



SAFETY, INSTALLATION, OPERATION & MAINTENANCE MANUAL FOR SOLAR PV MODULES



Manufactured By:

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1. General Informations

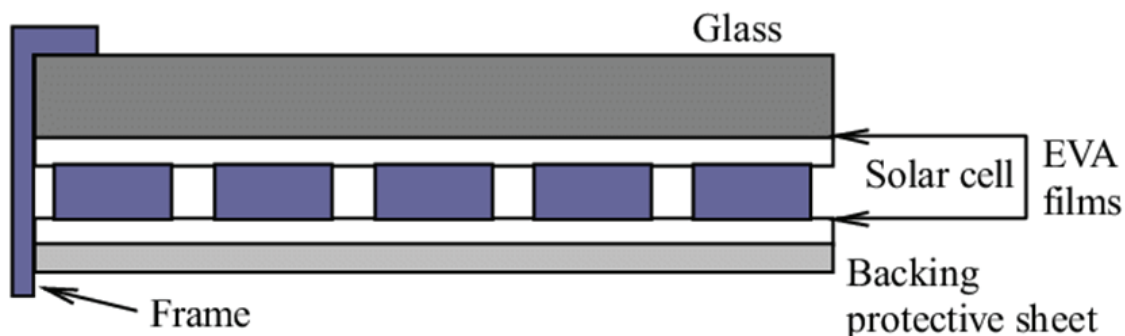


1.1 Introduction to Maglare pv modules

This all documents provides information for the safe installation and operation of our MAGLARE SOLAR PHOTOVOLTAIC MODULE. Please read carefully all this entire instruction of the product during installation. Information about system design, safety, and operation are available throughout our company. Determine the local permit, installation and inspection requirements before installation.

This document is applicable to all MAGLARE SOLAR MODULES PRODUCTS. MAGLARE SOLAR modules are made of crystalline solar cells in series with high-efficiency power. The circuit of cells is laminate dusing E.V.A(ethylenevinylacetate) as an encapsulant in a set formed by a tempered ARC glass on its front side and at the backplastic polymer which is used for the protection and electrical hazardsafter that the laminate is inserted into an aluminum structure frame with the matching sizes of the frame. The junction boxes with IP-65 enclosure protection which are made using plastics which can bear to high temperatures and contain the connection terminals and the protection of the bypass diodes. The frame has various holes in order to attach the module to the support structure, and to its ground-mounting if necessary.

Figure1 shows a schematic diagram of across-section of a photovoltaic module



1.2 Disclaimer of Liability

Please follow up all instruction of the Industry while handling, installing, and using the solar product. This guide is designed for use by trained and certified solar professionals only. MAGLARE SOLAR will have no responsibility for loss, damage, breakage or expense for improper installation, handling or improper use of this product.

1.3 General Safety Reminders

IMPORTANT NOTE: THE MAGLARE PRODUCT IS DESIGNED FOR INSTALLATION BY QUALIFIED PERSONNEL ONLY. ALL HANDLING AND INSTALLATION MUST BE PERFORMED IN COMPLIANCE WITH ALL APPLICABLE CODES, RULES AND REGULATIONS.

In addition to the applicable rules and regulations, please follow all guidelines for safe handling and installation of MAGLARE SOLAR modules. In addition to the guidelines below, always observe industry best practices when handling and installing any MAGLARE SOLAR PV module.

1. General Informations



1.4 Guidelines for Lifting Handling and Installation

LIFTING, HANDLING AND INSTALLATION

- Avoid lifting the module or carry the module by junction box or PV wire cables.
- Don't do extra holes in the frame for our comfort.
- Avoid scratches on the frame. Scratches on the frame will harm the protective coating and the scratches can result into corrosion and make the whole structure weak.
- Avoid scratches or damage on the module backsheets. Scratches on the Backsheet could affect module performance, output and validity.
- Don't stand on the module, do not throw anything on module, do not scratch or allow objects to hit modules directly (especially module glass side).
- Avoid installing or handle the modules during periods of high wind.
- Save these instructions for future reference for installation.

