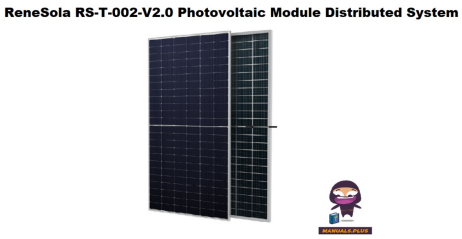
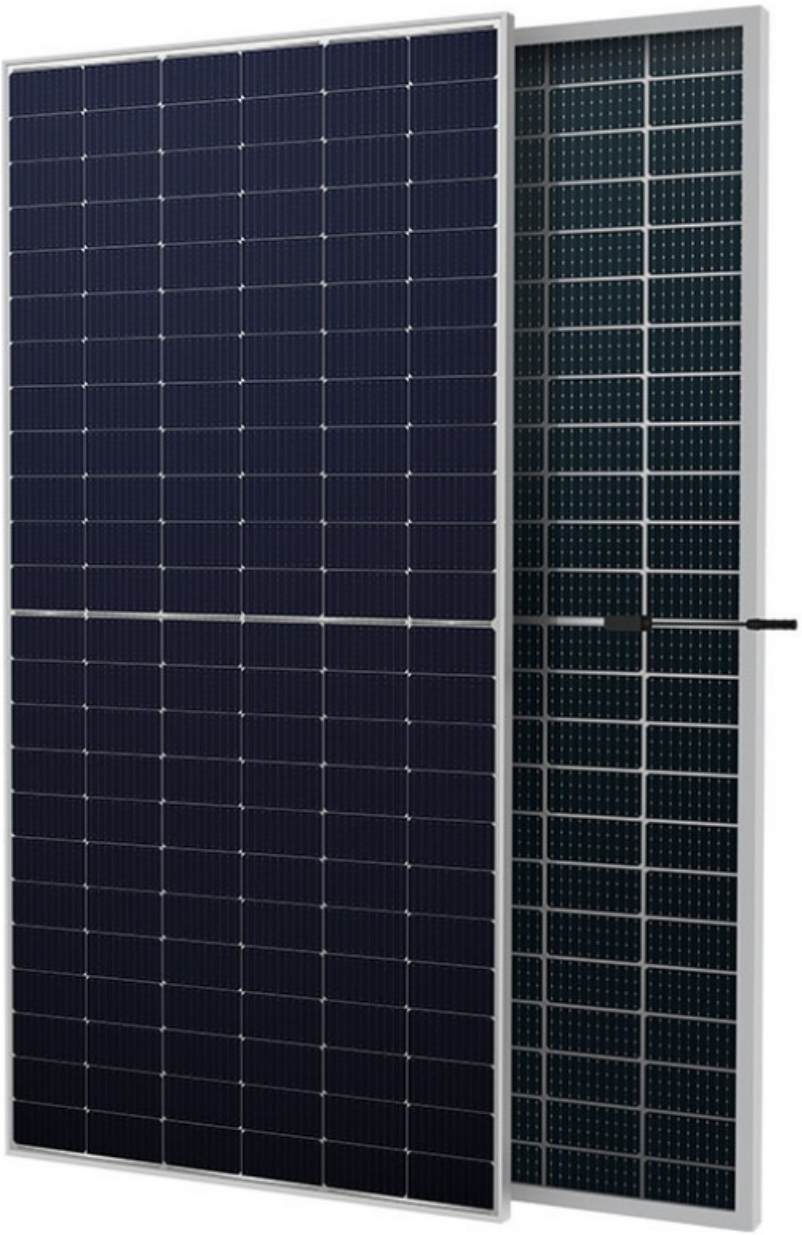


ReneSola RS-T-002-V2.0 Photovoltaic Module Distributed System User Manual

Contents

ReneSola RS-T-002-V2.0 Photovoltaic Module Distributed System



Overview

First of all, thank you very much for choosing to use ReneSola modules

This manual applies to the installation, maintenance and use of the framed series solar modules manufactured by Renesola Co., Ltd. (hereinafter referred to as “Renesola”), Failure to follow these safety instructions could result in personal injury or property damage. In order to safely and correctly install and obtain stable power output, please read the installation instructions carefully before installing and using the components.

Installation and operation of solar modules requires specialized skills, and only professionals can engage in the work, and the installer must inform the end customer (or consumer) of the above matters accordingly. “Modules” or “PV modules” as used in this manual refer to one or more framed series solar modules, please keep this manual for reference.

Disclaimer

All contents in this manual originate from long term of technical exploration and experience accumulation of ReneSola. The information and related recommendations, including but not limited to the product specifications below, do not constitute any warranty, whether express or implied. ReneSola reserves the right to modify manuals, PV products, specifications, or product information without prior notice. Failure of the customer to follow the

requirements outlined in this Manual during the installation of the module will result in the invalidity of product's limited warranty.

Limitation of Liability

This installation manual does not entail any explicit or implicit quality warranty. The use of this manual and the conditions under which modules are installed, operated, used, and maintained are beyond ReneSola's control, ReneSola shall not be liable for any loss, damage, or expense arising from the installation, operation, use, or maintenance of modules. ReneSola shall not be liable for any infringement of proprietary and third-party rights that may result from the use of products. Customer does not acquire any patent or license to any proprietary right, whether express or implied, arising out of the use of ReneSola Products.

Safety precautions

Warning

- Direct current is generated when the surface of the module is exposed to direct sunlight or other light sources and the risk of electric shock may occur in contact with the electrical part of the module.
- Do not use mirrors or lenses to focus sunlight on the solar cell module, and do not expose the back of the module directly to sunlight.

General Security

All installation work must comply with the local codes and the relevant international electrical standards.

- All installation instructions must be read and understood before installing, wiring and maintaining.
- Installation of the modules array must be carried out with an isolated solar device and only qualified professionals can engage in the installation and maintenance.
- The front glass of the solar module has the function of protection, the broken solar module is electrically dangerous (electric shock and fire) Such modules cannot be repaired, should be replaced immediately.
- If the photovoltaic system uses storage batteries, the configuration of the components should follow the opinions of the storage battery manufacturer.
- Components cannot be used to replace roofing and wall material; even partial substitution is not allowed.
- Components cannot be installed in areas where flammable gases may be present.
- Cannot remove any PV module spare parts supplied by ReneSola.
- Do NOT connect or disconnect the module when it is energized or connected with an external power supply.

Handling safety

- During transportation and storage, in order to ensure the safety of the components, carefully open the packaging of the components after arriving at the installation site.
- During transportation, please ensure that the transport vehicles or modules are not subjected to significant shaking, otherwise the modules may be damaged, or the battery may be cracked.
- To reduce the risk of electric shock or flame, the surface of the solar cell module can be covered with a light-proof material when the module is installed.
- It is forbidden to directly touch the electrical part with your hands, and electrical connections should be made

using insulating tools.

- Do NOT use water to extinguish fires of an electrical origin.
- Do not use pulling junction boxes or connecting wires to lift the modules.

- Only the same size, same specification and same type of modules can be connected in series.
- Please do not stand or walk on the modules, as this will damage the module and cause harm to the human body.
- Do NOT drop PV modules or allow objects to fall down on the PV modules.
- Do NOT allow the sharp-pointed objectives to come in contact with modules to prevent them from scratches, avoiding reducing the reliable of modules.
- Please do not drill holes in the frame of the modules, this may lead to a reduction of the module's load rating, ReneSola accepts the customized mounting holes, if you need to specify the mounting holes, please propose before cooperation.
- Do NOT install or handle modules when they are wet or during periods of high wind. At the installation site, take care to keep modules and in particular their electrical contacts, clean and dry before installation. If connector cables are left in damp conditions, then the contacts may corrode. Any module with corroded contacts should not be used.

Unload, transport and storage

ReneSola advises overseas customers

When take delivery of goods:

1. Please first check whether the seal (lock) is completely locked, because after the seal is opened, it cannot be restored.
2. Check whether the container seal (lock) is consistent with the content of the bill of lading.

If does not match the above, please do not sign in, please contact ReneSola sales, customer service, logistics personnel as soon as possible, thank you for your cooperation!

When opening the cabinet:

1. Please take a picture of the shipping mark of the first pallet near container door, so that we can compare the photo of the shipping mark of the first pallet retained before shipment, so that we can check whether it has been repacked.
2. In order to ensure your interests, please take a video from before opening to after opening the cabinet (clearly), if there is a need to settle a claim, so that we can give you the fastest reply in a short time.

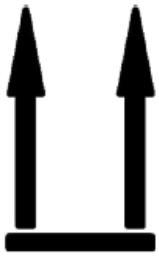
Since the customs will conduct random inspections of import and export goods, the implementation of the above recommendation can enable both parties to quickly and effectively discover and resolve the discrepancy between before shipment and after arrival.

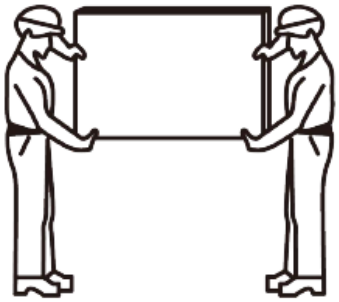
Precautions and general safety

The modules should be stored in the original package before installation, avoid any object collision with the package box. Unpack the modules as per the recommended unpacking procedures. The whole process of unpacking, transport and storing should be handled with care. Do NOT stand, climb, walk or jump on unpacked pallets of modules.

