

# UL Installation Guide

## for Suntech Power Photovoltaic Module

**SUNTECH**  
*Solar powering a green future™*





# UL Installation Guide (Version UL 11XXXX)

## for Suntech Power Photovoltaic Module

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## Purpose of this guide

- » This guide contains information regarding the installation and safe handling of Suntech Power Co., Ltd photovoltaic module (hereafter referred to as “module”). Suntech Power Co., Ltd referred to as “Suntech”.
- » Installers must read and understand this guide prior to installation. For any questions, please contact our Global Quality & Customer Support department for further information. Installers should follow all safety precautions described in this guide as well as local codes when installing a module.
- » Before installing a solar photovoltaic system, installers should familiarize themselves with its mechanical and electrical requirements. Keep this guide in a safe place for future reference (care and maintenance) and in case of sale or disposal of the modules.

### General safety

- Installing solar photovoltaic systems requires specialized skills and knowledge. Installation should only be performed by qualified persons.
- Installers should assume all risks of injury that might occur during installation, including, but not limited to, the risk of electric shock.
- One single module may generate more than 30V DC when exposed to direct sunlight. Contact with a DC voltage of 30V or more is potentially hazardous.
- Do not disconnect under load.
- Photovoltaic solar modules convert light energy to direct current electrical energy. They are designed for outdoor use. Modules can be ground mounted, mounted on rooftops, vehicles or boats. The proper design of support structures lies within responsibility of the system designers and installers.
- Do not use mirrors or other magnifiers to concentrate sunlight onto the modules.
- When installing the system, abide to all local, regional and national statutory regulations. Obtain a building permit if necessary.
- Under standard test conditions, the electrical characteristics are within  $\pm 10$  percent of the indicated values of  $I_{sc}$  and  $V_{oc}$  (irradiance of  $100\text{mW}/\text{cm}^2$ , AM 1.5 spectrum, cell temperature  $25^\circ\text{C}$  ( $77^\circ\text{F}$ ))
- Only use equipment, connectors, wiring and support frames suitable for solar electric systems.

### Handling safety

- Do not lift the module by grasping the module’s junction box or electrical leads.
- Do not stand or step on the module.
- Do not drop the module or allow objects to fall on the module.

## ***Purpose of this guide***

- To avoid glass breakage, do not place any heavy objects on the module.
- Be cautious when setting the module down on to a surface.
- Inappropriate transport and installation may break the module.
- Do not attempt to disassemble the modules, and do not remove any attached nameplates or components from the modules.
- Do not apply paint or adhesive to the module top surface.
- To avoid damage to the backsheet, do not scratch or hit the backsheet.
- Do not drill holes in the frame. This may compromise the frame strength and cause corrosion of the frame.
- Do not scratch the anodized coating of the frame (except for grounding connection). It may cause corrosion of the frame or compromise the frame strength.
- Be careful when setting the panel down onto a surface, particularly when placing it on a corner.
- A panel with broken glass or torn backsheet cannot be repaired and must not be used since contact with any panel surface or the frame can cause a electric shock.
- Work only under dry conditions, and use only dry tools. Do not handle panels when they are wet unless wearing appropriate protective equipment.
- When storing uninstalled panels outdoors for any period of time, always cover the panels and ensure that the glass faces down to stop water from collecting inside the panel and causing damage to exposed connectors.

### **Installation safety**

- Never open electrical connections or unplug connectors while the circuit is under load.
- Contact with electrically charged parts of the panels, such as terminals, can result in burns, sparks and lethal shock whether or not the panel is connected.
- Do not touch the PV module unnecessarily during installation. The glass surface and the frame may be hot; there is a risk of burns and electric shock.
- Do not work in the rain, snow or in windy conditions
- Avoid exposing cables to direct sunlight in order to prevent their degradation.
- Keep children well away from the system while transporting and installing mechanical and electrical components.
- Completely cover the module with an opaque material during installation to prevent electricity from being generated.
- Do not wear metallic rings, watchbands, ear, nose, lip rings or other metallic objects while installing or troubleshooting photovoltaic systems.
- Use only insulated tools that are approved for working on electrical installations.
- Follow the safety regulations for all other system components, including wires and cables, connectors, charging regulators, inverters, storage batteries, rechargeable batteries, etc.

