



MANUAL OF USE AND MAINTENANCE

Installation | Safety warnings | Maintenance

Edition n° 8

Photovoltaic module produced with high efficiency
monocrystalline / multicrystalline silicon technology with
a maximum power of 395 Wp

Models

VE1ZZPVXXX-YYYW;
VE2ZZPVXXX-YYYW;
VE3ZZPVXXX-YYYW**



Made in Italy

** Note: Number of solar cells from 2 to 72, XXX = optional suffix. The optional suffix may be: FG = green poly solar cells / green solar glass; MR = red poly solar cells / red solar glass; TT = transparent backsheet; FL = frameless module; TSE = frame with silicone adhesive (modules only up to 60 solar cells); YYY = rated power. W = watts

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Read carefully the following warnings for installation and the safety *.

Failure to observe these warnings may result in the loss of warranty rights.

For more information get in touch with the dealer specializing .

INFORMATION ON THE MANUFACTURER

GruppoSTG Fabbrica Srl is a new company inserted in the Biella's industrial fabric, born in response to one of the main problems of the Italian and Piedmont's manufacturing industry of components and systems dedicated to the production of energy from renewable sources. The dedicated employment in the companies of origin has been channeled into a common business project, for an activity that takes the form of direct achievements or through partnerships in the sector. The experience of each of the partners acquired in Italy and abroad and the cohesion of the group, experienced over years of common activity, constitute the basis from which to take up the challenge for the further development of the company.

GruppoSTG Fabbrica Srl contributes to the formation of the new supply chain and technological platform of photovoltaics in Piedmont area, developing an innovative production of photovoltaic modules in Biella.

The **GruppoSTG Fabbrica Srl** concretized its activities through the creation of high quality photovoltaic modules made according to "craft" criteria which consist in the care of the details, in the constant attention to the quality and controls very stringent.

GruppoSTG Fabbrica Srl provides support for studies of feasibility, completion of formalities bureaucratic and financial.

The technology adopted and developed by **GruppoSTG Fabbrica Srl**, it allows to obtain products with high performance, increase of productivity, diversification of models, on the basis of the requests coming from the market, maintaining always a constant ratio quality / price.

GruppoSTG Fabbrica Srl can count on a competent and highly professional management, in continuous training, attentive to change and sensitive to environmental issues.

The **GruppoSTG Fabbrica Srl** product is certified in compliance with the national and international standards IEC 61215 and EN 61730-1 / 2 and has a high standard of quality.

The modules photovoltaic are designed and integrated to ensure the plant a yield energy high and a duration than the time of repayment.

GruppoSTG Fabbrica Srl guarantees a rapid and **punctual** logistic system and a highly qualified pre and post-sales technical-commercial assistance service.

The two main types of application that the **GruppoSTG Fabbrica Srl** it aims to meet are:

- Equipment to integration architecture (partially or totally integrated);
- Appliances not integrated (modules PV installed in the ground).

GruppoSTG Factory Srl, a company young, tense the collaboration with Institutions Local, Regional, National and European Union; associations, companies supplying products and services for the energy world, consumers (individuals and companies) who intend to achieve important energy savings.

The our company contributes also to level local, to provide jobs through your own activities. It operates in the constant aim is to consolidate relations with the electrotechnical industry, industries, end-users, designers, installers and the wholesalers.

Thanks to the use of top quality materials and exhaustive quality controls, the photovoltaic modules produced by **GruppoSTG Fabbrica Srl** are characterized by a useful life of over 20 years and optimal operation from the first to the last day of use.

More information about the manufacturer: vgs.gruppostg.com

RECOMMENDATIONS OF CHARACTER GENERAL

Read carefully all the instructions of this document prior to making any operation installation, connection and manipulation of the GruppoSTG Fabbrica Srl module .

The advice provided for a **GruppoSTG Fabbrica Srl** module **can** be extended to several models.

GruppoSTG Fabbrica Srl shall not be liable for loss, breakage, damage or costs additional to a result of an erroneous manipulation of the product as part of staff stranger to this company.

The instructions on how to use, sell, install and connect the photovoltaic modules safely is to use exclusive of technical professionally qualified installation of the modules and in possession of the qualifications required.

No person deprived of such qualifications Professional is authorized to perform the operations described.

IMPORTANT!

GruppoSTG Fabbrica Srl do not assumes any responsibility and denies explicitly any obligation resulting loss, damage or expense arising out of or in any way connected with installation, management, operation or maintenance described in this manual. GruppoSTG Fabbrica Srl assumes no responsibility in relation to violations of patents or other rights of third parties that may result from the use of GruppoSTG Fabbrica Srl modules .

