. Warning notices and handling instructions

Warning notices

ATTENTION: Danger of death from electric shock

Solar modules start to generate electricity as soon as they are exposed to light. It is hazardous to your health to touch a module with a voltage of 30 volts or more. Every series or parallel connection of the modules increases the voltage or electric current respectively. Series connection of more than two solar modules can generate life-threatening voltages: **High voltage!** The fully insulated plug-in contacts do provide insulation protection, however, you should nevertheless observe the following when handling photovoltaic modules:

- Do not insert electrically conductive parts into the plugs and sockets.
- Do not install solar modules and wiring with wet plugs and sockets. Working conditions and tools must be dry.
- All work performed on the wiring must be carried out by authorised specialist personnel with the utmost caution and only with the aid of safety equipment.
- High voltages may be present in wiring, modules and inverters even when they are switched off. Undertake all work with the appropriate level of caution **– risk of death due to electric current!**
- After switching off the inverter, before beginning any further work it is essential to wait for the time interval specified by the manufacturer so that the high-voltage components can discharge.
- Be sure to carefully follow the inverter manufacturer's installation instructions!

WINAICO modules are designed to meet the requirements for the IEC 61215 and IEC 61730 standards for application class A. Hazardous voltages (IEC 61730: higher than 50V DC; EN61730: higher than 120V DC), hazardous power applications (higher than 240W) where general unrestricted access is anticipated. Modules qualified for safety through EN IEC 61730-1 and 61730-2 within this application class are considered to meet the requirements for Safety Class II).

ATTENTION: Danger of death from electric arcs

Modules generate direct current (DC) when exposed to light irradiation and a deadly electric arc can result when opening a closed section (e.g. when separating the DC cable from the inverter under load).

Product protection

Protect the modules from incorrect handling.

- Do not lay any objects on the modules, never walk on the modules and do not drop them.
- Only undertake modifications on the module if these have been confirmed in writing by WINAICO.
- Do not work on the modules with pointed objects.
- Keep all electrical contacts clean and dry.
- It is recommended that the serial numbers be noted for system documentation.
- The solar module is not saltwater-resistant (recommended distance from the sea: 2000 m).
- The module must not be subjected to unusual chemical loads (e.g. emissions from manufacturing plants).
- Do not use lenses or mirrors to concentrate light (danger of overheating).
- If solar modules are to be connected to storage batteries, the safety precautions of the battery manufacturer must be observed.
- Do not stand or step on the PV module, this is prohibited. There can be risk of micro-crack which may cause a sharp decline of module's power performance; what's more, it may threat your safety.
- Do not hit or put excessive load on the glass or back sheet. There can be risk of micro-crack which may cause a sharp decline of module's power performance; what's more, it may threat your safety.

Under the anticipated conditions, a PV module can supply a higher current and/or voltage than specified in the standardised test conditions.
The voltage rating of components, current rating values of conductors, fuse sizes and rating of controllers connected to the outputs of PV modules should be at least 1.25 times the modules Isc and Voc. The highest rating value for the overcurrent protection (reverse-current strength) is 15 A.

4. Transport and storage

Check the shipment immediately upon delivery to ensure completeness and integrity. Note any damage on the driver's consignment note and inform WINAICO in writing immediately. The utmost care is required when handling the modules. Take care when unpacking, transporting and storing them. For your safety, do not disassemble or modify the WINAICO PV modules in any way.

- Store the modules safely in cool and dry rooms. The packaging is not weatherproof!
- Leave modules in their packaging until they are to be installed.
- Do not stack the modules.
- Carry the modules with both hands or use glass suction cups for removal and transport.
- Under no circumstances use the junction box or connection lines as handles.
- Do not set the modules down roughly on hard ground and the module corners.