Before installation, ensure that all modules and electrical contacts are clean and dry. Unpacking must be carried out by two or more persons at the same time. It is forbidden to use the wires or junction boxes of the modules to carry the modules. Handling the modules requires two or more people with non-slip gloves; Do NOT handle the modules over-head or stack the modules. Do NOT allow the modules to come in contact with sharp-pointed objectives to prevent them from scratches, avoiding a direct impact on the safety of modules.

Markers on outer packaging

<table>
<tr>
<td>3.1-1
Do NOT discard the modules at will; special recycling is required.
 
EU-28 WEEE
COMPLIANT</td>
<td>3.1-2
Modules must be kept dry, not expose to rain or moisture.
  </td>
</tr>
<tr>
<td>3.1-3
Modules in carton are fragile, which must be handled with care.
  </td>
<td>3.1-4The packaging should be transported upright.
  </td>
</tr>
</table>

3.1-5 Do not step on the package and module. 	3.1-6 Cartons are recyclable 
3.1-7Modules shall be stacked as required, not exceeding the maximum number of layers printed on the outer packaging. (n = 2 means no more than two layers and n = 3 means no more than three layers) 	3.1-8 One module shall be handled by at least two persons together. 

Unloading warning

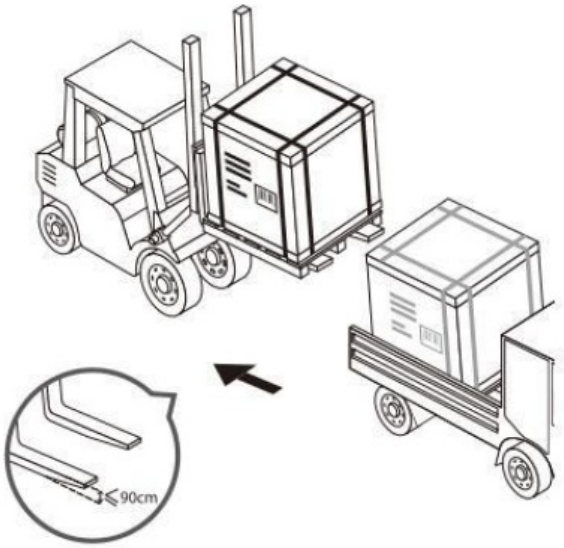
- The hoisting rope of crane unloading needs to choose a longer nylon sling, wire rope is not allowed to use.
- Before lifting, the length of the sling should be evenly distributed on both sides to avoid the case body tilting to one side during lifting, which causes the sling to be too tight and the modules explode.
- When lifting, the box should be kept balanced to avoid module tilting.
- When lifting and unloading, someone needs to command, when the lifting box falls down, it should be kept flat, avoid collision and throwing of the module box, and the ground should be flat.

3.2-1

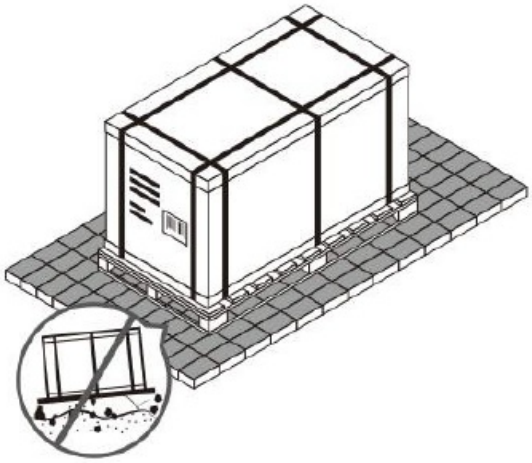
Use the correct (as picture) lifting fixture to handle, no more than 2 pallets per lift. Before lifting, please confirm the tray a nd the carton are NOT damaged and the hoisting rope is fir m and solid. Before lowering the carton back on the ground, two persons must support the two sides of the carton gently to put it on a relatively flat place.

3.2-2

Use a forklift to remove the module pallets from t he truck

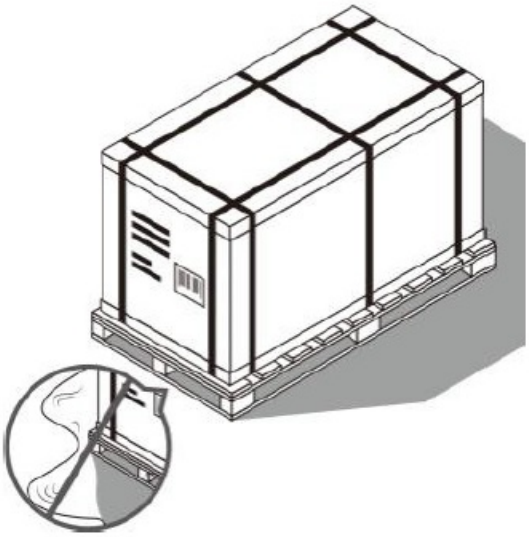


Put the modules on level ground.



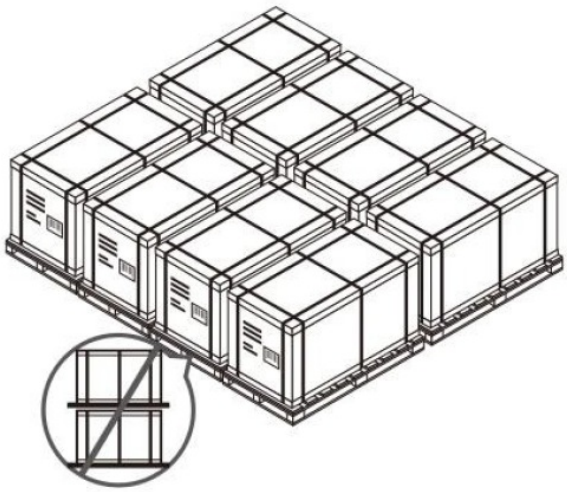
3.2-3

Store the module in a dry and ventilated place.



3.2-4

Do not stack the modules at the project site.

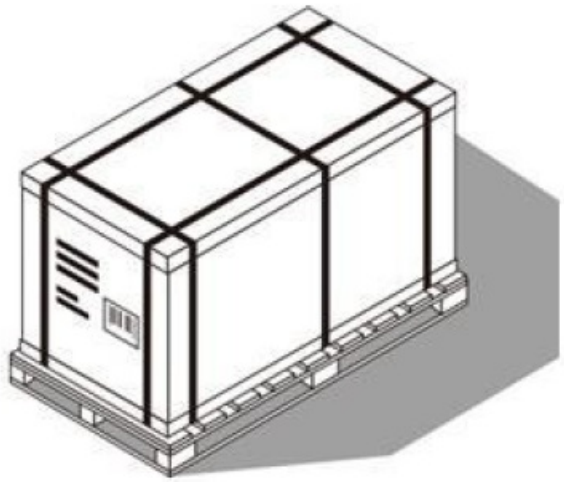


3.2-5Use a waterproof material to cover the modules and protect them from moisture

Second transportation and precautions

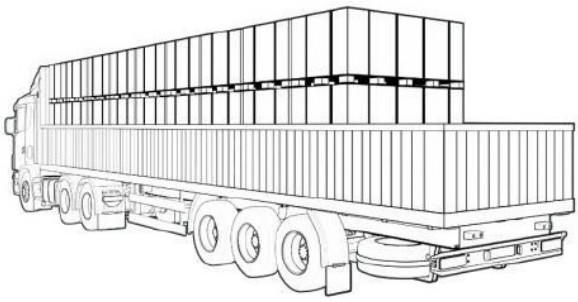
3.3-1

Do not remove the original packaging if the modules require long-distance transport or long-term storage.



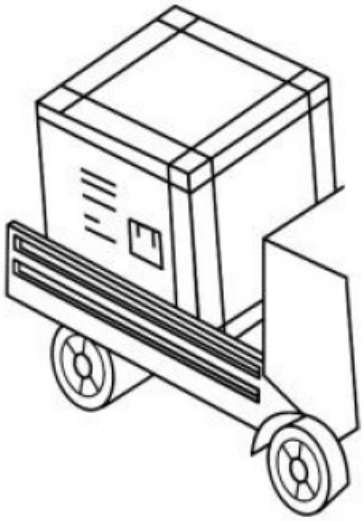
3.3-2

The finished package can be transported by land, sea or air. During transport, make sure that the pa ckage is fixed securely to the shipping platform wi thout movement. Transportation: Do Not stack mo re than two layers on a truck;



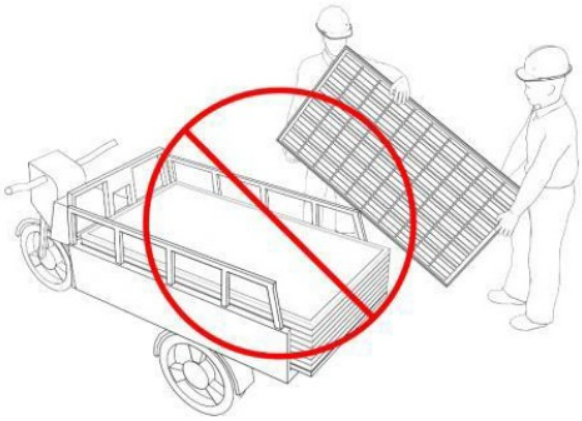
3.3-3

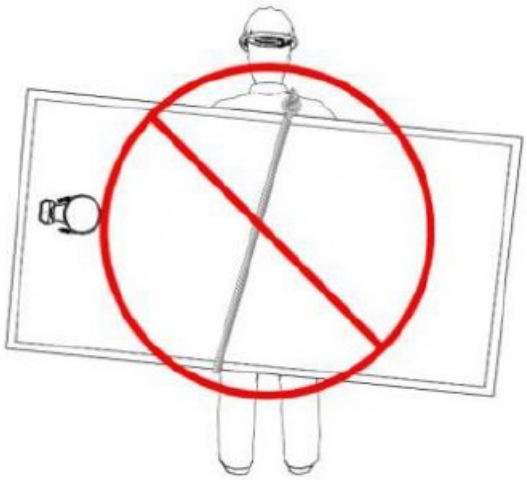
Note: Only one layer stacking is only allowed for transport a t the project site.



