TALESUN

Installation manual

INTRODUCTION

1.1 PURPOSE OF THE MANUAL

This guide contains information on precautions to be used during the handling and installation of Talesun Solar Co., Ltd photovoltaic modules along with technical instructions to be followed during installation, mounting, wiring and maintenance thereof. Talesun Solar Co., Ltd hereafter is referred to as "Talesun". Any divergence from the contents of this manual during the handling, installation, or maintenance of Talesun's products will render the warranty and any guarantees there under null and void.

Information for installers

- Installers must read and understand this manual before installation.
- Please ensure that installation, operation and maintenance of your photovoltaic system is only carried out by qualified persons able to carry out the technical procedures described in this manual, i.e. system planers, installers and maintenance personnel, and is carried out in accordance with all safety precautions in this manual and any and all applicable local codes. If you do not possess these qualifications, you may not carry out the work described herein except for cleaning.
- This manual and the instructions set forth herein are part of the product and should therefore be kept for the entire useful life of the solar installation.

Information for operators

- Keep these instructions safe for the entire useful life of the solar installation.
- Please contact your plant supplier for information concerning the formal requirements for solar systems. Please be sure to learn about directives and permit requirements from the responsible local authorities and energy providers prior to installation of the solar plant.
- We recommend that you insure your solar system against natural hazards (e.g. against lightning strikes).

1.2 DISCLAIMER OF LIABILITY

- These instructions are only valid for products of Talesun.
- The information in this manual is based on Talesun's knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not constitute a warranty, expressed or implied. Talesun reserves the right to change the manual, the PV products, the specifications, or product information sheets without prior notice.
- Talesun assumes no liability for damage, loss, or expense arising out of or in any way connected with such installation, operation, use or maintenance. Talesun assumes no responsibility extending beyond the functional capability and safety of the modules.
- No license is granted by implication or otherwise under any patent or patent rights.
- If your questions are not adequately addressed in this manual, please first contact your system supplier. You can find more information on our website www.talesun.com.

1.3 PRODUCTION IDENTIFICATION

Each module has three labels that provide the following information:

- **Nameplate:** describes the product type; rated power, rated current, rated voltage, open circuit voltage, short circuit current, all as measured under standard test conditions; weight, dimension etc.; the maximum system voltage is 1000 volts DC and is shown on the nameplate. Maximum fuse rating is also shown.
- **"QA Pass" stamp:** module will be strictly inspected according to standard and get a QA Pass stamp on the backsheet.
- **2-dimensional Bar code:** The serial number has 16 digits. There are two bar codes on each module. One is permanently attached to the interior of the module and is visible when viewing the front of the module, and another is stuck to the rear side of the module.
- Do not remove any label.

SAFETY GUIDELINES

2.1 GENERAL SAFETY GUIDELINES

DANGER! Danger due to electric shock!

A solar module generates electricity and voltage even at low intensity of illumination.

Physically disconnecting contacts in a live electrical circuit can cause arching, resulting in grave or mortal injury. The severity increases when several modules are connected in series.

- All installations must be performed in compliance with all applicable regional and local codes, such as the latest National Electrical Code (USA) or the latest Canadian Electric Code (Canada) or other national or international electrical standards as applicable.,
- Cover the solar modules with opaque material for the entire duration of assembly. Only then is the module reliably de-energized.
- Never disconnect plugs when under load. Be aware that even without the presence of daylight, residual charge may still be present in the plant. Ensure that the modules are first disconnected from the inverter prior to opening any contacts in the solar installation.
- Solar modules produce electrical energy when light shines on their front surface. The DC voltage may exceed 30V. Contact with a DC voltage of 30V or more is potentially hazardous.
- In the case of module or phase voltages of more than 120 V, the extra-low voltage range is left. Undertake the necessary protective and precautionary measures.
- Do not insert electrically conductive parts into the plugs and junction box. Do not touch the contacts or exposed terminals.
- Keep children and unauthorized persons away

from the modules.

- In case of damaged modules or operational errors of the solar array, always contact your installer or Talesun Technical Customer Service.
- Do not wear metallic ornaments or metallic devices while installing or troubleshooting photovoltaic systems.

WARNING! Danger of injury due to broken glass! Risk of injury due to falling modules!