ELECTRICAL HANDLING AND INSTALLATION

- **Modules interconnect with the points can conduct direct current (DC) which are sources of voltage when the module is underload and when it is exposed to light.**
- If improper connection or disconnection is made that may harm or cause serious injuries.
- While handling any module use safety.
- Remove all metallic jewelry touching to direct body while installing this product to reduce the chance of hazards to live circuits.
- To avoid electric shocks please use electric gloves and safety instruments.
- Don't touch any terminals while the module is exposed to direct light.
- During installation use suitable protection prevent a discharge of atleast 30 direct current volts to each person on crew.
- Don't connect or disconnect modules when current from the modules or an external source is present.
- Don't remove or misuse module connectors, this will avoid module warranty.
- While making connection or breaking any connection cover the module with sheets or anything through which light cannot pass through.

1. General Informations



1.4 Guidelines for Lifting Handling and Installation

ELECTRICAL HANDLING AND INSTALLATION

- Only the supplied locking connectors must be used and safety clips in order to prevent untrained persons from disconnecting the modules once installed to avoid hazards.
- Don't try to change or repair any part of the module because there are no serviceable parts available.
- Damaged modules (broken glass, torn backsheet, broken-boxes, broken connectors, etc.) can have or give electrical hazards. Direct Contact with damaged module to the module frame can cause electric shock. The dealer or installers should remove the module from array and contact the supplier for disposal instructions.

1.5 Electrical Specification

- The electrical characteristics are within ± 10 percent of the indicated values of Isc, Voc and Pmax under standard test conditions
- Under normal conditions, a Photovoltaic module is likely to experience conditions that produce more current and / or voltage than reported at standard test.
- Conditions accordingly, the values of Isc and Voc marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes, and size of controls connected to the PV output.

1.6 Installation

Please note down the following instructions:

- While the module is direct to sun the module is working and cell temperatures go high, so kindly install the module like that the air can freely circulated through the module.
- The cross section for the conductors must be ensured that the voltage drop during the installation does not exceed 2% of its nominal voltage.
- MAGLARE Solar modules are supplied with or without cables, according to where they are ordered. Should they be supplied without cables, it is recommended that cables with crosssections between 4 to 10mm to be used.
- The cables, which allow easy handling while providing high protection against overload and short-circuits, are formed by flexible Cuconductors, cross linked insulated polyethylene and coated with polyvinylchloride or similar insulation. The insulation should be flame, acid and alkali resistant and should be stored in a free area.

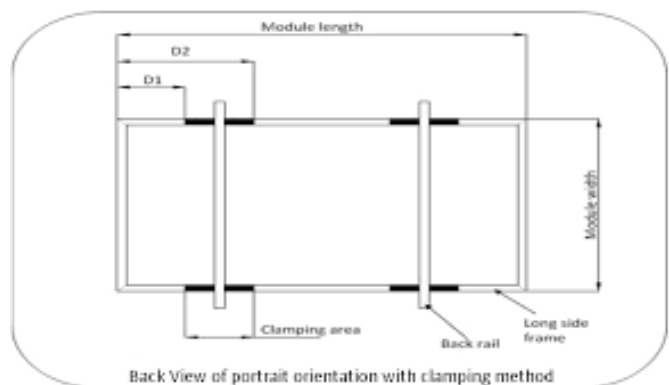
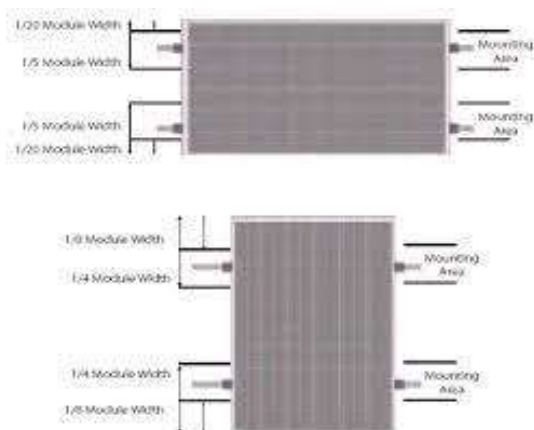
1. General Informations