## *Purpose of this guide*

- Under normal outdoor conditions the current and voltage generated by the system will differ from those listed on the datasheet. Datasheet values are the values measured under standard test conditions. Accordingly, during system designphase, current and short-circuit current should be multiplied by a factor of 1.25 to determine components ratings.
- Only use connectors to connect modules to form a string, or connect to another device. Removing the connectors will make the warranty void.

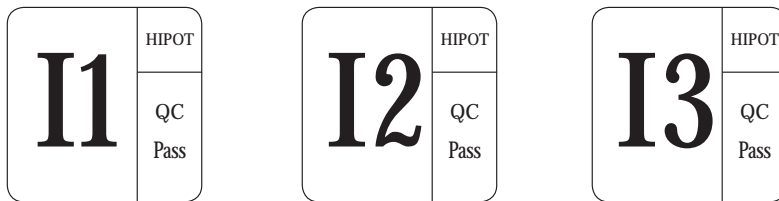
### **Fire Safety**

- Consult your local authority for guidelines and requirements for building or structural fire safety.
- Roof constructions and installations may affect the fire safety of a building; improper installation may create hazards in the event of a fire.
- Use components such as ground fault circuit breakers and fuses as required by local authority.
- Do not use panels near equipment or in places where flammable gases may be generated.
- The modules have been rated Fire Class C, and are suitable for mounting on to a Class A roof.

## Product identification

Each module has three labels providing the following information:

- 1. 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, dimensions etc.; the maximum system voltage of 600 volts DC.
- 2. Current Sorting and Quality label:** three different marks are shown on this sticker. "QC Pass" assures that the module has passed the quality control examination. "HIPOT" means that it has passed the insulation test. Finally modules are sorted out according to their output current, referred as a corresponding symbol "Ix" attached, in which x takes the value 1, 2 or 3. To get optimal performance out of a string of modules it is recommended to connect only modules of the same "Ix" class (for example only I2 modules) in one given string.



Current Sorting and Quality label

- 3. Barcode:** each individual module has a unique serial number. The serial number has 18 digits. The 15th and the 16th digits are the week code, and the 17th and the 18th digits are the year code. For example, xxxxxxxxxxxxxx0106 means the module was made in the first week of 2006. Each module has only one bar code. It is permanently attached to the interior of the module and is visible from the front of the module. This bar code is inserted prior to laminating.



Typical serial number barcode label

***Do not remove any labels. Removing a label will make the Suntech warranty void.***

## Selecting the location

- Select a suitable location for installing the modules.
- The modules should be facing south in northern latitudes and north in southern latitudes.
- For detailed information on the best installation angle, refer to standard solar photovoltaic installation guides or consult a reputable solar installer or systems integrator.
- The module should not be shaded at any time.
- Do not use modules near equipment or in locations where flammable gases may be generated or collected.

## General Installation

- The module mounting structure must be made of durable, corrosion-resistant and UV-resistant material.
- In regions with heavy snowfall in winter, select the height of the mounting system so that the lowest edge of the module is not covered by snow for any length of time. In addition, ensure that the lowest portion of the module is placed high enough so that it is not shaded by plants or trees or damaged by flying sand.
- Modules must be securely attached to the mounting structure.
- Provide adequate ventilation under the modules in conformity to your local regulations. A minimum distance of 10 cm between the roof plane and the frame of the module is generally recommended.
- Always observe the instructions and safety precautions included with the module support frames.
- Do not attempt to drill holes in the glass surface of the modules as this will void the warranty.
- Do not drill additional mounting holes in the module frames of the modules as this will void the warranty.
- Before installing modules on a roof, ensure that the roof construction is suitable. In addition, any roof penetration required to mount the module must be properly sealed to prevent leaks.
- When installing a module on a pole, choose a pole and module mounting structure that will withstand the anticipated winds for the area.
- Dust building up on the surface of the module can impair with their module performance. Suntech recommends installing the modules with a tilt angle of at least 10 degrees, making it easier for dust to be washed off by rain.
- Observe the linear thermal expansion of the module frames (the recommended minimum distance between two modules is 1 cm).
- Always keep the backsheet of the panel free from foreign objects or structural elements, which could come into contact with the panel, especially when the panel is under mechanical load.