3.3-4

No transport or handling by pedicab as shown bel ow;

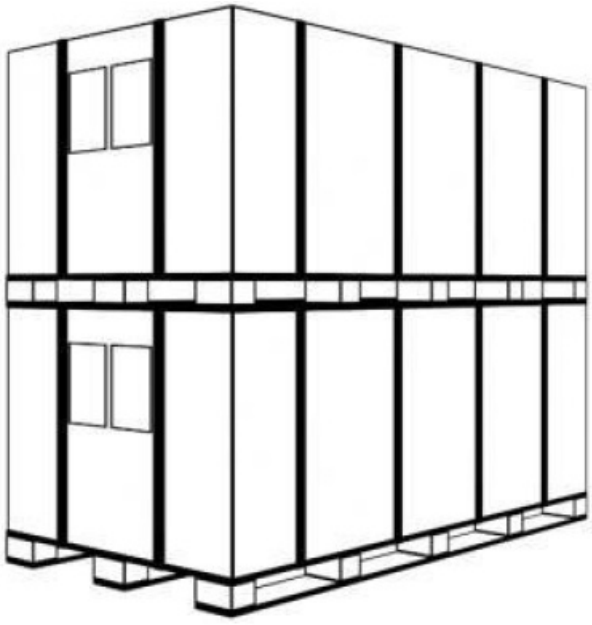


3.3-5 Do Not transport the module with rope as shown below: 	3.3-6 Do Not carry the modules on the back of one pers on shown below; 

Storage

- Keep the outer packaging intact, and the storage area should prevent the pallet and packaging box from moisture, direct sunlight, and take precautions of waterproof (rain) measures.
- Do NOT remove the original packaging if the module requires long-distance transport or long-term storage.
- The storage area should be kept dry, flat, and the ground and horizontal angle should be less than 10°.
- Do not stack other items on modules or boxes.

Project site storage(Humidity <85% temperature -20°C ~+50°C): frame module to be stacked staticly for 2 layers.



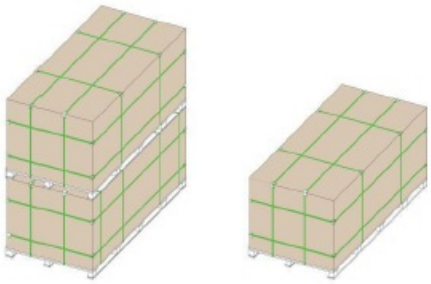
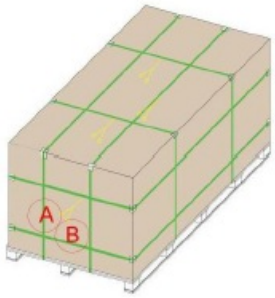
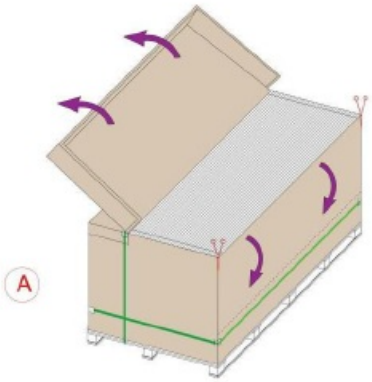
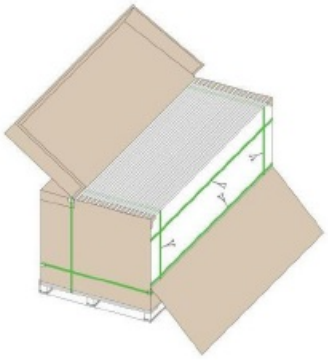
Unpacking instructions

Precautions for unpacking

- For unpacking outdoors, avoid operating it in rainy conditions, because the carton will become soft and spread out after it get wet in the rain which may cause damage to the modules.
- For a windy site, it is necessary to pay special attention to safety. Especially, it is NOT recommended to transport the modules in high wind conditions. The unpacked modules must be tied down to avoid any unwanted movement.
- After unpacking, place supports on the back of the modules to avoid the collapse of the modules.
- The work surface is required to be level to ensure that the package can be placed stably, avoiding sliding.
- Wear protective gloves during unpacking to avoid hand injury and fingerprints on the glass surface.
- Each module shall be handled by 2 people, it is forbidden to pull the junction box under any circumstances; When take the module out of the carton, pulling on the short side frame.

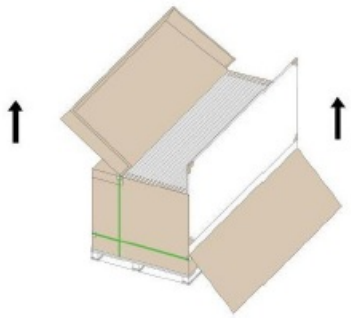
Unpacking steps

Horizontal unpacking method 1

1. Take down the upside pallet—Cut the stretch film around the carton boxes first, then cut the packing straps which wrapped the two carton boxes together. Take down the upside pallet using forklift. 	2. Cutting packing straps—Cutting all the packing tapes on the carton except No. A strap and No. B strap. 
3.Opening the box cover-- Open the box cover from that side where strap has been cutted. Turn the cover over to No. A strap as the figure show below. 	4. Cutting the carton and fold it down—Cut down the side of the carton by 1/2 to 2/3 height, then cut down the side of the carton(thefolding line is about the outer horizontal packing strap). Cut the four packing straps inside the carton from the open side of the carton folding. 5. 

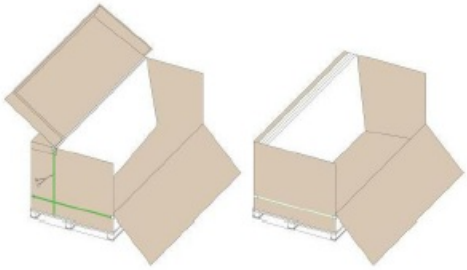
5.Taking out the modules in turn--

Carefully remove the modules according to the direction shown (no more than one piece at most), it needs two persons to work at the same time, and do not damage other modules and cartons.



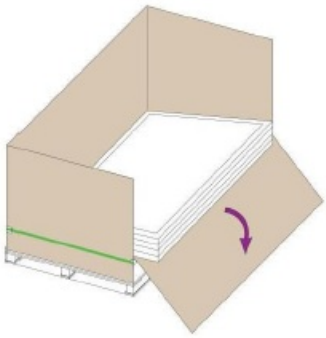
6.Cut the remaining packing straps--

When the remaining modules are covered by the uncut packing straps, the two people hold the remaining modules with hand while cutting the vertical strapping belt and removing the upper cover.



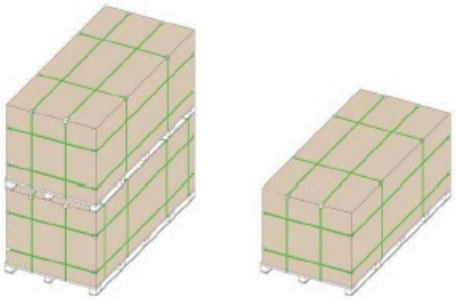
7.Remove remaining modules--

Pour the remaining modules slowly, place them flat on the pallet, and take out the remaining modules in turn.

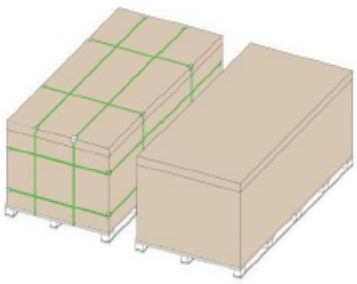


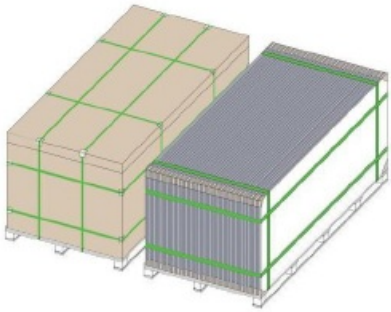
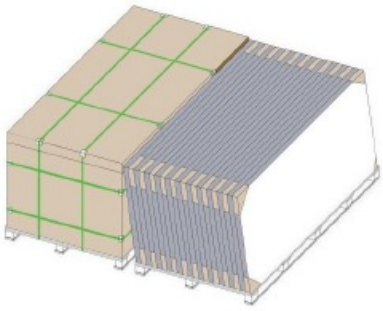
Horizontal unpacking method 2

1. Cut the plastic wrap outside the carton, cut the four strapping belts connected by the stacked pallet, and use a forklift to separate the two pallet modules.

