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1.1 PURPOSE OF THE MANUAL

The technical content of this guide applies to the installation, erection, connection and maintenance of photovoltaic modules of Suzhou Talesun Solar Technology Co., Ltd. (hereafter is referred to as "Talesun"). Any deviation from the contents of this manual will render the warranty and any guarantees thereunder null and void.

Information for installers

- ✧ Installers must read and understand this manual before installation.
- ✧ Please ensure that the installation, operation, and maintenance of the photovoltaic system described in the manual are performed by qualified personnel, such as personnel for system planning, installation and maintenance, whose operation must comply with all safety precautions in this manual and applicable local regulations; unqualified personnel can only carry out cleaning work.
- ✧ This manual is part of the product and should be retained during the service life of the photovoltaic system.

Information for operators

- ✧ Keep this manual during the service life of the photovoltaic system.
- ✧ Contact your equipment supplier for installation information concerning the photovoltaic systems. Be sure to learn about the guidelines and understand the needs of the persons who are in charge of local authorities, as well as the energy suppliers prior to the installation of photovoltaic power station.
- ✧ Make sure your PV system can withstand natural disasters (e.g. electricity, lightning strikes)

1.2 STATEMENT OF LIABILITY

- ✧ This statement is valid for Talesun products only.
- ✧ The information in this manual is based on Talesun's knowledge and experience and is considered to be reliable; but such information, including product specifications (without limitation) and suggestion, does not have any significance as a warranty or constitute an express or implied guarantee. Talesun reserves the right to change this manual, PV products, specifications, or product information sheets without prior notice.
- ✧ Talesun shall not bear any expenses arising from damage, loss or installation, operation, use or maintenance if the use of this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic products are beyond Talesun's control. Talesun does not cover any legal liability beyond the due function and safety performance. This manual is for reference only.
- ✧ No license is granted by implication or otherwise under any patent or patent rights.
- ✧ As for special modules, please install and use separately according to the module specifications or agreed terms in the contract.
- ✧ If your questions are not adequately addressed in this manual, please contact your system supplier. For more information, please visit Talesun website www.talesun.com.

1.3 PRODUCT IDENTIFICATION

Suzhou Talesun Solar Technologies Co., Ltd

Address: No. 1 Talesun Road, Changkun Industrial Park, Shajiabang Town, Changshu, Suzhou, Jiangsu Province, 215542, P.R. China

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Each module has three labels that provide the following information:

- ✧ Nameplate: describes the product type; rated power, rated current, rated voltage, open circuit voltage and short circuit current, all as measured under standard test conditions; weight, dimension etc.; as well as maximum system voltage fuse rating.
- ✧ Bar codes (One-dimensional Code or QR Code): The serial number has 16 digits. There are two bar codes on each module. One is permanently laminated inside the module which is obviously visible from the front of the module, and the other is pasted to the rear side of the module.
- ✧ Removing the nameplate will make the Talesun warranty void.

2.1 GENERAL SAFETY GUIDELINES

All installations must be performed in compliance with all applicable regional and local codes, or other national or international electrical standards

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- ✧ In order to ensure safe mounting, make sure that you are familiar with all applicable national regulations for safe working and accident prevention.
- ✧ To prevent injury, wear appropriate protective clothing (e.g. safety shoes, protective gloves). The working voltage that the protective suit provided to the working staff can withstand shall not be lower than 1500V.
- ✧ If the module glass is broken or the backsheet is damaged, contact with any surface or frame of the module will result in electric shock!
- ✧ Under normal circumstances, the current and voltage values generated by the modules may be higher than those obtained under standard test conditions. Therefore, when determining the photovoltaic power generation system modules, such as the rated voltage, wire capacity, fuse capacity and the parameters associated with the module power output, the corresponding short circuit current and open circuit voltage should be multiplied by a factor of 1.25 before application.
- ✧ Modules in this application class can be used in systems with DC voltages greater than 50V or 240W, where a general access point is expected. Modules that pass IEC61730 can be considered to meet the requirements of safety class II.

2.2 PRODUCT PROTECTION

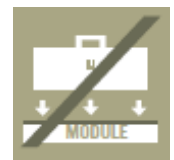
- ✧ Do not attempt to disassemble the modules.
- ✧ Do not attempt to remove any nameplates or parts and components from the modules.
- ✧ Do not open the junction box under any circumstances.
- ✧ Do not connect blocked or contaminated plugs.
- ✧ Only after receiving the written confirmation from Talesun, can you carry out the modifications or other operations on the modules.
- ✧ Do not attempt to drill holes into the module (e.g., for installing the fasteners).
- ✧ Only use insulation tools dedicated for electrical installation.
- ✧ Do not use light concentrators (e.g. mirrors or lenses) to attempt to increase the power generation of the module. Otherwise the module may be damaged as a result, so that make the warranty to be void.
- ✧ It is strictly prohibited to squeeze or use sharp objects to knock, collide, scratch the tempered glass of the photovoltaic module.