No license is granted by implication or under any patent or patent rights. The information contained in this manual is believed to be reliable, but does not constitute an express and/or implied warranty . GruppoSTG Fabbrica Srl reserves the right to make changes to the product, to specifications or to the manual without prior notice and at its sole discretion.

Observe also the instructions supplied with the other components of the system to power solar.

The manual installation will relate to installations on the ground, on the roof floor and on the roof tilted in modules framed solar

These instructions are part and parcel of the documentation solar system in which are installed the photovoltaic modules and must therefore be preserved with the documentation overall of the system.

At the end of the installation, hand over these instructions to the user of the system, i.e. the customer. Remember the customer to keep these instructions with the documentation overall solar system.

CERTIFICATIONS

GruppoSTG GruppoSTG Fabbrica Srl designs, manufactures and markets photovoltaic modules in Compliance with national and international standards and in particular are approved the following standard:

- **DIRECTIVE 2006/95 / CE Low Voltage / Low voltage**
- **DIRECTIVE 2004/108 / EC EMC**

The projects of the modules were subjected to qualification tests at the laboratories of **Kiwa Cermet Spa** accredited by **Accredia**, body of accreditation independently formed by the initiative of UNI (Ente Italian National Unification) and CEI (Italian Electrotechnical Committee) and under the patronage of the Ministry of Industry, Commerce and Crafts (today Ministry of Productive Activities), of the CNR (National Research Council), of ENEA (Agency for New Technologies, Energy and the Environment), of the Chambers of Commerce, Industry, Agriculture and Crafts and at the laboratories of **KIWA Cermet Spa**.

The evidence of qualification have been performed in accordance with the following rules:

- **CEI EN / IEC 61215 edition 1 (2016) :**

Modules photovoltaic (PV) in the silicon crystal for terrestrial applications. Qualification of the project and approval of the type.

- **CEI EN / IEC 61730-1 / 2 edition 2 (2016) :**

Qualification for the safety of photovoltaic modules (PV).
Requirements for Safety Electric : certification in Class A - Class of Insulation II.

The photovoltaic modules **GruppoSTG Fabbrica Srl** have passed all the tests and have therefore obtained the **qualification of the project and the approval of type IEC** in based on two rules earlier.

The body that performed the tests has issued a **certification on qualification tests** or a certificate of conformity drawn up according to the ISO / IEC 17025 standard .

GruppoSTG Fabbrica Srl have obtained the certification by **KIWA cermet Spa**.

The photovoltaic modules of **GruppoSTG Fabbrica Srl** are qualified by this combination that has achieved the qualification most prestigious of the IEC.

GruppoSTG Fabbrica Srl issues the **CE Certificate of Conformity** for its photovoltaic modules in full safety.

The production of **GruppoSTG Fabbrica Srl** modules is conducted in the regime of **Factory Inspection** , i.e. the control of the process production as part of an agency third certification, as stated in the last certificate issued on **July 24, 2020 report N ° 150301070 / a**. Consequently, it maintains the **“made in EU” certification** because it possesses the requisites required according to **art. 14-D of the IV energy account defined in the Ministerial Decree of 05/05/2011 and the V energy account for photovoltaics according to the Ministerial Decree of 5 July 2012 (article 5, paragraph 2, letter a)**.

TESTS CEI EN / IEC 61215 and CEI EN / IEC 61730- 2

The objective of the test sequence was to determine the electrical and thermal characteristics of the **GruppoSTG Fabbrica Srl** module and demonstrating that the **GruppoSTG Fabbrica Srl** module is capable of withstanding prolonged exposures in climatic conditions similar to those described in the field of application of the standard by covering almost all climatic conditions possible in normal operation. In addition, possible extra loads such as snow, wind and ice are considered, thus providing for extreme electrical conditions. The tests proposed by both the standards, of type electrical, thermal and mechanical, simulate, in complex an aging accelerated of modules comparable to the effect of 20-25 years of exposure in conditions real of operation in order to verify the stability in time.

In practice, the modules that exceed positively the tests have a time of life guaranteed for 20-25 years.

List of tests :

- Try to cycle thermal moisture and freezing
- Test of resistance to fire
- Electrical insulation test
- Test of resistance to the Hot Spot
- Try to cycle heat to warm wet
- Test of strength
- Try to exposure outdoors
- Performance at low irradiance
- Hail test
- Load mechanical test (snow and ice)
- Test of insulation in ambient wet
- Try to cycle heat on the diode of by-pass
- Test of insulation electric
- Try to break
- Try to overload the current reverse
- Try to cut

