

# Installation and maintenance manual for photovoltaic modules

## TARKA 126 - 138 in VSBD, VSMD or VSMS

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## I. INTRODUCTION

The installation and maintenance manual contain information on the handling and installation of VOLTEC Solar's photovoltaic modules. All instructions must be read and understood before proceeding with the installation. If you have any questions, please contact VOLTEC Solar. The installer must comply with the safety instructions listed in the manual when installing the modules. Before installing a solar photovoltaic system, the installer must familiarize himself with the mechanical and electrical requirements of photovoltaic systems in general. Keep this manual in a safe and accessible place so that you can consult it later.

In the rest of the text, unless specified, the terms: "module", "PV module" and "panel" are used interchangeably for the TARKA 126 & 138 VSBD, VSMD and VSMS framed panels.

## II. GENERAL SAFETY INSTRUCTIONS

Do not use a PV module in a situation or place where a failure could result in fatal accidents, injuries or material damage. Ensure that pv modules conform to the specifications of the overall system implemented.

### **DISCLAIMER**

Failure to carry out the minimum checks and maintenance operations defined in this manual may result in the withdrawal of all voltec solar warranties for all consequences arising from this failure.

### **2.1) FIRE SAFETY**

Refer to local requirements and standards for fire safety guidelines and specific requirements. A roof installation can affect the fire safety of a building ; inadequate installation can increase the risk in the event of a fire.

The panels shall be mounted above a fire-resistant coating. Do not use signs near equipment or places where flammable gases can be generated or collected.

## 2.2) PRECAUTIONS INSTALLATION

Installers must be qualified, and have experience in electrical work and the installation of photovoltaic systems.

The installation must be carried out in accordance with the documents in circulation, for example, electrical standard NF C 15-100, guide UTE C 15-712-1 and "Practical guide for use by design offices and installers for the installation of photovoltaic generators connected to the network" published by ADEME and ser.

Carefully insert the modules by applying safety rules to avoid injury and property damage. Handling precautions apply and must be scrupulously observed during the installation of modules.

Do not plug water drain holes.

Do not use a damaged PV module. A damaged module can cause a fire or electric shock with injuries or even death. Do not expose the PV module to artificially concentrated solar radiation. A PV module exposed to the sun generates voltage and current. Contact with the output wiring can cause a short circuit, fire or electric arc.

Never open electrical connections or disconnect connectors when the circuit is charging (PV in the sun).

On site, control the unladen voltage of the modules using a multimeter; the voltage measured shall be substantially equal to the voltage indicated on the module data sheet.

The maximum number of panels in series depends on the design of the plant, the type of inverter chosen, the environmental conditions and the maximum working voltage of the modules (refer to the product data sheet).

We recommend that you limit the number of modules connected in series to the maximum values shown in the following table:

Panel reference	Maximum number of panels in series
TARKA 126 VSBD or VSMD	46
TARKA 138 VSBD or VSMD	43
TARKA 126 VSMS	18

Connect in parallel only modules or series of modules of the same voltage. If modules or series of modules are connected in parallel, the total current is equal to the sum of the currents of the individual modules or series of modules.

Do not connect PV modules or chains in parallel without a properly sized current limiting device. In parallel configuration, be sure to use only modules of the same type.

If more than two strings are configured in parallel, then a group join box must be used. The maximum reverse current of voltec solar modules is 30A for the VSMD and VSBD format, and 20A for the VSMS format. The junction box must therefore be equipped with a protective device whose size is less than or equal to the specified reverse current value.

The maximum number of modules or chains in parallel per protective equipment is therefore 1.

The safety factor of 1.25 for the minimum voltage characteristics of the components can be modified during the design of a system, depending on the minimum temperature at the installation location and the temperature coefficient for Voc, Isc can be corrected from the maximum temperature, illuminance

and orientation of the module. For this purpose, a complete simulation of the specific environment using long-term meteorological data is required.