2.3 TRANSPORT AND STORAGE SAFETY GUIDELINES

Inappropriate transportation and installation may damage the modules. To prevent damage to the modules:

- ✧ Transport the modules in their original packaging until installation.
- ✧ Store the modules securely in a ventilated and dry space. The outer packaging of the modules is non-weather resistant!
- ✧ Protect the modules against scratches and other damage, especially when the module edges are knocked or the modules are improperly stored.
- ✧ Ensure modules do not bend under their own weight.
- ✧ Do not place the modules without any protection. Otherwise the modules and frames are liable to be damaged.
- ✧ Do not lift or move the modules by using the cables or junction box under any circumstances!
- ✧ Do not place any hard objects on the upper or lower surfaces of the modules.
- ✧ Do not let the module surface bear the mechanical stress.



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- ✧ Do not stand on the modules.
- ✧ Do not drop or place objects on the modules.

3.1 SELECTING THE LOCATION

- ✧ The modules passed the certification according to IEC 61215 and other standards, and are suitable for safe operation in mild climatic conditions. When installing modules at high altitude area, the effect of high altitude on module operation needs to be considered.
- ✧ Do not install or use the modules in an environment with highly corrosive substances (such as salt, salt mist, salt water, active chemical vapor, acid rain, or any other substance that will corrode the modules, affect the safety or performance of the modules).
- ✧ Do not place the modules in water. The projection grade of the junction box is IP68.
- ✧ Do not install the modules near flammable gases and vapors (e.g. gas tanks) or near open flames or flammable materials. Solar modules are not explosion-proof items.
- ✧ Long-term exposure to salt mist (i.e., marine environments) and sulfur-containing (i.e., sulfur sources, volcanoes) environments will lead to a risk of module corrosion. It is not recommended to install modules within the range which is 0.1Km from the marine environment; and install the modules with salt mist resistant function, when the distance is between 0.1Km and 1Km.
- ✧ Modules should not be shaded throughout the year (e.g. by buildings, chimneys, trees). Even partial shading of the modules (e.g. by overhead lines, dirt, snow) should be avoided either.

3.2 SELECTING THE APPLICABLE TRACKERS TO MOUNT

Guidelines and safety precautions should also be followed at all times when trackers and modules are installed and used. The mounting tracker structure of each module shall meet:

- ✧ Use durable, corrosion-resistant and UV-resistant material.
- ✧ The mechanical stress on the modules can be well transferred to the tracker structures.
- ✧ Ensure that no mechanical stress (e.g. caused by vibrations, twisting or expansion) is generated on the module.
- ✧ Ensure that it is well ventilated at the back of the modules.
- ✧ Ensure that the trackers have long term stability.
- ✧ Ensure that electrochemical corrosion is not caused by the use of metals in direct contact (i.e. ground wires, screws, washers, etc.).
- ✧ Allow for generating strain-free expansion and contraction due to natural ambient temperature variations.

3.3 GENERAL INSTALLATION

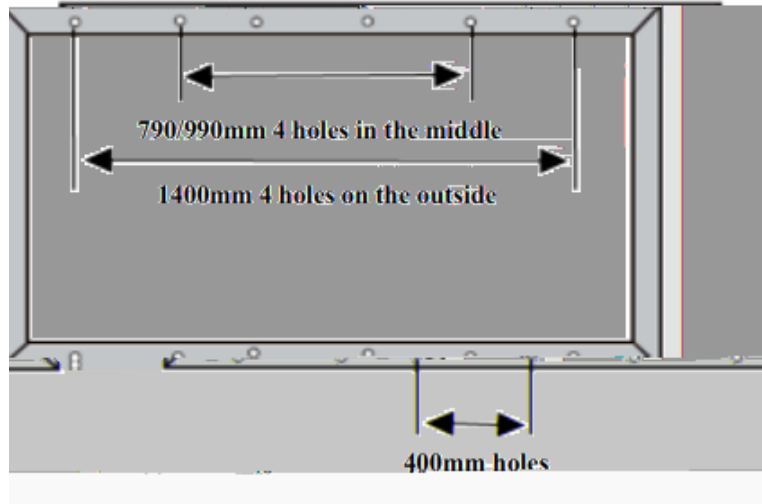
Modules installed in series should be ensured at the same orientation and angle. Difference in orientations or angles (different illumination) may cause a loss of power output.