TECHNICAL DATA

The photovoltaic modules products from **GruppoSTG Fabbrica Srl**, are carried out with cells in technology multicrystalline/monocrystalline silicon with treatment anti reflection high efficiency. They are protected by sheets of Ethyl Vinyl Acetate (EVA) for encapsulation, at the front they are laminated with tempered glass and at the back with an insulating multi-layer surface, resistant to atmospheric agents, mechanical stresses and provided with electrical insulation. The diodes of by-pass contained in the box of junction reduce the losses of power, caused by any phenomena of shading projected onto the surface of the modules photovoltaic. The characteristics of efficiency of the cells are enhanced through the use of glass prismatic which optimizes the collection of light. The process of lamination under vacuum (sealing) confers to **GruppoSTG Fabbrica Srl** module characteristics of duration and performance kept constant over time. The anodized aluminum frame applied to the perimeter of the "sandwich", in addition to simplifying the assembly operations, confers solidity and constant strength, withstanding loads and climatic stresses such as snow and ice with applied pressure in traction up to **1600 Pa and Safety Factor 1.5 -> Design Load 2400 Pa** and in compression up to **3600 Pa e Safety Factor 1.5 -> Design Load 5400 Pa**. The electrical connections are ensured through the junction box, it is supplied complete with by-pass diodes and cables with connectors. In addition to guaranteeing maximum connection safety over time with the high degree of protection IP68, it allows rapid heat removal, avoiding overheating phenomena.

Nominal electrical characteristics are within +/- 3% of measured values under standard test conditions (STC). The conditions are: Irradiation of 1000 W / m², cell temperature 25 °C and solar spectral irradiation per IEC 60904-3 (AM1.5 solar spectral irradiation). The tolerance of the values of power is set to 0/+4.99 W.

The data electrical modules VE172PV are the following:

$$\begin{aligned} I_{sc} &= 9.36 \text{ A} \\ V_{oc} &= 47.38 \text{ V} \\ P_{max} &= 345 \text{ W} \end{aligned}$$

The temperature coefficients of the VE172PV modules and related extensions are as follows:

$$\begin{aligned} \alpha &= 0.055\% / ^\circ\text{C} \\ \beta &= -0.301\% / ^\circ\text{C} \\ \gamma &= -0.388\% / ^\circ\text{C} \end{aligned}$$

The **GruppoSTG Fabbrica Srl** modules photovoltaic are certified for photovoltaic systems to 1000 V. The

GruppoSTG Fabbrica Srl modules have also the following data:

Nominal module operating temperature (NMOT): 45.9 °C.

Performance at NMOT (MQT 06.2): 236.6 W.

Power at low irradiation (MQT 07): 62.5 W.

All the values of electrical material is found on the label located on the side of the rear of the GruppoSTG Fabbrica Srl module and are shown on the technical sheet downloadable from the site: vgs.gruppostg.com

JUNCTION BOXES AND DIODES OF BY-PASS

Junction box



The boxes of junction IP68, realized with plastic resistant to high temperatures, contain cable glands, the terminals of connection and the diodes of protection (diodes of by-pass). The boxes of connection of the modules are placed on the back of the same. It is of boxes in watertight, prepared for resist to agents climate with a degree IP68, provided it respects the seal watertight in glands or gland in points of passage of the cables.

In this sense, GruppoSTG Fabbrica Srl disclaims any liability arising from installation erroneous of these cables (in the case of modules without cables in supplied).

Each GruppoSTG Fabbrica Srl module is equipped with a single box connection for both terminals or a box for the terminal positive and of another to clamp negative. At the end of a correct operation of the module, it will be necessary to respect the polarity of the connections. The cover features of a flange which the fixing to the base of the box of connection. Do not remove the lid for anyone reason. **This flange must not be tampered with.**

The boxes of connection does not go absolutely open and / or subjected to any type of pressure in the course of the installation

of the GruppoSTG Fabbrica Srl module on a support structure .

No element of the same must touch the box of connection.

The upper left figure shows the Sinotech junction box model, model ST-616-1 for VE172PV modules and extended models. The by-pass diodes included inside the junction box are Sinotech products, model 30PV045. MC4 connectors are Sinotech products, model ST4. The cables are Sinotech products, diameter of the section of 4 mm², length of a minimum of 1000 mm, the range of nominal temperature equal to -40 °C / + 90 °C, PPO insulation material .

The boxes of joining the module GruppoSTG Factory Srl are supplied with cables of 1000 mm in length with connectors both originals that are compatible MC4.

For the connection of the string to the device electronics of conversion or adjustment, use only connectors original / compatible.

Diodes of by-pass

The partial shading of a **GruppoSTG Fabbrica Srl** module can induce a reverse voltage between the cells and between the modules connected in series in the string. Consequently, the shaded part would consume power generated by the other cells or modules in series, with undesirable localized heating of the shaded part .

