

PANNELLI SOLARI MANUALE DI INSTALLAZIONE E USO

SOLAR PANELSINSTALLATION AND USAGE MANUAL

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PANNEAUX SOLAIRES
MANUEL D'INSTALLATION ET D'UTILISATION

SOLARPANEELE
INSTALLATIONS- UND BEDIENUNGSANLEITUNG

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1 > INTRODUCTION

Thanks to the photo-voltaic modules produced by SR Mecatronic Srl (hereinafter "SR Mecatronic") it is possible to transform the inexhaustible energy of the sun directly into electricity, in full respect of the environment. To ensure maximum efficiency of the SR Mecatronic photo-voltaic modules, read the following instructions carefully and follow the relative instructions. Failure to comply with the instructions could cause damage or injury to persons and/or property.

This installation and usage manual (hereinafter "Manual") provides instructions for the safe installation and use of the crystalline silicon photo-voltaic modules.

- ▶ Read these instructions carefully before proceeding with the installation.
- ▶ Keep these instructions for the entire useful life of the photo-voltaic modules.
- Make sure that this Manual is available to the operator at any time.
- ▶ This Manual must be given to all subsequent owners or users of the photo-voltaic modules.
- ▶ All additional information received from the manufacturer must be included.
- Pay attention to all the other applicable documents.
- ▶ If the Manual does not provide satisfactory answers to your questions, please contact your supplier. For more information, please visit our website www.srmecatronic.com.

Approved usage

This manual is valid for Africa, Asia, Europe, Latin America and South America. These instructions contain information on the safe handling and use of crystalline silicon photo-voltaic modules of SR Mecatronic quality, as well as on their installation, assembly, wiring, maintenance and disposal.

Safety standards

Above all, the installer and the user of the module are responsible for the relative compliance with all applicable mandatory requirements and regulations.

Except where otherwise specified by legal provisions or standards, the following provisions must be followed during the installation, operation and maintenance of the photo-voltaic modules:

- this manual
- other applicable provisions (such as, for example, specific national legal provisions concerning pressurised devices, operating safety, dangerous goods and environmental protection);
- ▶ specific legal standards and requirements for the installation; any applicable laws and requirements, in particular international, national and regional laws and regulations concerning the design, installation and operation of photo-voltaic systems and roof and roofing activities; any legal standards valid at international, national and regional level regarding work with direct current, especially those applicable to the installation of electrical devices and systems, as well as provisions issued by the respective energy supplier on the use of photo-voltaic systems in parallel with the public network;
- ▶ any international, national and regional regulations on accident prevention;
- ▶ other applicable provisions concerning safety in the installation and operation of electrical equi-

ΕN

1 > INTRODUCTION

pment and devices issued by the appropriate national institutions, for example, in Germany, the Bau-Berufsgenossenschaft (the German professional building association responsible for compulsory insurance in matters of accidents and prevention in the construction sector).

Competent and qualified personnel

Both the installer and the user are responsible for ensuring that the installation (including connection to the electricity grid), maintenance and dismantling are carried out by trained and qualified experts, with approved training certification (issued by a state or federal organisation) for the respective sector of specialisation.

Electrical work can only be carried out by a specialist technician who is officially certified in accordance with the provisions applicable in the individual country based on national standards and regulations (in Germany, for example, the DIN requirements, the VDE regulations) and what is established by the operator of the local electricity grid and/or by the electricity supplier.

Validity

These instructions are valid exclusively for the crystalline silicon photo-voltaic modules of the SR Mecatronic company. SR Mecatronic declines all responsibility for any damage caused by failure to comply with these instructions.

- Pay attention to the wiring and size of the system.
- ▶ The system installer is responsible for compliance with all the necessary safety regulationsduring installation and configuration.

SR Mecatronic assumes no liability based on these instructions.

SR Mecatronic is liable only in the context of contractual agreements or the guarantee provisions

SR Mecatronic assumes no other responsibility for the operation and safety of the modules.