Cables connected to VOLTEC Solar modules must have a minimum section of 4mm<sup>2</sup>. VOLTEC SOLAR photovoltaic panels are certified EN IEC 61730-1 and -2 and 61215. They meet the electrical criteria of class A: generally accessible hazardous electrical installations (according to IEC 61730 for systems operating at more than 120 VDC). VOLTEC SOLAR photovoltaic modules meet the requirements of protection class II defined in NF EN 61140 and are capable of operating under environmental conditions described according to IEC 60364-5-51.

### **2.3) PREPARATION OF THE INSTALLATION**

For on-site assembly operations, provide all safety measures to prevent the slipping or fall of a panel, mounting accessories or tools and thus avoid any injury or damage to persons or property.

Mark on the ground the risk area to prevent access to persons from outside the site.

Delimit the area of work, to prevent the risks related to falling objects.

Implement the appropriate safety, in accordance with the regulations in force, for workers working at heights.

Use of appropriate equipment (sliding scale, scaffolding, etc.).

Access development allowing the movement of people without direct support on photovoltaic modules (roofer ladders, nacelle ...).

Use of collective safety equipment (railings, net, scaffolding...) and individual (safety harness, laath, helmet...).

### **2.4) STORAGE**

The modules are delivered vertically on pallet with cardboard packaging and strapping. They must be stored in this way. As soon as the cerclages are removed, the modules must be supported or laid horizontally with the plastic bumper or cardboard corners as separators.

**Attention: pallets must be stored on flat ground protected from the elements.**

### **2.5) HANDLING**

Handle the photovoltaic module with care. Wear clean and soft gloves to avoid direct hand contact with the glass. When using suction cups or handling straps, ensure that they are clean and free of any fat or abrasive. Prohibit any contact of the glass with a fatty substance or containing silicone. Do not put or drop any object whatsoever on the glass.

Do not unmount the module. Do not modify or delete any component. Do not exert pressure on the PV module leading to bending of the surface. This could cause microcracks of the cells.

Do not stand or walk on a module: risk of breaking cells (microcracks) or damaging the surface of the glass (scratches, fouling).

Do not hit the front or back of the PV module with a hard or sharp object.

Do not knock or drop the PV module. Do not touch components that can be powered on: wires, cables, connectors, or junction boxes.

Ensure that the intended shut-off device, disconnect or circuit breaker, is opened before any intervention.

Always use appropriate safety equipment (insulated tools, insulating gloves, insulating shoes, etc.)

Do not use cables or connectors as a means of handling.

### III. MECHANICAL INSTALLATION

#### 3.1) CHOICE OF LOCATION

Choose an appropriate location for installing the modules.

The maximum allowable load applies to the uniformly distributed load of wind or snow. Avoid installing signs in areas exposed to gusts of wind, snow, ice cubes or ice build-up. The maximum altitude of use of modules of all ranges is 800 meter.

#### 3.2) CHOICE OF ASSEMBLY STRUCTURE AND INTEGRATION SYSTEM

Load and strength calculations are the responsibility of the project owner or installer.

Ensure that panels are not subjected to wind or snow loads in excess of the maximum allowable loads and are not subjected to excessive forces due to the thermal expansion of the support structure.

The mounting structure that will receive the panels must be able to withstand the forces created by the panels, the wind, the snow. These efforts vary according to geographical location. The mounting structure and fastening material must be made of durable materials that are resistant to corrosion and UV.

Read the local settings before making the choice.

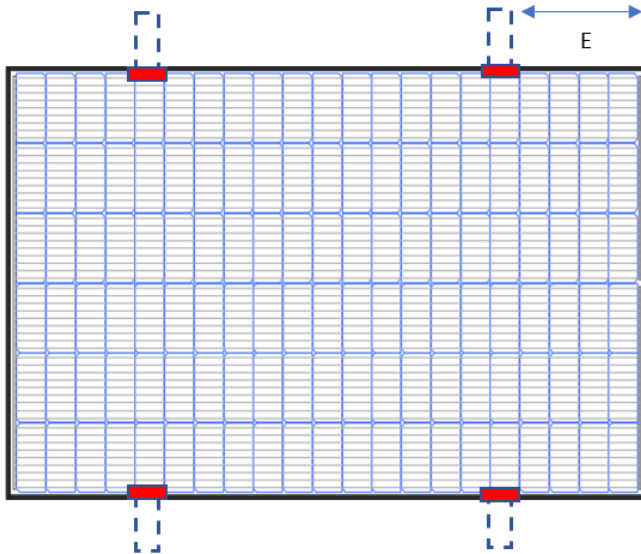
For roof-mounted systems, provide adequate rear ventilation under the panel to ensure good cooling (> 5 cm). The panels must be securely fixed using support frames or mounting accessories specially designed for PV applications. Always keep the rear surface of the panel free of any foreign objects or structural elements that may come into contact with the panel, especially when the panel is subjected to a mechanical load.