1.7 Warnings

ELECTRICAL HANDLING AND INSTALLATION

- The modules should be handled and installed by qualified or trained persons only.
- Don't climb-up or walk on the module.
- Don't drop the module or throw objects on the module.
- Use the module only for the purpose to which it is to be used or design.
- Do not dis-assemble the module or remove any part of the module assembled by the manufacturer without informing the manufactures.
- Don't concentrate sun light or other artificial light sources on to the module.
- Do use tools duly-coated with insulating material while working with the modules.
- Always work under dry conditions and normal weather.
- While maintenance of the module take care to avoid electric discharge.
- Don't touch the terminals with naked hands while the module is having direct light or sun light.
- Install with suitable protection to redirect a discharge of 30 or more direct current volts to if delivered any person on the installation team.
- Do not stand or step on pv module like below picture shows, this is prohibited and there should be micro-crack which may cause a sharp decline of module's power performance.



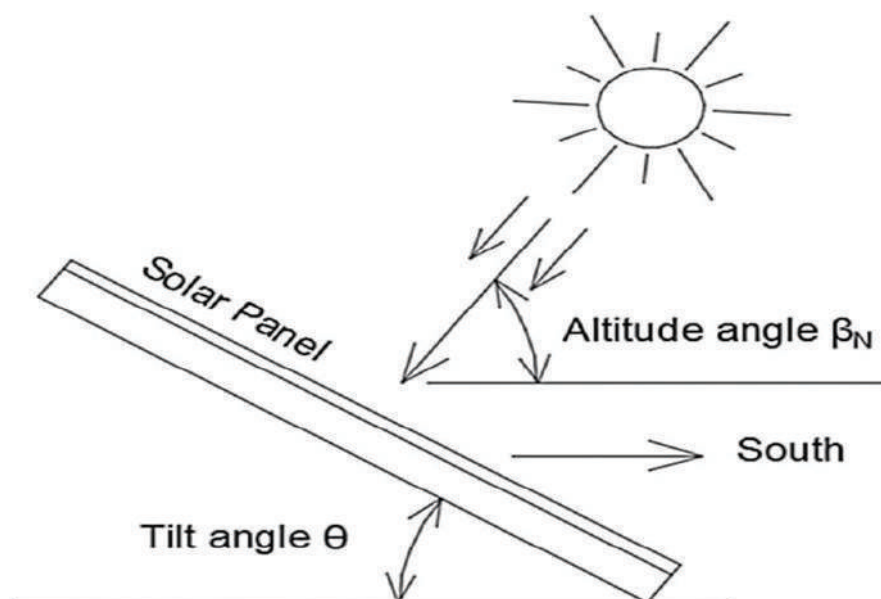
2. Mounting & Structures



- To have less risk of an indirect lightning strike avoid forming loops when designing the system.
- Modules must not be fitted at over height. Please ensure that the mounting is done in such a manner that it can take load of some wind.
- Precipitation can run off through small openings on the back side of the module. Make sure that the openings are not masked after mounting.
- The maximum load on the module must not exceed 30 lbs / ft² for UL & 5400 Pa for IEC to avoid exceeding the maximum load, site-specific live loads such as wind and snow should take into account. The modules have been evaluated by UL for a maximum positive or negative design loading of 30 lbs / ft².
- The installation of module facing towards north and south direction, and facing south and north direction that will generate low electricity. The incorrect installation will not give proper output.
- All modules, which connected in same series, must have in the same angle, otherwise it will lose the power because of the differences of sunshine radiation.
- Solar pvmodules produce the full power when they are directly pointed towards the sun.
- For installations where the solar modules are mounted to a permanent structure, the solar modules should be tilted for optimum winter performance. As a rule, if the system produces enough power in the winter, it will be definitely produces enough power during the rest of the year.