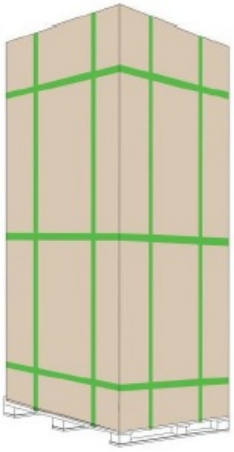
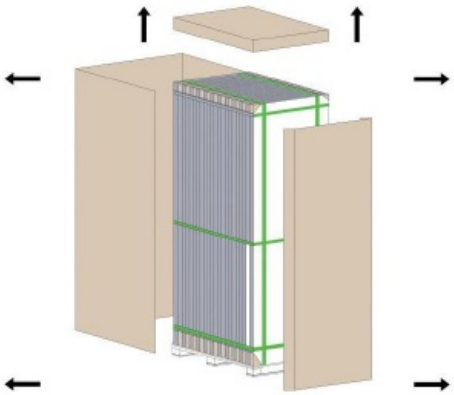


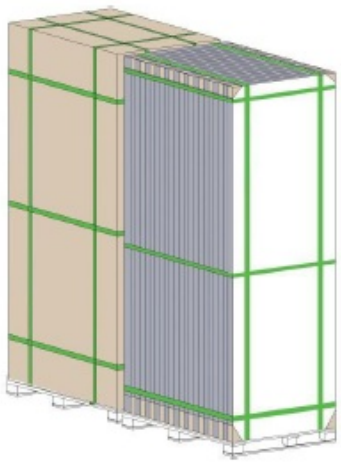
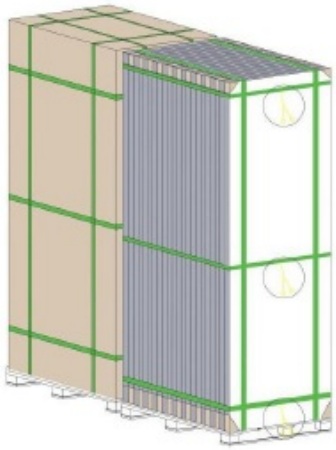
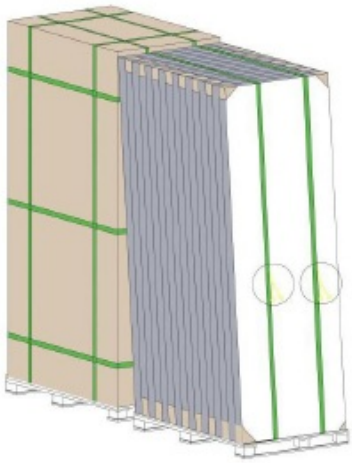
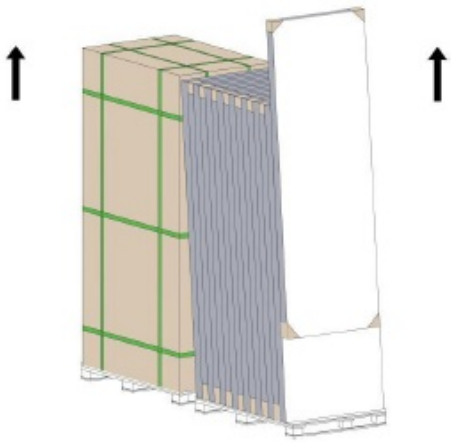
2. Leave the single box about 15~20 cm to solid support, such as wall, rack or unpacked module box of the same type. Then cut all the packing strap around the single box.



3. Remove the top cover on the carton and lift the carton to remove the enclosure. 	4. Two people hold the modules to prevent them from tipping. One person cuts the internal strapping belts. Two workers then push the modules tenderly to lean them against the solid support and remove the modules from the first one outside to the last one inside in sequence. 

Vertical unpacking method

1. Cut the plastic wrapping outside, and all the outer strapping. 	2. Remove the upper cover and box according to the direction shown. 

3. Leave the single box about 15~20 cm to solid support, such as wall, rack or unpacked module box of the same type. 	4. Cut off all the horizontal packing straps. 
5. When there are two vertical straps remaining, push the module gently toward the sturdy support, then cut the remaining two vertical straps. 	6. Take out the modules in order as shown below, (two people are required to work at the same time). . 

Installation conditions

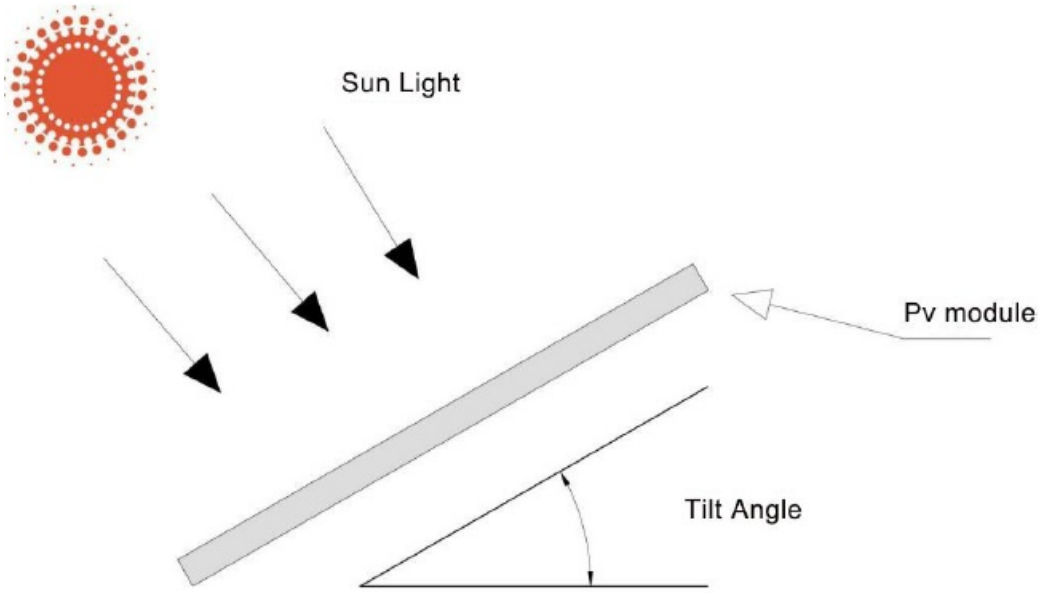
Site selection and installation environment

- Solar modules are recommended to be installed at an optimized tilt angle to maximize the energy output. It is roughly equal to the latitude of the project site as a rule of thumb, facing toward the equator. Optimized system designs incorporate other local requirements.
- Modules shall be installed on proper buildings or other appropriate places (such as ground, garage, building outer wall, roof, PV tracking system) but shall not be installed on any vehicles.
- When installing solar modules on a roof, the roof must be covered with a layer of fireproof material applicable to

this class, and adequate ventilation must be ensured between the back sheet and the installation surface. A safe working area also must be left between the edge of the roof and the external edge of the solar array.

- Please choose a high ground to install the components. Do not install modules at places that are possible to be flooded.
- ReneSola recommends that the module should be installed at a working ambient temperature of -20℃ ~50℃. The module's limit working ambient temperature range is from -40℃ to 85℃. Maximum altitude less than or equal to 2000m.The maximum mechanical load is 5400pa on the front and 2400pa on the back.
- Install modules in a location where there is rare shading throughout the year, and ensure that there are no obstacles near the installation site that may block the light.
- If the module is installed in an area with frequent lightning and thunder, the module must be protected against lightning strikes.
- Make sure flammable gases are NOT generated near the installation site.
- ReneSola modules have passed the salt mist corrosion testing of photovoltaic according to IEC61701, If the modules are placed in an environment of salt fog (i.e., marine environment) or sulfur (i.e., sulfur sources, volcanoes, etc.), there is a risk of corrosion.
- Renesola modules can be installed ≥50m away from the ocean side, must take stainless steel or aluminum to contact the modules, related parts and components should be protected with anti-corrosion measures.

Tilt angle selection



- Tilt angle of PV modules refer to the included angle between module surface and horizontal ground.
- The module will obtain the maximum power output when directly facing the sunlight.

ReneSola suggests that tilt angle of module installation be no less than 10°, because the tempered glass on the surface adopts ultra-hydrophilic self-cleaning coating techniques, so module surface dust can be washed away easily by rainfall, and it is easy for accumulated water to flow away physically and avoid water mark on the glass surface which may further affect module appearance and performance.

ReneSola recommends that modules should be installed in locations that receive the most light throughout the year. In the Northern Hemisphere, the PV modules should typically face south, and in the Southern Hemisphere, the PV modules should typically face north. Please refer to standard modules installation guideline or suggestions from experienced PV module installer, for the specific installation angle.