- The modules are primarily made of glass and must therefore be handled with appropriate caution.
- In order to ensure safe mounting, familiarize yourself with all applicable national regulations for work safety and accident prevention.
- Wear suitable protective clothing (e.g. safety shoes, protective gloves) in order to prevent injuries.
- If the front glass is broken, or the back sheet is torn, contact with any module surface or the frame can cause electric shock.

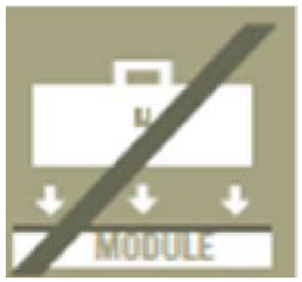
2.2 PRODUCTION PRECAUTION

- Do not attempt to disassemble the modules.
- Do not remove any attached nameplates or components from the modules.
- Do not open the junction box under any circumstances.
- Only carry out modifications to the modules that have been confirmed by Talesun in writing in advance.
- Do not carry out any extra drilling (e.g. for fasteners) on the modules.
- Use only insulated tools that are approved for work on electrical installations.

- Do not use light concentrators (e.g. mirrors or lenses) to attempt to increase the capacity of the module. The module may be damaged. This also voids the warranty.

2.3 TRANSPORT AND STORAGE SAFETY GUIDELINES

- Inappropriate transport and installation may break the module. To prevent damage of the modules:
- Transport the modules in their original packaging until installation.
- Store the modules securely in cool and dry rooms. The packaging is not weather-resistant!



- Protect the modules against scratches and other damage, especially from impact at the edges or improper storage.
- Ensure modules do not bow under their own weight.
- Do not rest a module unprotected on its edges. This can damage the module and the frame.
- Do not lift or move the modules using the cables or at the junction box under any circumstances!
- Do not set the modules down hard on any surface.
- Do not subject the module surfaces to mechanical stress.
- Do not stand on the modules.
- Do not drop or place objects on the modules.

MECHANICAL INSTALLATION

3.1 Selecting the location

- The modules are certified according to the norm IEC 61215 for safe operation in moderate climates.
- Do not expose the modules to chemicals.
- Do not place the modules in standing water. The junction box is splash-proof only.
- Do not install the modules near flammable gases and vapors (e.g. gas containers) or near open flames and flammable materials. Solar modules are not explosion-proof operating equipment.
- If there is exposure to salt (i.e., marine environments) and sulfur (i.e., sulfur sources, volcanoes), there is a risk of corrosion.
- The modules should not be shaded at any time of the day. Avoid shading of the modules, as this has a negative impact on the energy yield. A module is considered shade-free when it is entirely unshaded 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.

3.2 Selecting the proper support frame

- Always observe the instructions and safety precautions included with the support frames to be used with the modules.

Install each module to a mounting structure:

- That is made of durable, corrosion-resistant and UV-resistant material.
- That can transfer forces on the module to the assembly substructure.
- That ensures that no mechanical stress (e.g. caused by vibrations, twisting or expansion) is generated on the module.
- That ensures sufficient back ventilation of the module.
- That ensures long term stability.
- That will not give rise to galvanic corrosion in case of direct metal contact (i.e. grounding lead, screws, washers, etc.)
- That allows for strain-free expansion and contraction due to natural ambient temperature variations.

3.3 Mounting

Modules connected in series should be installed at the same orientation and angle. Different orientations or angles may cause a loss of power output due to the change in sunlight exposure.

When developing the final layout of photovoltaic system, consider keeping suitable access to allow the maintenance and inspection works.

To minimize risk in the event of an indirect lightning strike, avoid forming loops when designing the system.

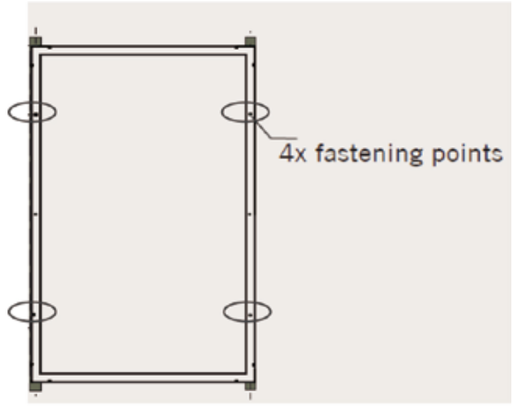
Ground mount

- Select the height of the mounting system to prevent the lowest edge of the module from being covered by snow for a long time in winter in areas that experience heavy snowfalls.
- In addition, assure the lowest portion of the module is placed high enough so that it is not shaded

by plants or trees or damaged by sand and stones driven by wind.