This effect, called hot spot, will be the greater the greater the radiation incident on the rest of the cells and the less the radiation incident on this cell due to the shadow. In an extreme case , the cell could break due to overheating.

The use of diodes for protection or bypass reduces the risk of heating of the cells shaded, limiting the current that the crosses and avoiding, in this way, the breakage.

The modules equipped with a number of cells equal to or greater than 60 in series, manufactured by **GruppoSTG Fabbrica Srl** , are already supplied with 3 protection diodes placed in the junction box

WARNINGS OF GENERAL SECURITY

During the various stages of installation of photovoltaic modules observe the instructions of the manufacturer and abide by all the rules local regulations, the rules of construction and the rules safety.

Before installing the **GruppoSTG Fabbrica Srl** module , contact the appropriate authorities to determine the authorization, installation and control requirements, which must be respected. This must be done not only for installations on buildings, but also for particular applications such as marine and motor vehicles. For the latter, additional requirements may be required .

Comply with the reference standards for the assembly of low-voltage systems, comply with the general requirements for electrical systems and special rooms for photovoltaic power systems.

The installer assumes the risk of any injury that may occur during installation, including, without limitation, the risk of electric shock and / or fire.

The assembly operations and transformation of photovoltaic systems may only be performed by technicians trained specifically authorized by the manager and with the knowledge fundamentals of electrical engineering, electronics and mechanics. During assembly, use clothing and equipment with the appropriate degree of insulation to avoid the risk of electric shock or injury.

The manager is required to implement all the measures necessary for the safe operation of the **GruppoSTG Fabbrica Srl** module .

To this end a person trained and authorized by the manager or the owner must observe and follow all the warnings of security mentioned in the instructions for installation and applied on the device.

To avoid the danger of electric shock and injury, children and unauthorized persons should not be allowed to come near the installation of the modules.

Avoid electrical discharges during installation, wiring, commissioning or maintenance of the **GruppoSTG Fabbrica Srl** module by covering the **GruppoSTG Fabbrica Srl** module with dark and opaque material .

Keep a copy of warnings to install for the photovoltaic modules in the immediate vicinity of the photovoltaics plant.

Do not disassemble the **GruppoSTG Fabbrica Srl** module or remove its components, labels or parts applied by the manufacturer, including protection diodes .

Do not artificially concentrate the sunlight to direct it on the **GruppoSTG Fabbrica Srl** module to avoid the danger of fire or malfunctioning problems .

The **GruppoSTG Fabbrica Srl** modules are supplied in packaging the appropriate waves ensure proper protection in transport. It is recommended to not remove them from the packaging until no is installed.

Do not transport the **GruppoSTG Fabbrica Srl** module by grasping the connection cables or the junction box to avoid the risk of electric shocks and injury or damage to the product.

Check the mechanical integrity of the **GruppoSTG Fabbrica Srl** module before installation. Use only intact modules . Do not install damaged photovoltaic modules .

Keep the **GruppoSTG Factory Srl** module always plan (not bend, turn , or the like).

To avoid the risk of injury, such as accidental fall of the **GruppoSTG Fabbrica Srl** module on a foot or cuts caused by sharp edges, the handling of the **GruppoSTG Fabbrica Srl** module must be performed by at least two persons using the frame for the outlet. Always use non-slip gloves .

Do not let fall the PV modules. Do not let it drop anything on the them. Do not remain standing or to walk over to avoid the risk of injury and damage to the **GruppoSTG Fabbrica Srl** module .

Do not treat the rear side of the **GruppoSTG Fabbrica Srl** module with paints or adhesive glues .
Do not leave never a **GruppoSTG Fabbrica Srl** module no structure to support or not secured in safety.

Do not use modules that may suffer shocks or other damage during assembly. A **GruppoSTG Fabbrica Srl** module with broken glass or with a damaged rear insulating sheet cannot be repaired and must no longer be used. Lightning risk.

Make sure that the structure intended to support the modules on the roof is correctly sized. For roof additions, compliance with specific indications necessary to provide correct installation may be required . Both the roof structure and the installation of the **GruppoSTG Fabbrica Srl** module contribute to the value of the building's fire resistance. Incorrect installation can contribute to an increased risk in the event of a fire. In addition to a preventive design risk assessment, please note that it may be necessary to use additional protection devices such as earth fault protection, fuses and emergency release devices to disconnect the system

Do not use the **GruppoSTG Fabbrica Srl** module for uses other than those envisaged. Use the **GruppoSTG Fabbrica Srl** moduel only for the use which is intended.

Do not install the **GruppoSTG Fabbrica Srl** module in the vicinity of easily flammable gases or vapors , in order to avoid the formation of sparks.