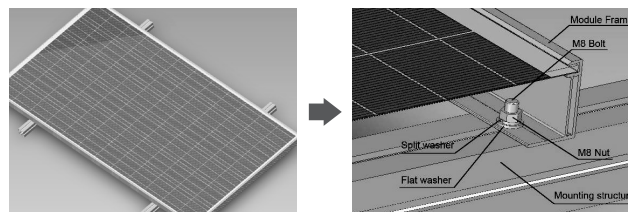


## Mechanical Installation

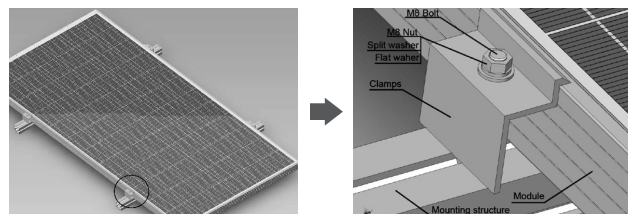
- Ensure panels are not subjected to wind or snow loads exceeding the maximum permissible loads, and are not subject to excessive forces due to the thermal expansion of the support structures: See the following paragraph for more detailed information.

### Installation methods

- Modules can be installed on the frame using mounting holes, clamps or an insertion system. Modules must be installed according to the following examples. Not mounting the modules according to these instructions may void the warranty.



Module installed with mounting holes



Module installed with clamps

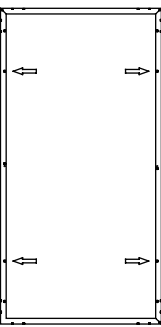
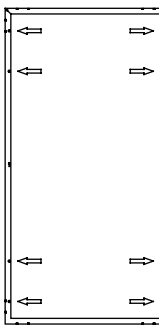
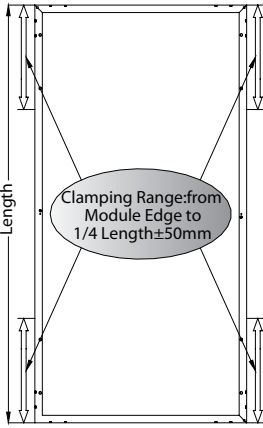
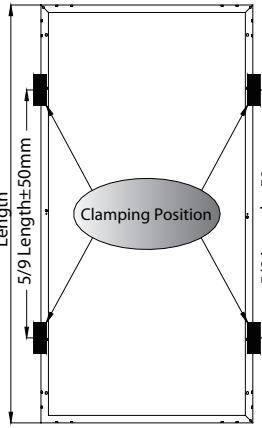
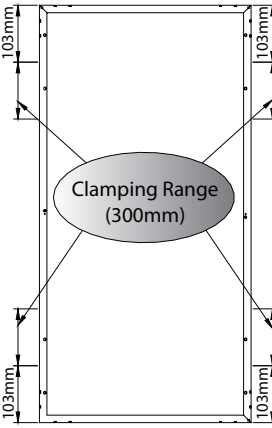
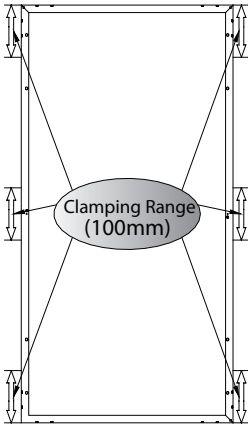
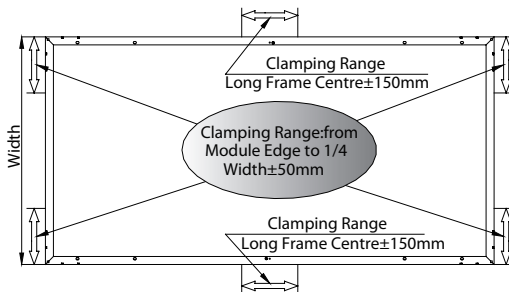
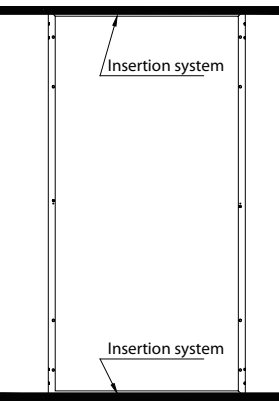
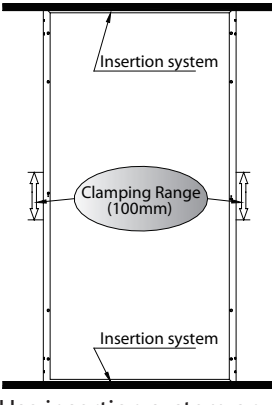
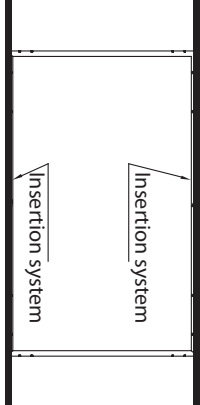
- Module can be installed in both landscape and portrait modes.
- The modules must be properly secured to their support so that they can withstand live load conditions, including wind uplift, to the pressure they have been certified for. It is the installer's responsibility to insure that the clamps used to secure the modules are strong enough.