The module tilt angle is measured between the solar modules and the ground.

Figure shows a schematic diagram of mounted photovoltaic module with tilted angle with respect to latitude.



- Please must Avoid installing under the shadow or nearby tree, even the factory use the bypass diode to decrease the loss of energy, but the shadow will lead to losing of output power or damage to the module.

Suitable installation

- Please ensure that the module meets the all technical requirements of the system. Make sure that other system components do not exert damaging mechanical or electrical influences on the modules when connected in series, modules must all have the same amper. When connected in parallel, the modules must all have the same voltage. The modules must not be connected together to create a voltage higher than the permitted system voltage or for high current and power.
- Modules must not be fitted as over height glazing or vertical glazing. Ensure that the mounting system can also take some pressure of wind loads. There are openings at the base of the module frame to allow water to drain. Ensure that these openings are not blocked not partially blocked by the module installation method.
- The modules have been evaluated for mounting using the 4 provided mounting holes in the frame.

Mounting with holes

- Each and every module must be securely tighten by screw sets at a minimum of 4 holes (12mm×6mm). The frame has been tested for mounting on the long sides of the module. From the short sides module is not secured.
- We recommend use a torque wrench for tightening the bolt during installation. The tightening torque (using stainless steel bolts. Stainless steel washer and Stainless steel nut) should be around 15-20Nm. Use the mounting holes to secure the module and do not drill additional holes (doing so would void the warranty). Use appropriate corrosion-proof material.
- Clearance between the module frame and mounting surface may be required to prevent the junction box from touching the surface and to circulate cooling air around the back of the module. If the modules are to be installed on the roof, the below standoff method is recommended.

Stand-off method

- The modules are supported parallel to the surface of the building roof. The space between the module frames and surface of the roof is required to prevent wiring damage and to allow air to circulate behind the whole module. The recommended stand-off height is minimum 50mm. If other mounting means are employed, this may affect the Listing for Fire Class Ratings.

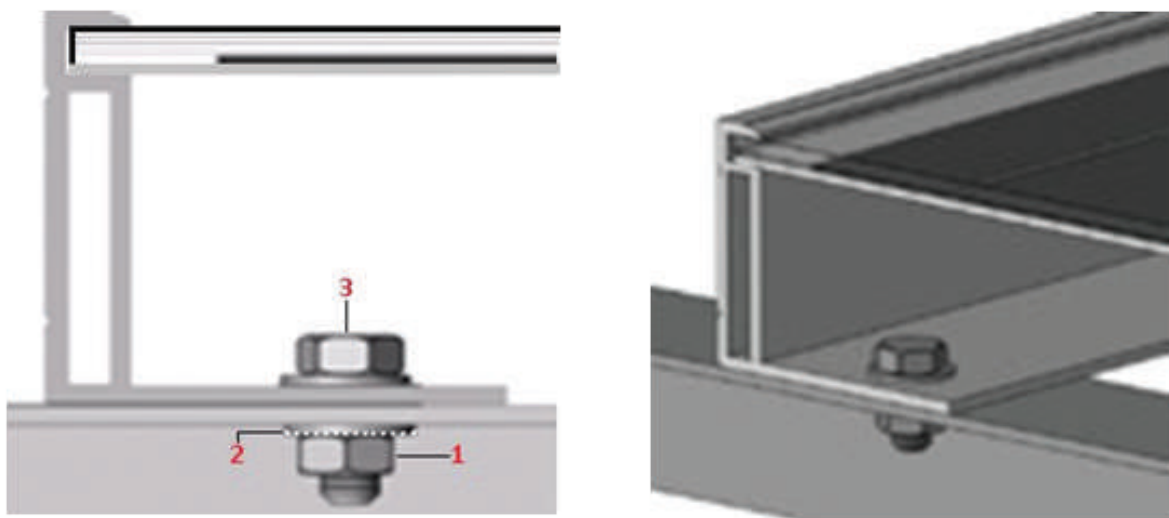
2. Mounting & Structures



Screwing

- Secure the module with the structure mounting holes which is given by the factory. The torque wrench must be used for only assembly. In the examples shown, the tightening torque must be 20Nm. Use the existing holes for securing the module, do not drill any additional holes (doing so will void the warranty). Use appropriate corrosion-proof fastening materials.