Installation

Installation Security

- When installing modules, wear protection equipment:head gear, insulated gloves, safety belt and safety shoes (with rubber soles).
- Do not install modules under rain, snow, wet or windy conditions.
- Do not wear any metallic jewelry which can cause electric shock during installing or maintenance.
- If the connector of the PV module is wet, do not perform any action to avoid the risk of electric shock.
- Keep the PV module packed in the carton until installation.
- Please use an opaque material to completely cover the PV module surface during PV module installation and wiring to prevent current generation.
- Do not unplug the connector under load.
- Do not stand on photovoltaic modules, and do not hit the surface of the module with install tools or other objects.
- Do not work alone.
- Do NOT damage the back sheet of PV modules when fastening the PV modules to a support with bolts.
- Do NOT damage the surrounding PV modules or mounting structure when replacing a PV module.
- Do not replace any PV module components (diodes, junction boxes, connectors, etc.).
- Please go through professional evaluation to make sure the building is suitable for installation before installing modules on roof.
- Cables shall be located and secured so that they will not be exposed to direct sunlight after installation to prevent degradation of cables. Low drooping of cables from the terminal box must be avoided. Low hanging cables could cause various problems such as animal biting, electricity leakage in water, and fire.

Installation method

Mechanical installation and precautions

- The connection of the module to the racking system can be mounted through bolts, clamps or embedded systems. The modules must be installed according to the following examples and recommendations.
- If alternative installation methods are used, please consult ReneSola and obtain permission from ReneSola, otherwise the module will not continue to have a valid warranty.
- Installation in array, the minimum distance between two modules is 10mm.
- Before installation, the mounting hole cannot be blocked, otherwise there will be a risk of water seepage inside.

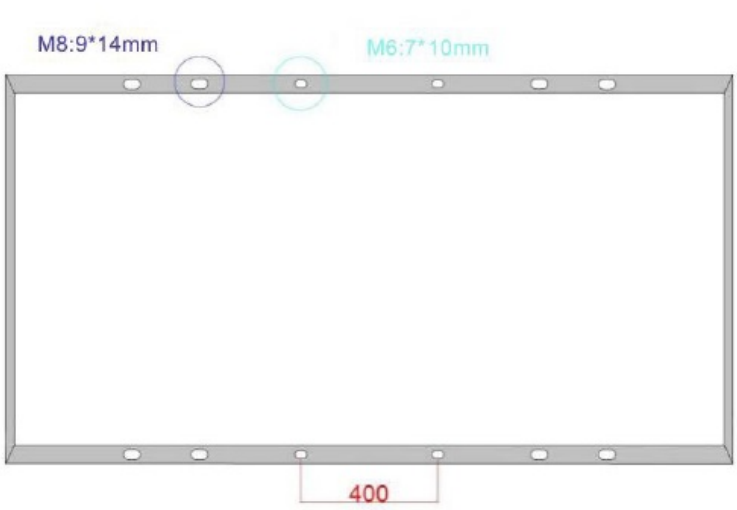
Notes

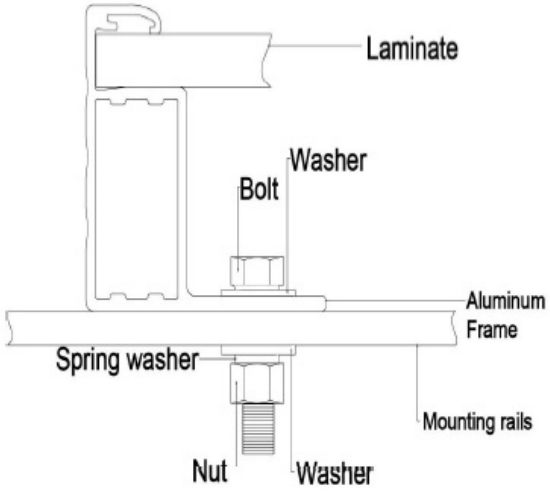
The design loading of modules have been evaluated by TUV according to IEC61215 with 1.5 times safety factor; The mechanical load bearing is dependent upon the mounting methods used and failure to follow the instructions of this manual may result in different capabilities to withstand snow and wind loads; The system installer must ensure that the installation methods used meet these requirements and any local codes and regulations.

Bolt mounting

The frame of each module come standard with M8 bolt mounting holes (the center distance of the mounting hole

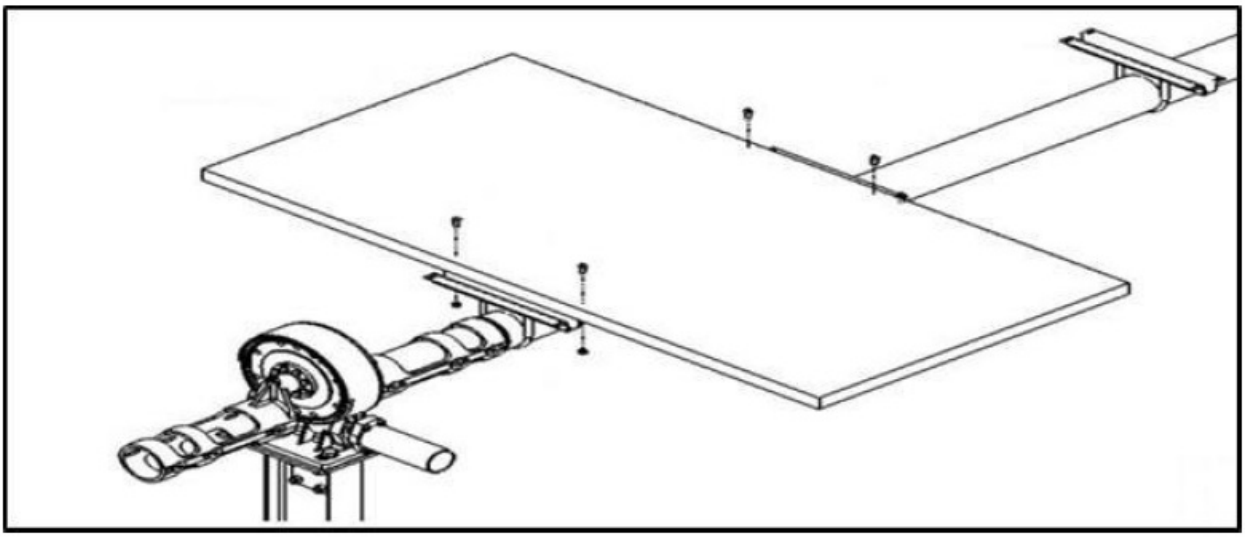
varies with the length of the module) and M6 bolt mounting holes (400mm center distance of the mounting hole, mainly used for the installation of “PV tracking systems”), through which ideally placed to optimize the load handling capability, to secure the modules to the supporting structure. The details are shown in the following figure.





- To maximize mounting longevity, Renesola strongly recommends the use of corrosion proof attachment hardware.
- Secure the module in each mounting location with an M8 bolt and a flat washer, spring washer and nut and tighten to a torque of 16~20 N.m.

Mounting with Single-axis Tracking System



- The PV tracking system tracks the direction of the sun’s incidence in real time through the rotation of the bracket system.
- Through the 400-hole distance (M6 bolt diameter 7*10mm) mounting hole on the back frame of the component, the component is fixed on the tracking system bracket with bolts, and the installation details are shown below.
- To maximize the service life of components, ReneSola strongly recommends the use of corrosion-resistant mounting fixings.
- Use M6 bolts, flat washers, spring washers and nuts to fix the components in each fixed position and tighten to a torque of 16~20N•m.