#### 3.3) FASTENING OF TARKA 126 & 138 VSBD OR VSMD FRAME PANELS TO THE STRUCTURE

Comply with all safety instructions and precautions for the implementation of the integration system. The modules shall be securely attached to the mounting structure using a minimum of four attachment points for normal installation. If high winds or snow loads are foreseeable, provide additional attachment points. Refer to the recommendations of the supplier of the assembly system.

### Fixing diagram of TARKA 126 & 138 VSBD, VSMD or VSMS panels:

#### 1) 4 point fixing module with 2 support passing under the module



#### Fixing by the long side of module

Mode :

4 point fixing module with 2 support passing under the module. The module is fixed by clamps on the frame or on the frame return  
 Distance E = 1/4 length of module ±15%

Charges ELS		
Référence produit	Pression	Depression
TARKA 126 VSMD	2400 Pa	1600 Pa
TARKA 126 VSBD	2400 Pa	1600 Pa
TARKA 126 VSMS	2400 Pa	1600 Pa
TARKA 138 VSBD	2400 Pa	1600 Pa
TARKA 138 VSBD	2400 Pa	1600 Pa

\*Loads of 2400 Pa (Snow and Wind) are given according to IEC conditions.

### Module dimensions:

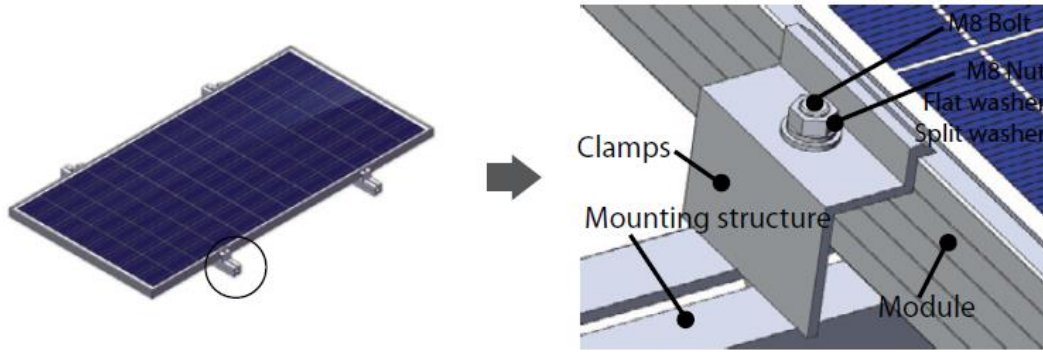
model	Glass thickness	Module dimensions (mm)			Junction box (mm)		Dimensions of the Alu frame profile (mm)	Long. cable (mm)
		Long.	wide.	Ep	Long.	wide.		
WISE 126 VSBD, VSMD to VSMS	3.2mm	1835	1042	35	100	30	Return of the frame Long Side /Small Side 25 / 14,5	1200
WISE 138 VSBD to VSMD	3.2mm	2005	1042	35	100	30	25 / 14,5	1200

### Mounting with flanges or calipers or pliers:

Respect the locations of the flanges indicated in the diagram belowus. Therefore, depending on the portrait or landscape orientation of the modules, the mounting structure will have to have profiles supporting the modules in the vertical or horizontal direction.

The flanges and fixing screws must be of cross-section and length in relation to the forces to be supported (winds, snow) depending on the location.

### Example of mounting with calipers:



**NOTE:** When mounting, the contact surface of the clamps with the panel frame shall be at least 70 per cent. The clamping torque specified by the supplier of the fastening system shall be respected.

In case of non-compliance with this condition, no claim will be accepted and the product will no longer be under warranty.