Follow the instructions for any other system components that could be part of the complete photo-voltaic installation. It may be necessary to perform a structural analysis for the entire project.

Additional information for the user

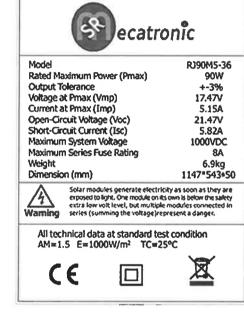
Keep this Manual for the entire useful life of the photo-voltaic system.

Contact your supplier for information on the formal requirements that photo-voltaic systems must meet.

2 > DESIGN > Technical specifications

Technical specifications

For more information, consult the corresponding technical data sheet available on the website www.srmecatronic.com.





Nominal operating cell temperature, NOCT = 44.3 ° C Temperature coefficients (@ 1000 W/sq.m.):

- current (alpha) = 0.0581 %/° C
- voltage (beta) = -0.3572 %/°C
- -peak power (gamma) = -0.4860 %/°C

WARNING!

Under normal conditions of use, a photo-voltaic module is likely to experience conditions that cause a higher current and/or voltage than what is set out for normalised test conditions. It follows that the values of lsc and Voc marked on this module should be multiplied by a factor of at least 1.25 when determining the voltage characteristics of the component, the current characteristics of the conductor and the dimensions of the controls connected to the output FV.

- EN
- Before starting to install, connect up, put the modules into operation or perform maintenance, make sure you understand all the installation and safety instructions.
- When installing, observe all the local, regional, national and international requirements, directives, standards and regulations currently in force.
- · Installation and maintenance may only be carried out by qualified and authorised personnel.

2 > DESIGN > Technical specifications

- · The output power produced by the modules can be higher than the nominal power specified.
- The nominal values according to the industrial standard are quoted with radiation equal to 1000 W/ sq.m. at module level, homogeneous cell temperature equal to 25 °C and solar spectrum with relative air mass AM 1.5. Colder temperatures can cause a significant increase in voltage and power.
- The current intensity and the electrical power produced by the module may increase due to the glare from snow, water or other reflective surfaces.
- · Do not use mirrors or lenses to concentrate solar radiation onto the module.
- The modules are designed exclusively for outdoor operation.
- Installations in which the modules are in contact or partially or completely immersed in fresh or brackish water are not provided for.
- · Only use appliances, plugs, cables and supports that are suitable for use in a photo-voltaic system.
- If the panels waiting to be installed are to be stored outside, always place the panels with the glass surface facing downwards and cover them in order to avoid issues with stagnant water.
- Do not modify, dismantle or adapt the module, or remove any part or label that is attached to it. This would make the warranty rights null and void.
- · Do not apply colours or adhesives to the back of the module.
- · Never leave the module unattended or unsupported.
- Modules with a damaged glass surface or with a crack in the backing film are irreparably damaged and therefore cannot be used. Any contact with the surface of the module or with the support could result in an electric shock.
- Broken or damaged modules must be dealt with and disposed of appropriately. Broken glass can have sharp edges and cause injuries so use suitable protective equipment.
- Always work in a dry environment using modules and equipment that are completely dry unless adequate protective equipment is available.
- · Avoid infiltration of water into the plugs.
- Do not carry out installation operations in the event of rain, snow, frost or strong wind.
- The photo-voltaic modules are not equipped with a switch for switching on and off. They stop operating when the front surfaces are no longer exposed to solar radiation.
- · If working with modules that are exposed to the light, observe all the requirements and regulations for operations with electrical systems under live conditions.
- During the installation and while the module is subject to effect of irradiation, avoid contact with electrical terminals or cable terminations.
- The modules must be protected by means of DC fuses, the nominal values of which are indicated in the technical data sheets of the photo-voltaic products.