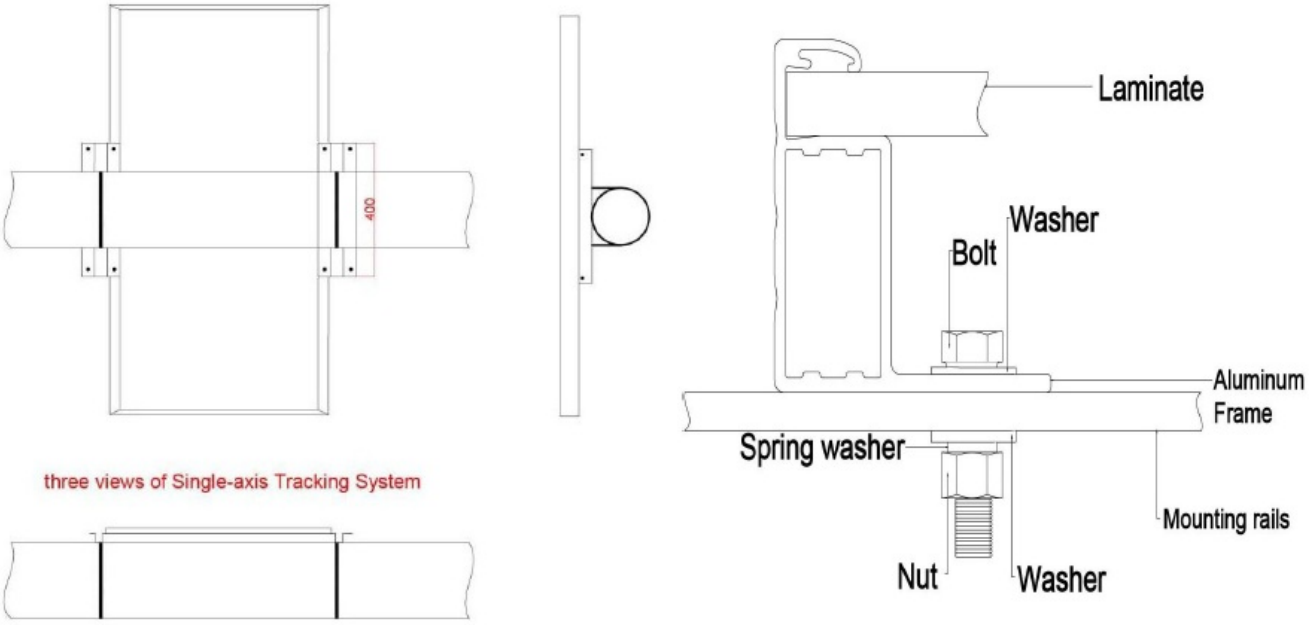
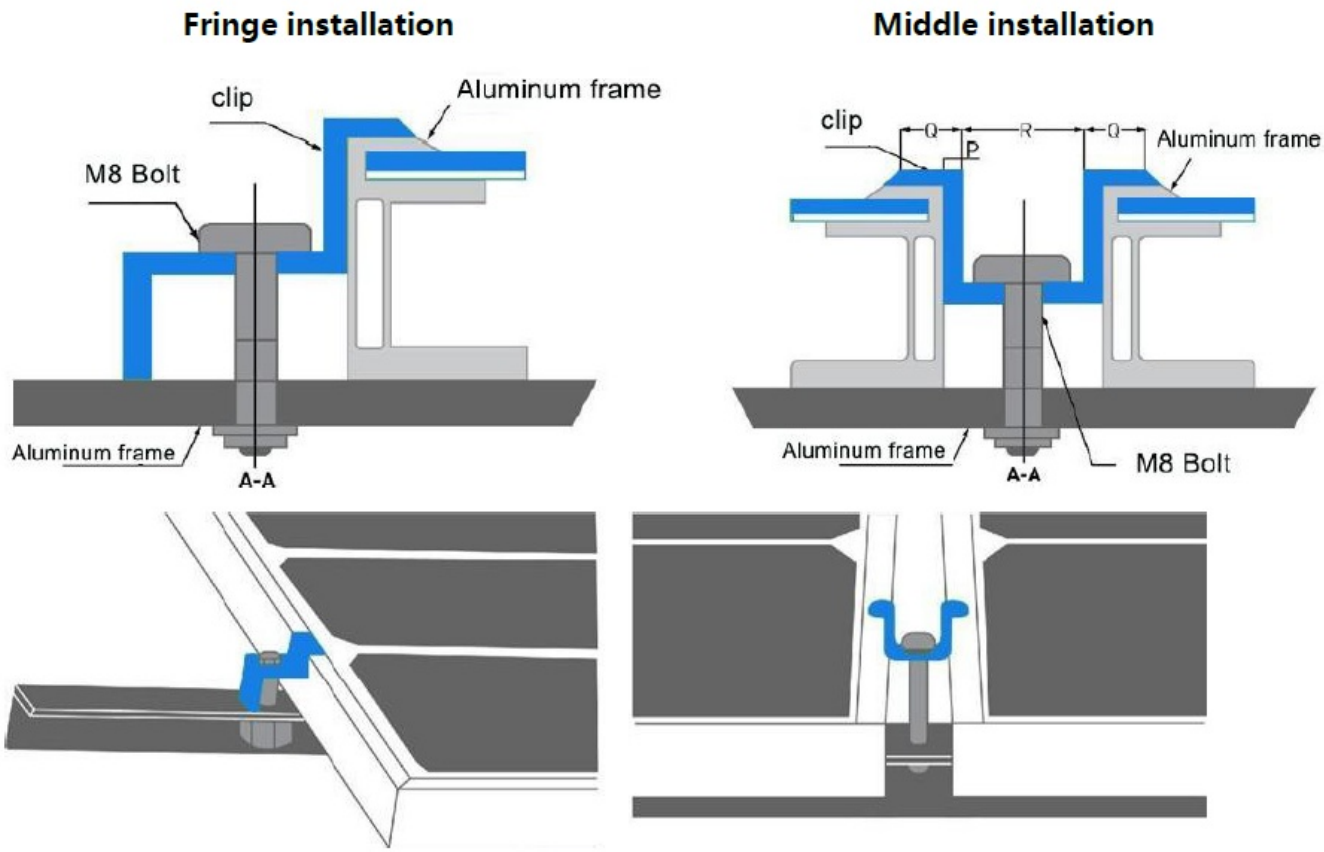


Illustration of single-axis tracking system installation

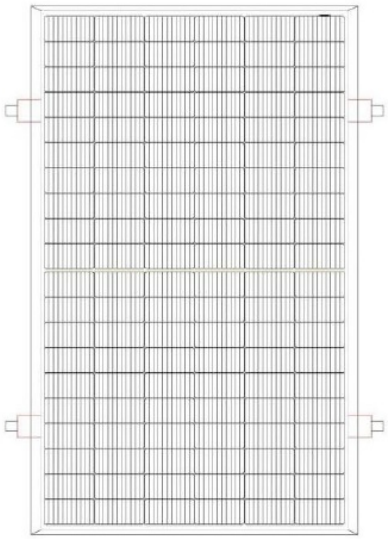
Mounting with Clamps

ReneSola recommends prioritizing mounting with clamps, which can bring greater stability to the modules and greater resistance to snow and wind loads. Detailed installation details are shown below.

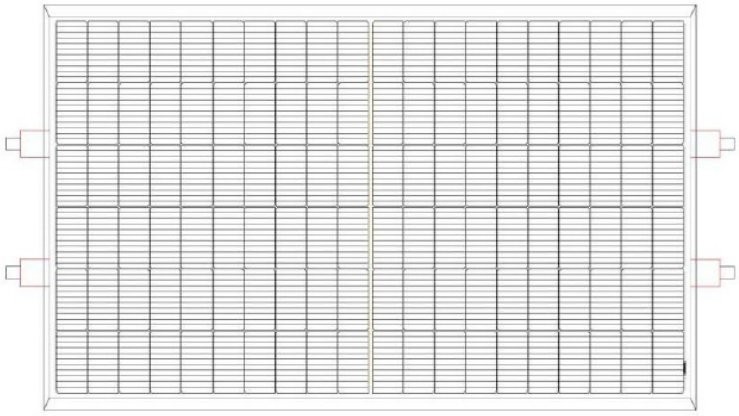


- Under no circumstances should the clamp touch the glass or deform the frame.
- The interface of the clamp to the front of the frame must be smooth and flat to prevent frame or other components from being damaged.

Long side clamps installation drawing



Short side clamps installation drawing



- Make sure that these has no shadow caused by clamps. The drain holes of module cannot be blocked by clamps. The clamp must maintain at least 7mm overlapping with the frame of the module, taking care that no more than 10mm overlap.
- When selecting a clamp mounting method, use at minimum 4 clamps to attach modules to the mounting rails.
- Two clamps on each long side (longitudinal) or each short side (transverse) can be mounted, ReneSola recommends prioritizing the option of installing two clamps on each long side of the module, so that the module will have a greater load.

Grounding

In design of modules, the anodized corrosion-resistant aluminum alloy frame is applied for rigidity support. For safety consideration and to protect modules from lightning and electrostatic damage, the module frame must be grounded.
Proper grounding is achieved by bonding the module frame(s) and all metallic structural members together continuously using a suitable grounding conductor. The grounding conductor or strap may be copper, copper alloy, or any other material acceptable for use as an electrical conductor per respective National Electrical Codes. The grounding device must be in full contact with inner side of the aluminum alloy and penetrate surface oxide film of the frame.

Grounding methods below are permissible

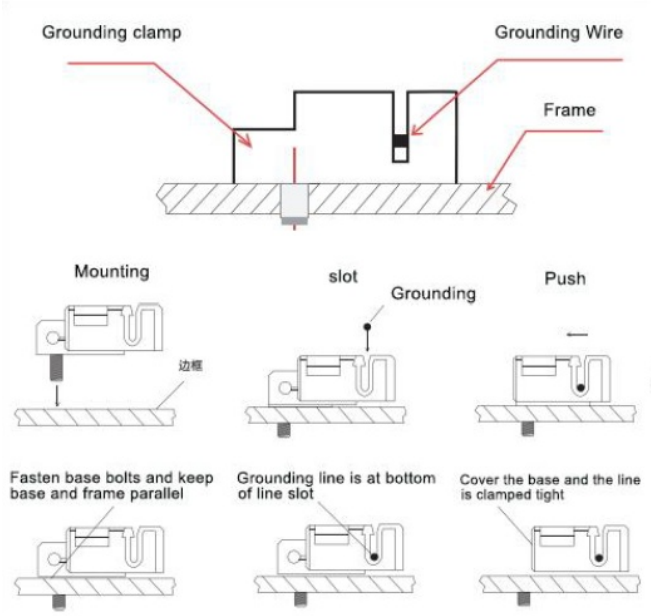
Grounding by grounding clamp

Renesola framed modules have grounding holes with the diameter of Ø4.2 mm at the edge location of module's back-side long-side frame. And the grounding holes are identified with typical grounding symbol according to IEC61730-1 standard. Grounding between modules shall be confirmed by qualified electricians and grounding devices shall be manufactured by qualified electric manufacturer. The torque of copper core wire used for the grounding clamp is recommended to be 2.3 N•m. 12 AWG. And copper wires cannot be pressed during installation in case of damage.