## (IV) ELECTRICAL INSTALLATION

Only authorized and trained personnel should have access to PV modules. The system generates electricity, and can be dangerous if the staff is not familiar with these products and with the appropriate safety procedures.

**The installation must be carried out in accordance with the electrical standard documents NF C 15-100, guide UTE C 15-712-1 and "Practical guide for use by design offices and installers for the installation of photovoltaic generators connected to the electricity grid " published by ADEME and ser. Provide in the circuit a circuit breaker or equipment to detect leakage currents.**

Do not use PV modules of different electrical characteristics and properties in the same system. Connect in series only modules of the same nominal output current.

If the modules are connected in series, the total voltage is equal to the sum of the voltages of each module. The open circuit voltage exceeds the nominal voltage. The solar cable used must have: a minimum section of 4mm<sup>2</sup>, a maximum permissible voltage of 1500 Vdc. The temperature of use of it must be between -40 °C and +80 °C.

Ensure that the open circuit voltage of a module at the lowest temperature of the site multiplied by the number of modules in series is not higher than the maximum voltage of the intended system and all DC electrical components (DC protection and inverter in particular). Under normal conditions (temperature, sunshine), a photovoltaic panel is likely to produce more current and/or voltage than under standard test conditions. Consequently, the values of I<sub>sc</sub> and V<sub>oc</sub> indicated on the back of the panel shall be multiplied by a factor of 1.25 for the determination of the sizes of the components, sections of cables, sizes of fuse, calibration of the cut-off components and protection connected to the exit of the panels.

Tables of characteristics: see the technical data sheets produced

Tolerances to be considered on electrical characteristics: ± 3% on V<sub>oc</sub> and ± 3% on I<sub>sc</sub>

### 4.1) GROUNDING OF PANELS

The frames of the modules must be grounded using the grounding holes of diameter 4 mm present on the frame (large side) and yellow green cables of section 10 mm<sup>2</sup> with lugs or ground braids.

In order to ensure an optimal level of safety, the installation's terrestrial connection diagram must be of type TT (neutral of the transformer connected to the ground, all masses are connected to the ground).

Comply with all applicable local requirements and regulations.

Use approved accessories and components for electrical connections: washers with ressort or fan (notched), bimetallic or stainless steel washers, screws, stainless steel lug - if necessary- to avoid galvanic corrosion. Ensure good electrical continuity between the frames of the modules and between frames and mounting structure.

Connect the entire metal structure to the earth after verification of its conformity.

During a maintenance operation that requires the disassembly of a module, ensure the ground continuity of the installation.

Specific parts for grounding can advantageously replace cables or braids, saving time in implementation and providing a very good contact such as Terragrif claws, patented and approved by mobasolar. The compatibility of the terragrif chosen with the profile of the module frames must be validated by VOLTEC Solar.



## 4.2) CONNECTION MODULES TOGETHER

Do not cut or damage cables coming out of the junction box.

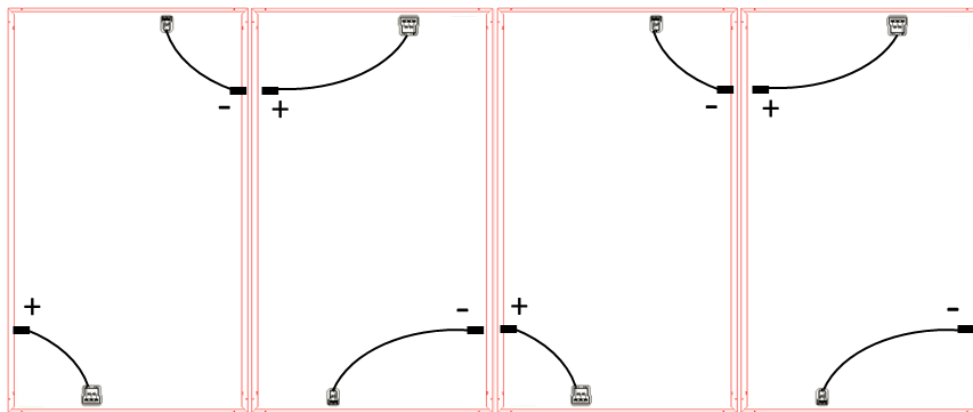
The PV module has a pair of waterproof male and female connectors. For a serial electrical connection, connect the positive connector of the first PV module to the negative connector of the next module. Ensure that the cables do not exert tension on the junction box of the PV module.