### Attachment guidelines

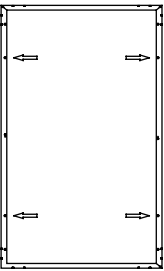
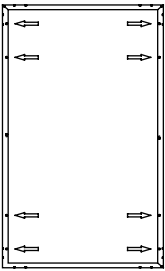
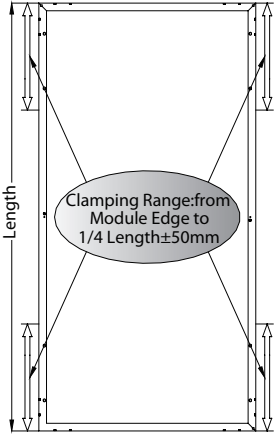
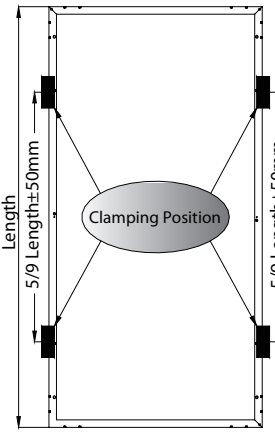
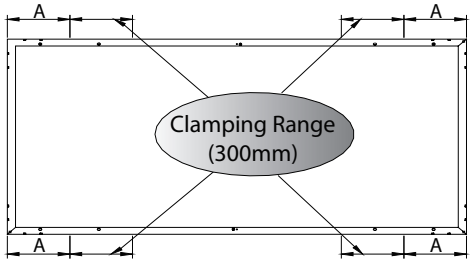
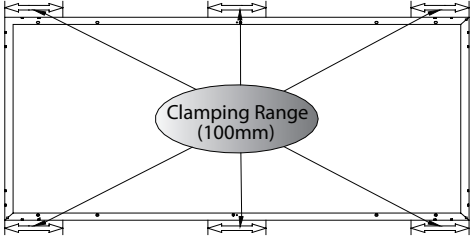
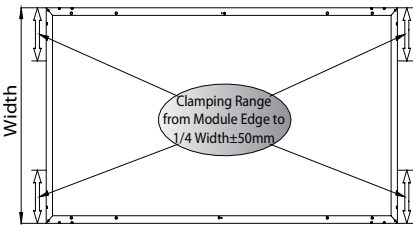
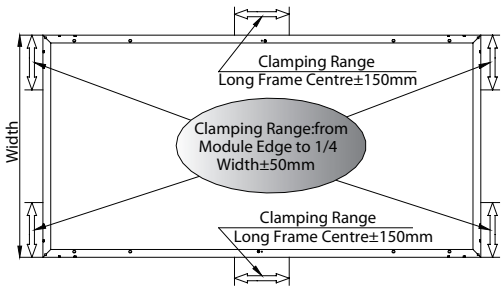
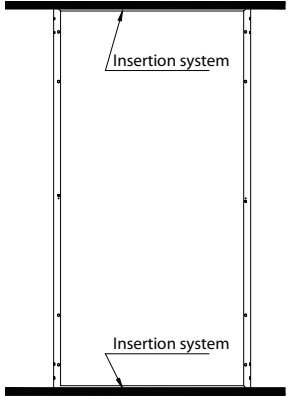
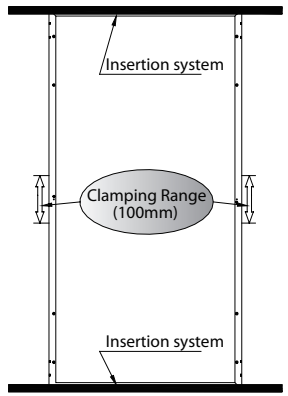
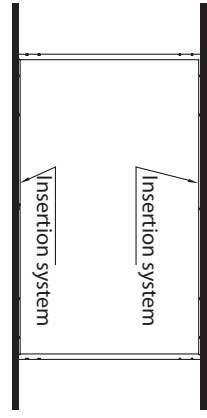
- Select the proper installation method depending on the load (See below for more detailed information). In the tables below the modules have been tested, depending on their installation method, with loads of 2400Pa, 3800Pa or 5400Pa. The maximum acceptable load that the modules can sustain, as imposed by UL 1703 standard, are therefore respectively 1600Pa, 2500Pa or 3600Pa.