Grounding by unoccupied mounting holes

- Mounting holes on modules that are not occupied can be used for installing grounding components.
- Align grounding clamp to the frame mounting hole. Use grounding bolt to go through the grounding clamp and frame.
- Put the tooth side of the washer on the other side and fasten the nuts.

- Put grounding wires through the grounding clamp and grounding wire material and dimension shall meet requirements in local national and regional law and regulations.
- Fasten bolts of grounding wires and then installation is completed.



Clamp grounding method

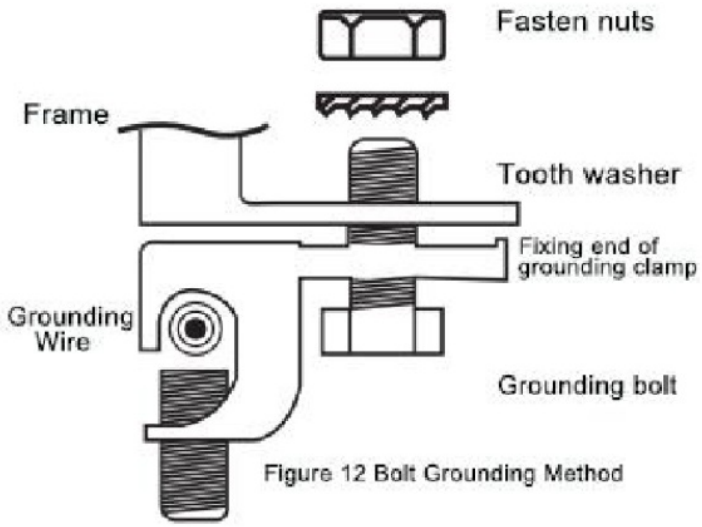


Figure 12 Bolt Grounding Method

Bolt grounding method

The third-party grounding devices

- The third-party grounding device can be used for grounding of Renesola modules but such grounding method shall be proved to be reliable.
- Grounding device shall be operated in line with stipulations of the manufacturer.

Electrical installation

- The electrical characteristics were tested under STC(standard test conditions), i.e. 1000W/m² irradiance, AM1.5 spectrum, and a cell temperature of 25°C (77°F).
- In some cases, modules may generate higher or lower voltage or current values than the rated value. The corresponding electrical characteristics can be downloaded from ReneSola's website: **www.renesola-energy.com**
- All wiring installation should be carried out by qualified installers in accordance with local electrical construction codes, procedures, and regulations. Modules can be connected in series to increase the operating voltage by plugging the positive plug of one module into the negative socket of the next. Before connecting modules always ensure that the contacts are corrosion free, clean and dry.
- When modules are in series connection, the string voltage is sum of every individual module in one string. When modules are in parallel connection, the current is sum of the individual module. Modules with different electric performance models cannot be connected in one string.
- The product can be irreparably damaged if an array string is connected in reverse polarity to another. Always verify the voltage and polarity of each string before making a parallel connection. If a reversed polarity or a difference of more than 10V between strings was detected, check the string configuration before connection.
- The string voltage must not be higher than the maximum system voltage, as well as the maximum input voltage

of the inverter and the other electrical devices installed in the system. To ensure that this is the case, the open circuit voltage of the array string needs to be calculated at the lowest expected ambient temperature for the location. This can be done using the following formula:

- Maximum system voltage≥ N* Voc * [1 + TCvoc× (Tmin-25)].

where:

- **N** Number of modules in seriess
- **VOC** Open circuit voltage of each module (refer to product label or data sheet)
- **TCvoc** Thermal coefficient of open circuit voltage for the module (refer to data sheet)
- **Tmin** The lowest expected operating temperature of module.

The number of modules that can be connected shall be determined by a qualified institution or person in accordance with the design specifications of the photovoltaic system and the local electrical design specifications. The calculation formula recommended by Renesola shall be for reference only.

Every module is provided with two standard output cables, and each terminated with a plugand- play connector. All wiring and electrical connections must be installed in accordance with the electrical design and construction specifications, procedures and regulations at the place of installation.

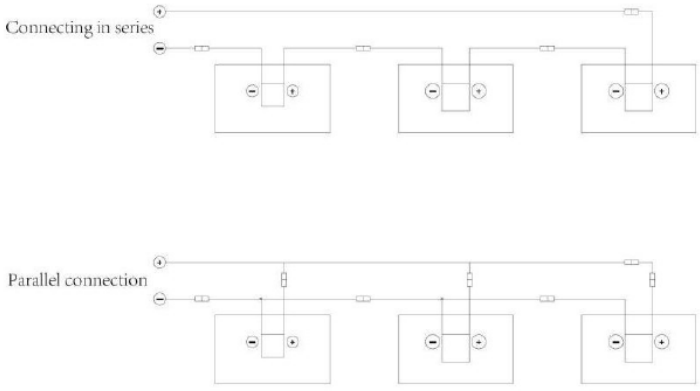
The minimum and maximum outer diameters of the cable are 5 to 7 mm. For wiring connections, please use standard PV copper wires with a cross-section area of at least 4 mm2 (12 AWG), and should be light-resistant and temperature-resistant at a minimum of 90 °C. It is suggested to use standard PV copper wires with a cross-section area of at 4-6 mm2 when conducting flat installation on the roof.

Do not bend the cables less than 43 mm (1.69 inch) radius

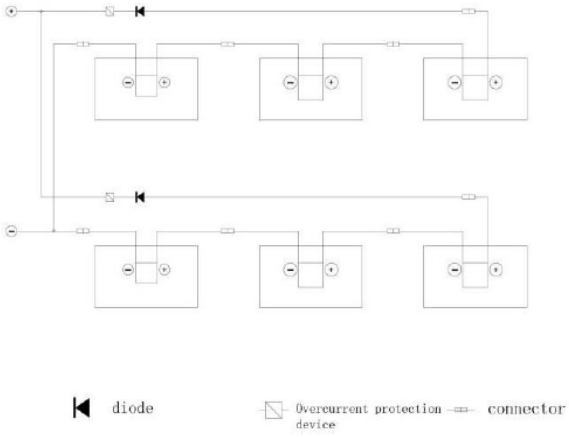
The correct routing and minimum bending radius of cables.

Wiring and connection

Series connection, parallel connection



Connecting in parallel after connected in series



To ensure proper system operation the correct cable connection polarity (Figures 1 & 2) should be observed when connecting the modules to each other or to a load, such as inverter, a battery etc. If modules were not connected correctly, the bypass diode could be destroyed. PV modules can be wired in series to increase voltage. A series connection is made when the wire from the positive terminal of one module is connected to the negative terminal of the next module. Figure 1 shows modules connected in series. PV modules can be connected in parallel to increase current (Figure 2). A parallel connection is made when the wire from the positive terminal of one module is connected to the positive terminal on the next module.

The maximum allowed quantity of modules in string connection shall be calculated according to relative regulations. The open circuit voltage value under the expected lowest temperature shall not exceed the maximum system voltage value allowed by modules and other values required by DC electric parts. (Renesola modules maximum system voltage is DC1000V/DC1500V—actually system voltage is designed based on the selected module and inverter model.) All instructions above have to be obeyed to maintain Renesola's limited warranty.

Fusing

When fuses are fitted they should be rated for the maximum DC voltage and connected in each, non grounded pole of the array (i.e. if the system is not grounded then fuses should be connected in both the positive and negative poles). The maximum rating of a fuse connected in series with an array string is typically 20A but the actual module-specific rating can be found on the product label and in the product datasheet.

This fuse rating value also corresponds to the maximum reverse current that a module can withstand (when one string is shaded then the other parallel strings of modules will be loaded by the shaded string and current will flow) and therefore impacts the number of strings in parallel. Do NOT share a fuse in a Combiner Box with two or more strings in parallel connection.

PID Protection, Inverter Selection & Compatibility

When installed in systems governed by IEC regulations, Renesola modules normally do not need to be electronically connected to earth and therefore can be operated together with either galvanically isolated (with transformer) and transformerless inverters. Choose inverters with isolation transformers in hot and wet areas (such as shores, and wetlands), to ensure proper module function under positive voltage.

ReneSola PV modules pass the most rigorous PID tests before delivery, and the negative electrode of the module usually does not need to be grounded, so it is compatible with isolated (with transformer) or non-isolated inverters.

1. PV modules may appear Potential Induced Degradation (PID) under high humidity, high temperature and high voltage condition. Modules may appear Potential Induced Degradation (PID) under the conditions below:

- PV modules install under hot and humid weather condition.
- PV modules installation site is under long-term humid environment such as water floating application.

2. To reduce the risk of PID, on the modules DC connection site, it is recommended to connect the negative to ground. The PID protection measures on system level are recommended as follow:
    - For isolated PV inverter, the negative of the PV modules DC connection side can be directly grounded.
    - For non-isolated PV inverter, isolated transformer is needed to be equipped before applying virtual grounding method for inverter.

Operation And Maintenance

It is the users' responsibility to carry out regular inspection and maintenance for modules, especially during the period of limited warranty. To inform the Renesola customer service personnel within two weeks when modules are found broken or other significant abnormality.