Figure shows a schematic diagram of screwing method for Mounting.

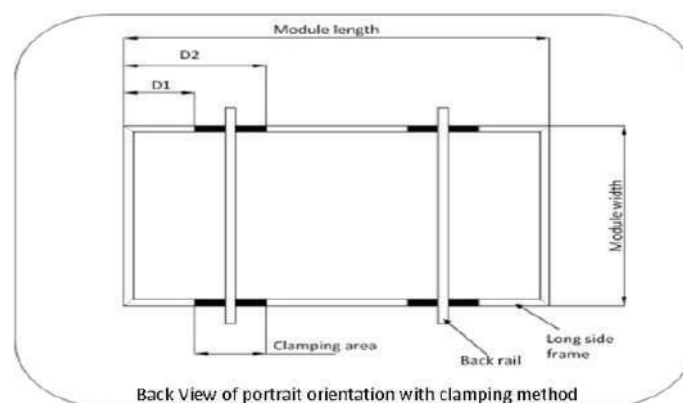


1. Stainless steel nut
2. Stainless steel washer
3. Stainless steel T-head bolt

Clamping

We suggest you to use the landscape and portrait orientation to install the solar module, please note the diagram below, while installing:

Figure Mechanical dimensions when modules installed in portrait & landscape



2. Mounting & Structures



Clamping

The sub-structure is a supporting frame. It's made of steel. We can install the modules on it.

The following picture is the practical example:



3. Earthing

Earthing for solar modules is important and should always have negative for reducing or eliminating shock and harmful hazards. The installer of a solar system have responsibility for earthing each and every module frame. It is recommended to ground each module frame at the provided earthing holes. (6mm diameter, marked with the Earthing symbol)

Figure shows an earthing hole and symbol.



3. Earthing

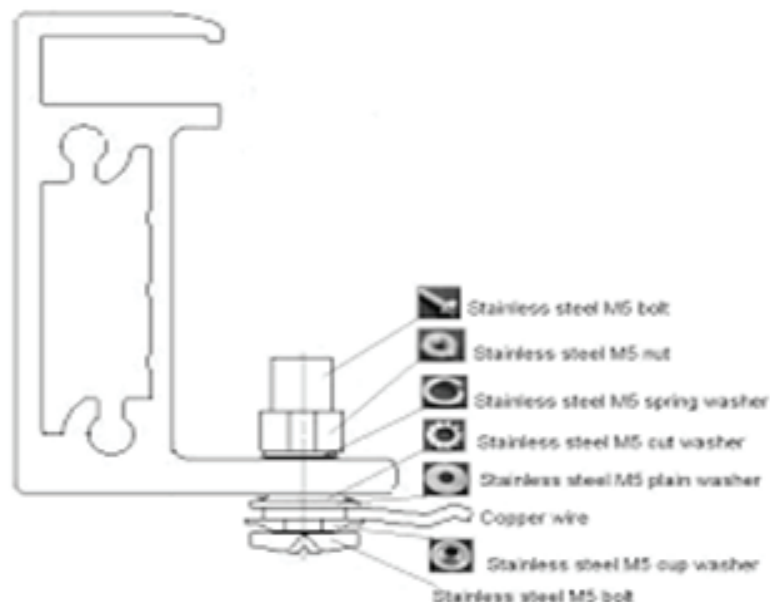


The earthing connections between modules must be approved by a well-qualified electrician. The main earth ground must only be connected by a qualified electrician. UL approved grounding method is important in the USA and Canada. Installation shall be in accordance with CSAC22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part I.