Suntech Module Type	Module Dimension Length×Width×Thickness
A Series	1580 mm×808 mm×35 mm
U Series	1482 mm×992 mm×35 mm
W Series	1665 mm×991 mm×50 mm
V Series	1956 mm×992 mm×50 mm

# Suntech A series module

	2400 Pa Load ** (UL 1703: 1600 Pa)	3800 Pa Load ** (UL 1703: 2500 Pa)	5400 Pa Load ** (UL 1703: 3600 Pa)
<b>Mounting system</b>		 <p>Use four mounting holes</p>	 <p>Use eight mounting holes</p>
<b>Clamping system *</b> Attachment to the long frame	 <p>Use four clamps</p>	 <p>Use four clamps</p>	 <p>Use four clamps</p>  <p>Use six clamps</p>
<b>Clamping system *</b> Attachment to the short frame			 <p>Use four clamps on the short frame and two clamps at the center of each long frame</p>
<b>Insertion System</b>	 <p>Use insertion system on short frame</p>		 <p>Use insertion system on a short frame and two clamps at the center of each long frame</p>  <p>Use an insertion system on a long frame</p>

# Suntech U series, W series, V series module

	2400 Pa Load ** (UL 1703: 1600 Pa)	3800 Pa Load ** (UL 1703: 2500 Pa)	5400 Pa Load ** (UL 1703: 3600 Pa)
<b>Mounting system</b>		 <p>Use four mounting holes</p>	 <p>Use eight mounting holes</p>
<b>Clamping system *</b> Attachment to the long frame	 <p>Clamping Range: from Module Edge to <math>1/4 \text{ Length} \pm 50\text{mm}</math></p> <p>Use four clamps</p>	 <p>Clamping Position</p> <p>Use four clamps</p>	 <p>Clamping Range (300mm)</p> <p>A (distance from module edge to clamping range) U series: 96mm; W series: 108mm; V series: 127mm</p>  <p>Clamping Range (100mm)</p>
<b>Clamping system *</b> Attachment to the short frame	 <p>Clamping Range from Module Edge to <math>1/4 \text{ Width} \pm 50\text{mm}</math></p> <p>Use four clamps on short frame</p>		 <p>Clamping Range Long Frame Centre <math>\pm 150\text{mm}</math></p> <p>Clamping Range from Module Edge to <math>1/4 \text{ Width} \pm 50\text{mm}</math></p> <p>Clamping Range Long Frame Centre <math>\pm 150\text{mm}</math></p> <p>Use four clamps on the short frame and two clamps at the center of each long frame</p>
<b>Insertion System</b>	 <p>Insertion system</p> <p>Use insertion system on short frame</p>		 <p>Insertion system</p> <p>Clamping Range (100mm)</p> <p>Insertion system</p> <p>Use insertion system on a short frame and two clamps at the center of each long frame</p>  <p>Insertion system</p> <p>Insertion system</p> <p>Use an insertion system on a long frame</p>

\* The module clamps must not come into contact with the front glass or deform the frame in any way. Avoid shading effects from the module clamps and insertion systems. Drainage holes in the module frame must not be closed or obscured by the clamps.

\*\* The installation methods applicable for 5400Pa are also relevant for 3800Pa and 2400Pa. The installation methods applicable for 3800Pa are also relevant for 2400Pa