Roof mount

• When installing a module on a roof or building, ensure that it is securely fastened and cannot fall as a



result of wind or snow loads.

• Provide adequate ventilation under a module for cooling; at least 10cm minimum air space between module and mounting surface; clearance of 1/4 of an inch (6.35 mm) or more between modules is required to allow for thermal expansion of the frames.

• When installing a module on a roof, please ensure the assembly is mounted over a fire resistant roof covering rated for the application. Talesun modules have been listed as Class C according to UL790 standard.

• Any roof penetration required to mount the module must be properly sealed to prevent leaks.

• In some cases, a special support frame may be necessary.

• The roof installation of solar modules may affect the fireproofing of the building construction.

• Do not install modules on a roof or building during strong winds to prevent accidents.

Pole mount

• When installing a module on a pole, choose a pole and module mounting structure that will withstand anticipated winds for the area.

Frame Holes Mounting

Modules must be securely attached to the mounting structure using four pre-drilled mounting holes (12mm*8mm) in the frame.

• Modules must be securely attached to the mounting structure using four mounting points for installation.

• Do not attempt to drill holes in the glass surface of the modules. Doing so will void the warranty.

• Do not drill additional mounting holes in the frame of the modules. Doing so will void the warranty.

• The modules may be installed in landscape or portrait format.

• Install the module in such a way that the junction box is positioned in the upper area of the module and the wires hang downwards.

• The optimal tilt angle

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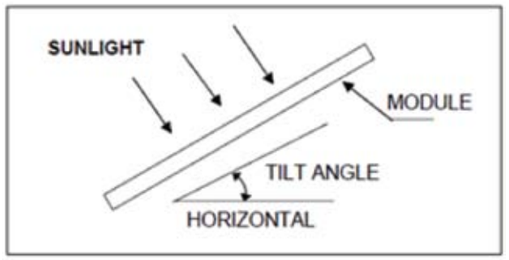


of the module depends on the respective latitude. We recommend a photovoltaic simulation tool to ensure the optimal orientation.

WATER RUNOFF

• Ensure that the drainage openings of the frame are left open following installation to allow water runoff. This prevents frost damage.

• Install the module in such a way that rainwater and snowmelt can run off freely to avoid standing water or pudding.

WIND/SNOW LOAD

• The modules have been designed to resist a static load of 5400Pa (112.78 lb / ft2) (positive or negative load).

This resistance value can decrease if modules are not mounted following the instructions above.

ELECTRICAL INSTALLATION

4.1 Module selection

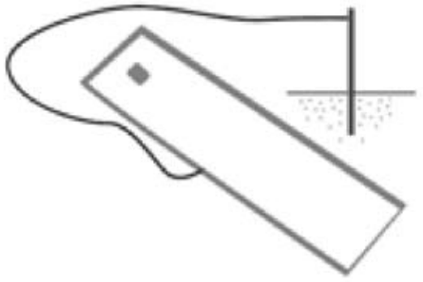
Only connect modules of the same type, same configurations and same power class in the same system. This is the only way to achieve optimal yields. The maximum number of modules can be calculated using the following formula, where N stands for the number of modules (N) = Vmax system / [Voc(at STC)].

4.2 Safety factor

Under normal outdoor conditions the module will produce current and voltages that are different than those listed in the date sheet. Data sheet values are

Table 1: Low temperature correction factors table for open-circuit voltage

Lowest Expected Ambient temperature (℃/℉)	Correction Factor
24 to 20 / 76 to 68	1.02
19 to 15 / 67 to 59	1.04
14 to 10 / 58 to 50	1.06
9 to 5 / 49 to 41	1.08
4 to 0 / 40 to 32	1.10
-1 to -5 / 31 to 23	1.12
-6 to -10 / 22 to 14	1.14
-11 to -15 / 13 to 5	1.16
-16 to -20 / 4 to -4	1.18
-21 to -25 / -5 to -13	1.20
-26 to -30 / -14 to -22	1.21
-31 to -35 / -23 to -31	1.23
-36 to -40 / -32 to -40	1.25



values expected at standard test conditions(STC). Accordingly, during system design, you should include a safety factor of 1.25 for:

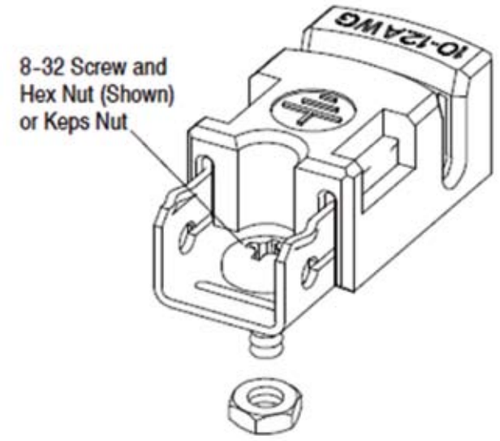
- the determination of the voltage measurement values (Voc) of components;
- the determination of the current measurement values (Isc) of components;
- the determination sizes of the fuses;
- the evaluation of control systems connected to the output of photovoltaic modules.

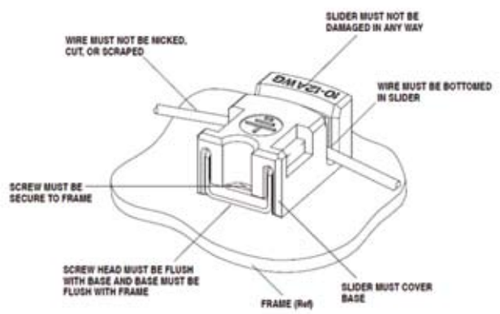
Alternatively, all valid national regulations for the installation of electrical systems are to be applied.

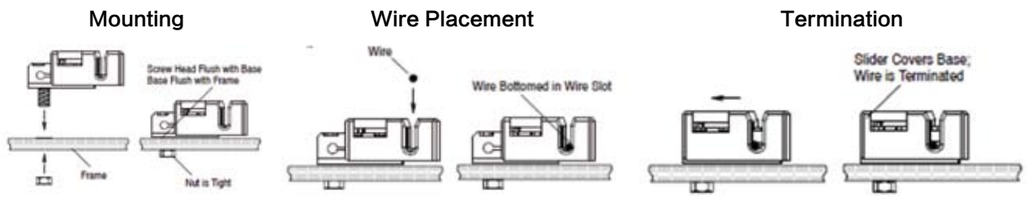
An additional 1.25 multiplier for a short-circuit current (for a total of 1.56), and a correction factor for an open circuit (see Table 1 below) for sizing conductors and fuses is applicable, as described in section 690-8 of U.S. NEC.

4.3 General installation

- Before installing modules, contact the appropriate authorities to determine permissions, installation and inspection requirements to follow that apply to your site and installation.
- Check applicable building codes to ensure that the construction or structure (roof, facade, support, etc.) where the modules are being installed is strong enough to support the weight of the modules and all







other system components.

- If modules are connected in series, the total voltage is equal to the sum of individual voltages. For applications requiring high currents, several photovoltaic modules can be connected in parallel; the total current is equal to the sum of individual currents.
- Use special solar cable and suitable plugs only (wiring should be placed in conduit that is sunlight-resistant or, if exposed, should be sunlight-resistant) in accordance with local fire, building and electrical codes. Ensure that they are in perfect electrical and mechanical condition.
- Only use solar cables as connection cables. Use connectors of the same type and manufacturer within a solar system, and compatible connectors to connect the inverter.
- Ensure that all electrical components are in a proper, dry and safe condition. In this way you avoid electrical short-circuits or dangerous contact voltages due to defective or dam-aged cables.
- Always avoid mechanical stressing of the connection cables.
- Ensure a tight connection between the individual connectors (especially to the inverter). Make sure they click together properly.

4.4 Grounding:

- The module frame must be properly grounded. The grounding wire must be properly fastened to the module frame to assure good electrical contact. Use the recommended type, or an equivalent, connector for this wire.
- If the support frame is made of metal, the surface of the frame must be electroplated and have excellent conductivity.

UL recognized grounding clip assembly (TYPE: TYCO ELECTRONICS 1954381-2). UL file number: E69905.

Wire selection and preparation:

The grounding clip accepts solid uninsulated copper wire sizes 10 or 12 AWG. The wire must not be nicked, cut, or scraped. There is no preparation required.

Spacing:

Care must be used to avoid interference between adjacent grounding clips and other components for removal of the grounding clip.