5. Application area and mounting site

Application area

- The module is intended for use in temperate climatic conditions.
- The module must not be exposed to concentrated light. It must not be immersed in water or constantly exposed to water spray (e.g. from fountains).
- There is risk of corrosion with exposure to salt (recommended distance from the sea 2000 m) and sulphur (sulphur sources, volcanoes).
- The permissible module temperatures are between -40 °C and +85 °C.
  Sufficient ventilation from behind should be ensured to prevent raised module temperatures.
- Do not subject modules to strong chemicals.
- Make sure that the modules and module components are never standing or lying in water.
- The module may not be installed adjacent to naked flames or flammable materials.
  Solar modules are non-explosion-protected equipment.

Mounting site

- **Orientation**
  The solar module should be mounted facing towards the south if possible. This results in the best energy yield. Alternatively, the solar module can be orientated towards the path of the sun. The gradient of the modules should be at least 15°. In Central Europe a gradient of 30° is optimal.

- **Location**
  The mounting site should be as free as possible from shade of any kind (houses, trees, branches, leaves, cables, antennas, etc.) shade can significantly reduce the output of the solar modules. Partial shade will also reduce the energy yield. A module is regarded as free of shade if the entire surface is free of shade throughout the year and if unhindered exposure to sunlight over a period of several hours per day is possible even on the most unfavourable days of the year.

- **Ventilation from behind**
  The output of solar modules produced by any manufacturer decreases considerably as the modules heat up. Ventilation from behind mitigates the effect of performance reduction in heat. This is especially true for our modules with a black film on the rear and a black frame. For this reason, sufficient space between the modules and the roof surface must be ensured during mounting to provide sufficient cooling of the modules with an air circulation.

- **Winter**
  When mounting the modules it is essential to ensure that the water drain openings at the corners of the modules are not covered in order to avoid damage from frost.
  The solar installation should be mounted such that as little snow as possible can remain on the modules. Solar modules from WINAICO are certified for snow loads of up to 5400 PA.

6. Mounting and installation

ATTENTION: Risk of fire if module components are damaged!

- Only install undamaged solar modules.
- Before the installation ensure that the junction box, cable and connector are undamaged.
- Never open the junction box chassis.

Safety precautions

- Store the modules safely in cool and dry rooms. The packaging is not weatherproof!
- Incorporate the installation in the existing lightning protection system in line with local requirements.
- WINAICO recommends only mounting and installing the system in dry weather.
- Observe the relevant accident prevention regulations.
- Do not carry out installation work in high winds.
- Secure yourself and other persons against falling.
- Prevent the possibility of falling objects.
- Secure the work area so that no other persons can be injured. Keep children away from the installation site.
- All parts of the module should be protected from mechanical stress (e.g. caused by pressure, tension, torsional stress) during transport and installation. Ensure that the radius doesn't fall below the minimum permissible bend radius of 60 mm for cables at the junction box output either during installation or system operation.
- Do not damage, pull, bend, or place heavy material on cables.

Fire protection

The installation of on-roof systems can affect the fire safety of a building; improper installations can result in a hazard in case of fire. In the case of on-roof applications, the WINAICO modules must be mounted above a fire-resistant surface.

The module is “non-explosion-protected equipment”. The use of improper installation methods and/or defective parts may result in the unexpected occurrence of an electrical arc during operation. Therefore, it may not be installed near highly flammable gases and vapours (e.g. filling stations, gas tanks or paint spraying systems). The module may not be installed adjacent to naked flames or flammable materials.

6.1 Mechanical module mounting

WINAICO modules are suitable for both vertical and horizontal installation due to their high degree of stability, in particular that of the frame. The modules must be clamped in place at a minimum of 4 points. The frame has only been stress tested for fastening by the long sides. Therefore always clamp the modules on the long sides only. The modules must always be installed with the junction box pointing upward, such that the junction box is located on the rear side of the module in the upper section.