## Electrical Installation

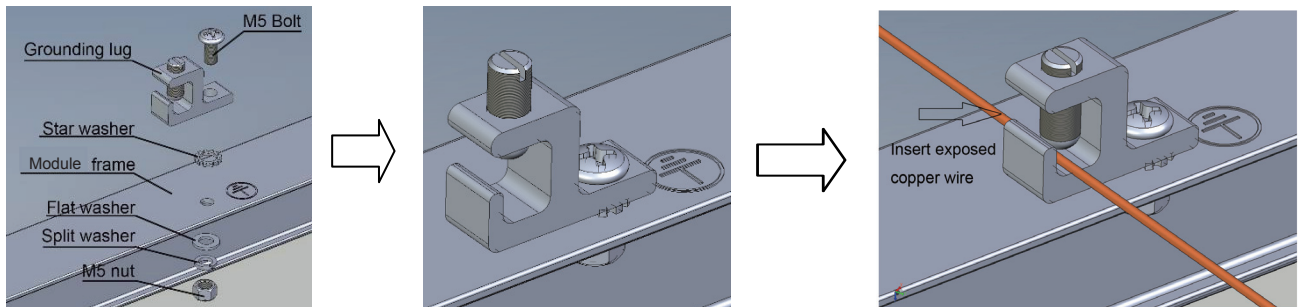
### General installation

- Any hardware used must be compatible with the mounting structure material to avoid galvanic corrosion
- It is not recommended to use modules with different configurations (grounding, wiring) in the same system.
- For applications requiring a high operating voltage several modules can be connected in series to form a string of modules; the system voltage is then equal to the sum of the voltage of each module.
- For applications requiring high operating currents several strings of modules can be connected in parallel; the system current is then equal to the sum of the current of each string of modules.
- Our modules are supplied with connectors to be used for system electrical connections.
- The maximum number of series connected modules depends on system design, the type of inverter used and environmental conditions.
- The maximum system voltage is 600 volts DC according to UL standards. However products are rated for use up to 1000V where UL standards do not apply.
- There is no limitation on the number of modules that can be connected in parallel, the number of modules is determined by system design parameters such as current or power output.
- Please refer to local regulations to determine the system wires size, type and temperature.
- To prevent the cables and the connectors from overheating, the cross section of the cables and the capacity of the connectors must be selected to suit the maximum system short circuit current (The recommended cable is PV wire with a cross section of at least 4mm<sup>2</sup> and the recommended connector is Amphenol H4, Multi Contact MC4 or equivalent ) .
- The DC current generated by photovoltaic systems can be converted into AC and fed into a public grid. As local utilities' policies on connecting renewable energy systems to their grids vary from region to region. A qualified system designer or integrator should always be consulted. Building permits, inspections and approvals by the local utility are generally required.

### Grounding

- For grounding and bonding requirements, please refer to regional and national safety and electricity standards. If grounding is required, use a recommended connector type for the grounding wire.
- If grounding is required, the grounding wire must be properly fastened to the module frame to assure adequate electrical connection.
- Suntech recommends the lay-in lug (Cat. No. GBL-4DBT (Supplier: ILSCO)) when grounding. Please refer to relevant connector specifications for instructions.

- For GBL-4DBT grounding lug, assemble the grounding lug to the aluminum frame using stainless steel M5 screw and hardware as shown below. The star washer is fitted directly under the grounding lug and makes electrical contact by penetrating the anodized coating of the aluminum frame; the screw assembly is further fitted with a flat washer, then a split lock washer and finally a nut to secure the entire assembly (see the pictures below). Recommended M5 screw assembly torque is 1.5 N•m. Next, insert the ground wire (10-12AWG exposed copper wire is recommended) to the feet of the lug, and screw down the slotted screw. Be careful not to damage the wire core.



## Maintenance

To ensure optimum module performance, Suntech recommends the following maintenance measures:

- Clean the glass surface of the module when required. Always use clean water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent may be used to remove stubborn dirt.
- Check the electrical, grounding and mechanical connections every six months to verify that they are clean, secure, undamaged and free of corrosion.
- If any problem arises, consult a professional for suggestions.
- Caution: observe the maintenance instructions for all components used in the system, such as support frames, charging regulators, inverters, batteries etc.

## Disclaimer of liability

- As the adherence to this manual and the conditions or methods of installation, operation, use and maintenance of photovoltaic (PV) products are beyond Suntech's control, Suntech does not accept responsibility and expressly disclaims liability for any loss, damage, or expense arising out of or in any way connected with such installation, operation, use or maintenance.
- No responsibility is assumed by Suntech for any infringement of patents or other rights of third parties, which may result from the use of the PV product. No license is granted by implication or otherwise under any patent or patent rights.
- The information in this manual is based on Suntech's best knowledge and experience and is believed to be reliable; but such information including product specification (without limitations) and suggestions do not constitute a warranty, express or implied. Suntech reserves the right to change the manual, the PV produce, the specifications, or product information sheets without prior notice.

