



INSTALLATION & MAINTENANCE MANUAL FOR DOUBLE GLASS PV MODULES

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1. Disclaimer of Liability

1.The use of this manual and installation, handling, maintenance and use of modules are beyond ReneSola’s control, and ReneSola does not assume any responsibility for loss, damage, injury or expense resulting from such installation, handling, use or maintenance.It is recommended to check regularly on www.renesola.com for latest updated version.

2 All information stated in this manual is based on ReneSola’s knowledge and experience, but no warranty about such information (including modules specifications) is made by ReneSola, whether expressly or impliedly. ReneSola reserves the right to update this manual, modules specifications or relevant information without prior notice.

2. General Information

This general manual offers important information related to the installation, maintenance and handling of Photovoltaic Modules (hereinafter referred to as the Modules) of ReneSola Jiangsu Ltd (hereinafter referred to as ReneSola). All the instructions given in this manual should be read carefully and understood before attempting to install the modules. Failure to follow these instructions may result in death, injury or property damage. Module installation requires specialized skills and should be only performed by licensed professionals. It is recommended to check regularly on www.renesola.com for latest updated version.

3. Safety Precautions

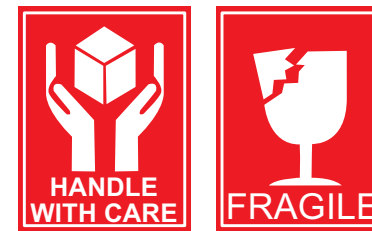


Warning: Module interconnects pass direct current (DC) when exposed to sunlight or light sources. Contact with electrically active parts of the module may result in injury or death whether the module is connected or not.

1. All PV modules should be installed in compliance with relevant international and local laws/regulations/standards.
2. Module installation should be performed by licensed professionals. The operators shall foresee the injury risk during the processes of installation, wiring, debugging and maintenance of the Modules.
3. Suitable wearing (nonslip gloves, clothes, etc.) is recommended to prevent direct contact with potential voltage and sharp edges during the installation process.
4. Mating connector pairs with original type and brand is strongly recommended.

5. Use suitable insulated tools to reduce the risk of electric shock.
6. To avoid the risk of module damage and people injuries, appropriate safety measures should be taken during the installing, debugging process in adverse conditions (dews, rain, strong wind and etc.).
7. Damaged modules with broken glass may cause electric shock, arcing or fire hazards. Do not install or use broken modules.
8. Do not attempt to disassemble the Modules or remove any part from the Modules.
9. Do not touch the exposed cables or connectors.
10. Do not expose the Modules to artificially concentrate sunlight.

4. Transport and Handling



HANDLE WITH CARE – FRAGILE GLASS

1. It is highly recommended to transport with container and the unfilled space (the gap over 20cm) shall be filled with inflatable bag. As for the non-container transport, the Modules shall be single laid and wholly cared, and some effective measures shall be taken to prevent displacement.
2. Store the modules safely in cool and dry area. The packaging is not weatherproof.
3. Keep the Modules away from inflammable gas, hazardous chemicals or fire source.
4. The Modules should be transported in the original package only and leave the Modules until you are ready to install.
5. Unpacking process with two operators handling carefully is strongly recommended by ReneSola.
6. Unpacking PV modules from the original package as shown in Drawing 1:

Step 1: Remove securing straps.

Step 2: Remove the pallet lid.

Step 3: Unpack the Modules one by one.

Step 4: If not all modules were needed in one package, secure the remaining modules to prevent them from falling over.



Drawing 1 Unpackaging

7. Check the module damage due to transportation before the installation.

8. After opening the packing, an opaque cloth or other materials shall be used to cover the frontage of the Modules for the reason that monolithic module may produce potentially fatal current or voltage in direct sunlight or other light source.

9. Carry the Modules carefully and handle them on respecting of instruction.

10. Do NOT move module by pulling the cable. Carry the module with both hands is permitted in certain condition that single operator available.

11. Do NOT carry the Modules on head.

12. Do NOT carry wet Modules, falling from heights and impact of falling tools may affect the electrical performance or even broke the module.

13. Do NOT trample or strike on the Modules.

14. Glass is susceptible to damage that could affect the performance or integrity of the PV module; do not damage the glasses, and do not spray the chemical non-validated or paints/adhesive to any of the glasses. Doing so may degrade performance or cause irreparable damage and will void any applicable warranties.

5. Installation

1. The electrical and mechanical installation must be comply with international and local standards and principles including cable connection building codes etc.

2. The mounting structures must be designed by qualified structural engineers, and installation design and procedures shall be consistent with the relevant local standards.