STANDARD OPERATING CONDITIONS

It is recommended that **GruppoSTG Fabbrica Srl** modules be installed in " **Standard Operating Conditions** ". It is advisable to avoid installation in conditions different from the conditions operational standards defined " **Operating Conditions Specials** ". The following are definitions of standard and special operating conditions :

1. Standard Operating Conditions

- **The GruppoSTG Fabbrica Srl** module must only be used for land applications . It is not allowed to use in space or in other " **special conditions** "
- The temperature of operating the **GruppoSTG Fabbrica Srl** module must be comprised between the -40 ° C and the + 40 ° C.
- The limit of moisture relative permitted is up to 100 %.
- The limit of altitude operative is fixed to 2500 mt s.lm, in case of altitudes more contact **GruppoSTG Fabbrica Srl** for further information.
- The modules are tested to resist to loads mechanical in pressure of 5400 N / m² and in traction of 2400 N / m². Check the installation for wind, snow and ice loads . It is necessary to use methods suitable installation. If loads exceeding 5400 N / m² are expected for long periods, contact **GruppoSTG Fabbrica Srl** for further information.
- The modules are tested to withstand exposure to fire according to IEC 61730-2 (MST 23), class C.

2. Special Operating Conditions

- The temperature operational and the conditions of the place of installation are different from the conditions operational standards.
- In the place of installation the saline damage is maximum.
- The local climate generates long periods of snow accumulation heavier than 5400 N / m² without snow being removed regularly. **Warning** : careless handling of snow and ice and use with suitable equipment can cause problems with the frame.
- The local climate generates hailstorms with grains larger than 25mm in diameter.
- The weather local generates storms of sand and dust for more than three days a year.
- In the place of installation the values of pollution, active chemical vapors, soot, acid rain are at the maximum values. Consult **GruppoSTG Fabbrica Srl** for areas in higher than normal concentrations of gases such as NH₃, H₂S, C_xH_y in about requirements special of installation

WARNINGS FOR THE ASSEMBLY

For an installation that hard in the time necessary to use a bracket to mount adequate.

No modifications to the frames of the photovoltaic modules are authorized .

Respect the maximum loads approved for the photovoltaic modules as per the **technical data sheets** .

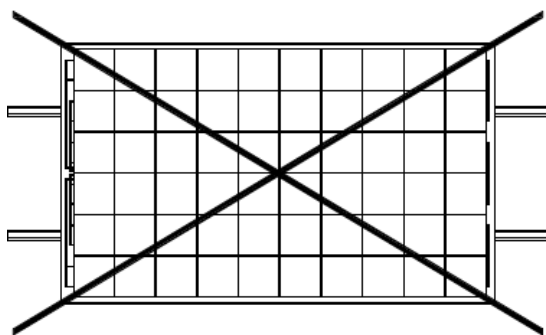
Use only mounting systems that correspond to the expected stresses (wind, snow, etc.)

Observe the loads generated in the way additional from the plant photovoltaic in the static of the building overall.
The fixing must be sized in order to bear the local loads.

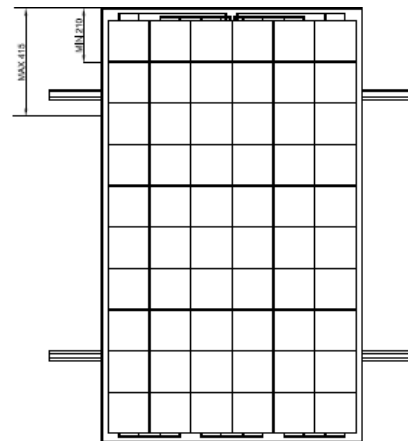
Repairing the cables from possible loads mechanical during the transport and installation.

The photovoltaic modules can be installed both in position vertically that cross.

Each module must be firmly fixed at a minimum of 4 points. The module has been laboratory tested for mounting on its long sides. The distance from the short side and the fixing point must be between a MIN of 210mm and a MAX of 415mm. NOTE: To avoid the possible detachment / detachment of the longer element of the frame due to massive loads of snow and ice, **GruppoSTG Fabbrica Srl** does not recommend locking the modules on the short sides. For any need, contact the **GruppoSTG Fabbrica Srl** technical office .



Fissaggio sul lato corto sconsigliato



Suggerimento delle distanze per il fissaggio sul lato lungo

The photovoltaic modules must rest on at least 4 points or on the linear supports of 2 opposite surfaces of the mounting support .

Do not perforate the frame of the **GruppoSTG Fabbrica Srl** module or subject it to pressure with other fastening systems and do not perform welding operations on it.

In case of mounting of photovoltaic modules only rolled (no frame / frameless) apply the same directions provided for the module standard with frame with the caveat of use terminals of attachment suitable to the thickness of the module laminate.