2 > DESIGN > Requirements

Installation site

Follow the guidelines below that apply to the installation site:

- the modules have been tested to operate in a temperate climate, in compliance with IEC 61215.
- Photo-voltaic modules are not explosion proof devices.
- Do not use the photo-voltaic modules near highly flammable gases and vapours (e.g. gas tanks or service stations).
- ▶ Do not install the modules indoors.
- Do not install the modules in places where they could be submerged in water for long periods (e.g. in flood plains).
- ▶ Do not use the modules in place of normal covers or roofing materials (the modules are not impermeable).
- Do not install the modules near air conditioning systems.
- Do not install the modules at an altitude of 4000 m above sea level.
- ▶ Do not install the modules in places with a high concentration of salt in the air (for example near the sea), where special precautions must be taken (see "Earthing" and "Maintenance").
- Do not let chemicals (e.g. oil, solvents, etc.) come into contact with the solar panel. Only substances supplied by SR Mecatronic may be used during installation, operation and maintenance.
- ▶ The installation of modules on the surface of water is prohibited. This prohibition applies to installations on both floating and fixed platforms. For these plants, SR Mecatronic may extend the right to the guarantee following a case-by-case investigation of the sizing of the system and of the site. However, the prior written approval of the guarantor will still be necessary.

The photo-voltaic modules are designed for the following applications:

- operating temperatures between -40 °C and +85 °C. Tensile loads up to a maximum of 2400
- Pa and compression loads up to a maximum of 5400 Pa.
- Installation by means of a support structure for photo-voltaic modules.

Prevention of any shading

Optimal solar irradiation allows the maximum energy yield to be obtained:

for this reason the modules must be installed so that they face the sun.

Avoid any possible shading (due, for example, to the presence of objects such as buildings, chimneys or trees).

Also avoid partial shading (caused for example by high voltage lines, dirt and snow).

2 > DESIGN > Electrical design

Module selection

For detailed electrical data refer to the current product data sheet corresponding to the module in question (available on the website www.smecatronic.com).

Only connect modules of the same type and of the same power categoy.

Safety Factor

During normal operation it may be that a module generates a higher current and/or voltage than those used under standardised test conditions, therefore it is necessary to adopt a safety factor:

- In determining the voltage values (V) of the components;
- ▶ In determining the current values (I) of the conductors;
- In the design of the control systems connected to the output of the photo-voltaic modules.

Follow the national guidelines that apply to the installation of electrical systems.

Connection in series

The modules are only permitted to be connected in series up to the maximum system voltage indicated in the up to date version of the data sheet for the individual modules to be installed.

The design of the system must take into account all the possible operating situations and all the technical regulations and requirements that apply. In this way it is possible to ensure that the maximum system voltage is not exceeded even when the safety margins needed are included. When configuring the maximum string length, the voltage limit of the inverter must also be taken into account.

Connection in parallel

The modules could be damaged by the presence of inverse currents (caused by module defects, short circuits to earth or shading).

▶ Make sure that the maximum inverse current load capacity quoted in the data sheet is not exceeded. To limit any possible inverse currents we recommend that the following safety provisions are adopted:

1) design with limited number of strings connected in parallel:

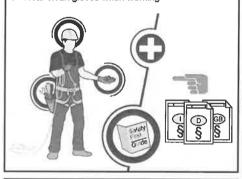
on an inverter or MPP tracker it is possible to operate with a maximum of two strings in parallel without adopting additional current blocking measures.

2) design with string fuses:

position suitable fuses on the positive and negative poles of each string. Use gPV fuses according to IEC 60269-6. Keep to the maximum number of strings allowed as indicated in the specifications provided by the respective string fuse manufacturer and in the technical guidelines.

3 > INSTALLATION > Safety and transport

- Make sure that all personnel are aware of and comply with the provisions on accident prevention and the safety standards
- ▶ Wear clean gloves when working



- Inspect the packaging to check for any damage
- Contact the transport company in the event of any damage to the packaging
 Follow any instructions on the packaging



- ► Keep the modules in their original packaging until the moment of installation
- Store the modules in a safe, cool and dry place. The packaging is not weather resistant.

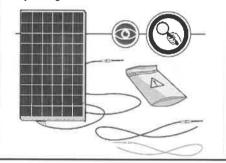


DANGER!