Example:

The modules can be connected at the grounding holes using stainless steel nut, bolt, star washer and flat washer. The torque rating provided for grounding means is 2.3 to 2.8Nm [20 and 25in.-lbs]. The grounding method of the frame of arrays shall comply with the NEC, article 250.

Figure shows a diagram of earthing of photovoltaic module.



The grounding screw, bolt or other parts are separately used from the mounting parts of the module. The earthing is achieved through securement to the array frame. The array frame shall be grounded in accordance with NEC Article 250.

4. Wiring

The maglare modules use the junction box with cable Photovoltaic wire, with single core which is with 90° sunlight resistant rating. This junction box, on the back side of the module, is climate proof and it is designed like that, that it is to be used with standard wiring or conduit connections. The Wiring methods should be in manners with the NEC (National Electrical Code). When the module is shipped from the factory it is supplied with bypass diode and cable clamps. The all modules had been tested with junction box for UL with photovoltaic wire, type PV Wire, with 90° sunlight resistant rating size has been used for IEC & UL testing. To avoid ingress of water the junction should be placed in the upper most position.

4. Wiring



Correct wiring scheme

- While designing any of the system, please do avoid forming loops around to minimize risk of an indirect lighting strike on the system. Always check the wiring is correct or not before starting up the generator. If the measured open circuit voltage (Voc) and short-circuit current (Isc) differ from the specifications, then there will be fault of wiring.

The Correct manners to contact plug connectors

- The plug connector has its own polarity. Always sure that the connection is safe and tight. The plug connector should not be stretched. Otherwise, it will break easily.

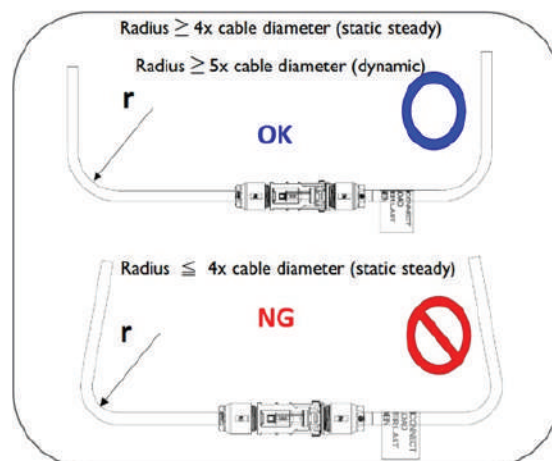
Use of suitable material

- Use cable extensions and plugs that are designed for outdoor application. Ensure that they are in perfect electrical and mechanical condition. Use only cables having one conductor. Select the appropriate cable diameter to minimize voltage drop (to calculate the minimum cable diameter and the fuse, and to calculate controls, multiply the Isc and Voc by a factor).

Cable Protection

- Secure the cables to the mounting system using UV-resistant plastic cable ties. Protect exposed cables from damage using suitable precautions. Avoid direct sunlight cables.
- The cable must not be bent or crushed on the direct exit of the cable screw joint. A minimum bending radius $r \geq 4x$ (static steady), $r \geq 5x$ (dynamic) cable diameter must be maintained. The cable must be routed in a way that tensile stress on the conductor or connection(s) is prevented.

Figure Minimum bending radius of cable.



4. Wiring

Cable Protection

To get higher current or higher voltage or both, the modules typically shall be connected into an array by field wiring. There are two methods of wiring: **Series wiring** and **Parallel wiring**.