The fixing of the photovoltaic modules must be carried out with anti-corrosion screws inserted in the holes provided on the frame of the modules or with special clamps on the frame of the modules with an interlocking system.

Do not install never a **GruppoSTG Factory Srl** module in a point if not properly secured. An eventual falling could break the glass.

Holding account expansion linear of the frames of the modules (the distance recommended between the modules is of 5 mm).

In the choice of materials for the system mounting keep account of the number of potential electrochemical (avoid corrosion by contact of materials different).

Make sure that no mechanical or electrical reactions harmful to the **GruppoSTG Fabbrica Srl** module occur by other system components.

The terminals do not have to ever touch the surface of the front of the glass or deform the frame. Avoid that the terminals or systems in interlocking cause shading.

The ventilation openings of the frames must not be closed or blocked, not even by the mounting support. Work only in dry conditions both for the **GruppoSTG Fabbrica Srl** module and for the tools.

Photovoltaic modules must never be in standing water. Avoid any infiltration of rain or condensation in the cable joints.

Fasten the cables electrical to support the assembly to avoid that the connections will find a level of water flow .

If installed on a roof, make sure that the **GruppoSTG Fabbrica Srl** module is attached with a mechanical fixing . The roof should have an adequate level of resistance to fire for the application.

WIRING AND ELECTRICAL RISKS

Run all the wiring in accordance with the rules in force.

For the connection of the PV modules to a system of protection lightning enforce the regulations national regulations.

Installation or implementation that does not comply with the rules can cause damage to people and property. The electrical activation of the photovoltaic modules can only be performed by specialized and authorized electricians . The photovoltaic modules are generators of voltage electricity and therefore Potentially dangerous.

Even in the presence of a minimum intensity light it can generate the maximum voltage in vacuum.

A **GruppoSTG Fabbrica Srl** module generates electricity when he is exposed to sunlight or other sources of light. Cover up completely the surface with a material opaque during the operations of installation, removal and manipulation.

Before the start of the works to interrupt the power supply electricity of the modules to avoid the risk of formation arc voltaic.

Do not disconnect any connections under load.

Do not insert or unplug never the connectors when they are under tension.

Always work in non-humid conditions, both as regards the **GruppoSTG Fabbrica Srl** module and the instruments. During installation, the photovoltaic modules and especially the connectors and tools must be dry.

Cater to a protection sufficient to avoid the contact with components conductors of voltage. Equipping the installation of special devices to protect electrical adequate.

Use tools specially coated with insulating material when working on the **GruppoSTG Fabbrica Srl** module .

Before installation check that cables and connectors are not damaged. Protect the socket contacts from dust and dirt. Do not perform connections if the contacts of the plug are dirty.

Protect the cables against damage. The connections must be in perfect mechanical and electrical condition .

The cables are equipped with connectors for photovoltaic systems. Always pay attention to the correct polarity of the **GruppoSTG Fabbrica Srl** photovoltaic module ; polarity reversal can cause damage to the diodes of protection. The negative pole is coded as minus, the positive pole as plus (the use of polarized cables is recommended).

For additional wiring is necessary to use only cables designed for use in photovoltaic systems type PV1-F namely unipolar cables for photovoltaic systems, with isolation and sheath elastomeric compound, free from halogens, not propagating flame and low development smoke.

If you face use of a controller, it will be necessary to install it in a point easily accessible so that the user you can verify the elements of control.

If the modules are used with batteries, follow all the recommendations provided by the manufacturer of the same in what to safety.

The section of the conductors used must be able to ensure that the drop of voltage of the system does not exceed the 2% of the nominal voltage of the same.

The connection in series of modules photovoltaic (sum of the voltage of the modules) can exceed the low voltage of 120 security Vcc.

The voltage maximum of the system of modules photovoltaic not may be exceeded even in case of low temperature environment (**see tab technical and nameplate of identification of the product**).

Under normal conditions , a **GruppoSTG Fabbrica Srl** photovoltaic module can produce more current and / or voltage than indicated in standard conditions. Therefore, the ISC and VOC values shown on the label of the characteristics of the **GruppoSTG Fabbrica Srl** module may be multiplied by a factor of 1.25 to determine the maximum allowable values of the components of the installation, in respect to voltage, current, section of the conductors, fuses , and cuts of the controls connected to the output of the photovoltaic generator .

The **GruppoSTG Fabbrica Srl** modules are provided with cables having the characteristics indicated **in the sheet of specific techniques** for each module **GruppoSTG Factory Srl** , with a range of temperature of work between - 40 and + 90 ° C.

Connection of modules in series / parallel

All **GruppoSTG Fabbrica Srl** modules connected in series must be of the same class and / or type of model. Only connect modules with the same current value in series. The load capacity of the reverse current is equal to 15A use fuses of protection for overcurrent equal to 15A.