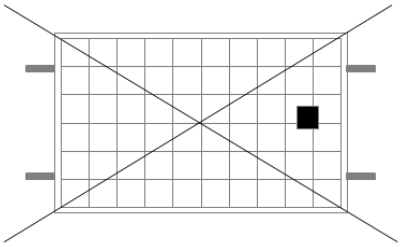


Figure: Clamping on the short sides is not permitted

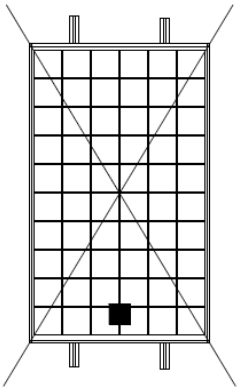


Figure: Reverse installation with junction box pointing downward is not permitted

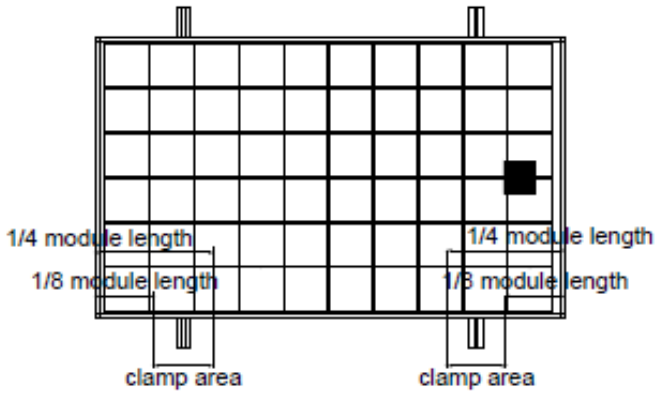
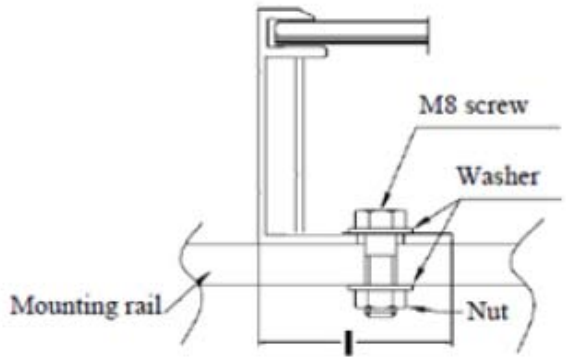


Figure: Only clamp at the specified clamping area!

The modules can be mounted to the substructure by clamping in place from the front or screwing on from behind. The clamping area (Figure above) for each fastening point must encompass an area of at least 135 mm^2. A torque wrench must be used for assembly. In the examples shown, the tightening torque (using M8 bolts

produced from V2A) is 20 Nm. Use the existing drilled holes for securing the module; do not drill any additional holes (doing so will void the product warranty). Use appropriate corrosion-resistant fastening materials and use washers to fasten the PV module.



Maximum mechanical load

Ensure that the maximum mechanical load is not exceeded, in particular while also taking into account any site-dependent loads (e.g. wind and snow). Please note that the module can bend under heavy loads. Do not use cable ties or other fastening elements on the rear side of the module because uneven structures can damage the module.

Note

The middle clamps can be used as spacers between the module rows when mounting the modules. To avoid any possible stresses and failure to comply with dimensions, a gap should be maintained between the module rows. We recommend a gap of approximately 2 cm. For aesthetic reasons we recommend using black clamps for mounting our module series with black anodised frame and black backsheet. Do not touch live terminals with bare hands, and use insulated tools for electrical connections.

Laying the cables

To avoid conductor loops, the strings (+ and –) should be laid together. The cable groove on the cross profile can be used here. If possible roof penetration should only be at one point. PVC cables are not recommended. Bare copper H07RN cables are not recommended because the contact resistance of crimping location will probably exceed the permitted value since the copper wires are oxidized. WINAICO recommends installers use only sunlight resistant cables qualified for direct current (DC) wiring in PV systems. The minimum wire size should be 12 AWG.

ATTENTION: Lightning protection is recommended for PV systems that are to be installed in locations with high probability of lightning strikes.