3. Installers must be qualified and familiar with solar and electrical principles.

4. The working ambient temperature rage is -40°C to $+85^{\circ}\text{C}$ and Relative Humidity $\leq 85\%$.

5. In the Standard Test Condition (STC: irradiance of 1000 W/m^2 , battery tag temperature of 25°C and spectrum of AM1.5), the electrical performance parameters of the Modules,

such as I_{sc} , V_{oc} have 3%-4% deviation with the nominal value.

6. Do not disconnect the cable under a load circumstance the bending cable radius of Junction Box must more than 45 mm.

7. Any part of module (including cable and connector) to soak in water for a long time is not permitted.

8. The maximum modules of one PV string $N=(\text{The Maximum System Voltage})/(V_{oc})$, note the V_{oc} is the value at the lowest temperature in the project sites.

9. Suitable over current protection devices (string fuses etc.) must be installed when connecting 3 or more strings in parallel configuration.

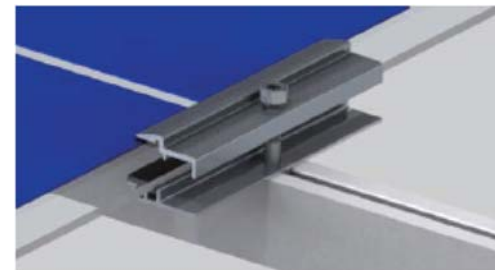
10. Under normal conditions, a Photovoltaic Module may be able to produce voltage and current higher than in standard test condition. Accordingly, when determining component rated voltage, conductor ampacities, fuse current and size of controls connected to the PV output, the short circuit current and open circuit voltage value marked on this module shall be multiplied by a factor (safety factor) of 1.25.*

*** Note: The safety factor for component rated voltage, conductor ampacities, fuse current and size of controls connected to the PV output is subject to the meteorological conditions of project sites.**

11. The Modules shall be installed in the position of the sun exposures fully and to ensure that not to be shaded by trees, buildings or anything others surrounding, such as in the northern hemisphere installed towards the south and in the southern hemisphere installed towards the north.

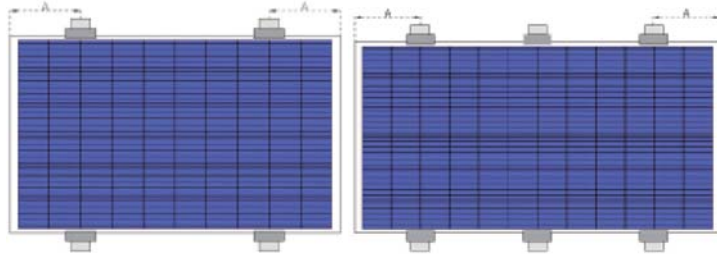
12. Use the bracket structure that could withstand the pressure of strong winds or heavy snow according to your practical installation condition. The bracket structure must be made from durable, corrosion resistant, UV resistant materials.

13. Fix the modules with clamps on the Fixture-fixing system.



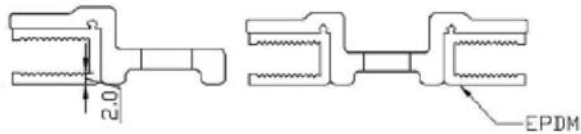
Drawing 2: Fixture-fixing system

14. Installation method and location



Drawing 3: Four clamps mounting

Drawing 4: Six clamps mounting



Drawing 5: Clamp with EPDM

Fixture-fixing

Fix the module safely and effectively on the brackets with specialized installation tools. The panels should be fixed on the long side of the panel within the constraints shown in Drawing 3 and Drawing 4.

- Four Clamps fixing:

Fix the modules with four clamps on the long-side frame of installation A area. The edge of the module to the center of clamp length A is 350mm to 450mm as shown in drawing 3. Use these method the 72 cells module can withstand maximum 2400 Pa wind load and 2400 Pa snow load and the 60 cells modules can withstand maximum 2400Pa wind load and 5400Pa snow load.

- Six Clamps fixing:

Fix the modules with six clamps on the long-side frame of installation A area. The edge of the module to the center of clamp length A is 350mm to 450mm as shown in drawing 4. Use these method the 72 cells module can withstand maximum 2400 Pa wind load and 5400 Pa snow load and the 60 cells modules can withstand maximum 2400Pa wind load and 5400Pa snow load.

- The clamp length should larger than 150mm.
- The clamp must overlap the module edge 13mm but no more than 20mm.
- Modules clamp with rubber pads like EPDM should be used. The thickness of EPDM should larger than 2mm shown in Drawing 5.
- All the fastening pieces are made of stainless steel.