For the connection in parallel connect only modules **GruppoSTG Fabbrica Srl** having the same value of voltage.

The "Class II electrical safety" certificate provided by the modules guarantees insulation up to a voltage of 1000 Vdc. (IEC standard); accordingly, it will be possible to connect modules in series up to achievement occurred of such voltage in base to the protection of class A.

All **GruppoSTG Fabbrica Srl** modules connected in parallel must be carried out with the aid of one Box of derivation.

It will be necessary to use a cable with an adequate section for conducting the sum of currents generated by the modules (minimum section of 4 mm²). All cables used in the installation must comply with IEC 60228 class 5.

The maximum number of **GruppoSTG Fabbrica Srl** modules **that** can be connected in series or parallel must depend on the legal requirements, the maximum current and voltage values indicated on the label of the **GruppoSTG Fabbrica Srl** module and the specifications of the connected equipment such as converters and inverters. The maximum value of **GruppoSTG Fabbrica Srl** modules **that** can be connected in series must comply with the following formula

$$N^{\circ} \text{ Mod.} = 1000 / (1.25 * V_{oc})$$

The **GruppoSTG Fabbrica Srl** modules may be used for installations "stand alone" to recharge the batteries are used only if charge regulators adapted to control and adjust the output parameters of the module **GruppoSTG Fabbrica Srl** in base to specific requests from the equipment to feed.

If for longer routes, was necessary a larger section of the cables for the transport of energy to the relative equipment, it will make use of boxes of connecting external and terminal blocks appropriately dimensioned.

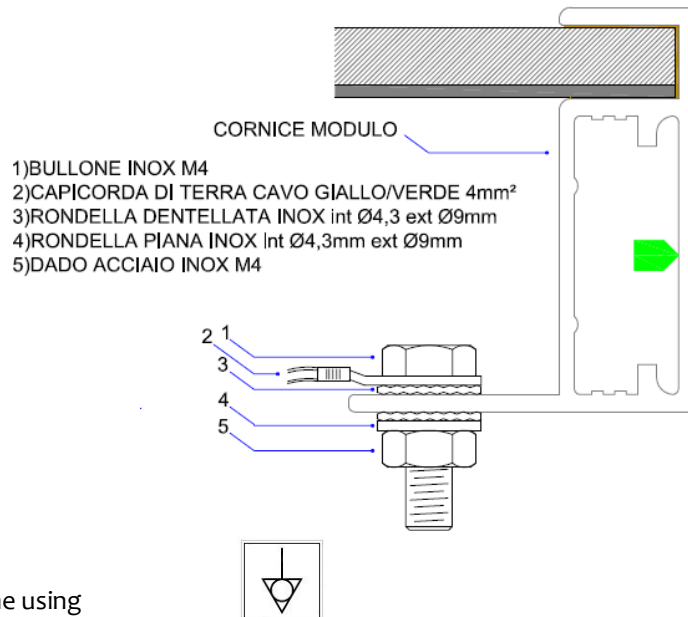
Connection of the modules to the earthing system

The mass in the ground of the module VGS must be carried out by securing the frame and the support structure in order to avoid shock or electrical fire, contact the local authorities to determine the requirements for putting in the ground required.

The mass to earth proper must be realized by connecting the frame of the modules and the support structure using a ground conductor continuous (it is recommended that a section of 4 mm²).

Make sure you have made an electrical contact through a hole \emptyset

4mm marked "ground" present on the frame using technique and components according to the scheme described on the side. The connections are made all in so bonding.



Warning: check the continuity of the electrical contact not allowing the contact of different materials such as copper and aluminum. Use cable lugs in stainless steel, beryllium or tin. Do not use never screws self-tapping.

MAINTENANCE OF THE PHOTOVOLTAIC GENERATOR

The photovoltaic modules require operations of maintenance limited.

The circuit inside of the cells and the welds of connection are in fact isolated from the environment external by means of layers of material protective and the own structure it is devoid of pieces furniture.

The operation of maintenance consists of:

- Periodic cleaning of the modules.
- Visual inspection of the modules.
- Control of electrical connections and the wiring.

Periodic cleaning of the modules

The dirt accumulated on the cover transparent (e.g. residues industrial and material of rejection of birds) of the modules can cause reversal of similar effects to those produced by shadows, reducing its performance.

A second of the conditions environmental, a degree of dirt more or less high can lead to a reduction of the generated energy . The intensity of the effect depends on the opacity of the residue.

The layers of dust that reduce the intensity of the sun in so uniform not are dangerous and the reduction of power not has, in general, significant.

The periodicity of the process of cleaning depends, logically, the intensity of the process of soiling. The action of rain can, in many cases, minimize or eliminate the need for cleaning the modules.