6.2 Electrical installation

Choice of module

Ensure the module meets the technical requirements of the system as a whole. Ensure that other system components do not exert damaging mechanical or electrical stresses on the module. When connected in series, modules must all have the same amperage. When connected in parallel, the modules must all have the same voltage. The modules must not be connected together to create a voltage higher than the permitted system voltage. Modules must not be fitted as overhead glazing or vertical glazing (façade). Ensure that the mounting system can also withstand the anticipated loads, e.g. wind and snow loads. There are openings at the base of the module frame to allow water from precipitation to drain away. Ensure that the functionality of these openings is not restricted by the format of the module installation.

Diodes and fuses

The shading of individual solar cells or solar modules can lead to the shaded area heating up because the shaded area begins to consume electrical energy generated by unshaded parts of the PV system. The use of bypass diodes or other technical elements to bridge the shady areas results in a reduction in the warming up process and in the loss of performance of the respective PV system. WINAICO solar modules are factory-fitted with integrated bypass diodes or other design elements, which offer efficient protection to the cells. Bypass diodes are not overcurrent protection devices.

If it should be necessary to connect the module strings in parallel then please proceed as follows:

- Select one of the module strings requiring parallel connection.
- Insert a suitably rated protective diode into one of the two connection lines leading to this string, in the direction of the generated current flow. In order to attain this, it is necessary to connect the diode anode with the positive (+) connection of this string and the diode cathode with negative (-) connection of the string.
- Once work on the first module string is complete, repeat this process for all of the other strings requiring parallel connection. Then establish the requisite connections for the parallel interconnection of these strings. In place of the additional diodes it is also possible to install direct current string fuses. These must be configured according to the maximum quiescent current (IR), which is quoted in the data sheets pertaining to the respective modules. If shading of individual module strings within a parallel circuit is expected, diodes are preferable.

The installation of additional diodes or fuses is necessary with the parallel connection of module strings because the internal protection measures adapted to module performance (e.g. bypass diodes) are only rated to each module, and are not able to adequately regulate the current flow in a parallel circuit in the event of the shading of individual module strings. A failure to observe this may result in the corresponding solar modules (including the electronic components contained within them) being damaged.

WINAICO fundamentally recommends the installation of string fuses (DC!) with both series and parallel type connections, in order to protect the solar modules in the event of a malfunction (e.g. an inverter defect). The fuses must be configured according to the maximum series fuse rating, which is quoted in the data sheets pertaining to the respective modules.

Cables and connectors

The PV module has a pair of male and female waterproof connectors.

- Connect the output cable to the other equipment in the system correctly.
- Connect the required number of PV modules to meet the voltage specification for equipment used in the PV system.
- Wire the output cable connectors so that they do not exert any force or pressure on the PV module's junction box. Attach the cable to the mounting frame using approved fasteners. The connectors should be placed behind the mounting frame so that the connectors can't be directly exposed to sunlight, wind and rain.
- To extend the cable, use proper commercial cables and connectors that can withstand outdoor use for long periods. Select the appropriate cable size according to its length to avoid voltage drop.

ATTENTION: WINAICO connectors' protection level is IP67. They cannot be put under water for a long time. Avoid sunlight exposure and water immersion of the connectors. Do not allow installed PV connectors and cables to be in contact with the roof surface or the ground.

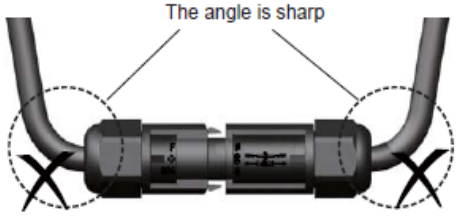
ATTENTION: Faulty connections can result in arcs and electrical shock. Check that all electrical connections are securely fastened. Make sure that all locking connectors are fully engaged and locked.

Wrong way for connection

Right way for connection

ATTENTION: To prevent electric shocks, please turn off the power when installing PV connectors. Do not pull out the PV connector under load. Turn off the DC/AC inverter or turn on DC circuit interrupter to disconnect PV connectors from load. Then insert and extract under voltage is permitted.