Cleaning

Accumulated contaminants on module surface glass will reduce the power output and lead to local hot spot, such as dust, industrial wasted water and birds' droppings. The severity of influence is determined by transparency of wastes. Small amounts of dust will affect the intensity and evenness of received solar irradiation but are not dangerous and power will not be reduced remarkably generally. During operation of modules, there shall be no environmental factors to shade modules fully or partially. These environment factors including other modules, module mounting system, birds dwelling, dust, soil or plants. These will significantly reduce output power.

Renesola suggests that the module surface should not be shadowed in any case. Frequency of cleaning depends on dirt accumulation speed. In normal situations, rainwater will clean the module surface and reduce the cleaning frequency. It is suggested to use sponge dipped with clean water or soft cloth to wipe the glass surface.

Do not use acid and alkaline detergents to clean modules. Do not use tool with rough surface to clean in any case.

Notes

- Clean PV modules when the irradiance is below 200W/m2; liquid with a large temperature difference from the modules must not be used for cleaning the modules;
- Do not clean PV modules under the weather conditions of wind more than 4 grades, heavy rain or heavy snow;
- Do not clean PV modules with pressurized water, the water pressure on the glass surface of the module must not exceed 700 KPa; the module must Not bear the extra force;
- When cleaning PV modules, do NOT step on the modules; do NOT spay water on the backside of the module or the cables; keep the connectors clean and dry; prevent fire and electrical shock from occurring; do NOT use as steam cleaner;
- The back surface of the module normally does not need to be cleaned but, in the event this is deemed necessary, avoid the use of any sharp projects that might damage the penetrating the substrate material.
- Periodically trim any vegetation which may shade the solar array thus impacting performance.
- When cleaning the modules, use a soft cloth together with a mild detergent and clean water. Take care to avoid severe thermal shocks which might damage the module by cleaning modules with water which has a similar temperature to the modules being cleaned.
- Use dry or wet soft clean cloth to clean the PV modules; non-corrosive solvents or hard objects are strictly prohibited;

- If installed in outdoor sites, avoid planting and shielding PV modules.
- If there is greasy dirt and other substances on the surface of the PV module which are difficult to clean, conventional household glass cleaning agents can be used; Do NOT use the alkaline and strong acid solvents.
- When cleaning the back surface of the module, take care to avoid penetrating the substrate material. Modules that are mounted flat (0° tilt angle) should be cleaned more often, as they will NOT ”selfclean” as effectively as modules mounted at a 10° tilt or greater.

Inspection of modules after cleaning

- Ensure that the module under visual inspection is clean, bright and free of stains;
- Spot check to verify whether there is soot deposit on the module surface;
- Check to see there are no visible scratches on the surface of the module;
- Check to see there are no man-made cracks are on the module surface;
- Check to see whether the module support structure is leaning or bent after cleaning;
- Check to see whether the wiring terminals of the module are detached;
- After cleaning PV modules, fill out the PV module cleaning record.

Inspection of connectors and cables

ReneSola recommends carrying out the following preventive inspection twice a year:

1. Check the tightness of the connectors and cables
2. Check if any crack or gap of silicone nearby the junction box.

Do not change the components of the module. If electrical or mechanical appliances are used for inspection or maintenance, they should be operated by qualified professionals to avoid any electric shock or loss of life.

Appendix Applied Products

The following applies to ReneSola series products:

	Classification-1	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS41-xxxMXB	Bifacial module with transparent backsheet (black	
	module, half-cut).	
RS41-xxxM	Mono-facial module (half-cut).	
RS41-xxxMX	Mono-facial module (black module, half-cut).	182 E1(1730×1133×30/35) E2(1728×1134×30/35) E3(1722× 1134×30/35) E4(1724× 1134×30/35)
RS41-xxxMBG	Bifacial module with dual glass (half-cut).	
RS41-xxxN	N-type mono-facial module (half-cut).	
RS41-xxxNX	N-type mono-facial module (black module, half-cut).	
RS41-xxxNBG	N-type bifacial module with dual glass (half-cut).	
	Classification-2	
Model	Product attributes	Monocrystalline silicon cell size and module size
	Bifacial module with	
RS4-xxxMXB	transparent backsheet	
	(black module, half-cut).	
RS4-xxxM	Mono-facial module (half-cut).	182 E1(1903×1134×30/35)
RS4-xxxMX	Mono-facial module	
	(black module, half-cut).	E2(1908×1134×30/35)
RS4-xxxMBG	Bifacial module with dual glass	
	(half-cut).	
RS4-xxxN	N-type mono-facial module	
	(half-cut).	

RS4-xxxNX	N-type mono-facial module (black module, half-cut).	
RS4-xxxNBG	N-type bifacial module with dual glass (half-cut).	
	Classification-3	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS6-xxxMXB	Bifacial module with transparent backsheet (black module, half-cut).	
RS6-xxxM	Mono-facial module (half-cut).	
RS6-xxxMX	Mono-facial module (black module, half-cut).	182 E1(2256×1133×30/35) E2(2274×1134×30/35) E3(2278×1134×30/35
RS6-xxxMBG	Bifacial module with dual glass (half-cut).	
RS6-xxxN	N-type mono-facial module (half-cut).	
RS6-xxxNX	N-type mono-facial module (black module, half-cut).	
RS6-xxxNBG	N-type bifacial module with dual glass (half-cut).	
	Classification-4	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS5-xxxMXB	Bifacial module with transparent backsheet (black module, half-cut).	
RS5-xxxM	Mono-facial module (half-cut).	182

RS5-xxxMX		
	Mono-facial module (black module, half-cut).	E1(2073×1133×30/35)
RS5-xxxN	N-type mono-facial module (half-cut).	
RS5-xxxNX	N-type mono-facial module	

	(black module, half-cut).	
	Classification-5	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS7-xxxN	N-type mono-facial module	182 E1(2443×1134×30/35) E2(2465×1134×30/35)
	(half-cut).	
RS7-xxxNX	N-type mono-facial module	
	(black module, half-cut).	
	Classification-6	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS8-xxxMBG	Bifacial module with dual glass	210
	(half-cut).	E1(2172×1303×35)
	Classification-7	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS9-xxxMBG	Bifacial module with dual glass	210
	(half-cut).	E1(2384×1303×35)
	Classification-8	

Model	Product attributes	Monocrystalline silicon cell size and module size
RS91-xxxMBG	Bifacial module with dual glass	210
	(half-cut).	E1(2384×1096×35)
	Classification-9	
Model	Product attributes	Monocrystalline silicon cell size and module size

RS2-xxxM	Mono-facial module (half-cut).	166 E1(1776×1052×30/35) E2(1763×1040×30/35) E3(1755×1038×30/35
RS2-xxxMG	Mono-facial module with dual glass (half-cut).	166 E1(1776×1052×30/35) E2(1755×1038×30/35)
RS3-xxxM	Mono-facial module (half-cut).	166 E1(2115×1052×30/35) E2(2102×1040×30/35) E3(2094× 1038×30/35) E4(2108× 1048×30/35)
RS3-xxxMG	Mono-facial module with dual glass (half-cut).	166 E1(2115×1052×30/35) E2(2094× 1038×30/35)
	Classification-10	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS13-xxxM	Mono-facial module (half-cut).	158.75 E1(2008×1002×40)
RS13-xxxMG	Mono-facial module with dual	158.75
	glass (half-cut).	E1(2031×1008×30)
RS14-xxxM	Mono-facial module (half-cut).	158.75 E1(1684×1002×35)

RS14-xxxMG	Mono-facial module with dual	158.75
	glass (half-cut).	E1(1704×1008×30)
	Classification-11	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS15-xxxM	Mono-facial module (half-cut).	158.75 E1(1980×1002×40)
RS16-xxxM	Mono-facial module (half-cut).	158.75 E1(1665×1002×35)

	Classification-12	
Model	Product attributes	Monocrystalline silicon cell size and module size
RS11-xxxP	Polycrystalline mono-facial	156 E1(1956×992×40)
RS12-xxxP	Polycrystalline mono-facial	156 E1(1640×992×40)

Note: Product code introduction

- ***RS:** Renesola
- ***M:** Monocrystalline silicon mono-facial.
- ***MG:** Monocrystalline silicon mono-facial module with dual glass
- ***MX:** Monocrystalline silicon mono-facial. (black module).
- ***MXB:** Monocrystalline silicon bifacial module with transparent backsheet. (black module)
- ***N:** N-type Monocrystalline silicon mono-facial
- ***NX:** N-type Monocrystalline silicon mono-facial (black module)
- ***NBG:** N-type Monocrystalline silicon bifacial module with dual glass
- ***MBG:** Monocrystalline silicon bifacial module with dual glass
- ***P:** Polycrystalline mono-facial module

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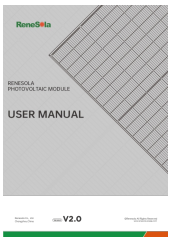
Documents / Resources

	ReneSola RS-T-002-V2.0 Photovoltaic Module Distributed System [pdf] User Manual RS-T-002-V2.0 Photovoltaic Module Distributed System, RS-T-002-V2.0, Photovoltaic Module Distributed System, Module Distributed System, Distributed System, System

References

- Jinko Solar-
- Renesola_Photovoltaic Modules,Distributed System,Large Surface Power Station
- User Manual