Wash the modules photovoltaic with water with a temperature adapted to that of the module GruppoSTG Fabbrica Srl using one rag or a sponge soft, avoiding the accumulation of water on modules photovoltaic.

In any case, you can use machinery to pressure.

If necessary, use a mild liquid detergent . Do not use never detergents containing agents abrasive..

The visual inspection of the modules

The purpose is to detect any:

- Tears of glass.
- Deteriorations interior of the seal watertight the module **GruppoSTG Fabbrica Srl**.
- Oxidations of the circuits and of the welds of photovoltaic cells for the most part due to moisture in the form **GruppoSTG Fabbrica Srl** in following the rupture of the layers of the housing in the phases of installation and of transport.

Control of the connections and the wiring

Every 6 months or so, do a maintenance preventive :

- Check the mounting and the state of the terminals of the cables for connecting the modules.
- Check the seal sealed the box of terminals.
- If necessary, check the electrical characteristics of the **GruppoSTG Fabbrica Srl** module .

In the event that you they spot problems of seal watertight, it is necessary to replace the elements concerned and carry out the cleaning of terminals.

It is essential to cure the sealing of the box of the terminals, using, in the second of the case, joints new or a sealant to silicone

ANY FAULTS

Thanks to rigorous controls of quality that are undergoing the modules Photovoltaic first to be put on sale, failures are very infrequent.

It can , however, verify the cases of which below, due however to causes unrelated to the process of manufacture:

- Breakage of the glass of the modules.
- Penetration of moisture within the modules
- Faults connecting the modules to the system.
- Shadow effect

Breakage of the glass

Glass breaking generally occurs as a result of external actions: breakage during transport to the construction site, due to erroneous installations , impacts, throwing stones, etc.

The breaking of the tempered glass always occurs in the form of total chipping of the surface, clearly highlighting the point of impact.

In addition to reducing performance, chipping can create dangerous conditions for electrical insulation. Even if the **GruppoSTG Fabbrica Srl** module will continue to function, it is **absolutely** necessary **to** change the **GruppoSTG Fabbrica Srl** module as soon as possible in order to guarantee both safety for people and things and the operation of the system.

Penetration of humidity inside the modules and relative oxidation of the internal circuit of the cells and of the connection welds .

Even if it is an infrequent failure, it can occur as a result of bumps and scratches on the rear insulating sheet due to external aggressions . When moisture penetrates up to the circuit of cells and the relative connections, gives rise to corrosion that reduce and even come to break the electrical contact of the electrodes with the material of the cells, preventing the collection of electrons and inutilizzando so the **GruppoSTG Fabbrica Srl** module.

The voltage and intensity are reset and the **GruppoSTG Fabbrica Srl** module must be promptly replaced. If, in a revision are detected serious deterioration of the module **GruppoSTG Fabbrica Srl** , it is preferable to provide for its replacement.

Faults in the system for connecting the modules

Date the excursion thermal, for eg., between the day and the night, you can verify a loosening of the connectors of the wiring of the modules. For this reason, it must be inspected regularly (for eg., In cadence biannual) the connections, providing to a their clamping if necessary.

In the course of installation, make sure the seal watertight of boxes of connection by means of the cable glands. In the event of water infiltration into the connection box, the presence of this element on the contacts causes voltage drops in the circuit and, consequently, a drop in the power generated. The remedy consists in cleaning the terminals of connection and the replacement of the joint of the box connections or cable, if they are defective. In this operation, it is useful to use terminal sprays used in the electronics field .

Shadow effect

The effect shadow or of point heat is caused by a shadow punctual in one or several cells of the **GruppoSTG Fabbrica Srl** module while the rest receives a radiation high. It should put a remedy to such a situation by eliminating the cause of the shadows. In order to avoid deterioration of the cells, they will predispose the diodes of protection referred to in Chapter.

Defects of manufacture

The manufacturing defects, if present, is normally detected during the first days of operation. They are , however, quite rare, with an incidence to the of under of one per thousand, given the strict control of quality done at the establishment **GruppoSTG Fabbrica Srl**.

PUTTING THE SYSTEM OUT OF SERVICE

Do not come into contact with bare connectors .

Separate the inverter on the side AC from the network of distribution, by placing the plant in the state in vacuum.

Separate the facility photovoltaic inverter in the point of disconnection on the side of CC in a way conforming to the norm.

The plant is now out of service and can be disassembled observing the corresponding warnings of safety.

CERTIFICATES DOWNLOAD

GruppoSTG Fabbrica Srl provides for the creation of forms in respect of standards national and international
(Ref. CERTIFICATIONS Paragraph of this manual).

All the certificates are downloaded from the website: vgs.gruppostg.com