ATTENTION: The cable must not be bent or crushed on the direct exit of the cable screw joint include connector and box. A minimum bending radius R≥5×cable diameter must be maintained. The cable must be routed in a way that tensile stress on the conductor or connection is prevented.



Wrong way for the cable

Right way for the cable

*Please refer to the detailed instructions of the minimum bend radius given by manufacturer.

Safety precautions

ATTENTION: Please ensure the correct connection of the sockets and sleeves

Do not cut the module cable connectors. The strings (+ and – cables) are fed into the inverter via the DC solar inputs. The polarities of the module connectors are specified. The cable on the + connector of the module should be connected to the inverter at the + input. The same procedure applies to the – connector and – inverter input. The cables can be laid in cable tray. It is important to make sure that no water remains in the cable grooves, which could happen on uneven roofs. If necessary drain holes can be drilled into the groove. Only certified socket connectors are approved for connecting the solar cables to the modules or inverters respectively. The socket connectors are crimped on with special pliers or connected to the modules and inverters with adapter cables. The adapter sets are connected to the (approximately 6 mm stripped) end of the cable. Now establish the crimp connection and shrink-fit the shrink tubing over the connection with a hot-air gun or flame. The individual strings can be checked for polarity and voltage with a multi-meter / voltmeter. The inverters should be connected in accordance with the manufacturer's instructions.

ATTENTION: Depending on yield and inverter, different string lengths are possible. It is essential to observe the assembly instructions and connection specifications for the inverter! Make sure each individual string is de-energised prior to connecting to the inverter. It is absolutely imperative that the inverter is connected to the public grid power by a certified specialist.

ATTENTION: High voltage direct current can occur even at low levels of radiation. Never touch unprotected + and – cables that are in operation.

6.3 Grounding

Proper grounding on the module frames is the responsibility of the solar installer or installation company. If an external lightning protection system is already provided or planned for the building, the photovoltaic system must be integrated into the protection concept against direct lighting strikes. When using transformerless inverters, grounding should be carried out for personal safety reasons. The grounding point is marked on the module frame. For grounding purposes, an M4 screw and washer are used. PV modules have an anodized coating on aluminium frames for corrosion resistance. In order to properly ground the modules frames, the coating must be penetrated. Please observe the national standards when grounding. If national standards do not require grounding, WINAICO still recommends all PV module frames to be grounded to ensure the voltage between electrically conductive equipment and earth ground is zero in all circumstances.

7. Cleaning / maintenance

As the operator, you should regularly remove dirt from the modules and check if all system components are functioning properly.

The following points should be noted:

- Never stand on the module surface. Do not exert any mechanical loads on the modules.
- Do not clean with water if there is a risk of frost or major differences in temperature between the module, water and air.
- We recommend decalcifying hard water. This will prevent lasting water stains. Remove standing water from the module.
- Do not use abrasive cleaning agents or detergents. Do not scrape off dirt as this may damage the surface of the module.

- Check if all cables and connector accessories are undamaged and properly secured.
- PV modules are not shaded by unwanted obstacles or any foreign material.
- Mounting and grounding components are tightly secured with no corrosion.

ATTENTION: Please make sure that the earth connection is not interrupted or damaged!

ATTENTION: WINAICO recommends PV system to be periodically inspected by the installer, or other qualified person.

8. Liability disclaimer

These installation and assembly instructions apply in general to standard systems. No responsibility is accepted for the correctness of this information. WINAICO does not provide any guarantee of the usability and serviceability of the modules if the user fails to observe this user information. As compliance with this user information and the conditions and methods for the installation, operation, use and maintenance of the modules from WINAICO cannot be checked or monitored, WINAICO shall assume no liability for damage resulting from improper use, faulty installation, operation, use or maintenance. In addition, no liability shall be borne for infringements of patent laws or other rights of third parties which result from the use of the modules, unless mandated by law.

9. Contact

If you have any questions, our WINAICO Team is available to assist you at all times:

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