- Risk of fatal injury due to electric shock!

 ▶ Do not install damaged modules

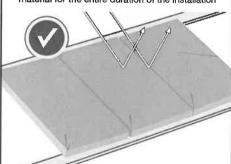
 ▶ Inform your supplier immediately in the event of any damage



DANGER!

Risk of fatal injury due to electric shockl

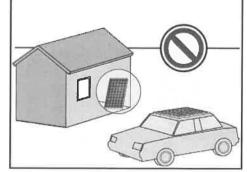
➤ Shield the modules with light-tight (opaque)
material for the entire duration of the installation



DANGER!

Risk of fire

Do not install the modules indoors

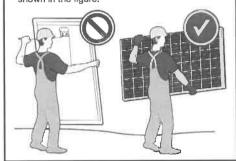


3 > INSTALLATION > Safety and transport

- NOTE! Risk of module damage!

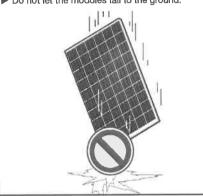
 ➤ Do not lift or move the module by holding it by the connecting leads or the junction box.

 ➤ Transport the modules vertically and horizontally as
- shown in the figure.



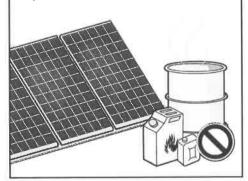
NOTE! Risk of module damage!

Do not let the modules fall to the ground.



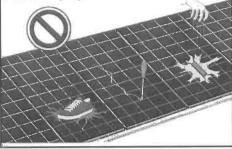
NOTE! Risk of module damage!

Do not install the modules near flammable gasses/ vapours.

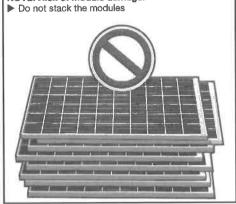


- NOTE! Risk of module damage!

 Do not climb onto the modules under any circumstances.
- ▶ Do not subject the modules to any mechanical
- Do not drop objects onto the modules.

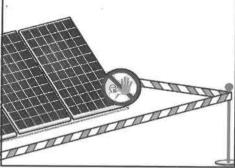


NOTE! Risk of module damage!

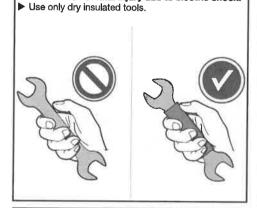


3 > INSTALLATION > Preparing for installation

- DANGERI Risk of fatal injury due to electric shock!
 ➤ Prevent access to the area of installation.
 ➤ Keep children and unauthorised persons away from the photo-voltaic system

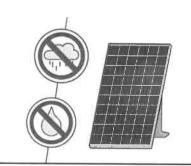


DANGER! Risk of fatal injury due to electric shock!



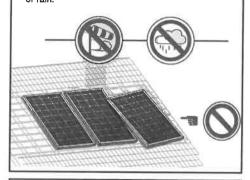
DANGER! Risk of fatal injury due to electric shock!

Make sure that modules and tools are not exposed to moisture or rain at any time during installation.

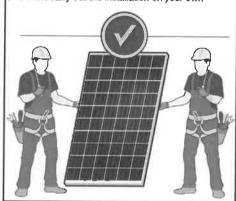


WARNING! Risk of injury if the modules fall!

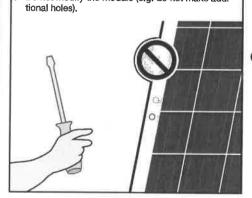
- Fix the modules during installation.
 Do not install the modules in the presence of wind or rain.