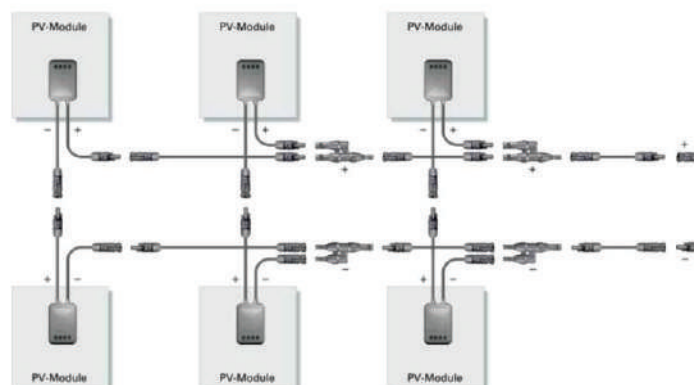
4.1 The series wiring

series wiring



4.2 The parallel wiring

parallel wiring



4. Wiring



4.2 The parallel wiring

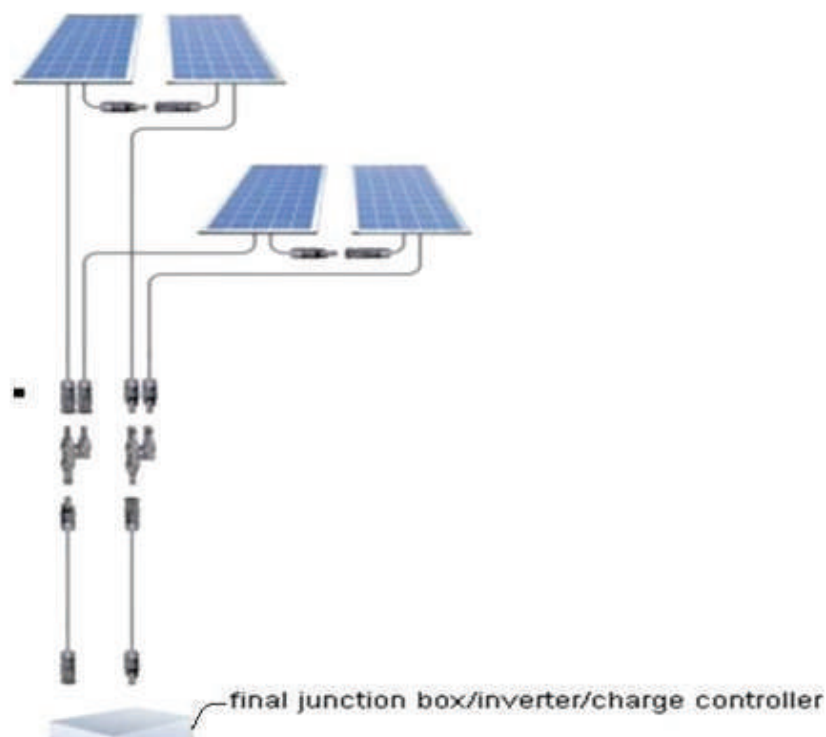
Some Additional cables and connectors are required to make parallel connection. Connector shall be type MC4 compatible male and female and cable shall be type single core.

For IEC testing there commended connectors are MC4 compatible male and female, 1000VDC UL and TUV and cables are PV wire type single core 4 sqmm, 1000 VDC from ULand TUV.

4.3 Suggested maximum number of modules in parallel and in series

4.3.1 When designing the system, we recommend that the maximum number of modules in parallel should be no more than the system voltage while the maximum number of modules in series no more than system voltage.

4.4 Wiring the array to final junction box / inverter / charge controller:



According the above picture to make field wiring to final junction box / inverter / charge controller. When additional connectors and cables used, connector shall be type MC4 compatible male and female and cable shall be type single core.

4. Wiring



4.5 Bypass diodes

- 4.5.1 Partial shading of an individual module can cause a reverse voltage across the shaded module. Current is then forced through the shaded area by the other modules.
- 4.5.2 When a bypass diode is wired in parallel with the series string, the forced current will flow through the diode and bypass the shaded module, thereby minimizing module heating and array current losses.
- 4.5.3 Diodes that are used as bypass diodes must: Have a Rated Average Forward Current 20A or above and have a Rated Repetitive Peak Reverse Voltage 45V or above.

4.6 Battery

- 4.6.1 When solar modules are used to charge batteries, the battery must be installed in a manner which will protect the performance of the system and the safety of its users.
- 4.6.2 The battery should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain, snow, or any other climate that damage the battery easily, and it should be well ventilated.
- 4.6.3 Most batteries generate hydrogen gas when charging, which is explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.