- ✧ When developing the final layout of photovoltaic system, adequate staff passage should be ensured for subsequent

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- ✧ The module is installed with the beam vertical to the frame long side; the module is installed with the beam parallel to the frame long side; and the mounting methods of tracking bracket (see the installation legend below for details), safety
- ✧ Modules should be bolted to support structures through mounting holes located on the back side of the frame. Do not drill additional holes, otherwise will void the warranty.
- ✧ Use M8 coarse thread bolts for the 4 mounting holes on the outside and the 4 holes in the middle (990mm); use M6 coarse thread bolts for the 4 mounting holes in the middle (790mm) / 400mm holes.
- ✧ Each module must be securely fastened by using at least 4 mounting holes. Emergency mounting holes shall be also used if there is additional wind or snow load. System designer and installer should calculate the load in advance to make proper design of support structure.
- ✧ Recommended bolt accessories are as follows:

Types & Materials of Accessories	Bolts	Washers	Spring Washers	Nuts	Torque
	Q325B / SUS304	Q325B / SUS304	Q325B / SUS304	Q325B / SUS304	
	M8 (full thread recommended)	2pcs, Thickness >1.5mm; External Diameter	8	M8	16~20N•m
	M6 (full thread recommended)	2pcs, Thickness >1.5mm; External Diameter	6	M6	10~16N•m

- ✧ Follow mounting guidelines recommended by the PV mounting supplier. The mounting design must be certified by a registered professional engineer.

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- ✧ The mounting design and procedures shall comply with local codes and all authorities having jurisdiction.
- ✧ Ensure that the drain holes of the frame are open to make the water flow drain out smoothly, so that may prevent frost damage.
- ✧ Modules shall be installed in such a way so as to ensure that rainwater and snowmelt can slide down freely, thereby avoiding water accumulation or freezing.

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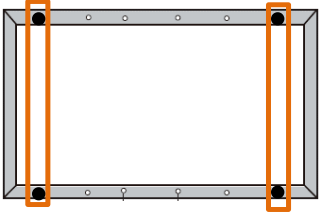
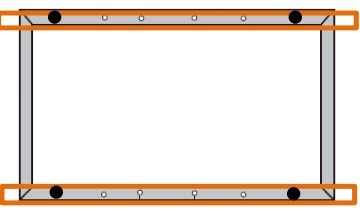
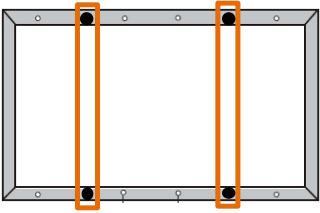
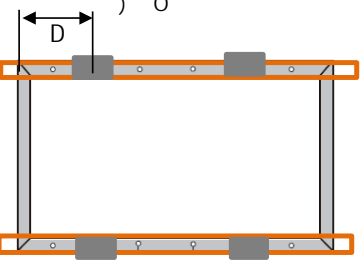
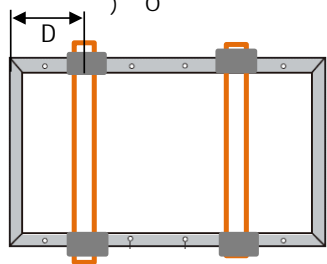
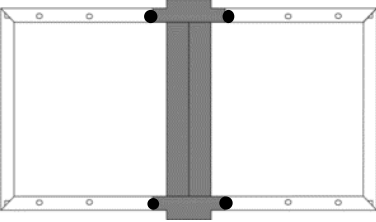
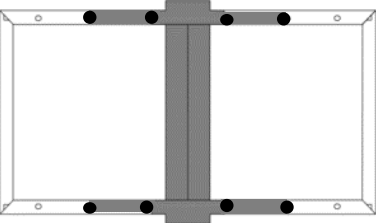
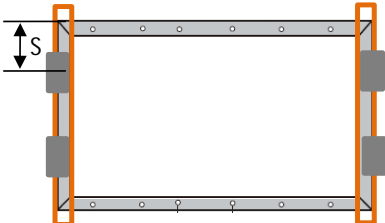
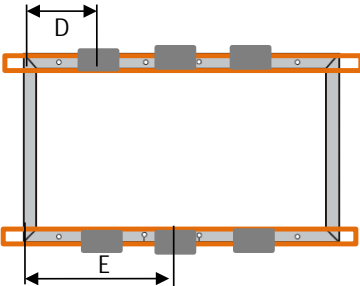
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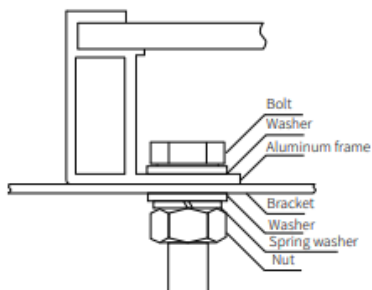
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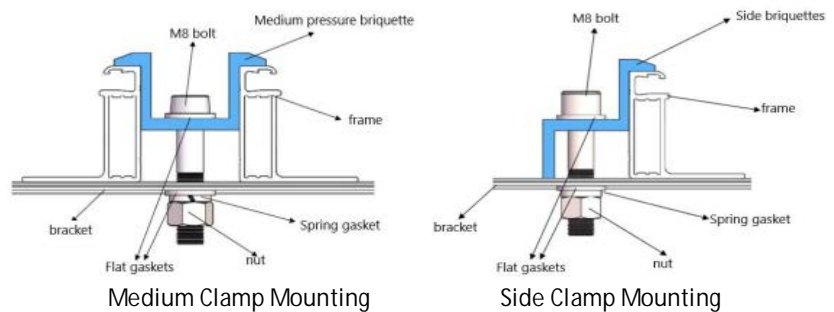
<p>a Outer 4 holes bolt mounting (with beam vertical to frame long side)</p> 	<p>b Outer 4 holes bolt mounting (with beam parallel to frame long side)</p> 	<p>c Middle 4 holes bolt mounting (with beam vertical to frame long side)</p> 
<p>d Clamp mounting with beam parallel to frame long side</p> 	<p>e Clamp mounting with beam vertical to frame long side</p> 	<p>f Tracking bracket bolt mounting</p> 
<p>g Tracking bracket + support bar bolt mounting</p> 	<p>h Clamp mounting with beam parallel to frame short side</p> 	<p>i With beam parallel to frame long side</p> 