Connect the panels to each other by means of the connectors with which they are equipped. Do not replace them. The replacement may result in the nullity of the warranty.

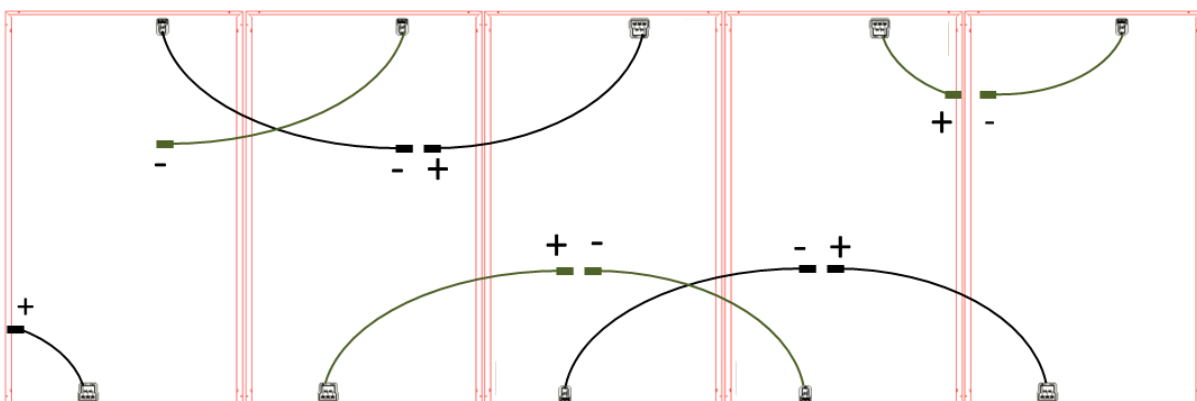
At each connection between panels, ensure that the connectors are fully engaged and locked. Improper contact can cause an electric arc or a warm-up resulting in a short circuit that can lead to a fire.

### Example drawing connection for panel TARKA 126 VSMS :

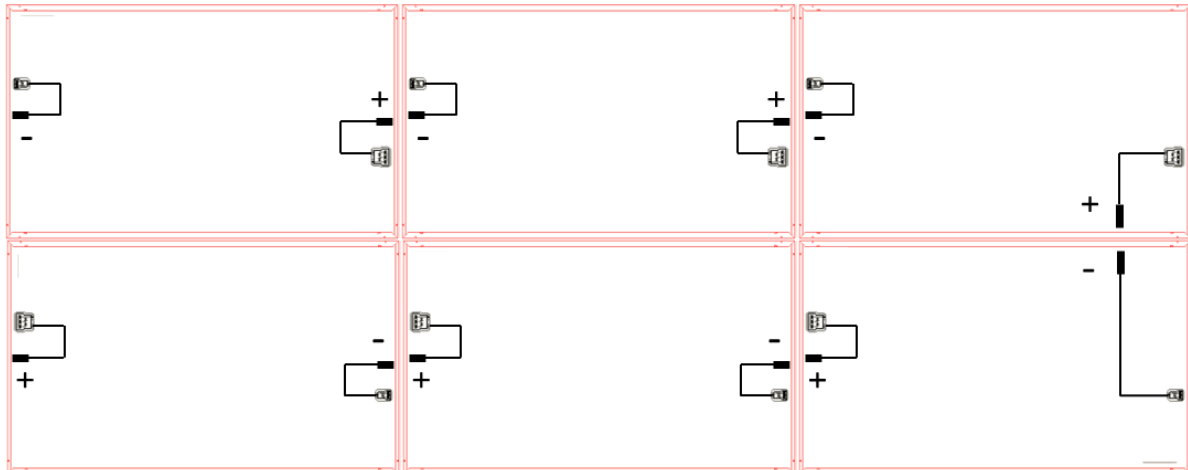
#### Portrait layout :



Or :



### Landscape layout :



### 4.3) CONNECTION OF MODULE CHAINS

Connect the output cable to other equipment in the system using a connector of the same type and making sure to use a well-sized section cable.