5. Maintenance and cleaning

- Do check all modules annually for safe electrical connections, sound mechanical connection, and corrosion.
- MAGLARE SOLAR PV module is using anti-reflective coating glass that is also known as ARC glass to enhance power output.
- Don't touch the glass surface with naked hand or an uncleaned in order to prevent fingerprints on the glass. If the fingerprints are there remove with simple glass cleaner.
- Always clean the glass and the module back side surface only with a soft cloth or sponge using mild detergent and water.
- Don't use rough cleaning materials such as scouring powder, steelwool, scrapers, blades, or other sharp instruments to clean the glass surface of the module. Use of such materials will not claim any module warranty.

5. Maintenance and cleaning



5.1 Module Cleaning Guidelines and Instructions

- If any Dirt is store up on the module's glass surface it reduces the performance of the module or the system and may cause the module hotspot effect which can damage the module. This problem may become serious in the case of waste or any bird waste dropped and collected on the module surface.
- Even the small layer of dust can be harm the module or reduce the performance of the module.
- Clean all the module regularly to reduce the small layer of soiling. The cleaning depends on how quickly material gone away. Mounting the module at or above a some degree angle which will help to prevent dust from collecting on the module.
- Sometimes rain remove the dirt of the modules. It is best to clean the module during early morning, late afternoon or cloudy day. Do not clean module during high temperature, or any time when there is a large temperature difference between module and cleanser.
- If it is necessary to clean back side of module, do not damage any components. Avoid allowing any oily liquids such as paraffin liquid, animal oil, or vegetable oil contacting with junction box, cable and connector.

Solution Mixture: Clean water with low mineral amount, non-abrasive / non-caustic detergent, weak acid / weak alkalescent solution, or solution of PH < 10. Do not use high pressure spray.

Cleaning Tool: Soft brush, non-conductive brush, non-abrasive sponge, non-abrasive cloth,seamless cloth.

- Clean module and glass surface with solution and tool described as above.
- If dirty area on glass surface which is hard to be cleaned such as oily substances, try to use commercial glass detergent, alcohol, isopropanol(IPA), or sodium bicarbonate solution.
- Use clean water to rinse glass clean of all cleaning solution. Dry wet modules using a clean and dry cloth. Do not leave stagnant water on glass surface.

5.2 Cleaning the Frame

- 5.2.1 MAGLARE SOLAR module frames come with an anodioxide coating to increase life of the module. The cleaning cycle for regular anodioxide coatings is generally every six months. While cleaning, make sure that there should be no scratches or damages to coatings.
- 5.2.2 Dirt can generally be cleaned off using a suitable lubricant or warm, mild soapy water, and a fiber brush may be used to clean any dust that may also stick to the surface. Do not use abrasive cleaning tools like steelwool oracidic / alkaline chemicals to clean.

5. Maintenance and cleaning



5.3 Visual inspection of the module

During regular cleaning cycles, be sure to visually inspect each module. The purpose of visual inspection is to detect possible faults or damage. Specifically:

5.3.1 Possible broken glass.

5.3.2 Rust on the circuits and soldering of the PV cells. Normally this is due to moisture entering the module through a breakage in the encapsulating layer during installation or transport.

5.4 Inspecting connections and cabling

While performing preventive maintenance every 6 months, carrying out the following operations:

5.4.1 Check the tightness and condition of the connection cable junctions.

5.4.2 Check the junction box sealing. Should sealing faults be observed, the items which have been affected should be replaced and cleaned. Contact MAGLARE SOLAR for additional information about resolving faults in module seal or any of the fault.

6. Storage and transportation

- When storing modules for long period of time, cover modules to ensure protection from the elements.
- When storing the modules, turn the glass is face down. Do not allow water to collect inside or nearby the module, this can damage modules.
- When storing the modules, do not allow the anodized profiles (frames) to come into contact with contaminants such as cement or mortar, which will cause damage to the anodic oxide coatings (frame).