Do not carry out the installation on your own



➤ Only install undamaged modules and components
➤ Do not modify the module (e.g. do not make addi-

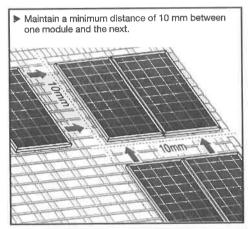


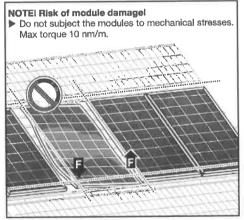
3 > INSTALLATION > Module installation

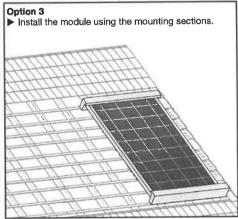
Installation on a camper roof

- ▶ Identify a sufficiently large free area on the roof of the vehicle (if possible without shadows) to allow the positioning of the modules.
- ▶ Clean the roof carefully all around the area chosen for installing the external unit (remove any oil, grease and dust). Also thoroughly clean the underside of the mounting sections to remove any remaining traces of dust and grease.
- ▶ Using a silicone gun, apply a uniform layer of structural polyurethane adhesive to the lower part of the fixing plate at room temperature.
- ▶ Then position the external unit on the roof in the area previously identified and cleaned, pushing it firmly onto the roof to ensure good adhesion and distribution of the adhesive.

N.B. Leave the glue to dry at room temperature for 24 hours before moving the vehicle.







4 > ELECTRICAL CONNECTION > Safety

Connection in parallel

DANGER!

Risk of fatal injury due to electric shock!

When an electrical circuit carrying direct current is disconnected, potentially deadly arcs can be generated.

- DO NOT disconnect the cable when it is under load.
- DO NOT connect exposed cable ends.
- DO NOT touch the two poles at the same time.

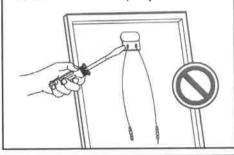
A photo-voltaic module produces electrical current and voltage even in low light conditions. Disconnection of a closed circuit can generate potentially deadly sparks and electric arcs. If several modules are connected in series, the danger is even greater.

- ▶ Check that the open circuit voltage is active even with reduced brightness levels.
- Follow the applicable national regulations and safety guidelines for the installation of electrical devices and systems
- ▶ Make sure you have taken all the necessary safety precautions. In case of module or phase voltages higher than 120 V, the extra low voltage range (ELV) is exceeded.
- Carry out operations on the inverter and the wiring paying the utmost attention.
- Make sure the modules are disconnected from the inverter before disconnecting the inverter from the system.
- ▶ Be sure to observe the specific time intervals after switching off the inverter. The high voltage components require sufficient time to discharge.

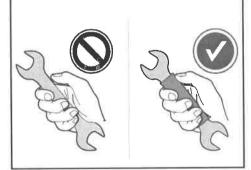
4 > ELECTRICAL CONNECTION > Safety

DANGER! Risk of fatal injury due to electric shock! ▶ Do not open the junction box under any circum-

- stances.
- Replacement of the bypass diodes is allowed only by qualified and trained personnel, with the modu-les disconnected and adequately shielded.

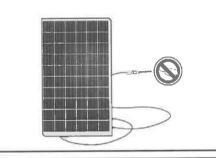


DANGERI Risk of fatal injury due to electric shock! Use only dry insulated tools when carrying out work on the electrical system.

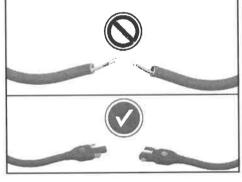


DANGER! Risk of fatal injury due to electric shock!

- Never touch live contacts with bare hands.
 Do not touch the two poles at the same time.
 Cover the connectors using appropriate protective caps until the moment of installation.



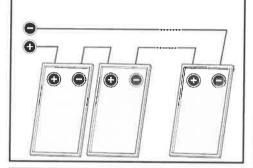
DANGER! Risk of fatal injury due to electric shock! ▶ Insulate any exposed cable ends. ▶ Only connect cables with plug connectors.



4 > ELECTRICAL CONNECTION > Electrical installation safety

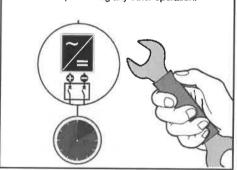
DANGER! Risk of fatal injury due to electric shock!

Neep to the correct polarity.