Connect the required number of photovoltaic modules corresponding to the voltage and current specifications of the equipment of the photovoltaic system (DC protection, inverter...).

Attach the cables to the mounting chassis using approved fasteners.

Connectors should be placed behind the mounting frame so that they are not directly exposed to sunlight, wind and rain.

To extend the connecting cables and make the connections to electrical equipment, use solar cables and quality connectors that are specifically designed for use in UV exposure and for long periods of time. Set the appropriate cable section based on current intensity and cable length to avoid voltage drops.

A cross-connection or "leapfrog" of photovoltaic modules is allowed.

When the wiring of photovoltaic modules is carried out after they are attached to the mounting brackets, the non-coupled connectors must be protected from moisture and dirt by means of a sealing cap.

For more information consult the UTE guide "Guide for cables used in photovoltaic systems", UTE 32-502 (Nov. 2008).

## V. MAINTENANCE

Before any intervention, make sure that the direct current electrical circuit is open (circuit breaker or DC disconnector open).

Do not touch the energized parts, cables, connectors and junction boxes.

Always use appropriate safety equipment (insulated tools, insulating gloves, etc.)

In case of intervention or repair on the DC part, cover the front of the module with an opaque fabric or any other material to prevent the module from producing electricity.

VOLTEC Solar recommends the following maintenance operations to ensure optimal module performance:

### **Active surface of modules: glass**

- Clean the glass surface of the modules as needed.  
Depending on the geographical location of the installation, the presence of vegetation, sources of dust, air pollution or any other type of dirt can be detected. Thus a cleaning may be necessary. The examination of the signs and the possible finding of fouling will dictate the action to be taken. To clean the glazed surface use demineralized water, possibly mixed with a maximum of 20% of conventional windshield washer product or alcohol, and a sponge or a soft cloth.
- Do not use dishwasher detergent. Do not exceed the proportion of 20% windshield washer product or alcohol.
- Do not use brushes or any other abrasive or sharp equipment

### **Fastening structures and electrical connections**

- Check if the nuts and bolts of the mounting structure are not loosen. Tighten all fasteners that require it.
- Electrical and mechanical connections must be checked periodically by qualified personnel to ensure that they are clean, tight or connected and in good condition.
- Check connection connections for connecting cables, ground cables and connectors.
- During a maintenance operation that requires the disassembly of a module, ensure the ground continuity of the installation.
- Check the state of electrical and mechanical connections from the point of view of corrosion.
- Check the mass resistance of metal parts such as the module frame and the mounting structure.

## VI. RECYCLING

VOLTEC SOLAR is a partner of the Soren organization and contributes to the establishment of a recycling sector.

This is why any defective or end-of-life product can be brought to one of the many Soren collection points. Cf: [www.soren.eco](http://www.soren.eco)

### **For private households**

Disposal information for WEEE users. This symbol (Figure 1) on the product and/or accompanying documents means that used electrical and electronic equipment (WEEE) must not be mixed with household waste for treatment, recovery and recycling, please bring this product(s) to designated collection points, where it will be admitted free of charge.



FIGURE 1

Disposal instructions: Please dispose of used electrical and electronic equipment (WEEE) at designated collection points for recycling such equipment

Alternatively, in some countries, you might be able to return your products to your local reseller when purchasing an equivalent product.

The proper disposal of this product will help to safeguard valuable resources and prevent all potential negative effects on human health and the environment; otherwise, improper handling of these products could increase these risks. Please contact the local authorities for more details regarding the nearest collection point. Penalties may be imposed in the event of incorrect disposal of such waste, in accordance with national legislation.

### **For professional users in the European Union:**

If you wish to dispose of electrical and electronic equipment (EEE), please contact your dealer or supplier for more information.

### **For disposal in countries outside the European Union:**

This symbol is only valid in the European Union (EU).

If you wish to dispose of this product, please contact the local authorities or your reseller to find out the appropriate method of treatment.

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