Remarks: "L" is module length; "W" is module width.

Bolt Legend



Clamp Legend



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TP6F**				/		
TP6G**						

3600Pa
-1600Pa 3600Pa
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4.1 MODULE SELECTION

- ✧ Select and use the modules of same type, same configurations and same power in the same system. This is the only way to achieve optimal yields.

4.2 SAFTY FACTOR

- ✧ Photovoltaic modules may withstand greater current and/or voltage under normal circumstances than those under Standard Test Conditions. Therefore, the values of I_{sc} and V_{oc} should be multiplied by 1.25 times when determining the module nominal voltage, nominal current, fuse current and controller size. Alternatively, a valid national installation guide of electrical systems can be used. Pay attention to avoid the PID phenomenon at the system installation side during installation.

4.3 GENERAL INSTALLATION

- ✧ Before installing modules, contact the appropriate authorities to determine permissions, installation and inspection requirements applicable to your site selection and installation.
- ✧ Check applicable building codes to ensure that the support structures (roofs, exterior walls, supports, etc.) are strong enough to support the weight of the modules and all other system components.
- ✧ When a high current needs to be obtained, several photovoltaic modules can be connected in parallel. The total current is equal to the sum of the respective currents, and each module (or a series of modules in series) must be configured with a specified maximum current fuse. The recommended number of parallel modules is one.
- ✧ When a high voltage needs to be obtained, several photovoltaic modules can be connected in series. The total voltage is equal to the sum of the respective voltages. However, the maximum system voltage must be lower than the maximum certified voltage and the maximum input voltage for inverters and other electrical equipment in the installation system. The maximum number of modules in series is $(N) = \text{System } V_{max} / \{V_{oc} \text{ (at STC)} \times [1 + (t - 25) * K_v]\}$, where:
System V_{max} : The smaller of the maximum certified voltage, the maximum output voltage of the system inverter or other electrical equipment
 V_{oc} : Open circuit voltage of PV module (v)
t: The lowest ambient temperature ()
 K_v : Temperature coefficient of open circuit voltage for PV module (/) -- refer to product technical data sheet
- ✧ Connect the appropriate number of modules according to the voltage specification of the inverter used by the system. Even under the worst local temperature conditions, the voltage generated by the connected modules shall not be higher than the voltage allowed by the system.
- ✧ It is recommended to connect modules with similar electrical properties on the same string to reduce array mismatch effects.
- ✧ Use dedicated photovoltaic cables and matching plug specified by local fire, building and electrical codes (wiring should be placed in light-resistant conduits or light-resistant materials if cables are exposed to air). Ensure that they are placed under optimum electrical and mechanical conditions.
- ✧ Only photovoltaic cables can be used as connecting cables. A PV system must use the same type of connectors from the same manufacturer and the connectors linked to the inverters should be the same type from same manufacturer as well. During installation, disassembly, maintenance, and any other related process, the applied force between the cable and the connector shall not be greater than 90N to avoid improper connection or damage of the connector and the cable caused by human factors, which may affect the electrical safety or service life of the product.