### A series - outer dimensions - 1580 mm×808 mm×35 mm

Module	Optimum Operating Voltage (Vmp) at STC, (V dc)	Optimum Operating Current (Imp) at STC, (A dc)	Open Circuit Voltage (Voc) at STC, (V dc)	Short Circuit Current (Isc) at STC, (A dc)	Maximum Power (Pmax) at STC, (Watts)	Maximum System Voltage	Maximum Series Fuse Rating
STP195S-24/Ad+	36.6	5.33	45.4	5.69	195	600	15
STP190S-24/Ad+	36.6	5.20	45.2	5.62	190	600	15
STP185S-24/Ad+	36.4	5.09	45.0	5.43	185	600	15
STP180S-24/Ad+	36.0	5.00	44.8	5.29	180	600	15
STP175S-24/Ad+	35.8	4.90	44.7	5.23	175	600	15
STP190S-24/Adb+	36.6	5.20	45.2	5.62	190	600	15
STP185S-24/Adb+	36.4	5.09	45.0	5.43	185	600	15
STP180S-24/Adb+	36.0	5.00	44.8	5.29	180	600	15
STP175S-24/Adb+	35.8	4.90	44.7	5.23	175	600	15
PLUTO200-Ade	38.7	5.17	45.9	5.50	200	600	15
PLUTO195-Ade	38.3	5.10	45.6	5.47	195	600	15
PLUTO190-Ade	37.8	5.03	45.4	5.43	190	600	15
PLUTO185-Ade	37.3	4.96	45.2	5.39	185	600	15

### W series - outer dimensions - 1665 mm×991 mm×50 mm

Module	Optimum Operating Voltage (Vmp) at STC, (V dc)	Optimum Operating Current (Imp) at STC, (A dc)	Open Circuit Voltage (Voc) at STC, (V dc)	Short Circuit Current (Isc) at STC, (A dc)	Maximum Power (Pmax) at STC, (Watts)	Maximum System Voltage	Maximum Series Fuse Rating
STP230-20/Wd	29.8	7.72	36.8	8.25	230	600	20
STP225-20/Wd	29.6	7.61	36.7	8.15	225	600	20
STP220-20/Wd	29.5	7.46	36.6	8.05	220	600	20
STP215-20/Wd	29.2	7.37	36.5	7.95	215	600	20
STP210-20/Wd	29.0	7.25	36.4	7.86	210	600	20

### U series - outer dimensions - 1482 mm×992 mm×35 mm

Module	Optimum Operating Voltage (Vmp) at STC, (V dc)	Optimum Operating Current (Imp) at STC, (A dc)	Open Circuit Voltage (Voc) at STC, (V dc)	Short Circuit Current (Isc) at STC, (A dc)	Maximum Power (Pmax) at STC, (Watts)	Maximum System Voltage	Maximum Series Fuse Rating
STP220-18/Ud	27.7	7.95	34.0	8.45	220	600	20
STP215-18/Ud	27.1	7.95	33.8	8.40	215	600	20
STP210-18/Ud	26.4	7.95	33.6	8.33	210	600	20
STP205-18/Ud	26.3	7.80	33.5	8.23	205	600	20
STP200-18/Ud	26.2	7.63	33.4	8.12	200	600	20
STP190-18/Ud	26.0	7.31	33.0	7.89	190	600	20

### V series - outer dimensions - 1956 mm×992 mm×50 mm

Module	Optimum Operating Voltage (Vmp) at STC, (V dc)	Optimum Operating Current (Imp) at STC, (A dc)	Open Circuit Voltage (Voc) at STC, (V dc)	Short Circuit Current (Isc) at STC, (A dc)	Maximum Power (Pmax) at STC, (Watts)	Maximum System Voltage	Maximum Series Fuse Rating
STP290-24/Vd	36.5	7.95	44.8	8.40	290	600	20
STP285-24/Vd	35.8	7.95	44.8	8.37	285	600	20
STP280-24/Vd	35.2	7.95	44.8	8.33	280	600	20
STP275-24/Vd	35.1	7.84	44.7	8.26	275	600	20
STP270-24/Vd	35.0	7.71	44.5	8.20	270	600	20
STP260-24/Vd	34.8	7.47	44.0	8.09	260	600	20



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