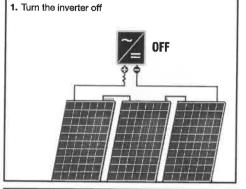
DANGERI Risk of fatal injury due to electric shock!

▶ After switching off the inverter make sure the time intervals specified by the manufacturer are observed before performing any other operation.

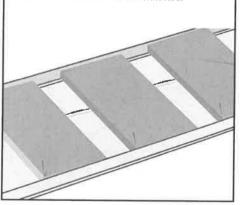


DANGERI Risk of fatal injury due to electric shockl

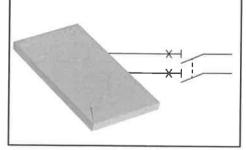
▶ Never disconnect the cable when it is under load.



2. Cover the modules to be disconnected.



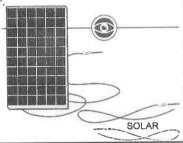
Switch off the DC isolating switch ("OFF" position).
 Disconnect the connectors using appropriate and suitable tools.



4 > ELECTRICAL CONNECTION > Connection of the modules

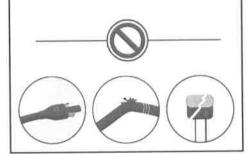
- Use solar cables to connect to the junction box
- output.

 Use the same type of connectors, compatible with the inverter.
- For the connections use copper cables of at least 4 sq.m., suitable for withstanding a temperature of at least 90°

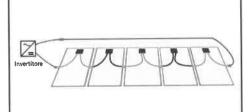


DANGER! Risk of fatal injury due to electric shock!

Make sure all electrical components are in good condition, dry and safe.

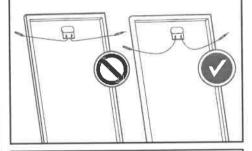


Standard wiring with a return lead.

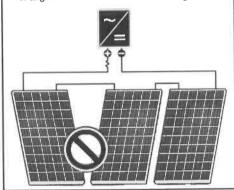


NOTE! Risk of module damage!

- Make sure that the wiring is not subject to stresses.
 Make sure that the cables do not run between the module and the substructure (danger of crushing).



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

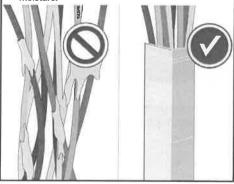


4 > ELECTRICAL CONNECTION > After installation

Make sure that all the necessary safety and operating tests have been carried out, in accordance with current industry standards.

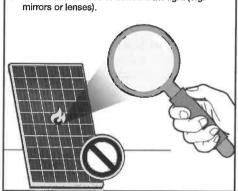


Make sure that the cables are not exposed and/or dangling and that they are protected from dirt and moisture.



WARNING! Risk of fire!

 Do not use devices to concentrate light (e.g. mirrors or lenses)



5 > EARTHING

Protective earthing

The modules must be earthed in accordance with the local regulations currently in force.

Operational earthing

For installations in tropical regions (between 23.5 ° N and 23.5 ° S) and an angle of inclination <5° it is necessary to carry out an operational earthing of the negative pole of the FV generator using an earthing kit.

- ▶ Make sure that the potential difference between the negative pole of the generator and the PE (N) conductor of each MPP tracker of the respective inverters is equal to 0 V.
- ▶ Follow the inverter manufacturer's instructions and the local regulations currently in force.
- ▶ Only use inverters that include authorised earthing kits.
- ▶ The operational earthing must also be carried out in installation sites with a high concentration of salt in the air (for example near the sea).

6 > ERRORS AND FAULTS

Do not try to resolve any problems on your own (e.g. cracks in the glass, damaged cables). In this case, contact an installer or the SR Mecatronic Customer Service Technical Department.

7 > DISPOSAL

Do not disconnect the modules on your own.

Contact an installer or the SR Mecatronic Customer Service Technical Department.

Dispose of the modules in accordance with the relevant local regulations.