- Renesola suggests using M8 bolt to fixing clamp the torque for screws should be suitable to avoid damage the glass. Applied torque is recommended as 16-21 N•m for M8(diameter is 8mm)screw.

15. Use the Modules with same configuration in a series connection system.

16. Recommended separation between two Modules shall be more than 10 mm; when installing on the roof, suggested separation between bottom of the Modules and the mounting surface shall be more than 100 mm, and when installing on the ground, more than 450 mm.

17. When installing the Modules on the roof, ensure there is an appropriate structure, and a suitable seal shall be made between the Modules and the bracket to prevent leaking.

18. Installing the Modules on the roof may affect the fire rating of the house which requires the construction organization to make more accurate assessment.

19. Grounding

19.1 PID (Potential Induced Degradation) due to combined effects of high temperature, high humidity and high voltage, is most likely to be observed in similar climates and mounting surroundings such as India, Southeast Asia, floating designs. Except for equipment grounding, negative system grounding is strongly recommended as the basic solution for PID phenomenon.

19.2 There is no bare conductor parts in double glass modules so its no need grounding to the earth.

20. When the connecting wire of the Modules cannot meet system design requirements, a proper commercial cable that could endure long-term outdoor use and assorted connector could be used to extend the connecting wire. The cross-sectional area shall be no less than 4 mm² and the connection system shall reach IP65 protection rating.

21. ReneSola modules have passed the salt mist and ammonia test (Please contact ReneSola or local office for detailed information) and can be installed in some brutal environments such as sea side.

22. The modules should not be installed at the place which is less than 100 meters from the seaside. If the distance of the seashore and the project site is 100~1000 meters, anti-corrosion application should be taken during the installation and grounding processes.

6. Product Identification

Nameplate: describes the product model; rated power; rated current, rated voltage, open circuit voltage, and short circuit current. All above parameters are measured in standard test conditions. Other information, such as weight, size, maximum system voltage and maximum

fuse current are marked on the nameplate as well. Barcode: the barcode is in the internal of the Modules, which containing the relevant retrospect information of the Modules. Please do not remove any label, or ReneSola will not provide any warranty.

7. Maintenance

1. Do not touch the live part of the wire cable and the connector. When touching, use the safety equipment (insulating tools, insulating gloves etc.
2. When maintaining the Modules, use opaque cloth or other materials to cover the frontage of the Modules. Exposed in sunlight, the Photovoltaic Modules may produce high voltage, which is potential danger.
3. Cleaning instruction

Periodic cleaning is necessary for solar module, which could reduce the power loss due to dust and is recommended by ReneSola. The cleaning process should be accomplished by licensed professionals with appropriate qualifications. When cleaning the module surface rules shown as below must be followed:

- Only at low irradiance, such as early morning, dawn, cloudy days and so on.
- During the cleaning process modules must be disconnected.
- Only soft cloth or sponge could be used to clean the glass surface.
- No other chemical could be used in cleaning process only clean water..
- Do NOT touch exposed cables or connectors.
- Do NOT trample or strike on modules.
- Forbidden to remove dust in dry way.

8. Annual Inspection

1. Check if nuts, bolts of mounting structures are secure and not loose. Tighten the loosen component again, if required.
2. Check the resistance of the connecting cables, grounding cables and connectors and the performance of the ground resistance.
3. Check all electrical and mechanical connections from freedom of corrosion.
4. Check the ground resistance of metal parts such as the module frames and the mounting structures.

9. Applicable Law and Dispute Settlement

This “Installations & Maintenance for Double Glass PV Modules” shall be governed by and interpreted under the laws of Hong Kong (irrespective of its choice of law principles).

Except for the technical disputes, all disputes arising out of or in connection with this

“Installations & Maintenance for Double Glass PV Modules” shall, unless amicably settled between the parties, shall be settled by arbitration in Hong Kong under the Hong Kong International Arbitration Centre Administered Arbitration Rules in force when the Notice of submitted in accordance with these Rules. The language of arbitration shall be English. The award of the Arbitrators will be final and binding upon the Parties.

10. Model of the Modules

ReneSola Standard PV Module Product Model Names covered under this manual are: Table 1

| Type | Cell | System |
|-----------------|------|-----------|
| JC***M-24/Bg() | Poly | IEC 1500V |
| JC***S-24/Bg() | Mono | |
| JC***M-24/Ag () | Poly | IEC 1500V |
| JC***S-24/Ag() | Mono | |

Remark

1. The “***” in the table above stands for the nominal power of module. The supplement information is shown in the bracket. Such as “s” it means modules with 4 bus-bar cells and “w” it means modules with 5 bus-bar cells. For detailed information, please refer to data sheet.

This document constitutes part of the contract and valid automatically when the contract is signed.