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- ✧ Ensure that all electrical components are placed in a proper, dry and safe condition. In this way may avoid electrical short-circuits or dangerous contact voltages due to defective or damaged cables.
- ✧ Always avoid mechanical stress on the connecting cables.
- ✧ Ensure the tight connection and correct connection between individual connectors (especially for inverters).
- ✧ The minimum bend radius of the cable is 43mm.

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Use unused mounting holes for grounding	<p>1. The existing but unused mounting holes on the modules can be used to install the grounding device. Align the grounding clamp with the frame mounting hole. Use the grounding bolt to pass through the grounding clamp and frame. Put the tooth washer on the other side and tighten the fasten nut. Pass the grounding wire through the grounding clamp. The material and size of the grounding wire shall meet the requirements of relevant local national, regional or international regulations, laws and standards.</p> <p>2. Tighten the grounding wire fastening bolt, and then the installation is completed.</p>	
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1. The grounding hardware includes:
grounding screw, fl51 (u.3nBT-0.005 Tc .6 0.439.6 0.48 0.48 ref261-6 (w)-9 40.004 Tc 0.005 Tw 9 -0 0 3.4 (ed.5eP (n)1 (i).005 Tw .227 Td[(r)-2

Use
grounding
holes for
grounding

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5.2 TROUBLESHOOTING

- ✧ Please do not attempt to solve the problem by yourself!
- ✧ In case of problems or damaged modules (for example, glass breakage, damaged cables), please contact your installer or the Talesun Technical Customer Service.

5.3 MAINTENANCE

- ✧ Talesun modules shall be inspected and maintained regularly after installation. Rain can wash away dirt. However, rain may not adequately remove more stubborn dirt (i.e. pollen, vegetation, bird droppings, etc.). Such dirt will obscure the power generation part of the module and may lead to a reduction in the system performance. Talesun recommends the following maintenance in order to ensure optimum performance of the module:
- ✧ Clean the glass surface if necessary. Make sure to use clean water and soft sponge or cloth, and use mild and non-abrasive cleaning agent to remove stubborn stains. Talesun limited warranty will be invalid due to damage caused by improper cleaning methods.
- ✧ Check the electrical and mechanical connections every six months to verify that they are clean, secure and undamaged.
- ✧ If any problem arises, have them investigated by a module specialist. Note: read the maintenance instructions for all components used in the system (such as support frames, charging regulators, inverters, batteries etc.).
- ✧ The right of final interpretation belongs to Suzhou Talesun Photovoltaic Technology Co., Ltd.

Headquarters

No.1, Tenghui Road, Shajiabang, Changshu, Suzhou City, Jiangsu Province, China

Tel +86 512 8235 5888

Email: sales@talesun.com

Thailand

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USA

99 S.Almaden Blvd, Suite 600. San Jose, CA 95113, USA

Email: sales@talesun.com

Japan

Sinmitsuibiru 11F 1-1-1 Hakataeki Mae Hakata-ku, Fukuoka-shi, Fukuoka-ken 812-0011, Japan

Email: sales@talesun.com

GERMANY

Konrad-Zuse-Platz 8, 81829 Munchen, Germany

Email: sales@talesun.com

France

2405, Route des Dolines-06560 Sophia Antipolis, France

Email: sales@talesun.com

Brazil

Av. Eng. Luis Carlos Berrini, 550-11° andar-Cidade Moncoes-Sao Paulo, Brazil

Email: sales@talesun.com

Turkey

Izzetpasa mah. Yeni Yol Cd, Nurol Tower. No:3/336 34381 Sisli, Istanbul, Turkiye

Email: sales@talesun.com

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Address: No. 1 Talesun Road, Changkun Industrial Park, Shajiabang Town, Changshu, Suzhou, Jiangsu Province, 215542, P.R. China