8 > MAINTENANCE AND CLEANING

Maintenance

- The photo-voltaic system must be checked regularly by certified personnel.
- ▶ The frequency and extent of inspections may vary depending on local conditions (for example the presence of salt, the concentration of ammonia in the air, high humidity, etc.). The customer/manager is required to find out about the frequency and the checks needed.
- ▶ The inspections must be carried out above all for extraordinary events (for example, storms, hail, high snow loads, etc.).
- ▶ During the course of the inspections it is necessary to check the safety, integrity and cleanliness of the components.

Cleaning

WARNING!

Risk of injury due to contact with surfaces of hot or live modules!

Only clean the modules after they have cooled down

Do not wear or carry components that conduct electricity

WARNING!

Risk of falling from unprotected access!

Under no circumstances should you enter the installation area alone or without taking appropriate safety precautions.

Instruct a specialised company or technician.

Clean the modules as follows:

NOTE!

Risk of damaging the module surface!

- Gently remove ice and snow (e.g. with a very soft broom)
- Do not scrape off the dirt.
- ➤ Wash off dirt (dust, leaves, etc.) with warm water or using an alcohol-based glass cleaner. Do not use abrasive or surface-active cleaners
- ▶ To remove stubborn dirt, use a soft cellulose cloth (kitchen roll) or a sponge, paying attention. Do not use fleece, wool or cotton cloths.



 Remove dirt with warm water or an alcohol-based glass cleaner, broom or soft cloth.

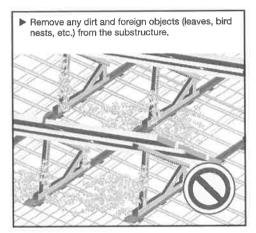
 Do not use surface-active cleaners, scrapers or high pressure cleaning systems



8 > MAINTENANCE AND CLEANING

In some places it is possible to use iso-propyl alcohol (IPA) to remove stubborn dirt and stains within an hour of forming.

- ► Follow the IPA detergent manufacturer's safety instructions .
- ▶ Make sure that the IPA cleaner does not flow between the module and the frame or edges of the module
- During the course of the inspections it is necessary to check the safety, integrity and cleanliness of the components.
- Only use inverters that include authorised earthing kits.
- ▶ The operational earthing must also be carried out in installation sites with a high concentration of salt in the air (for example near the sea).





Instructions for disposal of the product

Pursuant to art. 26 of the Legislative Decree of 14 March 2014, no. 49. Implementation of the directive 2012/19/EU on waste electrical and electronic equipment (WEEE) "The symbol of the crossed-out bin shown on the equipment indicates that at the end of its useful life the product must be subject to separate collection.

Therefore, the user must take the equipment at the end of its life to the appropriate separate electric and electronic waste collection centres, or return it to the supplier when purchasing new equipment of an equivalent type, at the rate of one against one or deliver it free of charge to the supplier at the rate of one against zero in the cases envisaged.

Adequate separate collection for the future use of the equipment assigned for recycling, treatment and environmentally compatible disposal helps to prevent possible negative effects on the environment and on human health and promotes recycling of the materials of which the equipment is composed.

WARNING! There are penalties for illegal disposal

EU DECLARATION OF CONFORMITY

The company SR Mecatronic Srl, based at Via Aldo Moro 1-3 loc. Porretta Terme 40046 Alto Reno (Bologna) - IT, declares under its sole responsibility as a manufacturer that the photo-voltaic module product Brand: SR Mecatronic, Models: RJ130M5-36 and RJ90M5-36, comply with the following community directives:

2014/35/EU - concerning the harmonisation of the laws of the Member States regarding the market availability of electrical equipment destined to be used within certain voltage limits (recasting).

The object of the above declaration complies with the relevant harmonisation legislation of the EU set out below

EN 61215:2005 EN 61730-1:2007+A1:2012+A2:2013+A11:2014 EN 61730-2:2007+A1:2012 CE

All documentation supporting the Compliance with the directives and the aforementioned decree is available from SR Mecatronic Srl.

Porretta Terme, 29 November 2019

Marco Santoli
Chief Executive Officer

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