Removal:

The wire can be removed from the grounding clip when the slider is disengaged (slider and screw are exposed). The screw must be loosened before the grounding clip can be removed from the frame. The grounding clip can be re--used up to 5 times after proper removals (the 8--32 screw and hex nut or Keps nut can be re--used; however, the thread--cutting screw must be replaced). The thread--cutting screw cannot be re-used after removing the grounding clip from the frame.

Repair:

The grounding clip is not repairable. Discard any defective or damaged grounding clips.

TOOLING:

A drill bit is required for drilling the frame holes. A No. 2 cross--recessed screwdriver must be used to secure (and remove) the screw of the grounding clip to (and from) the frame. For the grounding clip with the 8--32 screw and hex nut or Keps nut, a 3/8--in. wrench must be used to secure (and remove) the nut of the grounding clip to (or from) the frame. The

recommended screw tightening torque is 1.7+0.5/−0.2Nm (15+4.4/−1.7 in.−lbs).

The slider can be engaged manually or channel lock pliers can be used to engage the slider. A flat—head screwdriver must be used to disengage the slider.

ELECTRICAL INSTALLATION

5.1 Blocking diodes and bypass diode

• Blocking diodes prevent current flowing from the battery to the module when no electricity is being generated. It is recommended to use blocking diodes when a charging regulator is not used. Your specialist dealer can advise you regarding the suitable types.

• In systems with more than two modules in series, high reverse current can flow through cells that are shaded partially or outright when part of a module is shaded and the rest is exposed to the sun. These currents can cause the affected cells to get very hot and could even damage the module. To protect module from such high reverse currents, by-pass diodes are used in modules. All modules rated greater than 55 Watt have bypass diodes already integrated in the junction box. In the unlikely event of diode failure, it can be easily replaced; however, doing so will void warranty unless this exchange is made by an authorized person.

• Protect yourself from electric shocks while debugging or maintaining the solar power system.

5.2 TROUBLESHOOTING

DANGER! Life danger due to electric shock!

• Please do not attempt to correct problems on your own!

• 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 are built to last and require minimal maintenance. Light dirt is typically washed away by rain. However, rain may not adequately clear more stubborn grime (i.e. pollen, vegetation, bird droppings, etc.). Such soiling which shades the active area of the module can lead to a reduction in the system ‘s performance. Talesun recommends the following maintenance in order to ensure optimum performance of the module:

• Clean the glass surface of the module as necessary. Always use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used to remove stubborn dirt.

• 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 competent specialist. Attention: observe the maintenance instructions for all components used in the system, such as support frames, charging regulators, inverters, batteries etc.

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TECHNICAL DATA

Module Type	TP660P-***	TP660M-***	TP572M-***
Power Level	XXX=215-255 in 5W steps	XXX=210-260 in 5W steps	XXX=170-200 in 5W steps
Type	Poly-crystalline PV module	Mono-crystalline PV module	Mono-crystalline PV module
Dimension [mm]	1640*990*40	1640*990*40	1580*808*40
Weight [kg]	19	19	15
Distance between installation holes on one profile [mm]	1000	1000	1000
Fuse rating [A]	15	15	10
Max. system voltage [V]	1000		
Junction box	Protection class IP 65 with bypass diode		
Cable length [mm]	1000		
Cable cross section area [mm^2]	4		
Connector	MC4		
Flammability rating	C		
Wind / snow load [Pa]	5400		
Certificates	All modules: CE-compliant; IEC 61215 (Ed.2); IEC 61730 (Ed.1); UL1703; Application class A		

Module Type	TP672P-***	TP672M-***	TP596M-***
Power Level	XXX=260-300 in 5W steps	XXX=270-310 in 5W steps	XXX=230-270 in 5W steps
Type	Poly-crystalline PV module	Mono-crystalline PV module	Mono-crystalline PV module
Dimension [mm]	1960*990*50	1960*990*50	1580*1064*40
Weight [kg]	19	19	15
Distance between installation holes on one profile [mm]	1000	1000	1000
Fuse rating [A]	15	15	10
Max. system voltage [V]	1000		
Junction box	Protection class IP 65 with bypass diode		
Cable length [mm]	1000		
Cable cross section area [mm^2]	4		
Connector	MC4		
Flammability rating	C		
Wind / snow load [Pa]	5400		
Certificates	All modules: CE-compliant; IEC 61215 (Ed.2); IEC 61730 (Ed.1); UL1703; Application class A		

Talesun Solar Co., Ltd.

T: +86 400 885 1098 Email: sales@talesun.com
F: +86 512 5290 6773 Web: www.talesun.com